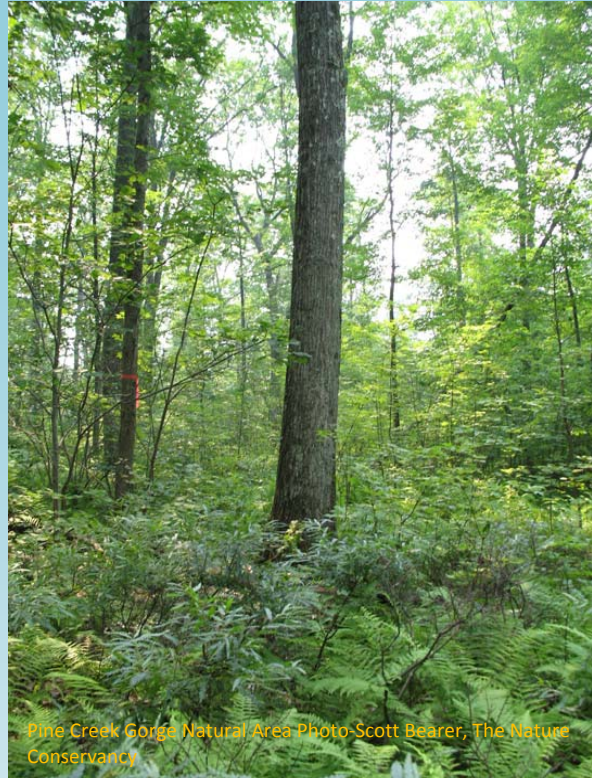
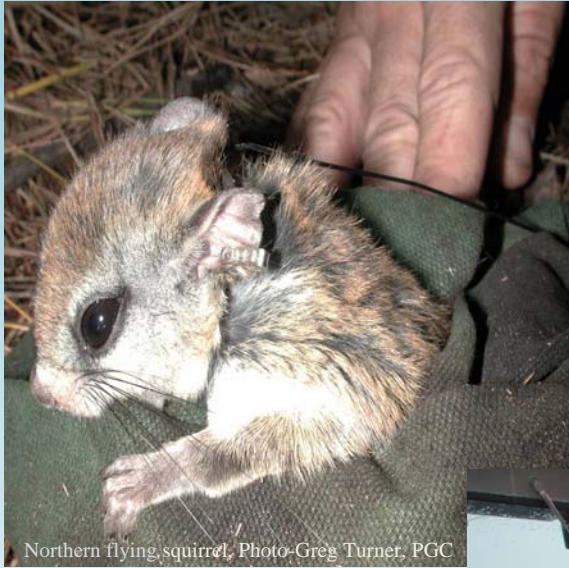


State Wildlife Grants: *Ensuring Pennsylvania's Natural Heritage Legacy*



February 2008



*Those who worked to piece this Strategy together
have created a roadmap that will inspire
conservationists and managers, and one that will
surely enhance the Commonwealth's ability to
manage and conserve its fish and wildlife.*

Peter Duncan, former Secretary of Pennsylvania's Department of Environmental Resources and former Executive Director of the Pennsylvania Game Commission.

See: [Pennsylvania's Wildlife Action Plan](#)





Marion E. Brooks Natural Area

Pennsylvania's Natural Heritage Legacy

"The nation behaves well if it treats the natural resources as assets, which it must turn over to the next generation increased and not impaired in value." -- President Theodore Roosevelt, 1907

Introduction

As President Roosevelt stated over 100 years ago, striving to ensure our natural heritage for future generations is an important responsibility. With the cumulative work conducted in recent years as part of the State Wildlife Grant Program (SWG), Pennsylvania's resource managers and researchers are gaining in understanding of our species of greatest conservation need (SGCN) and their habitats, to help ensure the Commonwealth's natural heritage.

As examples of securing these resources, this summary provides an overview of current and recently completed SWG-funded projects that are advancing our knowledge of fish and wildlife in Pennsylvania. Often cryptic, widely dispersed, or low in abundance, these animals are frequently difficult to assess.

