

BLACKWATER NATIONAL WILDLIFE REFUGE  
Cambridge, Maryland

Martin NWR  
Susquehanna NWR

ANNUAL NARRATIVE REPORT

Calendar Year 1993

U.S. Department of the Interior  
Fish and Wildlife Service

NATIONAL WILDLIFE REFUGE SYSTEM

REVIEW AND APPROVALS

BLACKWATER NATIONAL WILDLIFE REFUGE COMPLEX

Blackwater National Wildlife Refuge

Susquehanna National Wildlife Refuge

Martin National Wildlife Refuge

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Calendar Year 1993

  
Project Leader

3/1/95  
Date

  
Associate Manager  
Division of Refuges-South

10-10-95  
Date

  
Regional Office Approval

10-11-95  
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## 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 20,885 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 water-birds.

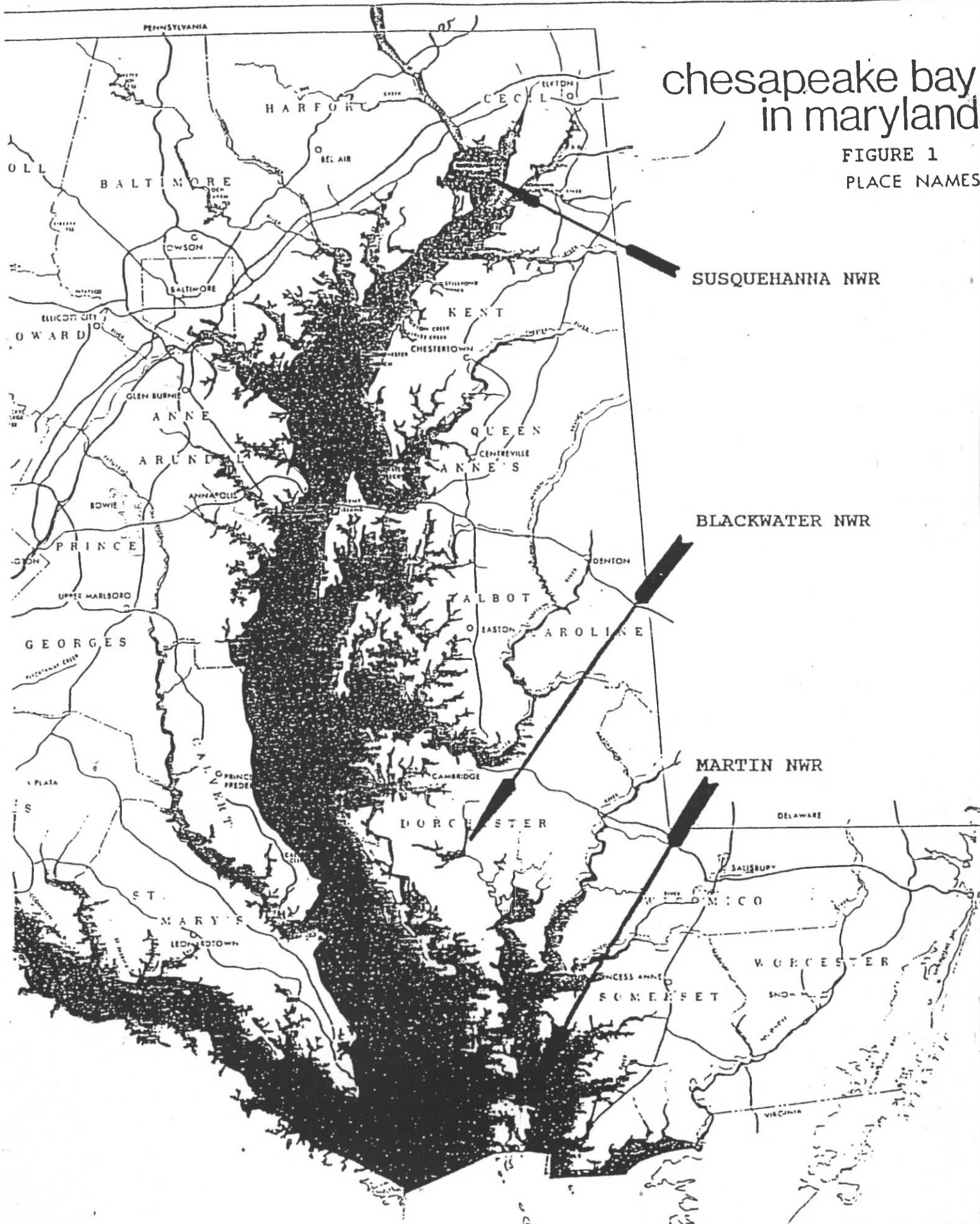
Two additional refuges, Eastern Neck NWR and Mason Neck NWR, were historically administered as part of the complex, but became independently operated in 1966 and 1973, respectively.

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).

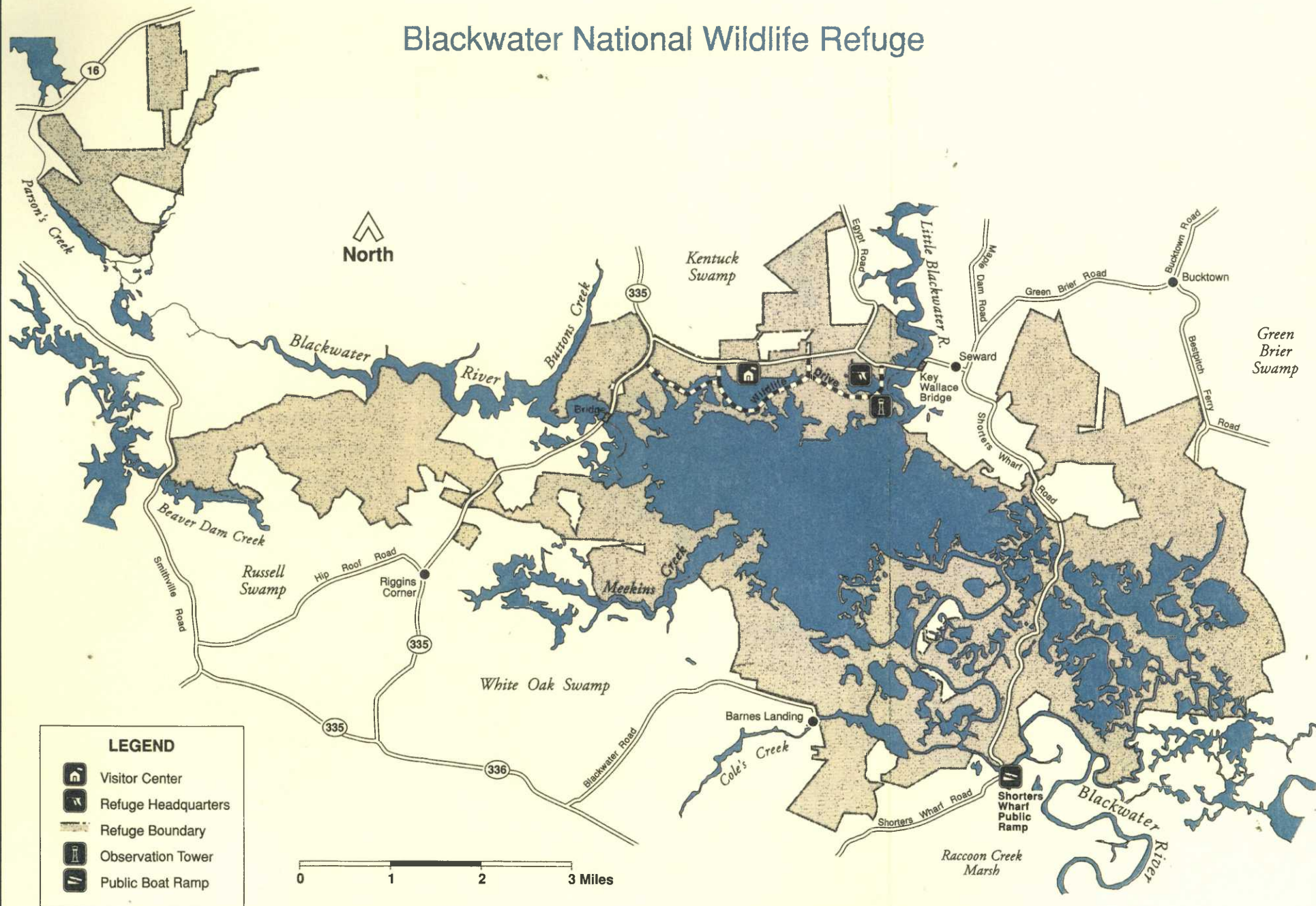
# chesapeake bay in maryland

FIGURE 1  
PLACE NAMES





# Blackwater National Wildlife Refuge



## LEGEND

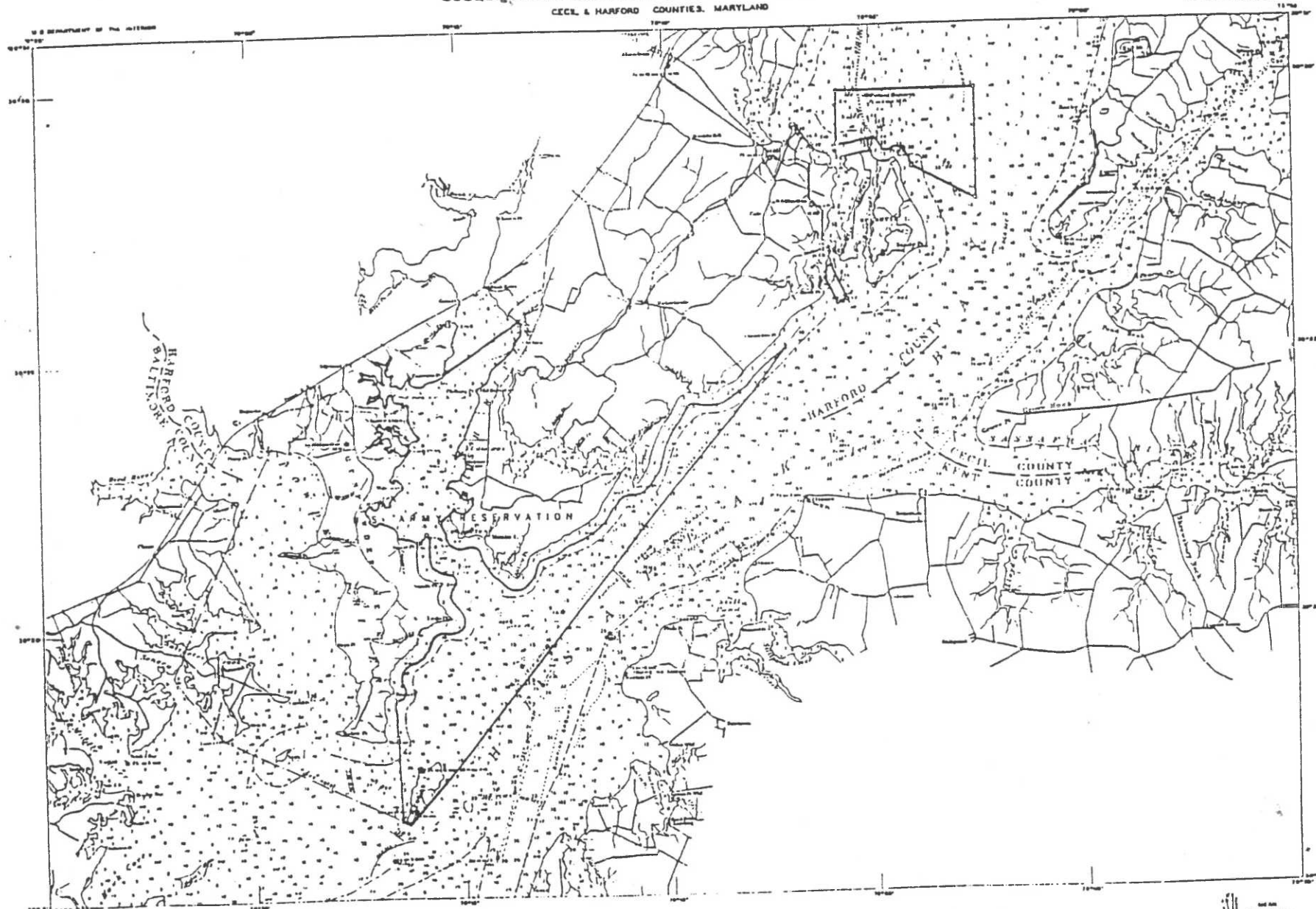
-  Visitor Center
-  Refuge Headquarters
-  Refuge Boundary
-  Observation Tower
-  Public Boat Ramp

NOTE: Barren Island and Bishops Head divisions are not shown

# SUSQUEHANNA MIGRATORY WATERFOWL CLOSED AREA CECE & HARFORD COUNTIES, MARYLAND

FISH AND WILDLIFE SERVICE

FIGURE 3



COMPILED BY THE DIVISION OF LAND ACQUISITION  
ON DATA OF W.F.A.S.  
NO. 1000-1000-0-00, 0-07-00  
SEPTEMBER 1950

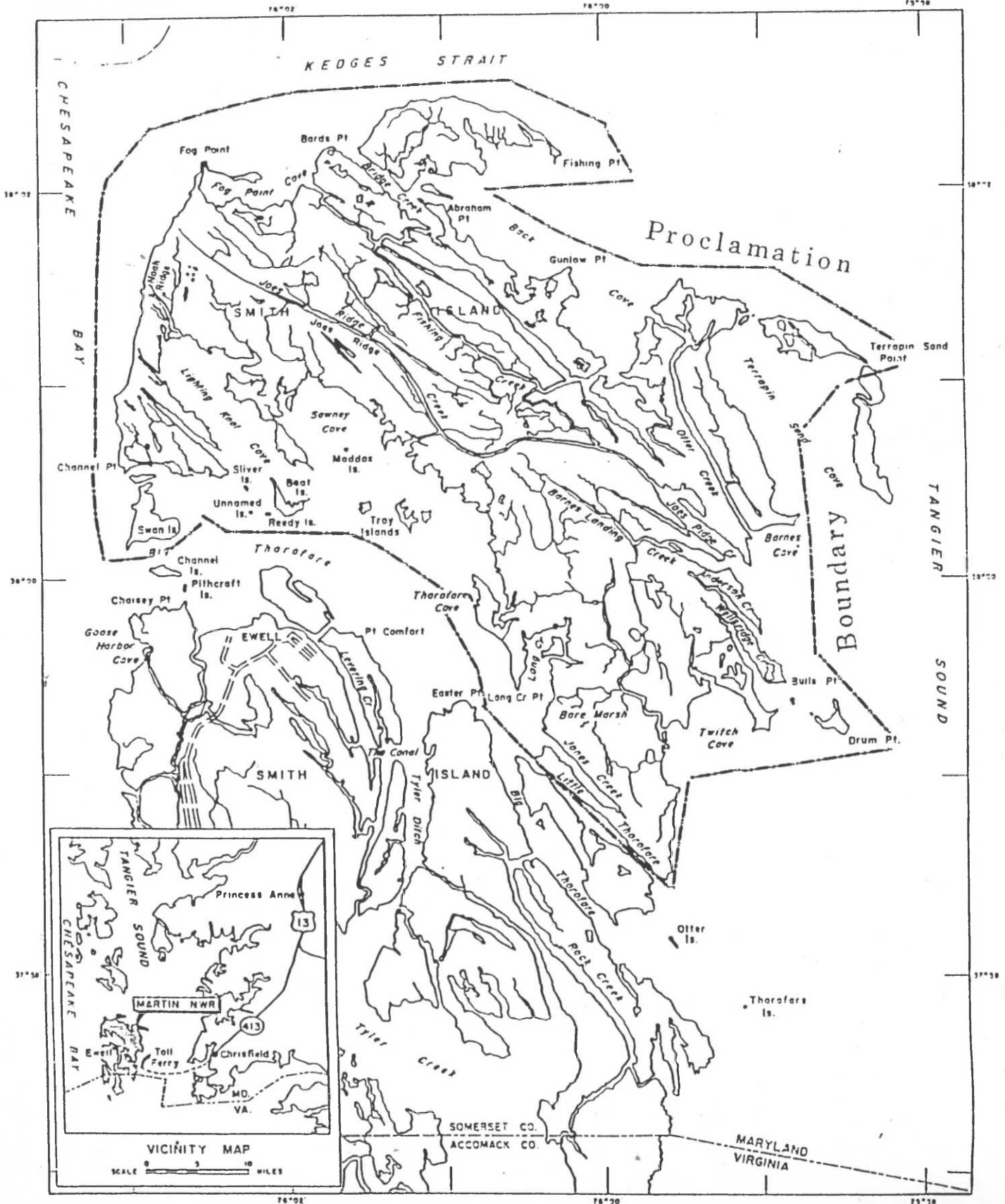
Scale 1:100,000

42 303M

FIGURE 4  
MARTIN NATIONAL WILDLIFE REFUGE  
SOMERSET COUNTY, MARYLAND

UNITED STATES  
DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE  
BUREAU OF SPORT FISHERIES AND WILDLIFE



COMPILED IN THE DIVISION OF REALTY  
FROM SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA

SEPTEMBER, 1970

Scale 0 1000 2000 4000 6000 8000 FEET  
1/4 1/2 3/4 1 1 1/2 MILE



MEAN  
DECLINATION  
1970

4R-MD-46



BLACKWATER

**BLACKWATER NATIONAL WILDLIFE REFUGE**  
Cambridge, Maryland

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Calendar Year 1993

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

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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), North American Wetlands Conservation Act (NAWCA), Refuge Administration Act (RAA), and the Refuge Recreation Act (RRA) for the purposes of providing additional wetland habitats for migratory birds and for the Southern bald eagle, the Delmarva fox squirrel, and other endangered species.

## A. HIGHLIGHTS

Project Leader Carowan met with Drs. Griffin and Sparrowe as part of the Service's continuing initiative regarding the conservation of biological diversity in the NWRS. (Section E.7.a).

On June 28, Tom Merryweather, Esq., finalized the land exchange with refuge neighbor David J. Wooten, thereby securing fee title to the property at the main entrance to the Williams Tract. (Section C.1).

The refuge sent two firefighters to battle the "Gnatcatcher" fire in Okefenokee NWR. (Section F.9).

Representatives from The Nature Conservancy, The Conservation Fund, and the North American Waterfowl and Wetlands Office toured the Big Blackwater, Nanticoke, and Marshyhope Rivers. (Section J.3).

Project Leader Carowan served as a member of the U.S. delegation to the fifth meeting of The Conference of the Contracting Parties to the Ramsar Convention in Kushiro, Japan from June 6-18. (Section J.3).

On June 9, the Regional Director approved the Advanced Planning Document for construction of the proposed visitor center/office. (Section H.1).

Blackwater NWR received a \$1,080,000 grant from the North American Wetlands Conservation Act in March. (Section C.1).

The refuge continued to refine its use of aerial ignition for wildfire suppression, burning almost 2150 acres in 3½ hours. (Section F.9).

Dorchester County's Environthon Team won the National Competition in Niagara Falls. (Section H.2).

Project Leader Carowan received the regions first John S. Gottschalk Partnership Award. (Section J.3).

# B. CLIMATIC CONDITIONS

Table 1. 1993 temperature and precipitation collected from the National Weather Service Weather Station in Baltimore, Maryland.

Month	High Temp. (°F.)	Low Temp. (°F.)	Precipitation
January	45.7	30.0	2.73"
February	40.3	22.4	2.84"
March	47.5	31.3	8.12"
April	63.3	41.7	3.68"
May	76.5	53.5	3.66"
June	83.9	60.5	2.56"
July	90.7	69.6	1.71"
August	87.8	65.5	2.55"
September	78.2	59.4	4.09"
October	65.3	45.6	3.02"
November	56.8	36.1	3.09"
December	44.0	28.4	4.45"

Mean Annual Temperature 55.2 F

TOTAL = 42.50"

In March, Blackwater NWR experienced a severe northeast storm with accompanying snow, rain, and wind. Tides were extremely high and several trees were lost, but structural damage was minimal.

After a very wet spring, dry conditions began in early June and settled in for the summer. Lack of rainfall delayed plantings of Japanese millet and buckwheat until the very

last threshold of the planting season in early September. Corn growth and production was dramatically reduced as heat and lack of moisture during tasseling (pollination) periods took their toll. Delayed growth of corn and sorghum allowed late season corn earworm infestations to damage the grain that was produced. Late planted clover that had not been planted earlier because of wet conditions simply was lost in some fields due to lack of moisture. Many acres of Maryland's Eastern Shore farmland suffered the same fate. Rainfall at the refuge totaled 4.26" compared to the normal 9.61" average for July and August.

A FWS-11 fire weather station was purchased with Regional fire management funds and installed to record conditions preceding and during prescribed burning activities. (See Section F.9).

### C. LAND ACQUISITION

#### 1. Fee Title

1993 continued to be as exciting and challenging as 1992 for acquisition programs and associated activities on Blackwater Refuge.

#### **GREEN BRIAR SWAMP ACQUISITION (Williams Tract)**

Although the Service closed on the Williams Tract on December 30, 1992, negotiations with adjoining landowners continued through much of the earlier months of 1993 to settle disputed ownerships on adjoining parcels. From the onset of negotiations for the Williams Tract, it was evident that ownership of Parcel 3 (Figure 5) was going to be contested by the adjoining owner, Reverend D. J. Wooten. Reverend Wooten had for several years occupied this parcel and had made numerous improvements to same, believing that the land was his. The Refuge, unwilling to jeopardize the million dollar land deal with Mr. Williams, negotiated a mutually acceptable compromise for all parties concerned, and interceded on Reverend Wooten's behalf to redefine the boundary between the Williams and Wooten properties. Tom Merryweather, Esq., the Service's local attorney, reviewed these plans on May 20 and subsequently obtained a tax-free donation from Mr. Williams of 5.36 acres to Wooten Ministries, Inc. on June 28. The Refuge, in return for its "good deeds," was deeded in fee title approximately 5,000 square feet of property owned by Reverend Wooten at the main entrance of the Williams Tract, an action that eliminated any possibility for future controversy over the ownership of the entranceway to the Williams Tract.





Fig. 5. Contested parcel 3 of the Williams Tract (GCH).

**CHESAPEAKE FOREST PRODUCTS COMPANY AND DELMARVA PROPERTIES INCORPORATED**

On April 13, Project Leader Carowan met with Dick Brake and Charlie Kerns of Delmarva Properties, Inc. and with Tom Tyler of Chesapeake Forest Products Company to review a substantial list of significant wetland tracts that are managed by Chesapeake and were being offered for sale. After more than 18 months of negotiating with Chesapeake, it appeared as if the refuge would be the recipient of an additional 1500± acres approved for acquisition by the Director in 1992 (Linthicum and Valliant Tracts).

Carowan met with David Sutherland and Pat Noonan on April 29 to discuss The Conservation Fund's role in funding the acquisition of these tracts, as well as the potential for developing an extremely diverse partnership involving multiple local, State, and Federal agencies and organizations to acquire, as a package, approximately 5050 acres of extremely important wetlands on the Eastern Shore. Carowan also secured a commitment from Chesapeake Forest Products to participate as a partner in this larger acquisition effort by donating one, if not more, of the 24 tracts being considered for acquisition.

Follow-up meetings were held with representatives of Chesapeake Forest Products Company and Delmarva Properties, Inc. on May 12, August 4, and October 1. However, by year's end, no formal negotiations were underway, even though Realty had agreed to focus FY94 attention on the acquisition of the 1131-acre Linthicum Tract and 324-acre Valliant Tract.

#### **NANTICOKE RIVER NATIONAL WILDLIFE REFUGE**

The Draft Preliminary Project Proposal for the establishment of the new Nanticoke River National Wildlife Refuge in Dorchester and Wicomico Counties, Maryland and Sussex County, Delaware was prepared in July. The proposed refuge would encompass approximately 16,000 acres of tidal wetlands and adjacent floodplain fields and forested buffer habitat.

The Nanticoke River is one of the last relatively pristine major watersheds on Maryland's lower southwestern Eastern Shore. The Nanticoke is an essential wintering area for black ducks and canvasbacks. Also, habitat types support active bald eagle nesting sites and are suitable for the Delmarva fox squirrel population recovery. The river serves as a major spawning and nursery habitat for striped bass and other important anadromous fish species including alewives and blueback herring. The project area is listed in the Regional Wetlands Concept Plan and is located within the Delaware-Maryland portion of the Atlantic Joint Venture Area, more specifically the Blackwater River-Nanticoke River Focus Area. Additionally, the project area supports the objectives of the Management Plan for Canada Geese in Maryland and the Chesapeake Bay Waterfowl Policy and Management Plan that was adopted by the Chesapeake Executive Council.

Specific wetland sites along the Nanticoke River that have been identified by the Service's Regional Wetlands Concept Plan for protection include:

- ▶ Mouth of the Nanticoke River and Fishing Bay tidal marshes (1,000 acres).
- ▶ Upper Nanticoke River and Marshyhope Creek tidal marshes and upland forest areas (4,000 to 6,000 acres).
- ▶ Wheatly Marsh, located immediately east of the Nanticoke River and adjacent to Jack's Creek (650 acres).
- ▶ Mill Creek area on the western shore of the Nanticoke River south of Vienna, Maryland (2,000 acres).

- ▶ Hurley Neck, south of Cokeland.
- ▶ Chicone Creek, northern shore of Nanticoke River, northeast of Vienna, Maryland.
- ▶ Sharptown Bog (115 acres) and Plum Creek Bog (50 acres).
- ▶ Round Island Gut, eastern shore of the Nanticoke River (1,550 to 2,000 acres).
- ▶ Pole Point/Marshall Point Marshes on the eastern shore of the Nanticoke River (2,100 acres).
- ▶ Chapter Point/Quantico Marshes, along the Nanticoke River between Long Point and Penknife Point (1,550 acres).

Three Natural Heritage Areas are within the proposed refuge area: Chicone Creek, Mill Creek, and the Upper Nanticoke River, Marshes, and Swamps.

The Chicone Creek Natural Heritage Area is a complex of tidal and non-tidal wetlands, plus an unusual uplands community. The latter is unusual in that, contrary to most ancient dunes, soil pH is apparently circumneutral. The cause of this anomaly is unknown, but the combination of well-drained sandy soil and high pH has resulted in a mixed deciduous community with piedmont affinities. In addition, two State-listed species are associated with the uplands area, the endangered Cream-flowered Tick-trefoil and the threatened Wild Lupine.

The Mill Creek Natural Heritage Area is an expansive complex of tidal and non-tidal wetlands. About two-thirds of the area is comprised of an "extensive marsh" type along the Nanticoke River. This type of marsh is of similar length and width and is drained by many tidal channels and creeks which have freshwater input from land. It is occupied by two communities, a Tidal Freshwater Mixed community and a Tidal Mudflat community. The Tidal Freshwater Mixed community is characterized by giant cordgrass, wild rice, arrow arum, cutgrass, marsh mallow, marsh elder, waterdock, switchgrass, and a variety of other species. The Tidal Mudflat Community is nonvegetated, exposed at low tide, and is characterized by spionid worms, mud snails, razor clams, and bloodworms. This Natural Heritage Area supports two State-listed species, the threatened Spongy Lophotocarpus and the endangered Marsh Wild Senna. The latter is also a candidate for Federal listing, and the population at Mill Creek is the only one known in the State.

The Upper Nanticoke area contains expansive tidal marshes, forested and unforested non-tidal wetlands, and ancient xeric dunes. Approximately three-five tons of detritus are produced per acre annually from this area. Forested non-tidal wetlands support the endangered Red-Berried Greenbrier, Giant Sedge, and Torrey's Rush. One type of non-tidal wetland supports the threatened Northern Pitcher Plant, while the non-tidal wetlands complex formed by Gales Creek and Galestown Millpond support at least 12 species of rare and endangered plants and animals.

On August 26, Project Leader Carowan met with Mr. Tom Tyler of Chesapeake Forest Products to tour the Davenport Tract, a 1,900-acre tract on the lower Nanticoke that joins the Fishing Bay marshes to the Nanticoke marshes near Cokeland. The owners of this tract are more than willing to sell, and the tract has great potential as the first for the new Nanticoke NWR since it represents the best roosting habitat for the Nanticoke's Canada goose flock. At year's end, The Conservation Fund had initiated negotiations with the owners.

#### UPPER BLACKWATER RIVER ACQUISITIONS

Subsequent to the completion of the 1992 Preliminary Project Proposal (PPP) for the Upper Blackwater River acquisitions, efforts were initiated to accomplish appraisals and negotiations so that these lands could be added to the Refuge as funds became available.

- The seven parcels that composed the 1992 PPP included the 1331-acre **Ewing/Madison** Tract, the 331-acre **Valliant** Tract, and the 301-acre **Burton** Tract, all of which are located approximately 3 miles northwest of the Refuge's northern boundary, within the upper headwaters of the Blackwater River watershed. The PPP also included the 1,146-acre **Linthicum** Tract, the 459-acre **Howard** property (Hog Range), the 201.9-acre **Mills** property, and the 150-acre **Seward** property.

(See 1992 Annual Narrative Report for a full description of acquisition objectives, habitat descriptions, and project justification.)

For simplicity in describing acquisition efforts in 1993, activities for each tract will be discussed separately as follows:



## **NORTH AMERICAN WETLANDS CONSERVATION ACT GRANT**

**EWING/MADISON TRACT:** This 1,331 acre tract was one of three parcels that formed the basis for the 1992 grant proposal to the North American Wetlands Conservation Council. Upon receiving the grant for \$1,080,000 in March (See 1992 ANR), The Conservation Fund (TCF) immediately initiated negotiations with Mr. Ewing. After some exasperating delays resulting from the landowner's discontent with the price that was being offered in the original negotiations, Project Leader Carowan was able to counsel the landowner into a more favorable mood that eventually resulted in TCF landing an option. By the end of April, the first of the two required appraisals was completed by Jeff Williamson, and the Service's appraiser, Howard Rybolt, had initiated the second. On August 24, TCF closed on the 1331-acre Ewing Tract.



Fig. 6. The Ewing/Madison Tract. (GCH)

On August 30, Mr. Carowan and Mr. David Sutherland from TCF discussed the transfer of the Ewing Tract to the Service, and a potential plan for an additional partnership that would establish a sustainable forestry program on this property, facilitate a trust fund for future acquisitions within the Blackwater/Nanticoke Focus Area, and facilitate the development of a variety of endangered species recovery plan activities with minimum or no cost to the Service.

Table 2.

## NAWCA MATCHING PARTNER CONTRIBUTORS

MILESTONE	ACREAGE	PROPOSED COMPLETION DATE	COMPLETION DATE	RESPONSIBLE PARTNER	FINAL \$ CONTRIBUTION
Acquire Bishops Head properties	430	May, 1992	June, 1992	TCF	
Fee title transfer of Bishops Head to FWS/Blackwater NWR by donation from The Conservation Fund (TCF)	430	June, 1992	Dec. 17, 1992	TCF/FWS	\$ 413,000
Acquire Howard Tract	459.47	July, 1992	Nov. 30, 1992	TCF	
Fee title transfer of Howard Tract to FWS/Blackwater NWR by donation to FWS/Blackwater from TCF	459.47	Sept., 1992	Dec. 28, 1992	TCF/FWS	\$1,129,441
Stabilize eroding marsh at Bishops Head	250 ft. shoreline	Aug., 1994		CBF	\$ 8,000
Boundary establishment and surveys	2225.47	Not identified	Mar. 15, 1993	FWS	\$ 10,000
Acquire Madison Tract	1336	Sept. 5, 1993	Aug. 24, 1993	TCF	\$1,980,000
Fee title transfer of Madison Tract to FWS/Blackwater NWR	856	Oct. 5, 1993	Feb. 28, 1994	TNC \$ 130,000 NAWCA \$1,080,000	\$1,210,000
Transfer management of easement on Madison Tract to FWS/Blackwater by TCF	480	Oct. 5, 1993	Apr. 1, 1994	TCF/FWS	\$ 770,000
TOTAL ACRES PROTECTED	2225.47	TOTAL CONTRIBUTION			\$3,540,441



Sutherland subsequently scheduled a meeting in the RO to discuss this partnership plan on August 31, and received the Regional Director's approval to proceed. On October 8, Project Leader Carowan and Biologist Hartis met with Howard Rybolt (FWS RE), Rupert Friday (Chesapeake Bay Foundation), David Sutherland (TCF), and local surveyor John Andrews to review the plan to develop a sustainable forestry program on 400 acres of the 1331-acre Ewing Tract. The program will be used to demonstrate "best management" forestry practices and to develop forestry management prescriptions for harvesting timber where Delmarva fox squirrels are an issue.

Realty had anticipated closing with TCF by year's end, but this was not possible; however, the property is scheduled for fee title transfer to the Service in 1994. This property will represent a significant addition to the refuge's effort in acquiring the Blackwater River watershed.

**VALLIANT, LINTHICUM, BURTON, AND MILLS TRACTS:** In December, Don Connor and Walt Quist from RE visited the refuge to discuss FY94 acquisition strategies. The refuge received \$1,000,000 from the Migratory Bird Conservation account for FY94, and it was agreed that acquisition efforts would be focused on acquiring these four tracts as soon as possible.

Mr. Tom Sampson (RE) met with Mr. Larry Mills on December 14, and cruised the timber on the Mills Tract as the first step in negotiating a selling price.

**HOWARD TRACT:** The Howard property was purchased by The Conservation Fund and donated to the refuge on December 28, 1992.

**SEWARD TRACT:** The property dispute over ownership of the Seward Tract remained unsettled. Until this case is adjudicated, the refuge will not be able to receive the proposed donation from the Hughes family.

**NEW ADDITIONS ON THE UPPER BLACKWATER:** Three additional landowners approached the refuge with interest in selling their properties on the upper Blackwater River system. These included properties owned by Spicer, Inc., Ms. Susan Elliott, and Mr. Roger Adams; properties which total over 2,000 additional acres. RE advised these landowners that the Service would be interested in acquiring their lands, and it was subsequently agreed to develop a consolidated PPP for all the tracts in the Upper Blackwater System, similar to the one developed in 1992 for the previously discussed seven tracts.

## **MONROE LAKE PROPERTIES**

On October 4, the refuge staff was notified that four tracts within the "proposed" boundary were being considered for sale by the heirs of the Lake and Pinder estates to settle debts owed to IRS. Project Leader Carowan spoke to the families' attorney, Bo Earnest, to determine the status and timing of the sale. Carowan also informed Realty of refuge priorities, and discussed acquisition with The Conservation Fund. Of particular interest is the 178-acre Lake Tract that is sandwiched between the recent purchases from Pascal and Williams.

On October 31, Project Leader Carowan completed the LARC Presentation Check List for the properties owned by the estates of Monroe R. Lake and Leomia Pinder, et al. Subsequent discussions with the families' attorney continued throughout the remainder of the year as everyone waited for the IRS to determine the amount of delinquent taxes owed.

### **2. Easements**

#### **JONES EASEMENT**

In early 1992, the refuge received notice of its first conservation easement from Farmers Home Administration (FmHA). The easement is in Caroline County, approximately 60 miles from headquarters.

The 3.37-acre easement is located on one end of a 150-acre soybean field perched on top of a very sandy hill that, according to the current owner, requires frequent irrigation to produce a crop. The area that was described in the Regional Director's November 27, 1989 letter to William Walmsley, Chief of the Farmer Programs for FmHA, was to be "palustrine emergent wetlands." Hardly so! This area, when inspected during the wettest time of the year, could hardly be classified as any kind of wetland. The ground water level was more than five feet below the surface, and the drainage is actually owned by a separate private individual, so restoration is completely out of the question. Only through excavation will the area ever be functional as a wetland because of the soils, drainage, and topography.

For these reasons, Project Leader Carowan filed a formal appeal to the Regional Office on March 6, 1992 recommending that "we do everything in our power to cancel, void, or hex ourselves out of this easement, and that we so notify FmHA."

After several discussions with personnel in Enhancement and differing opinions as to the importance of this area as a wetland throughout the balance of 1992 and most of 1993, no formal action was taken. At the end of 1993, the final instruction from Ecological Services regarding enforcing the provisions of the easement was **"to ignore that the easement exists."** We are to periodically visit the easement site, but that is all.

#### **HADDER EASEMENT**

At the end of 1993, we learned much to our surprise and bewilderment that the Refuge had yet another easement responsibility that Ecological Services and Realty had not taken the time or effort to inform us about for three years.

The William Hadder, Jr. FmHA easement in Wicomico County was first surveyed by staff from the Annapolis ES field office in 1988, and a recommendation was made to FmHA that the easement be managed by the Maryland Environmental Trust. However, regulation changes made it impossible for the Trust to accept the responsibility as easement manager. ES, therefore, simply amended the recommendation to have the Service assume the responsibility which was subsequently redirected to the Refuge. Realty recorded the easement on January 2, 1990. The Refuge was **never** consulted during the entire process, and we were not advised of the easement's existence until December 1993. A site visit was scheduled for February 1994 with staff from the Annapolis Field Office.

Our concerns and frustrations were expressed to ES without hesitation and with the "proper" attitude!

#### 3. Other

##### Handley/Slacum Tract Problems

In 1991, the owners of the private land adjoining the Handley Tract which was purchased by the Government in 1989 produced evidence that approximately six acres were improperly posted. The private landowners based their claim on the fact that the six-acre area was missed in the transfer of deeds and subsequent redescrptions and surveys. Contact was made with the Division of Realty, and Axel Larson and Katherine Bentley reviewed the boundary dispute while visiting the Refuge in July 1991. The problem was directed to the Government's lawyer in Cambridge, who did nothing! Ms. Bentley, therefore, contacted Mr. Matt Eglseider, of the Easton law firm Henry and Price, who advised us that he would investigate the problem. However, after more than a dozen attempts to motivate Mr. Eglseider

throughout 1993, we are currently no closer to resolving the matter than we were in 1991. We recently learned that Mr. Eglseider accepted a new job and promotion with the firm of Dewey, Cheatham, and Howe!

#### Little Blackwater Bridge Replacement

The Dorchester County Highway Department completed its permit application process, and tentatively scheduled bridge replacement for the spring of 1994. However, upon receiving the State wetland permits, the County was disappointed to see that the permit restricted work between March 1 and June 1 based on fish spawning activities. After consultation with the Refuge and the State's Tidal Wetlands Administration, a variance was received and, as the year ended, the County expected to have a contractor on site by mid-March 1994. (Consult the 1992 ANR for Right-of-Way easement for Key Wallace Drive.)



Fig. 7. Little Blackwater River bridge to be replaced. (GCH)

### Nanticoke River Watershed Management Team

On August 22, Project Leader Carowan met with representatives from Chesapeake Forest Products Company, Eastern Shore Land Conservancy, Maryland House of Delegates, Chesapeake Bay Foundation (CBF), The Nature Conservancy (TNC), The Conservation Fund (TCF), J. V. Wells, Inc., and Parker Forestry Services on the Nanticoke River to discuss plans on how to best protect the Nanticoke River and the valuable resources and biodiversity elements that make the Nanticoke River system so ecologically significant. The idea was to initiate communications between the major landowners, and to utilize their knowledge and opinions to the best advantage.

Project Leader Carowan and Biologist Hartis met with Mr. Larry Bandolin from Conte NWR and representatives from TCF, TNC, CBF, Chesapeake Forest Products, J. V. Wells, MD DNR, Friends of the Nanticoke, and the MD House of Delegates on October 21. Mr. Bandolin presented a program on the successes and failures that his team had experienced in the development of Conte NWR. His presentation was well received and greatly improved the Nanticoke Watershed Management Team's understanding and appreciation for the task at hand of involving the many agencies/organizations and the public in developing a protection plan for the Nanticoke River watershed. With the establishment of a new NWR on the immediate horizon, this action was deemed extremely timely and prudent for future relations and decisions affecting the acquisition of lands on the Nanticoke.

### D. PLANNING

#### 2. Management Plans

The only major plan revision accomplished during the year was the Hunt Plan that was submitted July 23 and approved August 9, 1993. The new plan expanded the program to include 25 days of archery hunting.

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

##### Public Notice 93-18 (Changes to Section 404 of the Clean Water Act):

Managers from Blackwater, Chincoteague, and Back Bay met with Chesapeake Bay Field Office personnel on September 13 to discuss new regulatory changes in the Clean Water Act that would affect our impoundment management activities on

these refuges. It was agreed that affected project leaders would coordinate with their respective Corps of Engineers (COE) Districts (Norfolk, Philadelphia, or Baltimore) for the COE's definition of these changes (with the assistance of respective ES offices). We felt that it would be better for each District to give an opinion of our management practices rather than trying to "interpret" the regulations and changes ourselves.

On October 12, Messrs. Wolflin and Zepp from the Annapolis ES Field Office and Project Leader Carowan met with Mr. Keith Harris, Deputy Chief of Regulatory, Baltimore District, and provided him with a definition of our moist soil management programs. After reviewing this definition, Mr. Harris interpreted the new regulations as being applicable only to the extent that certain activities were to be regulated by the COE, but added that all of the described activities included in the definition of our ongoing management activities were covered under several Nationwide permits, including but not limited to Nationwide 3 and 27. Mr. Harris recommended, and we agreed, that although these Nationwides did not require that we give the COE prior notification for these activities, it would be beneficial to all to define in our Annual Water Management Plans what types of activities (discing, root raking, dozing, etc.) were going to be performed, and that a copy of same be provided the District each year (the first to be provided in May 94). Receipt of same would be used to notify regulatory personnel that these activities were ongoing and were approved under applicable Nationwide permits. Mr. Harris also informed us that "any activities that were discussed in an existing EA, EIS, or Master Plan were considered adequately reviewed by the COE, and that such documentation, if available, should accompany the annual submission of the Annual Water Management Plan.

As explained to Mr. Harris, the success of waterfowl and other marsh and water bird management on many units of the National Wildlife Refuge System is dependent upon artificially created and maintained moist soil management units within diked areas that once were naturally functioning wetlands or uplands, but have subsequently been converted for these purposes by diking, internal ditching, dredging, filling, leveling, root raking, clearing, and installing water control structures and sometimes irrigation systems to provide the optimum water management capabilities. These units are regularly drained, then mowed, burned, disced, or sometimes planted with an agricultural crop. Most often, however, these units are very closely monitored during the growing season and water levels intensively manipulated to provide the exact amounts of soil moisture needed to produce the optimum diversity and



abundance of hydrophytic vegetation that will provide the greatest amount of food (including invertebrate populations) and nutrition for migrating and resident water birds. The areas are then reflooded, normally in the early fall and throughout the winter as management needs dictate, with varying water depths to accommodate the greatest diversity of water birds.

This practice is not new, and has been ongoing on southern refuges for decades. In fact, this method of providing food and cover for water birds has long been recognized as the most economical and ecologically preferred alternative to the antiquated but still practiced annual planting of a commodity agricultural row crop for fall and winter flooding. Within these units, the characteristics of a wetland (i.e., soil, vegetation, and hydrology) can be maintained by flooding and drawdown, or these areas can be drained in most instances to conditions that otherwise do not produce wetland characteristics (i.e., conditions identical to prior converted croplands). In fact, many moist soil management units are designed, constructed, developed, and maintained on lands that continue to be or have historically been prior converted croplands (PC), and many of the Service's private lands initiatives focus on restoring PC areas to moist soil management units.

Consequently, we proposed to Colonel Capka in the Baltimore District that we would prefer to continue these historical management activities within existing diked impoundments and moist soil management units without having to manage around both Corps and Soil Conservation Service regulations. Specifically, we indicated that we favored the continuation of the types of management practices which facilitated the production of natural moist soil plants and supported dependent wildlife communities rather than altering management programs to provide conditions conducive to the periodic planting of commodity agricultural crops in order just to maintain a nonregulated (PC) status.

In a letter to Colonel Capka dated November 6, we reiterated our previous discussions, and advised the Colonel that "although no work will be undertaken within existing moist soil management units on Maryland refuges in 1994 (other than rehabilitation activities at Blackwater National Wildlife Refuge where specific permits are current and valid), we will assume that the continuation of the above described management activities in the future will be authorized under Nationwide Permit 27 or 3 unless you inform us otherwise."

By year's end, we had not been informed otherwise!



### Chesapeake Bay Tributary Nutrient Reduction Program

BioTech Giese attended an EPA-sponsored meeting held at their Annapolis office on May 5. The meeting's objective was to familiarize Federal agencies with the Chesapeake Bay Tributary Nutrient Reduction Program, which was designed and implemented in an effort to reduce Bay nutrients by 40%. The continuing use of best management practices in its agricultural program has already put the Refuge well ahead of other agencies in compliance with these new mandates.

