

Tennessee National Wildlife Refuge  
Paris, Tennessee

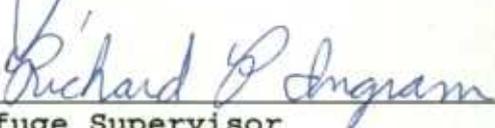
Annual Narrative Report  
Calendar Year 1998

U.S. Department of the Interior  
Fish and Wildlife Service  
National Wildlife Refuge System

Review and Approvals

Tennessee National Wildlife Refuge  
Paris, Tennessee

Annual Narrative Report  
Calendar Year 1998

 _____ Refuge Manager	<u>08/20/02</u> Date
 _____ Refuge Supervisor	<u>8/20/02</u> Date
 _____ Regional Office Approval	<u>2/10/03</u> Date

## INTRODUCTION

President Harry S. Truman established Tennessee National Wildlife Refuge by Executive Order No. 9670. The area was designated for use by the Department of the Interior as a wildlife management area for migratory birds and other wildlife. On December 29, 1945, the Department of the Interior and the Tennessee Valley Authority entered into agreement with respect to the lands that were to be reserved and used as the wildlife refuge. Under this agreement, the establishment of Tennessee Refuge in Benton, Decatur, Henry, and Humphreys counties was to further the purpose of the Migratory Bird Conservation Act (45 Stat 1222) and be in the public interest.

Tennessee National Wildlife Refuge lies within the Tennessee River Valley with Kentucky Lake being the dominant feature of the refuge. Three separate units make up the 51,358 acres; Duck River Unit with 26,738 acres, Big Sandy Unit with 21,348 acres and Busselton Unit with 3,272 acres. Headquarters for the Tennessee Refuge is in Paris, Tennessee, but a sub-headquarters exists on all three field units.

A distance of sixty air miles separates the three units of Tennessee National Wildlife Refuge. Lands now managed by the refuge were among the tracts purchased by the Tennessee Valley Authority in the construction of Kentucky Dam and the subsequent impoundment of Kentucky Lake. However, the Tennessee Valley Authority reserved all rights on flood control, navigation, and power production. Kentucky Lake has an annual water fluctuation which is exactly backwards for good waterfowl management. Normal summer pool is 359' MSL with a drawdown to 354' MSL during the winter months.

The primary habitat types on Tennessee Refuge are 25,179 acres of rivers, streams and water, 18,800 acres of various timber (primarily upland hardwood), 3,000 acres of farmland, 3,254 acres of seasonally flooded basins, and 764 acres of miscellaneous lands. The 5,762 acres in Duck River Bottoms (within the TVA diked area) has consistently been the "hub" of the refuge and supports an above average quantity of both waterfowl and eagle use days.

Waterfowl utilization in recent years has varied between 16 and 24 million use-days in a single year. During the past ten years, geese have peaked at 110,000 and ducks have peaked at

more than 350,000. In addition to waterfowl, Tennessee Refuge hosts a sizeable population of bald and golden eagles, with a peak recorded in 1986 of 92 birds.

Historically, Tennessee Refuge is located within a flavorful area. The Chickasaw Indians were the dominant tribe in this locale and many remnants of their presence still remain, such as pottery fragments, arrowheads, kitchen middens, flint fragments and other relics from their culture. Nearly all of these remnants are found along the shoreline of the Tennessee River. Steamboats once used the river for transportation of commodities and many boat landings still bear the names established and recognized by the river traffic of more than 100 years ago. Log structures are nearly a thing of the past although a few remnants can be found on and around the refuge. The Civil War left its mark on Tennessee Refuge as control of the river traffic became vitally important to both the Union and Confederate forces.

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### A. HIGHLIGHTS

- An observation platform is completed at Pool 5 of the Duck River Unit.
- Floods threaten the refuge once again.
- Canada geese winter on the refuge in low numbers.

### B. CLIMATIC CONDITIONS

#### Weather Summary - 1998

Month	Precipitation	Min. Temp.	Max. Temp
January	5.30	20	69
February	5.25	24	73
March	3.95	13	87
April	9.69	31	81
May	6.9	46	91
June	7.0	48	95
July	9.58	66	97
August	1.56	63	95
September	0.27	47	97
October	4.3	36	86
November	1.54	27	75
December	6.32	16	75
Totals	61.66	13	97

\* Data collected at Birdsong Lake by refuge volunteers Floyd Daniel and James D. Daniel

Precipitation totals were 13.66" higher this year than the average 48".

Tennessee National Wildlife Refuge experienced a difficult flood season in 1998. The refuge first flooded in late April and remained flooded until the first week in May. The first week in June the Kentucky Lake backwater posed a second threat to the refuge. Refuge staff worked hard to prevent floodwaters from entering the refuge. The work efforts paid off! However, the pressure was only thought to be over at this point. In late June a third threat from floodwaters was faced by the refuge staff. Realizing that the timing of this flood could totally destroy any hopes of replanting the refuge back to agriculture crops and moist soil production would be reduced, the refuge fought with all available resources to protect the badly needed agriculture foods (See Figure 1). The efforts again paid off, the refuge suffered minimal losses to agricultural crops.



