

NEW YORK COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT



2013

Annual Report

The New York Cooperative Fish and Wildlife Research Unit continues to form new relationships with our cooperators and engages in research to address natural resource issues in New York State and beyond.

Front cover photo: Angela Fuller (Assistant Unit Leader) and
Cat Sun (M.S. Student) holding black bear cub.

New York Cooperative Fish and Wildlife Research Unit

2013 ANNUAL REPORT

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Cooperators:

U. S. Geological Survey
Cornell University
New York State Department of Environmental Conservation
U. S. Fish and Wildlife Service
Wildlife Management Institute

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INTRODUCTION

The Cooperative Research Units (CRU) program was established in 1935 as a cooperative partnership between the Federal and State biological resource agencies and Land Grant universities to conduct research on managing wildlife populations and habitats, train wildlife managers, and disseminate information to management agencies. Seventy-five years later, the mission of the program remains unchanged. Now with 40 Units in 38 states, the CRU program employs over 100 scientists that conduct research on natural resource issues of importance to State and Federal agencies and other organizations, teach graduate-level courses at their host universities, and conduct workshops and short courses for their cooperators and other partners. Over the past five years, 595 Coop Unit students have graduated from their host institutions, and together with Unit scientists and postdocs, they have produced 1858 peer-reviewed publications and made 3804 presentations at scientific meetings (<http://www.coopunits.org/Headquarters/>, accessed on 1 May 2013).

The New York Cooperative Fish and Wildlife Research Unit was established in 1961 under the leadership of Dr. Daniel Thompson. Originally established as a separate wildlife unit, the fishery unit was added in 1963 and led by Dr. Alfred Eipper. In 1984, the units were combined and led through 2008 by Dr. Milo Richmond. Over its 50-year history, the New York Coop Unit has had five wildlife scientists and seven fishery scientists who have conducted research on a diversity of natural resource issues ranging most recently from assessing vertebrate biodiversity in New York State to evaluating immunocontraception of white-tailed deer to studying the ecology of Atlantic and shortnose sturgeon in the Hudson River.

Since 2008, the New York Coop Unit has undergone a complete change in personnel. Dr. William Fisher assumed the Unit Leader position in 2008 after serving nearly 18 years as Assistant Unit Leader-Fisheries for the Oklahoma Cooperative Fish and Wildlife Research Unit. In 2009, Dr. Angela Fuller became the new Assistant Unit Leader-Wildlife, coming to the New York Coop Unit from the University of Maine where she was a postdoc studying the effects of forest fragmentation on mammals. In 2011, Dr. Mitchell Eaton joined the New York Coop Unit as Assistant Unit Leader-Ecology. Mitch was previously a postdoc at the USGS Patuxent Wildlife Research Center where he worked on developing methods in and applying structured decision making and adaptive management to natural resource problems.

In late 2013, Dr. Fisher retired from the USGS and the NY Coop Unit and Dr. Eaton assumed a new position at the USGS Southeast Climate Science Center. We look forward to re-building the Unit and embarking on new research directions in cooperation with our partners at Cornell University, the New York State Department of Environmental Conservation, U. S. Geological Survey, U. S. Fish and Wildlife Service, Wildlife Management Institute, and other organizations.

*The Scientists and Staff of the
New York Cooperative Fish and Wildlife Research Unit*

PROGRAM STATEMENT

The New York Cooperative Fish and Wildlife Research Unit, one of 40 in a national Cooperative Research Units program, was established for the purpose of enhancing the management of this nation's natural resources. The mission of the program is to conduct research on natural resource questions, contribute to graduate education by engaging graduate students in research projects and teaching graduate-level courses, provide technical assistance and consultation on natural resource issues, and provide continuing education for natural resource professionals. The Unit is a partnership among the U.S. Geological Survey, the New York State Department of Environmental Conservation, Cornell University, the U.S. Fish and Wildlife Service, and the Wildlife Management Institute. The mission of the Unit is to conduct and facilitate applied and basic research in fish and wildlife management among state and federal natural resource agencies, non-governmental organizations, and university faculty and staff on topics of mutual concern. The three Unit research scientists are aided by a highly motivated group of graduate students and research affiliates who conduct scientific research and understand the need for application and dissemination of research results. Particular attention is given to the natural resource problems and issues of the Northeastern states, with New York as the focal point, but we also work on national and international conservation issues. Our research focuses on how spatial and temporal variation in environmental and habitat characteristics influence habitat selection, movements, and population ecology of fish and wildlife. When appropriate, we promote the principles and use of structured decision making to guide management and research, and apply methods of adaptive management as a framework to reduce the pervasive uncertainties that complicate natural resource management and policy decisions.

Approved: September 18, 2012

COOPERATORS AND PERSONNEL

COORDINATING COMMITTEE

U.S. Geological Survey

MIKE TOME, Eastern Supervisor, Cooperative Research Units, Leetown Science Center, 11649 Leetown Road, Kearneysville, WV 25430

New York State Department of Environmental Conservation

PATTY RIEXINGER, Director, Division of Fish, Wildlife, and Marine Resources, 625 Broadway, Albany, NY 12233

Cornell University

MARIANNE KRASNY/DANIEL DECKER, Chair, Department of Natural Resources, Fernow Hall, Cornell University, Ithaca, NY 14853

MAX PFEFFER, Senior Associate Dean, College of Agriculture and Life Sciences, Roberts Hall, Cornell University, Ithaca, NY 14853

U.S. Fish and Wildlife Service

RICHARD BENNETT, Regional Scientist, U.S. Fish and Wildlife Service, Northeast Regional Office, 300 Westgate Center Dr., Hadley, MA 01035

DAVID STILWELL, Field Supervisor, U.S. Fish and Wildlife Service, New York Field Office, 3817 Luker Rd., Cortland, NY 13045

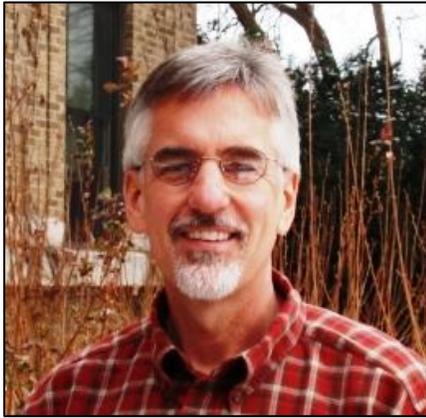
Wildlife Management Institute

SCOT WILLIAMSON, Northeast Regional Representative and Vice-President, Wildlife Management Institute, 69 Clinton Avenue, St. Johnsbury, VT 05819