### Cultural and Archaeological Resource Protection (Wetland Restoration/Construction)

On May 4-6, Regional Historical Preservation Officer (RHPO) John Wilson and assistant, Rick Kanaski, visited the refuge to conduct archaeological reviews of several sites where construction activities were being proposed. Their report of May 10, 1993 summarized the following needs and actions:

**Longfield/Pascal Tract** - Raising of existing road bed and the expansion of the ditches west of the road will have "no effect" on archaeological/historical resources. Specific areas should be disced (2-3 strips along the dike's route and 3-4 strips in the southeast field) so that an additional survey can examine the proposed dike along the tract's eastern edge and the projectile point find spot in the southeast corner of the tract. (NOTE: This action was accomplished, and RHPO revisited site in September and authorized project.)

**Linthicum House/Howard Tract** - Construction of access road to Button Creek will have "no effect" on archaeological/historical resources. Sparse scattering of 20th century trash in the area of the proposed leaching field behind the Linthicum House is not a significant archaeological resource.

**Howard Tract** - Project reconfiguration recommended. Four concentrations of bricks, two square cut nails, bottle glass, glazed redware shards and a strap hinge were found in a 57' x 40' area adjacent to the shed within the proposed trailer site and interpreted as possible brick piers for the earlier 19th century barn demolished by Herb Asplen in the 1950s. The demolished barn is probably associated with the 19th century tenant house. It was recommended that the refuge relocate the sites for the trailers and the leaching field to an area 20 feet north and 60 feet west.

**Wetland Restoration Project Areas - No effect.** No material culture was observed in the proposed wetlands restoration project areas in Fields 6, 7, and 8. Fragments of modern sewer pipe and porcelain toilet were observed in Field 17-18, and were probably associated with one of the 1938 Civilian Conservation Corps' (CCC) buildings. The 1963 construction of the visitor center and parking lot destroyed a concrete foundation among other small CCC buildings. These remains are not significant archaeological resources. The dike extension at Pool 4-Kuehnle Tract was reviewed in 1991 and determined to have "no effect" by the Maryland Historical Trust and RHPO.

**Open Land Management Revision Recommended.** The Wright Cemetery was located near the center of Field 8 as evidenced by a concentration of brick fragments. Although the cemetery will not be affected by construction of the dike and the borrow pit, it is recommended that this area no longer be plowed to prevent the collapse of other burial vaults. Cemetery limits will be defined and marked via survey at a future date.

**Historical Significance of Linthicum House -** On May 21 the RHPO advised the refuge staff that the SHPO had reviewed the historical relevancy and importance of the Linthicum (Howard) House that was constructed by Mr. Alvin Linthicum in 1914 on Hog Range. The SHPO concurred with our determination that the structure was not historically significant either in architectural style or in specially noted occupancy. We were subsequently free to perform renovations as we saw fit.

**Parsons Creek Project:** Consult "Research and Investigations"

### **Hunt Planning**

On October 15, at the eleventh hour, the Fund for Animals issued a letter charging that the Service had not properly complied with NEPA when planning the 1993 refuge deer hunt, and recommended that the early archery hunt be cancelled. Archery hunting was the Fund's major objection, particularly with the expansion of the number of days open for archery hunting. After much deliberation, a Categorical Exclusion was signed by the Regional Director, and the hunt was conducted as planned beginning on October 16, with expected moderate participation.

## 5. Research and Investigation

### a. Parsons Creek (Stewart's Canal) Project

(See 1992 ANR for background information on Marsh Loss and associated problems. For the record, the saga continues, not much unlike "As The World Turns".)

On May 17, Project Leader Carowan met with Mr. Robert Colona, LeCompte WMA; Mr. Bob Lumsford, DNR Freshwater Fisheries; Mr. Rowland Limpert, Power Plant and Environmental Review; Mr. Rick Ayuella, DNR Tidal Wetlands; Mr. Leon Fewlass, DNR Freshwater Fisheries; Dr. Ed Pendleton, FWS Chesapeake Bay Field Office; Dr. Court Stevenson, Horn Point; and Mr. Ace Akins, DNR Nontidal Wetlands, to review the continuing threats associated with salt water intrusion into the upper headwaters of the Blackwater River. Of major concern was the position by DNR Tidal Wetlands' staff that the solution to this problem (i.e., the installation of a tide gate on Route 16 at Stewart's Canal/Parsons Creek) was going to adversely affect 30 acres of already degraded tidal marsh (an action that would negatively affect the permitting process). After viewing a video of the upper Blackwater watershed taken from helicopter and subsequently visiting the area by airboat, the group agreed that the environmental problems were extremely serious, and that a tide gate was needed to resolve the problem of salt water intrusion. Staff from the Tidal Wetlands Division of DNR were also impressed with the level of biological monitoring being conducted by Refuge staff and State fisheries personnel. The meeting culminated with all State agencies in agreement that the installation of a tide gate was warranted and the understanding that each division would unanimously support the permit application. Additional information regarding construction techniques was provided by Project Leader Carowan to DNR Freshwater Fisheries which submitted the formal permit application to the COE on May 24, 1993, subsequent to approval by Dorchester County and the State Highway Administration.

Service involvement above the refuge level, and certainly across divisional lines, continued to show little interest or support in this process, even though the Refuge's internationally significant wetlands and associated resources were

being seriously affected. Numerous updates and "white papers" were provided ES, Refuges, and the Directorate, but there was no broad acclaim of support or concern. On the other hand, the State was very much concerned, as were many of the other Federal agencies, and as a result, we "hunkered down" for what appeared to be a fight to successfully protect one of Maryland's greatest freshwater ecosystems.

On July 13, the Public Notices for the installation of water control structures on Stewarts Canal (Parsons Creek) and a ditch on Smithville Road were advertised by the COE. Somewhat disturbing were the immediate comments from the Annapolis Field Office to the COE recommending a meeting at Blackwater to discuss the merits of the project. Months of advanced coordination by Project Leader Carowan with Field Supervisor Wolflin and his staff were essentially unproductive as ES staff apparently decided to become "involved" even after Wolflin had advised Carowan that "while we will not actively seek support from other reviewing regulatory agencies, we will also not seek to oppose the project designed to eliminate salt water intrusion into the upper Blackwater River." Obviously, Mr. Wolflin's staff was not informed of his statement, and a meeting was scheduled by ES with the COE on August 17.

On August 16, Carowan met with the State Director of TNC, Wayne Klockner, to discuss the possibilities of utilizing the remaining \$120,000 in their grant for the NAWCA Grant proposal to fund a long-term research study on the upper Blackwater Refuge, focusing on the affects that the previously mentioned tide gates would have on improving water quality and marsh habitats.

On August 17, in response to the Public Notices, Carowan met with representatives from COE, National Marine Fisheries Service (NMFS), and the Annapolis Field Office to discuss the project. Although extensive coordination and review by all the permitting agencies had been completed before the IP notice was issued by the COE, it was evident that these three representatives had not done their homework, and would therefore require additional time for review. In addition, NMFS requested that the project receive additional engineering review and possible redesign based on

their interpretation of the project's environmental consequences. To say the least, we and the State's environmental watchdogs were not pleased with this response from NMFS.

On August 24, Carowan responded to comments on the previously mentioned IP application 93-067013-5 regarding Mr. Ira Berry's letter of opposition. Mr. Berry had sent a letter to the COE stating that the area should be left "natural." Carowan explained that the mosquito control canal on Smithville Road and the canal on Parsons Creek were both man-made, and were both causing serious salt water intrusion into the upper Blackwater watershed. This process was not "natural!" Whether or not this explanation was accepted by Mr. Berry remains questionable, but he offered no objection.

On September 29, Mr. Chris Mantzaris, Habitat Program Coordinator with NMFS, wrote the COE expressing the following concerns and recommendations even though he did recognize that salinity intrusion was significantly affecting historical anadromous and estuarine fish resources. NMFS recommended the need (1) to ascertain whether the surface salinity sources were the sole contributors of salt water intrusion into the Blackwater system; (2) to develop a model of Parsons Creek system through collection of tidal data and other necessary hydrologic parameters that would facilitate appropriate weir design; (3) to utilize a weir at the proposed site only as an emergency, temporary measure while designing permanent solutions that would ultimately allow weir removal (these solutions included depositing spoil between Parsons Creek and the upper Blackwater and de-channelization of Parsons Creek); (4) to establish and implement a comprehensive monitoring plan that included a one-year baseline study to analyze numbers/species of estuarine organisms, to determine importance of the Creek to summer flounder, and to evaluate exchange rates of nutrients/detritus; and (5) to develop a contingency plan for early weir removal within three years.

Project Leader Carowan and State Fisheries Biologist Fewlass responded to NMFS and the COE on October 4:

"In regards to NMFS recommendations, the U.S. Fish and Wildlife Service and Maryland DNR's Freshwater Fisheries Division, subsequent to meetings with your staff and National Marine Fisheries personnel, have developed a bimonthly water quality monitoring schedule that will sample dissolved oxygen, pH, salinity, temperature, and hydrogen sulfide at Piney Gut, above and below the Route 16 bridge, Goose Dam, James Island, Blackwater River foot bridge, and Rt. 335 beginning in November 1993. Additionally, Freshwater Fisheries Division and the Maryland Estuarine/Marine Fisheries Program will immediately implement a monitoring plan to inventory resident and migrating fish species and benthic organisms using an otter trawl and one square-meter pot nets at the above mentioned locations to establish baseline data for one year. The investigation of alternative weir designs for fish passage will obviously be dependent on the information gained from the fisheries monitoring effort rather than relying on subjective data.

Water quality and aquatic organism studies are being conducted with a target date for weir construction during winter 1994-95.

We too agree that the best solution is to reestablish the marsh plug between Parsons Creek and the Blackwater River and/or to de-channelize Parsons Creek. The first option, however, is greatly dependent on removing the problem of salt water intrusion. The weir with tidal flap gates is necessary at the outset to lower salinity concentration on the marsh, and our continuing monitoring programs will determine the effectiveness of eliminating salt water and evaluating the success of fresh water plant recolonization. We will continue to work closely with Dr. Court Stevenson and his colleagues at Horn Point to develop methods of restoring the marsh **after** we have resolved the salinity problems. We must crawl before we run."

In reply to specific NMFS recommendations:

"Item 1. Within 30 days, FWS will initiate a ground water sampling program by testing well water from adjoining landowner wells. Additionally, a series of test holes will be dug until ground water levels are reached. Salinity samples, depths, and locations will be recorded at each site. These tests will be performed monthly for a six-month period."

"Item 2. Subsequent to discussions with NMFS personnel, members of your staff, and experts from the research community, we have already realized that the current weir design can easily be modified to include a flash board riser in the center that can be adjusted to meet a variety of management needs and actions, including emergency adjustments. This will be done. Data collection has been initiated to detail a tidal stream flow budget for the Parsons Creek. From this information, a computer model will be developed for guiding weir operation based initially on reducing James Island high tide salinity to less than 5 parts per thousand. This concentration is within the tolerance range of *Scirpus olneyi* and other freshwater organisms. Maintaining this salinity level at James Island will sustain downstream saltmarsh at Goose Dam and in Parsons Creek.

The computer model will also aid in developing a time-frame for project goals and updating the model will be an ongoing process. Subsequent to initial salinity concentration reduction, the model will be employed in conjunction with the water quality monitoring program to develop a design for Parsons Creek de-channelization."

"Item 3. As defined above, we intend to investigate the proposed weir site to determine effects on the watershed. If effects are favorable, the weir will be retained; if not, all or portions of the weir will be removed. 'De-channelization

is a favorable solution, and subsequent to investigations of weir effectiveness and impacts, the weir could be used as an infrastructure to support canal filling to agreed upon depths needed to preserve fishery resources while managing the salt water intrusion."

"Item 4. Most aspects of these recommendations have been addressed, and baseline and post evaluations will be implemented."

"Item 5. As discussed with COE and NMFS personnel, the current weir design will be modified, as mentioned in Item 2, to replace the slot with flashboards that can be adjusted to meet most contingencies. However, the Blackwater Refuge staff is equipped to simply remove the entire structure within a couple of days if conditions warrant such extreme action. We also have the resources to control phragmites, and will undertake vegetation management should surveys indicate a problem that has stemmed from the weir or its construction."

On November 24, Carowan was notified by the COE that a permit would be issued in December, but that construction would be conditional upon completing the biological monitoring efforts recommended by NMFS. In addition, the Refuge had to undertake a survey of all landowners to determine the impact of the weir on their navigation of Parsons Creek.

By mid-December, Refuge staff had established and implemented a water quality monitoring program including bimonthly water quality monitoring of dissolved oxygen, pH, salinity, temperature, and hydrogen sulfide at six predetermined sites along the Blackwater River. In addition, a monthly regime to collect ground water and well water samples from seven test-holes and six domestic wells for a period of six months had been initiated. (Fig. 8).



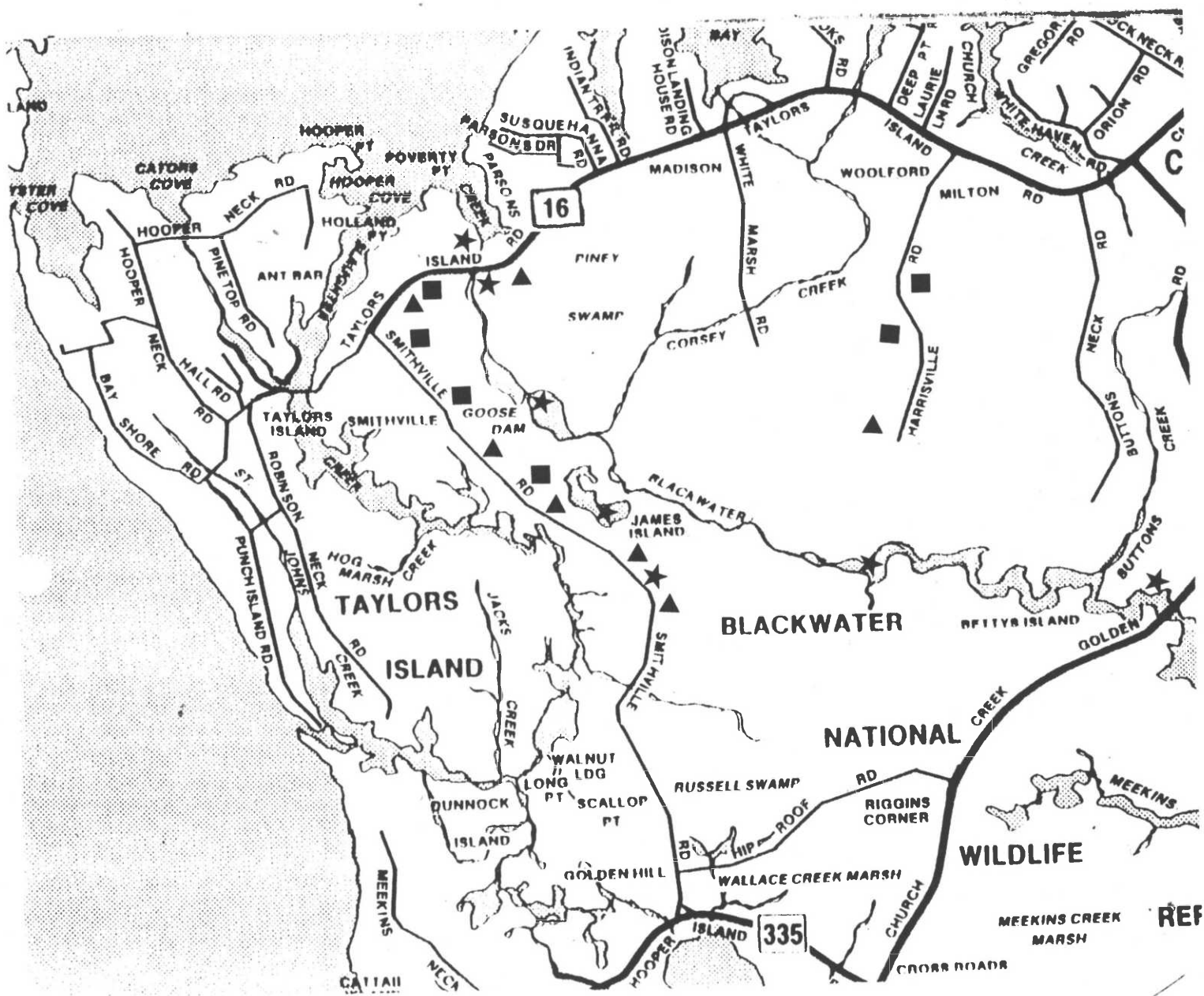


Fig. 8. Water monitoring area and ground water sampling.

LEGEND

- ★ = river sites
- = test holes
- ▲ = well water samples

Table 3. Preliminary results from the December water monitoring project, including river sampling, test holes, and well water.

Source <sup>1</sup>	Parameters Sampled <sup>2</sup>				
	Salinity	Temperature	DO	pH	H2S
River: 1	10	4	9.2	7	0
2	9.5	5	9.2	7	0
3	9.6	6	9.6	7	0
4	9	7	9.2	6.9	0
5	10	4	9.6	7.1	0
6	8	6	8.0	7.3	0
7	6	4	10	4.4	0
Test Holes:					
1	1	- <sup>3</sup>	-	-	-
2	0	-	-	-	-
3	0	-	-	-	-
4	0.5	-	-	-	-
5	0	-	-	-	-
6	1.5	-	-	-	-
7	0	-	-	-	-
Well water:					
1	0	-	-	-	-
2	0	-	-	-	-
3	0	-	-	-	-
4	0	-	-	-	-
5	0.5	-	-	-	-
6	0.5	-	-	-	-

- <sup>1</sup> Sampling site: River:
- Site 1 = Upper Route 16 bridge
  - Site 2 = Lower Route 16 bridge
  - Site 3 = Goose Dam
  - Site 4 = James Island
  - Site 5 = Piney Gut
  - Site 6 = Footbridge
  - Site 7 = Route 335 bridge
- Test holes:
- Site 1 = Moneystump Swamp
  - Site 2 = James Island
  - Site 3 = Red hunt club
  - Site 4 = Double red gate
  - Site 5 = Hwy 16, studio house
  - Site 6 = Hwy 16, East Piney swamp
  - Site 7 = Harrisville Rd
- Well water:
- Site 1 = Grey hunting house
  - Site 2 = James Woods residence
  - Site 3 = Luther Cornish residence
  - Site 4 = Studio house
  - Site 5 = William Chester residence
  - Site 6 = Cooper's residence

<sup>2</sup> Salinity = ppt, temperature = Celsius, DO = dissolved oxygen (ppm),  
H2S = hydrogen sulfide (milligrams/liter)

<sup>3</sup> - indicates data was not collected.

By the end of December, eight of the nine affected landowners had signed letters approving the weir's construction. Mr. Roger Adams was the only holdout and, as the year ended, we were working to obtain his approval. However, he owns a substantial amount of property that adjoins Route 16 and has expressed the feeling that this project will greatly reduce his land values "when the new bridge across the Chesapeake Bay to Virginia is constructed." (An unlikely event!)



Fig. 9. Parsons Creek was channelized in the late 1800s to facilitate the transportation of timber and agricultural crops from the farms along the upper Blackwater River watershed. It is now the major source of salt water intrusion into the refuge's fragile freshwater ecosystem. (GCH)



Fig. 10. The culvert under Smithville Road is a secondary source of salt water intrusion into the upper Blackwater River. Twice daily concentrations as high as 16 ppt are injected into the historical freshwater system from Slaughter Creek. (GCH)

b. "An Assessment of the Nutria Population on Blackwater National Wildlife Refuge" (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.

During the initial study year (as outlined in the original study proposal), 134 nutria were marked in late 1989 and 15 were subsequently recaptured during the trapping season in early 1990. This was an insufficient number of recaptures for a reliable population estimate. We considered this a pilot year; with more effort the following year, 1990-1991, we were successful in our mark-recapture ratio and estimated the study area population to be 2.7 nutria per acre. As a check on our estimate and on the effects of another year's trapping efforts on the study area, we continued the study during the winter of 1991-92 and estimated this year's nutria population to be 2.6 per acre, very comparable to the 1990-91 estimate. Trapping efforts, therefore, appeared to be at least preventing extremely sharp increases in population levels. The study was not conducted during the winter of 1992-93. However, as intentions are to continue the study for the winter of 1993-94, nutria were captured, marked, and released in late 1993 for recapture in early 1994. (See Section G. 8.)

The three original study objectives have been met and the study will continue to be implemented as outlined, mostly relating to objective #3 addressing "repeated annual studies." Objective #1, which called for field testing techniques to estimate nutria population levels and densities, was successfully accomplished. Population levels were high as evidenced by the taking of approximately 7500 nutria during the first three years of trapping in conjunction with data collection. Densities were high as well, as shown by the 2.6 - 2.7 nutria per acre estimates obtained from the study area and possibly higher on other portions of the refuge.

Objective #2 was to determine the nutria's current range and distribution throughout the refuge. The refuge trapper rebate portion of the study that provided incentive to trap refuge-wide demonstrated that the nutria range covered the entire refuge with distributions of nutria somewhat heavier in some areas, possibly shifting in relation to available suitable habitat and food resources.

Objective #3, to correlate through repeated annual studies changes in population levels and occupied range, was met and will continue to be implemented as needed. Another facet of this objective was to evaluate another population estimate technique being considered, the catch per unit of effort (CUE) of refuge trappers. Results showed this method to be unreliable for our purposes as trapper effort and success were difficult to monitor, measure, and interpret because of many variables. Current plans are to repeat the mark-recapture study once every two to three years as needed and indicated from general field observations in order to determine population trends.

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

The original study by refuge personnel 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, 1991, 1992, and 1993 on the same 52-acre (Egypt Road area) woodland block. The Delmarva Fox Squirrel Recovery Team (DFSRT) designated this area as one of many of their benchmark population monitoring sites, this particular one representing an example of a mature mixed hardwood/pine habitat type. In 1992, another representative benchmark site was established on the refuge and utilized for the mark-recapture study. This site, representing pure pine habitat type, is located on the Smithville Road side of the Jarrett Tract, and was also studied in 1993. As a result of discussions with the DFSRT, population estimates for both refuge sites beginning in 1992 will be studied through the mark-recapture technique every year. (See Section G.2.b.)

d. Effects of Various Burning Cycles on Blackwater NWR Marsh Loss

Natural wildfires, American Indians, and local trappers have historically burned the marsh system in Dorchester County, including the refuge marshes, for hundreds of years. This process helps maintain the marsh ecosystem at the *Scirpus*



olneyi level of plant succession, opens the marsh surface temporarily, and promotes *Scirpus* 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 our continuing marsh loss situation. This in-house study will be an attempt to monitor long-term differences in aboveground vegetation cover that may be seen when comparing various burning cycles on selected areas of refuge marsh. A study proposal for this long-term monitoring project should be submitted in 1994. Priority demanded that half of the study areas be sampled for baseline data during late summer of 1991 for correct sample size before the January 1992 prescribed burning season, and the other half of the study areas sampled before the 1993 burning season. To allow a time interval sufficient to demonstrate above ground vegetative change, if any, due to annual versus biannual burning, a resampling of the areas should occur within a complete two-year cycle (four or six years after baseline data collection in 1991-92, which would be 1995-96 or 1997-98).

e. "Analysis of Captive-Reared Mallard Release Programs in Maryland, State Releases, and Regulated Shooting Areas" (51530-91-02)

This study is being conducted by David B. Smith of Louisiana State University's School of Forestry, Wildlife, and Fisheries and is a cooperative effort between the U.S. Fish and Wildlife Service, Maryland Department of Natural Resources, and the Grand National Waterfowl Association. Initial study efforts began during the fall and winter of 1991-92 and continued during the winter of 1992-93. Although not specifically a Blackwater NWR study, the refuge comprises a large portion of the study area and provides an on-site field office and residence facility for the researchers as well as a significant amount of support. The study ended this winter 1993-94, and hopefully a final report will soon be available.

f. Effects of Back-pack Radio Telemetry Harnesses on Free-ranging Mallards (51530-92-01)

This study, begun in the fall and winter of 1992-93, is a spin-off of the "Analysis of Captive-Reared Mallard Release Program" (51530-91-02), and was conducted on essentially the same study area by Dr. Frank Rohwer and Mr. David Smith of Louisiana State University. The study was completed this year but a final report will not be available until 1994.

E. ADMINISTRATION

1. Personnel

a. Training

Only fire management, law enforcement, and maintenance operations training received funding this year. Refuge staff attended the following training in 1993:

Fire Management Training:

- ▶ Biologist Hartis and Refuge Operations Specialist Barker attended **S-390: Intermediate Fire Behavior** classes in Springfield, MO January 11-14.
- ▶ I-220: Biologist Hartis attended **I-220: Incident Command System** held at NASA's Wallops Island Facility near Chincoteague, VA on February 4 and 5.
- ▶ On June 21-23, Project Leader Carowan attended **S-205: Fire Operations in the Urban Interface** at Virginia Beach. The course provided excellent instruction and guidance for fostering fire preparedness and mutual working relationships between structural and wildland firefighters. As more and more people move into rural "wilderness" areas, the frequency of wildland fires involving structures is growing, and this course helps fire personnel better plan for these occurrences.



- ▶ A representative from Forest Technology traveled from Bellingham, Washington to give Biologist Hartis, Office Assistant Walkup, and personnel from Maryland DNR training in setting up the **FWS-11 Fire Weather** station and using the Fire Weather Plus™ software to access and record weather data.
- ▶ A **fire equipment** training session was organized by refuge fire personnel Hartis, Giese, and Morris and provided to refuge and MD Forest Service personnel on December 9 and 10 to familiarize firefighters with equipment capabilities.

#### Maintenance Training:

- ▶ The **FY93 Regional Maintenance Workshop**, held at Patuxent NWRC April 19-23 was attended by Blackwater and Martin NWRs' maintenance staff: Mike Harrison, John Johnson, Richard Webster, Richard Thurman, and Mike Truitt.
- ▶ **Heavy Equipment** training held at Eastern Shore of Virginia NWR May 17-21 was attended by Tractor Operator Mike Truitt, who learned to handle farm tractors, backhoe loaders, dozers, and graders.
- ▶ Automotive Mechanic Johnson and Tractor Operator Morris traveled to Valcourt, Canada to attend a **Bombardier maintenance** training seminar hosted by the manufacturer at their factory.

#### Biological Training:

- ▶ BioTech Giese, Maintenance Mechanic Webster, and Tractor Operator Truitt attended annual **Pesticide Application** Recertification in Frederick, MD on February 2.
- ▶ Biologist Hartis attended the **Shorebird Management Workshop** at Chincoteague NWR May 11-14. Coordinated by the Region 5 Migratory Bird Management Office, the workshop consisted of 28 hours of classroom and field training that focused on methods of managing wetlands to incorporate migratory shorebirds as well as waterfowl.

- ▶ Biologist Hartis attended a **Gypsy Moth Management Workshop** in Quantico, VA on August 31-September 2. Sponsored by the U. S. Forest Service, the course provided training in gypsy moth management techniques and egg mass surveys.
- ▶ Biologist Hartis and Coop. Students Brady and Sanderson attended a **Wetland Plant Identification Workshop**, sponsored by the Annapolis Field Office, at Eastern Neck NWR from October 25-28. The workshop provided training in plant species identification and information on plant/wetland relationships.

#### Safety Training:

- ▶ On April 15, a defensive driving course (DDC-6) given by the Safety Council of Maryland was completed by refuge staff. The required DDC-8 has been unavailable in our area.
- ▶ Refuge staff were recertified in CPR on 11/17 by American Red Cross personnel. This year's training included an extra segment on using a protective face mask during resuscitation.



Fig. 11. Project Leader Carowan practices CPR on Baby Annie while Biologist Hartis looks on. (GCH)

Table 4. **BLACKWATER NWR - ONBOARD STRENGTH**  
FY89 - FY93

	<u>FTE</u>	<u>PERMANENT</u>		<u>TEMPORARY</u>
		<u>Full-time</u>	<u>Part-time</u>	
FY 1993	11.2	9	2	2
FY 1992	11.2	9	2	5
FY 1991	10.75	9	2	4
FY 1990	10.3	9	2	2
FY 1989	11.0	9	2	2

**BLACKWATER NWR PERSONNEL**

<u>NAME</u>	<u>TITLE</u>	<u>GRADE/SERIES</u>	<u>EOD BLK</u>	<u>STATUS</u>
1. Glenn A. Carowan	Project Leader	GS-0485-13	6-05-89	PFT
2. Gary C. Heet	Supervisory Refuge Operations Specialist	GS-0485-12	12-30-90	PFT
3. Larry P. Hartis	Wildlife Biologist	GS-0486-11	5-06-90	PFT
4. Jason A. Barker	Refuge Operations Specialist	GS-0485-09	9-09-90	PFT
5. Maggie M. Briggs	Outdoor Recreation Planner	GS-0023-09	8-08-90	PFT
6. William M. Giese	Biological Technician	GS-0404-08	8-26-71	PFT
7. Caroline Sanderson	Refuge Mgr. Trainee	GS-0485-07	5-31-92	TFT
8. Stephanie Brady	Coop. Student	GS-0499-07	7-11-93	TFT
9. Meg Walkup	Office Assistant	GS-0303-06	4-14-87	PFT
10. Julie L. Barker	Clerk (Office Auto.)	GS-0326-04	12-30-91	PPT
11. Tammy D. Morris	Clerk (Office Auto.)	GS-0326-03	10-31-93	PPT
12. Ruth Kondylas	Recreation Assistant	GS-0189-04	3-21-93	TFT
13. Teresa B. Smith	Clerk(Stay-in-School) (Appt. expired 9/93)	GS-0326-03	6-03-91	TPT
14. Lacresha Kinnebrew	High School Coop. (Resigned 7/93)	GS-0499-01	5-30-93	TPT
15. Franklin A. Hughes	Automotive Mechanic	WG-5823-10	2-22-60	PFT
16. John H. Johnson	Automotive Mechanic	WG-5823-10	8-10-92	PFT
17. Richard O. Webster	Maintenance Mechanic	WG-4607-09	6-13-83	PFT
18. Vernon K. Morris	Seasonal Firefighter	WG-5716-08	12-17-90	TFT
19. Michael A. Truitt	Seasonal Firefighter	WG-5705-06	12-17-90	TFT

ORGANIZATION CHART  
BLACKWATER NATIONAL WILDLIFE REFUGE COMPLEX

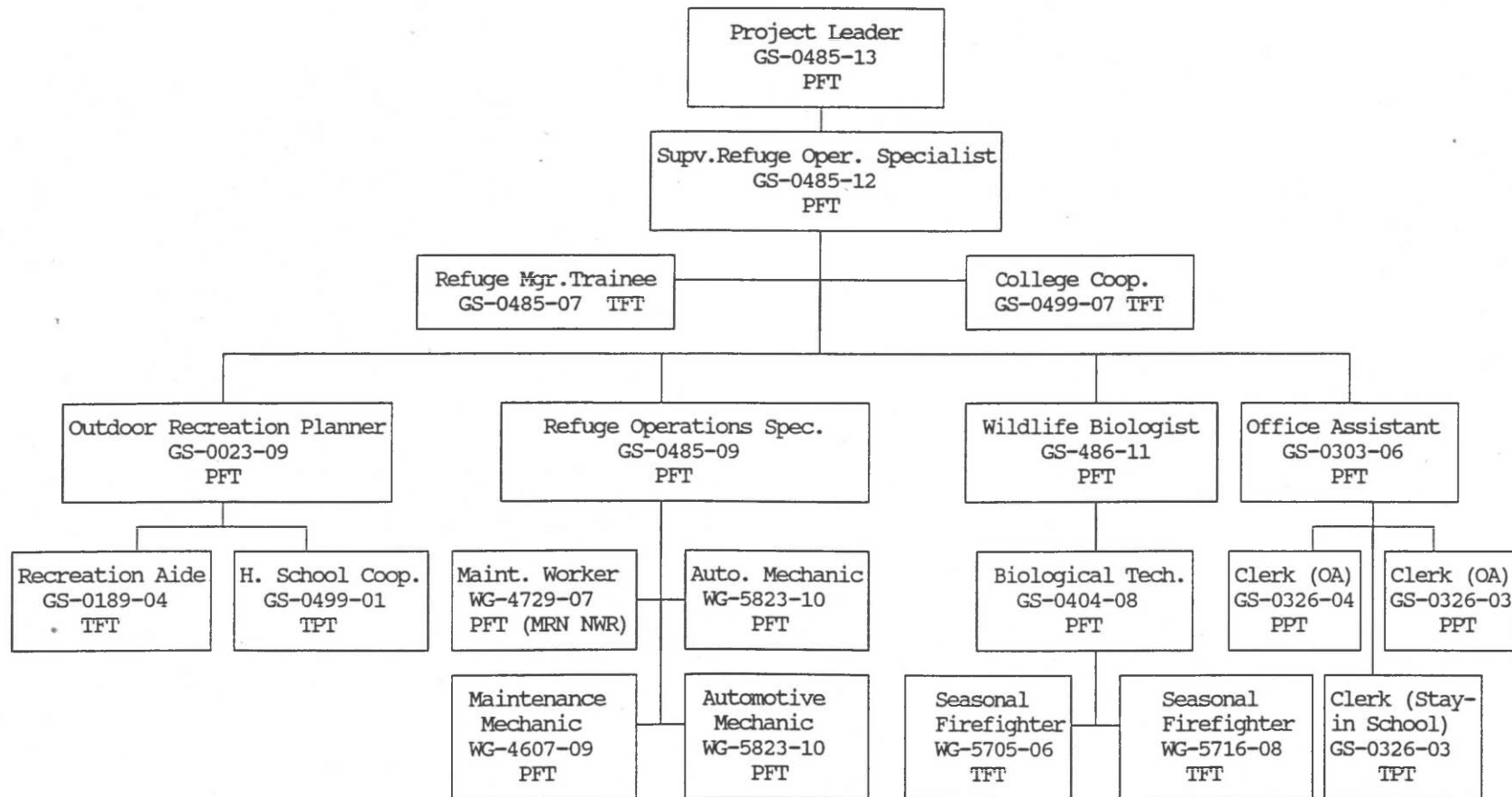




Fig. 12. Project Leader Carowan. (GCH)



Fig. 13. Supervisory Refuge Operations Specialist Heet and Refuge Operations Specialist Barker. (SLB)





Fig. 14. Wildlife Biologist Hartis. (GCH)



Fig. 15. Biological Technician Giese. (GCH)



Fig. 16. Outdoor Recreation Planner Briggs. (GCH)



Fig. 17. SCA volunteer Andi Lawrence and short-term High School Cooperative Student Lacesha Kinnebrew. (MMB)





Fig. 18. Automotive Mechanic Johnson, Maintenance Mechanic Webster, Coop Student Brady, Office Assistant Walkup, Clerk Morris, and Automotive Mechanic Hughes. (Not shown, Manager Trainee Sanderson). (LJP)



Fig. 19. Seasonal Firefighters Truitt and Morris. (GCH)

b. Personnel Actions:

Mrs. Ruth Kondylas, a former volunteer who worked two years on the Migrant/Resident Canada Goose Collar Study, was appointed as temporary, full-time Recreation Assistant (GS-0189-04) to help staff the visitor center and provide outdoor education programs from March 23 to June 12. On November 15, she returned part-time to assist with the public use program during the busy fall-winter season.

Engineering Equipment Operator (WG-5716-06) Thurman requested that his status be changed from full-time to intermittent effective June 26. Seasonal firefighter Keith Morris assumed the heavy equipment operation duties on June 27 to continue work on MARSH projects. This position was upgraded to WG-8 in October, and Mr. Morris received the competitive appointment in November.

Ms. Tammy Morris was appointed to two consecutive 30-day Special Need appointments as office automation clerk from November 3, 1993 through January 2, 1994. This GS-0322-03 position had been established in 1991 as a part-time adjunct to the refuge clerical staff, but recruitment was postponed due to regional FTE shortages. Ms. Morris' permanent appointment is pending OPM certification following her 10/26/93 civil service test.

On November 29, Seasonal Firefighters Keith Morris and Mike Truitt returned to active duty for the prescribed burn season, which extends through March, 1994.

c. Cooperative Education:

On March 19, Project Leader Carowan met with Joe Ketterman regarding Mr. Ketterman's desires to enter the Service via the Cooperative Education Program.

Ms. Lacresha Kinnebrew, a junior at South-Dorchester High, entered on duty as a High School Cooperative Student (GS-0499-1) on May 30. Ms. Kinnebrew assisted with the refuge's public use program until July 10, when she resigned due to a death in her family.

College Cooperative Education Student (GS-0499-07) Stephanie Brady entered on duty on July 11. Ms. Brady, a graduate student at UMass, is completing work on her master's thesis, "Sea Turtle Distribution and the Documented Fisheries Threats in the Northeastern United States."

d. Other:

Required for issuance of Maryland Commercial Drivers Licenses, drug tests were administered to Maintenance Mechanic Richard Webster and Automotive Mechanics Frank Hughes and John Johnson by Dorchester General Hospital's Occupational Health Services on May 18.

On June 12, the refuge received a request from Allen Carter, Regional Fire Management Coordinator, for Automotive Mechanic Johnson and Seasonal Firefighter/Tractor Operator Morris to serve as mechanic/truck driver and operator, respectively, in the "Gnatcatcher Fire" burning in Okefenokee NWR. On June 13, both employees and the Bombardier departed for Georgia, where Johnson and Morris diligently assisted for eight days.

On June 25, we were notified by the RO that EEOC had requested the Service to investigate the temporary suspension of Tractor Operator John Paul in 1991, indicating that the suspension was based on racial discrimination. The WO initially proposed a "quick fix" by recommending that Mr. Paul be paid for the three days. However, the refuge staff and the Associate Manager (RFS) strongly recommended that we hold our ground and not sway from the 1991 decision which had absolutely nothing to do with Mr. Paul's race.

BioTech Bill Giese's 21 years of service at the refuge was recognized at an informal ceremony following a safety meeting on November 17. Project Leader Carowan presented Bill with a "homemade" certificate signed by refuge and RO/RW staff, and a pewter Canada goose pin purchased from the Cooperative Association outlet.

The following individuals were nominated for a group On-The-Spot Award for the tremendous show of staff cooperation, hard work, and patience on the "Pole Shed Project": Webster, Barker, Giese, Harrison, Hartis, Heet, Hughes, Morris, Thurman, and Truitt.

Special Achievement Awards were earned by the following employees for their job performance during the rating period ending June, 1993: Project Leader Carowan, Supv. ROS Heet, ROS Barker, Biologist Hartis, BioTech Giese, ORP Briggs, Automotive Mechanic Hughes, Automotive Mechanic Johnson, Maintenance Mechanic Webster, and Office Assistant Walkup.

### 3. Other Manpower Programs

Stay-in-School Student Teresa Smith's appointment was completed on September 4. This youth employment program provided the financial assistance Ms. Smith needed to continue her education beyond the junior college level. She started with the program in 1991 while at Chesapeake Community College, and went on to earn a B.A. in Elementary Education at Salisbury State University while working part-time at the refuge office.

Vacancy announcements and application packages were sent to area colleges and high schools to recruit for the refuge's Stay-in-School position. The job description was rewritten to change the position from a clerical worker (GW-0303-03) to a maintenance helper (WW-3502-01), in the hopes of widening the range of potential applicants for this youth employment program.

### 4. Volunteer Program

The success of the Public Use Program and operation of the visitor center can be attributed largely to the refuge volunteers. Blackwater began the year with a staff of 92 volunteers and continued to grow with 25 new volunteers contributing their time and expertise, bringing the total of volunteers to 117 in 1993. Unfortunately, 25 volunteers resigned due to prior commitments, personal reasons, or loss of interest; 2 passed away, and 5 moved, leaving a total of 85 volunteers at the end of the year. Of these, 71 volunteers staff the visitor center and off-site mobile exhibits, assist in interpretive programs, lead bird walks and serve as trail guides or bus tour guides. The other 15

assist in biological surveys, administration, or maintenance. It's interesting to note that 33 of these volunteers have been volunteering at Blackwater for more than 4 years.

When regular volunteers were on vacation during the summer, the operation of the visitor center was dependent on Student Conservation Association (SCA) Volunteer Andrea Lawrence, who entered on duty June 1 and volunteered 490 hours through August 20. Andi is attending North Carolina State University to complete a BS degree in Natural Resource Management, to add to her BS in Education.



Fig. 20. Summer SCA Volunteer Andi Lawrence contributed 490 hours assisting with the public use program. (MMB)



Beginning August 23, SCA Kira Landsman volunteered 472 hours through November 13. Kira earned a BA degree in biopsychology from Vassar College, Poughkeepsie, New York. While looking for a full time position, Kira gained experience assisting with the busy fall interpretive program at Blackwater NWR.



Fig. 21. Fall SCA Kira Landsman assisting with the Dorchester County Outdoor Showcase. (MMB)

During 1993, volunteers donated a total of 5,215 hours (compared to 5,106 hours in 1992) performing a variety of duties.

In 1993, the Volunteer Program lost two volunteers. Bill McGlaughlon, who has been volunteering since December 1990, died from a heart attack on February 16. Bill volunteered 148 total hours, usually on Sunday afternoons. On July 5, another one of our volunteers, Mary Dotson, died at her home in Secretary. Mary began volunteering in September 1991 and volunteered a total of 56 hours. The Friends of Blackwater donated a book to the library in the name of each of these volunteers.

Table 5. Monthly Summary of volunteer hours for 1993.

Category	Month												TOTAL
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Visitor Center Staff	356	284	360	352	320	0	0	0	248	332	312	292	2,856
Other Public Use	30	43	6	23	7	123	37	46	47	274	22	11	669
Volunteer Coordinator	10	1	10	2	0	0	0	0	10	9	9	10	61
Friends of Blackwater	0	0	0	8	6	0	0	0	0	3	7	29	53
Administration	0	0	0	9	0	0	0	0	0	0	0	9	18
Biological Assistance	38	12	25	19	8	7	74	74	61	3	8	57	386
Maintenance	0	0	17	0	0	0	49	115	128	2	0	8	319
Student Conservation Assoc.	0	0	0	0	0	179	180	187	160	184	72	0	962
Total	434	340	418	413	341	309	340	422	654	807	430	416	5,324



A Volunteer Fall Update/Social was held on September 10 to update all returning volunteers on Blackwater NWR objectives and volunteer procedures. Several new volunteers also attended to learn more about the volunteer program. A second workshop held October 17 was composed of two sessions: one from 9:00 a.m. to 12:00 p.m. for all visitor center staff volunteers, and another from 1:00 to 3:00 p.m. for those interested in giving trail walks and bus tours. Volunteer Tom Brannock led the Marsh Edge Trail walk training. Tom, a Soil Conservation Service employee, continues to guide Dorchester County second-grade school groups on the Marsh Edge Trail. His volunteer work has been a great asset to Blackwater, especially in light of the shortage of permanent public use staff and continual turnover of short-term temporary assistance. Comments from teachers and the visiting public indicate that Tom has been a wonderful representative for the Refuge. Channel 16 WBOC-TV interviewed ORP Maggie Briggs and broadcast a short segment on the volunteer training session on their newscasts for that day.



Fig. 22. Volunteers Madeline and Harry Parker assist new volunteer Richard Fisher in learning the ropes. (MMB)

The end of the volunteer year was celebrated on May 26 with a Volunteer Awards dinner held at the visitor center. Staff members and volunteers socialized and enjoyed a covered dish dinner. After the dinner, awards were presented to the volunteers by Project Leader Carowan and ORP Briggs. There were 8 volunteers who worked a total of over 100 hours, 4 volunteers who had worked over 200 hours, 7 volunteers who had worked over 250 hours, 8 volunteers who had worked over 300 hours, 1 volunteer who had worked over 400 hours, 1 volunteer who had worked over 500 hours, and 1 volunteer, Bob Evans, who had worked a total of 719 hours. Awards were also presented to 6 volunteers who volunteered at Blackwater NWR for 5 years, 6 volunteers who volunteered 6 years, 4 volunteers who volunteered 7 years, 2 volunteers who volunteered 8 years, and 1 volunteer, Ruth Bien, who started volunteering 9 years ago.



Fig. 23. Volunteers Ruth Bien (9 years service) and Bob Evans (719 hours) received awards at the Volunteer Awards dinner. (MMB)

A special award was presented to Harry Armistead and Terry Allen for continuing to lead bird walks in the spring and fall; to Caroline Garner for coordinating the volunteer schedule; and to 3 young men for their 584 hours assisting in biology and maintenance last summer. There were 8 volunteers - Bob Evans, Harry Parker, Madeline Parker, Zeeger de Wilde, Caroline Garner, Joe Mason, B. J. Giangliulio, and Lois Albert - who volunteered more than 100 hours this year. The most hours were donated by Joseph Cotten with 359 hours assisting the refuge biologists and by Lois Albert with 137 hours staffing the visitor center. The Friends of Blackwater donated \$300 for the purchase of awards for these deserving people.