**Figure 1.** Refuge Equipment Mechanic, Terry Cherry, reinforces the outer dike in hopes that rising floodwaters will crest before over-topping the dike. (WL)

## D. PLANNING

### 2. Management Plans

Refuge staff began preparing a Forest Management Plan. The project will accelerate with the planned hiring of a refuge forester next year to assist completing the plan and begin the management activities. This process was initiated, in part, by a refuge forest habitat and management evaluation conducted on the refuge. That evaluation recommended a refuge forest management program, concentrating on the upland forested areas and their potential as habitat for a selected class of migratory land birds.

The Wildlife Inventory Plan, approved in 1992, was amended this year by Refuge Biologist, Robert Wheat. The primary change that prompted the plan to be amended was the additional effort that the refuge is dedicating to surveying migratory landbirds. This includes the operation of a Monitoring Avian Productivity and Survivorship (MAPS) banding station and several point count routes. Manpower and cost estimates were updated on all procedures. For applicable procedures, the illustrations that depict the locations of the surveys were updated using GIS and GPS technologies.

### 5. Research and Investigations

#### "Determination of Lead Exposure in Black Ducks Wintering in Tennessee Ten Years After Implementation of Non-toxic Shot"

The principal investigators are Dr. Michael D. Samuel, USGS, National Wildlife Health Center, Madison, WI, and Dr. Frank Bowers, USFWS, Division of Wildlife and Habitat Management, Atlanta, GA.

This research is a cooperative effort between the USGS National Wildlife Health Center (NWHC) and USFWS Region 4. This study is a follow-up to a similar study conducted from 1986-88 on Tennessee and Cross Creeks NWRs, prior to the 1991 nationwide ban on the use of lead shot by waterfowl hunters. The research objectives are: 1) to determine the current prevalence of blood lead exposure in adult black

ducks wintering in Tennessee and 2) compare current prevalence of blood lead exposure to prevalence obtained during 1986-88.

The refuge's involvement in this study is to capture and obtain blood samples from black ducks wintering on the refuge. During the winter of 1998-99, Tennessee NWR's biological staff captured 219 black ducks using cannon nets. Of those captured, blood samples were obtained from 210 individuals and shipped to NWHC for analysis.

Preliminary results from the blood samples taken during the winter of 1997-98 are as follows: Blood lead concentrations exceeded the exposure threshold ( $\geq 0.2$  ppm) for 6% of the sampled black ducks. The prevalence of adult black ducks exposed to lead had declined significantly from 14.4% ten years ago to 5.5% in last winter's sample. However, prevalence of lead exposure was not significantly different in juvenile black ducks sampled during the two periods. For juveniles 6.9% were found to exceed the exposure threshold in the 1997-98 sample as compared to 8.2% ten years ago.



**Figure 2.** The steady hands of Biological Technician, Clayton Ferrell, extracting a blood sample from a black duck. (RW)

**E. ADMINISTRATION****1. Personnel**

1. John T. Taylor, Refuge Manager, GS-0485-13, EOD 1/14/91, PFT
2. Alan D. Schriver, Refuge Manager (Deputy), GS-0485-12, EOD 03/10/91, PFT
3. J. Whit Lewis, Refuge Operations Specialist, GS-0485-11, EOD 08/16/89, PFT
4. Dorothy G. Easley, Refuge Clerk (Typing), GS-0303-07, EOD 02/11/79, PFT
5. John R. Travis, Engr. Equipment Operator, WG-5716-08, EOD 06/11/79, PFT
6. W. Terry Cherry, Heavy Mobile Equip. Mechanic, WG-5803-10, EOD 06/11/79, PFT
7. P. David Gaskin, Engr. Equipment Operator, WG-5716-08, EOD 10/06/91, PFT
8. Dale R. Norris, Maintenance Worker, WG-4749-07, EOD 11/01/92, PFT
9. C. Clayton Ferrell, Range Technician, (Refuge Technician), GS-0455-07, EOD 06/14/92, PFT
10. Robert M. Wheat, Wildlife Biologist, GS-0486-11, EOD 05/30/93, PFT
11. Emery Hoyle, Student Trainee (Wildlife), GS-0499-4, EOD 05/15/94, Transferred to Merritt Island NWR 08-02-98, PFT
12. Gavin Gensmer, Police Officer (LE), GS-0083-8, EOD 05/12/96, PFT

