

MUSCATATUCK NATIONAL WILDLIFE REFUGE

Seymour, Indiana

ANNUAL NARRATIVE REPORT

Fiscal Year 2007

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

REVIEW AND APPROVALS

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ANNUAL NARRATIVE REPORT

Fiscal Year 2007

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## APPENDIX

Refuge Annual Performance Plan (RAPP) FY '07



## Muscatatuck National Wildlife Refuge

### Annual Narrative

#### Seymour, Indiana

Fiscal Year 2007 (October 1, 2006 to September 30, 2007)  
(\*Calendar year data are used for climate and waterfowl Use Days)

*2007 Climatic Data				
Month	Temperatures (AVG)		Precipitation	
	Maximum	Minimum	NWR	Normal
January	37.8	28.2	4.69	3.30
February	28.4	15.7	3.85	2.94
March	52.2	41.7	2.50	4.22
April	55.5	43.2	3.92	3.83
May	76.1	62.1	1.99	4.31
June	78.5	66.7	2.00	4.14
July	82.4	61.5	1.20	4.77
August	88.4	67.6	4.25	2.91
September	80.5	56.3	4.52	3.03
October	70.2	49.1	3.12	2.47
November	51.3	34.8	1.90	3.09
December	40	28.9	4.08	3.16
Totals	61,78 (AVG)	46.32 (AVG)	38.02	42.17

1. Precipitation and temperature data from the office gauge.
2. Normal precipitation is from the 1951 to 1977 period (recorded at Seymour, IN).



Sunrise over Stanfield Lake. Credit: S. Knowles

## **HIGHLIGHTS**

- National Wildlife Refuge Week celebration (sec. 7a)
  - Refuge 40<sup>th</sup> Anniversary Celebrated during Refuge Week
- Refuge kicks off CCP Efforts (sec. 8a)
- FFA National Convention booth in Indianapolis, IN (sec. 7b)
- Ultra-light led whooping cranes visit Muscatatuck again
- Conservation Field Day Events Bring 1,200 students to Muscatatuck (sec. 7a)
- Refuge Master Naturalist Program Involves 54 people (sec. 7a)
- Refuge Tackles Autumn Olive on Chestnut Ridge Trail (sec. 7b)
- Junior Duck Stamp Contest attracts 463 entries from throughout the state (sec. 7a)
- Wings over Muscatatuck migratory bird festival attended by 600-800 people (sec. 7a)
- Take a Kid Fishing Day attended by 300 people (sec. 7a)
- Basement renovation project completed (sec. 8b)
- Deer have an outbreak of EHD (sec. 4b)

## **INTRODUCTION**

The Muscatatuck National Wildlife Refuge (MNWR) established October 6, 1966, is located in south central Indiana midway between Indianapolis, Indiana, and Louisville, Kentucky. The refuge is just south and east of the junction of I-65 and US 50 and is divided by the county line of Jackson and Jennings Counties. The Restle Unit, a 78 acre parcel northwest of Bloomington in Monroe County, Indiana, was donated in 1990 as part of the Muscatatuck National Wildlife Refuge and includes bottomland hardwoods and a restored wetland.

The refuge name, Muscatatuck, means "Land of Winding Waters" which historically reflects the topography of the area. Approximately 36% of the refuge lies within the annual flood plain of the Muscatatuck River-Vernon Fork which forms the southern boundary of the refuge. The topographic relief from the refuge bottomlands to gently sloping uplands ranges from 540 to 620 MSL in the otherwise flat region known as the Scottsburg lowlands. Given the physiographic diversity of the area, the refuge is rich in history of early cultures.

The refuge was authorized by the Migratory Bird Conservation Commission in 1966 and purchased with "Duck Stamp" money. A total of 7,724 acres were purchased. The primary objectives for the refuge are to provide migratory waterfowl with a resting/feeding area during the migration and to produce wood ducks.

To start achieving these objectives at significant levels, 1,200 acres of managed waters, (i.e., lakes, moist soil impoundments and green tree impoundments) were constructed with Bicentennial Land Heritage Program (BLHP) funding by the fall of 1983. Hardwood forest dominates 4,160 acres of the flood plain and on the upland slopes. An additional 2,015 acres of land are reverting to forest lands and brush lands and an ongoing cooperative farming program of 278 acres provides corn, wheat for winter browse, soybeans and hay to a broad spectrum of wildlife to compliment the habitat diversity within the Muscatatuck National Wildlife Refuge.

The Muscatatuck NWR Fish and Wildlife Easement Management District includes 30 Indiana counties.

## **MONITORING AND STUDIES**

### **1a. Surveys and Censuses**

The annual FWS Greater Sandhill Crane (*Grus canadensis*) Survey was conducted by Biotech Dailey from November 1-12, 2006. Survey results were submitted to Sean Kelly in the USFWS Division of Migratory Birds. No cranes were found on the refuge during the survey. Although no flocks of cranes were officially recorded at the refuge during autumn or winter, a single bird was sighted on October 22, 2006. In the past flocks have migrated to the refuge with up to 1,000 individuals occurring at one time. The Ewing bottoms in Jackson County hosted large numbers of these conspicuous creatures.

Skilled volunteers again conducted our annual Christmas bird count on January 1, 2007. All areas of the refuge were surveyed using the protocol established by the National Audubon Society. Sixty-four bird species were counted, down from 73 the previous year, and 4,813 individuals observed, down from 6,450 in 2006.

The annual FWS Midwinter Waterfowl survey was conducted on January 3, 2007 by Biotech Dailey. Survey results were submitted to Adam Phelps, Indiana Department of Natural Resources (IDNR) Waterfowl Biologist. During the refuge survey eight species and 2,316 individuals were counted. Roughly 30% of the birds seen were mallards (*Anas platyrhynchos*) and 65% Canada geese (*Branta Canadensis*), but a flock of 22 tundra swans (*Cygnus columbianus*) was also present.

The Indiana Mid-Winter Bald Eagle (*Haliaeetus leucocephalus*) Survey, conducted January 11, 2007 by Biotech Dailey, resulted in two mature eagles spotted on the refuge. The survey results were submitted to John Castrale, IDNR Non-game Bird Biologist. Castrale summarized statewide eagle survey data and found that 103 bald eagles were present in Indiana, a 49% reduction from the 211 present in 2006. Castrale attributes the decline to warmer weather which he believes has caused migrants to stop further north. The eagle nest located on MNWR was active again and produced two chicks. The bald eagle was removed from the federally endangered species list in 2007; however, it still remains a state listed species in Indiana.

The annual May Day bird count was conducted May 12, 2007. This survey covered all areas of the refuge and used protocol established by the National Audubon Society. A total of 125 species and 2,226 individuals were counted and highlights from the day included an abundance of warbler species, a Caspian tern (*Hydroprogne caspia*), several northern rough-winged swallows (*Stelgidopteryx serripennis*), and twenty semipalmated plovers (*Charadrius semipalmatus*).

A Biological Program Review, which is an evaluation of the relevance and direction of the biological program through the collective inputs of professionals among the various fields of ecology and wildlife sciences, began with a two-day meeting on June 20-21, 2007. The Regional Refuge Biologist facilitated the event which was attended by 17 individuals with various state, federal, and academic affiliations. Information was presented on the refuge, the general ecology of the region, establishing legislation and policy directives, current issues facing the refuge, prior program accomplishments, a report on the current biological inventory and monitoring program, and a draft vision for the future. The meeting was punctuated with field trips to specific sites to stimulate discussion and demonstrate issues of concern. The group discussed management

alternatives and potential strategies, identified potential biological program priorities, discussed the draft goals and objectives for the various program components and other ideas for the future of the program. Other notable results of the meeting were the completion of a biological review notebook by Wildlife Refuge Specialist (WRS) Susan Knowles and Biotech Dailey and of a resource overview PowerPoint presentation by Dailey. Both of these will be valuable reference resources.

The great blue heron (*Ardea herodias*) rookery located in the eastern portion of Moss Lake was checked in June of 2007 by biology interns Carter, Coffin, Everroad, Kapitan, Whitson, and Winebrinner. Twenty-seven active and seven inactive nests were documented. Additionally, the interns documented one active nest on Richart Lake.

MNWR volunteers held a butterfly count on July 21, 2007 using a protocol established by the North American Butterfly Association. Six surveyors documented 25 different species on the refuge during the counting period, which was a moderate count. This count is an annual effort and over time the information should provide insight on trends in the butterfly populations on the refuge.

Muscatatuck NWR again participated in the North American Amphibian Monitoring Program. This program is part of a larger international effort and is designed to determine the abundance and distribution of amphibians to better understand their conservation needs. Our survey route was completed in March, May, and July as prescribed by the national protocol, and results were submitted to IDNR. Eight species were recorded; spring peeper (*Hyla crucifer*), western chorus frog (*Pseudacris triseriata*), southern leopard frog (*Rana utricularia*), bullfrog (*Rana catesbeiana*), cricket frog (*Acris crepitans*), Copes gray tree frog (*Hyla chrysoscelis*), green frog (*Rana clamitans*), and American toad (*Bufo americanus*).

As in previous years, the refuge population of the state endangered southern tubercled orchid (*Platanthera flava* var. *flava*) was monitored by refuge volunteer Brian Lowry with the assistance of interns. Three plants were found at the MSS-RNA site. With our region five inches or so below normal rainfall levels, it was not surprising to find only a few plants. Some of the specific sections where several plants were noted last year, little foliar life was evident. It is our hope that the plants emerged in early spring and held on long enough to store energy for next year. We suspect the foliage had desiccated during the severe dry spell in early July. Twenty-three plants were confirmed at the Endicott Marsh location with only two in bloom, which was unusual but was attributed to the effects of this summer's drought conditions. Thirty-two Club Spur Orchid (*Platanthera clavellata*) plants were confirmed at the original Seep Spring Location with 25 occurring in full bloom. One Purple Fringeless Orchid (*Platanthera peramoena*) was found in bloom as well as several Crane's Fly Orchid (*Tipularia discolor*) in the mesic upland forest above the seep. This year's survey took place on July 23, 2007.

Waterfowl counts were conducted throughout the year and waterfowl brood surveys were conducted throughout the breeding season by refuge staff and volunteers. These counts allowed us to estimate total waterfowl use days at 563,136. Total waterfowl production was 830 wood ducks and 125 Canada geese. In recent years, there has been an increase of permanently protected wetlands on private lands in our area (5,682 acres of WRP in the Muscatatuck River basin), which offers increasing amounts of off-refuge habitat. It's hoped that guidance from the United States Geological Service (USGS) Biological Monitoring Team, in the near future, will help the refuge in refining our



estimating techniques.