UNIT PERSONNEL

Scientists

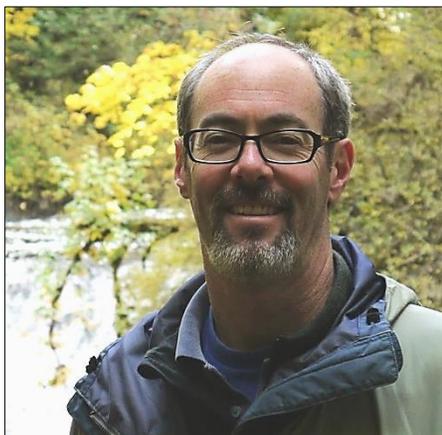
WILLIAM L. FISHER, Unit Leader-Fisheries, USGS, and Courtesy Associate Professor, Department of Natural Resources



ANGELA K. FULLER, Assistant Unit Leader-Wildlife, USGS, and Courtesy Assistant Professor, Department of Natural Resources



MITCHELL J. EATON, Assistant Unit Leader-Ecology, USGS, and Courtesy Assistant Professor, Department of Natural Resources



Staff



MELANIE MOSS, Administrative Assistant



KIMBERLEY CORWIN, Research Support Specialist

Postdoctoral Research Associates

KELLY ROBINSON, Department of Natural Resources



CHRISTOPHER SUTHERLAND, Department of Natural Resources



JASON TAYLOR, Department of Natural Resources



COLLABORATORS

BARRY BALDIGO, U. S. Geological Survey, New York Water Science Center

GORDON BATCHELLER, New York State Department of Environmental Conservation

TOM BAUDANZA, New York City Department of Environmental Protection

DANIEL DECKER, Cornell University

ERIC L. DERLETH, Partners for Fish and Wildlife Program, U.S. Fish and Wildlife Service

MIKE FLAHERTY, New York State Department of Environmental Conservation

Jacqui Frair, SUNY Environmental Science Forestry

STEVEN FULLER, Wildlife Management Institute, North Atlantic LCC

JIM DALEY, New York State Department of Environmental Conservation

MATTHEW HARE, Cornell University

RANDY JACKSON, Cornell University

Paul Jensen, New York State Department of Environmental Conservation

KATHRYN JAHN, U.S. Fish and Wildlife Service

DAVID KLEIN, The Nature Conservancy

FRED HENSEN, New York State Department of Environmental Conservation

PHIL HULBERT, New York State Department of Environmental Conservation

JEREMY HURST, New York State Department of Environmental Conservation

CLIFFORD KRAFT, Cornell University

Lisa Holst, New York State Department of Environmental Conservation

JEFF LOUKMAS, New York State Department of Environmental Conservation

SEAN MADDEN, New York State Department of Environmental Conservation

JOHN OZARD, New York State Department of Environmental Conservation

DANIEL ROSENBLATT, New York State Department of Environmental Conservation

J. ANDREW ROYLE, Patuxent Wildlife Research Center

MIKE SCHIAVONE, New York State Department of Environmental Conservation

TIM SMITH, NPS – Cape Cod National Seashore

BRYAN SWIFT, New York State Department of Environmental Conservation

ANTHONY TUR, U.S. Fish and Wildlife Service

MARK WOYTHAL, New York State Department of Environmental Conservation

GRADUATE EDUCATION

CURRENT STUDENTS

MATTHEW ADAMS, M. S., Natural Resources,
Wildlife Conservation (Advisor: Fuller)



NATHAN CRUM, M. S., Natural Resources, Wildlife
Conservation (Advisor: Fuller)



CHRIS NADEAU, M. S.,
Natural Resources,
Conservation
Biology/Quantitative
Ecology (Advisor:
Fuller)

CATHERINE SUN, M. S./Ph.D., Natural Resources,
Conservation Biology/Quantitative Ecology
(Advisor: Fuller)



ALEX ALEXIADES, Ph.D., Natural Resources, Fishery
and Aquatic Science (Advisor: Fisher)



CHRISTIAN PERRY, Ph.D., Natural Resources, Fishery and Aquatic Science (Advisor: Fisher)



MAYA WELTMAN-FAHS, Ph.D., Natural Resources, Fishery and Aquatic Science (Advisor: Fisher)



BEN MARCY-QUAY, M.S. Student, Natural Resources, Fishery and Aquatic Science (Advisor: Sullivan)



RECENT GRADUATES

Tyler Jeffery Ross. 2012.

COURSES TAUGHT & GUEST LECTURES

Eaton, M.J. Taught half-day adaptive management course and led a decision analysis workshop for the Diadromous Species Research Restoration Network (DSRRN) Conference, University of Maine, 8-9 January 2013.

Eaton, M.J. Lead Instructor, Introduction to Structured Decision Making. U.S. Fish and Wildlife's National Conservation Training Center, Shepherdstown WV. Aug 19-23, 2013.

Fisher, W. L. Spatial Modeling and Analysis (NTRES 6200). Co-taught with D. G. Rossiter. Cornell University, January - May 2013.

Fisher, W. L. Stream Fisheries Ecology and Management. Invited guest lecture in Fish Ecology, Conservation, and Management (NTRES 3110). Cornell University, 16 April 2013.

Fuller, A.K. Computational Challenges in Conservation. Invited guest lecture in Topics in Computational Sustainability (CS 6702). Cornell University, 19 February 2013.

Fuller, A.K. Integrating Social and Ecological Science in Decision Making. Invited guest lecture in Applying Human Dimensions Perspectives to Socio-Ecological Problems (NR 4320). Cornell University, 21 February 2013.

Fuller, A.K. Structured Decision Making for Natural Resource Management. Invited guest lecture in Principles and Practices of Applied Wildlife Science (NTRES 4280/6280). Cornell University, 23 April 2013.

Sun, C. C. Principles of Modeling Workshop – Teaching Assistant, The Wildlife Society Annual Conference, Milwaukee, 2013.

Sutherland, C. Co-Instructor. Occupancy modeling in BUGS/JAGS and unmarked - Hierarchical models for species occurrence and communities. Patuxent Wildlife Research Center, USA. Nov 2013.