## 5. Funding

Year	Total	Initial Operations	Salary	Other Fixed	Obligated	Discretionary
1994	641.5	373.3	476.4	42.1	99	24
1995	833.7	384.2	466.0	30.0	266.4	71.3
1996	768.4	665.1	530.7	30.0	96.0	111.7
1997	1454.1	683.7	565.0	30.0	772.5	86.6
1998	3559.4	691.6	632.6	31.1	2813.1	82.59

Total funding was up and down over the period, usually driven by the availability of construction funding, MMS, and other "special" funding additions. Initial operations monies and salary costs both increased throughout the period, however salary costs always exceeded the initial allocation. Fixed costs are generally stable, but are also not considered in initial allocations. With most of the "special" funding categories essentially obligated upon arrival and initial operations monies insufficient to even pay salaries, any discretionary monies left are usually taken up to cover salary deficits and to pay fixed costs. Initial operations funding should cover all fixed costs and at least minimum operational costs.

## 6. Safety

The Vehicle Inspection Report and Facility Inspection are done on a yearly basis. The update of new equipment and facilities helps to provide better compliance with both Refuge and OSHA Regulations. Whit Lewis was named Field Spill Response Coordinator for the refuge and Dale Norris was listed as alternate.

## F. HABITAT MANAGEMENT

### 2. Wetlands

There are 5,254 acres within 22 impoundments that are intensively managed to provide wetland habitats for a wide variety of wildlife. Water levels in most of these impoundments are drawn down during the growing season to produce food and cover for migratory birds and then flooded during the fall. The habitats within these wetlands

include moist soil, agriculture, bottomland hardwoods, and scrub/shrub.

The water management plan for the impoundments containing agricultural areas required a late winter drawdown to allow early planting of crops. Drawdowns for the moist soil areas were planned to be staggered throughout the growing season to provide a more diverse plant composition and shorebird habitat throughout the spring migration. However, due to a flood around the end of April through mid-May the water management plan on the Duck River Unit was significantly altered.

As a result of the flood, water levels within some impoundments on the Duck River Unit were higher than desired. This resulted in some loss of agricultural resources and delayed the drawdown for moist soil production. After the floodwaters receded to the summer pool elevation of Kentucky Lake, the pump station was put into operation. Pumping was conducted to lower the water level in several impoundments to allow planting of some agricultural lands and for moist soil production.

Even with the delays associated with the flood, moist soil production was very good this year. A total of 1,416 acres of moist soil habitat was produced on the refuge. Of this total,

1,372 acres were on the Duck River Unit, 34 were on the Big Sandy Unit and 10 were on the Busseltown Unit. Out of these 1,416 acres seven were rated excellent (greater than 85% of the plant species are good waterfowl foods), 627 were good (70-85% of the plant species are good waterfowl foods), 325 fair (50-70% of the plant species are good waterfowl foods), and 457 were rated as poor (less than 50% of the plant species are good waterfowl foods).

No spraying of alligator-weed, lotus or primrose-willow was done this year. Three acres of sesbania and some willows along the levees were also sprayed with 2,4-D. As a result of more effective water management, due in part to pumping and past chemical control programs, the acreage of problem aquatic plants such as lotus, alligator-weed and primrose-willow have declined from past years. Paspalum sp. is showing up as a growing problem and appears to be spreading.

Rehabilitation of the moist soil areas within Pool 1 and 3 on the Duck River Unit was conducted this year. Around 100 acres were disked in the fall and planted to winter wheat. This should help to improve the production of natural foods in 1999.

#### 4. Croplands

Tennessee National Wildlife Refuge experienced a good crop year in 1998. Refuge corn and milo were better distributed throughout all units. The Duck River Unit had 150 acres of refuge corn in 1998 as apposed to 40 acres in 1997. Busseltown and Big Sandy Units are higher in elevations than that of the Duck River Unit, thus withstanding slightly higher lake levels.

Two experiments were conducted on the refuge in 1998. One experiment was to collect the end results from the spraying performed in 1997 on the alligator-weed plants on various locations on the Duck River Unit. Conclusive test results are still being compiled at this time.

The second experiment was a follow-up spraying of a *purple loosestrife* colony on the Busseltown Unit. An early and mid-bloom spraying using *RoundUp* was performed on all known plants. The three years of experimenting has indicated that the control practices have been effective. The *purple loosestrife* colony was reduced from 150 plants in 1996, to 75 plants in 1997, to 15 plants in 1998. The same control methods will be used in 1999.

