

**US Fish and Wildlife Service - US Department of Energy  
Interagency Agreement for Activities at Upton Ecological and Research Reserve  
Brookhaven National Laboratory**

**Fiscal Year 2003 Accomplishments**

Fiscal year 2003 was a time of implementing baseline surveys and initiating and continuing additional ecological research studies at the Upton Ecological and Research Reserve (UERR). Primary research foci include invasive species, fire ecology, herpetological surveys, and ecology studies. Highlights included the discovery of several new species onsite (including one snake that had not been documented on Long Island for more than 50 years), the acquisition of extremely thorough reproductive data for endangered salamanders, and a better understanding of invasive species that occur at the lab. A number of these highlights have or will be featured in various media outlets and scientific publications.

**ADMINISTRATION:**

Biologist Peter Kelly entered his second year in the UERR program during FY 03. On October 21, 2002, Jeremy Feinberg, a biologist specializing in herpetology and Pine Barrens ecosystems, filled the second vacant US Fish & Wildlife Service biologist position.

**FISCAL YEAR 2003 EXPENDITURES:**

	<u>Cost</u>
• Salary: .....	\$107,918.04
• Equipment, Supplies, and Other Expenses: .....	\$ 3,208.37
• Office Space: .....	\$ 6,952.68
• Dr. Tuininga Research with Fordham University: .....	\$ 24,983.00
• Jeremy Feinberg Research with UERR .....	\$ 920.00
• Longwood High School outreach program: .....	\$ 4,328.11
<b>TOTAL:</b>	<b>\$148,310.20</b>

**RESERVE MANAGEMENT:**

- Surveyed white-tailed deer population throughout BNL. The data acquired from this long-term project will help land managers in developing wildlife management strategies and making important management decisions.
- Surveyed breeding forest songbirds across BNL. This long-term project captures data of the number, type and date of birds found at BNL throughout the breeding season. The data acquired are useful for researchers and land managers in tracking changes over time and space.
- Performed aerial survey for insect damage with assistance from US Forest Service. This free service provided photo documentation of the effects of defoliating-insect populations (focusing on gypsy moths and orange-striped oakworms) on forest health at BNL. The survey also provides a baseline that can be compared to past and future aerials to determine spread rates and the effectiveness of control efforts.

- Established deer exclosures and inventoried forest regeneration to study effects of deer overpopulation on vegetation. This long-term study looks at the impact of an artificially high deer population on forest health. By creating deer exclosures (treatment), we can study the impact of deer overpopulation in the Central Pine Barrens.
- Assisted researchers from Dowling College, Fordham University, Rutgers University and Stony Brook University
- Conducted breeding surveys of NY-state-endangered-Eastern Tiger Salamander. Fourteen of 28 wetlands surveyed were found to have active breeding populations in 2003. One of these wetlands had not been previously documented as supporting tiger salamanders.
- Conducted emergence surveys of Eastern Tiger Salamander and other salamander species. Between July and August 2003, a total of 413 tiger salamander larvae were captured emerging from two ponds at BNL. The data were used to estimate the total emergence of tiger salamanders from the two ponds.
- Published BNL's Fire Management Plan. This plan will allow fire to be re-established in a fire-adapted ecosystem at BNL within the Central Pine Barrens.

### **RESEARCH:**

In January 2003, a Request For Proposals (RFP) was mailed to various higher learning institutions notifying them of grants available for Pine Barrens-related research. The RFP was sent to more than 200 addressees. The TAG reviewed proposals in March, and final selections were made at that time. Two projects were selected. One of the two projects was cancelled due to logistical problems encountered by the researcher. Nevertheless, USFWS/UERR staff implemented a variation of the same project. In total, six projects were initiated, one ongoing project continued, and four projects were completed in 2003.

**The following research projects were initiated or continued this year:**

### **Factors promoting invasion of exotic plant species in forests of the Upton Reserve.**

*Katherine Howe and Jessica Gurevitch, Department of Ecology & Evolution, SUNY Stony Brook*

This study focuses on conditions under which native and non-native plants thrive. The project focuses on developing a better understanding of why invasion by exotic species is more problematic in some ecosystems than in others and how invasive plants threaten forest health. In April 2002, the researchers established study plots and recorded existing vegetation. They then experimented with forests in and outside the Reserve, by altering light conditions through the creation of forest gaps and modifying soil nutrients by adding nitrogen. In 2003, the research focused on comparative studies of the growth and success of native plants versus invasive plants planted in forested-research plots that were followed throughout the summer.