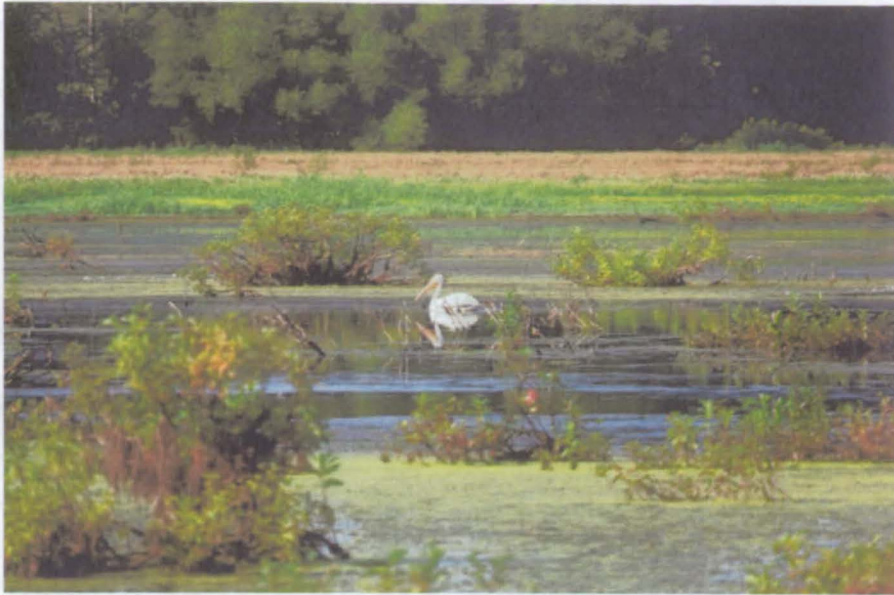
Water Quality monitoring was done quarterly in 2007, with the exception of the final quarter, on five refuge creeks: Sandy Branch, Mutton Creek, Storm Creek, a Richart Lake tributary, and a Stanfield Lake tributary. All were used as sampling sites as they entered refuge property. As in the past, these monitoring efforts were accomplished by volunteers using the Hoosier Riverwatch protocol, which includes habitat assessment, chemical monitoring (phosphate and nitrates only), and biological monitoring. Several contamination problems were found through this monitoring. Mutton creek contained high levels of *E. coli* on June 27, 2007 with 1,200 Colony Forming Units (CFU) per 100 mL which equates to roughly five times the State water quality standard (SWQS) for total body contact recreation. Storm, Mutton, and Sandy Branch Creeks along with the Stanfield feeder all contained *E. coli* levels at or slightly above the SWQS of <235 CFU/100 mL in late December. Pollution tolerance index ratings, based on surveys of invertebrate indicator species, were poor for every stream during the winter and spring sampling periods. All data were entered into the statewide Riverwatch Database which can be accessed at <http://www.hoosieriverwatch.com/>. Hard copies of the data can be found in refuge files.

Interesting wildlife sightings through the year included: Northern goshawk (*Accipiter gentilis*), American bittern (*Botaurus lentiginosus*), common loon (*Gavia immer*), tundra swans (*Cygnus columbianus*), osprey (*Pandion haliaetus*), spotted sandpiper (*Actitis macularius*), semi-palmated sandpiper (*Calidris pusilla*), sandhill crane (*Grus canadensis*), golden eagle (*Aquila chrysaetos*), great egret (*Ardea alba*), black-crowned night heron (*Nycticorax nycticorax*), marsh wren (*Cistothorus palustris*), ring-billed gull (*Larus delawarensis*), American white pelican (*Pelecanus erythrorhynchos*), Caspian tern (*Hydroprogne caspia*), blue-headed vireo (*Vireo solitarius*), snow goose (*Chen caerulescens*), Black Vultures (*Coragyps atratus*), Snowy Egret (*Egretta thula*), least bittern (*Ixobrychus exilis*), horned grebe (*Podiceps auritus*), little spectaclecase (*Villosa lienosa*), coyote (*Canis latrans*), Kirtland's snake (*Clonophis kirtlandii*), and Dekay's brown snake (*Storeria dekayi wrightorum*).



Tundra swans in M7. Credit: D. Lindsey





White Pelican resting in the M7 unit in August 2007. Credit: E. Carter



Snowy Egret in the closed area in August 2007. Credit: E. Carter

### **1b. Studies and Investigations**

A 2007 Cavity Survey was conducted on the refuge by John Denton, a Graduate Research Assistant at Southern Illinois University, with Dr. Charlotte Roy Nielsen. It was conducted under a Special Use Permit (SUP). In December 2007, they climbed 122 trees to examine cavities located from the ground. The field report was submitted to the refuge after field work. Trees with cavities were similar in size in this study to that of the previous study by Dr. Joe Robb (1986) and suitable cavity density appears to have remained nearly unchanged since Robb's work was completed.



The long-term copperbelly watersnake (*Nerodia erythrogaster neglecta*) monitoring project initiated in 2005 continued throughout the summer of 2007. The project was led by Biotech Dailey, who was assisted by refuge interns, IDNR staff, and volunteers. The purpose of this study was to estimate population size, compare population statistics to prior studies, and analyze population viability of the species through a mark-recapture/release study. Snakes were captured and permanently marked with Passive Integrated Transponder (PIT) tags to enable future identification. Data from previous years were insufficient to obtain statistically significant results on population size. Capture efforts occurred on a smaller portion of the refuge. Fifty copperbelly watersnakes were captured and 34 PIT tags implanted. Other data such as sex, age, body mass, length, and location were also recorded to provide life-history data on future recaptures. We succeeded in getting 14 recaptures, which is insufficient data for analysis of population abundance or trends. After much discussion in 2006 among staff and with input from snake researchers, it had been decided that before proceeding with future seasons using these same methods, a visual index sampling method should be implemented to try to determine population size and for long-term monitoring. These ideas were expressed again in 2007 during the biological review. If work on this project continues in the future, changes in protocol will need to be made in order to ensure that proper sample sizes are obtained.



Summer interns collecting data from a copperbelly watersnake. Credit: S. Knowles

An IDNR team led by Biologist Zach Walker assisted with the copperbelly watersnake project the last week of April. During that field work Walker was issued a SUP to collect clippings from snakes on the Refuge for a statewide DNA library. The library is part of an initiative undertaken by the IDNR Wildlife Diversity Section to build a genetic database of native species. Clippings were taken from nine copperbelly watersnakes, one eastern gartersnake, one eastern ribbon snake, and one northern watersnake.

Brant Fisher, nongame aquatic biologist for the IDNR, assisted by Wildlife Biologist (WB) Dan Wood, conducted a follow up investigation for several mussel survey sites from a 1995-1996 study conducted by Jeff Harmon. A total of eight sites were sampled in



September 2007 for live, fresh dead, and weathered dead shells. Harmon's study resulted in 20 species represented on the Refuge; the 2007 inquiry yielded three new species from the Vernon Fork that had never been documented on the refuge, including elephantear (*Elliptio crassidens*), flutedshell (*Lasmigona costata*), deertoe (*Truncilla truncate*). The little spectaclecase (*Villosa lienosa*) was found in both the Harmon and the 2007 survey; however, only fresh dead specimens were encountered. This species is a species of special concern in Indiana and is listed as imperiled (S2) within the state.

Tom Simon of USFWS-BFO office conducted surveys this summer as part of a contaminant study. The results and analysis will be completed next year. Preliminary results included 59 species of fish collected during the survey of water bodies within the Muscatatuck National Wildlife Refuge and tributary streams outside but near the refuge. The total number of species collected from within the refuge included 54 species. The most diverse families were the minnow and darter families, which each included 11 species on the refuge. Anglers fish for largemouth bass, bluegill, redear sunfish, black crappie, and catfish. A fish survey of 50 sites in the area surrounding the refuge was also conducted in 2007 by the U. S. Fish and Wildlife Service, Bloomington Field Office. New records included the finding of the eastern sand darter and harlequin darter in the Vernon Fork Muscatatuck River. In addition, the flier was collected from Moss Lake and Mutton Creek, while the redspotted sunfish was collected from Mutton Creek. These records are perhaps the furthest north and eastern records for these species.



Tom Simon USFWS/BFO and Jake Burskey conducting sampling for contaminants study at Moss Lake. Credit: P. Heglund

The Simon survey also included an intensive survey of aquatic macroinvertebrates which was conducted on the Muscatatuck National Wildlife Refuge during the spring of 2007. Fifty samples were collected from a variety of creeks, streams, and lake outlets. The results of this survey are still pending; however, five species of crayfish were collected including the paintedhand mudbug (*Cambarus polychromatus*), Great Plains mudbug (*Cambarus species A*), northern crayfish (*Orconectes virilis*), Sloan's crayfish (*Orconectes sloanii*), and rusty crayfish (*Orconectes rusticus*).



Tim Carter of Ball State University was issued a SUP to collect blood and fecal samples, attach radio transmitters, and track bats on the refuge including the federally endangered Indiana bat. This was part of a larger project with the general purpose to investigate the effect of selected military training and testing activities on tree-roosting bats by employing behavioral, physiological and immunological approaches for measuring, acute and chronic response of individuals and colonies to anthropogenic stimuli. Muscatatuck was considered a control site with other research being conducted at department of defense military bases. The project started May 21, 2007 and was conducted through July 9, 2007 with 77 bats captured. The state endangered evening bat was documented on MNWR during this study.



Indiana Bat with telemetry transmitter. Credit: S. Everroad

On June 20, 2007 an Indiana bat was found dead by Tim Carter's Technician Megan Caylor and MNWR intern Stephanie Everroad who reported the find to WRS Knowles. The dead bat had a type of tag attached that Dr. Carter was not allowed to use under his Federal or State Permits, or his refuge SUP. Refuge Manager (RM) Marc Webber contacted BFO Indiana ES Project Leader Pruitt to report the incident and an investigation was conducted. Dr. Carter was notified July 11, 2007 that he would not be allowed to conduct research under his refuge SUP at MNWR until further notice because of the suspension of his FWS ESA permit.

Special use permits issued for studies and investigations for Fiscal Year 2007 were to 1) Dr. Charlotte Nielsen to study natural cavity availability and suitability for cavity-nesting waterfowl on Muscatatuck NWR as part of a larger research project for the entire Upper Mississippi and Great Lakes region, 2) Nathan Grindle to research microbes from within ticks collected on the refuge, 3) Phillip Marshall to girdle, fell, and examine trees and set up tree traps for the emerald ash borer as part of a statewide IDNR survey, 4) Tim Carter to collect blood and fecal samples, attach radio transmitters, and track bats on the refuge, 5) Zach Walker to collect clippings from herpetofauna for a statewide DNA library, and 6) Brant Fisher to conduct a mussel survey as outlined previously.



## HABITAT RESTORATION

### **2a. Wetland Restoration**

Muscatatuck NWR staff, BFO Private Lands Coordinator, Jeff Kiefer and Dave Hudak (retired USFWS BFO), continue to work within the Restle unit area. The 78 acre Restle Unit tract is surrounded by a complex of protected land called the Bean Blossom Bottoms that includes acreage owned by Sycamore Land Trust, FWS and WRP acreage. A total of 708 acres are protected. The area is recognized as an Indiana Important Bird Area (IBA) by the Audubon Society in 2007.

Rehabilitation of the Restle unit dike with 36 acres of emergent wetland was needed due to muskrat, beaver, and flood damage. It was rebuilt in FY 05 beginning with de-watering in July and construction in August and September. This project was done as a Region 3 Maintenance Action Team (MAT) project utilizing Maintenance Management System funding and help from employees throughout the region. Maintenance Mechanic (MM) Rusty Pike and Region 3 Heavy Equipment Coordinator Dale Pittman spearheaded the project.



Spot seeding the Restle dike by Interns Everroad, Whitson and Winebrinner. Credit: S. Knowles

The seeding of the restored dike was inspected in the spring of 2007 and additional seeding has allowed more growth. Swinney Excavating was hired to mow the dike as RM Webber and WRS Knowles performed monthly checks. Intern Winebrinner performs weekly maintenance and checks recording wildlife observation, looking for evidence of trespass violation, picking up trash as needed. The unit is holding water and is being used by waterfowl.