Table I - SUMMARY OF THE 1998 COOPERATIVE FARMING PROGRAM

	Big Sandy	Duck River	Busseltown	Total
No. Permits	2	2**	1	4**
No. Acres	576.3	1,385.5	692.0	2,653.8
Corn Acres	278.3	250.5	414.0	942.8
Corn Avg. Bu/Ac.	85	85	110	93.3
Corn Range Bu/Ac.	75/90	75/90	90/135	-----
Corn FWS Share	87.5	149.5	64.4	301.4
Corn Coop. Share	190.8	101.0	349.6	641.4
Milo Acres	130.0	256.0	20.0	406.0
Milo Avg. Bu/Ac.	65	75	60	66.6
Milo Range Bu/Ac.	50/70	50/85	50/65	-----
Milo FWS Share	49.5	256.0	20.0	325.5
Milo Coop. Share	80.5	-0-	-0-	80.5
Soybean Acres	168.0	879.0	258.0	1,305.0
Soybean Avg. Bu/Ac.	40	44	45	43
Soybean Range Bu./Ac.	34/35	37/47	38/50	-----
Soybean FWS Share	-0-	-0-	-0-	-0-
Soybean Coop. Share	168.0	879.0	258.0	1,305.0
Winter Wheat FWS Share	49.0	-0-	50.0	99.0

Winter Wheat planted by FWS = 300.0 Acres

\*\* = Tennessee National Wildlife Refuge has four (4) cooperative farmers, one farmer farms all of the Busseltown Unit and half of the Duck River Unit. This is the reason for the mismatch in the number of permits for the 1998 crop year.

## 9. Fire Management

A fifty-acre prescribed burn was conducted on April 2nd within Pool 6 of the Duck River Unit. The fire (fire name Pool6, fire number 4560) was intended to kill woody vegetation and increase the quantity and quality of the moist soil vegetation. The burn was successful and treated approximately half of the prescription unit. The second proposed burn, to complete the unit as prescribed, could not be conducted due to the inability to meet the required burn conditions.

## 10. Pest Control

Integrated Pest Management Techniques (IPM-crop scouting) was conducted on the refuge by both the refuge and refuge farmers. Other means of pest control was by the application of approved chemicals for the refuge farming program. Below is a list of approved chemicals for 1998.

### Approved List of Chemicals for 1998

Chemicals	Crop	Target Pest
Aatrex	Corn	Sicklepod
Classic	Soybeans	Sicklepod
Accent	Corn	Grasses
Dual	Corn/Milo	Grasses
RoundUp	Corn/Milo/Soybeans	Burndown
Beacon	Corn	Grasses
Select	Soybeans	Grasses
Reflex	Soybeans	Broadleafs
Sevin	Corn	Insects
Fusilade 2000	Soybeans	Grasses
2,4D Amine	Corn	Broadleafs
Canopy	Soybeans	Broadleafs
Pursuit	Soybeans	Grasses
Butyrac 175	Soybeans	Broadleafs
Banvel	Corn/Milo	Broadleafs
Storm	Corn	Grasses

A variety of chemicals listed above for the same target pest functioned as an economical alternative for the cooperative farmers. Of the twenty-two (22) chemicals approved only ten (10) were actually used in 1996, compared to sixteen (16) chemicals approved and eleven (11) actually

used in 1997, compared to sixteen (16) chemicals approved and fourteen (14) actually used in 1998.

**Note:** Region IV Refuges and Fish Hatcheries obtained approval and used 113 chemicals in 1995, 99 chemicals in 1996, 90 chemicals in 1997, and 107 in 1998. The leading chemical used in 1998 region-wide was *RoundUp*, which totaled 3,600 gallons applied to 11,848 acres of refuge land.

Under the authority of a cooperative management agreement, the Tennessee Valley Authority (TVA) does some limited spraying for the control of mosquitoes along the margin of the refuge on the Duck River Unit. No spraying was reported in 1996, 1997, and 1998.

Refuge biological staff sprayed 2.5 gallons of 2,4 D Amine on 3 acres of *sesbania* in 1998.

A refuge cooperative farmer planted 550 acres of *RoundUp* - Ready Soybeans on the Duck River Unit in 1998. The soybeans were developed to withstand the burndown effects of the *RoundUp* chemical, without any damage to the plant. This would also reduce the number of different chemicals that may have to be applied to the plant for weed control.

## G. WILDLIFE

### 1. Wildlife Diversity

The refuge is managed to provide a diversity of habitats such as upland oak/hickory forest, bottomland hardwoods, moist soil impoundments, freshwater marshes, cropland, old fields, seasonal mud flats, wetland scrub/shrub plant communities and open water areas. With this variety of habitats the refuge supports a rich assembly of wildlife including 228 bird species, 109 fish species, 84 species of reptiles and amphibians, and 47 species of mammals.

### 2. Endangered and Threatened Species

There were two active bald eagle nests on the refuge this year. The Eagle Creek nest, which has been active for 14 years, fledged one young this year, bringing the total to 13 eagles fledged from this nest. The Opossum Creek nest,

in its eighth year, fledged two young this year. This nest has produced nine eagles over the years.

The highest bald eagle count for the winter of 1998-99 was 74, which was an increase from 65 the previous winter. There were also three golden eagles sighted on the refuge this winter. The golden eagle is state listed as endangered.