RESEARCH – FISHERIES AND AQUATIC

CURRENT PROJECTS

Fate of Stocked Trout and an Evaluation of Trout Stocking in New York State

INVESTIGATORS: William Fisher (NYCFWRU)
Pat Sullivan (Cornell)
Fred Henson (NYSDEC)

STUDENTS: Alex Alexiades, Ph.D.
Ben Marcy-Quay, M.S.

SPONSORS: New York State Department of
Environmental Conservation

STARTED: April 2011



**ALEX ALEXIADES WRESTLING
WITH AN EEL WHILE
SAMPLING FOR TROUT IN
THE CARMANS RIVER, NY**

Each year hundreds of thousands of hatchery reared trout are stocked into the state's streams and rivers according to statewide policies (Catch Rate Oriented Trout Stocking, or "CROTS"). Most stockings are designed to provide average angler catch rates of 0.5 fish per hour (or greater) for part of or all of a fishing season. Recent creel surveys indicate that in some circumstances the stocked trout are only briefly providing target catch rates, and survival within stocked reaches is lower than expected. Prior radio telemetry studies conducted in Catskill Mountain waters by regional DEC staff indicated widespread movements of hatchery fish out of stocked reaches was not occurring, thus would not account for the apparent disappearance of stocked fish.

Applied research to better document the fate of stocked trout, with an eventual goal of identifying important factors bearing on the fate of trout that are not caught and harvested by anglers, is needed to improve the effectiveness of this important and costly fishery management program.

Project findings revealed that angler effort and harvest rates have decreased dramatically for many streams since previous estimates were made. Angler catch per unit of effort, however, remained relatively consistent with historic estimates. Mortality rates for stocked trout in were found to be an order of magnitude higher than historic estimates in some cases, indicating a decline in stocked trout survival. Alex also spent several weeks last fall collecting and mapping habitat data in the field and continued with his analysis and modeling of DEC collected data. Alex spent the summer traveling to his



**BEN MARCY-QUAY, MS
STUDENT**

stream study sites across New York State to collect fish abundance, water quality, and nutrient cycling data. He also spent several weeks collecting and mapping habitat data in the field and continued with his analysis and modeling of DEC collected data. In addition to conducting field work, Alex has been analyzing trout diets and tissue stoichiometry. Alex also participated in an outreach program with Trout in the Classroom and NY State Parks to teach Ithaca area elementary school students about stream fish identification, life history, sampling techniques, and conservation. He also successfully completed his comprehensive A exam in November. Alex will finish his Project with the NYSDEC in March 2014, after which he will begin a year of research in Ecuador as part of a Fulbright Student Fellowship.

An Assessment of Black Bass Populations in New York State

INVESTIGATORS: William Fisher (NYCFWRU)
Patrick Sullivan (Cornell)
Randy Jackson (Cornell)
Jeff Loukmas (NYSDEC)

STUDENT: P. Christian Perry, Ph.D.

SPONSORS: New York State Department of
Environmental Conservation

STARTED: April 2011



**CHRISTIAN PERRY STABILIZING THE
TRAWLER AT THE CORNELL BIOLOGICAL
FIELD STATION**

To provide optimal management of New York's black bass (largemouth bass, *Micropterus salmoides*, and smallmouth bass, *Micropterus dolomieu*) populations, the New York State Department of Environmental Conservation, Bureau of Fisheries requires up-to-date knowledge about this economically and ecologically important fishery. Even though the DEC has continually surveyed bass waters for decades, the most recent comprehensive statewide black bass investigation took place nearly 30 years ago. For this reason, beginning in April, 2011, a new project was undertaken to provide an in-depth statewide assessment of lacustrine black bass population metrics.

In this study, population metrics of New York's lacustrine black bass populations were summarized using four multi-decadal fisheries datasets: The NYSDEC "modern" statewide fisheries database (1988-present), the Cornell Biological Field Station Oneida Lake database (1984-present), the NYSDEC Lake Erie fisheries database (1981-present), and the NYSDEC Eastern Basin of Lake Ontario fisheries database (1976-present).

The population status of black bass in terms of relative abundance, length frequency, Proportional Stock Density (PSD), condition (relative weight) and / or growth (length at age) was summarized and compared for over 200 inland lakes distributed across the state as well as the two bordering Great Lakes (Lake Erie and Lake Ontario).

Mixed-effect regression models were used to determine a) which of seven regionalization schemes most effectively maximized among-group regional heterogeneity for the various population metrics and b) which environmental characteristics (such as water chemistry, lake morphology, and land use in surrounding catchments) were most important in explaining variation in the bass population metrics. Temporal (annual) trends in the status of the population metrics were also investigated for individual lakes that had been sampled repeatedly throughout the time-frame of the study.

This study will be completed in March, 2014 and the completed report will be available thereafter.

Implications of Natural Gas Extraction on the Eastern Brook Trout

INVESTIGATORS: William Fisher (NYCFWRU)
Todd Walters (CU BEE)

STUDENT: Maya Weltman-Fahs, Ph.D.

SPONSORS: New York State Water
Resources Institute

STARTED: April 2012



**MAYA WELTMAN-FAHS HOLDING EASTERN
BROOK TROUT**

Natural gas extraction from the Marcellus Shale formation is underway in PA and WV and is expected to commence in NY in the future. Maya's research focusses on the implications of these activities for stream dwelling macroinvertebrates and fish. Her study makes use of the stark difference in hydraulic fracturing development across the New York-Pennsylvania border, and includes a field study in Pennsylvania and a predictive modeling study for New York.

At her Pennsylvania field sites, Maya is comparing a number of instream variables across State Forest watershed catchments with different hydraulic fracturing statuses and intensities. She performs seasonal replications of her data collections in Spring, Summer, and Fall, and is entering the third year of data collection. For her New York modeling study, Maya is developing two models that she will run in sequence to make predictions about incoming drilling in New York State and its implications for native Brook Trout. The first model makes use of spatial statistics techniques and predictor variables summarizing the landscape and characteristics of the Marcellus Shale to predicting incoming drilling locations in New York based upon Pennsylvania patterns. The second model links the predicted well locations to possible impacts on Brook Trout by way of likely sediment mobilization from land clearing for the hydraulic fracturing development.