**Project Start Date:** April 2002

**Project Duration:** 3 years

**Total Cost:** \$77,511.00

**Assessment of the effects of fire on the orange-striped oakworm (*Anisota senatoria*).**

*Peter Kelly and Manuel Lerdaun, Department of Ecology and Evolution, SUNY Stony Brook*

This project studies the effects of fire on the orange-striped oakworm (*Anisota senatoria*), a forest pest species common to UERR, BNL, and adjacent regions of the Pine Barrens. This study will evaluate the role of fire in controlling oak worm populations. The study began in May 2003 with a prescribed burn on State lands adjacent to BNL. After the fire, research plots were established to monitor post-burn survivorship of orange-striped oakworms and compare it to survivorship of conspecifics from adjacent, non-burned plots, to see to what roll, if any, fire plays in reducing populations of this species. The burn was performed in cooperation with NYS DEC, The Nature Conservancy, The U.S. Forest Service, local volunteer fire departments and NOAA.

**Project Start Date:** May 2003

**Project Duration:** 2 years

**Total Cost:** \$12,000.00



Picture of the May 2003 prescribed fire. This fire was part of an experiment to control the emergence of adult moths of the orange-striped oakworm.

### **Radio-telemetry of Hognose Snakes (*Heterodon platyrhinos*) at Brookhaven National Laboratory.**

*Jeremy Feinberg and Kristine Hoffmann, U.S Fish & Wildlife Service/Brookhaven National Laboratory (Upton Ecological and Research Reserve)*

This 1-2 year study is being used to develop a better understanding of hognose snake (*Heterodon platyrhinos*) life history, ecology, and behavior with a focus on habitat use, home-range size, and movement patterns relative to feeding, nesting, and hibernation activity. Additionally, the researchers also hope to gain some understanding of the population size and develop long-term management strategies for habitat preservation and enhancement at BNL. Five snakes were monitored between June and November 2003. All five snakes were captured in open scrubby habitat or on the edge of such habitats, and four of these snakes moved into heavily vegetated/forested habitats soon thereafter (a habitat-type not commonly associated with this species in the scientific literature), indicating a shift in habitat preference between the early and latter parts of the season. Prior to the onset of winter, the snakes returned to the open, scrub habitats where they were first captured in the spring to hibernate by burrowing in the loose sand. All five snakes showed movement patterns characterized by periods of movement interspersed with extended periods of stationary aestivation that lasted from several days to several weeks. While aestivating, snakes buried themselves under leaves, grasses, or debris. Preliminary estimates indicate that snakes moved around a defined territory that ranged in size from 21 to 82 acres. There were 17 different hognose snakes observed at BNL in 2003 and five additional unconfirmed sightings reported to the researchers by various lab employees. The only cost for this project was that of the radio transmitters.

**Project Start Date:** May 2003

**Project Duration:** 1 – 2 years

**Total Cost:** \$920.00

### **Vernal-pool drift-fence monitoring at Brookhaven National Laboratory.**

*Jeremy Feinberg and Kristine Hoffmann, U.S Fish & Wildlife Service/Brookhaven National Laboratory (Upton Ecological and Research Reserve)*

This study is being used to develop a better understanding of salamander breeding within several vernal pools at BNL. In 2003, two pools were monitored using drift-fence arrays. One pool has been anthropogenically impacted whereas the other pool is relatively pristine and natural. Preliminary results from 2003 provide estimates of 3,364 state-endangered tiger salamander (*Ambystoma tigrinum*) larvae emerging from the 0.52-acre altered pool, whereas only 124 of these salamanders are estimated to have emerged from the 0.43-acre natural pool, despite the fact that the natural pool had twice as many egg masses as the altered pool. It is believed that competition from a robust population of larval marbled salamanders (*Ambystoma opacum*), another state-listed species (special concern), reduced the number of tiger salamanders in the natural pool. The 2003 data indicate that an estimated 2,059 larval-marbled salamanders emerged from the natural pool in 2003. Additional species captured at the altered pool include

Fowler's toad (*Bufo woodhousii fowlerii*), green frog (*Rana clamitans*), and bullfrog (*Rana catesbeiana*). Additional species captured at the natural pool include green frog, wood frog (*Rana sylvatica*), spadefoot toad (*Scaphiopus holbrookii*), four-toed salamander (*Hemidactylium scutatum*), and red-spotted newt (*Notophthalmus viridescens*). Environmental influences (e.g., precipitation, temperature), and seasonal patterns are currently being analyzed. One to two additional pools will be incorporated into this project in 2004.