The peregrine falcon is an occasional visitor to the refuge during migration. One was observed on the Duck River Unit during fall migration this year.

An immature least tern was observed during a point count survey that was conducted on June 13 in the Duck River Bottoms. The interior population of the least tern is listed as endangered.

### **3. Waterfowl**

The waterfowl survey figures given are based on the winter of 1998-99. This seems to be a better method of reporting these figures than splitting two separate winters to follow a calendar year.

Blue-winged teal were the first fall migrant waterfowl to arrive on the refuge. They started showing up in high numbers in mid-September. Migrant Canada geese first arrived in late October. The first waterfowl survey flown on October 13 determined that 1,179 geese and 6,418 ducks were present on the refuge. Waterfowl numbers slowly increased to 2,108 geese and 60,544 ducks by the end of November. The mid-December waterfowl survey population estimates were 2,008 geese and 84,956 ducks. The duck population peaked at 211,405 during the first week of January. The goose population reached 13,000 during this count. The goose peak occurred during mid-January with 14,158 present on the refuge. Duck numbers declined to 120,956 during this mid-January count. Waterfowl populations quickly declined to 1,218 geese and 14,130 ducks by mid-February.

Twenty-three species of waterfowl were observed on the refuge this year. The most common species in order of abundance were mallard, Canada goose, gadwall, black duck, pintail, wigeon, green-winged teal, ring-necked duck, ruddy duck and canvasback.

The refuge is of particular importance to the Southern James Bay Population (SJBP) of Canada geese which has experienced a decline in numbers over the last several years. In an effort to better monitor this population, the refuge staff spent 82 hours attempting to read neck collars. There were 207 collar observations recorded by refuge personnel this year.

This refuge is also an important wintering area for American black ducks in the Mississippi Flyway. During the peak there were more than 10,500 black ducks using the diverse wetland habitats on the refuge this winter.

Agricultural and moist soil habitats were heavily utilized by waterfowl this year. Winter wheat fields provided browse for geese, and agricultural grains were utilized by several waterfowl species, especially mallards and Canada geese. Moist soil areas were utilized by a wide variety of waterfowl.

The refuge has an active wood duck nest box program with 177 boxes available for use in the 1998 nesting season. Of the total boxes available, 126 were used by wood ducks and seventeen were used by hooded mergansers. Out of the 126 boxes used by wood ducks, 102 were considered successful. Fifteen of the seventeen boxes used by hooded mergansers successfully hatched. Hooded merganser use increased by 30 percent over last year's figure. It was estimated that 1,073 wood duck ducklings hatched from the nest boxes this year (See the Annual Report Form).

"ANNUAL" REPORT FORM  
WOOD DUCK BOX PROGRAM INFORMATION  
YEAR 1998

Total Boxes Up	<u>17</u>	
Total Usable Boxes	<u>177</u>	(Boxes not in disrepair)
Use by Wood Ducks of Usable Boxes	<u>126 71%</u>	(# of boxes and % of usable boxes)
Number of Boxes with Dump Nest (>15 eggs)	<u>14</u>	
Number of Successful	<u>102</u>	(Box that hatched one egg or more = successful)
Boxes (Wood Ducks)		
Use by Other Ducks	<u>17/15</u>	(Mergansers, etc., and an estimate of successful hatches)
Period Checked (Month)	<u>May-July and Feb.</u>	(Specific dates of the yearly box inspections)
Use by Other Wildlife	<u>2</u>	
Total Wood Ducks Hatched	<u>1073*</u>	
Wood Duck Broods Produced	<u>104*</u>	
Wood Ducks Surviving to Flight Stage	<u>537</u>	

Plans for Next Year (Indicate Number)

\_\_\_\_\_ More Boxes                      \_\_\_\_\_ Moved Boxes

\_\_\_\_\_ Fewer Boxes

  X   No Change

Remarks: The boxes were on two different monitoring programs. Thirty-four boxes are checked intensively during the nesting season and 145 boxes are checked annually.

There was a little snake predation, as well as, more serious predation by woodpeckers.

Two screech owl nests represent the other wildlife use.

\*The intensive checks allowed for a more accurate counting of the broods produced and the actual number of eggs hatched in those boxes. The boxes that were checked annually were recorded as one brood and 10 hatched eggs for each successful box.

#### 4. Marsh and Water Birds

Great blue heron, double-crested cormorant, great egret, green heron, little blue heron, sora and American coot are the most common species in this category that utilize the wetland habitats on the refuge. Sandhill crane and American white pelican are noteworthy occasional migrants that visited this fall.



**Figure 3.** Great egrets feeding in an impoundment during a managed water level drawdown to produce moist soil habitats. (RW)

The Duck River Unit holds the third largest great blue heron rookery in the state. This rookery has been active since the refuge was established in 1945. There were 501 active nests counted within this rookery this year. The rookery is protected from disturbance by closing a large area around the rookery to all public access during the nesting season.