This summer's top volunteer hours were donated by Refuge volunteer Mike Brady. Mike spent his summer collecting biological data, assisting with hunt preparations, running errands throughout the shore, and being an integral part of the Refuge's subimpoundment project completion. After energetically and competently donating over 500 hours of his time, Mike accepted a temporary position with Maryland's Department of Natural Resources collecting goose neck-collar data.



Fig. 24. Volunteer Mike Brady, who donated over 500 hours, checking a wood duck box. (SLB)



## 5. Funding

Table 6. Funding: Five-year comparison.					
<u>ACTIVITY</u>	<u>Fiscal Year (\$1,000's)</u>				
	<u>FY94</u>	<u>FY93</u>	<u>FY92</u>	<u>FY91</u>	<u>FY90</u>
1113 - Endangered Species	3.0	3.0	3.0	3.0	3.0
6860 - Expenditures for Sale	6.5	7.0	7.0	7.0	7.0
9120 - Fire	41.0	25.0	89.0	50.5	117.5
1260 - Blackwater	743.7	755.9	664.8	555.3	477.5
1260 - Martin	49.6	63.0	60.3	46.3	44.8
<b>TOTAL</b>	<b>843.8</b>	<b>853.9</b>	<b>824.1</b>	<b>662.1</b>	<b>649.8</b>

Washington Office coordinator Sean Furniss transferred \$6,000 in FY93 forest pest management funds for gypsy moth control at Blackwater. \$5368 was used to aerielly spray 150 acres with Gypchek, and the balance returned to the WO.

## 6. Safety

Workers Compensation claims were processed for the following employees:

- ▶ Tractor Operator Truitt, who fractured his skull when he was struck in the back of the head by the nozzle of a fire hose.
- ▶ Biologist Hartis on May 28 after he was bitten by a deer tick and treated for Lyme disease.
- ▶ Automotive Mechanic Hughes, who required surgical repair of a hernia resulting from lifting a water control structure.

Refuge staff whose work exposes them to excessive noise levels were given annual audiometric testing at a local ENT specialist's office on November 18. Staff then attended an OSHA-required hearing conservation educational seminar conducted by the audiologist.

## 7. Technical Assistance

### a. Biological Diversity

On April 6 and 7, Project Leader Carowan met with Dr. Curt Griffin, Assistant Professor of Wildlife Biology at the University of Massachusetts and Research Corporate at the Wildlife Management Institute (WMI), and Dr. Rollin Sparrowe of WMI to conduct a preliminary study of Blackwater NWR related to the conservation of biological diversity. Drs. Griffin and Sparrowe were interested in gathering information about the inter-relationship of existing and planned management programs to the conservation of biological diversity on several "test" refuges. This is a very controversial issue that has the potential to influence the future of the NWRS, but resolution of differing views on the issue is hampered by the lack of reliable information. This study will point the way to address this deficiency. Dr. Griffin visited a small sample of refuges across the country to test his approach to gathering information that supports the NWRS's biological diversity activities. Both Dr. Griffin and Dr. Sparrowe were extremely impressed with Blackwater Refuge's recognition of biological diversity issues, landscape planning, ecosystem concepts, and overall diversity of programs. They both felt that Blackwater was playing an appropriate role in the conservation of biological diversity in the NWRS, and commented about the conscientiousness of the refuge's management to current biological diversity issues and the focus of programs on wetlands restoration, enhancement, acquisition, and management. Project Leader Carowan continued to work with Drs. Griffin and Sparrowe to develop guidelines on evaluation criteria.

### b. Delmarva Fire Management Group (DFMG)

Project Leader Carowan met with Acting Fire Manager of the Forest Service's Eastern Region on June 25 to establish plans to finalize the Cooperative Fire Management Plan for the eight counties on Maryland's Eastern Shore. DFMG was organized in 1991 by Project Leader Carowan and Mr. Milbourne Adkins of the Maryland Forest Service, for the protection of over 700,000 acres of forest land and 200,000 acres of marshlands in the Eastern Region of Maryland. The eight

cooperating agencies and companies bring industry and government together in an effective partnership for pre-suppression and suppression activities.

The success of this partnership was published in Fire Management Notes, 1992-93, Volumes 53-54, Number 2 in an article entitled, "Partnerships - Making Them Work in Times of Limited Resources." (Consult 1992 ANR for background.)

c. Assistance with Implementation of Canada Goose Management Plan Strategies

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

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

d. Sika Deer Studies

Refuge staff assisted Maryland Department of Natural Resources personnel for the fourth consecutive year in capturing and eartagging sika deer on the Refuge as part of the State's population study. (See Section G. 16 for a summary table of sika eartagging on the Refuge.)

e. U.S. Navy, Bloodsworth Island

Refuge staff participated in surveys of waterfowl populations in the "Bloodsworth Island Zone." The refuge conducts these aerial surveys as part of the 1990 Cooperative Agreement to assist the Navy in management of its property. Bloodsworth Island has a long history of use as a bombing range but supports large numbers of waterfowl in and around the island. Surveys were conducted over Bloodsworth, South Marsh, Smith and Barren Islands, and Bishops Head Point to monitor waterfowl use over the entire zone of influence.

During 1993, a total of eight aerial surveys (six wintering waterfowl and two breeding pair/brood counts) were conducted by refuge personnel utilizing FWS aircraft and pilots. Surveys were scheduled when access was granted by Patuxent control, and when air space was not being utilized by military aircraft; therefore, some variability in survey time was noted. Generally, no major problems were experienced in gaining access permission. Waterfowl surveys were flown at 200-250 feet at a maximum speed of 90 mph; brood surveys were conducted at 150-200 feet at a maximum speed of 90 mph. Survey lines were set at approximately 2,000 feet intervals and covered the land areas as well as surrounding waters.

As in previous years, it was difficult to schedule flights due to the unavailability of Federal aircraft/pilots. No certified private vendor is available in the area.

Significant observations included the following: 935 black ducks (February survey); 946 bufflehead (March survey); 1404 tundra swan (February survey).

In addition, staff worked closely with the Ducks Unlimited Institute for Wetland and Waterfowl Research (IWWR) and Clemson University on studies that were initiated on Bloodsworth Island in 1992. One study focuses on determining waterfowl habitat associations on Bloodsworth Island in comparison to adjacent islands owned by State and Federal agencies. Special attention is being given to black ducks. Waterfowl use data is being obtained from aerial and ground surveys, and analyzed in relation to wetland habitat data to determine habitat associations and preferences. Colonial bird use of the area is also being evaluated, particularly the great blue heron movements from the Island to mainland sites in comparison to Barren and Smith Island where similar uses occur. Wetland habitat data will be obtained from the GIS project being coordinated by the University of Maryland and from the second student study, which focuses on the ecological characterization of the wetland habitats. Specific objectives of this study are 1) to determine the composition, structure, and distribution of wetland plant communities; and 2) to determine physical and biological factors that influence the plant communities.



f. Dorchester County "Committee of 100"  
and Sailwinds Park

In 1992, Project Leader Carowan was appointed to serve on the 30-member Board of Directors of Sailwinds Park, a proposed multimillion-dollar development in Cambridge, a project that has been blessed by the Governor and his cabinet to spark the economic development of Dorchester County. The plan is a local, not State, initiative and as such has been developed on the local level with a broad cross-section of community leadership. Carowan was chosen to serve on the Board to represent Blackwater Refuge and the Service's interest, and to provide technical assistance with "public development" projects.

On August 19, Project Leader Carowan resigned from the Board because of the increasing number of professional and personal schedule conflicts. The Executive Board honored Mr. Carowan's request, but urged that he remain active in providing assistance with specific activities. This Carowan did throughout the balance of the year, actively participating in the development of the new Sailwinds visitor center to be located just south of the Frederick C. Malkus, Jr. Bridge in Cambridge. The \$3,000,000 facility was approved for construction by Governor Schaefer, and the refuge will participate on the "Exhibit Development Team" in 1994.

g. Christmas Tree Project for Erosion Control

On November 12 and 15, refuge staff assisted with the transport of last year's stockpiled Christmas trees for completion of Ecological Service's marsh restoration project.

h. Assistance to DOI Budget and Finance

On November 10, at the request of the Washington Office, Project Leader Carowan met with Mr. Kevin Gergler, DOI Budget and Finance, to review refuge operations, Service budgets, and FTE's. Of particular interest to Mr. Gergler was the apparent increase in Regional Office overhead and the decline in O&M dollars in the field. Mr. Gergler was also very interested in the force account construction projects that were being completed on the refuge and the significant savings to the government.



Fig. 25. Marsh restoration project on the Little Blackwater river using Christmas trees.  
(GCH)

i. Fishing Opportunities

On October 16, Project Leader Carowan met with Dr. David Rockland, Time magazine editor and board member for the Fish and Wildlife Foundation, regarding the development of a fishing pier and boardwalk on the Little Blackwater River. A subsequent meeting with Rockland on October 30 and a meeting with the Assistant Secretary of DNR on November 8 generated a great deal of interest in this project. At year's end, Project Leader Carowan was developing a series of alternatives, including the acquisition of lands by the State, for consideration by the Assistant Secretary.

j. GAO Review of Endangered Species Programs

On July 23, Project Leader Carowan met with Ms. Kathleen Johnson and Ms. Deborah Eichhorn from GAO to review endangered species recovery activities and funding for same on Blackwater Refuge. Of particular interest and concern to them was the progress that was being made towards Delmarva fox squirrel recovery activities and the

capabilities of Refuge O&M to fund these activities. Evidently GAO is going to be very interested in determining how the Division of Refuges is funding endangered species projects pursuant to the 1982 agreement between the Associate Directors for Wildlife and Federal Assistance that transferred 1400 O&M funding to AWR. Recent conversations with SE personnel in Region 4 indicated that similar concerns are being expressed on how Refuges intends to conduct routine O&M recovery activities.

k. Pocomoke State Forest

Biological Technician Giese continued to serve on the Citizens Advisory Committee for Pocomoke State Forest to help guide annual work planning for Pocomoke State Forest. In 1992, Governor Schaefer directed three State forests to develop this interesting concept of management oversight.

l. Barren Island Shoreline Stabilization

Refuge and ES staff, in partnership with the COE and the Fish and Wildlife Foundation, developed a proposal to utilize dredge spoil materials from the Honga River's Tar Bay channel to stabilize the eroding banks of Barren Island. This project, scheduled to start in 1994, will utilize the geotubes that were used at Eastern Neck NWR. Approximately 2 miles of tube will be installed in sections 200 feet long, with 50-foot breaks between sections; spoil materials will then be deposited behind the tubes. The project will receive \$109,000 from the Fish and Wildlife Foundation and \$25,000 from the EPA's Bay Program; the COE has also committed \$3,000 to the project for phragmites control.

m. Nutria Eradication

Responding to constituent concerns, Maryland State Senator Frederick Malkus introduced Maryland Senate Bill 27 in the 1994 Maryland Legislative session. After consulting with the refuge staff and Maryland DNR officials, Senator Malkus introduced this bill to eradicate nutria from Maryland marshes due to the destructive nature of this exotic rodent. The funding from this effort is proposed to be diverted from the Maryland duck stamp proceeds. The Malkus bill calls for 50% to 90% of the stamp revenues to be used for nutria

eradication. Senator Malkus met with the local newspaper and television media at Blackwater to announce his proposed bill. Despite some opposition from animal rights groups, this bill is expected to be enacted in 1994.

On November 15, Carowan, Hartis, and Giese met with Dr. Bauchman, Assistant Secretary for MD DNR, Josh Sandt, MD DNR Director of Wildlife, and several members of their staff to discuss nutria control and potential eradication. A follow-up meeting between Carowan, Sandt, and Peter Jayne (DNR Furbearer Biologist) was held on October 23.

On December 3, Carowan and Giese met with State Senator Malkus, Dr. Bauchman, Josh Sandt, and members of their staff to discuss nutria control and potential eradication. Senator Malkus has introduced legislation to utilize 50% of the Maryland Duck Stamp revenues to control nutria.

n. Patuxent Research Questionnaire

On August 26, Biologist Hartis submitted response to the Refuge Biological Information, Research, and Management Needs Questionnaire to Dennis Jorde of the Patuxent Wildlife Research Center for entry into their data base. The information was collected to help find ways for the PWRC to meet refuge research needs.

8. Other

a. NORTH AMERICAN WATERFOWL MANAGEMENT PLAN

The North American Waterfowl Management Plan (NAWMP), an international agreement established in 1986 between the U.S. and Canada to protect, enhance, and restore wetland habitats across the continent, presents a number of new opportunities and challenges for NWRs. The NAWMP sets conservation goals for wetland habitats in specific regions of the continent; identifies 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: the fresh estuarine bay marsh, brackish estuarine bay marsh, brackish estuarine river marsh, and brackish estuarine bay. Many of these marshes are adjoined by good-sized agricultural fields and by large tracts of sawtimber used by nesting bald eagles.

The Blackwater/Nanticoke section is an important waterfowl area. Canada geese, mallards, black ducks, and canvasbacks are most significant. 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. Other breeding waterfowl species include mallards, blue-winged teal, gadwall, and wood ducks. Large numbers of wood ducks concentrate at the head of the Blackwater, Little Blackwater, and Transquaking Rivers during their fall migration.

Several 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 improved through open water marsh management, reduction of insecticide use, and improved management of existing State and Federal impoundments, and 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 are identified for protection and 5,000 for enhancement.

Blackwater's 1993 activities to meet North American Waterfowl Management Plan and Joint Venture objectives included the following:

- ▶ In keeping with the Blackwater/Nanticoke Focus Area Plan's highest priority objectives, the Refuge completed impoundment restoration projects in Pools 1, 2, 3, and 5 (see Section F).
- ▶ Several major land acquisitions were made to protect valuable waterfowl habitats, including the Howard Tract, the J. D. Williams Tract, and Bishops Head and Spring Island Tracts during December 1992, and major management activities, including moist soil and cropland management, were performed to greatly enhance waterfowl objectives.
- ▶ On October 20, Project Leader Carowan met with Don Baugh, Chesapeake Bay Foundation (CBF), to discuss the bank stabilization project at Bishops Head. CBF, as part of the North American Wetlands Conservation Act grant, agreed to provide \$8,000 to rip-rap around the pier and adjacent areas at Bishops Head. The project will be accomplished as a partnership with the refuge providing services, CBF supplying materials, and the State's Boating Administration and Shoreline Erosion Control Services developing the designs. CBF will be responsible for securing the permits.

b. PRIVATE WETLANDS RESTORATION INITIATIVE

Project Leader Carowan met with Chesapeake Bay Field Office (CBFO) staff members Steve Funderburk, Carol Weinhold, and Cheryl Amrani on April 22 to discuss the refuge's role in the new "Partners for Wildlife" initiative. Recent changes to the Maryland Partners Program were discussed, and Carowan provided historical information pertinent to the success of the program on the Eastern Shore, including the minimum opportunities for wetland restoration for



properties immediately adjacent to the refuge due to the significant and increasing number of Regulated Shooting Areas. The group also discussed the refuge's role in providing staff assistance with surveying, construction, site ID, etc., with Carowan making very limited commitments to these activities pending completion of the very time-consuming, labor intensive, and extremely important ongoing MARSH restoration activities. Carowan did commit to assistance pending completion in the early fall of 1994 of the MARSH projects, and counseled the group on the need to utilize Service resources (particularly temporary local equipment operators) to keep construction costs down to \$1,000 per acre.

As an effort of renewed commitment to these programs, Project Leader Carowan met with local landowner, Pat Neil, on July 26 to reinitiate project evaluations and recommendations for the restoration of approximately 50 acres of wetlands on Taylors Island. This project was one of the ones originally identified by Carowan in 1989/90. At that time ES was not impressed but, as with most things in the Service, if you wait long enough, things will change. This was true of ES's opinion, and funding was received for FY94.

On August 19, Project Leader Carowan met with CBFO staff Cheryl Amrani and Carol Weinhold to review the project proposal.

On October 28 and November 16, Project Leader Carowan and SROS Heet met with Larry Hindman (MD DNR) regarding refuge assistance on completing a three-acre wetlands restoration project at Horn Point. The lowest of the project bids DNR received from several local contractors was \$12,000. The refuge's estimate was \$700 - a VERY BIG difference! This project was scheduled for completion in early 1994.

On November 19, Carowan attended the dedication of the Balling's wetlands restoration project. It was interesting to note that this was the second project identified by refuge staff during the 1989 project identification era, a time when ES folks couldn't make up their mind if this project was good or bad. Our hats are off to the folks at MD DNR who made this project a reality, regardless of the FWS!



c. PARTNERS IN FLIGHT

On October 23, Carowan and Hartis attended the first General Meeting of the Maryland State Working Group's Partners in Flight at Seneca State Park. The Neotropical Migratory Bird Conservation Program (Partners in Flight) was formed to coordinate an effective conservation effort to restore neotropical migrant populations in Maryland and elsewhere. The purpose of the October 23 meeting was to review the threats facing neotropical migrants, identify and prioritize the conservation issues related to neotropical migrants in MD, and to begin developing strategies to resolve the problems.

Seventeen primary issues or problems related to neotropical migrant landbird conservation in Maryland were identified in the following prioritized order:

1. Lack of public education and outreach;
2. Inadequate research (e.g., studies of breeding habitat, stopover habitat, causes of decline, individual species information;
3. A need for an ecosystem approach to land planning and management;
4. Lack of communication and educational efforts between managers, researchers, and planners;
5. Inadequate management of public lands and need for increases in the public land base;
6. Lack of funding;
7. Inadequate management, consolidation and distribution of data;
8. Unclear goals, objectives and desired actions of the Maryland PIF working group;
9. Lack of cooperation between private landowners and groups/agencies interested in protecting neotropical migrants and their habitats;
10. Inadequate or ineffective use of existing incentives to private landowners;

11. Need for prioritization, on multiple levels, of conservation efforts for neotropical migrants;
12. Inadequate or inefficient use of technology, (e.g., GIS);
13. Inadequate use of existing laws and regulations that could be used to protect neotropical migrant habitat;
14. Need for PIF to be institutionalized;
15. Inadequately addressed pesticide concerns and impacts;
16. Inadequate monitoring of species and habitats;
17. Lack of communication between states and regions, physiographic regions (Coastal Plain, Piedmont, etc.), and broad geographic areas (NE, SE, etc.).

#### F. HABITAT MANAGEMENT

##### 1. General

Blackwater NWR's major habitat types and approximate acreages including acquisitions through 1993 are as follows:

Estuarine	13,381
Palustrine	5,226
Other Wetland	25
Administrative	114
Woodland	1,345
Cropland	794
Total	20,885

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 causes of such devastating loss have 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. However, recent studies have

suggested 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 to generate new growth, 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 current Station Management Plan recognized the severity of the marsh loss problem and recommended 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. (Section G.8)
- 2) Removal of excess nutria and muskrat in accordance with the refuge's trapping plan. (Section H.10)
- 3) Development of alternative prescribed burning program on one- to two-year rotations. (Section D.5)
- 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)

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.)

## 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 and open water. The primary management activity 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. Nutria and muskrat population monitoring and trapping are management tools that also attempt to reduce destructive marsh grazers.

#### b. Moist Soil Management Units

Waterfowl habitat at the refuge is a favorable trichotomy composed of the moist soil management unit (MSMU) 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 habitat and food crops for maintaining a healthy population of migrating and wintering waterfowl and other wildlife.

Seven rainwater-dependent pools comprise the refuge MSMU system. These pools (Units 1-5 and new units at Fields 4 and 39) contain approximately 250 acres at full pond levels (not including flooded timber in Pools 1, 2, and 4 and emergent marsh in Unit 4). As a rule, all refuge MSMUs are eventually drawn down or pumped to maintain moist soil conditions during the summer months in order to encourage emergent natural moist soil vegetation or to plant refuge agricultural crops on higher elevations.

As usual for moist soil management purposes, rainfall occurred during the year when it was not needed and conversely did not occur when it was needed most. It must be specifically noted that the summer of 1993 was the second consecutive summer that the refuge was involved in major MSMU rehabilitation within Units 3 and 5. For construction purposes, soil moisture within these units was maintained as dry as possible throughout the spring, summer, and fall. For this reason, moist soil management hydrology was severely restricted if not completely eliminated in MSMU 3 and 5 during 1993.

#### MSMU 1

MSMU 1 is a 30-acre freshwater unit at full-pond composed of organic soil in the center portion, tending toward more mineral/sandy soils in the higher shallow edges. Salinities for the year ranged from 0.0 at drawdown to 1.0 at full pond.

In January, MSMU 1 reached full pond level of 1.9'. This allowed waterfowl to completely utilize remaining moist soil plant resources of flatsedge, wild millet, and panicgrass on the higher pool edges. In addition,

these higher water levels encouraged waterfowl access to a site baited for Canada geese, and greatly increased neck collaring/banding success. Prior to the start of gradual drawdown on January 28, waterfowl use peaked at 2000 Canada geese, 1600 mallards, 80 black ducks, and 300 pintails.

Gradual drawdown in MSMU 1 in February occurred all month. The initial portion of the drawdown, however, was rapid gravity flow from 1.9' on the gage to 1.0' the first couple of days of the month. Daily pumping with the 6" Gator electric pump lowered the reading to 0.7' by February 11 where it essentially remained, despite pumping, due to continued precipitation. As planned, this drawdown concentrated macroinvertebrates and made them more available for waterfowl. The most abundant invertebrate was an amphipod genus *Crangonyx* (scud, sideswimmer). In decreasing order of abundance, we also found concentrations of isopods (aquatic sowbugs), oligochaetes (aquatic earthworms), chironomids (bloodworms), corixids (water-boatmen) and odonates (damselflies). Waterfowl use peaked at 2600 Canada geese, 1100 mallards, 1800 pintails, 60 black ducks, and 90 shovelers.



Fig. 26. Duck and goose use on MSMU 1, mid-February. (LPH)





Fig. 27. The most abundant macroinvertebrate obtained from sampling MSMU 1 in February was an amphipod genus *Crangonyx* (scud, sideswimmer). (LPH)

Gravity drawdown in MSMU 1 continued as needed in March and April to remove excess rainwater and maintain a water gage reading of approximately 1.0'. Pumping with the Gator electric pump started on May 5 and water levels were pumped down to 0.7 and lower on the gage to create shallows and mudflat conditions for shorebirds and wading birds. Their populations peaked during migration the last three weeks of May at 800 semipalmated sandpipers, 160 semipalmated plovers, 30 greater yellowlegs, 8 least sandpipers, 120 dunlin, 12 spotted sandpipers, 60 great egrets, 35 great blue herons, 11 snowy egrets, and 2 green herons.

MSMU 1 was at complete drawdown all the month of June at -1.6' on the gage except for occasional rainfall which was immediately pumped down. No shorebird or wading bird use occurred this month as complete drawdown prevailed. Moist soil plant germination began the second week of June and was very dense and uniform in coverage. By the last of June average vegetative height was approximately 10" and promised to be the best stand ever in this organic-soil pool. This success can be traced back to a series of events that began in mid-February when gravity drawdown began to

concentrate invertebrates for waterfowl. As the water level lowered, foraging waterfowl and wading birds scoured the shallows thus agitating the seedbed in the organic soils. Water levels were lowered by pumping starting on May 5 and continued gradually all month to provide accessibility to invertebrates for shorebirds. Much agitation of the mudflat substrate occurred by foraging shorebirds during migration the last two weeks of May. Inadvertently, several hundred carp swam against the current and entered MSMU 1 while in the gravity flow drawdown mode in mid-April. They contributed even more to seedbed preparation during May's shallow-water period by constant agitation of the mucky substrate.

MSMU 1 remained at complete drawdown during July except for rain the first week of the month that was immediately pumped out as much as possible. Ponded water of about 2" in the center portion was drained partially by the use of the Gemco ditcher on July 7 and ditching was completed on July 13. By the end of the month, moist soil vegetation was above waist height and similar in composition to last summer's vegetation of flatsedge, wild millet, and panicgrass.

MSMU 1 remained dry in spite of occasional rainfall from August through October. Finally in November about 5" of rainfall collected in the lowest portions of the unit.

By the end of December MSMU 1 was at 0.2' on the water gage which shallow flooded about two-thirds of the existing moist soil portion of the pool to a desirable water level for this time of year. Canada goose use peaked in December in MSMU 1 at 2100. Mallards peaked at 800, black ducks 30, pintails 600, and green-winged teal 1500. Moist soil plants available for waterfowl use were, in order of abundance, *Cyperus* spp., *Walteri* millet, and *Panicum* spp.





Fig. 28. Shore bird/wading bird use in MSMU 1 in May 1993 was excellent in response to planned drawdown and concentration of available invertebrate food resources. (LPH)



Fig. 29. A birdwatcher at MSMU 1 in May took advantage of drawdown conditions that were timed and designed to benefit shorebirds by concentrating invertebrates. (LPH)



Fig. 30. Gemco ditcher in MSMU 1 in July where an existing ditch was reopened to facilitate drawdown. Moist soil plant response of flatsedge, wild millet, and panicgrass was excellent. (GCH)



Fig. 31. MSMU 1 water level during early December 1993. (LPH)



MSMU 2

MSMU 2 is a six-acre impoundment with organic soils and a two-acre GTR. Until 1990, the unit was a permanent water impoundment maintained for summer waterfowl brood habitat. Moist soil management with summer drawdown was conducted for two years during 1990 and 1991. Regardless of the variety of water management scenarios in those two years, the results were the same: lotus. Salinities for the year remained at 0.0.

Early January water levels were lowered and maintained at 1.9' on the gage to remove most of the water from the MSMU 2 GTR to prevent flooding and a premature invertebrate bloom there. Later in the month, by January 28, reflooding to 2.3' on the gage was accomplished to flood the GTR for production of macroinvertebrate communities next month. In the GTR, peak waterfowl feeding use amounted to 400 mallards. In the MSMU 2 proper, no significant waterfowl use occurred this month.

Water levels were increased in MSMU 2 in early February to 2.3' on the gage to flood leaf litter in the GTR portion of the pool to encourage production of macroinvertebrates. Drawdown to 2.0' by mid-month was done to concentrate and make any macroinvertebrates produced available to waterfowl. Numbers and kinds of macroinvertebrates are unknown, but we assume that some kind of production occurred as evidenced by daily feed activity of waterfowl in the GTR with peaks for the month of 800 mallards and 40 black ducks. Cropland Field 6 which is associated with MSMU 2 received excellent goose and duck use.

MSMU 2 began March at 2.5' and rapid gravity flow drawdown began on March 17 to a 1.3' reading for the rest of the month.

MSMU 2 held at a 1.3' gage reading throughout April and May, as planned, providing breeding and brood habitat for nesting resident waterfowl species.

MSMU 2 maintenance goal of a stationary water level of 1.3' for June fell short at month's end with a reading of 0.8' due to evaporation/transpiration.

MSMU 2 water levels dropped to approximately 0.6' due to evaporation/transpiration in July. Summer water level objectives for this pool is to maintain a 1.3' gage reading.



Fig. 32. Goose use in mid-February, Field 6, MSMU 2, in snow. (LPH)

MSMU 2 remained dry until December when the water level rose from very little water standing at the beginning of the month and not readable on the water gage, to a reading of 0.9' by month's end. Most of the standing lotus pods had broken off or fallen over and the pool was used by insignificant numbers of waterfowl, mostly Canada geese and mallards, for loafing and as a roosting site.

#### MSMU 3A, B, C, D

MSMU 3 contains approximately 117 acres when full. Soils are primarily mineral in composition. Salinities for the year ranged from 0.0 ppt at full pool to 3.0 ppt in the borrow pit area (at complete drawdown).

Stop logs were set in January to maintain a gage reading of 1.6', which flooded the unfinished lower portion of the unit to a depth of 3"-8" in the open field impoundment area. The portion of the unit where construction is complete (Pool 3A) reached a gage reading of 2.2', flooding the unit to a depth of approximately 1"-6". Peak use on moist soil plant areas of the entire pool system in Pool 3 was 2800 Canada geese, 1300 snow geese, 1200 mallards, 175 black ducks, 450 pintails, and 300 green-winged teal.

In February, the unfinished lower portion of MSMU 3 remained at approximately the 1.6' gage reading. MSMU 3A, the portion of the pool where construction was complete, remained at 2.2' and slightly higher. Waterfowl use of the entire unit peaked at 2900 Canada geese, 2400 mallards, 700 pintails, 30 shovelers, and 600 tundra swans on moist soil plant areas.

February 24-26, Engineer Equipment Operator Thurman constructed MSMU 3D at the low south end of Field 9. This area subsequently flooded and received tremendous utilization by waterfowl into early March.

MSMU 3 (B-C) was at 2.3' on the gage in early March and was drawn down rapidly on March 13 to 1.3' to prevent wind and water erosion on the uncompleted new subdike sections during the blizzard that month.

MSMU 3 gravity drawdown, in both old and unfinished new sub-impoundments, reached a 0.6' gage reading by the end of April. At this level, water was restricted to borrow ditches and had to be pumped to continue construction there on through May.

MSMU 3 began the month of June with a gage reading in the borrow pit of -1.5 and all construction cells remained at complete drawdown all month for excavation purposes. Moist soil plant germination was well underway during the first week of June. Many undesirable plant species appeared because of the early rapid drawdown for construction during the summers of 1991, 1992, and 1993 and because of the lack of scarification of the soil for several years. Undesirables included cocklebur, willow, buttonbush, hyssop loosestrife, Indian Hemp (*Apocynum sp.*), *Hibiscus sp.*, groundsel tree, and ragweed. Desirables were restricted mostly to *Bidens spp.* and *Eleocharis spp.* Shallow disking to scarify the seedbed to a 2"-3" depth was done in MSMU 3 during the first two weeks of June to discourage undesirable plant growth and undesirable seed production while hopefully encouraging the germination of a diversity of plants more beneficial to waterfowl and other migratory birds. All cells in MSMU 3 were disced except cell 3D. Cells 3B and 3C dikes remained to be constructed as of June. A four-acre contiguous central portion of each cell 3B and 3C was not disced, but left as controls to compare to the disced portion of each and because the area contained more of the desirable plant species including *Bidens* and three *Eleocharis* species. Two control portions were also left undisced in cell 3A for similar reasons: one was a half-acre toward the western end of

the cell and the other was an acre toward the eastern end.

MSMU 3A remained at a -1.5' drawdown gage reading all through July while construction of unit cells continued. Dry conditions for construction were not conducive to optimum moist soil plant germination response after June's disking efforts in this unit. Disking controlled much of the undesirable plant encroachment and some beneficial plant species were beginning to make their appearance in spite of the unusually dry conditions. Results of disking here indicated that where disking occurred, diversity was much greater for plant species preferred by waterfowl.

Essentially all new subdivisions of MSMU 3 (A, B, C, D) had only filled their borrow ditches by the end of December with no actual accumulation of water in the managed moist soil areas of each. No new water gages had been installed in the new subdivisions of MSMU 3 as of the end of December. The lack of flooding of the new MSMU 3 sub-units through December limited the amount of waterfowl use to peaks of only 600 Canada geese, 450 mallards, and 20 black ducks.



Fig. 33. Duck and goose use on MSMU 3 in mid-February. (LPH)





Fig. 34. February 1993: MSMU 3 willows provided thermoregulating cover for waterfowl. (LPH)



Fig. 35. Post migration waterfowl use in MSMU 3A in early March included much use by tundra swans. (LPH)



Fig. 36. Borrow ditch use by wading birds during summer construction drawdown was steady throughout summer period for MSMUs 3 and 5. (LPH)



Fig. 37. MSMU 3A-east end in December 1993. (LPH)





Fig. 38. MSMU 3B-east end in December 1993. (LPH)



Fig. 39. MSMU 3C-west end in December 1993. (LPH)



Fig. 40. MSMU 3D-east end in December 1993. (LPH)

#### MSMU 4

MSMU 4 is a 69-acre impoundment at full pool containing approximately 17 acres of open moist soil area, 9 acres of emergent marsh, and 43 acres of marginal timber land. Soils are organic in a shallow surface layer underlaid by a hard clay bottom. The organic layer tends to remain somewhat saline from previous flooding by marsh waters and ranged from 0.0 ppt at full pool to 2.0 ppt at drawdown in the borrow pit area.

The gage reading in MSMU 4 reached a high of 2.0' in January, which flooded into almost all the pine habitat and about half of the north side of the farmed field impoundment. Use was low in the deep-flooded portion of the unit, but the shallow-flooded Japanese millet in the northern portion of Field 35 received good usage by Canada geese, mallards, pintail, widgeon, green-winged teal, and shorebirds. Gradual drawdown was started on January 22.

Slow drawdown by gravity flow occurred all month in February from 2.0' to 1.1' as allowed by tidal levels outside the unit. This was not a sufficient amount of drawdown in the unit to optimize waterfowl feeding. Peaks of 600 mallards, 40 black ducks, and 20 shovelers occurred.

Gravity flow drawdown started on March 17 at 1.1' and by month's end was down to 0.5.'

MSMU 4 had a gage reading of 0.8' at the end of April. This was a slight increase in water level from last month, due to gravity flow drawdown not being able to offset rainfall and high tides.

MSMU 4 started May with a gage of 0.8' and ended with 0.1'. Shallows and mudflat conditions during this period hosted peaks of 80 semi-palmated sandpipers, 25 semi-palmated plovers, 30 yellowlegs, 15 spotted sandpipers, 6 great egrets, and 16 great blue herons.

MSMU 4 began the month of June with a reading of 0.1' and drawdown was completed at -0.5' by pumping on June 29. Very little moist soil plant germination had occurred by the end of June and that was limited to the higher unsubmerged areas.

MSMU 4 was drawn down to -0.5 again by pumping on July 9 to remove excess rainwater that collected in the unit during the first week of July. Moist soil plant response began during mid-July, within a few days after this drawdown. Moist soil plant density and composition during this early stage of development appeared to be similar to last year's response of Walteri millet, flatsedge, and panicgrass in the lower elevations.

No water collected in the unit until November, when a gain of 6" occurred in the lower portions.

MSMU 4 gained the most in water levels during the month of December to a gage reading of 1.4 due to slow steady drainage into the intake from surrounding flooded woods. The intake screwgate was closed at mid-month to maintain current water levels without flooding too much of the area too rapidly. Waterfowl use in MSMU 4 for December peaked at 400 Canada geese, 600 mallards, 450 pintails, 100 widgeon, 50 black ducks, and 1500 green-winged teal.



Fig. 41. MSMU 4 water level as existed in mid-May 1993 during drawdown for moist soil plant germination and shorebird use. (LPH)



Fig. 42. MSMU 4 moist soil vegetation/water level in August was a result of drawdown beginning in March and ending with complete drawdown the last of June. (LPH)





Fig. 43. MSMU 4 water level in November 1993. (LPH)



Fig. 44. MSMU 4 water level in December 1993. (LPH)



Fig. 45. MSMU 4 waterfowl use in December 1993.  
(LPH)

#### MSMU 5

MSMU 5 is approximately 60 acres in size and contains primarily mineral soils. Salinities this year ranged from 0.0 ppt at full pond to 2.0 ppt at drawdown.

Maximum gage reading in MSMU 5 for January was 2.2'; this, by design, effected the shallow flooding of the standing corn in adjacent croplands as well as in remaining moist soil plants at higher elevations. Peak use by waterfowl was 3800 Canada geese, 1600 mallards, and 600 pintail.

Water levels in February in MSMU 5 peaked at month's beginning at 2.2 feet and was gradually drawn down to 1.1 feet by mid-month. Subsequent precipitation refilled the unit to previous levels by the last of the month as outside tidal levels prevented any further drawdown by gravity flow. Waterfowl use of flooded moist soil plant areas peaked at 2500 Canada geese, 3100 mallards, 100 pintails, and 600 black ducks. Plant species present in the highest density were *Bidens* and *Ammania coccina*.



Fig. 46. MSMU 5 south (prior to subimpounding) and associated cropland (cornfield) use by geese and ducks in February 1993.



Fig. 47. Duck and goose use on MSMU 5 north in mid-February, prior to subimpounding. (LPH)



Gravity flow drawdown began on March 13 at 2.0' and by the end of the month was down to 0.4.'

MSMU 5's gage reading at the end of April was 0.3' due to gravity flow drawdown for construction. Subimpoundment ditching and diking with the excavator began mid-April on the higher and drier north side of the unit adjacent to our cropland fields on Key Wallace Drive, and continued through May.

MSMU 5 remained at complete drawdown the whole month of June and was disced for the same reasons as MSMU 3. However, this pool contained much more hyssop loosestrife and several isolated patches of phragmites. An approximate half-acre contiguous portion of the pool contained *Ammania coccinea* and it was left undiscd. Disking in MSMU 5 also favored a more diverse plant response mostly panicgrass, smartweed, and flatsedge.

MSMU 5 remained at complete drawdown in July, as it did in June, for construction of subimpoundment dikes. Some response to the June disking was evident in the appearance of beneficial moist soil plant growth in certain areas and the reduction in the density of undesirable plant species.

MSMU 5 remained dry the rest of the year to December when it filled to only 0.1' on the water gage in Unit 5B by the end of December. This only filled the borrow ditches of the unit's new subdivisions (5A, 5B, 5C) similar to the situation in MSMU 3. Only one water gage, Unit 5B, has been installed in this moist soil unit by the end of December. Waterfowl use was limited with peaks of only 400 Canada geese and 300 mallards using the area.



Fig. 48. Project Leader Carowan looks on as the GEMCO ditcher is used to construct a ditch to a water control structure at MSMU 5. (GCH)



Fig. 49. View: MSMU 5A-west end in December. (LPH)



Fig. 50. View: MSMU 5B-east end in December. (LPH)



Fig. 51. MSMU 5B waterfowl use in December 1993 was good at the existing water level until late mid-winter frozen conditions prevailed. (LPH)



#### MSMU Field 4

The newly constructed, small MSMU in Field 4 remained at full water level in January and February and attracted waterfowl that normally would not have used the field. Waterfowl that utilized the pool or the edge associated with Field 4 peaked at approximately 1500 Canada geese, 400 mallards, and 45 shovelers in February and March. Isopods, genus *Ascellus* (aquatic sowbugs), were abundant. Drought conditions prevailed in this mineral soil type unit the remainder of the year, and waterfowl use was low.



Fig. 52. Mid-march drawdown of newly constructed MSMU Field 4 attracted waterfowl to available concentrations of invertebrates (mostly isopods) during February and March 1993. (LPH)

### MSMU Field 39

Construction of this mineral soil unit was completed in 1992. MSMU Field 39 contains about two acres of field and moist soil habitat and about three acres of green tree reservoir capable of flooding. Modest use by approximately 200 to 300 mallards occurred on a regular basis in January and February. Drought affected the unit the balance of the year and no use was observed.

### MSMU Williams Tract

October was a month of discovery at the newly acquired Williams Tract as far as capabilities to manage for waterfowl. Using trial and error techniques, we became familiar with the layout and use of the two wells, underground piping system, and associated valves for pumping water to the various management units. Water can be pumped from each well separately or from both at the same time and diverted to any section of pipe in the system that supplies water to a particular portion of each management unit. We also discovered that the electric pump motor for one of the wells was not functioning, a PVC pipe valve was broken, and muskrat damage was evident on at least one dike at Flag Pond. These relatively minor problems will have to be corrected before any water management can occur at any of the sites on the Williams Tract.

### 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 (GIS) is underway, and 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 when undertaken.

Biologist Hartis completed a forest pest control package in July for routing through the Regional and Washington Offices, to meet Interior and Agriculture Departmental FY94 funding deadlines. The package contained a pesticide use proposal for Gypchek® to control hardwood defoliation caused by gypsy moth caterpillars on the refuge. In addition, the package contained the U.S. Forest Service Form 3400 necessary to obtain funding and pesticide from that agency. The acreage proposed for Gypchek® application increased from

150 acres in FY93 to approximately 1500 acres proposed for FY94, based primarily on U.S. Forest Service aerial reconnaissance information. Subsequently, a Section 7 Consultation was completed and retained on file at the refuge office.

Later during the year the refuge was advised by the USFS that the Gypchek® would not be available in the quantity needed to treat 1500 acres; additionally, the refuge acreage requiring treatment now appeared to total 1700 acres. The USFS therefore advised the refuge to consider using B.t.® instead. A subsequent proposal requesting use of B.t.® was approved and is planned for implementation in May, 1994.



Fig. 53. Typical gypsy moth egg mass. Thousands of these were found in areas proposed to receive suppression efforts in 1994. (LPH)



Fig. 54. Example of gypsy moth defoliation on hardwood leaves in an unsprayed area. Gypchek® was applied to 150 acres with fair to good results. Note the gypsy moth caterpillar. (LPH)



Fig. 55. Gypsy moth operation (suppression efforts - chopper, personnel). (LPH)



Southern pine beetle damage was beginning to be apparent on at least one small area of the refuge in 1993. Needles on at least a dozen trees immediately adjacent to and northeast of Moist Soil Management Unit 4 were turning brown and falling off. Further investigation revealed pitch tubes present on healthy live trees adjacent to the dying ones, indicating that they too were infested but in an earlier stage. The site was visited by Refuge Biologist Hartis and personnel from the U. S. Forest Service's Forest Health Protection branch in 1993. It was determined that, if the infestation persists, the most practical remedy would be to clear-cut buffer zones around the infested trees in an attempt to stop the spread.



Fig. 56. Aerial view of pine beetle damage (indicated by the brown canopy) on the refuge, northeast of MSMU 4. (LPH)



#### 4. Croplands

The refuge's 1993 agricultural program provided a variety of foods for wildlife throughout the year, by natural or mechanical means. Waterfowl, songbirds, resident game, and endangered species benefit directly and indirectly from the refuge's force account farming program.



Fig. 57. Acquisition of the Howard Tract added significantly to the cropland base of the refuge's farming program. Food plots for non-game species were planted along the entrance road. Ladino clover fields can be seen in background. (GCH)

On January 5, refuge staff met to initiate planning procedures for the upcoming farming season, with particular emphasis on how to manage more ground with significantly less money.

On January 13, Project Leader Carowan and BioTech Giese met with Drs. Russ Brinsfield and Court Stevenson regarding sustainable agriculture practices and utilization of organic fertilizer in reference to research being conducted at Wye Institute. Dr. Brinsfield assisted the refuge by collecting ground water samples for baseline data information. In addition, the Wye Institute agreed to provide assistance in implementing low input farming for the 1993 season.

Pesticide Use Proposals were submitted on February 3: Bicep®, Cygon®, Dipel ES® required Washington Office approval; Tordon®, Larvin®, and Rodeo® required Regional approval.

Soil samples were collected in March from all agricultural fields for analysis by the University of Maryland Extension Service office.

Price quotations were solicited for fertilizer blends for the refuge's agricultural program, and an acquisition was sent to CGS on May 4. The \$14K order was issued to Milford Fertilizer, Milford, DE.

Work continued on dozing/clearing brush along the main agricultural ditch at the Howard Tract. Approximately half of the ditch bank had been cleared by the end of February in anticipation of moving the excavator in for ditch cleanout. Ditch clean-out had been accomplished by the end of March.

Agricultural plantings totaled 712 acres in 1993 (Table 7). Corn, clover, and buckwheat/wheat were major crops, and involved the following activities:

Corn:

Corn from 1992 was left standing during the hunting season.

After the refuge met the post-season Canada goose neck-collaring quota, Field 6, part of Field 7, Field 9, and Field 22 were bush-hogged to make corn available for wintering waterfowl use during the latter part of the month. Legal ramifications prevent mechanical manipulation during the hunting season.

Bicep® was applied to 89.5 acres of corn and 22 acres of sorghum.

1993 corn planting began in May and continued in June. A five-acre field of silage corn was planted in order to evaluate this early maturing and lodging (falling down) variety. Corn production was down significantly due to the drought. Ears were small and insect damage was prevalent.

### Clover:

A dry period of weather in early February allowed for ground preparation of new clover fields on the Howard Tract. Fifty-six acres of corn fields were double disced before rain shut down this operation. Seventy-six acres of fields were planted in clover, using the ATV and seeder. This area included several additional fields where seeding was done without ground preparation, using freezing and thawing to work seed into the ground.

Twenty-seven acres of existing clover fields were spot seeded to fill in goose "eatouts" and wet spots. These fields will be maintained in clover for another year as part of our rotational program.