A Structured Decision-Making Approach to Fish Stocking in Owasco Lake, NY

INVESTIGATORS: William Fisher, (NYCFWRU)
David Lemon (NYSDEC)
Daniel Bishop (NYSDEC)

STAFF: Kelly F. Robinson, Postdoctoral Associate

SPONSORS: U.S. Geological Survey

STARTED: January 2013



**KELLY ROBINSON,
POSTDOCTORAL RESEARCH
ASSOCIATE**

Owasco Lake, one of the New York Finger Lakes, historically has provided diverse cold-water angling opportunities through fish stocking. These opportunities included the ability to catch trophy brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*). Brown and rainbow trout catches have declined since the inception of walleye (*Sander vitreus*) stocking in the mid-2000s. New York Department of Environmental Conservation (NYSDEC) fisheries managers believe that current stocking practices have produced suboptimal angling of all species. NYSDEC wants to change stocking practices to enhance opportunities and stabilize the fish populations. We used structured decision making (SDM) to guide NYSDEC's decision-making process while accounting for the multiple objectives inherent in stocking decisions (ecology, cost, angler values) and uncertainties about Owasco Lake community interactions. We held a half-day workshop in which we established the problem statement for this project, the fundamental and means objectives that should be met, and a suite of management actions that could be implemented to achieve the objectives. Additionally, we created a survey for anglers within the vicinity of Owasco Lake to better understand different aspects of satisfaction, including which species they prefer to catch. Through a series of face-to-face meetings and email correspondences, we were able to refine the qualitative consequences of each management action on each objective such that the managers have a better idea of how their choice of fish to stock might influence the fish community and angler satisfaction.

RESEARCH – WILDLIFE AND TERRESTRIAL

CURRENT PROJECTS

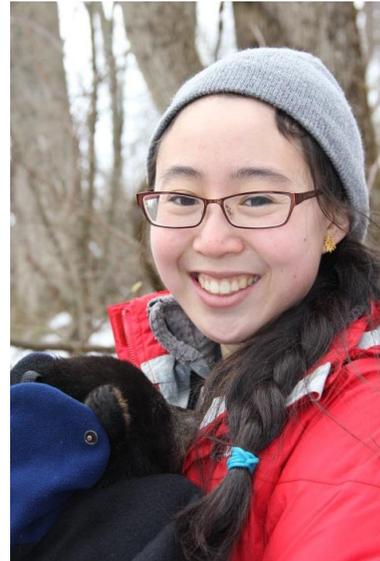
Estimating Black Bear Density Using Genetic Approaches

INVESTIGATORS: Angela Fuller (NYCFWRU)
Matthew Hare (Cornell)
Gordon Batcheller (NYSDEC)
Jeremy Hurst (NYSDEC)

STUDENTS: Catherine Sun, M.S.

SPONSORS: New York State Department of
Environmental Conservation

STARTED: August 2010



CATHERINE SUN, M.S. STUDENT

Black bear populations in New York have undergone range expansions since the early 1990s. Especially in the south, the expansion northward into central New York encroaches into areas of agriculture and densely populated urban areas. To manage black bears as they expand into central New York, it is necessary to estimate population size and understand the spatial, demographic, and genetic patterns that characterize the population. In this study, we conducted a non-invasive, genetic, spatial capture-recapture study in a region of a recently expanded black bear range in southern New York to 1) estimate spatially-referenced population size and density, 2) test for spatial patterns in population density related to habitat and landcover to understand patterns of range expansion, and 3) evaluate patterns of genetic diversity of the black bear population.

This study provides the first estimates of black bear population density in the Southern Black Bear Range of New York. Estimated population density was low compared to other black bear populations in the U.S. Patterns in density and detection probability differed from expected patterns of resource use; we documented a decline in the spatial pattern of bear density when forest landcover was >62%, no significant avoidance of areas with high road density (an anthropogenic landscape feature), but greater bear densities with higher percent of agricultural landcover (an anthropogenic landscape feature). Genetic diversity was comparable to that of non-expanding black bear populations, but more genetic sampling and tests would be required to identify signatures of bears dispersing into New York from north-central Pennsylvania. These results provide baseline estimates of bear density and patterns of resource use that will assist NYS management of bears in order to maintain and stabilize current population levels.

Spatial Ecology and Movements of Black Bears in New York State

INVESTIGATORS: Angela Fuller (NYCFWRU)
Gordon Batcheller (NYSDEC)
Jeremy Hurst (NYSDEC)

STUDENTS: Matthew Adams, M.S.

SPONSOR: New York State Department of
Environmental Conservation

STARTED: August 2010



**MATT ADAMS WITH A
RADIOCOLLARED BLACK BEAR**

As recently as 20 years ago the black bear population in NY was split into three discrete ranges – Adirondack, Catskill, and Allegany. Since that time, black bear abundance has increased in the southern portion of the state causing a merging of the Catskill and Allegany Ranges into what is now known as the Southern Black Bear Range. As the bears of the Southern Range have expanded their range northward they have moved into areas with higher human densities and into areas of increased development and agriculture relative to the historical range. These changes in conditions have potential to alter home range sizes given differences in habitat quality and may also influence movement behavior of bears. Data collected by GPS collars were used to evaluate black bear home ranges, habitat selection, and movements across the landscape. When combined with land use (e.g., human density, road density) and land cover data (e.g., stream density, land cover type) the results will provide information on how Southern Range bears are using anthropogenically modified landscapes and help predict where human-bear interactions may occur in the future. The project is scheduled for completion during summer, 2014.

Estimating the Distribution of Moose across New York State Using Hunter Survey Returns

Investigators: Angela Fuller (NYCFWRU)
Jeremy Hurst (NYSDEC)

Students: Nathan Crum, M.S.

Sponsors: New York State Department of
Environmental Conservation

Started: August 2013



**NATHAN CRUM,
M.S. STUDENT**

After moose re-colonized New York in 1980, their population was projected to exceed 1,000 individuals by 2010. However, estimates of moose abundance in New York have yet to exceed that figure, and there are growing concerns that moose populations are declining across the southern extent of their range, adjacent to New York. Yet, little is known regarding the distribution and dynamics of the moose population in New York. Producing rigorous estimates of the distribution and abundance of species, such as moose, that occur at low densities can be difficult, and that difficulty is compounded when producing estimates over a large spatial scale. To overcome these difficulties, we are using white-tailed deer hunter survey returns, which can provide a large amount of information regarding where hunters do and do not observe moose across the state, within an occupancy modeling framework. This method will produce an estimate of moose distribution across the state at a fine scale while providing information regarding what land cover, climatic, and biological factors correlate with moose occurrence. Additionally, this method may prove to be a rigorous and cost effective method for the New York State Department of Environmental Conservation to monitor the moose population.