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

An abundance of mud flats on Kentucky Lake during TVA's drawdown provides a good habitat for shorebirds during the fall migration. The late winter and spring drawdowns of the refuge impoundments produce habitat for the spring

migration. Some species that are commonly found on the refuge are the solitary sandpiper, greater yellowlegs, lesser yellowlegs, pectoral sandpiper, least sandpiper, semipalmated sandpiper, and spotted sandpiper. Some unusual shorebird species that were documented on the refuge this year were the American avocet and willet. A variety of gulls and terns, such as the herring gull, ring-billed gull, Bonaparte's gull, common tern, and Caspian tern, utilize the refuge. The endangered least tern was observed on the refuge this year.

#### **6. Raptors**

The most common raptors that utilize the refuge are the red-tailed hawk, red-shouldered hawk, American kestrel, northern harrier and bald eagle. Uncommon species are the sharp-shinned hawk, Cooper's hawk, broad-winged hawk, merlin, osprey and golden eagle.

#### **7. Other Migratory Birds**

Habitat for neotropical migratory birds is found throughout the refuge. In an effort to better monitor the species and habitats that occur on the refuge, MAPS station operations were continued this year. (See section G. 16. Marking and Banding)

The three roadside breeding bird survey routes that have been in operation since 1995 were run again this year. Point counts along these routes are conducted every year during the breeding season to derive a list of breeding birds using the refuge, as well as to provide data for determining population trends for early-successional and edge species. Red-winged blackbird, common grackle, indigo bunting, Canada goose, great blue heron, northern cardinal, and prothonotary warbler were the most abundant species located along the bottomland routes. Some noteworthy species that were less abundant were the least tern, bald eagle, red-headed woodpecker, and willow flycatcher. The most abundant species encountered on the upland route were the indigo bunting, eastern tufted titmouse, northern cardinal, red-bellied woodpecker, yellow-breasted chat, white-eyed vireo and yellow-billed cuckoo. Other less common but important species encountered were the prairie warbler, wood thrush, field sparrow, and northern bobwhite.

This was the second year that the five point count routes located in mature hardwood forest stands were surveyed. Data will be collected on these routes annually during the breeding season. The primary purpose for these routes is to provide baseline data for bird habitat associations within the forested areas of the refuge, prior to forest management activities. The most abundant species found on these routes this year were the eastern tufted titmouse, red-eyed vireo, yellow-billed cuckoo, wood thrush, red-bellied woodpecker, and scarlet tanager (See Table 1 for a more detailed species list).

Table 1. Relative Abundance of Species within Forested Point Count Routes

Species	Total Number of Points		Number of Individuals Encountered					Indiv/ Point
	62	Nix Landing	Pigpen Hollow	Baker Cemetery	Britton Ford	Ross Creek	TOTAL Indiv	
Eastern Tufted Titmouse	22		13	6	20	16	77	1.24
Red-eyed Vireo	11		15	17	7	27	77	1.24
Yellow-billed Cuckoo	10		9	22	10	23	74	1.19
Wood Thrush	3		13	11	20	14	61	0.98
Red-bellied Woodpecker	9		11	12	12	12	56	0.90
Scarlet Tanager	10		9	13	7	14	53	0.85
Carolina Wren	12		6	10	9	7	44	0.71
Eastern Wood-Pewee	10		6	7	11	10	44	0.71
White-breasted Nuthatch	4		7	8	15	7	41	0.66
Summer Tanager	2		7	7	12	9	37	0.60
Blue Jay	2		7	9	10	6	34	0.55
Northern Cardinal	11		1	7	10	2	31	0.50
Acadian Flycatcher	2		5	7	6	9	29	0.47
American Crow	9		3	5	3	9	29	0.47
Great Crested Flycatcher	4		9	5	1	7	26	0.42
Kentucky Warbler	3		3	1	6	3	16	0.26
Carolina Chickadee	2		2	2	6	3	15	0.24
Yellow-throated Vireo	3			2	4	5	14	0.23
Pileated Woodpecker	4		1	1	4	3	13	0.21
Downy Woodpecker			3	2	3	4	12	0.19
White-eyed Vireo	11						11	0.18
Eastern Towhee	3				5		8	0.13
Red-tailed Hawk				1	3		4	0.06
Barred Owl			2				2	0.03
Brown-headed Cowbird				1	1	1	3	0.05
Indigo Bunting	3						3	0.05
Mourning Dove	1			1	1		3	0.05
Orchard Oriole	1			2			3	0.05
Worm-eating Warbler	1		2				3	0.05
Blue-gray Gnatcatcher						2	2	0.03
Common Grackle	1				1		2	0.03
Great Blue Heron	1			1			2	0.03
Northern Bobwhite	2						2	0.03
Ovenbird					1	1	2	0.03
Prothonotary Warbler	2						2	0.03
Red-shouldered Hawk	1		1				2	0.03
Baltimore Oriole					1		1	0.02
Brown Thrasher						1	1	0.02
Hairy Woodpecker						1	1	0.02
Hooded Warbler	1						1	0.02
Louisiana Waterthrush	1						1	0.02
Northern Flicker				1			1	0.02
Wood Duck	1						1	0.02
Yellow-breasted Chat	1						1	0.02
TOTAL INDIVIDUALS	164		135	161	189	197	846	