**Project Start Date:** June 2003

**Project Duration:** 2 - 3 years

**Total Cost:** N/A



Picture of recently metamorphosed eastern tiger salamanders (NYS endangered) from vernal pool study.

### **Herpetological inventories at Brookhaven National Laboratory.**

*Jeremy Feinberg and Rocco DeVito, U.S Fish & Wildlife Service/Brookhaven National Laboratory (Upton Ecological and Research Reserve)*

This 2-year study is being used to develop a better understanding of the diversity, distribution, and abundance of herpetofauna at BNL. Intensive survey and trapping methodologies were implemented between March and November 2003, to answer these questions. By November 2003, 25 species (4 turtle, 8 snake, 8 frog, 5 salamander) had been confirmed with the possibility of an additional 5 species being likely to occur based on anecdotal reports, diverse habitat types at BNL, and confirmed-neighboring offsite populations. Continued effort will emphasize surveys for these species in 2004. Highlights from 2003 include the discovery of two red-bellied snakes (*Storeria occipitomaculata*), a species that had had not been reported from Long Island



since the 1940s, three four-toed salamanders, and abundant numbers of eastern spadefoot toads. Anthropogenically-impacted habitats (flooded roads, ditches, tire ruts, disturbed sandy areas, altered ponds, and disturbed grasslands) were found to support a surprisingly diverse number of amphibian and reptile species, especially for reproduction and feeding during periods of flooding.

**Project Start Date:** November 2002

**Project Duration:** 2 years

**Total Cost:** N/A



Two young red-bellied snakes found at BNL. Despite their different colors, these snakes are likely siblings.

**Effects of fire on the ericaceous understory and edaphic factors and their role in phosphorus cycling in the pine barrens ecosystem at Upton ecological and research reserve: Implications for Management.**

Amy Tuininga, Professor, Fordham University

Dr. Tuininga is studying the effects of burn regimes and their timing in relation to nutrient cycling between trees and understory vegetation. The primary goals of this study are to determine an optimal rotation time between prescribed fires and to help determine what time of year is best to conduct such fires so that soil nutrients are kept within the nutrient cycle from which they came from. Other goals include determining the importance of understory vegetation in the nutrient cycling process subsequent to fires and also the relationship between mycorrhizal fungi (which help the roots of understory plants acquire and retain nutrients) and the nutrient-

cycling process. This study began in May 2003 with a prescribed burn on State lands adjacent to BNL. The burn was performed in cooperation with NYS DEC, The Nature Conservancy, The U.S. Forest Service, local volunteer fire departments and NOAA.

**Project Start Date:** May 2003

**Project Duration:** 2 years

**Total Cost:** \$24,983.00

**The following research projects were completed this year:**

**A gypsy moth population study in the Upton Ecological and Research Reserve, Brookhaven National Laboratory, Upton, New York:**

*Longwood High School Science Department, Longwood High School, Middle Island, NY*

The gypsy moth (*Lymantria dispar*) is one of the most important defoliating insects in both forested and residential areas in the northeastern United States. Since its introduction into the U.S. near Boston, Massachusetts in the late 1860's, it has expanded its range to include all of the northeastern states, and most of the Mid-Atlantic States. The results from this study indicate that the gypsy moth population at UERR is significant. Many of the oak trees in UERR were observed to have suffered defoliation from the gypsy moth during May and June of 2002, and many of the same trees were defoliated a second time by the orange-striped oakworm later that summer. There is certainly cause for concern because significant tree mortality may occur. An egg mass density threshold of 250 egg-masses per acre has been used elsewhere to justify treatment in both forest and residential areas. The egg mass density in the Upton Reserve was more than double that number. One potential method for controlling this exotic pest is to promote the spread of *Entomophaga maimaiga*, a fungus that prefers cool, damp weather. Future studies should be conducted for the purpose of determining if the population is increasing or declining to aid decisions regarding possible future management efforts. Egg mass surveys may be useful in monitoring the status of this species at BNL. Large numbers of old, non-viable egg masses (> 50%) are indicative of a declining population.