A Rapid Assessment Tool to Prioritize the Management of New York Species of Greatest Conservation Need in a Changing Climate

INVESTIGATORS: Angela Fuller (NYCFWRU)
Daniel Rosenblatt (NYSDEC)

STUDENT: Christopher Nadeau, M.S.

SPONSORS: New York State Department of
Environmental Conservation



CHRIS NADEAU, M.S. STUDENT

STARTED: April 2011

Climate change is expected to cause major ecological change. Hence, wildlife management agencies need to adapt management plans to include the potential effects of climate change in order to minimize extinction risk and ensure that future management actions provide long-term benefits for focal species. Climate change vulnerability assessments (hereafter vulnerability assessments) can help management agencies identify priority species and areas of the landscape on which to focus adaptation efforts. We developed a new vulnerability assessment method that overcomes many of the limitations of existing vulnerability assessments by taking a spatial approach and using expert knowledge to obtain information on rare and poorly studied species. We have applied our vulnerability assessment to two applications. First, we used our vulnerability assessment to evaluate where biodiversity is likely to be most vulnerable in the northeastern United States and provide guidance for climate-smart management of biodiversity under climate change. Second, we ranked the relative vulnerability of 113 species of greatest conservation need in New York State to climate change. We combined the relative vulnerability of all the focal species to identify areas on the landscape where decreasing landscape resistance (i.e., decreasing the effect of dispersal barriers) or reducing non-climate threats could help reduce the vulnerability of a large number of focal species. We also identified factors that may influence the long-term benefit of species-specific management actions under climate change (i.e., climate-smart management considerations) for each of the focal species. The results from these two applications of our vulnerability assessment will help guide the revision of the State Wildlife Action Plan in New York State.

Spatial Capture-Recapture Models for Carnivores

INVESTIGATORS: Angela Fuller (NYCFWRU)
J. Andrew Royle (USGS, Patuxent Wildlife Research Center)
Sean Madden (NYSDEC)
Kathryn Jahn (USFWS)

STAFF: Christopher Sutherland,
Postdoctoral Research Associate

SPONSORS: U.S. Fish and Wildlife Service
New York State Department of
Environmental Conservation

STARTED: June 2011



**CHRIS SUTHERLAND,
POSTDOCTORAL SCIENTIST**

It is difficult to estimate abundance and density of carnivores due to their elusive nature, often low densities at landscape-scales, and the expense of methods that rely on capturing individuals. In this project we are specifically interested in estimating and comparing density of a riparian carnivore in two river systems. To do this we combine three revolutionary approaches to wildlife monitoring that overcome this difficulty associated with difficult to capture species: 1) the use of both hair snares to collect hair samples and the use of trained and highly skilled scat detection dogs to locate otherwise very difficult to find DNA yielding scat, 2) the identification of individuals based on DNA extracted from samples collected non-invasively (scat and hair), and 3) the analysis of spatial encounters of unique individuals with spatially explicit capture-recapture models.

A large-scale field study was successfully completed in 2013, which was based on data collected and analyzed from a pilot study in 2012. The 2012 study highlighted the value of conducting pilot studies prior to large-scale data collection. Specifically, we were able to identify that sampling design is extremely important when carrying out spatial capture-recapture studies, that standard spatial capture-recapture (SCR) models which are based on Euclidean distance may not reflect animal movement in structured habitats like ecological networks (e.g. streams) – the “Euclidean assumption”. For the 2013 study we therefore adopted a ‘clustered transect’ design to maximize the number of samples found of individuals in unique locations which appears to have performed extremely well based on preliminary genetic results. We have also developed a statistical framework for explicitly relaxing the Euclidean assumption which enables the association between species and landscape characteristics to be formally estimated. Interestingly, this translates directly to estimating landscape connectivity using capture-recapture data.

Revision of the New York State Endangered Species and Species of Greatest Conservation Need Lists

INVESTIGATORS: Angela Fuller (NYCFWRU)
Mitch Eaton (NYCFWRU)
John Ozard (NYSDEC)
Dan Rosenblatt (NYSDEC)

STAFF: Kimberley Corwin, Research Support Specialist

SPONSORS: New York State Department of
Environmental Conservation

STARTED: January 2010



**KIMBERLEY CORWIN,
RESEARCH SUPPORT
SPECIALIST**

New York State's official list of endangered species was promulgated in 1971 and threatened species authorization was added in 1981. Over 10 years have passed since the last major review and revision of these lists around 1992. New information has been developed from the listing of Species of Greatest Conservation Need (SGCN) through the Comprehensive Wildlife Conservation Strategy. This project is providing supporting documentation for making recommendations on the status of species to enable the NYSDEC to amend the New York list of Endangered, Threatened, and Special Concern species with an emphasis on prioritizing and updating the New York SGCN list.

Species assessments have been completed for each of the 537 Species of Greatest Conservation Need (SGCN) as the first step in the project to prepare a revised State Wildlife Action Plan, due in 2015. The assessments summarize current information on seven critical criteria: federal status, regulatory mechanisms, trends in abundance and distribution, current abundance in New York, threats to the species, New York's contribution to the North American range, and knowledge of management actions. These seven criteria will be used in a model that has been developed to place the current SGCN into one of several priority categories. A similar model will use the information in the assessments to amend the state endangered species list.

Meetings of experts are being convened to review the information in the assessments and to discuss the trends and specific threats to populations of each species in New York.

A structured Decision Making Approach to White-tailed Deer Buck Harvest Management in New York State

INVESTIGATORS: Angela Fuller (NYCFWRU)

Jeremy Hurst (NYSDEC)

Bryan Swift (NYSDEC)

STAFF: Kelly F. Robinson, Postdoctoral Associate

SPONSORS: U. S. Geological Survey

STARTED: March 2012



**KELLY ROBINSON,
POSTDOCTORAL RESEARCH
ASSOCIATE**

The 2012 Deer Management Plan for the New York State Department of Environmental Conservation (DEC) states that the agency should “encourage various strategies to reduce harvest of young bucks in accordance with hunter desires.” Based on this directive, we have engaged the DEC in using structured decision making as a framework to guide their decision process. Structured decision making is a defensible, transparent, objective way to make complex decisions by breaking decisions into component parts. In 2013, we continued to make progress on the decision model for determining the optimal harvest decision for white-tailed deer in New York State. As the project has progressed, numerous meetings, conference calls, and email correspondences have allowed the team to refine the set of objectives related to buck harvest management in New York State and make predictions about how harvest rates might change under different harvest alternatives. The predictive model to evaluate how each harvest alternative would affect the number of bucks harvested and available on the landscape, as well as population size, has been completed. In addition, Kelly Robinson and Angela Fuller have worked closely with the Big Game Team of NYSDEC to elicit how these harvest alternatives will affect other aspects of buck management, such as ability to maintain the population at desired sizes and ease of enforcement of each alternative.