Wet conditions prevented early tillage of the remaining clover fields until mid-April. Thirty acres of clover were seeded over the burned, non-tilled agricultural fields on the J.D. Williams Tract (Fields 55 and 61). Maintenance clover seeding was also conducted on Fields 35, 36, 37, 38 and 42 in small areas.

Ladino clover was planted in Fields 5, 11, 12, 47, and 61 for a total of 41.3 acres. This planting was late due to extremely wet conditions, but good germination occurred with cool weather and several rain showers.

Clover mowing occurred on newly planted refuge fields to retard weed growth and stimulate clover growth. Final mowing of refuge clover fields was conducted to stimulate growth prior to the arrival of migratory geese.

Drought conditions during the summer stressed the late planted clover and several fields were tilled and seeded in wheat because of clover loss.

### Buckwheat/Wheat:

Buckwheat planting was delayed due to extremely dry conditions. In August, 65 acres of grass fields were burned in preparation for pre-planting ground tillage.

During September, 32 acres of buckwheat were prepared and planted in Fields 22, 21, 7, 9, 10. These fields were also seeded in wheat to provide green browse as well as a seed food.



Fig. 58. Mowed corn with wheat/ryegrass browse overseeded. This cover crop provided a green browse, protected the soil, helped build soil nutrients and prevented nitrogen leaching. A real multi-purpose practice! (GCH)



Fig. 59. Two of the major crops in the farming program: corn (on the left) and ladino clover (on the right). Our menu offers several main courses and the waterfowl use them heavily. (GCH)





Fig. 60. One of the first crops used in fall by migrating waterfowl: buckwheat with a wheat browse understory planted simultaneously. (GCH)

#### Sorghum:

A total of 48 acres of sorghum was planted in Fields 4B, 31B, 22C, 35C, 41, and 60. Sorghum was planted in areas where late season flooding would occur or as part of food plots for neotropical migrants and *Delmarva* fox squirrels. Only the 22 acres planted in Field 60 were treated with herbicide.

#### Millet:

Japanese millet was planted in 93 acres of refuge fields, primarily along MSMU edges and low elevation fields where early flooding would occur. Planting of Japanese millet usually begins in early July but, due to the drought, planting was delayed.

#### Soybeans:

Several small fields were planted in soybeans as part of our rotation program: 15 acres in Fields 10B and 51A were planted in June. No herbicide was applied at planting but eight acres were oversprayed with the herbicide *Blazer*® to reduce broadleaf weed competition.



The extremely dry, hot summer greatly affected refuge crops. Corn production was poor and growth retarded. Japanese millet and buckwheat planting was delayed due to the total lack of moisture during July and early August. Late planted clover, which had not established good root systems, withered and died and was replaced with wheat in some areas to provide green browse.

Waterfowl utilization of refuge crops was exceptional. The refuge continued to receive support and compliments from local officials, the general public, hunters, and adjacent landowners for this program. The force account farming provided food for wildlife throughout the year with primary emphasis on waterfowl usage during the migratory season. Ladino clover and buckwheat seeded with winter wheat receives heavy waterfowl use for the entire wintering period. Sorghum, corn, and soybeans provided needed carbohydrates during the late winter period after the hunting season and during periods of extreme weather when food sources were generally unavailable.



Fig. 61. "Do we want buckwheat or clover?" Canada geese are sometimes torn by the food selections at Hotel Blackwater. (GCH)

The staff is continually seeking new ways to accomplish this program with limited manpower, money, and equipment. We are striving to utilize methods which protect the wildlife, waters and land of the refuge and the Chesapeake Bay by using crop rotations, filter strips, cover crops, nitrogen builder crops, etc., thus reducing chemical and fertilizer inputs and reducing erosion and sediment loss.

The force account farming program involves a heavy commitment of manpower and hard work from the refuge staff. However, the benefits of this program to migratory waterfowl, songbirds, endangered species, and resident wildlife are extremely rewarding. Also, the public use value of the wildlife observation opportunities created by this program is immeasurable. This program brings more local advocates to support the refuge than any other activity.

Table 7. **FORCE ACCOUNT FARMING**  
Blackwater NWR - 1993

<u>Crop</u>	<u>Acreage Herbicide-Treated</u>	<u>Acreage Untreated</u>	<u>Total Acreage</u>
Corn	90	0	90
Sorghum	22	26	48
Clover (ladino)	0	251	251
Soybeans	8	7	15
Japanese millet	0	93	93
Buckwheat	0	88	88
Food plots	0	14	14
Wildlife Browse	0	98	98
Wheat	0	15	15
<b>TOTALS</b>	<b>120</b>	<b>592</b>	<b>712</b>

#### 8. Haying

A Special Use Permit was issued to a local farmer for experimental haying in Field 7. The clover/grass mix browse crop grown in this field would have been mowed by refuge staff. The refuge received \$361.62 from the permittee for 124+ tons of hay removed from refuge fields. This is the first real interest expressed by local farmers to utilize the ladino clover and orchard grass grown in some of the refuge fields.

## 9. Fire Management

The annual Prescribed Burning Program was submitted and approved in the fall of 1992. The 1993 program addressed justification for burning 6006 acres of refuge marshes, croplands, waterfowl impoundments, and woodlands to reduce fuel hazards and wildfire dangers, to encourage Olney three-square growth, to assist in control of muskrat and nutria populations, to reduce mechanical manipulation of the cropland fields, to encourage moist soil plant growth, to control phragmites, and to reduce understory growth.

Refuge staff were actively involved in prescribed burning for wildfire suppression during January. Approximately 1000 acres were burned through ground ignition in preparation for the aerial ignition scheduled for February. Nevertheless, three wildfires were documented on adjacent properties, but rainy weather kept the fires contained to small acreages.

OAS authorized use of Maryland DNR Police's Aviation Section personnel and helicopter for the 1993 aerial burn, which was accomplished on February 2. Maryland's Jet Bell Ranger arrived at the refuge at approximately 10:30 a.m. Two Department of Natural Resources pilots were OAS-carded, and burning began at approximately 11:30 a.m. In 3½ hours, 2139 acres were burned. No problems were experienced during the aerial burn. However, one fire that burned into a low area of woodland blazed up the following day; high winds and low humidity required staff response to secure this wildfire, which burned 15 acres of woodland and required monitoring for several days.

Approximately 150 acres of ground prescribed burning was conducted after the aerial burn, primarily touch-up and spot burning.

Four trespass wildfires were experienced from adjacent landowners burning their marsh land in February. Such fires are closely monitored to insure no threat to refuge marshes.

In February, 65 acres of agricultural fields were burned on the J. D. Williams Tract in preparation for clover seeding. In March, 120 acres were prescribed burned on trapping Units B and C to prevent snow goose depredation.

In February we sent our JD550 dozer to assist Maryland Forest Service (MFS) at Bishops Head, when their dozer got stuck during firefighting.

Table 8. FY93 MARSH 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	430	-	2	230	-	200
B	190	70	-	-	-	55	15
C	175	100	-	-	-	100	-
D	60	47	-	1	2	45	-
E	200	175	5	1	100	-	75
F-I	225	180	-	-	-	105	75
G	530	350	-	-	-	150	200
H	500	435	10	1	15	220	200
J	525	315	-	-	-	115	200
K	380	250	-	-	-	250	-
L	760	480	-	1	50	30	400
M	200	50	-	-	-	-	50
N	607	420	-	-	-	20	400
O	560	410	-	-	-	210	200
P	300	225	-	2	110	40	75
Q	202	190	-	1	150	-	40
<b>TOTALS</b>	<b>5894</b>	<b>4127</b>	<b>15</b>	<b>9</b>	<b>657</b>	<b>1340</b>	<b>2130</b>

During June, Blackwater sent two firefighters and equipment to battle the "Gnatcatcher" wildfire at Okefenokee NWR. Our newly acquired LT9000 Ford truck tractor and a 35-ton drop trailer was used to transport our Bombardier with 500 gallon water tank and associated equipment to Okefenokee for use in finding and marking fire boundary lines and standby for fire attack. The men and equipment were on detail for two weeks.

Blackwater NWR was notified on July 29 that a Level 4 fire alert was issued by the MD DNR. Under our cooperative agreement with Maryland, refuge equipment was readied and refuge staff were put on standby.

Under the direction of RFMC Allen Carter and with Regional fire management funds, the refuge issued a \$12,000<sup>+</sup> purchase order to Forest Technology Systems, Inc. for a FWS-11 fire weather station. The system included a data recorder and display unit; sensors to measure temperatures, humidity, and wind direction/speed; a 20-foot telescopic mast; a remote telephone modem; and Fire Weather Plus® software. A demo disk of the software was reviewed during April, and installation of the required dedicated telephone line was contracted. The fire weather station, which documents current conditions and provides up to 60 days of archived weather data, can be accessed by any other refuge or agency with Fire Weather Plus® and a modem by having the system call 410-228-0988.

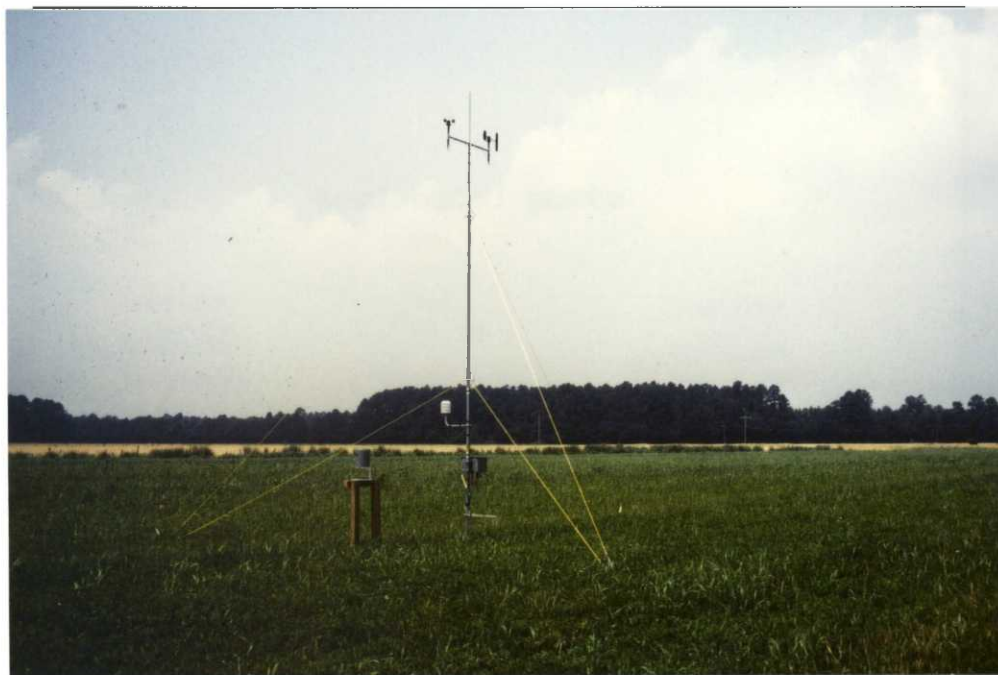


Fig. 62. The newly-acquired fire weather station. (LPH)

In August, in preparation for buckwheat planting, 65 acres of refuge fields were burned to remove dead grass vegetation and to facilitate minimum tillage for preparation of seed beds.

In August, our fire equipment and dozer were used to assist the Maryland Forest Service (MFS) in fighting a fire that threatened the refuge's Jarrett Tract.



On August 28, ROS Barker and Engineering Equipment Operator Morris responded, upon the request of the Maryland State Forest Service, to a forest fire adjacent to the refuge. They bulldozed a fire line around the small (three-five acre) woodland/logging area fire and utilized the Bombardier to cool down and hold the backfire line. Maryland Forest Ranger Jim Spicer expressed great appreciation for their quick response and efforts.

In October, the boundary and fire break surrounding the Williams Tract were mowed and all downed trees crossing fire lines were removed by bulldozer.

The Prescribed Burn Plan for the 1994 season was submitted to RFMC Carter on November 23. All refuge fire personnel were tested for physical fitness utilizing the step test and received required medical exams in December prior to commencing burning activities.

Fire personnel Giese, Hartis, and Morris met with Maryland Forest Service employees to plan a two-day equipment training session scheduled for December 9 and 10. This two-day session familiarized refuge and Forest Service personnel with equipment capabilities.



Fig. 63. This training session familiarized MD Forest Service and Refuge staff with each others fire suppression resources. (GCH)

Staff time expended on prescribed burning and other fire management activities (excluding training and program/report preparation) during the 1993 season totaled 230 staff days.

<u>Fire Management Activity:</u>	<u>Staff Days:</u>
Wildfire pre-suppression, aerial	10 hrs
Wildfire suppression	52.5 hrs
Habitat Maintenance	<u>167.5 hrs</u>
Total	230 hrs

Salary costs for these staff hours were \$3408. Seasonal firefighter salaries totaled \$14,000. Cost of helicopter aerial ignition totaled \$3,041 (\$950 for flight time and \$2091 for incendiary ping pong balls).

Following the Okefenokee fire, a number of maintenance repairs were required to refit the Bombardier and to increase its effectiveness. The following maintenance and rehab items were accomplished by the end of the year:

- ▶ Strobe light and shields installed
- ▶ Siren, back-up alarm, and rear winch installed
- ▶ Snatch blocker and pump safety bar installed
- ▶ Emergency warning light bar was installed

#### 10. Pest Control

**Pine bark beetle** infestations of refuge woodlands were monitored during aerial surveys as well as from the ground. One area of beetle kill was found in water-stressed trees along Pool 4 on the east side of the refuge. Since the infestation is only in a thin band of trees adjacent to the boundary with Maryland DNR's Fishing Bay Management Area and the State has proposed no action, the refuge is not actively attempting to control the problem in this area, which is fortunately cut off from the major areas of woodland on this tract. Another infestation was found adjacent to the boundary on the south side of the refuge on private land. Both of these areas are extremely wet which would make cutting difficult. It is hoped that the extremely cold weather experienced this winter will naturally control this pest.

**Gypsy moth** control plans were coordinated with the U.S. Forest Service in preparation for applying Gypchek® to approximately 150 acres of infested woodlands at the refuge's Longfield Tract. Three treatment areas were mapped and flagged just prior to the arrival of USFS coordinator Brad Onken on April 28. Moth larval development and tree

foliation progress indicated that the first of two applications should be scheduled for the first week in May. Two aerial treatments of Gypchek® biological insecticide were applied to 150 acres of gypsy moth infested woodland located on the Pascal Tract. The insecticide applicators were contracted U.S. Forest Service personnel; Refuge staff assisted by marking spray areas. Control results were found to be fair to good. Unfortunately, the area sprayed was surrounded by many acres of heavily infested private lands and the newly acquired Williams Tract.

Planning began in summer for submitting FY94 gypsy moth spray proposals. (See Section F.3.) Aerial surveys by U.S. Forest Service estimated 1400 acres of heavy defoliation during 1993.

The refuge maintained coordination with the U.S. Forest Service office in Morgantown, WV in relation to revising plans for gypsy moth population management activities planned for the 1994 defoliation season. A proposal/funding process was well into its final stages of approval when the refuge learned from the U.S. Forest Service that the pesticide of choice, Gypchek®, would not be available in the amount required. The USFS added 200 acres to the proposed 1500-acre treatment area, and recommended B.t.® as an alternate choice of pesticide. A good portion of October was spent revising the entire gypsy moth population management proposal package for resubmission requesting the approval of B.t.®.

**Weeds and grasses** in 89.5 acres of corn were controlled with the herbicide Bicep®. This was the most effective herbicide we have used for control of weeds and grasses. Bicep® treatment was also used on 22 acres of sorghum at the Williams Tract. Due to the extremely dry weather, poor control of morning glories and some other broadleaf weeds was found in two cornfields thus forcing a post-emergence treatment of Banvel® on 15 acres. No pre-emergence treatment was done on 15 acres of soybeans, but heavy infestations of pigweed and jimson weed forced a post-emergence treatment of Blazer® on 8 acres of soybeans.

**Minimal Corn borer** damage was observed in the corn fields, but no action was necessary. No insecticide has been used in the force account farming program since 1989 (when it all started).

**Johnsongrass and Canadian thistle** occurred in small areas and were spot-treated with Roundup® herbicide. Control of these noxious weeds is required by Maryland law.

**Phragmites** aerial spraying was not funded this year. Patches of phragmites in refuge pools, field edges, and long dikes and ditches were hand spot-sprayed with Rodeo® and a surfactant from funds that were scavenged from any available source.

All herbicide treatments on the refuge were conducted under the direction of BioTech Giese, a certified pesticide applicator. BioTech Giese, Maintenance Mechanic Webster, and Tractor Operator Truitt attended the required annual Pesticide Application Recertification course sponsored by the MD Department of Agriculture.

## G. WILDLIFE

### 1. Wildlife Diversity

This narrative in its entirety, but more particularly Sections F. and G., incorporate the wildlife diversity theme throughout in reference to the refuge's management programs. Recent Service emphasis on diversity is not a new concept at Blackwater NWR, as the Refuge's broad variety of management programs already inherently provide for a diverse range of resources, habitats, and species. However, with new information being collected and renewed emphasis being placed in such directions as management of neotropical migrants and nongame species, we will no doubt be striving to be much more specific in our management approach to these areas as soon as clear goals are set and funding is allocated. We must keep in mind, however, that a single refuge cannot be the provider of all things, to all species, all of the time.

### 2. Endangered and/or Threatened Species

Blackwater has historically provided habitat and protection for three Federally endangered species: the bald eagle, the Delmarva fox squirrel, and the peregrine falcon. Bald eagles and Delmarva fox squirrels are year-round residents; peregrine falcons are only occasionally observed migrating through the mainland marshes of Blackwater, but frequently visit Bishops Head Point and Spring Island from nearby nesting towers on Fishing Bay Management Area, South Marsh Island Management Area, and Martin NWR.

The red-cockaded woodpecker, once found on Blackwater, is now believed to no longer exist in Maryland.

The Northeastern tiger beetle is believed to have suitable habitat on Barren Island; however, no specimen has been found to date.

Sea turtles such as the endangered Atlantic loggerhead, green, hawksbill, leatherback, and Atlantic ridley are occasionally found in the waters surrounding Barren Island, Bishops Head Point and Spring Island.

a. Bald Eagles

Bald eagles utilize the refuge's expansive marshes, open waters, 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 roost throughout the refuge and County.

On January 14, the Mid-Winter Eagle Survey was conducted by refuge staff and the Maryland Department of Natural Resources personnel. Forty eagles were observed during the one-half hour survey.

Blackwater NWR and the surrounding area contain a major concentration of nesting eagles. Refuge personnel assist MD DNR staff by monitoring eagle nests in the refuge vicinity during aerial waterfowl surveys, thus reducing air traffic around nests.

An aerial survey on February 9 by refuge staff and a follow-up survey on February 18 and 19 by Maryland Department of Natural Resources biologists found the following eagle nest activity:

Kuehnle/Pool 4	- Incubating
J. D. Williams	- Incubating
Barbadoes Island	- Incubating
Barnes Landing	- Incubating
Meekins Creek/Unit E	- Incubating
Cole Comfort Island	- Incubating
Bull Point	- Adults by nest
Woods Trail/Field 8	- Incubating
Wildlife Drive/Field 23	- Incubating
Barren Island	- Incubating

In addition to these ten nests on the refuge, eagles were observed incubating on another additional ten nests adjacent to the refuge.

During a follow-up aerial survey in early March, nine active bald eagle nests were observed on the refuge. Gale force winds on the weekend of March 13-14 blew out two nests and downed one nest tree. One pair of eagles immediately began rebuilding but no eggs or incubating activity was observed.



On April 15, Maryland Department of Natural Resources performed a follow up aerial survey to check eagle production.

Table 9. 1993 Bald Eagle Production

<u>Eagle Nest Site</u>	<u>Production</u>
Kuehnle/Pool 4	1 young
J. D. Williams	2 young
Barbadoes Island	2 young
Woods Trail/Field 8	2 young
Wildlife Drive/Field 23	2 young
Barren Island	1 young
Total	10 young



Fig. 64. We held our breath while one eagle chick was successfully raised to flight stage in this badly windblown nest on the Kuehnle Tract. (GCH)

In 1993, 33 active eagle nests were found in Dorchester County: 6 nests, with 10 young, on the refuge; 10 nests, with 23 young, adjacent to the refuge (within 2 miles); 9 nests, with 17 young, were in the remainder of the County. Dorchester County eagle production totaled 50 young from 25 nests, for an average of 2.0 young per active nest.



Fig. 65. One of six productive nests on the refuge in 1993. This is the way an eagle's nest is supposed to be built! (GCH)

In recent years, refuge personnel and volunteers conducted bi-weekly eagle roost use surveys at four sites on the refuge. These roost locations were monitored from late fall to late spring, the period of peak usage for eagles. The peak roost usage occurred on January 29 when 165 eagles were counted at 4 roost locations. There now appears to be some variation in eagle roost usage at these sites as use fluctuated during the period (Table 10). With these numbers of eagles present, Blackwater is a principal eagle viewing site for the general public on the east coast.

Table 10. WINTER/SPRING EAGLE ROOST SURVEYS

Roost Location	-----Number of Eagles Sighted-----							
	1/1	1/14	1/29	2/25	3/12	3/30	4/12	5/7
Smithville/Jarrett Tract	41	12	50	50	21	5	15	5
Handley/Spicer Tracts	6	5	10	5	5	4	*	*
Kuehnle Tract/Pool 4	14	15	93	14	17	6	10	*
Smith Tract	42	44	12	61	100	33	55	7
TOTAL	103	76	165	130	143	48	80	12
* Not surveyed								

Table 11. FALL EAGLE ROOST SURVEYS

Roost Location	---Number of Eagles Sighted---	
	10/16	11/18
Smithville/Jarrett Tract	15	17
Handley/Spicer Tracts	*	*
Kuehnle Tract/Pool 4	4	10
Smith Tract	10	6
TOTAL	29	35
* Not surveyed		

Closed-area zones around eagle nests and roosts were posted prior to the opening of fishing/boating, deer hunting and trapping seasons. The Kuehnle Tract/Pool 4 (Hunt Area A) and half of Hunt Area E were closed to deer hunting this year in order to protect the new roosts from disturbance.

An adult banded bald eagle was killed by an automobile on Key Wallace Drive on November 19. This eagle had been observed feeding on a road-killed nutria just prior to its demise. This incident was used by MD State Senator Malkus to promote his nutria eradication bill on the local TV news. According to Senator Malkus, "that eagle would be alive today if it weren't for the nutria."

On December 18, a dead adult bald eagle was found eight miles north of the refuge by deer hunters who reported it to the MD DNR Police. The eagle was brought to the refuge and shipped to the Madison Wildlife Health Laboratory. Cause of death was determined to be carbamate poisoning, although the exact poison has not yet been determined. FWS Special Agents are

investigating this eagle poisoning incident, the first in this area since 1988 when eight eagles were found poisoned throughout the County.

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. 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.

As part of the Delmarva Fox Squirrel Recovery effort, two areas of the refuge were identified as benchmark population sites: one in predominately pine forest and one in old-growth mixed pine/hardwood forest. These benchmark locations are surveyed once every year to monitor the status of the squirrel on Blackwater by determining a population estimate through a mark-recapture study. Also as part of the study, these areas are monitored biannually by nest box checks during the winter and by trapping in early spring. These checks, conducted over a five-year period, will provide baseline data to be used to monitor other populations in the core habitat, as well as transplant populations.

BioTech Giese, a member of the Delmarva Fox Squirrel Recovery Team, attended several recovery team meetings which were held to review the final draft of the Recovery Plan and to coordinate management activities on federal, state, and private facilities. On July 27, the Recovery Team met with managers of the Federal properties where DFS are found and reviewed plans for recovery efforts.

Giese assisted Ms. Allie Dewey of the Baltimore Zoo in organizing and scheduling a DFS mini-course for Johns Hopkins University graduate students. The seminar consisted of one day in the classroom, one day at the zoo, and one day in the field at Blackwater NWR, and was a very rewarding exercise for both students and instructors.





Fig. 66. The endangered Delmarva fox squirrel is seen regularly at the refuge. (GCH)

In October BioTech Giese presented a review of refuge management practices for DFS and answered questions posed by a class of graduate students given an assignment to assess Recovery Team practices and goals. Later in the month Giese attended the presentation on Delmarva fox squirrels given by the students. The students' assignment was to research DFS problems and present possible solutions to the DFS Recovery Team. The students generated some excellent ideas with potential application to the recovery process. This graduate course was part of a Resource Management class at the University of Maryland. Graduates were from many states as well as five foreign countries.

Several food plots, totaling five acres, were planted in sorghum and soybeans for Delmarva fox squirrels as part of the farming program.

The automobile continues to be the major cause of death for Delmarva fox squirrels in the area. All road-killed squirrels were collected, tagged and frozen for utilization in recording efforts. The worst periods for road-kills appear to be May-June (soybean planting/wheat harvest) and October-November (soybean and corn harvest).



In October, refuge staff trapped 28 gray squirrels for necropsy and genetic testing by Dr. Nancy Montcrief of the VA Museum of Natural History, as part of a comparison genetic evaluation of Delmarva fox squirrels. In addition, 24 road-killed Delmarva fox squirrels collected over an 18-month period were given to Dr. Montcrief for necropsy evaluations conducted by the VA Museum of Natural History, Smithsonian Natural History Museum, and associated research facilities.



Fig. 67. DFS nest boxes were checked during night surveys as part of a mark-recapture study of the two benchmark population sites on the refuge.

Data from the 1993 DFS nest box checks and trapping are listed below.

Table 12. 1993 DFS Mark-Recapture Study		
SITE	RESULTS	METHOD
<u>Egypt Road</u>	11 DFS marked	Box check
Benchmark	6 Grays marked	Box check
	30 DFS captured	Trapping
	(6 marked, 24 new)	
	0 Grays captured	Trapping
Population estimate = 57 Delmarva fox squirrels with a 95% confidence interval limits of 36 to 78 squirrels.		
<u>Jarrett Tract</u>	12 DFS marked	Box check
Benchmark	6 Grays marked	Box check
	6 DFS captured	Trapping
	(3 marked, 3 new)	
	0 Grays captured	Trapping
Population estimate = 22 Delmarva fox squirrels with a 95% confidence interval limits of 13 to 31 squirrels.		

c. Peregrine Falcon

There were several sightings of migrating peregrine falcons on the refuge during December.

d. Northeastern Tiger Beetle

During August, MD DNR biologists surveyed Barren Island for tiger beetles; none were found.

e. Loggerhead, Leatherback, Hawksbill, Green, Atlantic Ridley Sea Turtles

No sea turtles were found along refuge shorelines during the year. Local fishermen reported several sightings of sea turtles near Barren Island and Bishops Head Point.

Refuge staff contacted the Maryland Tidewater Administration to determine procedures for reporting marine mammals stranded along the shorelines of Barren Island and Bishops Head Point.

### 3. Waterfowl

A predominant management focus at Blackwater NWR continues to be on migratory birds and their habitats -- the original purpose for refuge establishment. 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 the fifth consecutive year, cooperative farming has been replaced by force account farming, with refuge staff and equipment conducting all aspects of cropland production. This method 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 low input agriculture, emphasizing reduced pesticide use and increased use of no-till practices and organic fertilizers.

In 1991, Blackwater NWR set new five-year waterfowl objectives for the winter seasons 1991-92 through 1995-96. 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. Peak populations of waterfowl generally occur on the refuge during the fall migration period from mid-November to late-December. Some of these birds migrate farther south, leaving a relatively stable wintering population. Therefore, Blackwater NWR waterfowl objective numbers are respectively two-phased: peak and mid-winter.

**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 historically conducted comprehensive statewide surveys only during the mid-winter period from which to base their own objectives. (Figure 68.)

**Peak** refuge objectives, on the other hand, are based strictly on the refuge's average peak for the last ten years.

The current Station Management Plan for Blackwater NWR consequently reflects the following waterfowl management objectives:

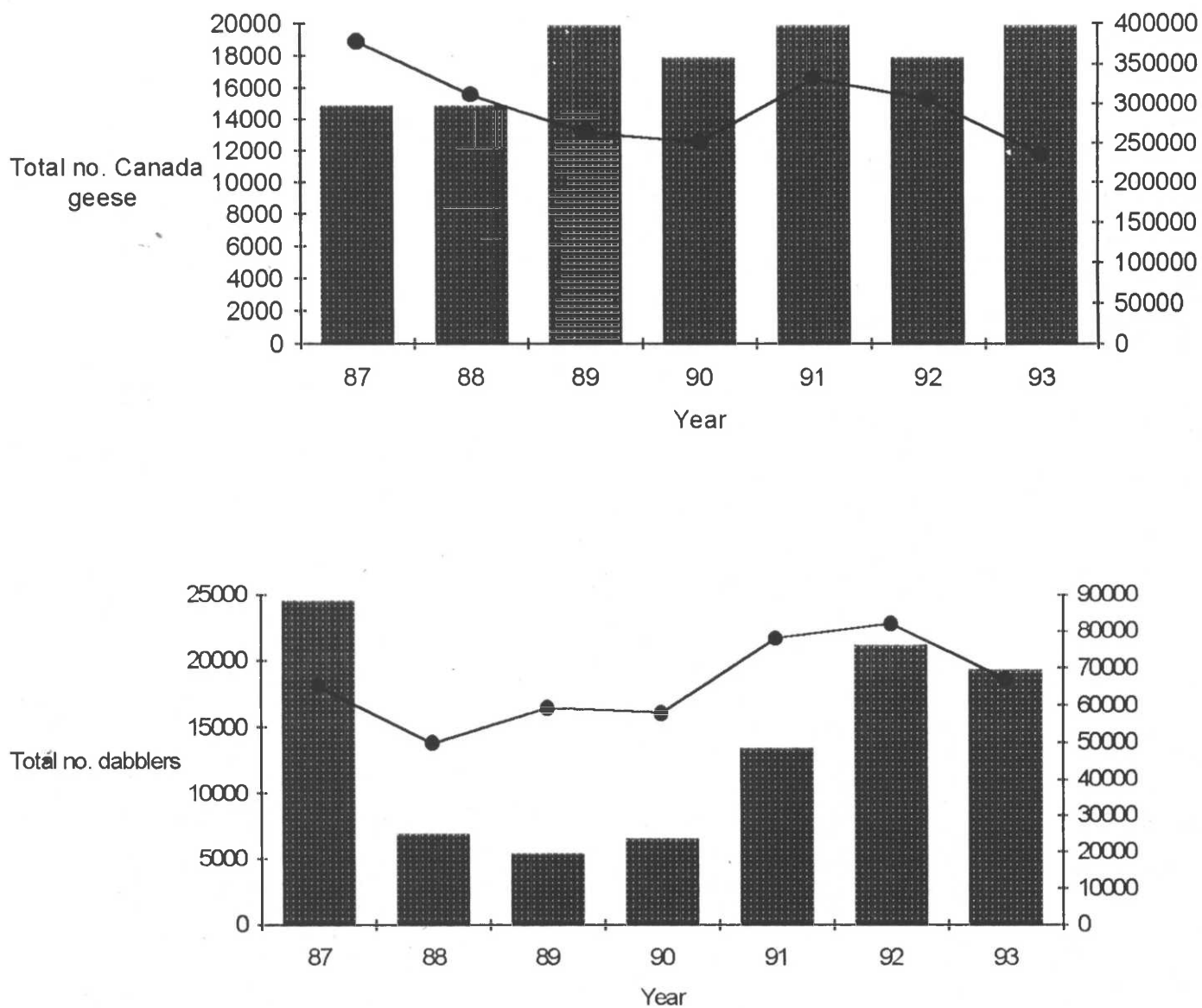


Figure 68. Comparison of Total Number of Canada Geese and Dabblers for Maryland and Blackwater NWR (Mid-Winter).

**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 the corresponding numbers of waterfowl utilized in setting these short term objectives. The ten-year peaks and mid-winter tables (1980-89 and 1981-90, respectively) correspond to the same ten-year waterfowl over-wintering periods, i.e., winter seasons 1980-81 through 1989-90.

**Table 13. MID-WINTER WATERFOWL COUNTS (1981-1990)  
USED IN SETTING WINTER 1991-92  
THROUGH 1995-96 OBJECTIVES**

	---Canada Geese---		--Dabbling Ducks--	
	BLK NWR	STATE	BLK NWR	STATE
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



Table 14.  
**BLACKWATER NWR WATERFOWL PEAKS 1980-1989**  
**USED IN SETTING WINTER 1991-92**  
**THROUGH 1995-96 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

In 1993, waterfowl survey methods were again implemented according to the Wildlife Inventory Plan drafted in 1990. Aerial surveys were scheduled for every other week during the winter, with regular ground/water surveys alternating every other week between the aerals. The new waterfowl inventory procedure also included fixed-point ground surveys. The fixed-point surveys were conducted the morning of and immediately 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 calendar years and for 1993 are shown in the first table below. **Peak** waterfowl counts (November-December) are similarly charted in the second table, but for Blackwater NWR **only**, as Maryland Department of Natural Resources did not begin conducting comprehensive State-wide mid-November aerial surveys until 1991. When utilizing the tables, remember that a calendar year splits two entirely different waterfowl seasons (a mid-winter count of one waterfowl season and a peak count of the next season).

Table 15. WATERFOWL MID-WINTER COUNT COMPARISONS 1988-1993

	Maryland Mid-Winter					5-yr.	1993
	1988	1989	1990	1991	1992	Mean	
Canada geese	312,000	263,400	250,900	331,900	305,700	292,780	234,400
Snow geese	61,400	105,000	11,200	78,300	63,400	63,860	43,300
Dabblers	49,900	59,200	57,900	78,000	81,900	65,380	66,900
Tundra swan	22,100	28,500	20,600	23,100	23,000	23,460	18,200
Blackwater NWR, January (first week)							
	1988	1989	1990	1991	1992	5-yr. Mean	1993
Canada geese	15,000	20,000	18,000	20,000	18,000	18,200	20,000
Snow geese	3,500	2,500	2,000	3,500	4,000	3,100	2,500
Dabblers	7,050	5,600	6,700	13,600	21,000	10,850	19,460
Tundra swan	100	50	100	200	2,000	490	400

Table 16. BLACKWATER NWR WATERFOWL PEAK COUNTS 1988-1993

	1988	1989	1990	1991	1992	5-year Mean	1993
Canada geese	35,000	25,000	28,000	30,000	20,000	27,600	20,000
Snow geese	4,000	3,600	3,550	6,000	2,700	3,970	4,000
Dabblers	9,035	12,600	20,839	21,350	13,300	15,425	11,300
Tundra swan	500	450	350	1,200	400	580	400

Overall waterfowl use at Blackwater NWR for CY 1993 was above average when comparing use-days from the table below. The total use-days for 1993 of 6,677,661 was above the 1988-92 five-year mean of 5,511,250 and above last year's total of 5,082,578.

Table 17.  
WATERFOWL TOTAL USE-DAYS  
1988 - 1993

1988	4,900,838
1989	5,552,084
1990	5,665,825
1991	6,354,928
1992	5,082,578
5-yr. mean	5,511,250
1993	6,677,661

Canada goose use-days for CY 1993 were up: 2,905,395 in 1993, compared to 1992's 2,360,675. Most of the Canada geese left the refuge the last week of February; the first fall arrivals appeared in early October. Canada geese peaked twice, once in January and again in December, at 20,000.

Snow goose use-days for CY 1993 were 324,759, compared to last year's 386,524. All snow geese had left the refuge by the last week of March; the first group (50 birds) of fall arrivals appeared the first week of October. Snow geese peaked in late November/early December at 4,000. Total Canada and snow goose use-days this year were 3,230,154 (1992's total was 2,747,199).

Tundra swan use-days for CY 1993 were 92,549, compared to 89,913 in 1992. Swan numbers dwindled all spring until the last 50 migrants left by the end of March. Tundra swans peaked in March, when 1,500 were recorded. The fall swan population began at the end of October and peaked in late November/early December with 400.

Duck use-days in CY 1993 totaled 2,326,530; 1992's total was 2,244,172. Spring duck migration from the refuge occurred generally the last week in February and fall arrivals began appearing in mid-October. The peak duck population occurred in January with a total of 20,815 recorded. Mallards peaked at 15,000, black ducks at 3,000, pintails at 1,000, and green-winged teal at 500. Other species were recorded in small numbers. Coot populations were the same as the previous year, with no more than 15 sighted at any one time.

Table 18. **WATERFOWL PEAKS/USE-DAYS**  
BLACKWATER NWR - 1993

<u>SPECIES</u>	<u>1993 PEAK</u>	<u>USE-DAYS</u>
Canada geese	20,000	2,905,395
Snow geese	4,000	324,759
Tundra swan	400	92,549
Mallards	15,000	2,326,530
Black ducks	3,000	
Pintail	1,000	
Green-winged teal	500	

Wood duck use on the refuge peaked in mid-October: 2,800 were counted during the fall roost period. Wood duck production, determined from an annual check, totaled 251 wood ducks to flight. Another 150 wood ducks were estimated to have been produced from natural cavities.

Table 19. ANNUAL REPORT FORM  
WOOD DUCK BOX PROGRAM INFORMATION-1993

Total boxes up:	<u>181</u>
Total usable boxes:	<u>181</u>
Use by wood ducks of usable boxes:	<u>155</u>
Number successful boxes used by wood ducks:	<u>69</u>
Use by other ducks:	<u>0</u>
Period boxes checked:	July 1993-Jan. 1994

Use by other wildlife: 76 of the 181 (42%) boxes checked contained starling disturbance which is an increase from last year. Screech owl use was detected in two boxes and an unknown warbler species was detected in two boxes.

Total wood ducks hatched:	* <u>501</u>
Wood duck broods produced:	<u>69</u>
# surviving to flight stage:	<u>251</u>

Plans for next year:

<u>          </u>	More boxes	<u>          </u>	Fewer boxes
<u>          </u>	Entrance holes created in trees		
<u>          </u>	No change		
<u>  X  </u>	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 1993 were Canada geese, 214; mallard, 175; black duck, 100; gadwall, 8; and blue-winged teal, 10.

Resident Canada geese numbers were totaled in late July for the 1993 summer breeding season on the refuge. By this time most of the adults had completed their molt and were flying, and most of the young were to flight stage. Forty refuge breeding pairs produced an average of 3.1 young to flight per pair or a total of 214 young. Non-breeding adults at this time numbered approximately 90 birds. All totaled, 384 resident Canada geese utilized the refuge during the summer breeding season. Mid-September resident goose numbers rose to approximately 2,000 as post-molting local residents moved onto the refuge in preparation for the winter.

#### 4. Marsh and Water Birds

The shallow water and marshes of Blackwater provide excellent feeding areas for wading birds. The primary species in this category, the great blue heron, is a year-round resident. Green-backed herons, little blue herons, great egrets, snowy egrets, cattle egrets, black-crowned and yellow-crowned night herons, and glossy ibis return to the region in spring and depart in October or November depending upon the weather conditions. All of the above species nest on the refuge.

The colonial bird rookery at Barren Island was noted to be active with great blue herons, great egrets, and snowy egrets (the primary species) during April. No estimate of production was made this year.

Cormorants have become a year-round resident in the area as their population expands. Bishops Head Point and Barren Island host the greatest numbers; however, cormorants are also regularly seen within the refuge. Nesting and production of young was documented for the first time on Barren Island.



Fig. 69. Nesting cormorants were documented for the first time on the refuge during 1993. (GAC)



Other species which nested on the refuge include American bittern and least bitterns.

Five species of rails frequent the refuge: Virginia, clapper, king, black, and sora. The most common is the Virginia rail and the most unusual is the black rail, a State-listed "species of concern." The black needlerush marshes at Bishops Head Point are heavily populated with rails. Late evening visits will find the marshes filled with their calls.

#### 5. Shorebirds, Gulls, Terns, and Allied Species

Large flocks of herring gulls and ring-billed gulls were seen in refuge fields following rains in late winter and early spring. Laughing gulls and herring gulls utilized refuge fields during farming operations. Great black-backed gulls are commonly found following white perch and other fish movements in early spring.

Early impoundment drawdowns have made excellent feeding opportunities for shorebirds, particularly dowitchers, dunlins, semi-palmated plovers, semi-palmated sandpipers, yellowlegs, killdeer, and least sandpiper.

Shorebird use was reduced as refuge impoundments dried up due to construction activities and the extreme summer drought.

Natural tidal areas are heavily utilized by many species of shorebirds throughout the year.

Willetts nest throughout the entire refuge and young are frequently observed along Shorters Wharf Road in *Spartina* marshes.

American oyster-catchers were observed nesting on Barren Island beaches and shoreline.

The colony of 100+ common terns on Barren Island produced approximately 50 young birds to flight stage. Some mortality was observed around the colony; cause was unknown. Herring gull production on one of the small marsh islands at Barren was also documented, although an accurate count was not conducted.



Fig. 70. Tern use on Barren Island. Nesting occurs on this small marsh island and it is being jeopardized by erosion. (WMG)

Herring gulls were also found nesting on Spring Island, part of the Bishops Head acquisition.

Caspian and Forster's terns were found frequenting the interior of the refuge as well as Barren Island and Bishops Head Point, but the most frequently seen terns are common and least terns.

#### 6. Raptors

Bald eagles continued to be the most prominent raptor found on the refuge, and was a major focus of the general public's interest and refuge's management activities (see Section G.2.a). In 1993, there were 9 active nests on the refuge and 13 immediately adjacent (within 2 miles). These nests produced 10 on the refuge and 23 adjacent. Dorchester County supported a total of 33 nests which produced 50 young. Many eagles frequent the refuge year round but the peak use occurs in late winter and spring. Four roost locations have been found on the refuge and are surveyed periodically to monitor eagle use. Peak eagle use at roost locations totaled 165 on January 29.

The 1993 National Wildlife Federation Mid-winter Bald Eagle Survey was conducted by refuge staff and MD DNR personnel on January 14. Forty eagles were observed during the half-hour survey, down from 73 in 1992. This decline appeared to be weather related as numbers of eagles on the refuge increased shortly after the survey.

Golden eagles were also observed on the refuge, with an estimated five to seven birds frequenting the area during the winter months.

Red-tailed hawks, American kestrels, and Northern harriers are the most common hawk species; red-shouldered hawks, sharp-shinned, merlins, and broad-winged hawks are seen occasionally. Red-tailed hawks nest in several locations on the refuge. Every fall large migrations of kestrels pass through the area.

The osprey is a very prominent raptor at Blackwater. Osprey arrive at Blackwater in March, usually around St. Patrick's Day, and rapidly stake out territories and build nests. Virtually all nest sites found on the refuge are on artificial nest structures. In 1993, a total of 25 osprey pairs nested on the refuge and produced 48 young to fledging. Immediately adjacent to the refuge, 5 more nest sites produced 10 young to flight stage.

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.

The refuge placed 8 barn owl nest boxes in marshes and grass fields: 6 of these structures were used by barn owls, producing 26 young. Second and/or fall clutches are also found: 2 fall nestings produced 7 young.

#### 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 300-400, and small populations nested on the refuge during the summer.

American crows now nest on the refuge. Major flights were 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 and Barren Island. Crows continued 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. The heron rookery on Barren Island is also subject to crow predation if disturbance forces adult herons from their nests.

American woodcock are year-round refuge residents, with limited nesting occurring. Woodcock breeding rituals were observed regularly during sika deer netting activities in February and March. Significant numbers of woodcock are observed migrating through the area each spring. Substantial woodcock habitat exists throughout the refuge, including the clear-cut areas of the Pascal Tract. BioTech Giese and Maintenance Mechanic Webster conducted the annual woodcock singing ground survey in South Dorchester for Patuxent NWRC.

Myrtle warblers, pine warblers, white-throated sparrows, and red-winged blackbirds are some of the major species of songbirds that migrate through the area. Refuge staff planted several food plots to provide food for songbirds and to enhance viewing opportunities for visitors.

1993 was the ninth year of the bluebird nest box program at Blackwater. All 34 boxes were utilized, and 88 bluebirds were fledged. Other species utilizing bluebird nest boxes were Carolina wrens, chickadees, English sparrows, and tree swallows. English sparrows were removed and eliminated when possible.

Table 20. BLUEBIRD NEST BOX PRODUCTION, 1988-1993

	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>
Bluebirds fledged	124	145	120	69	120	88
Other Species	11	30	14	37	35	18

Refuge staff provided artificial houses for various songbird species to increase nesting sites and to enhance interpretive efforts. Four purple martin houses located around the residence, office, and visitor center were all used. Prothonotary warbler boxes were maintained in several refuge impoundments.