## 8. Resident Game Animals

Gray squirrel, fox squirrel, coyote, beaver, raccoon, white-tailed deer and wild turkey are legally hunted on the refuge and all populations remain abundant. Some other game species on the refuge that are not hunted are northern bobwhite, cottontail rabbit, swamp rabbit, red fox, gray fox, mink, muskrat, otter and bobcat.

## 15. Animal Control

Beavers continue to cause problems by damming water control structures, thus interfering with agricultural and moist soil management plans and causing tree mortality. The beavers, along with muskrats, also damage levees by tunneling activities, causing cave-ins and leaks in the levees. Measures were taken to control beavers and muskrats in areas where they caused problems.

## 16. Marking and Banding

There were 209 black ducks captured and banded on the refuge as part of a research project (See Section D. 5. Research and Investigations). The focus of this study is to determine the blood lead levels in black ducks six to seven years after the nationwide ban on lead shot use by waterfowl hunters and to compare these results to data collected ten years earlier.



**Figure 4.** Biological Technician, Clayton Ferrell, and Intern Student, Jay Corbitt, banding a black duck. (RW)

There were 1,177 wood ducks banded on the Duck River Unit during pre-season wood duck banding, exceeding the quota of 240.

A MAPS station was again operated this year in upland hardwoods (oak/hickory type) near Ross Creek on the Big Sandy Peninsula to monitor landbirds utilizing this habitat. A total of 480 net-hours resulted in 38 newly banded individuals, 13 recaptures and one bird released unbanded. There were 13 different species captured. The most common species captured this year were wood thrush, Louisiana waterthrush and Acadian flycatcher. Thirteen additional species that were not captured in nets were identified as probable breeders within the study area. Many of the species encountered on the MAPS station are on the list of species of management and/or monitoring concern for our physiographic area (Interior Low Plateaus).



**Figure 5.** A downy woodpecker captured in a mist net at the MAPS station on the Big Sandy Unit. (RW)

## H. PUBLIC USE

### 1. General

For the fourth year, the refuge hosted and sponsored the Federal Junior Duck Stamp Program in partnership with Tennessee Wildlife Resources Agency and The Tennessee Conservation League. Distinguished judges for the contest were Benton County Executive Jimmy Thornton, Tennessee Wildlife Resources Agency Biologist Dave Gabbard, Westvaco Forester Ronnie Alsip, Leaf Chronicle Outdoor Editor Owen Schroeder and TVA Land Use Specialist Robert Olson. Bethany Carter from Kingsport won best of show competing against 1250 other participants. An awards ceremony was held May 2<sup>nd</sup> at the Opryland Hotel, awarding a scholarship of \$1000 to Ms. Carter.



**Figure 6.** Junior Duck Stamp Best of Show Winner, Bethany Carter, with her teacher Joan Zimmerman. (SW)

In February, area high school students participated in the first annual Education Edge Job Shadowing Day. Six students spent the day "shadowing" six different refuge employees in order to get a better understanding of the daily activities and requirements of the profession in which they are interested.

## **2. Outdoor Classrooms - Students**

615 students participated in environmental education activities both on and off the refuge. Park Ranger Sarah Welker continues to provide programs for both Cross Creeks NWR and Tennessee NWR. However, both programs are beginning to suffer due the amount of public needs on both refuges.

## **6. Interpretive Exhibits/Demonstrations**

Interpretive booths were set up at the local annual Octoberfest celebration in Paris and at the Folk Life Festival at Nathan Bedford Forest State Park in Eva.

Centered around Earth Day, Park Ranger Welker presented programs for 525 students in 4th and 5th grades from three counties during the Humphries County "Celebrate the Earth" event. This event lasted for two days and offered environmental presentations from many local natural resource organizations. The Conservation Cargo Trunk was used to present information on the Illegal Wildlife Trade.

## **8. Hunting**

The annual hunt coordination meeting with the Tennessee Wildlife Resources Agency (TWRA) was held on March 5th at the TWRA building in Jackson, Tennessee. Manager Taylor, Deputy Manager Schriver, Biologist Wheat and Park Ranger Welker attended the meeting/briefing.

The spring turkey hunts were held the first, fourth, and last weekends of the state turkey season.