### **2b. Upland Restoration – Nothing to Report**

### **2c. Riverine Restoration – Nothing to Report**

### **2d. Deepwater/Coral Reef Restoration - N/A**

## **HABITAT MANAGEMENT**

### **3a. Water Level Management**

Currently, 5,421 wetland acres are present at the refuge of which complete water management capability exists for 1,287 acres. Water management of this acreage occurs within 21 units (including ten moist soil units) and is conducted by refuge staff guided by the 2007 water management plan to benefit fish, wildlife and water quality. Water level gauges on managed water units were monitored biweekly to ascertain the condition of each unit and allow management intervention when necessary. The total precipitation for 2007 was below normal with 38.02 inches of precipitation recorded at the refuge office. Drought conditions were noted in the summer and fall months.

The green tree reservoir units, including G1, G2, G3, and Moss Lake, underwent the drawdown process beginning in mid to late March of 2007 and was completed by the first week of April. The water management plan directs that these units are to be maintained empty until flooding begins in November. Beaver continued to cause problems by impeding water flow during the drawdown efforts. Beaver contribute to significant increases of tree loss in these units through cutting and felling; several trees were felled across the constructed dikes and needed to be removed as part of maintenance activities. The defective water control structure on G3 was removed with heavy equipment in August to allow the unit to revert to a more natural hydrologic regime. The G3 unit no longer has management capabilities and therefore will be removed from the water management plan in 2008.

### **3b. Moist Soil Management**

Management of ten units, totaling 296 acres, was administered by refuge staff guided by the 2007 water management plan. Water management of these units was timed to coincide with the critical life history needs of a variety of species including waterfowl, shorebirds, and wading birds. Vegetation checks of Moist Soil Units (MSU) were conducted on all units between August 17-21, 2007. Recommendations for vegetation manipulations within select units will be made based on these surveys.

M1, M2, M3, M4, M5, M6 and M10 were passively managed in 2007 and allowed to remain at full pool and fluctuate with rainfall and evaporative forces. Most of these units served as brood marshes through the spring and summer and provided ample foraging and resting habitat for shore birds and wading birds through the summer and fall. Two boards were removed from M7 in March to reduce water levels; subsequently, the unit dropped two feet in elevation due to a leaking structure. This was corrected and ensuing rains increased levels which later succumbed to the forces of evapo-transpiration. The unit was maintained at higher levels to prevent cocklebur and willow germination. Affected by the drought conditions, M5, M6, and M7 provided copious mudflat habitat in the latter part of summer and consequently those units received a fair amount of shorebird use. Water levels in M8 and M9 were reduced by one foot in mid-March and underwent rapid drawdown in July in preparation for vegetation manipulation activities. This late season rapid drawdown produced significant amounts of desirable vegetation. Millets, sedges, and rice cutgrass constituted 50% of the vegetation in M8 and 38% of the vegetation in M9; this vegetative response demonstrates the potential of the refuge's moist soil units to provide ample food resources for fall and winter migrant waterfowl.

Maintenance of units, dikes, and Water Control Structures (WCS) occurred throughout the year. In August, MM Pike repaired several areas of muskrat damage along the M4 north dike and the M1 and M2 west dikes. A contract was awarded to St. John Trucking to remove dead snags from the Richart and Stanfield lake WCS; the work was completed in March 2007. MM Pike similarly removed snags and debris from the Moss lake WCS. Mowing and some bulldozing to remove willows and buttonbush occurred in M8 and M9 in September to promote moist soil plant production and set back succession of the unit. Although the mowing operations in the units were completed, bulldozing of the larger willows and buttonbush will be concluded in Fiscal Year 2008. Work began in September on the south and west levees of M8 and M9; these areas will be reshaped and countless areas damaged by muskrats patched by the close of the calendar year. Following these repairs the affected portions of the dikes will be fertilized and seeded in an effort to establish vegetation to circumvent erosion of these areas. Mowing of all dikes and levees was completed by MM Pike and WB Wood by the end of September. Brush along Richart, Stanfield, and Moss Lake dams was controlled with the use of herbicides; application was conducted by contractor Dailey with the assistance of summer interns.

### **3c. Graze/Mow/Hay**

Mowing of roadsides and dikes and dams are done through the summer months on a regular basis to facilitate wildlife viewing, public safety, and maintenance. In accordance with the refuge grassland and cropland management plans, hay cutting was done on 40 acres in the Sandy Branch area to set back succession and keep the field open for sandhill crane use. This was done in mid September.

### **3d. Farming**

Croplands are managed for migrant waterfowl, sandhill cranes and resident wildlife. Cropland production supports the moist soil management program in food production for migratory birds. In 2007, 278 acres were farmed using a rotation of corn and soybeans with wheat as a cover crop. The different crops are evenly distributed across the farming acreage and in accordance with the cropland/grassland management plan and the Refuge Cooperative Farming Agreement. Haying in rotation was dropped from cooperative farm agreements when the agreement was renewed this year. The reasoning for dropping haying in rotation was because the hay date for migratory birds should not occur before mid September and our farm cooperator felt it would not be worth haying at that time due to poor hay condition and lack of profitability.

In 2007 drought conditions persisted and hay was at a premium price, even for poor quality hay. The farm agreement was amended to hay 40 acres in the Sandy Branch area in September. This was done to set back tree growth and to keep the fields open for sandhill crane use.

### **3e. Forest Management**

Field #3, farm 4291 tract 32410 was retired from the cropland program and planted to trees. The 15.5 acres was planted with eight species (mostly oaks) at a rate of 500 trees/acre in May 2007. The planting plan was written by IDNR Forester Rob McGriff in consultation with WRS Knowles. Planting was done by a consulting forester and our friends' group, the Muscatatuck Wildlife Society (MWS), helped fund the project. The



field was in wheat cover crop and was strip sprayed during planting of trees to reduce weed competition. A monitor check of the field in September showed approximately 90 percent survival of seedlings.



Consulting Forester Rob Haubry and wife conduct tree planting. Credit: S. Knowles

### 3f. Prescribed Burning

No prescribed burns were conducted in 2007. With a change in refuge objectives beginning in 2003, reforestation may negate the need for future prescribed burn plans at the refuge.

Big Oaks NWR fire specialists Brian Winters and David Jones are working on a burn plan for MNWR to allow the burning of brush piles.

### 3g. Pest Plant Control

As required by Indiana noxious weed laws, spraying and mowing was conducted for Johnsongrass (*Sorghum halepense*) and Canada thistle (*Cirsium arvense*) control.

### 3h. Invasive Plant Management

Muscatatuck NWR awarded a contract to continue the invasive plant control efforts to Theresa (Dailey) Bordenkecher in June 2007. She was contracted to conduct control efforts and mapping of invasive species and supervise efforts conducted by summer interns. Funds for the project were procured through a challenge cost share grant in cooperation with the Muscatatuck Wildlife Society. As part of the agreement a final report is to be submitted by the contractor on October 31 of the 2008 fiscal year. One objective of the project was to map all known infestations of the following seven species: Japanese stilt grass (*Microstegium vimineum*), oriental bittersweet (*Celastrus orbiculata*), Japanese knotweed (*Polygonum cuspidatum*), purple loosestrife (*Lythrum salicaria*), kudzu (*Peuraria lobata*) tree-of-heaven (*Ailanthus altissima*), and garlic

mustard (*Alliaria petiolata*). The second objective was to treat all known infestations of the first six species. The following summer interns played a crucial role in completing the project: Justin Kapitan, Evin Carter, Stephanie Everroad, Patrick Whitson, Robert Winebrinner, and Molly Coffin.

Oriental bittersweet infestations treated in 2006 were inspected in 2007 and no bittersweet was found. The bittersweet found in previous years along County Road (CR) 500 was left untreated because identification was uncertain. We will continue to monitor re-growth and the presence of bittersweet in other areas of the refuge.

Japanese knotweed found along 1225 E. was treated again this summer by the interns. Staff observations and comments indicate that a reduction in the aerial extent of the patch occurred. This site will continue to be monitored and treated until complete control is achieved.

The infestation of purple loosestrife, found in 2006 on private land along Sandy Branch west of US Highway 31, was treated again in 2007. WRS Knowles notified the absentee landowner, Greg Hoevener, of the issue and with his permission the plants were chemically treated.

The entire infestation of kudzu, found by the Jackson County REMC on CR 900, is less than an acre in size and was treated for the third consecutive year using a combination of techniques (hand cutting and herbicides). Observational data suggests that stem density and overall abundance of this plant has been greatly reduced, indicating that our control efforts are succeeding.

In 2007, the tree-of-heaven population near Turkey Trail was chemically treated; monitoring of this area will continue in the future. New infestations were found along Richart Trail and were treated but were not mapped. Three solitary trees were reported by WB Wood near Quarters 40 but were not treated.

Some garlic mustard was mapped by the interns during 2007. The maps were created utilizing visual estimation techniques and hand written on paper maps. This data was not included in the Bordenkecher final report as several of the paper maps were misplaced prior to her receiving them. Several groups of students were engaged in the hand-pulling of garlic mustard plants from numerous target sites on the refuge in 2007.

Most of the known infestations of Japanese stiltgrass were mapped and initially treated; however, a second round of Japanese stiltgrass growth occurred resulting in less than expected control for many of those infestations. Treatments were either mechanical (mowing or cutting), chemical (glyphosate or sethoxydim), or a combination of the two.

A \$4,500 grant for volunteers to work on invasive plant removal was received during the year. The refuge project was autumn olive removal from the Visitor Center area. Volunteers made a noticeable dent in the trail autumn olive population during the year. The cambium layer of the freshly cut stumps were treated with table salt to see if it would prevent re-sprouting. Initial results were very good.



Many hands, and many trips to the dump site, were needed to make a dent in the autumn olive bushes on the Chestnut Ridge Trail. Credit: D. Stanley



## FISH AND WILDLIFE MANAGEMENT

### **4a. Bird Banding**

No duck banding occurred on the refuge in 2007. The bird banding permit for the refuge expired and was not renewed. Future efforts to band will first require a new permit.

### **4b. Disease Monitoring and Treatment**

August of 2007 ushered in a wave of reports of dead or dying deer. Near the end of the month staff had confirmed 11 deaths and visitor reports began to inundate refuge staff. Many of the dead deer were spotted in the water in several impoundments. IDNR district biologists Nate Yazel and Chris Grauel assisted by WRS Knowles and WB Wood collected and shipped tissue samples for laboratory testing at the Southeastern Cooperative Wildlife Disease Study in Athens, Georgia. Results of lab work confirmed the presence of a virus that causes epizootic hemorrhagic disease (EHD). In total, 43 deer mortalities were confirmed through visitor and staff reports followed by verification by biological staff. Several more deer are suspected to have died without being included in the final count. EHD occurred to some extent in 2006 and reoccurred in 2007 after a nine year remission of the disease in the state. Speculation of state and federal wildlife biologists is that the drought has produced perfect conditions for extreme reproductive success of the vector, a biting midge, by evaporation of wetlands leaving behind the mucky habitat needed by the insects for breeding. The outbreak was fairly widespread throughout much of the country occurring in over twenty states from Texas to New York. In Indiana, EHD spread rapidly across 41 counties and is believed to be the worst outbreak in state's history. At Muscatatuck NWR deer mortality peaked in September and lasted until mid-October when the first frost likely killed off most of the midges.



IDNR Biologists Grauel and Yazel perform a field autopsy on a dead deer to acquire samples to send to wildlife lab for confirmation of EHD disease. Credit: S. Knowles



Refuge staff received reports of disoriented, friendly, or confused raccoons in September 2007. WB Wood responded to complaints and assumed these animals were suffering from the effects of distemper, although no tissue samples were taken nor were any laboratory analyses completed.