However, through SWG funding, the breadth and scope of projects in Pennsylvania are allowing the collection of robust information that will greatly assist resource managers with developing conservation plans to secure the Commonwealth's natural heritage for future generations.

In this report, the various projects collectively show the reliance of animals on certain habitats and how the status of these animals is reflective of habitat conditions. For example, forest health is indicated by animals as diverse as flying squirrels and Allegheny woodrats, whereas the condition of diverse aquatic habitats can be seen in large fish such as the Atlantic sturgeon or small invertebrates like crayfish. Essential to supporting these animals is recognizing how landowners can manage their lands to improve the

opportunities for these vulnerable animals. Recently, a forest restoration tool has been developed to provide such assistance. Although much has been learned through these and other projects, due to the complexity and interrelatedness of habitats and species, as well as emerging threats, there are still many knowledge gaps. Pennsylvania will continue to apply State Wildlife Grant resources to most efficiently and effectively manage and protect our species of greatest conservation need and address our Wildlife Action Plan.



Marbled salamander, Photo-Rick Koval, Shippensburg University

The Ecological Setting

Pennsylvania straddles many ecological systems and exhibits a diversity of habitats supporting species from northern and southern climates, lowlands and uplands, and grasslands and forests. The Commonwealth is at an ecological crossroads and thus plays a pivotal role in conserving many species and habitats, resident and migrant,

common and rare. For this reason, the strategies and priorities identified in Pennsylvania's Wildlife Action Plan incorporate the needs of Pennsylvania's "Responsibility Species" and their associated habitats. Pennsylvania's ecosystems include:

- An estuary on the Delaware River,
- Woodlots and wide agricultural valleys in the southeast,
- Deciduous forests of the central ridges,
- Extensive mixed forests of the Allegheny high plateau,
- Glaciated woodlands and wetlands, and
- Lake Erie in the northwest.

Terrestrial Habitats

Predominant are expansive hardwood forests, covering more than 62 percent of the landscape and hosting world-renowned timber and wildlife values. These forests provide critical wildlife habitat for abundant white-tailed deer and a dazzling array of neotropical migratory songbirds.

Aquatic Habitats

The Commonwealth lies within parts of six major river basins: Ohio, Lake Erie, Susquehanna, Potomac, Genesee, and Delaware River drainages, and contains numerous wetlands, nearly 4,000 lakes and more than 83,000 miles of waterways, ranging from high-gradient coldwater streams to large, warmwater rivers. These waters support a high diversity of fish, freshwater mussels and other aquatic life, dependent upon Pennsylvania's management and protection efforts.

Northern Flying Squirrel in flight, Photo-Greg Turner, PGC



Pennsylvania's Northern Flying Squirrels

Summary: This project helped identify the distribution and habitat use of northern flying squirrels. In this State Wildlife Grant study, the distribution and habitat use by northern flying squirrels (*Glaucomys sabrinus*), as well as interactions with southern

flying squirrels (*G. volans*) in Pennsylvania, were assessed. Previous research in Pennsylvania and throughout the Appalachians documented the population decline of northern flying squirrels as well as their dependence on forests with hemlock (*Tsuga* spp.), spruce (*Picea* spp.), and pine (*Pinus* spp.) as major overstory tree components. As hemlocks decline throughout the Appalachians due to an invasive insect pest, the

hemlock woolly adelgid (*Adelges tsugae*), the conservation of forest stands that contain non-hemlock coniferous tree species should become a priority. Aside from habitat loss, direct and indirect competition between northern and southern flying squirrels may be contributing to the decline of northern flying squirrels in the Appalachians. Flying squirrels may compete for tree cavities and some food resources. Furthermore, the southern flying squirrel carries a parasite

PLANNING APPROACH

The protection and management of Pennsylvania's fish and wildlife, and their habitats, and the incorporation of human interests are the basis for the five guiding principles of the Wildlife Action Plan. These principles include:

1. **Conserve At-Risk Species.** Species exhibiting warning signs today at the local level must be conserved before they become imperiled at the regional, national or global level.
2. **Keep Common Species Common.** Native wildlife species must be retained in healthy populations throughout their natural ranges to maintain their role in ecological processes.
3. **Recognize the Important Conservation Role of Pennsylvania.** Strategies and priorities incorporate the needs of species and their associated habitats for which Pennsylvania holds particular responsibility.
4. **Foster Voluntary Partnerships for Species, Habitats and People.** The resources of public and private organizations throughout the Commonwealth must be aware of this effort – common contribution to common values.
5. **Develop a Comprehensive Strategy.** The State Wildlife Action Plan strategies and priorities are presented at the species, habitat, and species-suite levels. This allows stakeholders to gather information and provide input regardless of their scale and scope of interest.

(*Strongyloides* sp.) that may be debilitating or lethal to northern flying squirrels. The co-occurrence of northern and southern flying squirrels at all study areas in northeastern Pennsylvania lends support to this competition hypothesis. Radio telemetry revealed that both species of flying squirrels forage at night in the same hemlock/spruce habitat in the study area. However, northern flying squirrels left this conifer habitat during the day to roost in large deciduous trees. These observations support the management goal of maintaining large overstory tree species (regardless of species) as roost sites for northern flying squirrels. A revised Gap habitat model developed during this study indicated that the best combination of factors for predicting northern flying squirrel primary habitat in Pennsylvania was an 80-m wide riparian conifer corridor combined with the presence of mature and persistent (historic) forest cover. This study suggests that loss and fragmentation of mature coniferous habitat and competition with southern flying squirrels are contributing to the decline of the northern flying squirrel in Pennsylvania. In November 2007, the Pennsylvania Game Commission designated the flying squirrel as endangered in Pennsylvania.



Northern flying squirrel in cage, Photo-Greg Turner, PGC

Northern Flying Squirrel Management Recommendations

- Identify and protect mature (> 80 years old) conifer forests especially those with a red spruce component from further fragmentation and loss.
- Restore native red spruce and promote older forest structural features within these stands.
- Based upon habitat models, develop a regional approach to forest management and land use planning, especially in northeastern Pennsylvania.

(Dr. Carolyn Mahan, Penn State University-Altoona, Dr. Michael Steele, Wilkes University, Dr. Joseph Bishop, Mr. George Baumer, and Dr. Wayne Myers Penn State University-University Park; T- 24, *Eastern hemlock and mixed coniferous forested ecosystems: distribution and use by scurrid communities including the endangered northern flying squirrel*).

Conserving Atlantic Sturgeon in the Delaware River

Summary: This study initiated an assessment of the current population status and breeding habitat of Atlantic sturgeon in the Delaware River. Conserving priority wildlife in Pennsylvania requires good information. The Delaware River, on Pennsylvania's eastern border, used to be the center of the world's Atlantic sturgeon population. Attaining lengths of 14 feet and weights of almost 900 lbs., Atlantic sturgeon are the largest fish found in Atlantic coastal rivers. Unfortunately, overharvest, water pollution, and habitat loss led to a drastic decline in Atlantic sturgeon populations in the late 1800s. To

obtain vital information about this species, Delaware State University researchers initiated an assessment of the current population status and breeding habitat in the Delaware River. Results indicate that the river still supports Atlantic sturgeon, but both suspected breeding and feeding habitats are at risk for future degradation, highlighting the need to conserve these critical habitats. This State Wildlife Grants-funded project provides managers with the vital information needed to recover Atlantic sturgeon in the Delaware River for future generations. (Dr. Dewayne Fox, Delaware State University; T-12, *Contemporary population status and identification of spawning locations of Delaware River Atlantic sturgeon*).