In addition to working within the group to understand how harvest alternatives will affect the deer population and logistics of management, a statewide survey of buck hunters was completed in conjunction with the Human Dimensions Research Unit at Cornell University. This survey provides the team with much-needed information about how hunters value different aspects of buck hunting. This information, along with data regarding population dynamics and harvest management, will be used to determine the optimal buck harvest management strategy in different regions of the state. The results of this project will provide the NYSDEC with an optimal harvest decision and a framework for evaluation of harvest alternatives in the future.

A Structured Decision-Making Approach to Regulating Fall Turkey Harvest in New York and Pennsylvania

INVESTIGATORS: Angela Fuller, (NYCFWRU)
Michael Schiavone (NYSDEC)

STAFF: Kelly F. Robinson, Postdoctoral Associate

SPONSORS: New York Department of Environmental Conservation

STARTED: September 2013



**KELLY ROBINSON,
POSTDOCTORAL RESEARCH
ASSOCIATE**

Setting fall turkey (*Meleagris gallapavo*) harvest regulations entails taking into account both biological and social concerns, including turkey population dynamics and the satisfaction of multiple stakeholder groups. These multiple concerns require decision-makers to integrate different sources of information. Based on this need for the integration of multiple objectives, we have engaged wildlife biologists from New York and Pennsylvania, as well as the Cornell University Human Dimensions Research Unit and the New York and Pennsylvania Cooperative Research Units, in a joint structured decision-making effort for setting fall turkey harvest regulations. The results of the structured decision-making workshop that was held at Cornell University in October 2012 provided the starting point for this project. We are creating a quantitative predictive model of turkey population dynamics to forecast how turkey populations and spring and fall turkey harvest would be affected by different harvest alternatives in different regions of New York and Pennsylvania. Additionally, a statewide survey of New York turkey hunters was completed that provided the team with information regarding hunter satisfaction with different aspects of fall turkey harvest in New York State. The turkey population model, the results of the hunter survey, as well as information elicited from our group of experts will be used to create an overall decision framework that will evaluate the harvest alternatives to determine the optimal fall turkey harvest regulation package.

PUBLICATIONS AND PRESENTATIONS

JOURNAL ARTICLES

- Fisher, W. L., M. Bozek, Vokoun, J., and R. Jacobson. 2013. Aquatic habitat measurements. Chapter 4, in A. V. Zale, D. L. Parrish, and T. M. Sutton. Fisheries techniques, 3rd edition. American Fisheries Society, Bethesda, Maryland.
- Fuller, A.K., and D. J. Harrison. 2013. Modeling the influence of forest structure on microsite habitat use by snowshoe hares. *International Journal of Forestry Research*. doi:10.1155/2013/89232.
- Fuller, A. K., S. S. Spohr, D. J. Harrison, and F. A. Servello. 2013. Nest survival of wild turkeys in a mixed-use landscape: influences at nest-site and patch scales. *Wildlife Biology* 19:138-146.
- Nadeau, C. P., C. J. Conway, L. Piest, O. Hinojosa-Huerta, and B. Burger. 2013. Multi-species call-broadcast improved detection of endangered Yuma clapper rail compared to single-species call-broadcast. *Wetlands* 33: 699-706.
- Royle, J.A., R. B. Chandler, C.C. Sun, and A. K. Fuller. 2013. Integrating resource selection information with spatial capture-recapture. *Methods in Ecology and Evolution* 4:520-530.
- Sutherland, C., D.A. Elston, and X. Lambin. 2013. Accounting for false positive detection error induced by transient individuals. *Wildlife Research* 40:490-498
- Weltman-Fahs, M. & J. M. Taylor, 2013. Hydraulic Fracturing and Brook Trout Habitat in the Marcellus Shale Region: Potential Impacts and Research Needs. *Fisheries* 38:4-15.

TECHNICAL REPORTS

- Marcy-Quay, Benjamin. 2013. Evaluation of the NYS DEC Catch Rate Oriented Trout Stocking Program: Project Report.

PRESENTATIONS AND SEMINARS

- Alexiades, A.V. Angler effort, catch rates, and population dynamics of stocked trout in New York streams. NYSDEC Trout Team Meeting, Cornell University, NY, June, 2013.
- Alexiades, A.V., W.L. Fisher, P.J. Sullivan. Stream trout abundance and mortality estimation. New York American Fisheries Society Chapter Annual Meeting, Watertown, NY February 1, 2013.
- Alexiades, A.V. 2013. The Fate of Stocked Trout in New York Streams. NYSDEC Trout Team Meeting, Cortland, NY. 26 February 2013.