Refuge staff were vigilant for signs of avian influenza, West Nile disease, and chronic wasting disease on the refuge in 2007. No cases were reported.

#### **4c. Reintroductions**

For the sixth year in a row, whooping cranes led by ultra light aircraft visited MNWR. Eighteen whooping cranes and the Operation Migration (OM) crew arrived on November 17, 2006, to the delight of several visitors who got a glimpse of the birds in the air. On November 18, 2006, the planes and cranes left MNWR while spectators watched the departure flyover on the way to Shelby County Kentucky.

The project used the same secluded field as last year for a landing strip and overnight penning of the cranes. The project is part of an international partnership effort to establish a migrating flock of whooping cranes in the Eastern United States. All portions of the stop-over went well, with refuge staff accommodating needs of the cranes, aircraft, and ground crew. Muscatatuck NWR is the only national wildlife refuge on the stop-over schedule between the winter breeding sites of Necedah NWR and the wintering grounds at Chassahowitzka NWR.

Biotech Dailey and WRS Knowles monitored the Brownstown bottoms for whooping cranes from November 2006-March 2007 to assist the Whooping Crane Eastern Partnership (WCEP) Senior Project Biologist, Richard Urbanek. Thousands of sandhill cranes were present most of this winter. A total of six cranes were tracked with telemetry using the migration route.



The Ewing Bottoms at Brownstown attracted thousands of sandhill cranes, plus some other neat visitors in December 2006. (Note the three whooping cranes-two juveniles and an adult, and two white pelicans). Credit D. Kaiser

#### **4d. Provide Nest Structures**

Some of the 30 bluebird boxes mounted on refuge sign posts (monitored by volunteer King) were removed this year during sign maintenance. Of the remaining boxes, six were used by bluebirds and most of the others used by wrens.

#### **4e. Native Animal and Predator Control**

Beaver continue to plug water control structures especially during greentree unit and moist soil unit draw down activities. Affected structures requiring maintenance staff time to clean out include G1/Moss Lake, G1/M7, M3, M4, M5, Lake Linda, Display Pond, M2, M8, M9 M10, Wood duck pond, Persimmon pond, and G3. Beaver dams backing up drainage are beginning to affect the integrity of some of our forests and affect our water management goals in the moist soil units and greentree units and take a number of maintenance hours. We are in the process of developing a beaver and muskrat control plan and a non-Law Enforcement (LE) firearms use protocol for the refuge.

Musk rats continue to damage dikes especially M8, M7, M9, Moss Lake, and M2. At this time the only control method being used is water elevation changes. This has not been successful.

#### **4f. Invasive Animal and Other Invasive Non-Plant Taxa Management**

The IDNR continued to place and monitor gypsy moth (*Lymantria dispar*) traps on the refuge. All traps were negative for gypsy moths in 2007.

In 2007 a SUP was issued to IDNR, Phil Marshall to conduct emerald ash borer (EAB) surveys. Results for the EAB survey were negative in 2007.

As in many other natural areas, the presence of feral cats (*Felis catus*) has become a problem on MNWR. Although we have no studies measuring the impact of these animals on refuge wildlife, the frequency with which the animals are spotted suggests that they are abundant. In an effort to decrease the impacts of these non-native predators, Biotech Dailey began a trapping effort using live traps baited with tuna fish. Several traps were stolen during the year, but we began chaining the traps to nearby trees and the problem was eliminated. Throughout the year a total of 12 feral or abandoned cats were captured, either by hand or with live traps, on the refuge. Captured animals were released to Jennings County animal control for adoption or disposal.

## **COORDINATION ACTIVITIES**

### **5a. Interagency Coordination**

WRS Knowles continues to work with Natural Resources Conservation Service (NRCS), Soil and Water Conservation District (SWCD), and IDNR with Wetland Reserve Program and Partners for Fish and Wildlife and other joint projects concerning the Muscatatuck River Basin and watershed. She worked with local work groups to review and update the local resource concerns that need to be addressed for Jackson, Jennings and Washington Counties that was facilitated by the SWCD and NRCS.

WRS Knowles worked with IDNR District Biologist McGriff to tour the refuge and discuss forest management and forest restoration. Mr. McGriff will help with tree planting plan recommendations for forest restoration.

WRS Knowles was contacted by NRCS in Jennings and Washington Counties in December 2006 and fulfilled their request for input from the refuge for the local work group ranking of local resource concerns.

WRS Knowles worked with INDOT Jack Monroe and they coordinated the Department of Corrections picking up trash along Highway 50 and Highway 31 throughout the year.

WRS Knowles attended a meeting in March 2007 with INDOT in reference to the US 50 North Vernon corridor planning and EAS in reference to widening Highway 50 along the refuge northern border. RM Webber and WRS Knowles met with the environmental firm Bernardin-Lochmueller & Associates (BLA) that is doing the initial work on the project for INDOT and express refuge concerns. The project progress was monitored by WRS Knowles throughout the year.

Muscatatuck interns assisted IDNR with goose banding on June 13, 2007 at Crosley State Fish and Wildlife area and at Krueger Lake in Jefferson County Park located near Big Oaks NWR.

WRS Knowles continued to work with the Experience Works program to encourage enrollees and the refuge continues to serve as a host agency for the program. Two enrollees John Gaffney and Ken Ketcham worked during the year. John Gaffney completed his training and went on to another employment opportunity.

WB Wood and WRS Knowles coordinated with Jackson County REMC on the easement clearing of their line on Jennings CR 900 East. REMC did trimming, spraying invasive species (autumn olive), mowing and mulching of the debris.

MM Pike was detailed to Big Oaks NWR for four days in August to do road grading and other maintenance.

This year's annual conservation field days were held in May for Jennings County and October for Jackson County. The refuge does this program as a collaborative effort for environmental education with students working their way through rotating stations. The sessions consist of wetlands, wildlife, forestry, soils, geology, and recycling. The sessions were taught by personnel from Purdue Extension, Jackson and Jennings County SWCD, IDNR, NRCS, Jackson County Solid Waste Management District, and

the refuge.

IDNR Conservation Officers and Division of Fish and Wildlife employees were of great help to the refuge with enforcement and deer and turkey hunting drawings. RM Webber, Outdoor Recreation Planner (ORP) Stanley, and Big Oaks staff met with IDNR Biologist Mitchell on deer permit numbers on July 18. The IDNR Bloomington Office does the random drawing for refuge turkey and deer permits, mails information to hunters, and provides a list of drawn hunters to the refuge. When a problem this year required us to mail the 2,600 hunting leaflets out (instead of the State) we were reminded of what a valuable service the IDNR does for us.

The refuge ORP spent considerable time working with the Jackson County Visitor Bureau on the Wings over Muscatatuck bird festival. A meeting was held monthly from January through April, usually at the Jackson County Visitor Bureau. The ORP lines up the bird festival program, group participants, and volunteer help. The Visitor Bureau gave outstanding support to the festival this year by creating the festival brochure, contributing printing, doing advertising in State publications, recruiting vendors, and assisting with grant applications for the festival. They also lined up a sizeable donation of artistically painted birdhouses this year that were available at the festival and brought almost \$800 in donations to the MWS bird festival fund.

Personnel from many different agencies including the Indiana Geological Survey, Purdue Extension, IDNR, Monroe County Parks, U. S. Forest Service, and Beckham Bird Club assisted FWS staff in instructing refuge Master Naturalist classes (see Section 7a).

#### **5b. Tribal Coordination – N/A**

#### **5c. Private Land Activities**

Muscatatuck NWR staff and local NRCS staff have concentrated Wetland Reserve Program (WRP) efforts in the Muscatatuck River basin and a lot of interest has been generated. In the Muscatatuck River Watershed there are currently (FY07) 90 easements totaling 5,682 acres of land under WRP easement protection.

WRS Knowles provided technical assistance to NRCS for the ranking of nine potential WRP applications. Eight of these are in Jackson County and one is in Jennings County. The total acres in the nine applications are 373.2. She is the FWS member of the WRP Wetland Evaluation Team with USDA-NRCS for the 22 county southeast Indiana area.

RM Webber and Refuge Officer Travis Robison visited four Conservation Easement sites in Delaware and Henry counties on March 3, 2007. No significant problems were noted. This is part of our effort to visit each easement every other year.

WRS Knowles and intern Carter conducted a field check of the Schepman WRP application July 16, 2007 at the request of NRCS. A confirmation was made of the presence of copperbelly watersnake on the property via examination of photography from a recent road kill. The information was sent to IDNR for inclusion into the heritage database.



## **RESOURCE PROTECTION**

### **6a. Law Enforcement**

Muscatatuck National Wildlife Refuge saw many changes to its law enforcement program during 2007. The greatest change occurred when the refuge's only law enforcement officer, Travis Robison (based at Big Oaks NWR), returned to active duty with the U.S. Army early in the year. With the refuge left without a steady law enforcement presence throughout the year, management called upon other Refuge Officers within the southern part of the region to assist with critical patrol periods. Refuge Officers from Southern Illinois conducted nearly a dozen separate patrols of the Muscatatuck NWR throughout the 2007 year, and in doing so we were able to provide the public and refuge resources adequate protection.

A number of incidents were reported to Refuge Officers during 2007. They included trespass in closed areas, off-road use of vehicles, illegal deer hunting, reckless driving, vandalism, sign and live-trap theft, hunting out of season, hunting in closed areas, unauthorized boating, illegal dumping, public nudity, unauthorized release of animals onto refuge (including dumped cats and dogs), lock-ins, abandoned vehicles, and fishing in closed areas. Speeding was another problem and several Canada geese were run over at different times along the Auto Tour Route. The Hackman Overlook and Wood Duck Trail bridges were decorated with obscene graffiti during the year, and there was a report of a meth lab that was not found.

On November 21 a motorist called and reported witnessing two men driving north on County Road 900 while "oil" drained from a towed vehicle. Refuge Officers Donaldson (Cypress Creek NWR) who happened to be in the area, and Robison responded to the scene where they discovered what appeared to be transmission fluid dumped/drained on the road. The fluid had drained in the center of the road for over three miles and also on refuge property.

Further investigation resulted in finding and interviewing the suspect. During the interview the suspect admitted to draining transmission fluid and attempting to deceive law enforcement officers by deliberately dumping gallons of transmission fluid in the bed of his tow truck in order to claim it as the source of the liquid. Two citations were issued to the suspect and he paid his fines. No environmental clean-up was necessary due to the small quantity of fluid lost.

State Police officers worked two patches (23 plants) of marijuana being cultivated on the west side of the refuge and made two arrests from stakeouts and surveillance relating to one patch. A State Police officer also found two boys, six and seven years old, playing alone at the edge of Mutton Creek (a deep, wide creek) in July with their wagon which they apparently dragged about a mile from their house. The State Police Officer took the boys home, found marijuana at the home, and arrested the parents. It was believed the parents were involved in at least one of the refuge marijuana patches. The cases were in the court system at the end of the year.

All incidents were reported and documented by other non-law enforcement personnel, other law enforcement agencies, the general public, or by Refuge Officers on patrols.

Despite the lack of a continuous law enforcement presence on the refuge, law enforcement officers with the U.S. Fish and Wildlife Service, Indiana State Police, and the Indiana Department of Natural Resources in 2007 reported nearly 70 law enforcement incidents, with approximately half of those incidents being followed up with either a citation or written warning.