Atlantic sturgeon, Photo-Lori Brown, Delaware State University

Indicators of Forest Health

Summary: Two studies are directed at a key indicator of forest health—the Allegheny Woodrat. Not unlike the gauges on an automobile dashboard that assess different functions such as speed, oil pressure, etc., the health of our natural resources can be measured through the populations of animals that inhabit a variety of habitats. One such indicator in Pennsylvania is the Allegheny woodrat (not related to the Norway rat) which is one of our best-and last-indicators of true wilderness. Once found on mountains throughout the Commonwealth, woodrats-also occasionally called packrats-today are limited to certain rocky stretches of the Allegheny and Appalachian mountains. Pennsylvania once held a solid woodrat population from Maryland to New York, but development and forest fragmentation have altered habitats sufficiently so that the species is now considered extirpated in New York and Connecticut. In Pennsylvania, two projects have been directed at protecting this

species; *Developing the Allegheny Woodrat Conservation Management Plan* (Jerry Hassinger) in which a model management plan for Species of Greatest Conservation Need will list best management practices to integrate conservation activities and plans used by state agencies. In addition to understanding the best practices for protecting habitat, a second project will help identify and predict high-quality Allegheny woodrat habitat (Drs. Joseph Duchamp and Jeff Larkin, Indiana University of PA). This conservation planning project will develop a model for predicting population viability, testing supplemental feeding, characterizing habitat and

dispersal boundaries, and determining age-specific demographics. Work will include radio-telemetry, DNA profiling and mark-recapture trapping. (Cal Butchkoski; T-11, *Conservation-management plan for the threatened woodrat; Identifying and predicting high-quality habitat in relation to Allegheny woodrat demographic trends*).



Allegheny Woodrat, Photo-Cal Butchkoski, PGC



Allegheny Woodrat Habitat, Photo-Cal Butchkoski, PGC

Professional Publications & Reports from State Wildlife Grant-funded projects

Project T-13.

Barry, P., R. F. Carline, D. G. Argent, and W. G. Kimmel. Movement and Habitat Use of Stocked Juvenile Paddlefish in the Ohio River System, Pennsylvania. *North American Journal of Fisheries Management*, Volume 27, Issue 4 (November 2007) pp. 1316–1325

Project T-02.

Argent, D.G., W.G. Kimmel, R. Lorson, and E. Emery. 2007. Ichthyofauna of the Monongahela River Basin in Pennsylvania: A contemporary evaluation. *Journal of Freshwater Ecology* 22(4): 617-628.

Kimmel, W.G. and D.G. Argent. 2006. Development and application of an Index of Biotic Integrity (IBI) for fish communities of wadeable Monongahela River tributaries. *Journal of Freshwater Ecology* 21(2):183-190.

Kimmel, W.G. and D.G. Argent. 2006. Efficacy of two-pass electrofishing employing multiple units to assess stream fish species richness. *Fisheries Research* 82:14-18.

Project T-16.

The Academy of Natural Sciences of Philadelphia. 2006. Evaluating the Pattern and Rate of Ecological Recovery from the Manatawny Creek Dam Removal. Report No. 06-05. 111 pages.

Helping Landowners & Managers Restore Ecological Values to Working Forests: *The Forest Restoration (FoRest) Decision Tool*

Summary: This project developed three products that will assist landowners and land managers to manage their working forestlands for biodiversity conservation.

Landowners and resource managers lack clear planning and management guidance on how forest management practices might be applied at the landscape level to benefit species of greatest conservation need. However, extensive research exists on numerous wildlife species' preferences for forest community type, seral stage, and habitat structure. So, using this information to address this need, The Nature Conservancy in Pennsylvania developed three products that will assist landowners and land managers to manage their working forestlands for biodiversity conservation by

explicitly correlating features of forests to economic and biodiversity values. The three products include; 1) a tool to predict the occurrence of upland forest community types in the High Allegheny Plateau and the Central Appalachian Forests (Vegetation Prediction Index (VPI)), 2) the Habitat Profiles for bird and mammal species of greatest conservation need. This profile helps identify the habitat preference for 200 bird and mammal species in six forest community types and four successional stages of the forests, and 3) silvicultural modeling to determine the practices (see box-right) most helpful to target species of greatest conservation need. The Nature Conservancy-PA completed original research to develop forest community definitions by successional stage (emphasis on