- Alexiades, A.V., C.E. Kraft, and A.S. Flecker. Potential nutrient subsidy synergies between agriculture and stocked trout in New York streams. American Fisheries Society Annual Meeting, Little Rock, AR, September 9, 2013.
- Eaton, M.J. Developing a sampling design for multi-state monitoring of the New England cottontail (*S. transitionalis*). Annual Meeting of the New England Cottontail Technical Working Group. Stockbridge, MA. 17-18 Jan, 2013.
- Eaton, M.J. The NY Cooperative Fish and Wildlife Research Unit's effort at capacity building in natural resource decision making. Invited presentation to Cornell University Dept. of Natural Resources 10-year external review. 22 Jan, 2013.
- Eaton, M.J., Fuller, A.K., Corwin, K., Rosenblatt, D., Ozard, J., Holst, L. Applying the SGCN decision model for species priority classification. Presentation of draft decision model to external technical review team for NYSDEC State Wildlife Action Plan preparation. 6 February 2013.
- Fuller, A. K. 2013. Spatially explicit models for density estimation of mammals using noninvasive DNA sampling. Invited presentation to the academic program external review team for the Department of Natural Resources, Cornell University. 22 January, 2013.
- Fuller, A.K., Eaton, M.J., Corwin, K., Rosenblatt, D., Ozard, J., and Holst, L. A decision model for prioritizing New York's Species of Greatest Conservation Need (SGCN). Presentation of draft decision model to external technical review team for NYSDEC State Wildlife Action Plan preparation. 6 February 2013.
- Fuller, A.K., Eaton, M.J., Corwin, K., Rosenblatt, D., Ozard, J., and Holst, L. A decision model for prioritizing New York's Species of Greatest Conservation Need (SGCN). Presentation of draft decision model to NYSDEC Bureau of Wildlife Manager's Meeting. 11 February 2013.
- Fuller, A. K. 2013. Spatial ecology and decision analysis. Overview of research program to graduate students and faculty, Department of Natural Resources, Cornell University. 27 August 2013.
- Fuller, A. K., J. A. Royle, and C. Sutherland. Investigation of mink abundance and density related to polychlorinated biphenyl contamination within the Hudson river drainage: Summary of data and results. Presentation to Hudson River Trustees. Albany, NY. 29 August 2013.
- Fuller, A. K. Tradeoffs among forest management objectives, focal wildlife species, and ecological reserves: Implications for future biodiversity and timber harvests. Invited seminar, Department of Wildlife Ecology Seminar Series, University of Maine, Orono, ME. 28 October 2013.
- Fuller, A. K. Science to inform management: the New York Cooperative Fish and Wildlife Research Unit. Presentation to the New York Fish and Wildlife Management Board. Hamilton, NY. 31 October 2013.
- Marcy-Quay, Benjamin. Assessing Changes to New York's Stream Trout Fishery. Annual Meeting of the New York Chapter of the American Fisheries Society 2013.

- Nadeau, C. P., and A. K. Fuller. A climate change vulnerability assessment to aid in the management of New York Species of Greatest Conservation Need. Department of Natural Resources Symposium, Ithaca, NY. 18 January 2013.
- Nadeau, C. P., and A. K. Fuller. Incorporating Spatial Heterogeneity in Climate Change and Landscape Features into Rapid Climate Change Vulnerability Assessments. 69th Annual Meeting of the Northeast Association of Fish and Wildlife Agencies, Saratoga, NY. 9 April, 2013.
- Nadeau, C. P., and A. K. Fuller. Incorporating Spatial Heterogeneity in Climate Change and Landscape Features into Rapid Climate Change Vulnerability Assessments. U.S. Regional Association of the International Association for Landscape Ecology, Austin, TX. 16 April, 2013.
- Nadeau, C. P., and A. K. Fuller. A new measure of climate change: accounting for multiple climate variables and multiple statistics of climate. 20th Annual Conference of The Wildlife Society, Milwaukee, WI. 8 October, 2013.
- Perry, P. C. and W. L. Fisher. Characterizing black bass length-at-age, relative weight, relative abundance and stock densities across New York lakes. 2013 Annual Meeting, New York Chapter of the American Fisheries Society, Watertown, New York.
- Robinson, K.F. and A.K. Fuller. A structured decision making approach to white-tailed deer (*Odocoileus virginianus*) buck harvest management in New York state. Department of Natural Resources Symposium, Cornell University, Ithaca, NY. 17-18 January 2013.
- Robinson, K.F. and A.K. Fuller. A structured decision making approach to white-tailed deer (*Odocoileus virginianus*) buck harvest management in New York state. 69th Annual Northeast Fish and Wildlife Conference (Northeast Association of Fish and Wildlife Agencies), Saratoga Springs, NY. 9 April 2013.
- Robinson, K.F. 2013. Structured decision-making in natural resources management. Cornell University, Department of Natural Resources Fall Seminar Series, Ithaca, NY, 29 October 2013.
- Robinson, K.F. and W.L. Fisher. A structured decision-making approach to fish stocking in Owasco Lake, NY. Annual Meeting of the American Fisheries Society, Little Rock, AR, 9-13 September, 2013.
- Sun, C. S., M. C. Adams, and A. K. Fuller. Black Bears in New York: Ecology, History, and Management. Invited talk, National Wild Turkey Federation, New York State Chapter Leadership Meeting. Waterloo, NY. 12 January, 2013.
- Sun, C. S., A. K. Fuller, J. A. Royle, and M. P. Hare. Comparing Spatial and Non-Spatial Capture-Recapture Methods to Estimate Population Size of Black Bears in South-Western New York. Department of Natural Resources Symposium, Cornell University, 18 January, 2013.
- Sun, C.S., A.K. Fuller, M.P. Hare, and J.A. Royle. Joining Resource Selection and Spatial Capture-Recapture into a Single Model: Estimating the population size of black bears in southwestern New York using a spatially-explicit capture-recapture model. 69th Annual Northeast Fish & Wildlife Conference, Saratoga Springs, NY. 9 April, 2013.

Sun, C. S., A. K. Fuller, and J. Andrew Royle. Joint estimation of black bear resource selection and population density. 22nd International Conference on Bear Research and Management, Provo, UT. 19 September, 2013.

Sun, C. C., A. K. Fuller, J. A. Royle, and M. Hare. Joint estimation of black bear resource selection and population density. The Wildlife Society Annual Conference, Milwaukee, WI. 7 October, 2013.

Sutherland, C. S., J. A. Royle, and A. K. Fuller. Using stream distance to estimate connectivity, movement and density of American mink in a river network using spatial capture-recapture models. The Wildlife Society 20th Annual Conference, Milwaukee, WI. 9 October, 2013.

Taylor, J. M. and W. L. Fisher. An evidence-based approach to developing environmental flow needs for Great Lakes tributaries in New York. 2013 Annual Meeting, New York Chapter of the American Fisheries Society, Watertown, New York, 1 February, 2013.

Weltman-Fahs, M., J.M. Taylor, and B. Fisher. Hydraulic fracturing and brook trout habitat in the Marcellus Shale region: Potential impacts and research needs. New York Chapter of the American Fisheries Society Annual Meeting. Watertown, NY. 1 February 2013.

Weltman-Fahs, M. and B. Fisher. Understanding the relationships between hydraulic fracturing and brook trout habitat in the Marcellus Shale region: A research agenda. Northeast Fish and Wildlife Conference. Saratoga Springs, NY. 8 April 2013.

ACTIVITIES

TECHNICAL ASSISTANCE

Alexiades, A.V., Instructed “Trout in the Classroom Stream Ecology” Field Trip Program – June 2013, Robert Treman State Park.

Eaton, M.J. Taught half day adaptive management course and led a decision analysis workshop for the Diadromous Species Research Restoration Network (DSRRN) conference. Jan 8-9, 2013. University of Maine, Orono.