#### **6b. Permits and Economic Use Management**

Six biology special use permits were issued during FY 07 for scientific studies and one permit for public use management (see section 1b for summary of the scientific studies).

#### **6c. Contaminant Investigations - Nothing to Report**

#### **6d. Contaminant Cleanup - Nothing to Report**

#### **6e. Water Rights Management**

The 2007 water management plan was written and approved March 13, 2007.

#### **6f. Cultural Resource Management**

Volunteers helped maintain the Myers Cabin and Barn during the year. Both structures are in good condition due to the efforts of our friends' group, the Muscatatuck Wildlife Society (MWS) in past years. Volunteers from the MWS also maintained the grounds around the cabin and barn with almost weekly mowing and litter pick-up. In past years, volunteers have also done extensive work repairing cemetery stones in the Myers and Barkman cemeteries.

A "history book" about the settlements and families who lived on the refuge prior to its establishment was written by volunteer Phil McClure during the year after years of extensive research. The book should arrive at our bookstore in February 2008.

Considerable archaeological work has been done on Muscatatuck over the years and many sites of the Woodland occupation have been located here. A large ceramic pot found in pieces at the Sandhill site was reconstructed and is housed at the Glenn Black Museum in Bloomington, IN along with all other Native American artifacts found here.

#### **6g. Landownership Support - Nothing to Report**

## PUBLIC EDUCATION & RECREATION

### **7a. Provide Visitor Services**

The operation policy of the Visitor Center changed this year. The building, opened in 1976, had always been open to visitors with or without staff presence (the Office/Bookstore area was locked). This year the policy changed and the building was open only when staffed. Locks were changed on January 18. Volunteers continued to staff the building every afternoon and some mornings.

Thirty-seven people attended an Indiana Master Naturalist class held at the Visitor Center on Sunday afternoons in October and November. Another 17 people attended evening classes held on Monday evenings in April and May. Participants attending seven of the nine course sessions and donating 27 hours of volunteer time to a public agency received a "Master Naturalist" pin and certificate. Classes included sessions on invasive species, geology and fossils, tree identification, use of keys and field guides, wetlands, birds, compass/maps/ GPS units, insects, reptiles and amphibians, and raptors.



FWS Biologist Forrest Clark talks to the spring Master Naturalist Class about wetlands. Credit: D. Stanley

Muscatatuck celebrated its 40<sup>th</sup> birthday on the morning of October 14 with special programs at the Visitor Center attended by approximately 70 people. Refuge Supervisor Jon Kauffeld attended the event and spoke briefly followed by RM Webber and Indiana University Professor Rob Fischman. The Muscatatuck Wildlife Society provided birthday cake and special anniversary pins to those attending the program.





Left to right - Lois Scheffe, Maxine Wolfal, and Norma King watch RM Webber and STEP Student Wallace light birthday cake candles. Lois was present, with her husband RM Charles Scheffe, at the establishment of the refuge. Credit: D. Stanley

The annual Muscatatuck Wildlife Society's "Log Cabin Day" festival at Myers Cabin followed the morning programs. The refuge "closed area" was also open to walk-in visitors (as usual during Refuge Week). Approximately 600 people attended the Saturday festival. This event features a free lunch, old-time crafts, music, a blacksmith, an interpreter with wildlife skins and bones, and a refuge intern with a spotting scope and eagle information in the closed area.

"Nature of Learning" programs were given to 55 Girl Scouts from North Vernon during October. The programs focused on refuge management and how girls can get involved with conservation.

About 100 people attended the departure fly-over of the ultra-light led whooping cranes from Muscatatuck on November 18. The crane "fly-over" of the Sandhill Pond parking lot has been an annual public event when the whoopers leave the refuge and, despite the uncertainty of a flight on any given day, a large crowd is usually present. Operation Migration staff use the fly-overs as public relations opportunities to explain their program, and have made many enthusiastic friends on their visits here.

The annual refuge deer hunt for permit archery and muzzleloader hunters was held December 9-24. A late open archery hunt was held from December 25-January 7. Sixteen Hundred archery and 480 muzzleloader deer permits were given out during the permit hunt. Each of the drawn hunters could bring a partner with the same weapon effectively doubling the potential harvest. Two hunter registration boxes were available (one at each gate) and refuge deer hunters were required to register their kill. The registrations indicated 111 deer were taken during the special permit archery and muzzleloading gun hunt, and one deer was taken during the late archery season.



Refuge hunters are required to sign the refuge hunting leaflet (indicating they have read the regulations) and carry it with them while hunting. The refuge allows turkey, squirrel, rabbit and quail hunting (in addition to deer hunting) in certain areas.

Muscatatuck manages the Indiana Junior Duck Stamp Contest and there were 463 entries this year. Judging took place March 24 and the winning entry was by Seth Spradlin, a home-schooled student from Westport. The awards ceremony was held at the Visitor Center during Wings Over Muscatatuck and attended by approximately 60 people from all over Indiana. The winning first, second, third, and honorable mention artwork is kept on display on the walls of the Visitor Center Auditorium for one year before being returned to the student.



Seth Spradlin, a home-schooled student from Westport, was the 2007 Indiana Junior Duck Stamp Art Contest Winner.

A "Wetland Day" program on a Saturday in mid-March featured a guided refuge tour, otter program, and displays of wildlife game boards by the Refuge Rangers at the Visitor Center. There were lots of migrating ducks to be seen on the refuge that day and approximately 100 people visited.

MNWR's turkey hunt covers 13 days in April and May. An IDNR drawing allows 10-15 permits to be issued each day. Only seven turkeys were reported taken. Hunting is permitted in the same area as deer hunting. Hunters are required to check their bird at the refuge office.

Wings Over Muscatatuck, our migratory bird festival, was held May 12, 2007. We had good weather. 600-800 people attended the festival which ran from dawn to dusk. Features were guided bird tours of the refuge closed area, bird walks, kids activities, live birds of prey, a bald eagle, interpretive programs on birds, butterflies, invasive plants, and frogs, the Junior Duck Stamp awards ceremony, and a refuge volunteer dinner. Vendors and booths by conservation organizations were also present. This event is heavily supported by the Jackson County Visitor Bureau and the MWS.





First-place Junior Duck Stamp Contest Winners at Wings Over Muscatatuck. Credit: D. Kuhlman

The Refuge Rangers "Kids Field Guide to Muscatatuck" was finished in May and is free to students visiting the refuge. The guide features wildlife and plants commonly seen here with text and photos. It was funded by a \$5,000 Nature of Learning grant obtained by group advisor Lori Kendrick. Printing was funded by the MWS with donations by North Vernon newspapers (Plain Dealer and Sun). The project received good publicity and along with student letters to Congressman Baron Hill, he and his staff visited the refuge on July 2 for a short Refuge Ranger led tour. RM Webber and Congressman Hill spoke briefly before everyone boarded a school bus for the tour.



Congressman Baron Hill with the Refuge Rangers during the refuge tour. Credit: L. Kendrick



Work began on the main entrance three-panel kiosk on May 31 and completed in July. The structure is a standardized design for our Region and located just northeast of the main gate. The kiosk was built by volunteers Mark Wolfal, Phil McClure, and Dick Shrake, who did an excellent job on the structure. As the year ended the exhibit panels had not yet been received.



Volunteers Wolfal, Shrake, and McClure construct a three-panel kiosk. Credit: D. Stanley

Our annual Take A Kid Fishing event was held June 2, 2007 and was attended by approximately 300 children and their parents on a very hot day. Fishing was again permitted in the Office Pond to facilitate bank fishing. Large numbers of largemouth bass were caught but very few bluegill. As usual, contests were held for the most and biggest fish, casting distance and accuracy, and fish art. Hayden Boy Scout Troop #518 provided the food concession. Trophies and door prizes were donated by the MWS.



This young woman was very pleased with her catch (weighed by volunteer Marilyn Strickland). Credit: D. Stanley

"Junior Birder" and "Nature Stories" programs for youngsters were given at the Visitor Center on various dates during the summer by Visitor Services Intern Elyse Billman. The Junior Birder program involves hands-on learning about birds, field guides, and binoculars, and awards participants with a patch on completion of the several hour session. The program is being funded by MWS as a memorial to refuge volunteer John Favinger, our "resident" bird-man.

Personnel from the Indiana Tourism Commission visited Muscatatuck with Jackson County Visitor Bureau staff on June 27.

The Indiana Turkey Federation held a "Women in the Outdoors" program for 41 women at the Visitor Center on July 14. The program was once again a great success. Topics of instruction included canoeing, outdoor cooking, archery, orienteering, shot-gunning, turkey hunting and calling, self-defense, and handgun use.

Six mounted fish donated by taxidermist Dave Witters were installed in the Conservation Learning Center display in September. Plans are to add additional mounted animals to the display including a swimming beaver and more fish. Progress on the display depends on the schedule of the "volunteer" taxidermist, and he was swamped with his own work for most of the year.

The ORP spent time providing contractors from Wilderness Graphics with material for new Visitor Center exhibits during the year. The exhibits will fill the old lobby and auditorium of the original building and are developing nicely. Part of the project will involve reworking the entrance of the refuge bookstore and installing new counters, sliding glass doors, and display cases.

#### **7b. Outreach**

Visitor Services Intern Kate Greeman assisted refuge staff with an Intern Fair at Purdue University October 3. ORP Stanley staffed booths at Intern Fairs at Indiana University on October 25 and February 6 (Biotech Dailey assisted) and Ball State on January 23.

Muscatatuck NWR, Big Oaks NWR, and National Conservation Training Center (NCTC) staff operated an exhibit at the 77th National FFA (formerly Future Farmers of America) Convention in Indianapolis October 24-27. The convention focused on careers and was attended by approximately 47,000 students, advisors and guests. Booth exhibits included the Suitcase for Survival, Conserving the Nature of America, a USFWS Law Enforcement exhibit, and a "Risky Critters" Wildlife Jeopardy game. Refuge staff provided teacher packets this year which were quickly snatched up. This was the 27<sup>th</sup> year FWS has participated in the national agricultural career fair.





Biotech Theresa Dailey talks to FFA youth about wildlife. Credit: D. Stanley

Muscatatuck Wildlife Society volunteers took refuge information and books to the Indiana Woodland Owners Association Conference in Columbus November 3-4.

Hayden School's Refuge Ranger group was active during the year doing volunteer work, working on the field guide, and learning about the refuge. Several refuge staff members gave programs to the group during the year.

In December, WRS Knowles and Biotech Dailey attended a program "Nature at Play" at Ball State University that former intern Roumie was a part of and they discussed recruiting of interns with Dr. Islam and Dr. Brown.

WRS Knowles helped coordinate an Arbor Day/Earth Day 2007 program with Principal Comer at Vienna Finley Elementary School April 27, 2007. Three hundred students and staff in grades K-5 participated. The teachers incorporated conservation education in special programs throughout the week. This annual program conducted by teachers, features environmental education learning stations for students and then all participants went home with a tree seedling to plant. This is the 17th year for this program.

The ORP and Muscatatuck Wildlife Society volunteers staffed two booths and distributed refuge and Junior Duck Stamp information at the Hoosier Association of Science Teachers Conference in Indianapolis February 7-9. At least 2,000 teachers normally attend the event and it is an excellent way to contact teachers.

The ORP and the Big Oaks Refuge Manager had refuge and wildlife information available at a "Nature Day" program for students and parents at Hayden School April 27.

The ORP gave a program on Backyard Birds at a Jennings County Soil and Water Conservation District Workshop April 28, a Seymour Library program on wildlife in June, and a whooping crane program to 70 senior citizens in Vernon in July.