**Invasive species mapping project at Brookhaven National Laboratory.**

*Peter Kelly and Timothy Walters, U.S Fish & Wildlife Service/Brookhaven National Laboratory (Upton Ecological and Research Reserve)*

An invasive-species mapping project was conducted in 2003 to map and document invasive plant species on the BNL property in order to establish baseline information for potential future management and control efforts. This data can also be helpful in developing a better understanding of the causative agent(s) that allow invasive species to become established in specific areas, rate of spread, and potential vehicle(s) of transmission between areas. The researchers conducted their project using methods developed by the University of Montana,

which combined remote sensing with rigorous field observations. The most abundant invasive plant species at BNL were found to be Japanese barberry (*Berberis thunbergii*), multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), black locust (*Robinia pseudoacacia*), common mullein (*Verbascum thapsus*), and Oriental bittersweet (*Celastrus orbiculatus*). Two additional species of interest include bamboo (*Bambusa* spp.) and kudzu (*Pueraria montana*). Comparison between the 2003 mapping data and historic aerial photographs indicates that anthropogenic habitat disturbance (e.g., roads and trails) might be the primary factor in the establishment of invasive plants at BNL. The mapping data obtained during this project can also be used in the future; by comparing it to future invasive maps, researchers will be able to plot and track the rate at which invasives spread over time.

### **A Physiological analysis on the effects of early and late season defoliation on oak trees**

*Richard Wilkens, Professor, Dowling College and Dirk Vanderklein, Professor, Montclair State University*

This study was conducted to determine the effects of leaf removal on tree health and longevity. This is an important issue at BNL because large-scale defoliation of oak trees has been documented for the past several years throughout much of the BNL property. The researchers measured photosynthesis, water uptake from soil, and other physiological parameters in oak trees exhibiting different levels of gypsy-moth defoliation in the spring and summer of 2002. Later in the fall, the researchers measured the same trees, some of which had been defoliated again, this time by the orange-striped oakworm. Preliminary results suggest that only severe defoliation has an impact on water relations. Data analysis of nitrogen and carbon-14 levels within leaves is currently in progress and a final report is still pending.

### **Invasive, exotic non-invasive, and native woody vines of the Northeastern United States, SUNY Stony Brook.**

*Isabel Ashton and Manuel Lerda, Department of Ecology and Evolution, SUNY Stony Brook*

This research project investigates the role of physiology and natural enemies (herbivores) in determining the success of temperate invasive vines at BNL as well as the mechanisms by which imported vine species become invasive. This study compares invasive and non-invasive vines by looking at differences in leaf longevity, seed dispersal, resource usage (light, nutrients, and water), and susceptibility to pests and pathogens. The project began in June of 2002 with the planting of target species in greenhouses and preliminary field plots at BNL. In 2003 all comparative experiments were conducted outdoors at BNL with a primary focus being given to the effects of herbivory on the success of non-invasive and invasive plants. Preliminary analysis of the herbivory data suggests that invasive vines are just as susceptible to damage from herbivores as native vines, but the invasives show a much greater ability to regrow after damage. Field research on this two-year project is now complete, and a report of the final results is pending.



### **EDUCATION:**

Between June and August 2003, two college interns were brought into the UERR program to assist and learn from UERR biologists. The students were part of a Department of Energy/BNL program called "Science Undergraduate Laboratory Internships" (SULI). Both students were responsible for working ten 40-hour weeks during the summer, assisting UERR biologists, conducting independent research, and providing final reports and poster presentations upon completion of the program. Both students also returned to BNL during the fall to give talks about their research at the 2003 Pine Barrens Research Forum. Additionally, one high school senior was also brought into the UERR program through another Department of Energy/BNL program known as the Community Summer Science Program. The structure and experience provided by this program is similar to that of the SULI program.