- **5 Treatments:**
 - Two-stage shelterwood 1
 - Two-stage shelterwood 2
 - Thinning with Group-selection
 - Individual Tree Selection
 - Null Model (do nothing)
- **5 Treatments + Prescribed Burn**
(same as above with fire)

structural attributes for mid-, late-successional and old-growth stages). These three products are being integrated to develop the Forest Restoration (*FoRest*) Decision Tool, which will soon be available to the public.



Current Extent of FoRest:

FoRest was developed for two ecoregions, the High Allegheny Plateau and the Central Appalachian Forest.

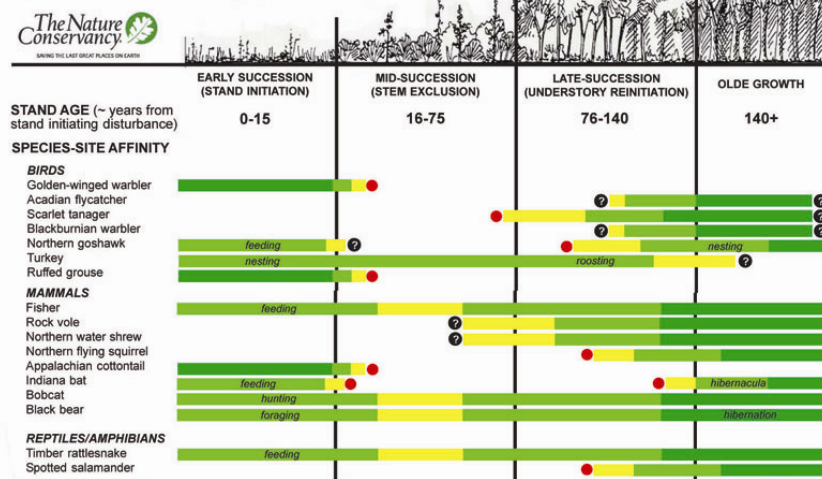
When managing their land, *FoRest* provides the landowner with information about the types of animals which may benefit from



different forest management practices and as the forest ages. An example is shown here for several Species of Greatest Conservation Need in Pennsylvania. Currently, *FoRest* is being applied by PA Department of Conservation and Natural Resources and the PA Game Commission. (Scott Bearer, Ph.D., Dylan Jenkins, CF, Emily Just, The Nature Conservancy-PA; T-36, *Multi-species habitat profiles for four major terrestrial forest types in Pennsylvania*).

Northern Hardwoods Forest Multi-Species Habitat Profile

! DRAFT: for demonstration only; values are not necessarily accurate



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Timber rattlesnake Inventory and Assessment

Summary: The assessments and pit-tag information from both phases of this population study will be used to evaluate the current status of the timber rattlesnake in Pennsylvania. The timber rattlesnake, which inhabits rocky outcrops, ledges, ridge tops, and talus slopes, is listed as an immediate concern (highest level) species in the PA Wildlife Action Plan. To address critical data gaps, the Pennsylvania Fish and Boat Commission recently completed a project to assess habitat and population status of this species.



Location information and site classification (e.g., den, gestation or basking areas) were collected at 467 historically occupied sites statewide. Only 19% of these sites were considered moderate to high quality and 66% were characterized as poor to low quality habitat.

Understanding the condition of these habitats is important for potential future management activities and for providing recommendations to avoid and minimize adverse development impacts to critical habitats. Population assessment and viability are being evaluated based upon tagging of 816 snakes. The second phase of this project has surveyed the areas devoid of rattlesnake data, yet possess suitable rattlesnake habitat. An additional 250 sites have been assessed (807 total to date), and 329 (974 total to date) snakes



have been marked with pit-tags. The assessments and pit-tag information from both phases of this overall population study will be used to evaluate the current status of the timber rattlesnake in Pennsylvania. This information along with genetic evaluation of blood samples (241), currently under analysis, will be used to determine the feasibility of establishing specific management units for these animals. (Chris Urban; Projects T-03, T-23).