#### 8. Game Mammals

Muskrat and nutria transect surveys were conducted during November. Muskrats remained at low levels throughout the refuge. Nutria, however, increased drastically over the last year. Nutria populations were estimated at 11,800, a

significant increase above the 7,750 estimated the previous two years.

During the 1993 trapping season, 358 muskrats and 6,268 nutria were taken on the refuge.

A total of 87 nutria were captured and eartagged as part of the mark-recapture study to document population increases. The recapture portion of this study will take place during the trapping season of 1994.

Raccoon populations were reduced significantly due to the occurrence of rabies on the refuge and in neighboring areas. Refuge trappers took 155 raccoons in 1993.

Red fox and gray fox are present on the refuge, with red fox the dominant species. Trapping method restrictions prevent the taking of these animals; therefore, only one red fox was taken in 1993.

Skunk and opossum were taken incidentally during raccoon trapping. Their pelts were generally not saved by refuge trappers.

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

River otter are present on the refuge and are seen occasionally along the Wildlife Drive. Although otter can legally be taken in the State, they are protected on the refuge. Approximately 30 otter are believed to use the refuge.

The eastern gray squirrel and the endangered Delmarva fox squirrel are found throughout the refuge's woodlands. New woodland acquisitions are planned to be surveyed over the next several years to document squirrel presence and abundance.

The refuge woodlands and marshes support two species of deer: the white-tailed 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 sika population continues to increase significantly while the white-tailed herd continues to increase only slightly.





Fig. 71. The elusive sika buck - what many sought but only a few found during the refuge deer hunt. (MMB)

A 25-day archery hunt was permitted from October 16 to November 13, and a two-day gun hunt was held on December 1 and 8. The refuge deer herd remains healthy and the hunts are primarily to reduce deer depredation complaints from adjacent farms.

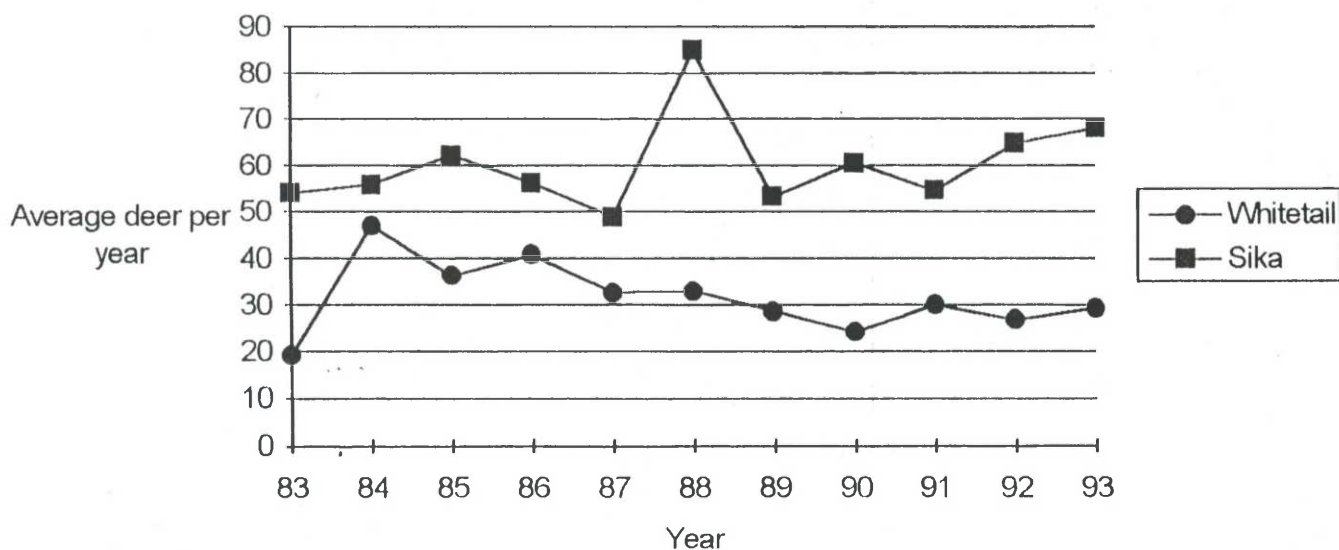


Fig. 72. Average Deer Per Year

#### 10. Other Resident Wildlife

The bobwhite quail population increased in 1993 and more quail broods were observed as a result of the dryer than normal spring and summer.

Over 30 wild turkeys were observed on the refuge several times during the year, another indication of a favorable nesting season.

Several small fields maintained for browse and cover were mowed periodically to control woody species.

Southern flying squirrels were found throughout the refuge, and were frequently found during DFS nest box checks.

#### 15. Animal Control

Over-population of nutria and the resulting marsh vegetation loss continued to be a major concern. Refuge trappers took 2,002 nutria for refunds from their trapping bids under the refuge rebate program, and then continued to remove an additional 2,556 nutria from refuge units. Refuge staff killed 710 nutria during marsh burning and impoundment dike patrols.



Fig. 73. Now you see it, now you don't...disappearing marsh adjacent to Wildlife Drive. This one year's depredation by nutria will probably not revegetate. Yes, nutria are a major concern at Blackwater, although some would argue otherwise. (WMG)

Maryland Senator Frederick Malkus introduced legislation to utilize funds from the Maryland Duck Stamp Program to fund a nutria control program. If the legislation is enacted, the refuge will most likely play an important role in nutria eradication.

In an attempt to harvest additional deer on the refuge, Blackwater increased the number of deer hunters for the 2-day gun hunt, opened several new hunt areas, and established a 25-day archery season. This effort will help minimize the number of depredation complaints from adjacent farmers and landowners.

No action was taken by the MD DNR to alleviate the mute swan problem, which is causing destruction of submerged aquatic vegetation beds and disturbance to black skimmer and tern colonies on Barren Island. The mute swan, a State-protected species, is rapidly increasing along the Bay shorelines and is now spreading into the interior of the refuge. A population of 500-600 is found in the waters around Barren Island.

In April, Special Use Permits were issued to two local trappers to remove snapping turtles from refuge waterways to help prevent waterfowl brood predation.

#### 16. Marking and Banding

In cooperation with Maryland Department of Natural Resources, the refuge began leg-banding and neck-collaring back in 1991 as participants in the Migrant-Resident Canada Goose Study. An initial quota of 200 Canada geese was assigned to the refuge in 1992 as a post hunting season goal for winter migrants. Two rocket net shots in 1993 in late January resulted in the capture and marking of 252 geese; 219 of the new white flexible collars and 33 of the old yellow hard-plastic collars were utilized.

Neck-collaring summer resident Canada geese was not done on the refuge in 1993, as MD DNR Biologist Harvey was of the opinion that the refuge had already collared more than a sufficient proportion of their flock. During an inspection of the refuge flock in late June, refuge Biologist Hartis observed that more than one-fourth of the total population had been neck-collared. There was no significant depredation on refuge crops by resident Canada geese this summer. It is suspected that a combination of factors may have been responsible: ditch/dike construction in impoundments that discouraged molting adults and young from moving from the marshes into the fields, the attraction of newly germinated vegetation following disking in impoundment bottoms: and the desiccative effect of unusually dry and hot

weather conditions on sprouting crops.

During the mark-recapture study of Delmarva fox squirrel benchmark areas, refuge staff ear-tagged or recorded numbers of DFS recaptures at the Egypt Road site and at the Jarrett Tract site. (See G.2)

In July, 21 wood ducks were captured and banded by refuge staff during nightlighting, air boat operations on the Little Blackwater River, and 8 more were captured by trapping.

Blackwater NWR staff assisted Maryland DNR personnel in live-trapping and marking (eartagging) 33 sika deer on the refuge in February and March 1993. Two sika deer with eartags were taken in the refuge fall hunt.

Table 21. Location, sex, and age class of sika deer trapped and tagged in Dorchester County, MD in 1993.

Date	Location Description	Location Code	Juvenile <sup>1</sup> Male	Adult Male	Juvenile Female	Adult Female	Total
3/11/93	Gootee (Kerwins Neck)	534	0	0	1	0	1
3/20/93	Ransome (Tall Timbers)	533	1	4	0	5	10
3/25/93	Ransome (Tall Timbers)	533	0	1	0	1	2
2/5/93	BNWR (Rt. 335)	533	0	0	4	9	13
2/11/93	BNWR (Rt. 335)	533	0	0	0	0	0
2/16/93	BNWR (Rt. 335)	533	0	0	4	8	12
2/9/93	Spicer (Keene)	533	1	2	0	1	4
2/18/93	Spicer (Keene)	533	0	0	0	0	0
2/24/93	Spicer (Keene)	533	0	0	0	0	0
3/3/93	Gramm Property		0	0	0	0	0
3/7/93	Gramm Property		0	0	1	1	2
3/10/93	BNWR Slacum		0	0	1	3	4
3/19/93	BNWR Slacum		0	1	1	2	4
	TOTAL		2	8	12	29	52

Note: Blackwater (BNWR) = 33 of the 52 deer.



## 17. Disease Prevention and Control

The southward spread of rabies on the Delmarva Peninsula accelerated this year. Numerous cases of rabid animals - mostly raccoon and skunk - were documented in Dorchester County and in the vicinity of the refuge. No cases were confirmed on the refuge this year; however, it's probably just a matter of time. The deaths of several raccoons discovered in refuge fields could have been attributed to rabies or distemper. All refuge field staff have received rabies pre-exposure vaccinations, and are extremely careful when approaching and handling all mammals.

### H. PUBLIC USE

#### 1. General

Total visitation for 1993 was approximately 120,638, a 5% decrease over 1992's 126,193. March visitation was affected by the large amounts of rain and the '93 blizzard (which closed the visitor center Saturday, March 13).

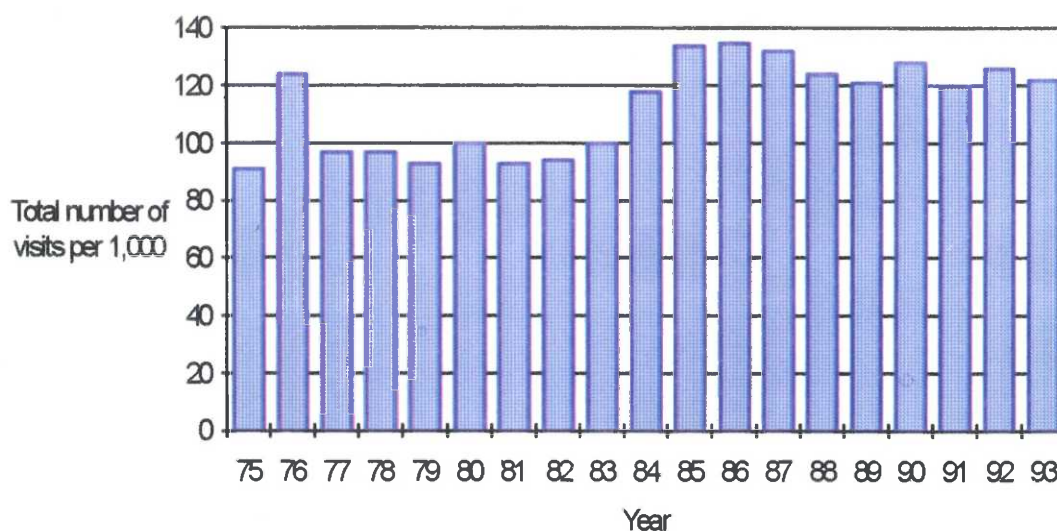


Fig. 74. Total number of visits to the refuge per 1,000



This year, 102,703 visitors used the Wildlife Drive, a 6% decrease compared to 109,608 visitors in 1992. Approximately 52,406 visitors toured the visitor center in 1993, a 9% decrease compared to 48,185 visitors in 1992. It is obvious the declining economy affected the visitation.

The Blackwater slide program became inoperable at the beginning of the year and drastically lowered the number of people receiving an orientation about the Refuge. A video projector and four new videos were donated to the refuge by the Friends of Blackwater NWR. As a result, films and/or videos on wildlife at the Refuge were shown approximately 405 times to approximately 4,074 visitors. However, a video focusing on Blackwater NWR, its goals and management, is needed to continue orienting the visitor to the refuge.

A new visitor center would greatly increase the ability of the Refuge to orient the visitor, and a larger building would provide more room and facilities for other groups to use for their meetings while introducing and promoting the Refuge. On June 9, the approved copy of the Refuge's Advanced Planning Document for the construction of a new visitor center/office was received.

Several groups made use of the visitor center and its facilities for meetings this year: The Delmarva Fire Management Group Team V, July 12; the Delmarva Fox Squirrel Recovery Team, July 26 & 27; MD DNR biologists, August 11; and the Maryland Greenways Commission held an Eastern Shore Greenways Workshop and Maryland Greenways Commission, October 5.

The Critical Area Commission held a meeting at the visitor center on November 3. A tent had to be set up outside the visitor center to accommodate the large number of people, committee meetings, and lunch catered by the Railway Market. State Senator Malkus and the Dorchester County's National Envirothon winning team along with several others were honored with Maryland Governor Certificates of Recognition at the luncheon. Governor Schaefer had been expected but was unable to attend the function. Therefore, Judge North presented the Governor's certificates.



Fig. 75. Envirothon team members Drew Weaver, Autumn-Lynn Harrison and Mike Giese received Governor's Awards at the Critical Area Commission meeting for their excellent performance with environmental education. (KL)



Fig. 76. Senator Fred Malkus accepted an award at the Critical Area Commission meeting for his environmental concerns with the Chesapeake Bay and support of the Critical Area Commission's work. (KL)



Fig. 77. BioTech Giese with his son Michael Giese who received the Governor's award. (KL)

Sixty new chairs for the auditorium arrived just in time for the meeting. The other chairs in the auditorium had been removed the beginning of September because they were constantly falling apart and created a safety hazard.

Many TV and newspaper interviews promoted the refuge and its programs in 1993. On January 19, Channel 2 (WMAR-TV) filmed the mid-winter eagle survey and waterfowl using the refuge. On February 10, Biologist Larry Hartis assisted Bill Hoy and film crew in obtaining TV footage for a Chesapeake Bay Magazine documentary on Blackwater. Alysse Hecker from WMDT-TV Channel 47 in Salisbury, visited Blackwater with her camera crew on June 14; in addition to filming wildlife along the Wildlife Drive, Ms. Hecker interviewed ORP Maggie Briggs. The "Day Trip" was shown during Channel 47's 6:00 p.m. news broadcast on June 17. WBOC-TV Channel 16 interviewed ORP Maggie Briggs at the Volunteer Workshop on October 9. Aired on the 6:00 p.m. news broadcast, the publicity prompted several people to be volunteers.

Biologist Hartis was interviewed during November by Charles Reid of television station WTTG's FOX Channel 5 News (Washington, DC). Film footage of eagles on the refuge was taken and aired later that same day.

On November 22, BioTech Bill Giese also gave an interview for Channel 5 regarding wildlife viewing opportunities at Blackwater during the fall months.

Numerous newspaper and magazine interviews also publicized the refuge. On August 14, ROS Barker met with Tom Holliday, a writer from Boston, and gave him a tour of Blackwater's marshes, vegetation types, and wildlife as background information for Mr. Holliday's publication. ROS Barker was also interviewed on October 20 by The Daily Times reporter Jim DeCoursey for a feature story on eagles; the article appeared in the October 21 edition. On October 19, Project Leader Carowan accompanied a group of nine National Geographic reporters on a tour of the refuge. The group was responsible for the article "Hanging in the Balance - Chesapeake Bay" by Tom Horton in the June 1993 issue of National Geographic. The article featured a drawing from one of Blackwater's slides and described the refuge's wetlands habitat and its importance to the Chesapeake Bay.

Short term assistance for the Public Use Program was a problem again this year. A Temporary Recreation Aide, Kathi Weir, was selected. Kathi entered on duty February 23 to assist with the mid-winter and spring programs. Although very enthusiastic about the job, trying to work two jobs turned out to be more than Ms. Weir could handle; after three days, she quit. Temporary Recreation Aide Ruth Kondylas was then selected to work March 21 through June 12; Mrs. Kondylas was also appointed to an emergency hire appointment November 14 through the end of the year, after SCA volunteer Kira Landsman decided not to work the full scheduled 16 weeks. The Public Use Program continued to run smoothly in spite of the continual training of new employees.

Unfortunately, the High School Cooperative Student Program got off to a bad start this year. Recruitment was unsuccessful until the end of the school year. High School Cooperative Student Lachesha Kinnebrew began her position with the Public Use Program on June 14. After a death in her family, she had to relocate and subsequently resigned July 10. A replacement was not acquired until the end of December when there were suddenly six applicants. Ms. Lanishia Ennals was appointed to the position, and will start in January 1994.





Fig. 78. WBOC-TV interviewed ORP Briggs at the fall Volunteer Workshop. (KL)



Fig. 79. Temporary Recreation Aide Ruth Kondylas assisted in staffing the visitor center and other public use programs in the spring. (MMB)



ORP Briggs and RecAide Kondylas attended an environmental education meeting held at Pickering Creek Environmental Education Center in Talbot County on April 13. Environmental educators from throughout Maryland's Eastern Shore introduced their facilities and programs to the rest of the group. A second meeting was held on May 21 at the Chesapeake Bay Maritime Museum in St. Michaels, Maryland. This meeting, which also included school teachers and administrators, introduced the environmental education resources and agencies to the educators and prepared for the Environmental Education Symposium. The symposium, held at Horn Point Environmental Education Facility on October 5 and 6, not only teamed up educators and resource facilities to determine what kind of programs were needed, but also developed model, hands-on activities that would use the various resource facilities and meet the school curriculum. The planned activities included using actual biological data, reading published articles, making outdoor observations, and writing proposals or recommendations. A lot of great educational activities were formulated and taken back to the schools and resource facilities.

One of the biggest improvements to the visitor center and environmental education program was the video projector donated by the Friends of Blackwater. On March 19, 60 fifth grade students from Maple Elementary School visited Blackwater NWR and BioTech Giese's farm. Half the students watched the video "Kids, Do Your Part," and had a refuge orientation while the second half had a tour of the Wildlife Drive. The first group watched the video on the television in the exhibit area while the projector was being installed in the auditorium. The second half of the group were able to view the video on the screen projected by the newly installed video projector. There was an amazing difference in the attention given to the same video shown on the projection screen as compared to being shown on the TV.

On January 11, Project Leader Carowan met with the Chamber of Commerce and the Office of Tourism to discuss methods to improve eco-tourism in Dorchester County. A new visitor center for the County at Sailwinds Park will include an exhibit on Blackwater to draw more people to the Refuge.

## 2. Outdoor Classroom - Students

A total of 1,795 students visited Blackwater in 1993 and received some type of orientation, compared to 2,103 students in 1992. As in previous years, Dorchester County second-graders visited the Refuge as part of their study of the Canada goose. There were 15 Dorchester County school groups totalling 595 students that toured the Wildlife Drive, viewed a film or slide program, and received an orientation from the Refuge staff compared to 16 school groups and 735 students in 1992. Also, 37 out-of-county school groups of 1,099 students that toured the Wildlife Drive and the visitor center compared to 35 schools with 1,036 students in 1992. An orientation program was presented to 31 of the 37 groups. Another five 4-H, YMCA, and Scout groups of 75 students also toured the Wildlife Drive and received an orientation and/or viewed a slide program or film at the visitor center.

The continuing lack of regional support to reinstate the full-time public use position vacated by Heather Nicholas in 1989, severely restricts our abilities to provide environmental education at historical levels. Reliance on volunteers and temporary staff cannot replace the benefits associated with an additional full-time person.



Fig. 80. ORP Maggie Briggs introduces students to Blackwater NWR. (AL)

With the opening of the new Environmental Education Center at Horn Point, the refuge is cooperating with the University of Maryland in more outdoor "hands on" environmental education programs. ORP Briggs and SCA Volunteer Lawrence traveled to the Horn Point Environmental Education Center on July 7 to assist the MD 4-H leaders in their wildlife education programs. Approximately 80 high school students from all over Maryland spent one of the hottest weeks of the year at the environmental education center. ORP Briggs instructed four separate groups of students in wildlife while orienting them to various habitats, especially the shaded forest. The students had visited BioTech Giese's farm the previous day to learn about agriculture and its importance to wildlife and people.

Then on July 27, ORP Briggs and BioTech Giese assisted the Soil Conservation Service's Land and Water Connection Program held at Horn Point. As the "Recreation Resource Specialist," ORP Briggs answered students' questions concerning outdoor recreation, Blackwater NWR, and the Chesapeake Bay. BioTech Giese, the "Farmer/Agriculture Specialist," answered questions about how farming and agricultural practices affect the waterways and Chesapeake Bay. On July 30, these students, along with another group from Caroline County, visited Blackwater NWR and participated in an environmental education program on the wetlands and learned how the freshwater and brackish water at Blackwater contributed to the Chesapeake Bay. They also enjoyed a guided tour of the Wildlife Drive, viewed the "Vanishing Lands" video, and received an orientation to the refuge at the visitor center.

On June 24, students participating in the Talbot County Environmental Education Program, which was spending the week at Horn Point Environmental Education Center, visited Blackwater again this year. Half the group of 40 students viewed the video "Kids, Do Your Part," received an orientation to the refuge from ORP Maggie Briggs, and toured the visitor center. The second half of the group toured the Wildlife Drive with SCA Andi Lawrence. Another group from the Talbot County Environmental Education Program repeated this performance on the first of July.

Fifty Frostburg State Regional Math and Science Education Program students, also spending a week at the Horn Point Environmental Education Center, visited Blackwater on July 21. The students explored the Wetlands and identified the various wildlife and plants in a brackish water marsh. They received some relief from the scorching heat and humidity when touring the visitor center, viewing the video "Vanishing Lands," and touring the Wildlife Drive.



Fig. 81. ORP Maggie Briggs identified wetland vegetation with a group of students from the Frostburg State Regional Science Center. (AL)

A college group from the University of Maryland visited Blackwater on June 30. Interested in wildlife management and especially refuge management, the 17 students viewed the National Wildlife Refuges video and then received an orientation to the management of Wildlife at Blackwater NWR. ORP Briggs spent over an hour answering their many questions on the subject before they toured the Wildlife Drive.

On November 14, another group from the University of Maryland-Baltimore College studying wetlands observed the "Vanishing Lands" video and explored the wetlands at Blackwater NWR with ORP Briggs after receiving an orientation to the refuge.



In order to introduce all of Dorchester County high school students to the local, State, and National Envirothon and to encourage students to enter in the competition, Blackwater assisted Soil Conservation Service District Manager Cyndi Slacum in an assembly program for the schools. ORP Briggs presented a slide program on the Envirothon to Cambridge South Dorchester High School on January 7 and to North Dorchester High School on January 29. Last year's Envirothon team members gave a short speech on the advantages and benefits they received from the competition. As a result, two teams from North Dorchester High School and four teams from Cambridge-South Dorchester High School competed in the 1993 Dorchester County Envirothon.

As the Wildlife Resource Specialist for the Dorchester County Envirothon, ORP Briggs traveled to Cambridge South Dorchester High School on March 25, and again on March 26, to give a slide program on wildlife for 30 Envirothon team members as part of their training. On March 31, ten North Dorchester High School Envirothon team members traveled to the refuge to get their "hands-on" training.



Fig. 82. Soils training at the 1993 Dorchester County Envirothon held at Blackwater NWR. (MMB)



The team members traveled to Blackwater NWR to compete in soils, aquatics, forestry, wildlife, and the current issue, "non-point source of pollution," for the 1993 Dorchester County Envirothon. Training in each of the natural resource areas and the first two competitions in wildlife and soils was conducted at Blackwater NWR on April 5. The competitions in forestry, aquatics and non-point source of pollution were held in the morning at the University of Maryland's Horn Point Environmental Education Center on April 6. Each team gave their presentations on the current issue of dealing with development and non-point source of pollution in the afternoon.



Fig. 83. "Non-point Source of Pollution" presentations for the 1993 Dorchester County Envirothon April. (MMB)

The winning team, "The Great Psychedelic Herons," represented Dorchester County and won the 1993 Maryland State Envirothon held in Prince George's County May 13-15. This same team won the 1991 and 1992 Dorchester County Envirothons and the 1991 Maryland State Envirothon, although there were a few changes in team members each year. The 1993 team representing Maryland consisted of Mark Asplen, Sean McGinnis, Robbie Allen, Autumn-Lynn Harrison, alternate Drew Weaver and captain of the team, Michael Giese, the son of Blackwater NWR's BioTech Bill Giese.



Fig. 84. 1993 State Envirothon Winners: ORP Maggie Briggs, team members, Autumn-Lynn Harrison, Drew Weaver, Mark Asplen, Robbie Allen, Coach Steve Haley, team member Sean McGinnis, and SCS District Manager Cyndi Slacum.

ORP Briggs accompanied the Dorchester County Envirothon Team to Niagara Falls, NY, where the Envirothon team became the 1993 National Envirothon winners. The competition was held at Niagara Falls University from July 31 through August 5. The Dorchester County/Maryland team held the highest score in both the Aquatics and Non-point Source of Pollution competition. As one of the 5 finalists, the team gave a second 20-minute presentation on the Non-point Source of Pollution problem dealing with "Love Canal," earning the most points and winning the 1993 National Envirothon.



Fig. 85. 1993 National Envirothon Winners: ORP Maggie Briggs, team members Sean McGinnis, Robbie Allen, Drew Weaver, Autumn-Lynn Harrison, Mark Asplen, Michael Giese and coach Steve Haley.



### 3. Outdoor Classroom - Teachers

ORP Briggs held a teachers training session for approximately 30 environmental education student-teachers from Salisbury State College on March 27. The student-teachers learned what was available at Blackwater NWR and what materials were available from the FWS for environmental education programs. Acting as middle school students, the new teachers viewed the "Kids Do Your Part" video and received an orientation to the refuge. Volunteer Tom Brannock then took them on the Marsh Edge Trail to demonstrate how to give a trail walk.

On July 23 and again on October 2, Loyola College teachers/students were given an orientation to Blackwater NWR. During the orientation, they were informed as to what facilities and educational opportunities are available for school groups at Blackwater NWR, and they were given resources to use in their classrooms.

ORP Briggs traveled to Centreville Middle School in Queen Anne's County on August 27 for a Student-in-Service Learning workshop for teachers sponsored by the Maryland Department of Education. The Blackwater's mobile exhibit visually demonstrated refuge resources while ORP Briggs answered teacher's questions about opportunities for student involvement at the refuge.

Due to permanent staff shortage and temporary turnover, the teacher workshop program is strictly by request.

### 4. Interpretive Foot Trails

With the exception of Dorchester County School groups using Volunteer Tom Brannock for a guided walk on the Marsh Edge Trail at Blackwater, and a few school groups outside the County requesting a guided Marsh Edge Trail Walk, the majority of foot trail hikes are self-guided. The draft for a self-guided Marsh Edge Trail leaflet to accompany numbered trail signs was returned to the Regional Office in August. The published leaflet, the result of a Friends of Blackwater challenge grant, will greatly enhance the interpretation of the Marsh Edge Trail. Approximately 28,621 visitors hiked the Marsh Edge Trail and Woods Trail in 1993. In addition, 8 guided trial walks were enjoyed by approximately 325 students.

## 5. Interpretive Tour Routes

Like the foot trails, the Wildlife Drive is self-guided. Although 11 of the 19 commercial bus tours were given a guided Wildlife Drive Tour, the 102,703 visitors who toured the Wildlife Drive were self-guided. To assist these and future visitors in their tour, a "Blackwater NWR Wildlife Drive Guide" was published and distributed at the entrance station and visitor center. Accompanying trail signs will be installed, along with an electronic entrance gate, in the near future.

The commercial bus tours introduced approximately 900 people to Blackwater NWR by stopping at the visitor center, sometimes viewing a film, and touring the Wildlife Drive. This was a 15% decrease in commercial bus tours. These groups included: Audubon Society, Smithsonian Association Members Birding Tour, Retired Maryland State Employees, Ocean Pines American Association of Retired Persons, Madonna AARP, Dunfield AARP Heartland Retirement Community, Graceland Park GAC, Christ Church Harbor Apts., St. William of York, Our Lady of Perpetual Help, St. Brigid's Senior Citizens, Bykota Senior Citizens, Woodhome Senior Citizens, Essex Golden Age Club, Castle In Sand MCEA, Rohrer Bus, and Starr Tours.

Blackwater NWR continues to be listed in Maryland's Travel and Outdoor Guide under the "Hiking and Cycling" section, in the Maryland Office of Tourism Development's The Best Bike Routes in Maryland, and in the Bicycling in Dorchester County leaflet published and distributed by the Dorchester Chamber of Commerce and Maryland Department of Tourism. These publications have brought at least 1,460 bikers to tour the Wildlife Drive. A great many more travel the 25-mile loop that goes through the Refuge on Shorter's Wharf Road and Route 335.

Special organized group activities also bring bikers to the refuge. On July 26, approximately 1,500 cyclists participating in the First National Bank Cycle Across Maryland Tour, cycled from Cambridge, Maryland to Blackwater NWR on Egypt Road. The tour ended in Towson, Maryland after 5 days and 320 miles. The group, consisting of all shapes, sizes, ages, and equipment, were exposed to different aspects of the State of Maryland, including Blackwater. While stopping at Blackwater, one of the cyclists, James Edwards, passed out in the parking lot and needed CPR. BioTech Giese assisted two other cyclists in performing CPR while waiting for the ambulance. By the time the ambulance arrived, the victims's heart was beating and he had resumed breathing. Unfortunately the gentlemen died at the hospital the next day from diabetes complications.





Fig. 86. Bicyclists at entrance to Wildlife Drive. (MMB)



Fig. 87. Bicyclists enjoying "Cycle Across Maryland".

## 6. Interpretive Exhibits/Demonstrations

Blackwater's mobile exhibit continued to be popular at numerous shows, where it introduced the Refuge to many people, improved the public's understanding of the Refuge activities and policies, and enhanced the spirit of cooperation with other local organizations.

The exhibit was displayed at the 48th Annual National Outdoor Show held at the South Dorchester K-8 School on February 26 and 27. Amid a flurry of this year's first real snow fall, approximately 11,000 people attended the World Championship Muskrat Skinning Contest, Muskrat Cooking Contest, Miss Outdoors, Little Miss Outdoors, Little Mr. Outdoors, Log Sawing, Duck Carving, and Duck and Goose Calling Contests. There were gun dog trials, trap demonstrations, over 50 exhibits on display and plenty of food including muskrat. Volunteers Albert Keller, Sandy Boone, and Madeline and Harry Parker assisted ORP Maggie Briggs in answering questions and staffing the Blackwater NWR exhibit.

Along with the Blackwater NWR mobile exhibit, the Friends of Blackwater set up a display and sold merchandise at the Third Annual Earth Day event held in the Cambridge-South Dorchester High School on April 25. The affair was attended by approximately 700 people, a 29% increase over last year's attendance.

Blackwater was requested to display its exhibit at the Talbot County 4-H Fair held near Easton, July 16 and 17. This was the first time the exhibit was set up and left without someone to maintain the display. Approximately 2,600 people attended the fair.

As in previous years, the Blackwater exhibit was displayed at the Dorchester County Seafood Feast-i-Val. The festival was held this year at the new Sailwinds Park in Cambridge, Maryland. The space was donated by Christ Episcopal Church. SCA volunteer Lawrence enjoyed the all-you-can-eat feast along with the approximately 2,000 other people in attendance, a 30% increase over last year's event.

Blackwater's mobile exhibit was in a prominent position at the 45th Delmarva Chicken Festival held in Cambridge, Maryland this year. Attended by approximately 40,000 people, the festival was a great success. In addition to the exhibit staffed by ORP Maggie Briggs, SCA volunteer Andi Lawrence, and Temporary RecAide Ruth Kondylas, a booth was set up by the Friends of Blackwater and staffed by Blackwater volunteers and FOB members to sell products advertising Blackwater NWR.



Fig. 88. RecAide Ruth Kondylas answered questions and distributed information at the 45th Delmarva Chicken Festival held in Cambridge. (AL)



Although high winds required an ingenious setup, the Blackwater NWR mobile exhibit was again on display at the 17th Annual Dorchester Outdoor Showcase held in Cambridge on High Street on September 26. Manned by volunteers and SCA Kira Landsman, the display was viewed by approximately 6,000 people.



Fig. 89. The mobile exhibit, staffed by SCA Volunteer Kira Landsman, had to be wired to a table to keep from being too mobile in the high winds at the 17th Annual Dorchester Outdoor Showcase. (MMB)

The last exhibition of the year was the 26th Annual Ward Art Exhibition & Sale in the Wicomico County Civic Center in Salisbury, Maryland on October 1-4. Volunteers Mary Hester, Henry and Ruth Bien, Bob Evans, B.J. Giangliulio, Lois Albert, Sam Bennett, and Helen Combes assisted ORP Briggs and SCA Volunteer Landsman in staffing the mobile exhibit. Attendance was again about 3,000 this year, a 57% decrease from 1991 caused by last year's move to the Parkside High School. Even though the event was moved back to the Wicomico Civic Center this year, it may take several years to build back the attendance of both exhibitors and visitors.

A new addition to the visitor center was a working bee hive set up in September in the exhibit area. Beekeeper Oliver Collins representing the Chicone Ruritan Club, set up the trial hive to experiment with what light, heat, and other conditions would be necessary for a larger hive and exhibit structure he will construct in the spring of 1994. The hive has provided a lot of interest for the public as well as for volunteers and staff.



Fig. 90. The visitor center's newest interpretive exhibit, a beehive, generated a lot of visitor interest.

#### 7. Other Interpretive Programs

Three bird walks were held at the Refuge in April and May, and five more in September, October, and November. Experienced birders Harry Armistead and Terry Allen volunteer their time each year to conduct these walks. The walks were usually held on Saturday mornings beginning at 7:30 a.m. at the visitor center. However, Terry led one on a Saturday afternoon at 1:30 pm. Although it is not an ideal time to see a lot of different birds, there were more visitors available for the walk. Participants usually car-pooled, stopping at various places around the Wildlife Drive.



There were several request for off-site programs throughout the year. ORP Maggie Briggs presented a slide program about Blackwater NWR to the Cambridge Women's Club members at the Women's Club Cottage in Cambridge on February 5, and again to the senior citizens at the MAC Center in Cambridge, Maryland on April 23, and the MAC Center in Secretary, Maryland on August 25. BioTech Bill Giese was the host speaker at the Caroline County Bird Club meeting October 15. He introduced the club members to Blackwater NWR and its Birding community through the use of slides. Bill also presented a wildlife identification and hunter ethics program to 24 hunter education students as part of the Department of Natural Resource programs.

Blackwater had several requests for programs at the local day care centers and elementary schools. Recreation Assistant Ruth Kondylas traveled to Cambridge on March 31 to give a "hands-on" program to 50 Little Totland Day Care children. Using a few mounted animals and handouts, Ruth explained to the children, two to five years old, what a refuge does for wildlife. SCA Volunteer Lawrence visited Sandy Hill Elementary School's third and fourth grade students on July 15, and Hurlock Elementary School's first through third grade students on July 22 to speak about animals and the environment.

In addition to educating the young, the Refuge also educated adults. Blackwater again co-sponsored a "Waterfowl Identification for Beginners" workshop, with Chesapeake College. The workshop was held at the visitor center on Saturday, November 14 from 9:00 a.m. to 3:00 p.m. The class received a lecture from instructor Les Noble in the morning and then proceeded to the Wildlife Drive for first-hand identification.

In November, career information was a big topic request. In addition to written requested information, several groups wanted a speaker. ORP Briggs spoke to the YCC group working on the Christmas tree project and to Boy Scout Troop 855 on careers with the FWS. Maggie also traveled to Queen Anne's County High School to speak to approximately 50 students interested in careers in wildlife.

The County schools requested assistance with their science fairs again this year. Temporary RecAide Ruth Kondylas served as a judge for the South Dorchester K-8 School Science Fair on April 14 while ORP Briggs served as a judge at the Dorchester County Science Fair on April 29. As usual, the projects were impressive.

On April 3, Project Leader Carowan conducted a class and field trip on moist soil management for 30 juniors and seniors from the University of Maryland. The wildlife management students were impressed with the sub-impoundments being developed by the refuge. For many, it was the first opportunity to see first-hand how impoundments are managed for moist soil plant production. Dr. Lowell Adams from the National Institute for Urban Wildlife was the class professor.

Biologist Hartis gave a presentation on Blackwater NWR management relative to optimum land and resource use and diversity to a group of 15 students and their professor, Gordon Nelson, from the University of Waterloo, Waterloo, Ontario, Canada on April 29.

On August 28, ROS Barker conducted a tour of the refuge for Pete Chiericozzi, Vice President of Sales for Chesapeake Paper Products. They explored refuge woodlands and marshes and discussed wildlife, with particular emphasis on Delmarva fox squirrels.

#### 8. Hunting

The refuge held its two-day, either sex, quota gun hunt for white-tailed and sika deer on December 1 and 8. Following a news release announcing the hunt, 767 applications, with fees totaling \$3,833.00, were received by the September 30 deadline. Hunters were allowed to apply and hunt in groups of up to three. A public drawing was held on October 12 to select a quota of 383 hunters to hunt approximately 4,880 acres. Of these, 289 participated in the two-day hunt; no standby permits were issued because it has been our policy since 1991 to overdraw for the desired 80% show rate. 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. Table 23 and the corresponding graph in Figure 91 represent a summary of refuge quota hunt harvests since 1985. As indicated, there was a slight increase in the white-tailed harvest from a previous eight-year mean of 15 to the 1993 two-day (December 1 and 8) harvest total of 20.

Sika deer had an eight-year harvest mean of 41, and in 1993 the harvest was 76. This was almost an exact copy of last year's harvest results even though the number of hunters initially selected to hunt increased from 323 in 1992 to 383 in 1993, the number of acres opened to hunting increased from 4,175 to 4,880 acres, and the number of hunters that actually participated increased from 260 to 289. This brings the last two years' harvest rate to 0.35 deer taken

per hunter. Annual harvest rates and hunter success are also as much a result of weather conditions during the hunt as any other factor. Extremes in temperature and moisture, in combination with weather patterns, may tend to bring harvest rates up or down each year, especially with only a limited number of hunting days as has been the case at Blackwater. Regardless, harvest rates should average out over several years to demonstrate harvest trends.

White-tailed deer harvest rates, as shown in Table 22, have remained fairly constant at 20 or less deer each year. Sika harvest trends on the other hand have risen from a low of 2 deer in 1985 to a high of 76 in 1993. Table 23 provides information on the number of hunters participating in the gun hunt and a summary of deer harvested by area of the refuge.

Table 22. GUN DEER HUNT SUMMARY BLACKWATER NWR - 1993									
YEAR	WHITE-TAILED			----SIKA----			TOTAL DEER	TOTAL HUNTERS	TOTAL DAYS
	♂	♀	TOTAL	♂	♀	TOTAL			
1985	5	15	20	2	0	2	22	76	2
1986	14	7	21	10	10	20	41	118	2
1987	5	10	15	12	37	49	64	160	2
1988 <sup>1</sup>	9	6	15	14	19	33	48	154	2
1989	13	4	17	16	46	62	79	98	2
1990	4	0	4	9	25	34	38	142	2
1991 <sup>2</sup>	5	4	9	23	30	53	62	235	2
1992 <sup>3</sup>	9	11	20	39	35	74	94	260	2
1993 <sup>4</sup>	11	9	20	17	59	76	96	289	2

<sup>1</sup> First year for Areas D and E.  
<sup>2</sup> First year for Area A (Longfield) and Area F.  
<sup>3</sup> First year for actual deer harvest on Hunt Area H (disabled).  
<sup>4</sup> First year for actual deer harvest on Area J, Area A (Williams), and Area G.

Table 23. HUNTER DISTRIBUTION & NUMBER OF DEER HARVESTED BY AREA  
BLACKWATER NWR 1993

HUNT AREA	#HUNTERS SELECTED (2 DAYS)	#HUNTERS HUNTED (2 DAYS)	WHITE- TAILED HARVESTED	SIKA HARVESTED	TOTAL	% TOTAL
A	91	68	8	0	8	8.3
B	50	33	3	0	3	3.1
C	32	26	0	15	15	15.6
D	52	36	0	20	20	20.8
E	34	31	0	4	4	4.2
F	30	25	0	7	7	7.3
G	31	21	3	8	11	11.5
H	32	26	6	4	10	10.4
J	31	23	0	18	18	18.8
TOTAL	383	289	20	76	96	100.0

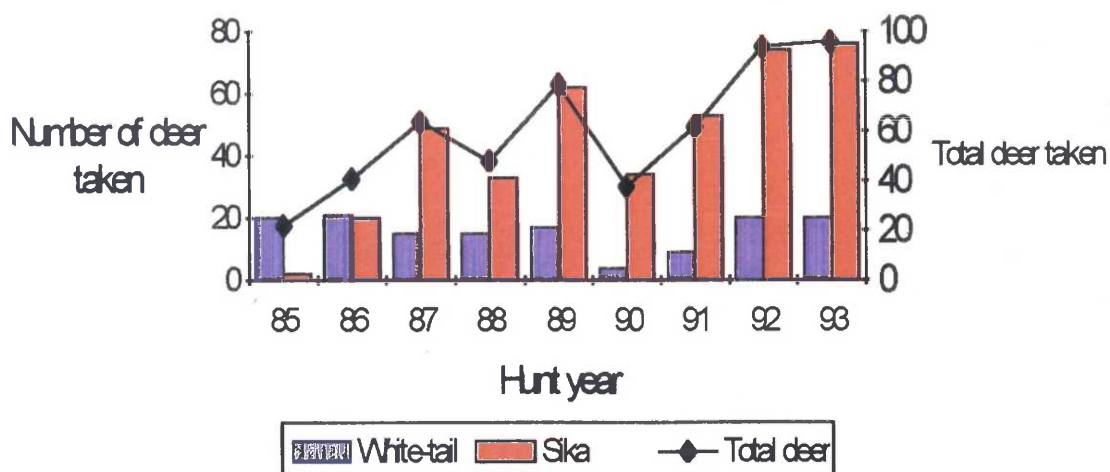


Fig. 91. Number of white-tailed and sika deer taken at Blackwater refuge from 1985 to 1993 during the gun hunt.

This year Blackwater extended archery deer hunting, which previously had been allowed only during the two days of quota hunting, to include a non-quota, walk-in, archery hunt for 25 hunt days from October 16 through November 13. This hunt was permitted on specified areas with a \$10.00 seasonal entrance fee from each archery hunter. A successful first year was experienced with this extended archery hunt: 430 passes were issued, including 11 Golden Age passes and 1 Golden Access passport, for a total of \$4,180. Deer taken on the non-quota archery hunt were required to be registered at a Maryland designated check station as the refuge did not function as a check station during this hunt. Therefore, an estimate of deer harvested on the refuge during the 1993 archery hunt will not be available until Maryland DNR finalizes its statewide deer harvest count on computer, possibly as late as March 1994. A preliminary check of DNR computer records indicated eight deer harvested on the refuge archery hunt. However, a more accurate estimate would be 15, as discrepancies were discovered in specific harvest location codes recorded at some Maryland designated check stations within the County. Better coordination with the State, redefinition of location codes, and more intense checks on harvest data at local check stations are planned in 1994 to improve collection of harvest data.

The Southeastern Cooperative Wildlife Disease Study Unit from Athens, Georgia, conducted a herd health check on Blackwater NWR on July 29, 1993. The health check involved examination of five deer by necropsy for parasitologic, serologic, and pathologic factors. A summary paragraph of the results from their report follows which prompted no major changes in the proposals for the refuge hunt program for 1994.

"As is evident from our comments, herd health appears to be relatively good, and although we encountered two overtly diseased animals, both of these were individual animal problems. The APC value indicates that the herd has a high probability of being near (possibly below) carrying capacity. Based on these data, the herd can be maintained near its present density without undue risk of disease related mortality or declines in herd health."





Fig. 92. The Southeastern Cooperative Wildlife Disease Study Unit from Athens, Georgia performed a routine herd health check on white-tailed deer in late July. (JAB)

## 9. Fishing

With the beginning of the spring run of white perch, the numbers of fishermen increased along Key Wallace Drive and the Route 335 bridge, with a corresponding rise in traffic and litter problems. The refuge was opened to fishing, canoeing, and crabbing on April 1. Fishing at the Route 335 bridge was at its peak during the month of October and early November, when fishermen were avidly attempting to hook their one-per-day limit of rock fish in the Blackwater River.

The refuge is closed to fishing October 1 to April 1. However, fishermen continued to fish for white perch, bass, catfish, and carp along Key Wallace Drive near or on the bridge and at the Route 335 bridge. Parking remains to be a major problem, especially since Dorchester County placed "No Parking" on the west side of the Route 335 bridge, and there is no space to park on Key Wallace Drive near the Little Blackwater bridge.