### **OUTREACH:**

- Participated in BNL's "Summer Sunday" event
- UERR research was featured in multiple news and media outlets such as Newsday, the BNL Bulletin, and the Village Beacon Record.
- Several scientific papers submitted to "Herpetological Review" have been accepted or are in review
- Provided tours to local high school science teachers and BNL and DOE employees
- Participated in Heckscher State Park Earth day event
- Presented slideshows on UERR program and research projects to students at Murray State University in Kentucky and at the American Museum of Natural History
- Attended meeting of the Partners in Amphibian and Reptile Conservation and assisted in the development of conservation initiatives and contributed input based on data from UERR research
- Presented the results of all current USFWS/UERR staff and intern research at the Pine Barrens Research Forum

**US Fish and Wildlife Service - US Department of Energy  
 Interagency Agreement for Activities at Upton Ecological and Research Reserve  
 Brookhaven National Laboratory**

**Fiscal Year 2004 Work Plan**

**Proposed Activity:** **Anticipated Completion Date:**

**Reserve Management:**

Intern orientation/training	2/04
Collect, analyze, and prepare 2003 in-house ecological research data	5/04
Establish new drift-fence arrays for ongoing amphibian monitoring	1/04
Continue drift-fence monitoring throughout amphibian-breeding season	9/04
Monitor radio-telemetered hognose snakes & spotted turtles through hibernation	5/04
Continue hognose snake & spotted turtle radio-tracking projects	9/04
Surveys for undocumented herpetofauna species	9/04
Acquire results from completed UERR-funded research projects	6/04
Provide continued assistance with wildlife surveys (deer, birds, etc.)	As Necessary
Provide support with regional prescribed burn activities	As Necessary
Technical Advisory Group Meetings	6/year

**Research:**

Mail RFP to prospective researchers	12/03
Rank research proposal with TAG and fund successful applicants	2/04
Provide funding, access, and support to all newly funded projects	As Necessary

Assist Professor Tuininga in her research of the effects of fire on nutrient cycling by assisting in the coordination of prescribed fires in the Central Pine Barrens. This collaboration provides her with the necessary information to complete her funded research and provides Natural Resource Managers with useful information about fire ecology.

Provide Professors Howe and Gurevitch with necessary work permits and field assistance on their continued invasive vegetation research at BNL. Research plots have been established to compare growth of native and invasive plants. UERR staff will assist with upkeep of experiments.

Assist Professor Dale Madison from SUNY Binghamton on wetland buffer research. This project will be initiated by Dr. Madison and a doctoral student, Valorie Titus, and will involve radio tracking several amphibian species including tiger salamanders. The goal of this project is to fill a knowledge gap regarding terrestrial habitat use by amphibians. The results from this study can then be used to supplement New York State's habitat conservation efforts and endangered species management practices.

Support and assist any new projects that develop from the current UERR RFP. Targeted-potential research projects include an infrared aerial survey of the white-tailed deer population at BNL, establishment of a Central Pine Barrens research database, mammalian surveys, establishment of multi-purpose research plots throughout the Central Pine Barrens, and sampling of vernal pool invertebrates.

#### **Education/Outreach:**

Provided continued consultation to local and regional media sources for reports and feature stories on research, discoveries, and important ecological issues at UERR, BNL and the greater Central Pine Barrens.

Attend scientific and outreach-based meetings and conferences to present slideshows on the UERR program and research projects.

Participate in New York State Parks Earth Day Event by providing information and literature about Upton Reserve.

Participate in the Environmental Services Division (ESD) sponsored Earth Day event at BNL.

Lead lunchtime tours of Upton Reserve for BNL staff by providing information on UERR's location, environmental research, and available recreational opportunities.

Provide tour of Upton Reserve for teachers as part of BNL's "teach a teacher" program.

Participate in Services' Celebration of the National Wildlife Refuge System week by providing assistance with setting up displays and providing information for the public on various projects the Service is involved with at the Upton Reserve.

Provide research opportunities for research at the high school, undergraduate, graduate, and professional levels by providing funding, assistance in developing research projects,

and support with technical implementation of projects. Established programs include the Science Undergraduate Laboratory Internship (SULI) program and the Community Summer Science Program (CSSP) for high school students. Additional opportunities exist outside these programs.

Present UERR research at annual Pine Barrens Research Forum. These presentations will be an overview of the research that USFWS/UERR staff and their interns have completed throughout the year at the Upton Reserve.

**Staff Training:**

Maintain NY State Wildfire and Incident Management Certification. This training allows Upton Reserve staff to participate in all controlled-burn activities throughout Long Island and to provide Natural Resource advice to BNL's fire department when wildfires occur. Because of the many different agencies involved, it allows Reserve staff to develop new relations with other local Natural Resource managers.

Attend career development workshops, meetings, and training sessions when appropriate opportunities are available that will enhance staff knowledge of ecological principals, monitoring, and research skills.