Fuller, A.K. Expert Reviewer of Canada Lynx Conservation and Assessment Strategy: Interagency Lynx Biology Team. 2013. Canada lynx conservation assessment and strategy. 3rd edition. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication #R1-13-XX, Missoula, MT.

Fuller, A.K., Eaton, M.J., Corwin, K., Rosenblatt, D., Ozard, J., Holst, L. A decision model for prioritizing New York’s Species of Greatest Conservation Need (SGCN) for the NYSDEC State Wildlife Action Plan preparation.

Fuller, A.K. Study design and survey oversight for fisher occupancy and spatial capture-recapture study of fishers in southern New York – New York State Department of Environmental Conservation.

Robinson, K. Apprentice coach, Balancing Demographic Benefits and Risks of Using Predator Exclosures on U.S. Atlantic Coast Piping Plover Nests, USFWS/USGS Structured Decision Making Workshop, National Conservation Training Center, Shepherdstown, WV, December 9-12, 2013.

Robinson, K. Netica expert, decision model workshop for conservation of the endangered Allegheny woodrat, State College, PA, March 11-13, 2013.

TRAINING

Crum, N. Participated in Occupancy modeling in BUGS/JAGS and unmarked - Hierarchical models for species occurrence and communities. Patuxent Wildlife Research Center, USA. Nov 2013.

Fuller, A. Participated in Occupancy modeling in BUGS/JAGS and unmarked - Hierarchical models for species occurrence and communities. Patuxent Wildlife Research Center, USA. Nov 2013.

Nadeau, C. P. Participated in Enhancing linkages between mathematics and ecology: metacommunity ecology and evolution. Kellogg Biological Station, Michigan State University. 3-21 Jun 2013.

Nadeau, C. P. Participated in Bayesian population analysis using WinBUGS and JAGS . Patuxent Wildlife Research Center. 8-12 July 2013.

Perry, C. P. Motorboat Operator Certification Course (MOCC). Department of Interior. June 4-6, 2013. Missisquoi National Wildlife Refuge.

Robinson, K. F. Decision Analysis: Tools, workshop participant, National Conservation Training Center, Shepherdstown, WV, March 3-8, 2013

Sutherland, C. Participated in Bayesian Population Analysis Using WinBUGS and JAGS. Patuxent Wildlife Research Center, USA. July 2013.

SERVICE

Mitch Eaton:

Member, Biometrics Working Group, The Wildlife Society, October 2010 – Present

Appointed Member, New England Cottontail Research and Monitoring Working Group, October 2012 – Present

Member, IUCN Species Survival Commission (SSC) Crocodile Specialist Group, August 2011 - Present

Bill Fisher:

Past President, American Fisheries Society, August 2012 - Present

Faculty Advisor, Cornell Student Subunit, American Fisheries Society, March 2010 - Present

Member, Management Committee, American Fisheries Society, September 2007 - Present

Member, Governing Board, American Fisheries Society, August 2006 - Present

Member, New York Chapter, American Fisheries Society, January 2009 – Present

Member, Steering Committee, New York State Water Resources Institute, January 2011 - Present

Member, Advisory Committee, Cornell Biological Field Station, January 2009 - Present

Angela Fuller:

Cornell University Integrated Deer Research and Management Program Committee (2012-present)

State Wildlife Action Plan Advisory Committee, New York State Department of Environmental Conservation (2013-present)

Appointed Member, Oversight Committee for the Cornell Center for Wildlife Conservation, September 2010 - Present

Co-chair, Student Activities Committee, 2013 Northeast Association of Fish and Wildlife Agencies, Northeast Fish and Wildlife Conference (May 2012-April 2013)

Member, The Wildlife Society Leadership Institute Committee, December 2008 - Present

Member, College and University Education Working Group, The Wildlife Society, November 2008 - Present

Member, Biometrics Working Group, The Wildlife Society, November 2010 - Present

Member, Spatial Ecology and Telemetry Working Group, The Wildlife Society, November 2010 – Present

Appointed Member, Biodiversity Conservation Advisory Committee, New York State Department of Environmental Conservation (2011-present)

Appointed member, Excellence in Wildlife Education Award Committee, College and University Wildlife Education Working Group, The Wildlife Society (April 2012-present)

Appointed member, Nominating and Elections Committee, College and University Wildlife Education Working Group, The Wildlife Society (2012)

AWARDS & RECOGNITION

Alexiades, A.V. New York American Fisheries Society Annual Meeting “Best Student Paper 2013”

Alexiades, A. V. 2013 Kieckhefer Adirondack Fellowship Award funding “Potential nutrient subsidy synergies between agricultural and stocked trout in Adirondack streams”. \$5,000

Marcy-Quay, Benjamin 2013 Kieckhefer Adirondack Fellowship Award funding “Assessing movement and linkages between lake and tributary populations of brook trout (*Salvelinus fontinalis*) using small scale PIT tag arrays. \$5,000

Nadeau, C. P. International Association of Landscape Ecologists – U.S. Chapter, Student Travel Award 2013.

Nadeau, C. P. One of 30 selected to attend a 3-week (all expenses paid) workshop at Kellog Biological Field Station sponsored by the National Science Foundation 2013.



HISTORY

New York Cooperative Wildlife Research Unit (established 1961)

Unit Leaders

Daniel Q. Thompson, 1961-75

Milo E. Richmond, 1975-77 (acting), 1977-1984

Assistant Unit Leaders

Milo E. Richmond, 1968-1975

Richard A. Malecki, 1978-84

New York Cooperative Fishery Research Unit (established 1963)

Unit Leaders

Alfred W. Eipper, 1963-75

John G. Nickum, 1975-76 (acting), 1977-80

Steven P. Gloss, 1980-84

Assistant Unit Leaders

Henry A. Regier, 1964-66

Clarence A. Carlson, Jr., 1966-72

John G. Nickum, 1973-75

Steven P. Gloss, 1978-80

New York Cooperative Fish and Wildlife Research Unit (combined 1984)

Unit Leaders

Milo E. Richmond, 1984-2008 (wildlife)

William L. Fisher 2008-2013 (fisheries)

Assistant Unit Leaders

Steven P. Gloss, 1984-87 (fisheries)

Richard A. Malecki, 1984-2008 (wildlife)

Mark B. Bain, 1991-2003 (fisheries)

Angela K. Fuller, 2009-present (wildlife)

Mitchell J. Eaton, 2011-2013 (ecology)