## 10. Trapping

Refuge and Maryland trapping seasons began on January 1. Muskrat was the primary species of interest to refuge trappers. In December 1992, bids for the 1993 trapping rights were opened. A total of \$4,693.37 was received from 13 trappers for the trapping rights on 6,002 acres of refuge marshes.

For the third year, Blackwater offered trapping permittees a \$1.50 rebate from trapping bids for each nutria taken from refuge trapping units. Of the 13 trappers that worked in the refuge marshes this year, all but one earned their entire bids back through participation in the nutria rebate program. This is the only incentive available to refuge trappers to take nutria, since there is no current fur pelt value.



Fig. 93. Refuge trapping permittees Mills and Thomas with a morning nutria catch. Note tails which were clipped to be turned in as part of the rebate program.

Fur values remained low: Muskrat pelts brought only \$1.00-\$1.25, and carcasses, used locally for food, sold for \$2.00-\$2.50 each.

Refuge trappers reported taking a total of 3528 muskrats, 155 raccoons, 1 fox, 36 opossum, 11 skunks, and 5558 nutria from refuge trapping units during the January 1-March 15 season. Of the 5558 nutria removed by trappers, 3002 were redeemed under the \$1.50 per kill bid rebate program. Refuge staff killed 710 nutria during marsh burning and impoundment dike patrols.

Table 24. **Furbearer Harvest - Blackwater NWR**

	<u>1991</u>	<u>1992</u>	<u>1993</u>
Muskrat	3614	4300	3528
Nutria	2282	3908	5558
Raccoon	178	221	155
Opossum	62	89	36
Skunk	24	22	11
Fox	3	3	1

#### 11. Wildlife Observation

Visitors reported observing 276 mature and 49 immature bald eagles (a total of 325), with as many as 23 eagles observed in one trip around the Wildlife Drive, a 14% increase from 1992 observations of 224 mature and 56 immature (a total of 280) sightings. Visitors also recorded 11 mature and 7 immature golden eagles (a total of 18), compared to 27 mature and 5 immature golden eagles (a total of 32) in 1992. This is a 44% decrease in golden eagle observations. There were two rather notable observations in January. Harry Armistead, prominent Dorchester County birder, observed 51 bald eagles between 9:00 a.m. and 11:00 a.m. on January 24. He noted having 29 in sight at one time. On January 31, a group from the Wild Bird Center observed a pair of eagles and a pair of red-tailed hawks mating. In addition there were 92 mature and 8 immature eagles sighted in January for a record total of 100 eagles in one month.

Only 2 peregrine falcons were recorded by visitors again this year, compared to 11 sightings in 1991.

A Kumlien's gull, not recorded before at Blackwater NWR, was reported on January 23.

Accidentals seen this year were a brant on November 13, a yellowheaded blackbird on April 10 and a Ross goose on January 11, 12, 16, April 17, and August 19.

Three species normally not seen at Blackwater during the dates they were observed were the osprey on February 6, wood



thrush on December 2, and rosebreasted grosbeak on December 5.

Rare birds reported included the merlin, upland sandpiper, and Hudson godwit.

Occasional and uncommon species or species not normally seen at Blackwater NWR at the time of the year they were reported by visitors included: common loon, pied-billed grebe, horned grebe, little blue heron, cattle egret, glossy ibis, northern shoveler, canvasback, ring-necked duck, oldsquaw, common goldeneye, red-breasted merganser, black vulture, Cooper's hawk, red-shouldered hawk, American coot, black-bellied plover, semi-palmated plover, black-necked stilt, solitary sandpiper, spotted sandpiper, western sandpiper, pectoral sandpiper, short-billed dowitcher, American pipit, cedar waxwing, yellow-throated warbler, palm warbler, American redstart, prothonotary warbler, white-crowned sparrow, purple finch and pine siskin.

#### 16. Other Wildlife Oriented Recreation

On October 17, a surrey with a fringe on top was seen traveling around the Wildlife Drive. A group of horse-drawn wagon owners arrived from various places in Maryland and Delaware to meet at Blackwater NWR to tour the Wildlife Drive and the surrounding area for a nice Sunday afternoon drive.



Fig. 94. A group of horse drawn wagons toured the Wildlife Drive in October. (MMB)

## 17. Law Enforcement

As part of a special task force on illegal hunting activities, Refuge Officers Barker, Hartis, and Giese assisted State and Federal agents in Talbot County in January.

Officers Giese and Hartis were subpoenaed to State Court for the sixth appearance on February 16 for the January 1991 apprehension of a subject observed setting fire on the Refuge. At this appearance, the officers learned that the accused was now willing to accept a plea judgment and that all involved in the case would be advised at a later date of the outcome.

Finally, on March 15, Refuge Officers Giese and Hartis appeared for the sentencing of an arson defendant in Circuit Court. This case had taken 2 years, 2 months, and 15 days and 8 court appearances to conclude. After various legal maneuvers, the defendant pled guilty to malicious setting of fires and driving under the influence. The defendant was sentenced to 180 days in jail with 120 day suspended, 2 years probation, and \$45.00 in court costs for setting the fire and 60 days in jail with 30 days suspended, 2 years probation, \$100.00 court costs, and mandatory attendance at substance abuse classes for driving under the influence. The defendant, however, apparently failed to appear after several weekends and a warrant is now outstanding.

On July 7, Refuge Officers Giese and Barker appeared in Dorchester County Circuit Court in reference to spotlighting cases made on the refuge in December, 1992. Unlike the lower District Court, the State's Attorney was unwilling to prosecute the non-shooters in these cases: Of the five individuals charged, only the two shooters were prosecuted. The State's Attorney felt that a jury would not convict the other occupants of the vehicles despite the fact that Maryland law mandates that all occupants be charged. The case was plea bargained, and each shooter plead guilty to shooting from a public road and hunting at night. Each shooter was fined \$160.00 plus \$200.00 court costs, forfeited one weapon, and lost their hunting privileges in Maryland for five years. The charges of the other occupants were null processed.

BioTech Giese assisted Dorchester County Highway Department by temporarily blocking Key Wallace Drive for 3½ hours in the early morning of July 30 after roofing nails were found spread along a one-mile stretch of the road. At least 50 pounds of nails were either swept up or off the road. No apprehensions were made.



Refuge Officers Heet and Barker completed law enforcement background investigation reports as requested by RO.

Refuge Officers Carowan, Heet, Barker, Hartis, and Giese provided law enforcement assistance during Eastern Neck NWR's deer hunts.

Refuge Officers Barker and Giese issued a Notice Of Violation to a waterfowl hunter without a Federal Duck Stamp on October 15, the opening day of a two-day split waterfowl season.

All five law enforcement officers from Blackwater NWR attended semi-annual law enforcement requalification at Patuxent WRC on October 21. In addition to requalifying with handguns and shotguns during the session, the refuge officers had a course on drugs and narcotics.

Refuge Officer Giese assisted Special Agent Ricker and MD DNR officers in locating several baited areas and other hunting areas with potential violations around the refuge.

Refuge aerial waterfowl surveys continued to provide information to FWS special agents and MD DNR officers in documenting baiting activities around the refuge.



Fig. 95. The most commonly used illegal bait for waterfowl hunting is now sorghum. This baited area was located immediately adjacent to the refuge. Subjects were apprehended by FWS Special Agents and refuge officers. (WMG)

Routine checks of Blackwater bow hunters were made periodically, with no violations cited.

Refuge Officer Barker provided LE assistance at Mason Neck NWR's deer hunt on November 21-22, and at Bombay Hook NWR's waterfowl hunt on November 5.

Refuge Officers Giese and Barker conducted LE patrols on the night of November 26 prior to the Maryland deer season; no violations were noted.

A stakeout of a section of refuge boundary on the opening morning of deer season was conducted, as this area was reported to be an access area for hunters trespassing from adjacent lands last year; no violations were noted.

Giese and Barker assisted Special Agent Lacey in a stakeout of a baited area adjacent to the refuge on Thanksgiving Day, the opening day of the Maryland duck season; no apprehensions were made.

Refuge Officers Giese and Barker and MD DNR officers set up several stakeouts using the mounted sika deer during MD deer season in an attempt to apprehend spotlighters. No apprehensions were made although several subjects were observed to show some interest.

The new Ford 4x4 pick-up truck was equipped with law enforcement lights and equipment.



Fig. 96. If you are going to dump your garbage on the refuge, it would be a good idea to exclude any letters addressed to you. This individual was apprehended and cited in State court, and fined \$250 for his inattention to detail. (JAB)



Fig. 97. Shorelines of Barren Island and Bishops Head Point were registered to prohibit waterfowl hunting within 500 yards of the shoreline. (WMG)

## 18. Cooperating Associations

The Friends of Blackwater (FOB) have been very active this year. One of their major concerns was the proposed entrance fee increase. They expressed objections to the proposed increase and developed a campaign to develop support from their political representatives and the local public in preventing the increase. FOB was concerned that the new increase would not only affect visitation to the Refuge, but the economy of the local area. The organization questioned why the public wasn't given the opportunity to express their opinions/feelings toward the raise in fees, considering the majority of people never see the Federal Register (the only place it was publicized). They asked why only 24 of the nearly 500 Refuges collect entrance fees, why only these few were expected to support the other Refuges throughout the nation, and why other options were not explored. On March 25, the refuge was notified by Senator Sarbanes that Secretary of the Interior Babbitt had agreed to delay and reconsider the entrance fee increase at Blackwater NWR. On April 5, this information was passed on to the Regional Office. FOB then shifted their campaign to inform the Secretary of the Interior Babbitt of their concerns. On October 6 the Refuge received a memo stating the entrance fee increase would be implemented no later than January 1, but Blackwater NWR fees would remain the same due to Congressional direction. FOB was gratified to learn that the concerns of a small organization in a small town were heard nationwide.

- The cooperating association continued to support Blackwater with the publication of their newsletter, "Blackwater Tidelines," reporting refuge news and policies to members as well as to community and State officials and organizations.

Another major concern was the lack of a book store manager. The volunteer managers, Marilyn and Paul Stone, did not have the time to come to the refuge regularly and keep up with the inventory. With their resignation in August, it was decided to hire a manager part-time. Mrs. Ruth Kondylas began the position on October 12. This decision has not only kept things running smoothly for the book store, but has released a great deal of time formerly spent on inventory, counting money, etc. by ORP Briggs, enabling her to spend more time on other FWS activities.





Fig. 98. 1993-94 FOB officers: (front row) Vice-President Barbara Keene, board member Darlene Alexander, Secretary Lois Albert, board member Madeline Parker, FWS advisor Maggie Briggs. (back row) Project Leader Glenn Carowan, board member Zeeger de Wilde and President Frank Wolff. (Not pictured Treasurer Philip Albert) (RK)



Fig. 99. Friends of Blackwater booth at the Chicken Festival. (MMB)



The book store gross sales for 1993 were \$40,074.78 compared to \$31,711.22 for 1992. This was a 21% increase in sales!! There was only a 9% increase in visitation to the visitor center. The organization decided to set up a display booth at the Chicken Festival held in Cambridge this year. Selling items at the festival added \$566.30 in sales. They also increased sales during the Christmas holidays by having an open house December 4 & 5. Sales that weekend were \$1,152.04 compared to \$562.54 on December 5 and 6 in 1992, almost double the sales.

Table 25. FRIENDS OF BLACKWATER SALES, 1987 - 1993

	1987	1988	1989	1990	1991	1992	1993
Jan		\$ 632.33	\$ 452.41	\$ 651.21	\$ 828.17	\$ 2,443.00	\$ 2,774.46
Feb		474.82	248.51	836.65	2,221.63	2,839.53	2,275.49
Mar		422.17	383.49	381.66	1,539.11	2,409.67	2,416.67
Apr		634.37	783.02	470.72	1,584.04	2,605.69	3,241.06
May		512.90	492.88	616.97	1,067.63	1,961.40	3,195.16
Jun		\\\\\\\\\\	101.71	\\\\\\\\\\	509.11	835.29	1,889.90
Jul		404.54	404.72	\\\\\\\\\\	580.28	1,208.03	1,190.23
Aug		\\\\\\\\\\	\\\\\\\\\\	106.22	1,173.49	999.55	2,168.45
Sep		351.99	402.39	776.69	2,323.13	1,914.63	3,046.51
Oct	\$ 408.99	1,170.92	754.40	1,924.91	4,567.68	5,255.12	6,589.31
Nov	1,332.04	1,332.04	1,339.07	1,447.30	6,509.95	6,572.57	6,928.06
Dec	831.67	478.48	531.64	1,322.04	3,568.02	2,666.74	4,359.48
TOT	\$2,572.70	\$6,441.59	\$6,000.47	\$10,431.00	\$26,472.24	\$31,711.22	\$35,723.30

/// Money added in next month's total  
 \\\ Money added in previous month's total

The bookstore deleted 9 items and added 39 new items for a total of 121 different items at the end of 1993. The new books include: Reptiles of North America, Trees of North America, Golden Guide to Insects, How To Photograph Birds, Peterson Field Guide to Advanced Birding, 25 Bike Tours On Delmarva, Birds of the Chesapeake Bay, Finding Birds in the Capital Region, Birds of the Northeast, Waterbirds of the Northeast, Complete Birdhouse Book, Bird Feeder Book, Birders Guide to Bed & Breakfasts, Guide to National Wildlife Refuges, Birds of Prey Coloring Book, Birds Eyewitness Book, Endangered Animals Zoobook, Come Out Muskrats, Farewell to Shady Glade, A Walk in the Wild, and Chadwick Forever. Other new products include: Canada goose magnet pads, Blackwater NWR hat, magnet, goose sweatshirt, children's goose T-shirts, and eagle T-shirts, red fox, raccoon, and wood duck posters, Chesapeake great blue heron educational poster, blue bird and robin nest boxes, bat boxes, bird feeders, goose and duck pins, colored book marks, chickadee and peregrine falcon notepaper, and a brass goose Christmas ornament.

The Friends of Blackwater's \$3,000 challenge grant proposal was met by the National Fish and Wildlife Foundation, to revise and print the "Marsh Edge Trail Guide" leaflet and the "Canada Goose at Blackwater NWR" leaflet.

FOB also donated a \$6,000 video projector for the visitor center auditorium. It was installed on March 19. The new videos, also donated by the FOB, included "Birds of Shore and Marsh," "Bluebirds...Bring Them Back," "The Osprey's Domain," and "The Great Blue Heron Story." Blackwater's volunteers enthusiastically thanked the Friends for the wonderful videos, the magnificent video projection setup, and especially for the "easy-to-use" operation of the equipment.

The Envirothon (county, state and national) was of great interest to the cooperative association. They donated money to the Refuge to support the Envirothon, specifically to provide \$100 (transportation of team members to the National Envirothon) and books at cost for the State Envirothon, as awards for the Dorchester Envirothon. Several members were available to distribute the books at the Dorchester County Envirothon.

## 20. Entrance Fees

Although the total visitation to the refuge decreased by 5% and the numbers of visitors touring the Wildlife Drive decreased by 6%, the entrance fee collections increased by 11%. Entrance fee collection data for 1993 and previous years are outlined in the following tables. The main increase was in September and October.

Table 26. Public Use Fee Collections, 1993

<u>Type</u>	<u>Number</u>	<u>Fees Collected</u>
Wildlife Drive Entrance Pass	9,932	\$27,208.43
Duck Stamps	192	2,880.00
Golden Eagle Passport	140	3,500.00
Golden Age Passport	564	FREE
Golden Access Passport	17	FREE
Archery Hunt Pass	418	4,180.00
Gun Hunt Permit	767	3,833.00
Total		\$41,601.43

Table 27. Wildlife Drive Entrance Fees, 1988-1993.

Month	1988	1989	1990	1991	1992	1993
Jan		\$1,510.97	\$2,192.59	\$2,020.52	\$ 2,522.48	2,808.60
Feb		2,551.42	2,515.72	2,196.30	2,113.04	1,926.40
Mar		396.71	1,228.44	2,810.04	2,479.13	1,671.72
Apr		471.00	3,848.05	1,625.47	2,038.26	2,476.71
May		670.96		968.65	1,904.19	1,986.40
Jun		1,079.04	683.72	1,693.88	1,652.92	1,358.80
Jul		1,828.15	1,452.86	1,646.95	1,597.85	1,604.60
Aug	\$ 744.95	721.16	1,573.79	1,474.95	1,706.18	1,647.17
Sep	1,507.50	768.29	1,651.67	2,302.50	1,543.58	1,800.00
Oct	5,213.00	3,149.21	4,201.18	4,665.45	4,062.61	4,272.76
Nov	4,637.00	7,291.86	6,242.04	5,784.71	5,071.58	4,340.93
Dec	918.91	1,411.01	2,657.18	2,250.00	1,400.61	1,314.84
Tot	\$13,021.36	\$21,849.78	\$28,247.24	\$29,439.42	\$28,092.43	\$27,208.43

Table 28. Total Fees Collected 1988-1993

Year	No. of Passes	Total Fees Collected
1988	5,945	\$16,296.36
1989	8,060	25,837.78
1990	9,902	33,134.74
1991	11,494	35,951.92
1992	11,277	35,347.43
1993	10,845	41,601.43

Table 29. Number of Entrance Passes Issued 1988-1993

	<u>1988</u>	<u>1989</u>	<u>1990</u>
Entrance Fees	4,654	6,990	8,878
Duck Stamps	315	181	255
Golden Eagle	5	69	68
Golden Age	947	795	676
Golden Access	24	25	25
Total	5,945	8,060	9,902
	<u>1991</u>	<u>1992</u>	<u>1993</u>
Entrance Fees	10,424	10,218	9,932*
Duck Stamps	275	237	192
Golden Eagle	103	148	140
Golden Age	667	656	564
Golden Access	25	18	17
TOTAL	11,494	11,277	10,845

\* There was a slight decrease from fees collected in 1992.

## I. EQUIPMENT AND FACILITIES

### 1. New Construction

Regional Engineer Emile Bishara was on site for fuel storage shed inspection from January 6-9. At this time he also took information needed to consider repair costs on the newly acquired Howard House.



Fig. 100. The flammable materials storage building. (GCH)

Also in January work was initiated to level and improve drainage around the pole shed and fuel shed area (including nine culverts and forty-five truck loads of fill). This fill was allowed to settle until December; then the site was finish graded with Eastern Neck NWR's grader and crushed rock was spread-dumped on driveway areas. Also at this time all landscaping was completed.



Fig. 101. 3/4" stone being spread dumped at new fuel storage building. (SLB)



In February, local masonry contractor Edgar Cannon laid the block/foundation work for three kiosks to be built at the observation tower site, woods trail parking lot and visitor center entrance, for \$1373.00. Maintenance Mechanic Webster pre-fabricated the main construction panels for all three kiosks and supervised the construction of the one at the observation tower site.



Fig. 102. Completed interpretive kiosk at the Marsh Edge Trail. (GCH)

In February, we removed the cement slab where the old flush type toilets had been located by the marsh edge trailhead. A new site was cleared at the same area but in a more accessible/aesthetic location. In May, we received a handicap accessible 750-gallon vault toilet with plastic and cedar construction (Romtec, Inc., Roseburg, OR, \$7985.) In November, the vault was installed, toilet house placed, and trimming and concrete pad work completed. Now we have a functional, good-looking, low-maintenance toilet that matches the adjacent cedar pavilion and kiosk - a marked improvement over the bright blue fiberglass Porta-Johns used to date.



Fig. 103. ROS Barker and MM Webster constructed forms for concrete pad around new handicapped accessible toilet. (GCH)





Fig. 104. The completed project. (GCH)

On March 1, an aluminum pipe gate was fabricated and installed at the entrance of the newly acquired Howard Tract. The Jarrett east gate, destroyed by a falling tree, was also replaced.

On April 28, Supv. ROS Heet met with RO architect Kurt Otting and the vice-president of Climate Masters, Inc. to inspect the flammable materials storage building. The 90-day contract was on day 181, with the end not in sight. A 25-item punch list of discrepancies was compiled. The delay was caused primarily by substandard blueprints supplied by a private engineering firm contracted by the Regional Engineering office. Mr. Otting and the contractor also discussed the installation of the materials handling system (I-beam monorail).

During his visit, Mr. Otting also looked at the Howard House which was proposed to be rehabed/restored and utilized as the new refuge office.

In April Mrs. Dukart of Jarrettsville, MD donated a 70 ft. Burlington mobile home to the refuge. We traveled to Jarrettsville (western Maryland) and did all the pre-move work (unhook plumbing, electric, phones, decks and block foundation) and removed all debris from the site. In May, we contracted Quality Homes, Seaford, DE (\$1400.00) to transport the trailer to a location behind the existing headquarters for use as expanded office space. Subsequently new steps were delivered and skirting, electric, telephone, and heating/air conditioning were installed by the maintenance staff.



Fig. 105. The newly acquired office trailer!!

The ongoing Blackwater/Ducks Unlimited sub-impoundment MARSH project required a major chunk of staff time this year. Once again, water control structures were fabricated to specification by Cahoon Farms, Arapahoe, NC (\$18,525).





Fig. 106. Cahoon Farms delivered aluminum water control structures. (GAC)



Fig. 107. In recognition of the on-going DU MARSH PROJECT, a new interpretive sign, "Excuse Our Dust" was installed on the Wildlife Drive to inform the public of this important work.



Following is a chronological account, by pool, of construction completed involving an extensive sub-impoundment project that began in 1992:

**POOL 1 and 2 GTR**

**APRIL**

- replaced broken pipe and collar on the WCS between Pool 1 and Pool 2 GTR.



Fig. 108. Dike west of Pool 1 before... (GAC)



Fig. 109. And after construction. (JAB)

## SEPTEMBER

- finish graded, seeded, and mulched the dike between Pool 1 and Pool 2 GTR.



Fig. 110. Newly seeded dike that separates Pool 1 from Pool 2 GTR. (JAB)

## POOL 3

## MAY

- Shaping Pool 3A/B dike almost complete
- Started shaping Pool 3D dike
- Installed two 18" X 60' screwgate structures in Pool 3D

## JUNE

- Installed two 30" X 60' screw gates/flapgate structures in the west side of the Pool 3 diversion canal
- Seeded and mulched the northeast portion of Pool 3A dike





Fig. 111. Pool 3 supply canal during... (GCH)



Fig. 112. And after construction. (JAB)

## JULY

- Prepared seed bed, fertilized, seeded, and mulched .75 mile of Pool 3A/B dike
- Finished shaping east-west Pool 3D dike and hauled excess material to the diversion canal dike
- Installed flap gates and rip-rapped the 30" intake structures on the diversion canal
- A screw gate on Pool 3D's 24" X 60' water control structure was replaced with a combination screw flap gate

## AUGUST

- Completed excavation and rough dirt work on Pool 3 B/C dike
- Installed 24" X 60' flashboard WCS on Pool 3B/C dike
- Constructed an alternate goose banding/rocket net site on the northeast end of Pool 3A
- Graded, seeded, and mulched Pool 3 A/B dike



Fig. 113. "First pass" work on Pool 3 B/C dike was completed in August. (GAC)

**POOL 5****MARCH**

- Completed excavating the portion of the diversion canal ditch running east to west
- Completed first pass construction of east/west diversion canal dike

**APRIL**

- Completed excavation of main diversion canal ditch running north/south.

**MAY**

- Excavated material to construct western most dikes for Pools 5A and 5B

**JULY**

- Installed 72" flashboard riser, 48" X 40' diversion canal WCS in Pool 5
- Installed 24" X 60' WCS in Pool 5A.
- Placed 60 tons of rip-rap around above two structures.
- Excavated ditch from 72" structure to existing outlet WCS and borrow ditch to facilitate future drawdowns.
- Began construction of Pool 5C dike.



Fig. 114. Morris and Barker applying seep-shield to 72" diversion canal structure in Pool 5. (GAC)





Fig. 115. Partially installed 72" diversion structure in Pool 5. (GAC)



Fig. 116. Both 72" and 24" structures installed and rip-rapped at south end of Pool 5 diversion canal. (GAC)



Fig. 117. Ditch excavated from 72" diversion canal structure to Wildlife Drive outlet structure. (GCH)



Fig. 118. View north from 72" structure showing construction of the main Pool 5 diversion canal. (GAC)



## AUGUST

- Completed all first pass dike/ditch construction in Pool 5 and rough graded same to a point where it could be left safely over winter
- Constructed emergency waterway overflow system from Pool 5 to SR335
- Installed two 24" X 60' flashboard WCS in the west end of Pool 5 connecting the impoundment with the above mentioned overflow system.
- Installed 24" X 60' flashboard WCS in Pool 5C
- Completed rip-rap work on all of above structures
- Constructed an alternate goose banding/rocket net site in Pool 5A.

## SEPTEMBER

- Graded, seeded, mulched, and terra-tacked Pool 3D, Pool 3 diversion canal and Pool 3A/B dikes



Fig. 119. Construction of grassy waterway and emergency overflow for Pool 5 adjacent to SR335 at Wildlife Drive exit. (GCH)

\* Note: To accomplish the amount of work completed on the dikes in the last two months of construction (prior to wet weather and arrival of fall waterfowl), we had to excavate on double shifts and on weekends (Tractor Operator Morris and Automotive Mechanic Johnson).

All dikes were seeded with a mixture of annual ryegrass and fescue. Fertilizer (10-20-20) was applied at a rate of 300 pounds per acre, and then mulched straw was applied with a bale chopper/mulcher. Two problems kept recurring: 1) the wind kept blowing mulched straw off the dikes, and 2) resident geese grazed heavily on sprouting grass. To alleviate problem 1 and to a lesser extent, problem 2, we contracted for spraying Terra-tac on the mulch with a hydroseeding spray machine (Jerol Moore, Cambridge, MD, \$965). To discourage goose damage, stakes were driven into the top of the dikes and Mylar ribbon was stretched between them.. Judicious use of shellcrackers was also employed.



Fig. 120. Excavated materials were graded to establish rough elevations using the laserplane. (JAB)



Fig. 121. The top width was established and 3:1 slopes cut with the dozer. (GAC)



Fig. 122. All of the dikes were graded, seeded, mulched... (GCH)





Fig. 123. and terra-tacked... (GCH)



Fig. 124. with excellent results!! (GCH)

By late winter, both Pools 3 and 5 were again operational even though much finish work remained to be done.



Fig. 125. Completed Pools 3A, 3B, 3C, and 3D. (GAC)



Fig. 126. Completed Pools 5A, 5B, and 5C. (GAC)



## 2. Rehabilitation

In January Maintenance Mechanic Webster solicited bids from local contractors on completely renovating the Howard House. The total for all jobs was \$180,743.35. We recommended immediately replacing the roof (\$23,000) and repairing the chimneys (\$400) to maintain the weathertight integrity of the house until other repairs could be made.

Work on the handicapped-accessible pavilion was completed by the end of May. Refuge staff re-pitched the pavilion roof (from a 2:12 to a 8:12 pitch to shed pine needles better and match pitch and construction type/material of adjacent material) with force account trusses, and trimmed both fascia and gable ends with cedar. Cedar shingles were then added to the pavilion roof by a local contractor (Ewing's Roofing and Siding Co., Hurlock, MD, \$1690). Existing sides and torn screening were removed, and the pavilion will be maintained in this open state. The ceiling and metal framing were repainted by a local contractor (Bill Marvel, Cambridge, MD, \$1300).



Fig. 127. Force account environmental education pavilion construction . (GCH)

The County spent two days clearing overgrown drainage ditches on the Howard Tract (Hog Range) with their grader-mounted boom bushhog. The results were spectacular, providing improved crop utilization by waterfowl.



Fig. 128. Pool 2 before restoration. (JAB)



Fig. 129. County mowing Howard Tract ditch. (JAB)



Work was completed to restore the former boneyard to open, productive waterfowl habitat.



Fig. 130. Boneyard before cleanup... (JAB)



Fig. 131. ...and after. What a difference! (JAB)



### 3. Major Maintenance

Completed maintenance activities are described by season as follows:

#### **SPRING**

- A long-standing cooling system problem was finally fixed on the Massey Ferguson 3545 tractor by replacing the radiator, water pump, thermostat, belts, and coolant hoses. New rear tires were also installed.
- To comply with over the road transportation rules, we purchased and installed a load tarp on the GMC 7000 dump truck.
- ATV serviced twice (due to heavy use in clover planting).
- Front tires were replaced on the Case 990 tractor.
- Front tires and brakes were replaced on the 1992 Dodge Ram pickup truck.
- Cleaning teeth were installed on the Brillion cultipacker to facilitate removal of packed mud, which throws the machine off balance and destroys bearings.
- On March 24, all brakes (non-asbestos) were replaced on the 1991 Dodge pickup.
- Replaced and modified the bottom plate in the excavator's V-bucket to minimize wear on same, improving the original manufacturer's design.
- The drawbar connection on the Brillion cultipacker broke down. It was inspected by the manufacturer's representative, who said the problem was a design flaw. The factory shipped us replacement parts and we fixed it.
- A new adjustment handle was fitted onto one section of the refuge's spike drag.
- In preparation for kiosk installation, the PTO-powered auger was given a major overhaul. Work included welding stress fractures, greasing, and fabricating new cutting teeth/blades.

**SUMMER**

- Attached new cutting blades on Eastern Necks's grader.
- Completed major overhaul of Massey Ferguson disk.
- Replaced battery and main hydraulic line on Gemco ditcher.
- Conducted routinely scheduled service on MF 3545 and JD 4055 tractors.
- Conducted routine service on JD 892 excavator and repaired seal above gear swing box and replaced muffler.
- Replaced linkage, solving JD 550 dozer foot throttle failure.
- Conducted routinely scheduled service on '89 Dodge pickup, Massey Ferguson 3545 tractor, Bombardier, Ford LT9000 truck-tractor, and GMC dump truck.
- Installed air conditioners in both the Howard Tract and office trailers, as well as painted interiors, cleaned gutters, removed interior wall, and moved furniture into office trailer.
- New Ford LT9000 was returned to New Castle, DE for factory repair work on rear differential leak.
- A Caterpillar service representative repaired/adjusted steering clutches on Mason Neck NWR's D4 Caterpillar.
- The entire maintenance staff spent one day (July 9) conducting a thorough cleanup of all shops, buildings, vehicles, and equipment, resulting in a safer and more efficient work environment.
- Installed new front tires GMC 7000lb dump truck.
- Repaired Ford 555 backhoe door latch and emergency brake.
- Additional work on JD 892 excavator by James River Company. Again, they repaired the swingbox (faulty lower seal) and replaced the exhaust pipe that James River John Deere Company damaged during the original installation.

- Replaced leveling arm on JD 1518 batwing mower and modified design per John Deere factory service bulletin to avoid future breakage.
- Initiated repair of Navy surplus air compressor.
- The John Deere 892 excavator experienced loss of power and stalling problems. Replacement of the hydraulic filter did not remedy the situation, so Standard Equipment of Delmar, MD was called for assistance. The problem was a restricted fuel filter which negatively affected the entire hydraulic system, causing the power loss. The service technician recommended changing the filter more often than the service specifications recommended.

#### **FALL**

- Repaired steering drag link arm ball joint on Case lawn tractor.
- Replaced hydraulic filter kit on 2096 Case tractor.
- Re-wired lighting in SCA volunteer trailer and repaired heating element in research trailer.
- Contracted Rooftop Chimney Sweep to service the Quarters 2 wood stove.
- Contracted Dorchester Service Associates to perform seasonal maintenance on all station furnaces.
- Repaired electric pump for diesel fuel trailer.
- Cleared around entire JD Williams Tract with JD 550 dozer.
- Replaced muffler and tailpipe on '89 Chev. pickup and tailpipe on '85 Dodge.
- Utilized excavator to destroy two USFWS Special Agent boats and motors.
- Upon discovery of oil in antifreeze, had Case dealer replace oil cooler on 2096 Case tractor. Also at this time we found a crack in the flail mower boom and repaired/strengthened it.
- Re-graded the road surface by Entrance Fee Station.

- Front brakes were replaced on the Caravelle and Chevy Blazer, and all four tires were replaced on the Blazer.
- Replaced front PTO shaft on John Deere 10 foot bushhog.
- The heating system hooked up and running in new office trailer.
- John Tieder, a local electrical contractor, repaired a string of lights at the V.C. It appears that insulation on top of the recessed lighting holes built up so much heat that wires are melting and shorting out. The insulation will have to be removed from around the light fixtures.
- Standard Equipment finished repairs on the excavator headgasket. They had the oil cooler pressure-tested for leaks but could not find any. They said they would do any other work gratis if there proved to be a problem after all.

#### WINTER

- Drained, winterized and repaired flat tire on Demco agricultural sprayer.
- New F250 truck was taken to the dealer for warranty work on the trailer light system.
- Mercury 20 HP motor was taken to the dealer for repairs.
- Initiated Marsh Edge Trail toilet project (see Section I.4)
- Serviced Ford 555 backhoe, replaced all brakes and put new tires on the Caravelle. Installed new tailpipe and new tires on Dodge 4X4.
- Replaced hot water heater in research trailer.
- The Ford 555 backhoe had to be taken to ABC Equipment Co. Skipton, MD for hydrostatic transmission repairs.



#### 4. Equipment Utilization and Replacement

Two trips were made to the GSA Area Utilization Office in Chesapeake, VA by refuge staff: a lowboy trailer and two refrigerators were acquired on May 6 and May 20, respectively.

The 1984 Plymouth Sedan replacement vehicle, a Ford F250 pickup, arrived on June 9.

To further our sustainable agriculture program we purchased a used rotary hoe from Stevenson Equipment (\$871).

We purchased a 6" Lombardini pump from Slim Flinchum, Cambridge, MD, for various (and frequent) pumping needs. The pump proved to be highly portable and efficient.



Fig. 132. Lombardini pump. (GCH)

A new 50-ton Kalyn lowboy trailer was delivered on August 23. The trailer was purchased with fire funds from Kalyn Incorporated, Highway 84 West, Gatesville, TX 76528 for \$42,604. The factory subsequently paid to repair the defective "pins" that hold the loading ramp support brackets in the support position. Later, the staff fabricated stronger support arms to prevent wet, muddy equipment from sliding off the 'wheel hump' when loading from the rear.



Fig. 133. New Kalyn lowboy trailer. (GCH)

In December, Maintenance Mechanic Webster constructed a new, wheelchair accessible picnic table for placement at the visitor center.

Due to the vast and varied projects underway at Blackwater, we came to rely heavily on the ability to borrow equipment from other stations. Following is a log of equipment used:

Chincoteague - Borrowed JD 2955 tractor for corn/soybean planting. Returned tractor upon completion of planting.

Eastern Neck - Borrowed JD 3155 tractor for corn planting. Returned tractor upon completion of planting. Borrowed grader for Pool 3 dike construction.



- Mason Neck - Borrowed Ford dump truck, trailer, and Caterpillar D4 dozer for dike projects. (while the D4 was here a factory representative had to come adjust the steering clutches)
- Patuxent - Borrowed two F900 Dump trucks and a Dresser tracked loader for hauling fill in dike projects and constructing rocket net/goose banding sites.
- E B Forsythe - Borrowed 2096 Case tractor with side mount flail mower for mowing around the Wildlife Drive.



Fig. 134. Case 2096 tractor with flail mower for dike slope mowing. This type of mower was totally inadequate for mowing dikes at Blackwater. (GCH)

If it were not possible to have borrowed these pieces of equipment, our projects would not have been completed as rapidly or as well as they were.

The following equipment was obtained from various excess sources:

- Davey 7M125 air compressor from US Navy, Norfolk, VA for sandblasting jobs
- lift truck from US Navy, Norfolk, VA for use as a lift/boom and service truck



Fig. 135. Automotive Mechanics Johnson and Hughes smiling as they unload the surplus lift truck from Norfolk Naval Base. (GCH)

- a 1985 Ford ranger pickup truck from Santee NWR to boost transportation needs for growing staff
- an Allis Chalmers propane powered forklift from US Navy, Norfolk, VA to replace the much needed antique one that died last year
- a mig welder from Bowden NFH to enhance shop repairs and fabrication projects
- an IBM selectric typewriter from Albany LE field office



- a monochrome computer monitor from Back Bay NWR
- 8" Gator pump with Wisconsin power head from Harrison Lake NFH for use in impoundment management and impoundment construction



Fig. 136. Excess gator pump (8") with Wisconsin power head. (GCH)

The following equipment was purchased to enhance/upgrade our dike construction/finishing capabilities:

- a used 3-point, 5 foot, offset disk to prepare seed beds on the dike top (\$200).
- a used 3-point, 5 foot, Brillion seeder ) Stevenson Equipment \$1100.
- a Goossen haybale chopper/mulcher to blow straw mulch over seeded areas for erosion control and moisture retention (\$3900).

## 5. Communications Systems

An old siren from the excessed station wagon was altered and installed in the S-10 Blazer for law enforcement use.

FCC-required annual radio checks were conducted by Caldabaugh Communications on April 14 and 22. The refuge base station and vehicle radios were inspected and tested at the refuge, and portable radios were returned with the technician to troubleshoot problems we've been experiencing with the units.

The refuge applied for Internet access to enable electronic communication with two University of Virginia students working with Blackwater's GIS. The "X.400 Alias Request" forms were completed and forwarded to the Region 5 EMail Coordinator for approval on April 8, and the Internet account established April 29.

On May 3, a dedicated telephone line (410-228-0988) and two RJ-11 jacks were installed for the FWS-11 fire weather station modem. (See Section F9.)

## 6. Computer Systems

An Orchid ProDesigner videoboard, a key component of the refuge's GIS hardware, malfunctioned and was returned to the manufacturer for replacement.

A defective 5 1/4" drive was replaced on an Everex 286 computer received on excess. The floppy drive was purchased for \$25 from Trac Associates, Dale City, VA.

In May, an acquisition request was submitted to CGS for a 486/66 computer with 16MB RAM, 32-bit EISA bus, a 1.2 GB SCSI hard drive, and an external CMS 250MB tape backup system. This faster, larger computer was required to more effectively support image processing and storage for the refuge's GIS. The contract was issued to Gateway 2000 for \$3980 (without monitor). The machine was received and set up in July, when problems were immediately experienced with a defective power supply. Nearly four months of contacts with Gateway finally produced a replacement system on 11/2. In addition to DOS 6.0 and Windows 3.1, this system offered a choice of several bonus software packages; we picked PowerPoint 3.0, which was used to produce the graphs for this Narrative.

The Fire Weather System (FWS-11), from Forest Technology Systems, Bellingham, WA, purchased with \$12,773.00 in fire funds authorized by Regional Fire Management Coordinator Carter, was delivered and installed in June. On June 28,

FTS representative Allan Amott provided training in accessing the system with the data logger and Fire Weather Plus® software to Biologist Hartis, Office Assistant Walkup, and three Maryland Forest Service personnel. (See Section F9.)

A Dell 486/66 microcomputer, ordered with \$3267 in regional end-of-year funds, was received in November. This welcome addition to the refuge's ADP equipment inventory was immediately put to use as a central computer for processing data relating to the refuge's cropland, wood duck, fire and other management programs, and for running regional databases such as RPPS and RMIS. The Gateway 386 computer it replaced was moved to the visitor center to provide ORP Briggs with a higher capacity model than her current 40 MB, 10 MHz 286.

#### 8. Other

Hughes and Morris assisted LE Division in demolishing excess boats, motors and a trailer.

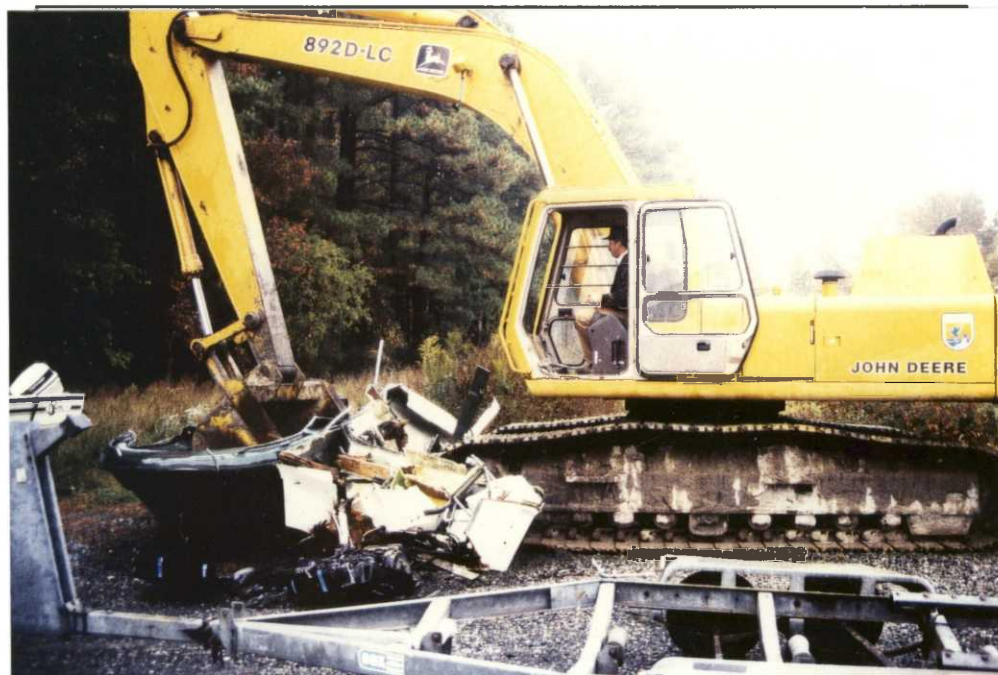


Fig. 137. Equipment Operator Morris demolishes LE boats and trailer.

On July 27, Bob Carpenter (ESV NWR) and Bailey White (GDS NWR) transported the regional Gemco ditcher from Blackwater NWR to Back Bay NWR (Happy Days are here again!!). The tall and wide flotation tires could not be hauled on the same load; Back Bay will transport the tires at a later date.

## J. OTHER ITEMS

### 1. Cooperative Programs

Refuge staff continued to conduct aerial waterfowl surveys over the Bloodsworth/South Marsh/Smith Island area as part of the North American project with the Department of Defense.

On February 24, Project Leader Carowan met with David Wilson, Maryland Eastern Shore Resource Conservation and Development Council (RC&D) in an effort to implement a partnership with the Service, Maryland Forestry Division, local fire departments and RC&D for the acquisition and installation of ten dry hydrants at various locations throughout the refuge area.

Refuge staff assisted State Wildlife personnel in capturing and eartagging sika deer at several refuge sites.

Maryland's Department of Natural Resources donated eight tons of corn to the refuge. The corn had been left over from the 1992 harvest year and needed to be removed in order to make room for this year's corn.

### 3. Items of Interest

Carowan attended the Project Leaders' meeting March 8-11. During one of the sessions, Project Leader Carowan was presented the John S. Gottschalk Partnership Award for his development of partnerships aiding the preservation of our natural resources.

Project Leader Carowan and BioTech Giese participated in the National "Bring Your Daughter to Work Day" on April 28. In addition to helping out at the refuge office, both Bonnie Carowan and Cheryl Giese assisted with the Delmarva fox squirrel trapping program. Both refuge volunteers, Bonnie and Cheryl are veterans at working with surveys and other "fun" refuge duties.





Fig. 138. Project Leader Carowan was presented the first "John S. Gottschalk Partnership Award" for his leadership in generating \$2,940,736 in partnership dollars in 1993.



Fig. 139. BioTech Giese with assistants Bonnie Carowan and Cheryl Giese during "Bring Your Daughter To Work Day" on April 28. (GCH)

On June 5, Maintenance Worker Harrison and Refuge Operations Specialist Barker conducted a tour of the Nanticoke and Marshyhope Rivers for Wayne Klockner of The Nature Conservancy, David Sutherland of The Conservation Fund, Bob Streeter of the North American Waterfowl and Wetlands Office, and several Marine Fisheries Subcommittee members. Topics of discussion during the tour included the importance of the Nanticoke River watershed and its importance to the health of the Chesapeake Bay, special habitats, eagle use, rockfish values, and methods of protection. The following day, BioTech Giese and Supv. ROS Heet conducted a canoe tour of the Big Blackwater River for the same group. Everyone had a very informative and enjoyable time.