The refuge had an exhibit and CCP information available at the Jackson County Fair July 22-28.

New outreach leaflets developed by Intern Billman during the year included mammal, herps, and butterflies of Muscatatuck. Billman spent considerable time updating our species list and did an excellent job with the handouts.

### **Volunteers/Work Programs/Cooperating Associations/Friends Groups**

Approximately 10,886 volunteer hours were recorded during the year by approximately 200 volunteers. Volunteers continued to staff the Visitor Center most afternoons and some mornings. Most volunteer hours at Muscatatuck are in the Visitor Service category and are donated by many different individuals. Recreation and EE accounted for 4,100 hours, maintenance was 3,449 hours, wildlife and habitat was 2,746 hours, cultural resources was 300 hours, and a mixture of other jobs accounted for 291 hours. College student interns were also very helpful in assisting with invasive plant control, wildlife monitoring and studies, and various maintenance activities.

Volunteers continued to assist with Christmas and May Day bird counts and the refuge butterfly count.

Visitor Services Intern Kate Greemann worked at Muscatatuck from fall through February and also assisted with biological work. Visitor Services Intern Elyse Billman arrived in June and left in August.



Visitor Services Intern Elyse Billman. Credit: T. Dailey

In April volunteers made a major offensive against garlic mustard on the refuge. Scouts, 4-H youth, Hayden School students, Trinity Lutheran High School students, Timberland Store employees, master naturalists, individuals, even a UPS driver parked her truck at Turkey Trail to pull garlic mustard before it went to seed. Overall



approximately 500 hours were donated during the month by volunteers working with the ORP and Biotech.



Timberlain Store employees and many others pulled garlic mustard along road-sides in April. Credit: D. Stanley

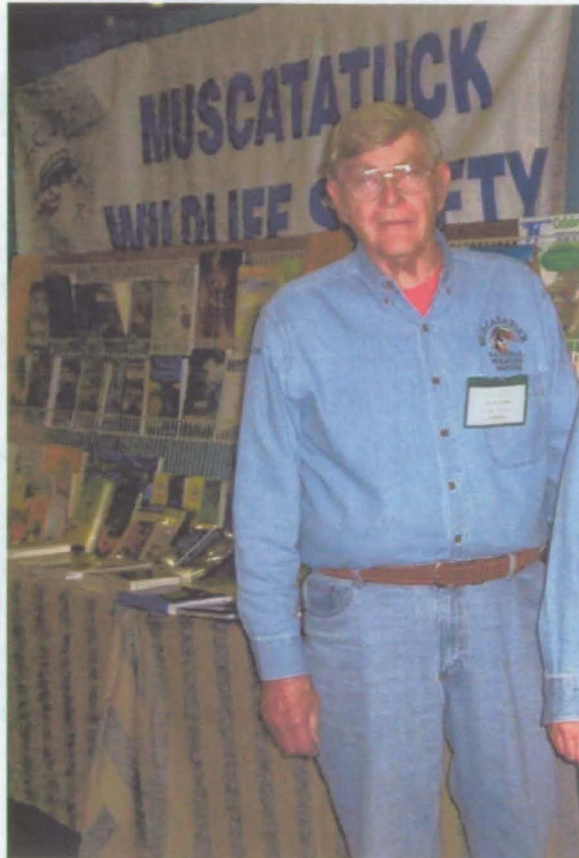
Biological Interns working May-August were Robert Winebrenner, Molly Coffin, Stephanie Everroad, Justin Kapitan, Patrick Whitson, and Evin Carter. As usual the interns accomplished a tremendous amount of work for the refuge.



Summer interns self proclaimed the "A Team" included Robert Winebrinner, Stephanie Everroad, Justin Kapitan, Molly Coffin, Patrick Whitson, and (not pictured) Evin Carter. Credit: S. Knowles



Muscatatuck suffered a major loss on Aug. 20 when volunteer Mark Wolfal passed away suddenly at home at age 70. Mark had volunteered more hours on Muscatatuck than anyone else ever had (over 9,200 hours). Mark, who started volunteering at the refuge while still working for the telephone company, was a master carpenter who had added on to the Visitor Center, repaired Myers Cabin and Barn, built observation decks and fishing piers, worked special events, banded ducks, and did whatever he could to make the refuge a better place. Mark was an exceptional person and leaves a big hole in the refuge volunteer program.



Mark Wolfal was a regular at the HASTI Conference and will be greatly missed at Muscatatuck. Credit: D. Stanley

Two National Public Lands Day volunteer work-day events (September 22 and 29) were attended by 43 people who worked on a variety of projects around the refuge including trash pickup, autumn olive removal, lime spreading at the entrance kiosk, trail trimming, guard-rail and ditch brushing, and Visitor Center weeding and mulching. The refuge provided the workers lunch.

Two Eagle Scout projects took place on Turkey Trail during the year. Adam Luecke and Zachary Smith built recycled lumber bridges and graveled wet spots on the trail to provide safer, accessible, surfacing on the trail in wet conditions. Turkey Trail covers a great diversity of habitat and has some interesting "seep" areas that sometimes make wildlife observation an adventure.



A volunteer dinner was held at the Visitor Center on May 10 and attended by approximately 30 volunteers and staff. RM Webber gave an update on current events at Muscatatuck, fielded questions, and showed a program on "Birds of the Hawaiian Islands National Wildlife Refuge".

The MWS funded many refuge projects during the year. Total bookstore revenue was \$34,630 with the store providing most of the MWS income. The group is a membership organization with approximately 400 dues-paying members. There are seven board members who attend monthly meetings. During the year, board member Kelly Misamore of Madison resigned and replaced by Gary Dorman of New Albany.

Big projects for the year supported by the MWS were donations of \$3,000 to invasive species control, \$3,100 to tree-planting, and approximately \$1,000 for Jr. Duck Stamp Contest awards. They also partnered on the Master Naturalist and Public Lands Day programs. The group sponsored Take A Kid Fishing Day, Wings Over Muscatatuck, the Log Cabin Day festival, the Junior Birder program, paid for the mowing of the River trails, the printing of the quarterly newsletter, food for the Biological Review and refuge birthday party, anniversary pins, trophies for fishing day, the compilation of a refuge history book, parts of the kids field guide to the refuge, trail signs for wood duck trail, and the fees for bird count participants. Several group members provided a hot lunch for participants in the Christmas Bird Count. The MWS paid for the installation of window film on the south side of large breezeway windows between the two wings of the Visitor Center. The film installation has stopped lethal bird hits on the south side windows.

MNWR has teamed with Experience Works since 1966. The refuge has one Experience Works employee, Ken Ketchum. Webb Jaynes, a former Experience Works employee came back and helped out for a few days during the year as a volunteer.



Experience Works Laborer Ken Ketchum. Credit: T. Dailey



## PLANNING AND ADMINISTRATION

### **8a. Comprehensive Conservation Planning**

Muscatatuck NWR's Comprehensive Conservation Planning (CCP) effort got underway with a two and a half day "kick-off" meeting held March 7-9. Our full staff attended along with John Schomaker, the Regional Office planner assigned to coordinate our CCP effort, Tom Larson, Chief of Planning, Mary Mitchell, RO GIS Specialist, and Jon Kauffeld Refuge Supervisor for Indiana.



Round table discussion at CCP "kick-off" meeting. Credit: M. Mitchell

At this meeting Schomaker presented a schedule with deadlines for specific accomplishments, guidance on how phases of the CCP would be completed, and outlined the roles and responsibilities of Regional Office and MNWR Staffs. John told us to expect to be in a process that would take 16 to 24 months to complete.

The entire staff including Refuge Officer Robison met on April 11 and May 2 to work on a Vision Statement for the refuge and the CCP. After minor corrections, our statement was finalized as:

*As the land of winding waters, treasured for generations, Muscatatuck National Wildlife Refuge honors its heritage and connects visitors with the natural environment by conserving a rich mosaic of sustainable habitat for a diversity of wildlife and plants.*

A CCP Public Scoping Meeting was held on May 22 from 3:00 to 8:00 PM at the Visitor Center on the refuge. Press releases were sent to all local newspapers, and radio and television stations, announcing the meeting and inviting the public to attend and submit



comments on all aspects of MNWR management, history, public uses, and issues. Additionally, comment forms and a planning update were sent to the refuge's newsletter mailing list members.



Refuge neighbors Richard and Kay Schwade share thoughts about the refuge with WRS Knowles at the CCP Public Scoping Meeting. Credit: Seymour Tribune

About 30 people attended the meeting and discussed the refuge with staff and our RO Planner Schomaker. IDNR CCP liaison Jim Gerbach and IDNR Director Glenn Salmon also attended. Trent Deckard, Field Representative for Congressman Baron P. Hill, also attended the scoping meeting as did a representative from the Jackson County newspaper. Comments were received from about 25 meeting attendees that evening, and additional comments came in throughout the rest of the reporting year by mail, email, and fax.

The next phase of the CCP process involved the refuge holding a Biological Program Review. This effort was planned and led by Regional Wildlife Biologist Pat Heglund, supported by MNWR staff, with noteworthy assistance from WRS Knowles and our interns. The Muscatatuck Wildlife Society generously provided all of the participants with lunches, snacks, and drinks during the meetings, which helped keep us well fed and saved us from having to take lengthy breaks to travel off refuge. A detailed notebook on refuge resources was assembled and distributed to all participants. The notebook has become a valuable reference guide to the refuge with sections on all topics well supported with maps and graphics, many of which were created by Regional Office GIS Specialist Gabe DeAlessio. In addition to WB Heglund, RP Schomaker, RM Webber, WRS Knowles, and WB Wood from the Regional Office and the refuge, attendees included:

Dr. Katie Gremillion-Smith, Chief Wildlife Diversity Section IDNR



Dr. Bruce Kingsbury, Purdue University, Fort Wayne  
Dr. Vicky Meretsky, Indiana University  
Dr. Joe Robb, Project Leader Big Oaks NWR  
Dr. Leigh Frederickson, Wetland Management and Educational Services Inc.  
Michael Homoya, Botanist/Plant Ecologist IDNR  
Rick Speer, Refuge Operations Specialist Mingo NWR  
Lori Kendrick, Member, Board of Directors Muscatatuck Wildlife Society  
Jerry Roach, Resource Conservationist USDA NRCS  
Rick Ward, USFWS Private Lands Biologist for Northern Indiana  
Michelle McDowell, Wildlife Biologist Rice Lakes NWR



MNWR Biological Review Team Members discuss forest management issues near Lake Linda.  
Credit: M. McDowell

Additionally, the following could not attend the review, but agreed to send in written comments:

Ellen Jacquart, Director of Stewardship, IN Chapter of the Nature Conservancy  
Dr. Brian Miller, Extension Services, Purdue University  
Lori Pruitt, USFWS Wildlife Biologist, Bloomington Field Office





MNWR Biological Review Team Members discuss MNWR water management and the potential for changes to the moist soil units in the Waterfowl Sanctuary alongside M7. Credit: M. McDowell

The meeting discussions were active and detailed with numerous ideas and opinions expressed on the conservation contributions and potential of the refuge, and the options for the direction of future management. WB Heglund collected all of the minutes and comments from the participants and is assembling a summary report for the refuge.



WRS Knowles explains MNWR water management issues in the Waterfowl Sanctuary by a water control structure on G2. Credit: P. Heglund

RM Webber traveled to the Regional Office on August 27 and delivered a report on refuge progress on the CCP with an overview of resource and management issues at the refuge. Planning meetings were also held with Schomaker, Stanek and Kauffeld.