A non-quota archery hunt was held Sept. 20 - Oct. 26. The first pre-season quota archery hunt was held this year harvesting 20 male and 19 female deer. The Youth Muzzleloader/Gun Hunt was held on October 4-5, 1998, on all units of the refuge. All regular refuge quota hunts were held on three weekends, October 11-12, 18-19, and 25-26 harvesting a total of 135 male and 175 female deer. A total of 1750 permits were issued.

## **9. Fishing**

All areas of the refuge, but especially the Duck River Bottoms, are very popular with the fishermen. Highly

publicized in sporting magazines as a good fishing spot, parking lots and boat ramps have continued to get heavy use.

### **11. Wildlife Observation**

Work continues on the new observation deck at the Duck River Unit adjacent to Pool 5. The Army National Guard of Waverly has assisted with its ground moving equipment to prepare the site. The maintenance staff has begun construction of the raised walkway and decking for the observation building. The maintenance staff has also begun construction of a new parking lot.

### **17. Law Enforcement**

Refuge Operations Specialist Whit Lewis joined the ranks of refuge officers this year. Though his collateral duty time is limited, he helps the full-time officer patrol our widely scattered refuge areas during busy periods and hunts.

Full-time Officer Gensmer took on the responsibility of Regional Health and Fitness Coordinator for Region 4. This increased workload has reduced his available patrol time and subsequently, the total number of cases for the refuge in 1998.

The following cases were reported by refuge officers in 1998:

MBTA	6
Hunting	9
Fishing	21
Trespass	2
Take-plant or animal	4
Drive off road	6
Motor vehicle	9
Boats	1
Firearms	4
Removal of public property	1
Artifact violations	8
Possession controlled substance	10
Illegal structure	1
Litter	2

In addition, over 394 verbal warnings were issued this year. Details with state and local law enforcement officers resulted in many cases prosecuted in state court.

All officers completed the required 40-hour in-service this spring. Semi-annual qualifications were certified by Gensmer at the Duck River Unit.

No marijuana gardens were observed on the refuge this year.

### **19. Concessions**

Cuba Landing Marina continues to run smoothly under new management which anticipates the improvements will make the area much more attractive and bring in more proceeds.

Mansard Island Marina completed a good year with no real difficulties.

## **I. EQUIPMENT AND FACILITIES**

### **1. New Construction**

A Wildlife Observation Platform was completed in Pool 5 in 1998. Refuge maintenance staff worked under time and budget restraints to construct the platform.



**Figure 7.** The newly completed Wildlife Observation Platform will be utilized by refuge visitors at various times throughout the year. (WL)

A new 30 feet by 50 feet storage building was erected by Barrett's Construction Company from Paris, Tennessee, in 1998. The refuge was in desperate need of this storage facility (See Figures 8 and 9).



**Figure 8.** The storage building in the early Construction stages. (WL)



**Figure 9.** The storage building nearing the end of construction. (WL)

## **2. Rehabilitation**

We rehabilitated one agriculture impoundment (Pool 3) on the Duck River Unit this year. The impoundment had become congested with early growth of willow, buttonbush, and other woody vegetation. Mechanical techniques, followed by disking, helped to set back the successional stages and make them more attractive to waterfowl (See Figures 10 and 11).



**Figure 10.** Willow trees encroaching refuge agriculture fields help to interrupt water drainage from the adjoining agriculture fields. (WL)



**Figure 11.** Removal of the willow trees allows the refuge to plant the rehabilitated land back to winter wheat. The wheat is browsed by wintering geese, plowed under in spring as green manure, and planted to agriculture crops by refuge farmers.

(WL)

Refuge staff worked with the Tennessee National Guard on the Big Sandy Unit in 1998. The Guard provided equipment and personnel to grade refuge roads, paint the shop facilities, and repair a breach in the Ross Creek levy (See Figures 12 and 13).



**Figure 12.** The Tennessee National Guard grading the main entrance road to the Big Sandy Unit. (WL)



**Figure 13.** The Tennessee National Guard hauling and placing fill material into the breach in Ross Creek levy. (WL)

### 3. Major Maintenance

Refuge staff met with Kent Cochran (Regional Engineer) to start the ball rolling on the 2.5 million dollar dike project on the Duck River Unit. The dike project is expected to begin in 1999.

### 4. Equipment Utilization and Replacement

The refuge accepted delivery on the remaining two vehicles ordered in 1997. This almost completes the update on the refuge motor pool for the present time.

The refuge accepted delivery on a new truck tractor, dump truck, excavator, lowboy, disc, bush-hog, and two mowing tractors.

### 7. Energy Conservation

All units were involved in recycling this year. Paper, cans, and waste oil made up the bulk of the recycled products. All waste oil is being collected and disposed of by a private business in New Johnsonville, Tennessee.

## J. OTHER ITEMS

### 4. Credits

This year's narrative was a cooperative effort of all the staff at Tennessee National Wildlife Refuge.