Fig. 140. Tour of the Nanticoke. (JAB)





Fig. 141. Canoeing the Big Blackwater River.  
(JAB)

BioTech Giese was selected for a black duck banding assignment at the St. John's River Woodstock area in New Brunswick, Canada. This banding station was one of many projects across Canada where joint U.S. and Canadian wildlife personnel conduct annual pre-season banding. The St. John's station was funded as part of the Black Duck Joint Venture. After picking up a vehicle, boat, and banding equipment at Patuxent NWRC on August 7, Giese drove to Rhode Island where he rendezvoused with Iroquois NWR Biologist Eric Derleth. After traveling to Woodstock, NB just across the U.S. border, the two-man crew began prebaiting sites. Traps were set and the first ducks were caught nine days after team's arrival. Despite the frustrations of dealing with 3'-4' water fluctuations due to hydroelectric dam activity, the team caught and banded a total of 842 ducks, including 389 black ducks. Giese, a Dorchester County trapper, gained international experience by conducting preventative predator control at trap sites. All predator trapping was conducted under permit from the Canadian Wildlife Service, and 10 raccoons, 1 red fox and 1 mink were caught. The size of the northern raccoons impressed Giese, who was used to trapping the much smaller marsh coons of Dorchester. The banding crew left Canada on September 13 and Giese arrived at Blackwater on September

14. Equipment, boat, and traps were returned to Patuxent on September 16. This assignment consisted of hard work, long hours, and 34 days away from home and family; however, it provided a great experience.



Fig. 142. The results of efforts by BioTech Giese and Iroquois NWR biologist Eric Derleth during their black duck banding assignment in New Brunswick, Canada.

On August 10 and 11, Carowan met with other project leaders and RO staff to review the FY94 Blue Book. The most progressive part of the meeting was felt by many to be the "Blue Book Blues."

On August 23, we were notified that, while both manager positions at Eastern Neck NWR were vacant, Eastern Neck would be administered from Blackwater. Project Leader Carowan visited Eastern Neck on August 30 to meet with the staff and develop "interim" operating procedures, resolve several pending issues, and initiate work to restore the badly maintained residence. Carowan remained as the Acting Project Leader for Eastern Neck throughout the balance of 1993.



On October 23, Carowan was recognized by the Dorchester County DU Chapter at their 22nd Annual Banquet for the outstanding contributions that have been made towards revitalizing the waterfowl management programs on and off the refuge.

On November 18, Carowan and Giese attended the annual Dorchester County Harvest Breakfast.

On December 12, Project Leader Carowan was selected as the 1994 Vice President for the Chicone Ruritan Club.



Fig. 143. Project Leader Carowan accepted two bat boxes from the 5th grade students at Vienna Elementary School in South Dorchester County. The bats on the refuge "JUST SAY NO TO DRUGS"!!

On December 27, President Bill Clinton made his way to Dorchester County for the now famous presidential hunting expedition on John Tieder's farm near Taylors Island. Reactions to the visit were split along partisan lines among hunters and nonhunters. Ms. Heidi Prescott maintained a lonely vigilance along Rt. 16 on behalf of the Fund for Animals, petitioning to stop waterfowl hunting on Regulated Shooting Areas (RSAs), and Ms. Jenny Woods for PETA (People for the Ethical Treatment of Animals) said "Hillary doesn't wear fur...we just don't know why he decided to go hunting." But Ladd Johnson, a primary advocate of the released mallard duck program, was very pleased. The gun lobby and the NRA were also pleased to see the President with his guns. But the FWS' reaction to the President's visit to an RSA was quiet, very quiet, particularly at a time when the Service was publishing notices in the Federal Register to curtail the duck release program nationwide. The President's reaction was great, and, according to his host, he had a wonderful time visiting the Eastern Shore - as everyone who comes to this part of the world always does!



Fig. 144. President Clinton and Congressman Bill Brewster visited the Eastern Shore on December 27 for a duck hunting expedition at the Fruit Hill Farm Regulated Shooting Area, one of the many mallard duck release farms in Dorchester County. Although the President credited Mr. Brewster with the one duck the party killed, Mr. Brewster said it was the President's duck. The press said it was the Secret Service's duck!

**Ramsar Convention: Kushiro, Japan**

The Fifth Conference of the Contracting Parties (COP5) to the Convention on Wetlands of International Importance (Ramsar Convention) met June 9 - 16 in Kushiro, Hokkaido, Japan. With 95 countries and 1231 registered delegates in attendance, COP5 made significant decisions designed to enhance its wetland conservation program and the long range goal of reversing the global loss of wetlands and wetland values.

The United States had a special interest in the success of this meeting. For the past three years, the U.S. served as Chairman of the Convention's Standing Committee which is the Convention management body between meetings of the Conference. Many of the decisions considered at the Kushiro Conference were the result of initiatives by the U.S. in its capacity as Chairman, and had their genesis in the exercise of this leadership opportunity. In particular, this meeting included four technical workshops related to wetland conservation. The U.S. delegation had active roles that targeted specific results and recommendations that the U.S. felt were essential to the Convention's future. In addition, the COP5 formulated the strategy, work plan, staffing, and budget for the Convention's next triennium. The U.S. had historically participated in the drafting of the Conference documents related to these topics, and since much of the Convention work plan is financed through U.S. payments, it was important that the Convention adopt a strategy and work plan that would allow rational management control over the growth of the Convention's work. It was equally important that the delegates decisions and participation reflect the best possible thinking on the fundamental elements of global wetland conservation needs.

In addition to Mr. Carowan, the following delegation membership participated in COP5: Dick Smith, Acting Director, FWS, and Chairman of the Convention Standing Committee; Larry Mason, Chief, Office of International Affairs; John VanDerwalker, Office of Ecology, Health and Conservation, Department of State; Tom Dahl, National Wetlands Inventory, FWS; Mary Kentula, Wetlands Research Center, EPA; John Wilson, Office of Environment and Natural Resources, U.S. Agency for International Development; and Marc Holmes, Save the San Francisco Bay Association.

## U.S. CONFERENCE OBJECTIVES

1. Ensure that the 1994-1996 Programme Document serves as a guidance document for the Convention, the Bureau, and the Standing Committee, not as a budget driving document.
2. See that the budget as proposed is adopted insofar as possible. Accept the 100% increase as within the means of U.S. agencies to finance. Support increased growth in the conservation business of the Convention. Do not support infrastructure or administrative cost increases beyond those proposed. Support proposals that shifted resources from infrastructure and administration to conservation efforts.
3. Work for strong and clear action on a number of conservation related issues including: the technical capacity of the Convention Bureau; management of the Conservation Fund; management of the monitoring procedures developed at Montreux; follow up on monitoring activities; adopt a set of wise use guidelines for the parties and a continued remit for the Wise Use Working Group and management of the Bureau for conservation objectives.
4. Use the presence of an NGO on the Delegation to get the message out that wetlands conservation will succeed only in a partnership environment, and support Japanese NGO conservation objectives by various networking, consultation, and other mechanisms.
5. Establish points of contact for technical follow-up on Convention matters.
6. Identify and pursue linkages between Convention and USAID program objectives and establish credible processes to take advantage of these linkages to the advantage of wetland conservation in developing countries.

All of these objectives for COP5 were achieved.



The following summary is provided:

1. Kushiro, Hokkaido, Japan played host to the Fifth Conference of the contracting Parties to the Convention on Wetlands of International Importance during the week of June 9 - 16, 1993. Also known as the Ramsar Convention for the town in Iran where it was negotiated in 1971, COP5 was the first conservation convention conference to take place since the UNCED Rio conference of 1992. It was the largest COP in Convention history with 1231 registered delegates from 72 of the 76 parties. There were 23 observer states in attendance, 7 intergovernmental agencies, 14 international nongovernmental (NGO) organizations, 22 foreign NGOs, and 68 Japanese NGOs. There was extensive local, unregistered participation by interested organizations, local citizens, and students.
2. The COP played against a background of Japanese NGO efforts to bring about a strengthened environmental commitment from the GOJ (Government of Japan). Numerous examples were presented by Japanese NGOs of GOJ domestic and foreign assistance projects which ignored environmental considerations and resulted in serious, perhaps irreversible consequences for wetland habitats. Japanese NGOs became progressively more adept at using the press to score its points as the week progressed. U.S. NGOs clearly abetted this maturation of Japanese NGO skills. The Japanese Environment Agency was under strong and continuing pressure from the Japanese Construction Ministry not to accept Convention guidance on the use of environmental impact statements for projects involving wetlands. Sensing impasse on the subject and a very high potential for a Japan based plenary, the U.S. and U.K. brokered corridor negotiations to prevent weakening of the EIS guidance to a point unacceptable to the parties. While the EIS guidance was softened so as to be consistent with national statutory regimes, the implications of the situation were clear to all parties and to the press, which remained unwilling to let GOJ off the hook.

3. The COP conducted four technical workshops. The first dealt with the Convention list of 600<sup>+</sup> Wetlands of International Importance which have been identified by the parties as having particularly important biological values. At COP4 in Montreux, Switzerland, the parties began to identify those sites on the list whose values were being diminished or degraded. This second list, known as the Montreux Record, highlights those Wetlands of International Importance deserving of immediate attention or restoration. COP5 adopted a process for managing the Montreux Record, assuring party follow-up for sites on the Record, and for helping fund restoration efforts in developing countries. During COP5, the Everglades National Park was placed on the Montreux Record. The USDEL did not oppose this action. (Although not discussed at COP5, the Service needs to be aware that freshwater wetlands on Blackwater Refuge are being seriously jeopardized by salt water intrusion, primarily originating from man's historical dredging activities on the Upper Blackwater River. As a Ramsar site, corrective actions need to be taken to avoid the need to elevate this problem to the level of listing like the Everglades National Park.)

The second workshop provided the parties with guidance related to the wise, sustainable, and prudent use of wetlands and water resources. Addressing such matters as policy, legislation, regulation, management, wetland inventories, wetland classification, monitoring, research, training and education, and public awareness, this workshop prepared a blueprint for developing countries' pursuit of the wise or sustainable use concept. It was in this workshop that Japanese NGOs were especially effective in unmasking destructive GOJ practices. Mr. Dahl presented a paper on Wise Use planning during this workshop.

A third workshop developed guidance for the parties related to the necessity, process, and techniques of management planning for wetland habitats and the watershed systems of which wetlands are a part. Delegates from France and the U.K. had met earlier in the year and had prepared a "Guidelines" document for the preparation of management plans. While thorough, these guidelines were technically cumbersome for interpretation and quite overwhelming to

developing country parties. Carowan's task in this workshop was to prepare and present a paper that would place the management planning process into a more comprehensible, common sense application of thought processes that would lead the third world countries to the point of applying the more technical aspects of the "Guidelines." The U.S. presentation was well received.



Fig. 145. Project Leader Carowan presented a paper on "How to Approach the Management Planning Process for Ramsar and Other Wetland Sites" at the Fifth Conference of Contracting Parties to the Convention on Wetlands of International Importance in Kushiro, Hokkaido, Japan in June.

In considering the subject matter before both this workshop and that on wise or sustainable use, the parties recognized the need for a technical committee to advise various Convention bodies on these topics, and established a Scientific and Technical Review Panel to be made up of individuals selected purely on their technical merit.



Fig. 146. Deputy Director Smith and Project Leader Carowan (the tallest two) were given the "red carpet" tour of the Jushiro Shitsugen, a Japanese Ramsar site on Hokkaido.

The fourth workshop looked at the subject of international bilateral and multilateral cooperation. Citing numerous case studies, this workshop concluded that human resource and institutional development assistance for wetland management, conservation, and research remained a priority for developing countries. It was in this workshop that questions arose related to the Convention assistance fund, the Wetlands Conservation Fund, that was established at COP4 to help developing country implementation of Convention concepts. Efforts to open the Fund to countries whose economies are in transition were rigorously opposed by the developing countries. U.S. and European support for this change was to no avail and the only compromise acceptable to developing countries was a statement of support for bilateral assistance to emerging economies to take place outside of the Convention.



4. The COP pointedly addressed its conservation agenda. It adopted a workplan for the next triennium. The COP clearly stated its feeling that insofar as wetland issues were concerned, this Convention should be the source of expertise and the mechanism for implementing Biodiversity Convention wetland obligations. The COP adopted a one hundred percent budget increase with growth primarily directed to strengthening its conservation assistance capacity and providing for the staffing to deliver that assistance. In adopting the budget increase by consensus, which the U.S. supported, only Germany voiced reluctance.
5. The Convention is composed of four bodies: the Conference of Parties; the Standing Committee which acts as overseer on policy, programs, and budget between COPS; a Secretariat of ten permanent staff co-located with the International Union for the Conservation of Nature and natural Resources (IUCN) in Gland, Switzerland; and the newly established Scientific and Technical Review Panel. For the past three years, the U.S. has chaired the Standing Committee. During this time, the convention has doubled in membership, established a wetlands conservation assistance fund, and become one of the world's major conservation organizations; the only one focused on wetland issues. Under U.S. leadership, the Convention forged important linkages with international organizations working in the field of nature protection, particularly the IUCN, the International Wetlands and Waterfowl Research Bureau, the World Wide Fund for Nature, the Asian Wetlands Bureau, and Wetlands for the Americas. All of these organizations have field level operations in developing countries, possess a high level of technical expertise, and maintain an awareness of relevant assistance needs in their areas of operation. Completing its term as Chair of the Standing committee, the U.S. will be replaced as the North American representative to this body by Canada. In addition to Canada, new Committee members are Hungary (Chair), Kenya (Vice Chair), India, Uruguay, New Zealand, and Spain. The conference accepted an invitation to hold COP6 in Australia in 1996.

6. Local participation in COP5 was extensive. Numerous volunteers were present to assist conference staff and many locals participated as observers to various sessions. Kushiro is located adjacent to a large marshlands area that is habitat to the highly revered Japanese Crane. Interest in conservation of the Kushiro marsh, the Japanese Crane, and in wetland conservation in general, prompted local businesses and organizations to contribute over \$100,000 U.S. to the Convention Wetland Conservation Fund.
7. USDEL provided essential leadership in a number of COP events including Conference Vice Chair, technical workshops, corridor negotiations, and general information exchanges. Follow-up items likely to come to mission attention include wetland inventory assistance; Armenia for training and technology exchanges; Denmark for technical cooperation related to wetland restoration, restoration data bases, and guidelines for developing country training in restoration techniques; and Panama for wildlife management training under existing Park Service management assistance projects.

The final workshop looked at the subject of international bilateral and multilateral cooperation.

The U.S. delegation viewed COP5 as an important milestone in the evolution of Ramsar's conservation program. Nearly all U.S. objectives were met.

Post-Ramsar, Project Leader Carowan continued to assist The Office of International Affairs in planning a November visit to the U.S. by a delegation from the Japanese Hokkaido Development Agency. The 23-person delegation arrived at Blackwater on November 24, following a stop-over at San Francisco Bay. The tour for the delegation focused on wetlands, wetlands restoration, and agriculture.

#### 4. Credits

The 1993 narrative involved nearly all refuge staff members. Completion of the narrative was delayed, as approved, by higher priority work on 1994 refuge compatibility determinations.

<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 Manager Trainee Brady
E	Project Leader Carowan Refuge Operations Specialist Heet Refuge Manager Trainee Brady Outdoor Recreation Planner Briggs Biologist Hartis Office Assistant Walkup Office Automation Clerk Morris
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 Refuge Manager Trainee Brady Office Assistant Walkup
J	Refuge Operations Specialist Heet
K	Project Leader Carowan

Photo credits are indicated by initials after each caption: JAB, Jason Barker; MMB, Maggie Briggs; GAC, Glenn A. Carowan; WMG, Bill Giese; LPH, Larry Hartis; GCH, Gary Heet; SLB, Stephanie Brady; KL, Kira Landsman; AL, Andi Lawrence; RK, Ruth Kondylas.

The majority of the 1993 Narrative was typed, formatted, and proofread by Office Automation Clerk Morris. Supv. Refuge Operations Specialist Heet, Refuge Manager Trainee Brady, and Office Asst. Walkup edited various sections of the Narrative. Refuge Manager Trainee Brady developed graphs using PowerPoint®.



MARTIN

**MARTIN NATIONAL WILDLIFE REFUGE**

Smith Island, Maryland

**ANNUAL NARRATIVE REPORT**

Calendar Year 1993

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

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## 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 was 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.



#### A. HIGHLIGHTS

Congressman Gilchrest visits Smith Island. (See J.3.)

#### B. CLIMATIC CONDITIONS

Climatic conditions were similar to those at Blackwater NWR. The cold snap in December caused problems for boat traffic to and from the island.



horizontal photo

Fig. 1. The ice breaker boat making a path from Crisfield to Smith Island. (JAB)

#### D. PLANNING

##### 5. Research and Investigation

Two studies were conducted by Clemson University graduate students. Scott Jones is examining waterfowl habitat use/preference on Bloodsworth, South Marsh, and Smith Islands by aerial surveys and ground vegetation work. Jerry Hayes is examining habitat associations and spatial use patterns of wading birds in the Bay area (predominantly colonies on Martin NWR and Bloodsworth Island). Preliminary results from aircraft follow flights (n=54) show herons flying up to 26 kilometers from Martin NWR colonies to feeding areas on the mainland (Figure 2). Some birds actually crossed the Bay to the western shore.

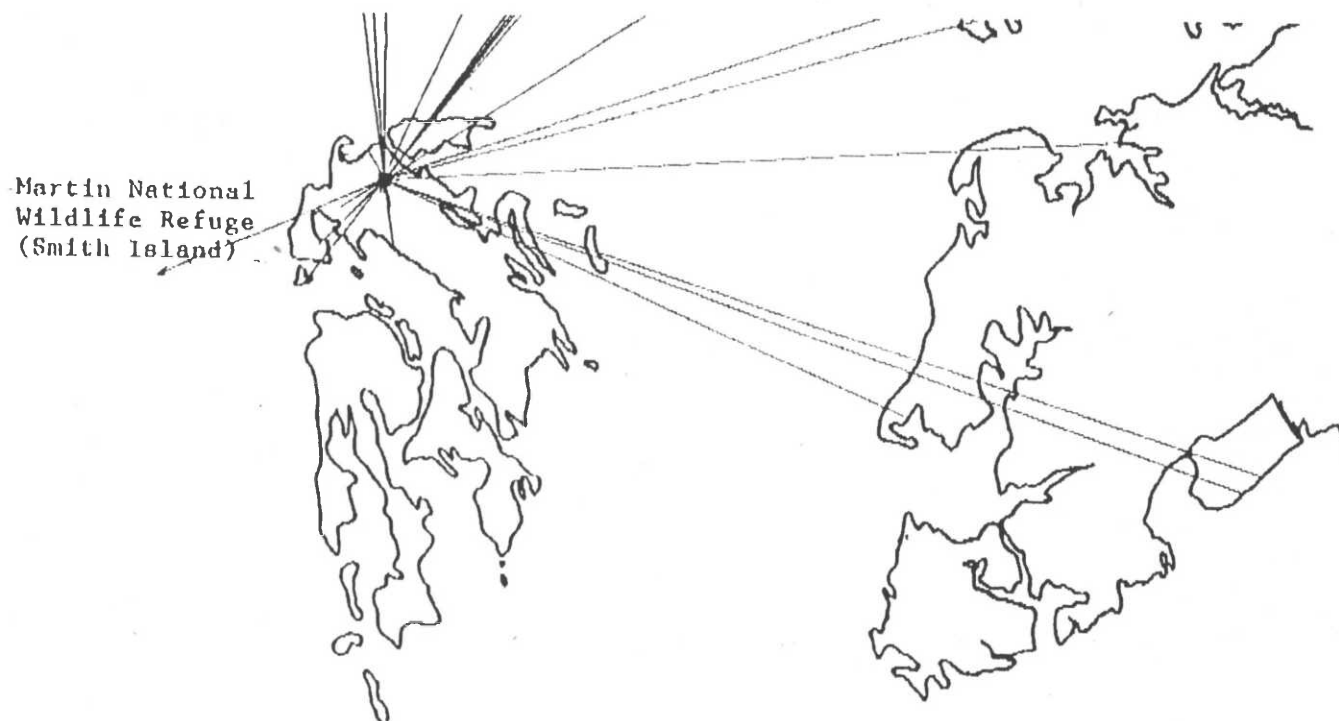


Fig. 2. Flights of Great Blue Herons from Martin NWR, Smith Island, Maryland, summer 1993.

Maintenance Worker Harrison provided logistical and transportation support to Clemson graduate students Jerry Hayes and Scott Jones several times.

On July 20, ROS Barker and MW Harrison met with researchers Mike Haramis and Dennis Jorde of the Patuxent National Wildlife Research Center regarding the potential for a black duck study which would encompass Martin NWR as part of the study area. The project would use telemetry to provide needed data on areas and habitat types used by nesting and brood-rearing black ducks.

ROS Barker responded to Dennis Jorde's (Patuxent WRC) research and information questionnaire and identified the following needs for Martin NWR:

1. Determine factors limiting Osprey production potential on salt marsh islands.
2. Determine effective survey techniques for wading bird colonies.
3. Determine potential (effectiveness) for erosion control on Smith Island and Martin NWR.
4. Determine use of salt marsh habitat by nesting and brood-rearing black ducks.
5. Determine implications of using fire to manage black needlerush; e.g., how well will it burn, what habitat changes might occur, potential benefits, etc.

A Special Use Permit was issued to John Klapac, Royal Queen Company, to locate a queen bee apiary on Martin NWR. The apiary was established to create an isolated breeder apiary for maintaining genetic purity of the ARS-Y-C-1 strain of honey bee and use the apiary for propagating mated, full-blooded queens for commercial queen raising. This strain of bees is immune to the tracheal mite which is destroying hives State-wide and throughout the country.

October 19, ROS Barker met with John Klapac to review the status of the ongoing Smith Island bee project. Progress is being made in the queen rearing setup. Mr. Klapac has made several modifications to the boat house for the benefit of his study and the Service.

#### E. ADMINISTRATION

##### 1. 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 Specialist	GS-09	9-09-90	PFT
Michael K. Harrison	Maintenance Worker	WG-07	7-19-79	PFT



Fig. 3. Maintenance Worker Michael Harrison. (JAB)

On February 22, Maintenance Worker Harrison injured his back while trying to free an outboard motor boat which was stuck on a mud bank. A DI-134 and CA-1 were sent to the Regional Safety Manager in Hadley.

Harrison joined Blackwater staff on November 17 for CPR recertification conducted by personnel from the Dorchester General Hospital/American Red Cross. This year's training included an extra segment on using a protective face mask during resuscitation.

Refuge staff whose work exposes them to excessive noise levels were given annual audiometric testing at a local ENT specialist's office on November 18.



## G. WILDLIFE

### 1. Wildlife Diversity

For the second summer brown pelicans nested on Cheesman Island, south of the refuge. No northward movement of nesting was noted during 1993. Casual observations of this tract of private land show a significant increase in tern production and a decrease in gull production. No black skimmer nests were observed.

### 2. Endangered and/or Threatened Species

Eagles were conspicuous on the refuge throughout the year. Prior to the arrival of nesting great blue herons, a pair of eagles initiated nesting in the heron rookery on Captain Dan's Island. However, as the heron nesting hit full tilt the eagles left, presumably due to heron pressure.

Peregrine nesting was a tremendous success this year, fledgling a record number of seven birds (four from Tower 1 and three from Tower 2). Two years ago, a female was seen on the new tower with no mate. Last year a pair was present and formed a depression in the nest box but did not produce. However, the third year proved to be a charm as a pair fledged three young, marking the first time this new tower had been used.



Fig. 4. Peregrine Falcon eggs in nesting box of Tower 1. (JAB)

On August 5, MW Harrison transported two Maryland Department of Natural Resource (MD DNR) staff members around the refuge, searching for the Northeast Beach Tiger Beetle. None were found.

### 3. Waterfowl

Aerial waterfowl surveys were conducted monthly in spring/fall except November and December due to airplane mechanical failures (Table 1). A breeding pair survey was conducted on April 13, 1993 (Table 2) and a brood survey was conducted on June 25, 1993 (Table 3).

Table 2. Aerial pair count survey, Martin NWR,  
Smith Island, Maryland. April 13, 1993

Pairs Observed	
<u>Species</u>	
Black Duck	4
Mallard	59
Gadwall	1
Bufflehead	6

Table 3. Aerial brood survey, Martin NWR,  
Smith Island, Maryland. June 25, 1993

<u>Species</u>	<u># Broods</u>
Black Duck	2

The number of Black Duck broods observed was considerably lower than ocular estimates would indicate. Apparently, accurate brood surveys via airplane in this habitat type may not be feasible.

### 4. Marsh and Water Birds

On June 30, two MD DNR biologists conducted a departure/arrival study of great blue herons and great egrets from Captain Dan's rookery. Results will be plotted against future numbers for an index of rookery condition/population.

### 5. Shorebirds, Gulls, Terns, and Allied Species

Due to extreme winds in May, the number of personnel needed to conduct the Long-Acre gull survey were unable to get to Smith Island at one time. Visual estimates of the population do not indicate a reduction in numbers.

Table 1. A monthly summary of aerial waterfowl survey data for Martin National Wildlife Refuge, Smith Island, Maryland.

Species <sup>1</sup>	Month <sup>2</sup>											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Mallard	6	265	39	19	-	3	-	-	1	7	-	-
Black Duck	462	1402	427	116	-	72	-	-	208	173	-	-
Gadwall	48	8	6	0	-	3	-	-	0	1	-	-
Wigeon	453	473	15	0	-	0	-	-	0	10	-	-
G-W Teal	0	0	0	31	-	0	-	-	0	0	-	-
Pintail	0	67	0	0	-	0	-	-	0	0	-	-
Goldeneye	140	16	53	0	-	0	-	-	0	2	-	-
Bufflehead	932	889	1063	48	-	0	-	-	0	0	-	-
Surf Scoter	607	100	425	12	-	0	-	-	0	0	-	-
C. Scoter	16	0	0	0	-	0	-	-	0	10	-	-
W-W Scoter	45	0	30	0	-	0	-	-	0	0	-	-
Oldsquaw	27	0	72	0	-	0	-	-	0	0	-	-
C. Merganser	0	39	295	0	-	0	-	-	0	0	-	-
H. Merganser	12	17	7	11	-	0	-	-	0	3	-	-
Red B. Merganser	3	15	0	0	-	0	-	-	0	0	-	-
Canada Goose	1516	585	95	0	-	3	-	-	0	133	-	-
Tundra Swan	882	754	543	0	-	0	-	-	0	0	-	-
Mute Swan	0	0	0	3	-	0	-	-	5	1	-	-

- <sup>1</sup> G-W Teal = Green-wing teal  
 C. Scoter = Common Scoter  
 W-W Scoter = White-winged Scoter  
 C. Merganser = Common Merganser  
 H. Merganser = Hooded Merganser  
 Red B. Merganser = Red-breasted Merganser

- <sup>2</sup> 0 = Indicates no birds were observed.  
 - = Indicates no surveys were completed.

## 6. Raptors

From February 17 through months end, Maintenance Worker Harrison was busy repairing and replacing osprey nest platforms in anticipation of the birds arrival next month. This preparation is well-deserved because 49 osprey pairs were observed during nest box surveys on April 12. A barn owl box check was conducted on April 13 but no owls or active nests were found.

On July 6, ROS Barker, MW Harrison, and researcher Craig Gorsuch banded osprey young at Smith Island. Following is a summary of that effort:

Table 4. Results of 1993 Osprey Young Banding Project, Martin NWR, Smith Island, Maryland.

Nest	Number of Young Banded	Comments
#2	2	---
#5	1	---
#7	2	Banded adult female Young not banded, too small
#8	1	---
#9	1	---
#10	1	---
#17	2	Banded adult female
#19	2	---
#27	1	---
#29	1	---
#44	1	---
#47	2	---
#49	1	Dead young present in nest
#52	1	---
#53	1	Dead young present in nest
#56	1	---
#62	2	---
#64	1	---
#65	1	Dead young present in nest
#70	1	Banded adult male
Total Banded	24	

Mr. Gorsuch, having banded osprey on the refuge for many years, commented on the high number of dead young. He stated that the high number of dead young is usually a function of poor food supply, related to weather conditions and water currents that can delay the availability of prey.





Fig. 5. ROS Barker checking osprey production with mirror...Sure beats hauling step ladder around the marsh. (MH)



Fig. 6. View of nest as the female osprey sees it. (MH)

## 16. Marking and Banding

On July 26, baiting was initiated for pre-season duck banding. Martin NWR's quota was raised from 100 to 250 black ducks this year.

Mike Haramis, Patuxent Wildlife Research Center, visited Martin NWR three times in August to assist with black duck banding and to offer new ideas on trap construction. Approximately 180 black ducks were banded this month, the most ever captured during the month of August. Two incidental and unexpected trap captures were a gadwall and a brant, with the brant categorized as extremely unusual.

The pre-season banding effort wound down at the end of September with MW Harrison exceeding the Martin NWR's 250 black duck quota by 75 ducks, for a season total of 325. These results are indicative of MW Harrison's intense efforts to accomplish this objective.

## H. PUBLIC USE

### 6. Interpretive Exhibits/Demonstrations

We received two pieces of our interpretive displays this year. Work was also initiated on waterfowl and wading bird dioramas that entailed collection of specimens and background photos.



Figure 7. Middleton House sign on the left was a new addition in 1993. (JAB)

## 17. Law Enforcement

MW Harrison coordinated a "verbal cooperative agreement" with MD DNR Marine Police regarding provisions for transportation of refuge staff to and from the island when they were making scheduled trips.

### I. EQUIPMENT AND FACILITIES

#### 3. Major Maintenance

The "Osprey" workboats' 4208 CAT diesel engine was cleaned and repainted in an effort to preserve its integrity in a destructive, marine bilge environment.

The stairway and the upper hall floor at the Middleton house was painted.

During early June, the Caterpillar diesel engine on the "Osprey" began stalling when in low speed. MW Harrison discovered that the fuel had become contaminated. A new fuel filter solved the problem.

Wiring was installed in the refuge truck to connect the electric winch on the boat trailer.

Major maintenance was conducted on the 18-foot aluminum scow including the repainting of the entire boat, putting in a new floor and console (subsequently fiberglassed), and installing a new compass and steering assembly.

#### 4. Equipment Utilization and Replacement

The interior cabin on the Osprey was rebuilt by MW Harrison. This included replacing windows, seats, and all trim work. A new Furuno depth finder was installed. It enables MW Harrison to compute forward boat speed, water temperature, and provides both graphic and digital depth displays. A Magellan NAV 5200 GPS receiver was purchased and installed.

On July 2, a Boston Whaler (excess property from Bombay Hook NWR) was transported from Blackwater to Martin NWR for use as a rough weather, shallow-water work boat. After installing a new console, seat, steering system, and used 85 hp motor, the boat was outfitted with complete U.S. Coast Guard safety equipment.

A new wrench set was purchased to replace an old set that had been damaged due to salt water use.

## 8. Other

April 19-23, Blackwater and Martin NWRs' maintenance staff - Mike Harrison, John Johnson, Richard Webster, Richard Thurman, and Mike Truitt - attended the FY93 Regional Maintenance Workshop at Patuxent NWRC.

## J. OTHER ITEMS

### 3. Items of Interest

Maintenance Worker Harrison participated in the Waterfowl Wingbee at Patuxent WRC from January 25-28.

On June 5, MW Harrison and ROS Barker led Wayne Klockner of The Nature Conservancy, David Sutherland of The Conservation Fund, Bob Streeter of the North American Waterfowl and Wetlands Office, and several Marine Fisheries Subcommittee members/aides on a tour of the Nanticoke and Marshy Hope Rivers in Martin NWR's workboat, the "Osprey" (150 mile round trip for MW Harrison). Topics of discussion during the tour included: the importance of the Nanticoke River watershed and its importance to the health of the Chesapeake Bay, special habitats, eagle use, rockfish values, and methods of protection.

In late July, MW Harrison assisted Smith Island resident Gene Parks, who had lost the prop from his boat adjacent to refuge waters. MW Harrison towed Mr. Parks' boat back to Ewell.

In early September, Congressman Wayne Gilchrest visited Smith Island to examine the severity of erosion along the Bay shore. Residents heartily pleaded for government assistance to combat this problem.

FY92 revenue sharing checks were received and issued to Somerset County (Martin NWR, \$10,892).

### 4. Credits

The 1993 Narrative was compiled by ROS Barker, edited by Refuge Manager Trainee Brady and Office Assistant Walkup, and typed and formatted by Office Automation Clerk Morris.

Photo credits are indicated by initials after each caption, Jason Barker (JAB) and Michael Harrison (MH).





**SUSQUEHANNA NATIONAL WILDLIFE REFUGE**

Havre de Grace, Maryland

**ANNUAL NARRATIVE REPORT**

Calendar Year 1993

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.

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 exessing the property administratively rather than legislatively.
3. The Service would investigate the requirements for exessing 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, 1991, 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 exessed 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.

On January 27, 1992, Senator Mikulski sent a follow-up letter to the Coast Guard inquiring about the status of the jurisdiction. Finally, on February 3, 1992, the Coast Guard drafted the following response:

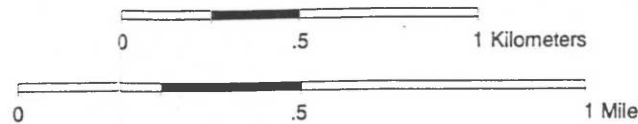
"The Coast Guard owns the skeleton tower and lighthouse structure at the Shad Battery site. The control and jurisdiction of the underlying land, a 45' x 45' parcel rests with the Department of the Interior. The Department of the Interior, however, cannot interfere with the Coast Guard's right to use the property for lighthouse purposes. The jurisdictional question has been discussed with the Department of the Interior and they are in agreement with this position. The Coast Guard has no objection to a third party (non-profit organization) using the lighthouse. It will make whatever arrangements necessary with the Department of the Interior to make the lighthouse available to a third party."

This recent correspondence paves the way for the Battery Island Preservation Society to perform needed maintenance and preservation on the deteriorating lighthouse and structure. However, it does little in relieving Blackwater Refuge from the burden of responsibility concerning the land. Furthermore, there are now three parties involved in the administration of a useless piece of eroding island less than 0.5 acres in area.

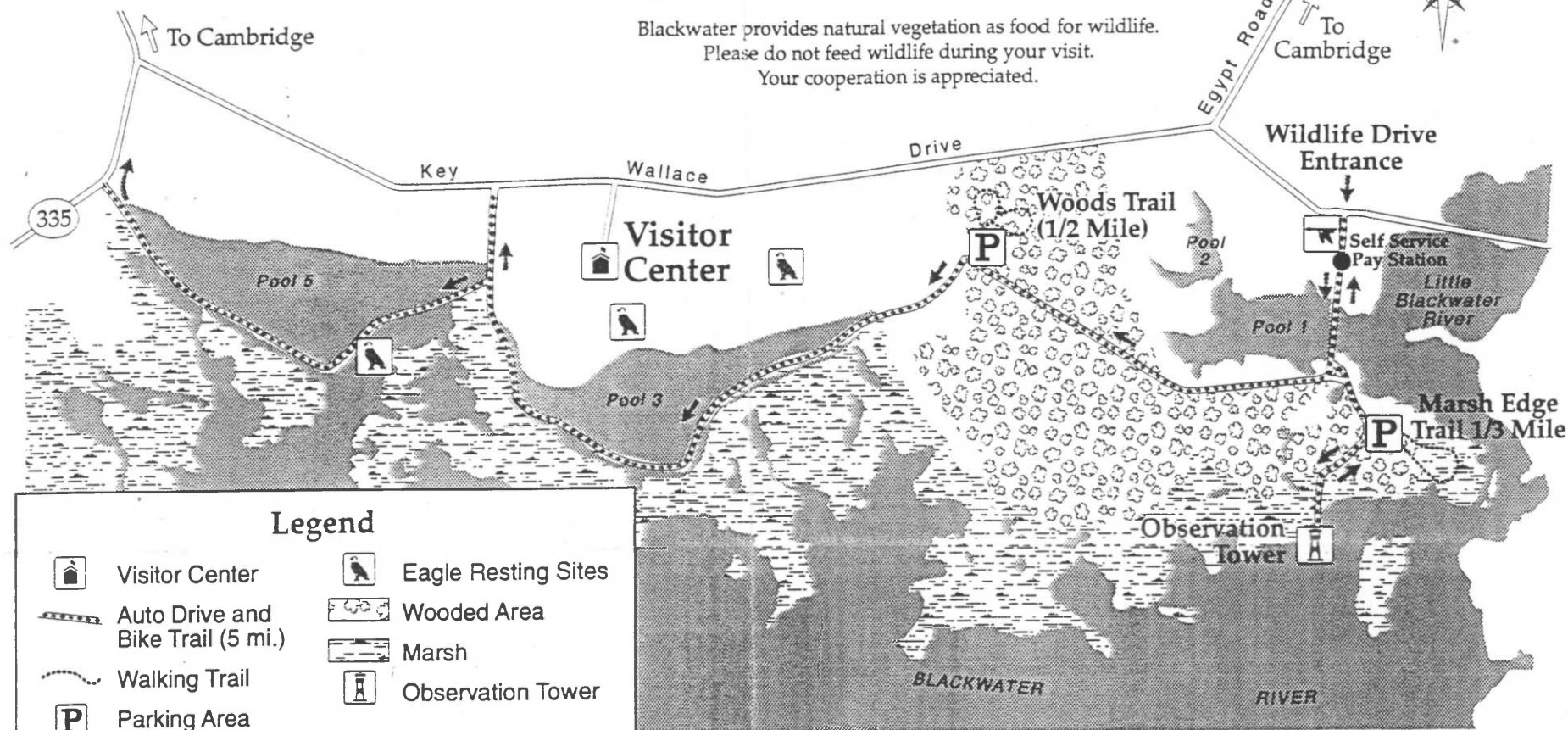
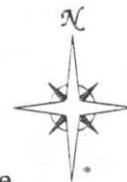
During 1993, the Coast Guard contacted Blackwater Refuge to inform us that they intended to demolish the old deteriorated lighthouse. Evidently, third-party interest in saving the lighthouse had dwindled. Blackwater informed the Coast Guard that we had no objection with them removing the lighthouse, since the FWS has no jurisdiction over the structure. At year's end we had received no word on the outcome.

# Wildlife Drive

Blackwater National Wildlife Refuge  
(Open Dawn to Dusk)








Blackwater provides natural vegetation as food for wildlife.  
Please do not feed wildlife during your visit.  
Your cooperation is appreciated.

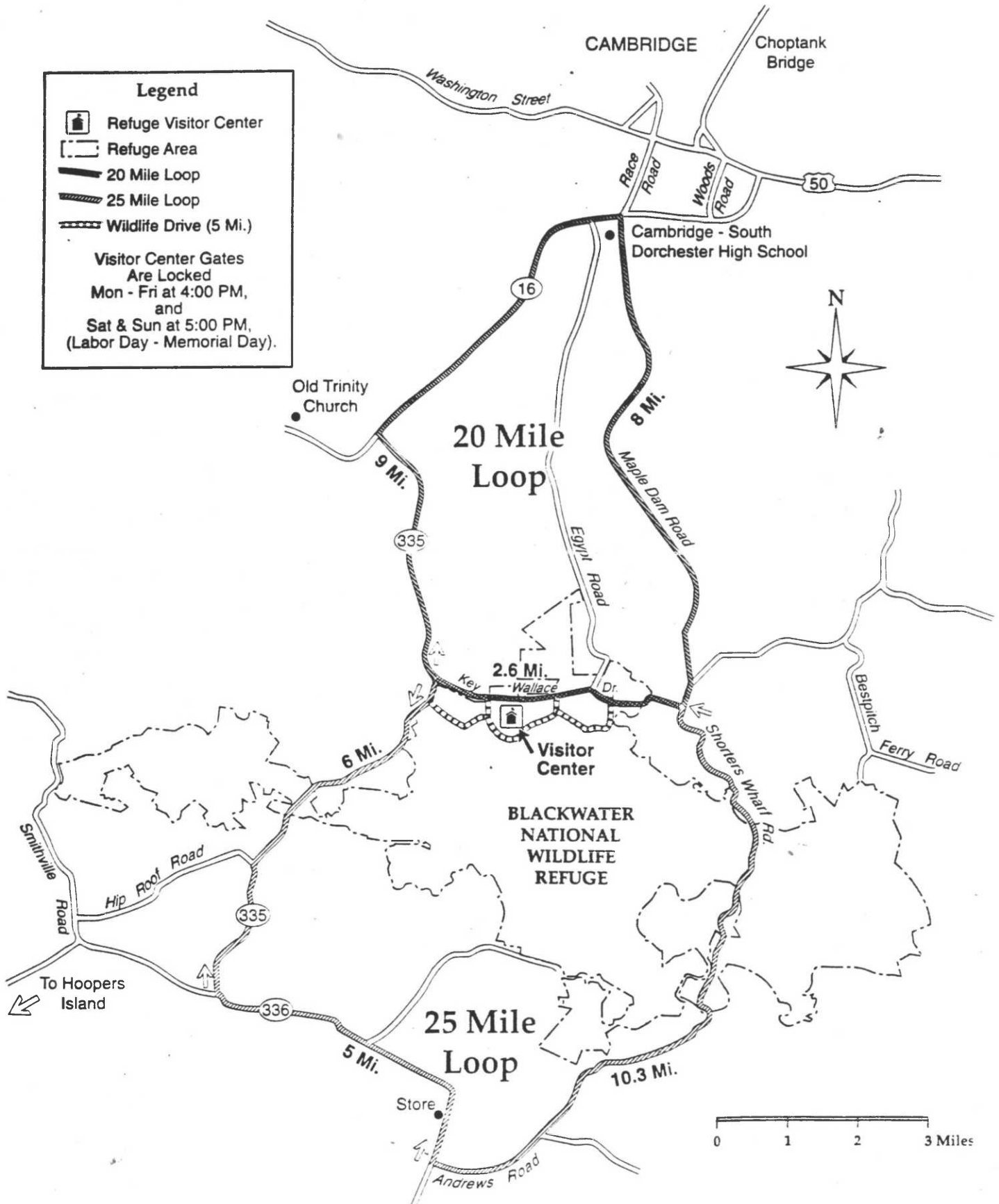


# BLACKWATER NATIONAL WILDLIFE REFUGE BIKE MAP

**Legend**

-  Refuge Visitor Center
-  Refuge Area
-  20 Mile Loop
-  25 Mile Loop
-  Wildlife Drive (5 Mi.)

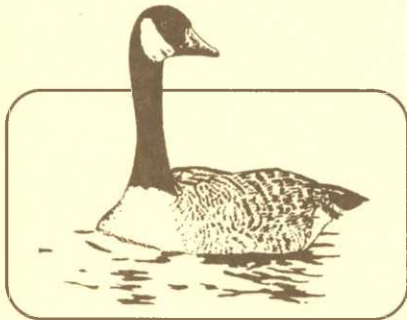
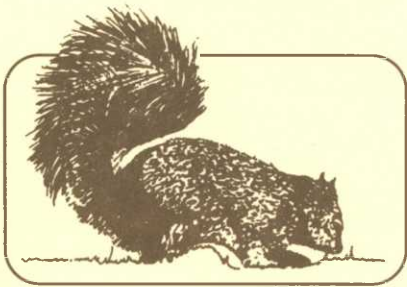
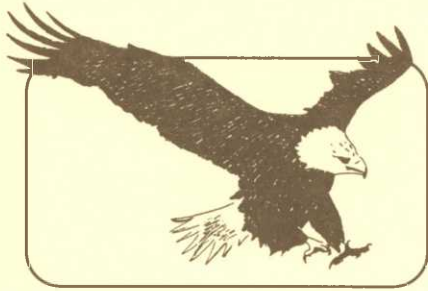
Visitor Center Gates  
Are Locked  
Mon - Fri at 4:00 PM,  
and  
Sat & Sun at 5:00 PM,  
(Labor Day - Memorial Day).





# *Blackwater*

National  
Wildlife  
Refuge



Cambridge, Maryland

## 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.

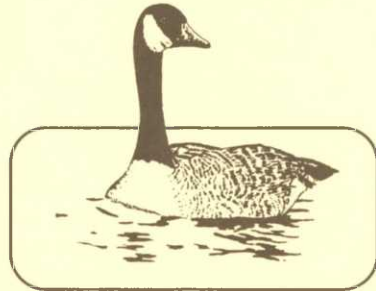
## WILDLIFE

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.

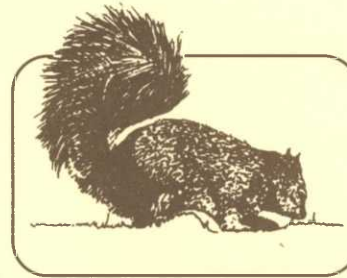
Numerous marsh and shore birds arrive in the spring, searching for food in the shallow waters. Ospreys, or "fish hawks," are common spring through fall and conspicuously use nesting platforms that have been placed throughout the marsh.

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

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.