Starting early in FY'08 refuge staff are scheduled to meet again with members of regional planning team to prepare a draft matrix of alternatives for the CCP. Additionally, staff will be given preliminary drafts of the first three chapters of the CCP to add background information and details on refuge history and resources.

The station Safety Plan and Hazard Communication Program was written and sent to RO safety in August 2007. This included a review of all materials used on the refuge and updating the Material Safety Data Sheet (MSDS) files.

## **8b. General Administration**

### **Personnel**

- Marc Webber, Refuge Manager, GS-12, PFT
- Susan M. Knowles, Wildlife Refuge Specialist, GS-12, PFT
- Donna Stanley, Outdoor Recreation Planner, GS-9, PFT
- Dan Wood, Wildlife Biologist, GS-7, PFT, EOD 8/6/2007
- Mark Rarey, Administrative Support Assistant, GS-7, PFT
- Theresa Dailey, Biological Science Technician (Wildlife), GS-5, TFT
  - Position Terminated on 5/30/2007
- Frederick (Rusty) Pike, Maintenance Mechanic, WG-9, PFT
- Joshua Wallace, Laborer – STEP Student, WG-1, TPT
  - Position Terminated on 4/28/2007
- Travis Robison, Park Ranger (LE), GS-9, PFT
  - Assigned to Big Oaks NWR with 50% of time spent at MNWR
  - Resigned Position on 5/30/2007 to Return to Military Service

The comfort station at Persimmon Pond parking area was found to have a defect in the vault in March 2007 and work began by CFM Jake Jacobson, MM Pike and WRS Knowles to put in a claim with Romtec for a latent defect warranty resolution. The comfort station was closed to the public and at years end the claim was still being considered.

In March 2007, Muscatatuck NWR suffered a loss with the passing of former Administrative Technician, Roger G. Blasdel. Roger had worked at Muscatatuck for more than 15 years and was a tremendous asset to the staff. He will be remembered for his dedication to the refuge and missed by all who knew him.

A 2008 F350 Ford Crew Cab was delivered June 26, 2007. It is the replacement vehicle for the 1993 crew cab which was sold at GSA auction site.



MM Pike cleared the boat ramp of debris and sedimentation September 20, 2007 which was completed due to the drought causing low Stanfield Lake water levels.

In June 2007, Stapleton Enterprises LLC was contracted to install a new HVAC system in the headquarters building. The work consisted of removal and disposal of the existing furnace and air conditioning unit and the installation of a new 80,000 BTU high efficiency furnace and compatible 13 SEER heat pump.



This 30 year old furnace was replaced in June with an energy efficient furnace and heat pump unit. Credit: M. Rarey

Administrative Support Assistant (ASA) Rarey completed the work that he began on the basement. Before the work was started, the basement was determined to be unusable due to the volume of water that entered during inclement weather. Some of the basement walls were covered with old barn wood which had been damaged due to the rain leaking into the basement. This produced mold and rot around the bottom edges. There were also signs of a rodent nesting in the cardboard boxes making it nearly impossible to safely store items in the basement.





The basement before removal of barn wood and center wall and after removal of years of accumulated material. Credit: M. Rarey

Starting in October 2006, ASA Rarey hired a contractor, Green's Remodeling, to remove the old barn wood, false ceiling, and the center wall which had been erected to divide the basement in half. New basement windows were installed and well covers added to help reduce the amount of rain water that was entering the basement. ASA Rarey, assisted by RM Webber, then sealed the interior walls and floor. Joe Vogerl, a volunteer and retired electrician, was contacted and agreed to assist MM Pike with installing new lights. After all of the renovation work was completed, new shelving, plastic storage totes and cabinets were purchased and installed, giving each staff member their own storage area.

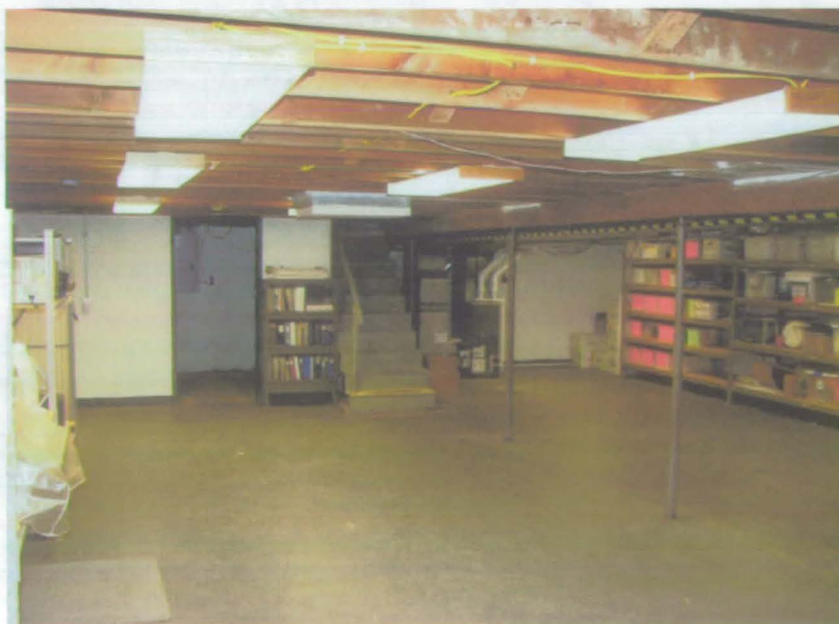


Removal of the barn wood paneling. Credit: M. Rarey



ASA Rarey sealing the walls and floor. Credit: T. Dailey

The results speak for themselves and have transformed an area that was not suitable for use into additional storage for the entire staff.



The basement after the renovation. Credit: M. Rarey

**8c. Funding**

Funds for operating the refuge the last six years are shown below. The figures reflect all funds appropriated and fund targeted as available to this station except quarters O&M.

FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
\$1,339,425	\$805,000	\$570,343	\$682,920	\$662,410	\$539,439

**8d. Feedback – Nothing to Report**



U.S. Fish & Wildlife Service



# Refuge Annual Performance Planning Workbook 2007



REFUGE MUSCATATUCK NWR

DATE 8/31/2007

## RAPP [Goal 1] [Muscatatuck NWR]

	2005		2006		2007		2008
	Actual	Target	Actual	Target	Actual	Variance	Target
<b>I. Habitat Condition Classification</b>							
<b>Class 1A Lands where management is not needed</b>							
1.01 Uplands, no management needed	0	0	0	0	0	0.0	0
1.02 Wetlands, no management needed	0	0	0	0	0	0.0	0
1.03 Open water, no management needed	0	0	0	0	0	0.0	0
1.04 Total Acres of Class 1A Lands	0	0	0	0	0	0.0	0
<b>Class 1B Lands receiving needed management</b>							
1.05 Uplands receiving needed management	550	550	550	550	499	(9.3)	514
1.06 Wetlands receiving needed management	1,200	1,200	1,200	1,200	1,200	0.0	1,200
1.07 Open water receiving needed management	400	400	400	400	400	0.0	400
1.08 Total Acres of Class 1B Lands	2,150	2,150	2,150	2,150	2,099	(2.4)	2,114
<b>Class 2 Lands where management is deferred</b>							
1.09 Upland management deferred	3,000	3,000	3,000	3,000	3,000	0.0	3,000
1.10 Wetlands management deferred	1,800	1,800	1,800	1,800	1,800	0.0	1,800
1.11 Open water management deferred	50	50	50	50	50	0.0	50
1.12 Total Acres of Class 2 Lands	4,850	4,850	4,850	4,850	4,850	0.0	4,850
<b>Class 3 Lands where restoration is deferred</b>							
1.13 Upland restoration deferred	384	384	384	384	435	13.3	420
1.14 Wetland restoration deferred	400	400	400	400	400	0.0	400
1.15 Open water restoration deferred	18	18	18	18	18	0.0	18
1.16 Total Acres of Class 3 Lands	802	802	802	802	853	6.4	838
<b>Total Acres by Habitat</b>							
1.17 Total uplands	3,934	3,934	3,934	3,934	3,934	0.0	3,934
1.18 Total wetlands	3,400	3,400	3,400	3,400	3,400	0.0	3,400
1.19 Total open water	468	468	468	468	468	0.0	468
1.20 Total of classified acres	7,802	7,802	7,802	7,802	7,802	0.0	7,802
1.21 Total Refuge Acres (from Realty)	7,802	7,802	7,802	7,802	0	(100.0)	0
<b>Riparian Mile Condition Classification</b>							
1.22 Riparian miles, no management needed	0	0	0	0	0	0.0	0
1.23 Riparian miles receiving management	0	0	0	0	0	0.0	0
1.24 Riparian miles management deferred	16	16	16	16	16	0.0	16
1.25 Riparian miles restoration deferred	1	1	1	1	1	0.0	1
1.26 Total Riparian Miles	17	17	17	17	17	0.0	17



RAPP [Goal 1ii] [Muscatatuck NWR]

	2005		2006		2007		2008	
	Actual	Target	Actual	Target	Actual	Variance	Target	
11 Habitat Management								
11.28 Is your Habitat Management Plan approved?	No	No	No	No	No	No	No	
Specific Management Prescriptions A-71								
1.29 Prescribed burning	0	0	0	0	0	0	0	
1.30 Forest stand removal	0	0	0	0	0	0	0	
1.31 Forest stand thinning	490	490	490	490	490	0	490	
1.32 Prescribed grazing	0	0	0	0	0	0	0	
1.33 Cropland management	344	344	344	344	278	(18.2)	263	
1.34 Revegetated grassland	170	170	170	170	127	(28.2)	127	
1.35 Wetland manipulation	900	900	900	900	935	35.9	935	
1.36 Moist soil management	300	300	300	300	300	0	300	
1.37 Managed by other techniques	0	0	0	0	0	0	0	
Acres Mile(s) Habitat Restored								
1.38 Upland Acres Restored	0	0	0	0	15	0	15	
1.39 Wetland Acres Restored	35	0	37	58	58	0	46	
1.40 Open Water Acres Restored	0	0	0	0	0	0	0	
1.41 Riparian Miles Restored	0	0	0	0	0	0	0	
Invasive Plant Infestation Treatment Control								
1.42 Total acres treated by herbicide	1,800	1,800	1,800	1,800	2,100	16.7	2,100	
1.43 Total acres treated for invasive plants	180	160	190	190	220	15.8	220	
1.44 Total acres of invasive plants controlled	3	0	3	0	3	0	3	
Invasive Animal Infestation and Control								
1.45 Number of invasive animal populations	11	11	16	16	16	0	16	
1.46 Number of invasive animal populations controlled	3	0	3	0	3	0	3	
Invasive Species of Concern								
1.47 Control invasive species of concern			Microstegium vimineum Japanese stitgrass (P)	Microstegium vimineum Japanese stitgrass (P)	Microstegium vimineum Japanese stitgrass (P)		Microstegium vimineum Japanese stitgrass (P)	
1.48 Control invasive species of concern			Alliaria petiolata Garlic mustard (P)	Alliaria petiolata Garlic mustard (P)	Alliaria petiolata Garlic mustard (P)		Alliaria petiolata Garlic mustard (P)	
1.49 Control invasive species of concern			Lythrum salicaria Purple loosestrife (P)	Lythrum salicaria Purple loosestrife (P)	Lythrum salicaria Purple loosestrife (P)		Lythrum salicaria Purple loosestrife (P)	
1.50 Control invasive species of concern			Pueraria montana Kudzu (P)	Pueraria montana Kudzu (P)	Pueraria montana Kudzu (P)		Pueraria montana Kudzu (P)	
1.51 Control invasive species of concern			Felis catus Domestic cat (A)	Felis catus Domestic cat (A)	Felis catus Domestic cat (A)		Felis catus Domestic cat (A)	