Assessing the Distribution of Pennsylvania's Crayfish

Summary: Crayfish species that are either threatened or in decline were surveyed to update information on the ranges of native and introduced species in Pennsylvania. To effectively address the needs of species of greatest conservation need, knowing current distribution is essential. The objective of this project was to identify crayfish populations or species that are threatened or in decline, and to update information on the ranges of native and



introduced species in Pennsylvania. The individual species accounts and maps (and

database) developed as part of this project cover the complete fauna for the whole state (67 counties), with an emphasis (most field work) on the Eastern Pennsylvania epigeal (surface water dwellers) species. There are 38 counties, wholly or in part, that constitute Eastern Pennsylvania. Records were added for 35 of these counties. A database was compiled of the available records for Pennsylvania from a wide array of sources. Sites were added to the file from recent field efforts, primarily in Eastern Pennsylvania, by personnel from the Academy of Natural Sciences of Philadelphia and Penn State University. This

project was supported with State Wildlife Grants and Wild Resources Conservation Program Funding (Ray Bouchard; T- 19, *Assessing Changes in Crayfish Fauna over the Past 100 Years: Phase I, Eastern Pennsylvania*).



Stream Habitat Improvement through Dam Removal & Fish Passage

Summary: Dam removal and fish passage projects are reopening streams to enhance movement of fish and other aquatic life. The Fish Passage Section's Consultation and Grant Program for Fish Passage and Habitat Restoration advanced the completion of 16 dam removals and construction of a rock ramp fishway resulting in the reopening and restoration of nearly 135 miles of stream habitat for migratory and resident fishes. Over \$1.2 million of funding assistance was obtained in 2007 to support completion of these projects. Approximately 100 dam removal and fishway projects are ongoing. (Scott Carney and Dave Kristine; T- 09, *Fish Passage and Habitat Restoration Planning*).



During Removal of Dam, Photo-Dave Kristine, PFBC

(2004) Dettler's Mill Dam Removal, W. Conewago Creek, York County, PA



After Removal of Dam, Photo-Dave Kristine, PFBC

Fishes of the Allegheny River

Summary: Large-river habitats were sampled for fishes. In the summer of 2007 gillnets were used to collect large-bodied fish and a trawl to collect bottom-dwelling fishes of the Allegheny River from Lock and Dam #2 to Lock and Dam #8, excluding pool #5. Gillnet sampling collected

Allegheny River Fish Sampling Summary		
Species of Greatest Conservation Need (SGCN)		
Status	Gillnet	Bottom Trawl
State Candidate	Longnose gar, bowfin, river redhorse	
State Threatened	Smallmouth buffalo, Mooneye	Bluebreast darter, channel darter, longhead darter
State Endangered		Silver chub
Recovering	Paddlefish	

795 fishes representing 32 species or hybrids. Included in these samples were five Species of Greatest Conservation Need (SGCN) (See Table). These fishes accounted for 18% of the overall catch with the smallmouth buffalo most numerous. Dominant species were the common carp and channel catfish which represented over 50% of the total catch. Other fishes that were grouped included buffalo/redhorse/carp sucker (B/R/C). These species accounted for about 40% of the catch.

Trawling surveys captured a total of 395 individuals from four families and 16 species. Four SGCN, representing 30% of the total catch, were captured (See Table). Dominant species included the channel darter and logperch. (Dr. David G. Argent, California University of Pennsylvania; T-40, *Biodiversity of Riverine Fish Assemblages of the Lower Allegheny River*).



Allegheny River fish sampling

Photo-Dr. David Argent, Cal U. of PA

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