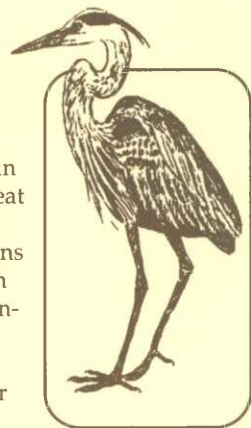
Another endangered species which utilizes the Blackwater area is the peregrine falcon, which is occasionally seen during migration.

## 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

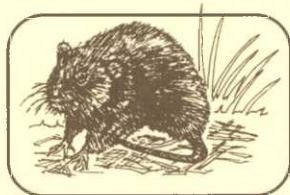
Resident ducks and geese incubating. Majority of migrant marsh birds return by mid-April. Blue-winged and green-winged teal passing through. (Blue-winged are latest in spring and earliest in fall). Fox squirrels reproducing. Eaglets hatching.

## 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.

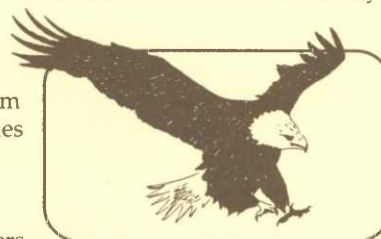
## October - December

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.

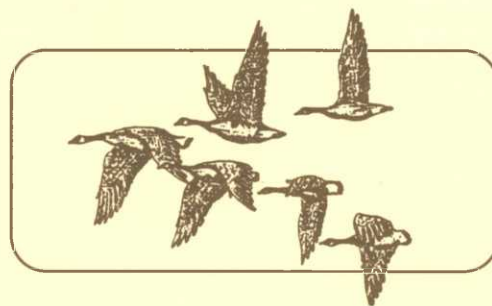
**Marsh Edge Trail** - Wheelchair accessible trail loops through and along the edge of the marsh for 1/3-mile. An 80-foot boardwalk extends into the marsh. Located at parking turn-off before Observation Tower.

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

**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

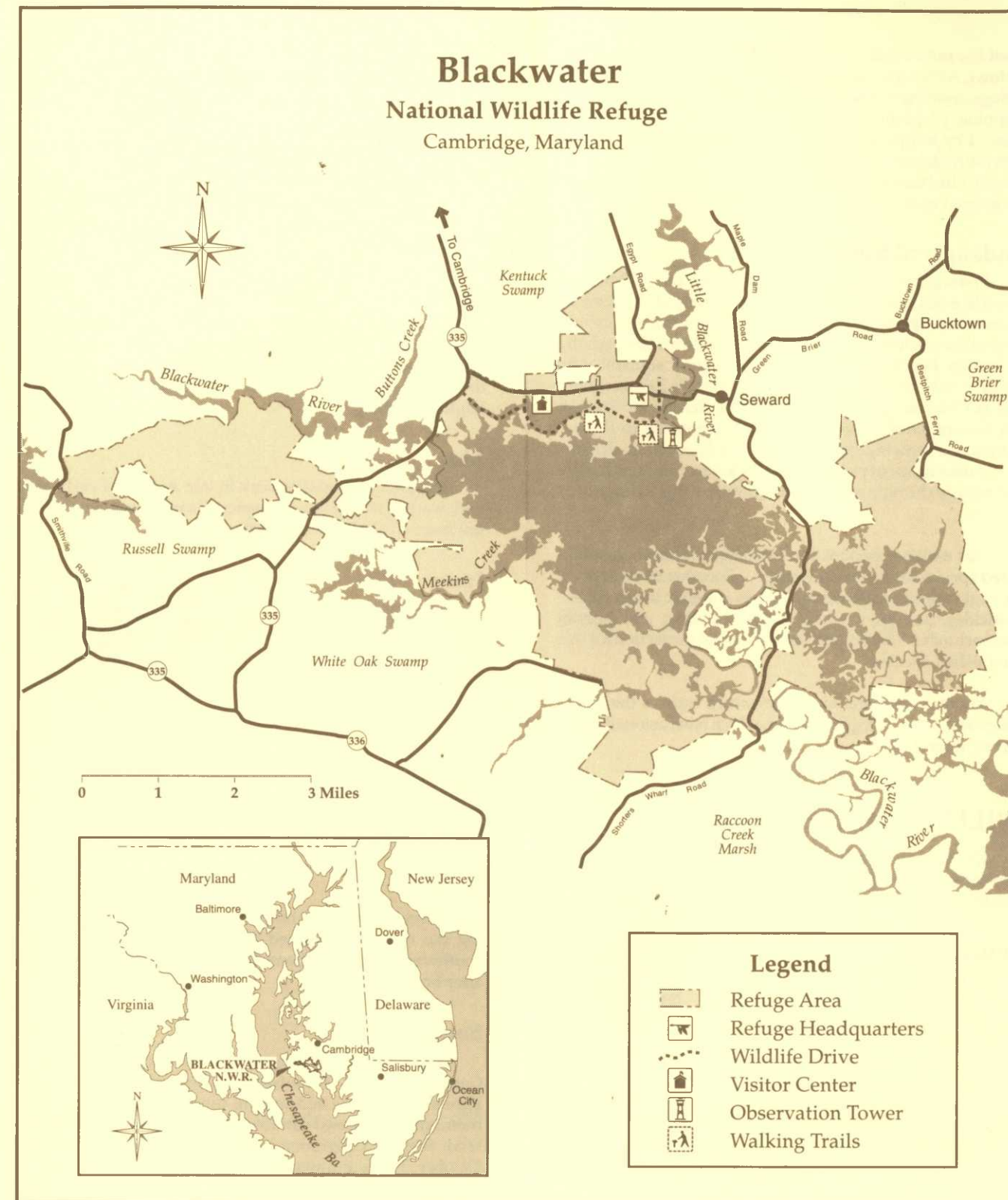
**Visitor Center** - Open 8:00 a.m. to 4:00 p.m., Monday-Friday; 9:00 a.m. to 5:00 p.m., Saturday-Sunday. Closed on all Federal holidays and on summer weekends (after Memorial Day through Labor Day).

**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.

The Service also manages National Fish Hatcheries, and provides Federal leadership in habitat protection, fish and wildlife research, technical assistance and the conservation and protection of migratory birds, certain marine mammals and threatened and endangered species.

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



# Hunting Regulations

**BLACKWATER**  
National Wildlife Refuge



Cambridge, Maryland

# Hunting Regulations

## General Provisions

Blackwater Refuge is one of over 500 National Wildlife Refuges in the United States. The primary objective of a national wildlife refuge is to provide habitat for the conservation and protection of all species of wildlife. The harvest of surplus animals is one tool used to manage wildlife populations. Carefully managed hunts maintain wildlife populations at a level compatible with the environment, provide wholesome recreational opportunities and permit the use of a valuable, renewable resource.

The regulations listed below supplement the general regulations which govern hunting on wildlife refuges set forth in Title 50, Code of Federal Regulations. Hunting will be in accordance with applicable State regulations and the following special Refuge regulations.

## General Hunting Regulations

Public hunting on Blackwater National Wildlife Refuge is permitted for a two-day quota deer hunt during the Maryland firearms deer season and a 25 day, non-quota, walk-in, archery deer hunt during the Maryland archery season. Hunting on Blackwater NWR is permitted on approximately 6,680 acres. Only areas A, B, C, D, E, F, G, H, and J as shown on the reverse map, are open to deer hunting. Some of these areas, or parts thereof, are closed to hunting during the archery season as indicated in the legend. Private inholdings within these areas (as also shown on the reverse map) are closed to all hunting. Such areas are conspicuously marked with "No Hunting Zone" or "Area Closed" signs. Participants are strongly encouraged not to trespass on private lands.

Portions of Area H will be designated for permanently disabled quota hunters. Remaining portions of area H will be filled by non-disabled hunters as usual by public drawing the same as all other areas. To qualify as permanently disabled, an individual must be certified as "wheelchair bound" by a physician. Each permanently disabled hunter must be accompanied by an assistant, who is not permitted to use a firearm.

Only persons possessing an appropriate State hunting license and a Refuge quota permit or a seasonal archery entrance pass are authorized to be on the indicated Refuge areas during hunting dates. Only quota permittees are authorized to be on the indicated Refuge hunt areas during the scouting period. Quota permittees will be chosen by a lottery drawing. See permit information details on how to apply.

- \* Motorized vehicles (including ATV's and motorcycles) are restricted to roads and parking areas designated on a detailed hunting map which hunt participants will receive when they are permitted to participate. Access to the archery hunt is by walk-in only.

- \* Camping is not permitted.

- \* Only contained fire cooking devices are permitted, and these are restricted to designated parking areas.

- \* All hunters during the firearms season must wear in a conspicuous manner on head, chest, and back a minimum of 400 square inches of solid-colored daylight fluorescent orange clothing or material.

- \* It is unlawful to drive a nail, spike, or other metal object, including climbing or screw-type spikes, into any tree or hunt from any tree in which a nail, spike, or other metal object has been driven.

- \* Only temporary portable stands that do not damage trees may be used.

- \* All marking tape, reflective pins, or other materials used to mark trails to and from stands during the firearms season must be removed at the end of the hunt day. During the archery hunt, these marking materials must be removed the last day the hunter participates.

\* In Area H, non-disabled hunters are required to hunt from stands which must be elevated a minimum of 8 feet above ground level.

\* Pets are prohibited.

\* Only designated game species may be taken and other wildlife may not be molested in any manner.

## Scouting For Quota Hunt

Scouting will be permitted the first two Sundays of November from 12:00 noon to 5:00 p.m. No check in or check out is required, and participants may proceed directly to their chosen hunting area to scout. Firearms are not allowed on the Refuge when scouting. Only participants possessing authorized quota hunt permits will be allowed to enter the hunt areas.

## During Hunt Day(s)

Successful quota applicants must check in at the designated Refuge check station (see reverse map) before hunting. The check station will open at 5:00 a.m. Personal identification (driver's license, etc.) will be required to check in.

All deer killed on the **quota hunt** must be properly tagged and presented for examination at the refuge check station on the day killed and will not be counted toward the state-wide bag limits.

Deer harvested on the Blackwater NWR archery hunt must be taken by the hunter and registered at one of the following two Maryland designated check stations (Snow's Turn, Woods Road Shell and Sub Station), and will be counted toward the state-wide bag limits.

## Seasonal Pass and Permit Information

There is a one time seasonal entrance pass fee of \$10.00 for each archery hunter. Passes will be free to hunters with Golden Age or Golden Access Passports. In order to obtain the seasonal entrance pass for the archery hunt, each hunter must present a driver's license or other photo identification and a

current Maryland hunting license. The seasonal pass may be acquired at Blackwater NWR headquarters on Key Wallace Drive Monday - Friday 8:00 a.m. - 4:00 p.m. or weekends between Labor Day and Memorial Day at the Visitor Center 9:00 a.m. - 5:00 p.m.

Applications for permits to participate in the quota hunt may be obtained by mail or picked up at the Blackwater NWR Visitor Center on Key Wallace Drive. All hunters must obtain a permit regardless of age. Permits are non-transferable. An application fee of \$5.00 will be required for each hunter applying (i.e., if one hunter applies, the fee is \$5.00; if two apply, \$10.00; if three, \$15.00. The \$5.00 per person fee will cover applications for one or both hunt days. Not more than three hunters can apply on one application form.

Written requests for quota hunt applications should be directed to: Refuge Hunts, 2145 Key Wallace Drive, Cambridge, Maryland 21613 and accompanied with the application fee(s).

Only one permit application per quota hunt is allowed for each day of hunting. Persons or groups submitting more than one application will be disqualified from the drawing. Applicants may apply individually or as a group of three. Applicants can apply for both days of hunting, but if selected for the first day, will not be eligible for the second day. Applications for both days of hunting must be postmarked by September 30 to be entered in the drawing on the second Tuesday in October.

## Specific Hunt Regulations

Species: White-tailed and sika deer

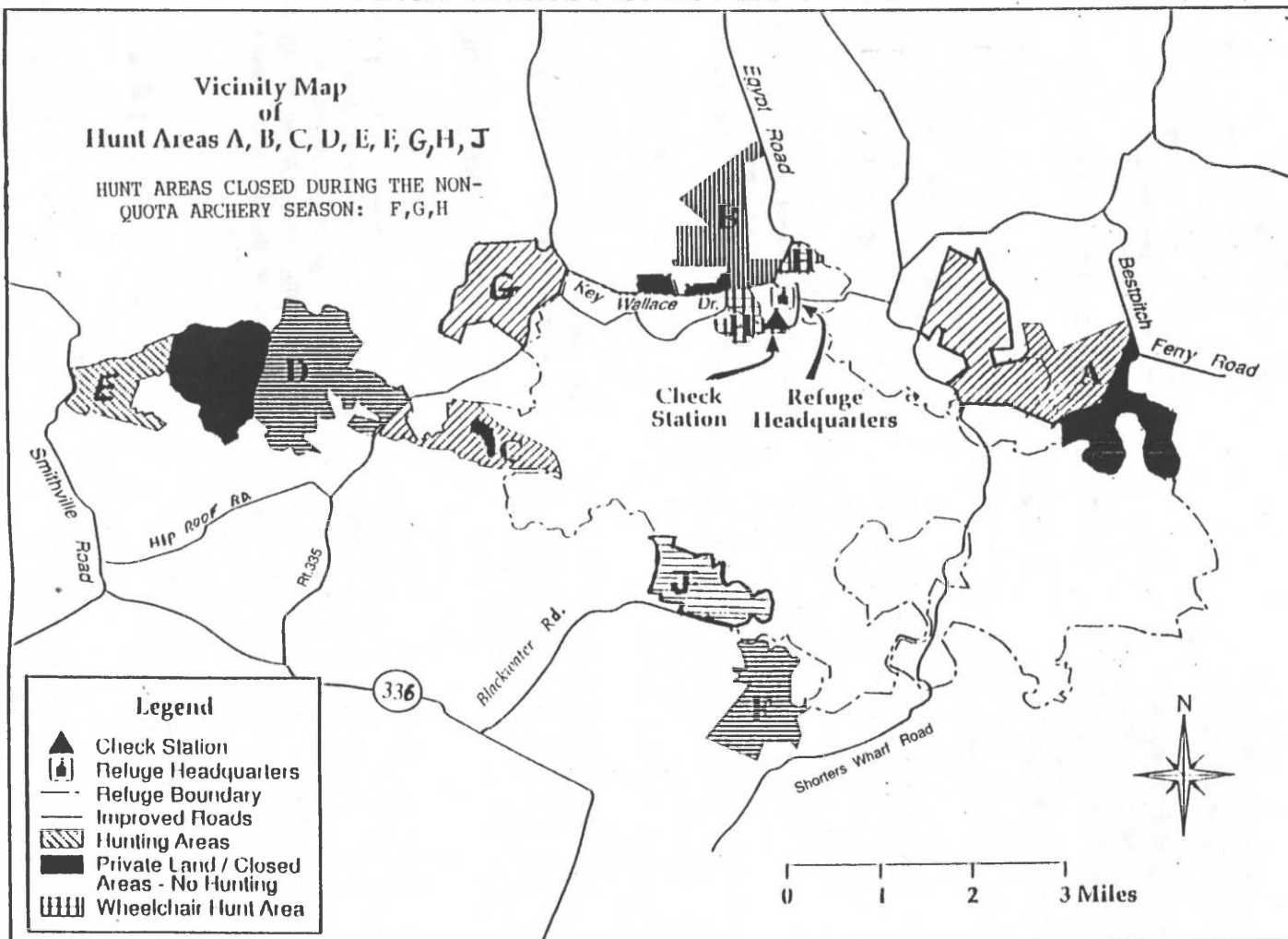
Season: NON-QUOTA ARCHERY - third Saturday in October through the second Saturday in November.

QUOTA HUNT - first and second Wednesday of the State firearms deer season.

# BLACKWATER NATIONAL WILDLIFE REFUGE

## Vicinity Map of Hunt Areas A, B, C, D, E, F, G, H, J

HUNT AREAS CLOSED DURING THE NON-  
QUOTA ARCHERY SEASON: F, G, H



- Sex:** Either sex for both species.
- Bag Limits:** State bag limits. Note: Archery harvests will count toward state bag limits.
- Weapons:** State regulations except that hand guns and breech-loading rifles are not permitted.

### **An Important Message**

Hunting on a National Wildlife Refuge is a privilege and your behavior while participating on a Blackwater National Wildlife Refuge hunt may affect future hunting on refuges. The Refuge provides habitat for several endangered and threatened species. Federal and State laws prohibit any activity that might harm endangered or threatened plants and animals. We believe that these hunts can be conducted without harming any endangered species and have taken certain precautions to make it so. We cannot, however, prevent irresponsible acts by hunters, and if such acts do occur, we may be forced to discontinue the hunts. The following endangered wildlife may be found on the Refuge:

- \* Southern bald eagle
- \* Delmarva fox squirrel
- \* Arctic peregrine falcon

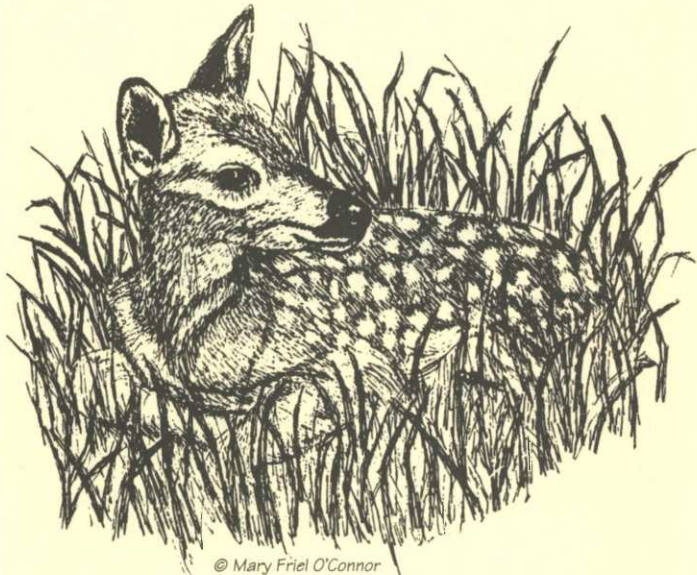
**REMEMBER!** Your hunt permit authorizes you to take specified game only. Harming or needlessly disturbing any other wildlife, including any birds, mammals, turtles, frogs, lizards and even poisonous snakes, is a violation of Refuge regulations and is cause for prosecution.



# *Mammals*

BLACKWATER  
National Wildlife Refuge

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Cambridge, Maryland

## Welcome

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 over 20,000 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 hooved white-tailed deer.

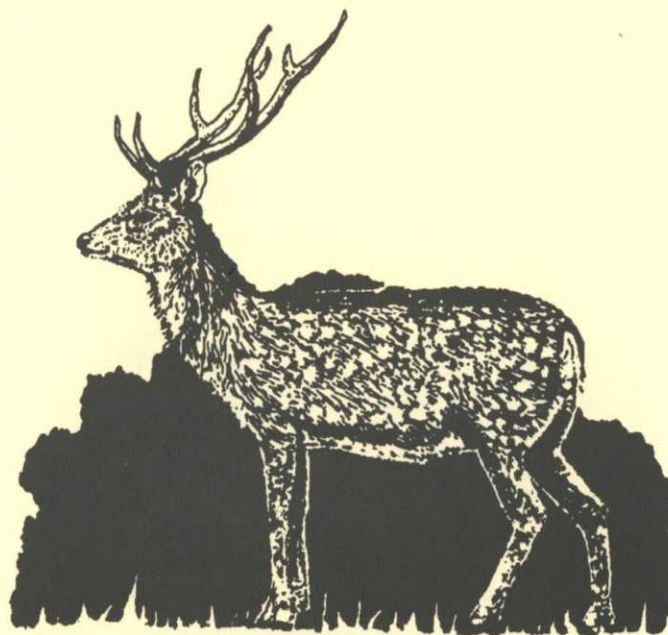


One species worthy of special note is the large, grizzled gray Delmarva fox squirrel. Currently listed as an endangered species, this squirrel is found only in a few localities on the Eastern Shore. Common on the refuge, it is occasionally observed in the woods bordering the Wildlife Drive. Forest management 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 1940s 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).



## 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.



**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 the 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*)

## U.S. Fish and Wildlife Service

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For further information, contact:

Refuge Manager  
Blackwater National Wildlife Refuge  
2145 Key Wallace Drive  
Cambridge, Maryland 21613-9535  
Telephone: (410) 228-2677



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

# *Reptiles & Amphibians*

BLACKWATER  
National Wildlife Refuge

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Cambridge, Maryland



## Welcome

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.

### 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*)

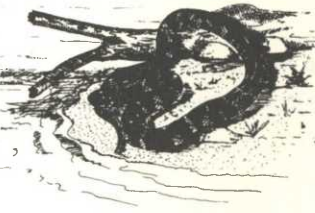
Very common. Aquatic, though often wanders well away from water in hot, humid weather. Both water snakes like to bask on logs or brush and are adept at swimming and diving.

### 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

(*Opheodrys 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.



**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.

**Pickereel 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

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For further information, contact:

Refuge Manager  
Blackwater National Wildlife Refuge  
2145 Key Wallace Drive  
Cambridge, Maryland 21613-9535  
Telephone: (410) 228-2677



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

# *Birds*

BLACKWATER

National  
Wildlife  
Refuge



Cambridge, Maryland

**Blackwater National Wildlife Refuge** established in 1933 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 of Florida.

Species names and order are in accordance with the Sixth American Ornithologists Union Checklist as amended. This folder lists 257 regular species of birds identified by Refuge personnel and ornithologists, plus an additional 25 species of accidentals that have been seen only one or two times.



Most birds are migratory, therefore, their seasonal occurrence is coded as follows:

#### SEASON:

**s** - Spring      March - May  
**S** - Summer    June - August  
**F** - Fall        September - November  
**W** - Winter    December - February

- Birds known to nest on or near the Refuge
- Italics indicate threatened/endangered species*

#### RELATIVE ABUNDANCE

**a** - abundant      a species which is very numerous  
**c** - common        likely 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            may be present but not every year

#### LOONS - GREBES

Common Loon .....	u		o	o
Pied-billed Grebe .....	u	o	u	u
Horned Grebe .....	o		o	o

#### CORMORANT

Double-crested Cormorant .....	u	r	o	
--------------------------------	---	---	---	--

#### BITTERNS - HERONS - IBISES

• American Bittern .....	u	u	u	o
• Least Bittern .....	u	u	u	
Great Blue Heron .....	c	c	c	c
Great Egret .....	c	c	c	r
Snowy Egret .....	c	c	c	
Little Blue Heron .....	u	u	u	
Tricolored Heron .....	u	u	u	
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 .....	c	c	u	o
Green-winged Teal .....	c	r	a	u
• American Black Duck .....	c	c	c	c
• Mallard .....	a	c	a	a
Northern Pintail .....	c		c	c
• Blue-winged Teal .....	c	u	c	r
Northern Shoveler .....	u	r	c	o
Gadwall .....	u	o	u	u
Eurasian Wigeon .....	r			r
American Wigeon .....	u		u	u
Canvasback .....	r		r	o
Redhead .....	o		o	o
Ring-necked Duck .....	o		o	o
Greater Scaup .....	o		o	o
Lesser Scaup .....	o		o	o
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



	S	S	F	W
<b>VULTURES - HAWKS - FALCONS</b>				
___ Black Vulture .....	u	u	u	u
___ • Turkey Vulture .....	c	c	c	c
___ • Osprey .....	c	c	c	
___ • Bald Eagle .....	c	c	c	c
___ • Northern Harrier .....	c	u	c	c
___ Sharp-shinned Hawk .....	u		c	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	o
___ American Kestrel .....	c	o	c	c
___ Merlin .....	o		u	r
___ Peregrine Falcon .....	o		o	r
<b>GROUSE - QUAIL - TURKEY</b>				
___ Wild Turkey .....	r	r	r	r
___ • Northern Bobwhite .....	c	c	c	c
<b>RAILS</b>				
___ • Black Rail .....	r	r	r	
___ • Clapper Rail .....	u	u	u	r
___ • King Rail .....	u	u	u	u
___ • Virginia Rail .....	c	c	c	u
___ Sora .....	u		u	o
___ Common Moorhen .....	u	u	u	
___ American Coot .....	u	o	u	u
<b>PLOVERS - SANDPIPERS</b>				
___ Black-bellied Plover .....	o		o	r
___ Lesser Golden-Plover .....			r	
___ Semipalmated Plover .....	c	u	c	
___ • Killdeer .....	c	c	c	u
___ Black-necked Stilt .....	o			
___ Greater Yellowlegs .....	c	c	c	o
___ Lesser Yellowlegs .....	c	u	c	o
___ Solitary Sandpiper .....	u	u	u	
___ • Willet .....	u	u	r	
___ Spotted Sandpiper .....	u	u	u	
___ Upland Sandpiper .....			r	
___ Whimbrel .....	r			
___ Hudsonian Godwit .....			r	
___ Ruddy Turnstone .....	o			
___ Sanderling .....	o			
___ Semipalmated Sandpiper .....	a	a	a	
___ Western Sandpiper .....		o	u	

	S	S	F	W
___ • American Robin .....	c	c	c	u
___ • Gray Catbird .....	c	u	c	u
___ • Northern Mockingbird .....	c	c	c	c
___ • Brown Thrasher .....	c	u	c	u
<b>WAXWINGS - SHRIKE - STARLING</b>				
___ American Pipit .....	o		u	u
___ Cedar Waxwing .....	u	o	u	u
___ Loggerhead Shrike .....	o		o	o
___ • European Starling .....	a	a	a	a
<b>VIREOS - WOOD WARBLERS</b>				
___ • White-eyed Vireo .....	c	c	c	
___ Solitary Vireo .....	o		o	
___ • Yellow-throated Vireo .....	u	r	u	
___ • Red-eyed Vireo .....	c	c	c	
___ Blue-winged Warbler .....	u		u	
___ Golden-winged Warbler .....	r			
___ Tennessee Warbler .....	o		o	
___ Orange-crowned Warbler .....			r	r
___ Nashville Warbler .....	o		o	
___ 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		a	c
___ Blackburnian Warbler .....	o		o	
___ Yellow-throated Warbler .....	u	o	o	
___ • Pine Warbler .....	c	c	c	u
___ • Prairie Warbler .....	u	u	u	
___ Palm Warbler .....	u		u	o
___ Bay-breasted Warbler .....	o		o	
___ Blackpoll Warbler .....	u		u	
___ Black-and-white Warbler .....	u	o	c	
___ American Redstart .....	u		c	
___ • Prothonotary Warbler .....	u	u	r	
___ • Worm-eating Warbler .....	u	u	o	
___ • Ovenbird .....	c	u	c	
___ Northern Waterthrush .....	o		u	
___ Louisiana Waterthrush .....	o	r	o	
___ • Kentucky Warbler .....	u	u	o	
___ Connecticut Warbler .....			o	
___ Mourning Warbler .....			o	
___ • Common Yellowthroat .....	a	c	a	o
___ Hooded Warbler .....	o		o	
___ Wilson's Warbler .....	o		r	

	s	S	F	W
• American Robin .....	c	c	c	u
• Gray Catbird .....	c	u	c	u
• Northern Mockingbird .....	c	c	c	c
• Brown Thrasher .....	c	u	c	u
<b>WAXWINGS - SHRIKE - STARLING</b>				
American Pipit .....	o		u	u
Cedar Waxwing .....	u	o	u	u
Loggerhead Shrike .....	o		o	o
• European Starling .....	a	a	a	a
<b>VIREOS - WOOD WARBLERS</b>				
• White-eyed Vireo .....	c	c	c	
Solitary Vireo .....	o		o	
• Yellow-throated Vireo .....	u	r	u	
• Red-eyed Vireo .....	c	c	c	
Blue-winged Warbler .....	u		u	
Golden-winged Warbler .....	r			
Tennessee Warbler .....	o		o	
Orange-crowned Warbler .....			r	r
Nashville Warbler .....	o		o	
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		a	c
Blackburnian Warbler .....	o		o	
Yellow-throated Warbler .....	u	o	o	
• Pine Warbler .....	c	c	c	u
• Prairie Warbler .....	u	u	u	
Palm Warbler .....	u		u	o
Bay-breasted Warbler .....	o		o	
Blackpoll Warbler .....	u		u	
Black-and-white Warbler .....	u	o	c	
American Redstart .....	u		c	
• Prothonotary Warbler .....	u	u	r	
• Worm-eating Warbler .....	u	u	o	
• Ovenbird .....	c	u	c	
Northern Waterthrush .....	o		u	
Louisiana Waterthrush .....	o	r	o	
• Kentucky Warbler .....	u	u	o	
Connecticut Warbler .....			o	
Mourning Warbler .....			o	
• Common Yellowthroat .....	a	c	a	o
Hooded Warbler .....	o		o	
Wilson's Warbler .....	o		r	

	s	S	F	W
Canada Warbler .....	u		u	
• Yellow-breasted Chat .....	c	c	u	o
<b>TANAGERS - SPARROWS</b>				
• Summer Tanager .....	c	c		
• Scarlet Tanager .....	u	u	u	
• Northern Cardinal .....	c	c	c	c
Rose-breasted Grosbeak .....	u		u	
• 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
• Grasshopper Sparrow .....	u	u	u	
• Henslow's Sparrow .....	r	r		
• Sharp-tailed Sparrow .....	u	u	u	o
• Seaside Sparrow .....	c	c	u	r
Fox Sparrow .....	u		u	u
• Song Sparrow .....	u	u	a	a
Lincoln's Sparrow .....			o	
• Swamp Sparrow .....	c		c	c
White-throated Sparrow .....	a		a	a
White-crowned Sparrow .....	o		o	o
Dark-eyed Junco .....	a		a	a
Snow Bunting .....			o	o
<b>BLACKBIRDS - FINCHES</b>				
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	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 .....	u	o	u	u
Red Crossbill .....	o		o	r
White-winged Crossbill .....				r
Common Redpoll .....				r
Pine Siskin .....	o		o	u
• American Goldfinch .....	c	c	c	c
Evening Grosbeak .....	o		o	o
• House Sparrow .....	c	c	c	c

### ACCIDENTALS

The following species have been seen on the Refuge one or two times.

<input type="checkbox"/> Western Grebe	<input type="checkbox"/> Red Knot
<input type="checkbox"/> Red-throated Loon	<input type="checkbox"/> Baird's Sandpiper
<input type="checkbox"/> American White Pelican	<input type="checkbox"/> Buff-breasted Sandpiper
<input type="checkbox"/> White Ibis	<input type="checkbox"/> Red-necked Phalarope
<input type="checkbox"/> Ross' Goose	<input type="checkbox"/> Wilson's Phalarope
<input type="checkbox"/> Mute Swan	<input type="checkbox"/> Ruff
<input type="checkbox"/> Brant	<input type="checkbox"/> Roseate Tern
<input type="checkbox"/> Barnacle Goose	<input type="checkbox"/> Black Skimmer
<input type="checkbox"/> Fulvous Whistling-Duck	<input type="checkbox"/> Snowy Owl
<input type="checkbox"/> American Swallow-tailed Kite	<input type="checkbox"/> Northern Shrike
<input type="checkbox"/> Gyrfalcon	<input type="checkbox"/> Yellow-headed Blackbird
<input type="checkbox"/> American Avocet	<input type="checkbox"/> Brewer's Blackbird
<input type="checkbox"/> Marbled Godwit	

### NOTES

Date \_\_\_\_\_ Time \_\_\_\_\_

Observers \_\_\_\_\_

Weather \_\_\_\_\_

Tides \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## U.S. Fish and Wildlife Service

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*Cover illustration by Alex Briggs*

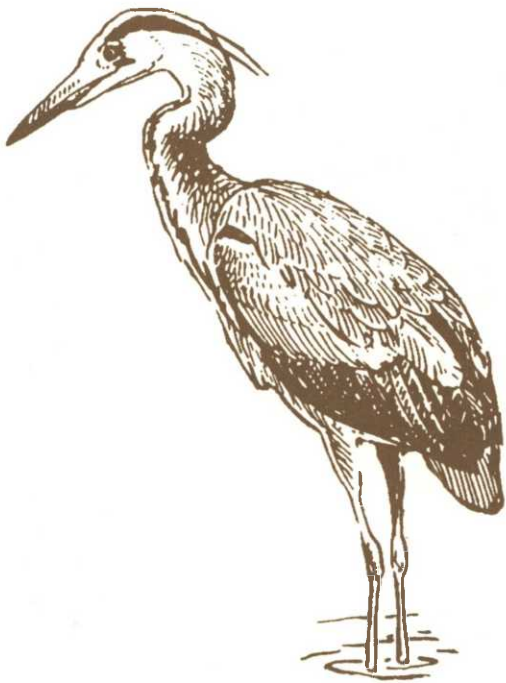


DEPARTMENT OF THE INTERIOR  
U.S. FISH AND WILDLIFE SERVICE

# *Marsh Edge Trail Guide*

BLACKWATER  
National Wildlife Refuge

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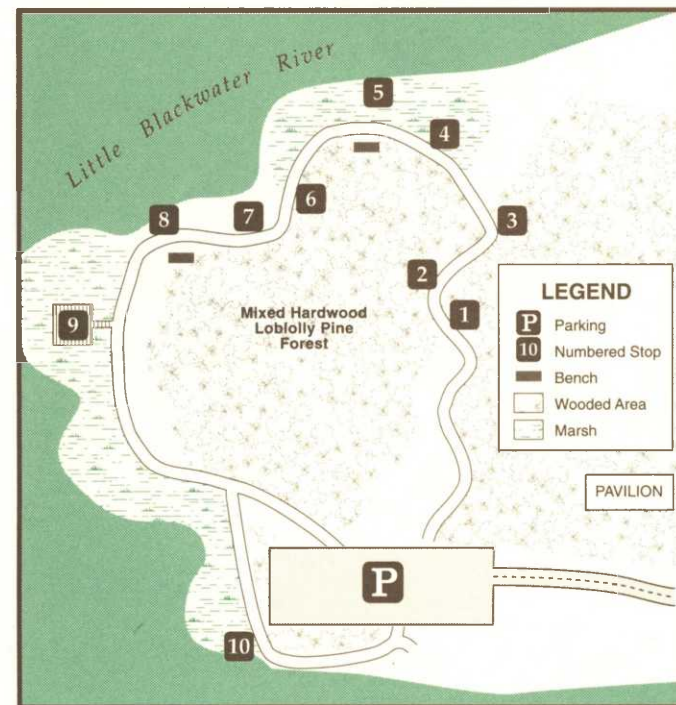
Cambridge, Maryland



## Welcome to Blackwater's Marsh Edge Trail

This 1/3-mile walking trail leads from a mature pine forest to a typical Eastern Shore marsh of three-square bulrush. Within this area is a transition zone where the forest and marsh overlap, called an "edge." Edge habitat has a high diversity of plants, providing important food and cover for wildlife.

During your leisurely half-hour walk, take the time to observe the abundant plant and animal life of the marsh ecosystem, one of the most productive habitats on earth. Consider the adaptations plants make to survive in their environment and think about the value of these plants to wildlife.



## To make your walk more pleasant, please remember:

From April to October, poison ivy is common along the trail. Although the young leaf buds and white berries are valuable food for birds, rabbits and deer, the plant's oils can cause a red, itchy rash in humans. Remember the saying, "leaves of three, let it be."

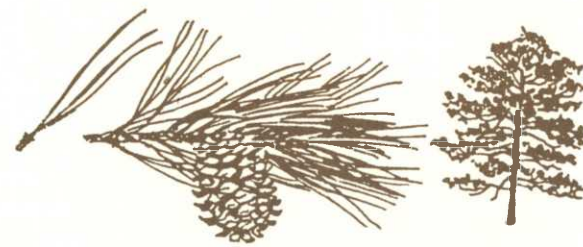


© Alex Briggs

Biting insects are present from mid-April through late September. Protective clothing and insect repellent are recommended.

## Loblolly Pines for Endangered Species

1 Blackwater's forests are mostly loblolly pines mixed with small stands of oak. The Eastern Shore is the northern limit of the loblolly pine's range. Loblollies can be identified by their long, twisted, yellowish-green needles growing in bundles of three.



© Alex Briggs

Seeds of the loblolly are an important food source for the refuge's endangered Delmarva fox squirrel. About 550-600 of these large, light-gray squirrels live at Blackwater Refuge, one of the largest concentrations anywhere.

Loblolly pines also serve as perches and nesting sites for endangered bald eagles.

## Shrubs for Wildlife

2 Many wildlife species depend upon shrubs that grow along the Marsh Edge Trail for food and protection. Because it can tolerate semi-saturated soils, the wax myrtle or northern bayberry grows close to the marsh edge.



© Alex Briggs

The shiny, yellow-green leaves of wax myrtles are retained throughout the winter, and are used in cooking for bay-like seasonings. Birds feed on wax myrtle berries when other food supplies are depleted, and the scented wax from the berries can be used to make candles and soap.

## Decaying Logs Mean New Life

3 Under the logs that line the trail you can see the important process of decay. As the wood breaks down, it forms a rich organic material which becomes part of the soil.

In the marsh, plants break down into tiny particles called detritus. This material is an important food source for shellfish, aquatic larvae, and other invertebrates.

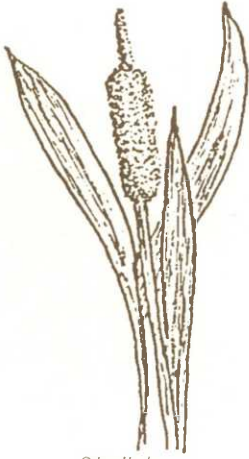


© June Henshaw

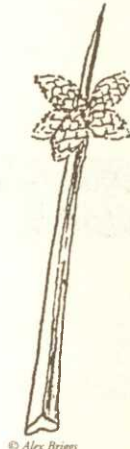


## The Changing Transition Zone

**4** The marsh edge is a transition zone where forest and marsh meet. Here, the types of plants change from dry to wet ground, depending on how well they can tolerate water. Look for shrubs like groundsel and wax myrtle in the upper edge of the transition zone.



© June Henshaw



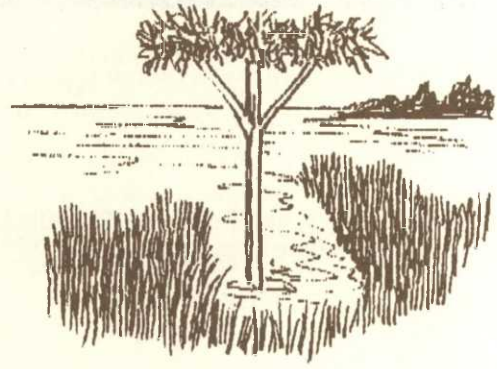
© Alex Briggs

In the lower edges, cattails and three-square bulrushes grow.

Habitats and vegetation in the transition zone are constantly changing. Dead trees along the marsh edges mark where rising water levels changed woods to marsh.

## Osprey Nesting Platforms Help Re-establish Populations

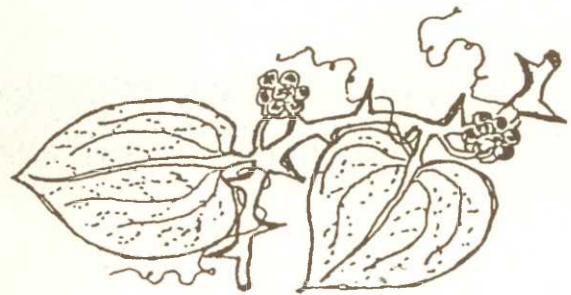
**5** In mid-March, ospreys return to the Chesapeake Bay area to nest. To help this species, once threatened by DDT, refuge managers have erected nesting platforms to increase reproduction. Young ospreys, which hatch in May, will accompany their parents to South American wintering grounds in September.



DDT, which caused eggshells to be thin, has been banned in the United States since 1972, and no longer threatens osprey populations. However, it remains a reminder of how humans impact our wildlife and environment.

## Greenbriar's Many Uses

**6** A woody vine called common greenbriar serves many purposes for wildlife at Blackwater. White-tailed deer feed on its leaves and songbirds enjoy the dark blue berries. Birds, rabbits and other small rodents use the dense thicket for protective cover.

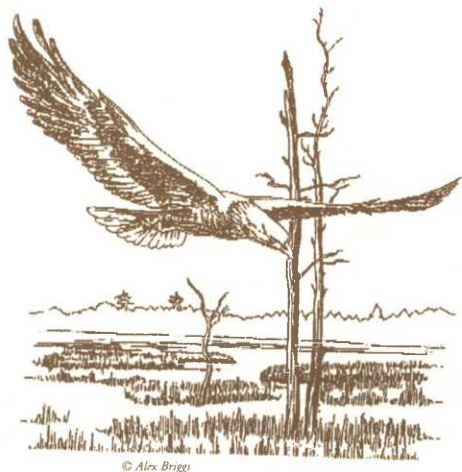


© Alex Briggs

## Bald Eagles Like Isolation

**7** Unlike ospreys, bald eagles cannot tolerate the presence of people. Eagles prefer isolated marsh areas bordered by woods for resting and nesting.

If you look across the marsh, you can see Barbados Island, where a pair of eagles have been nesting since 1975.

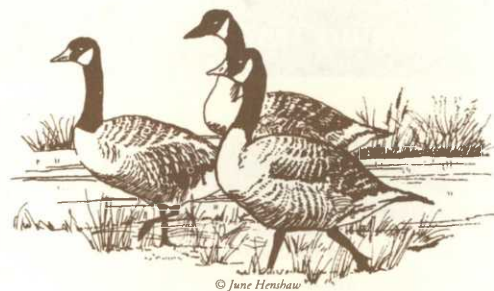


Isolated islands of loblolly pines like these provide secure nesting sites near the abundant food source of the marsh, where eagles can feed on fish, birds, and other wildlife.

The lands surrounding Blackwater host one of the largest concentrations of nesting bald eagles along the Atlantic Coast. An average of 55-60 eagles use the refuge year-round.

## Olney Three-Square Makes a Good Meal

**8** Olney three-square dominates the marsh at Blackwater, blooming from June into September. Look for this three-sided grass-like plant along the marsh edge towards the boardwalk. The tubers of three-square are an important food source for ducks, geese, muskrats, and nutria.



Waterfowl also feed on the seeds. Bulrush leaves are used by muskrats for building their lodges, and the densely growing stands serve as protective cover for nesting songbirds and ducks.

## Chesapeake Bay

**9** The Marsh Edge Trail boardwalk borders the Little Blackwater River which flows into the Blackwater River near the refuge observation tower. The water then flows into Fishing Bay, an arm of Chesapeake Bay.

From the boardwalk, try to envision the tides carrying rich nutrients and detritus from the marsh to the estuary, an area where fresh and salt water mix. This process helps to nourish extensive populations of microorganisms, fish, crabs, oysters, and clams.



Many types of fish and shellfish use the marsh as a nursery, because it offers protective vegetation and rich nutrients to feed their young. Wetlands like this one are vital to the health of the rivers and Bay; they serve as a filter for pollutants and sediments from groundwater and surface runoff from the land.



## The Disappearing Marsh

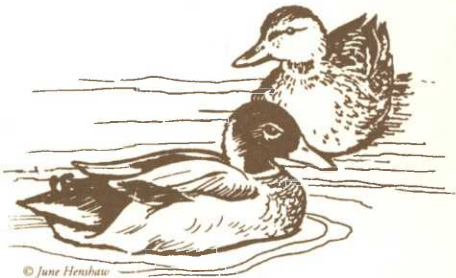
**10** Much of the open water area you see before you was once dense marsh. More than 5,000 acres of marsh vegetation have been lost since the refuge was established in 1933. Some reasons for this loss include: natural forces such as the rising sea level, wind and wave erosion, high water salinity during droughts, and changes in the flow of the Blackwater and Little Blackwater Rivers.

Outside the refuge, dredging and filling associated with development destroys thousands of acres of marsh each year. Saving existing wetlands is the key to restoring the Chesapeake Bay. You can help by encouraging alternatives to development around the Bay, and by reporting illegal dredging and filling activities in wetland areas.

## Some Closing Thoughts

**O**n your walk today, you have experienced the mature loblolly pine and three-square marsh habitats of the Eastern Shore. The wildlife species that so many people appreciate depend on these habitats for food, shelter, nesting and raising young. These habitats are all integrated ecosystems where all components are interdependent.

As you consider the future of natural areas and wildlife species, please remember how sensitive the natural world is to any changes in the fragile balance.



© June Henshaw

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*This leaflet is dedicated to the memory of  
Sigmund Cooper Hartman.*

*Leaflet printing supported by the Friends of Blackwater.*



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