	2005	2006		2007		2008	
	Actual	Target	Actual	Target	Actual	Variance	Target
III. Wildlife Populations, Inventory, & Monitoring							
1.53 Is your Inventory & Monitoring plan approved	No	No	No	No	No		No
1.54 Number of I&M surveys	23	21	19	16	20	25.0	18
1.55 # migratory bird populations w/ target goal	1	1	0	0	0	0.0	0
1.56 # migratory bird pop. increasing or stable	0	0	0	0	0	0.0	0
1.57 # migratory bird pop. decreasing	0	0	0	0	0	0.0	0
1.58 # migratory bird pop. w/ changes unknown	0	0	0	0	0	0.0	0
1.59 # fish populations w/ target goals	1	1	0	0	0	0.0	0
1.60 # fish populations increasing or stable	0	0	0	0	0	0.0	0
1.61 # fish populations decreasing	0	0	0	0	0	0.0	0
1.62 # fish populations w/ changes unknown	0	0	0	0	0	0.0	0
1.63 # other populations w/ target goals	1	1	0	0	0	0.0	0
1.64 # other populations increasing or stable	0	0	0	0	0	0.0	0
1.65 # other populations decreasing	0	0	0	0	0	0.0	0
1.66 # other populations w/ changes unknown	0	0	0	0	0	0.0	0
1.67 # T&E populations w/ target goals	0	0	0	0	0	0.0	0
1.68 # T&E populations increasing or stable	0	0	0	0	0	0.0	0
1.69 # T&E populations decreasing	0	0	0	0	0	0.0	0
1.70 # T&E populations w/ changes unknown	0	0	0	0	0	0.0	0
1.71 Number of T&E actions in recovery plan	0	0	0	0	4	0.0	2
1.72 Number of T&E actions implemented	2	2	3	0	3	0.0	2
1.73 Number of population management action	3	4	5	7	4	(42.9)	7
1.74 Number of research studies	1	0	0	0	5	0.0	2



## RAPP [Goal 7] [Muscatatuck NWR]

	2005	2006	2007	2008
	Actual	Target	Actual	Target
Law Enforcement				
7.01 LE field hours	250	1,000	1,080	1,080
7.02 Violation Notices issued	35	100	95	100
7.03 Criminal LE incidents documented	4	8	1	1
7.04 Other LE incidents documented	100	200	115	125
7.05 Community Policing Program in place	No	No	No	No
Easements				
7.06 Total number of easements	8	8	8	8
7.07 Number of easements inspected	0	8	4	4
7.08 Easements found in compliance	0	8	4	4
7.09 Easements violations detected	0	0	0	0

	2005		2006		2007		2008
	Actual	Target	Actual	Target	Actual	Variance	Target
Air							
2.01 Number of Class 1 areas	0	0	0	0	0	0.0	0
2.02 # Class 1 areas meeting air quality standards	0	0	0	0	0	0.0	0
2.03 # Class 1 areas meeting visibility standards	0	0	0	0	0	0.0	0
Water							
2.04 On-refuge acres of State 303d-listed water	0	0	0	0	0	0.0	0
2.05 Other documented water quality problems	No	No	No	No	No		No
2.06 Water resource assessment conducted?	No	No	No	No	No		No
2.07 Sufficient water resource legal protection?	Not needed	Not needed	Not needed	Not needed	Not needed		Not needed
2.08 Number surface/gw systems protected/restored	0	0	2	2	2	0.0	2
Contaminated Sites							
2.09 Contaminated sites not in existing systems	0	0	0	0	0	0.0	0



## RAPP [Goal 3] [Muscatauck NWR]

	2005	2006		2007		2008
	Actual	Target	Actual	Target	Variance	Target
Wilderness						
3.03 Is your Wilderness Plan approved?	No	No	No	No	No	No
3.04 Number of designated wilderness acres	0	0	0	0	0.0	0
3.05 Acres achieving wilderness objectives	0	0	0	0	0.0	0
Wild & Scenic Rivers						
3.06 Wild and Scenic River miles	0	0	0	0	0.0	0
3.07 River miles achieving values in WSR Act	0	0	0	0	0.0	0
Marine Managed Areas						
3.08 Equals 1 if station has marine habitat	0	0	0	0	0.0	0
National Historic and Scenic Trails						
3.09 Number trail segments on Refuge/WMD	0	0	0	0	0.0	0
3.10 Number of trail segments meeting objectives	0	0	0	0	0.0	0

RAPP [Goal 4] [Muscatatuck NWR]

	2005		2006		2007		2008	
	Actual	Target	Actual	Target	Actual	Target	Actual	Target
<b>Signs and Orientation</b>								
4.01 Adequate directional signs to find refuge?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4.02 Adequate signs to orient visitors?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4.03 Percent of existing signs in good condition?	90	100	100	100	100	100	100	100
4.04 Standard or approved entrance sign in place?	No	Yes	No	Yes	No	Yes	No	Yes
<b>Adequacy of Boundary Posting</b>								
4.05 Percent of boundary posted to standards?	75	100	95	100	95	100	95	95
<b>Brochures, Publications and Web Site</b>								
4.06 Adequate supply of current general brochures	No	Yes	No	Yes	Yes	Yes	Yes	Yes
4.07 Is a current web site maintained to standards?	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes



	2005	2006	2006	2007	2007	2008
	Actual	Target	Actual	Target	Actual	Target
<b>General Visitation</b>						
5.01 Is the refuge/WMD open to public entry?	Yes	Yes	Yes	Yes	Yes	Yes
5.03 Is your Visitor Services Plan approved?	Yes	No	Yes	Yes	Yes	Yes
5.04 Total number of visitors	142,000	142,000	110,000	110,000	173,000	173,000
5.05 Special Events Hosted on site	14	14	11	11	12	9
5.06 Number of participants in special event	4,000	4,000	3,641	4,000	4,000	3,500
5.07 Visitors to Visitor Center or Contact Sta	10,000	10,000	7,300	7,300	12,800	15,000
<b>Hunting</b>						
5.08 Is hunting compatible?	Yes	Yes	Yes	Yes	Yes	Yes
5.09 Is hunting offered?	Yes	Yes	Yes	Yes	Yes	Yes
5.10 Indicate the quality of the hunt program	Good	Good	Good	Good	Good	Good
5.11 Waterfowl hunt visits	0	0	0	0	0	0
5.12 Other migratory bird hunt visits	0	0	0	0	0	0
5.13 Upland game hunt visits	650	920	700	850	800	800
5.14 Big game hunt visits	3,480	3,480	3,480	3,700	2,800	2,800
5.15 Total hunting visits	4,130	4,400	4,180	4,550	3,600	3,600
<b>Fishing</b>						
5.16 Is fishing compatible?	Yes	Yes	Yes	Yes	Yes	Yes
5.17 Is fishing offered?	Yes	Yes	Yes	Yes	Yes	Yes
5.18 Indicate the quality of the fishing program	Good	Good	Good	Good	Good	Good
5.19 Freshwater fishing visits	18,000	25,000	15,000	15,000	15,000	15,000
5.20 Saltwater fishing visits	0	0	0	0	0	0
5.21 Estuarine fishing visits	0	0	0	0	0	0
5.22 Total fishing visits	18,000	25,000	15,000	15,000	15,000	15,000
<b>Wildlife Observation</b>						
5.23 Is wildlife observation compatible?	Yes	Yes	Yes	Yes	Yes	Yes
5.24 Is wildlife observation offered?	Yes	Yes	Yes	Yes	Yes	Yes
5.25 Indicate quality of wildlife observ. program	Good	Good	Good	Good	Good	Good
5.26 Pedestrian visits	44,700	44,700	55,000	55,000	55,000	55,000
5.27 Auto Tour Visits	70,000	70,000	25,000	25,000	35,000	35,000
5.28 Boat Trail/Launch Visits	300	300	300	300	300	300
5.29 Total wildlife observation visits	115,000	115,000	80,300	80,300	90,300	90,300
<b>Wildlife Photography</b>						
5.30 Is wildlife photography compatible?	Yes	Yes	Yes	Yes	Yes	Yes
5.31 Is wildlife photography offered?	Yes	Yes	Yes	Yes	Yes	Yes
5.32 Indicate quality of wildlife photography	Good	Good	Good	Good	Good	Good
5.33 Photo Blind Visits	0	0	0	0	0	0
5.34 Other Photography location visits	2,000	2,000	2,500	2,500	2,500	2,500
5.35 Total photography visits	2,000	2,000	2,500	2,500	2,500	2,500
<b>Environmental Education</b>						
5.36 Is environmental education compatible?	Yes	Yes	Yes	Yes	Yes	Yes
5.37 Is environmental education offered?	Yes	Yes	Yes	Yes	Yes	Yes
5.38 Indicate the quality of the EE program	Good	Good	Good	Good	Good	Good
5.39 Number of leaders in on-site program	100	100	17	17	25	25
5.40 Number of leaders in off-site program	60	80	14	14	30	30
5.41 Number of students in on-site program	3,000	3,000	3,000	3,000	3,000	3,000
5.42 Number of students in off-site program	40	400	85	100	800	800
5.43 Total EE participants	3,200	3,580	3,116	3,131	3,855	3,855
<b>Interpretation Program</b>						
5.44 Is interpretation compatible?	Yes	Yes	Yes	Yes	Yes	Yes
5.45 Is interpretation offered?	Yes	Yes	Yes	Yes	Yes	Yes

	2005		2006		2007		2008
	Actual	Target	Actual	Target	Actual	Variance	Target
<b>Volunteer Program</b>							
6.01 Does the station have a volunteer program?	Yes	Yes	Yes	Yes			
6.02 Number of volunteers	150	175	179	180	200	11.1	225
6.03 Volunteer Hours for wildlife and habitat	2,250	2,750	2,811	2,800	2,746	(1.9)	3,000
6.04 Volunteer Hours for Refuge maintenance	300	800	2,824	3,000	3,449	15.0	3,000
6.05 Volunteer Hours for environmental education	6,400	6,400	160	200	300	50.0	300
6.06 Volunteer Hours for other recreation	50	50	3,301	4,000	3,800	(5.0)	4,200
6.07 Volunteer Hours for cultural resources	200	200	273	300	300	0.0	300
6.08 Volunteer Hours for other activities	400	400	326	350	291	(16.9)	300
6.09 Total Volunteer hours	9,600	10,600	9,695	10,650	10,886	2.2	11,100
<b>Friends and Community Support Groups</b>							
6.10 Does the station have a Friends Organization?	Yes	Yes	Yes	Yes	Yes		Yes
6.11 Other Community Support Groups?	Yes	Yes	Yes	Yes	Yes		Yes
<b>Conservation partnership projects</b>							
6.12 Number of partnership projects	10	10	12	12	19	58.3	19
6.13 # of projects with monetary contributions	0	0	12	12	17	41.7	17
<b>Alaska Subsistence</b>							
6.14 Number of subsistence hunting visits	0	0	0	0	0	0.0	0
6.15 Number of subsistence fishing visits	0	0	0	0	0	0.0	0
6.16 Number of other subsistence visits	0	0	0	0	0	0.0	0