

# Project Plan for the Adirondack All Taxa Biodiversity Inventory

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The initiator of the ATBI concept for the Adirondacks is the Association for the Protection of the Adirondacks. Primary writers of the plan were Craig Milewski, Ph.D. at Paul Smith's College and Stacy McNulty, Ecologist at the Adirondack Ecological Center, SUNY-ESF in Newcomb, NY.

## Executive Summary

An all-taxa biodiversity inventory is a biological information gathering process that is dependent upon and supported by the stakeholders (the people) of the geographic area of interest. It acknowledges the close interdependence that stakeholders have with the biological community within which they live, work, and recreate. Through the active participation in an ATBI, individuals and groups can uncover these relationships and learn about this global treasure called the Adirondacks, an internationally recognized Biosphere Reserve. Much of this recognition is derived from the knowledge that unlike many other Biosphere Reserves, the Adirondacks encompass an enormous six million acre land mass with about one-half in public Forest Preserve land protected as “forever wild” by the New York State Constitution. Residents of New York and elsewhere, some 90 million within a day’s drive, can recreate, explore, and marvel at the vast areas of northern hardwood and boreal forests, peatlands, the 11,000 lakes and ponds, and 12,000 miles of streams and rivers. Ninety percent of the wildlife species in the northeastern US are found here; few places on the planet can make such boasts.

### Rationale

Management approaches rely upon defining relationships between biological diversity and the surrounding environment to be able to address ongoing environmental issues at local and regional scales, such as air and water quality, climate change, land use and development, and invasive species. An ATBI will provide essential biological knowledge for management decisions. Moreover, the ATBI will increase the connectedness of people to the environment through citizen science efforts, increase public support for protected areas, raise the potential for economically beneficial discoveries, and elevate an overall awareness and appreciation for the beauty and wonder of Adirondack biodiversity.

### A Clear Mission

Foremost, an Adirondack ATBI should focus on all taxonomic groups, citizen participation, education, and public and private collaboration. This shall be a project that both serves and is supported by the larger Adirondack community. The project mission is: *Surveying the diversity of life and connecting people to the natural world through participation in biological inventories and related activities in the Adirondack Park of New York State.*

### Project Plan

The project plan is the primary guiding document for the Adirondack ATBI. The Adirondack ATBI will document and synthesize past scientific work, heighten interest in ongoing work, and employ a systematic approach to collecting biological diversity information into the future. The plan has two main themes and six goals which articulate key elements for successful, long-term implementation of the ATBI. The themes are: biodiversity survey and citizen participation. The biodiversity survey has four goals: 1) perform the biodiversity inventory within an ecosystem and conservation framework, 2) coordinate among taxonomic working groups and the biodiversity inventory process, 3) develop and maintain a temporally and spatially-referenced database, and 4) coordinate with other ATBIs. Citizen participation has two goals: 1) community involvement and active citizen participation, and 2) appreciation of place-based biodiversity through art, culture and community.

## **Introduction**

An all taxa biodiversity inventory (ATBI) is a biological information-gathering process dependent upon and supported by the citizens (the stakeholders). It acknowledges the interdependence between stakeholders and the biological community within which they live, work, and recreate. In an ATBI, citizens and scientists from the region and elsewhere work together to learn about the biodiversity of a specific place. The Adirondack ATBI encompasses the entire six-million-acre Adirondack Park, about half of which is composed of public Forest Preserve land that is protected as “forever wild” by the New York State Constitution. The remaining three million acres within the Park are composed of private forests, farms, and about 100 human communities, where some 130,000 people live, either seasonally or year-round. Adirondack Park is an internationally recognized Biosphere Reserve, where ninety percent of the wildlife species in the northeastern United States are found. Residents of New York and elsewhere, some 90 million within a day’s drive, can recreate, explore, and marvel at the vast areas of northern hardwoods and boreal forests, the 11,000 lakes and ponds, and 12,000 miles of streams and rivers. Acknowledging that the Adirondacks are locally, regionally, and globally significant, a diverse community of public, private, academic, and governmental individuals and groups have come together to support the initiation of the Adirondack ATBI program. We believe that the following project plan outlines a course of action that will implement an exciting, innovative, model ATBI that combines scientific inquiry with active citizen participation and education, including links between the ATBI and appreciation of the arts and culture of the region’s human community.

## **Mission Statement**

*Surveying the diversity of life and connecting people to the natural world through participation in biological inventories and related activities in the Adirondack Park of New York State.*

## **Vision Statement**

The vision of the Adirondack ATBI is centered upon a scientifically-based inventory of the biological diversity in the Adirondack Park, including a strong component of citizen participation. The inventory information will support scientific inquiry within a standardized framework, promote coordination and information transfer, and will lead to a better understanding of the richness and diversity of life in the Adirondacks. This vision will be achieved by creating learning opportunities whereby citizens actively participate in biological inventories in cooperation with scientific experts, have broad access to inventory information, become aware and knowledgeable about organisms and their ecosystems, develop a sense of honor and respect for biological diversity, and develop a commitment to stewardship and to retaining the benefits that conservation of our natural communities offer to humans and all life.

## Rationale

Why is biological diversity important to society? We believe it is important because humans feel an ethical responsibility to all life, we have strong aesthetic connections to natural environments, we derive direct economic benefits from biological diversity, and we benefit from the services provided by healthy and biologically diverse ecosystems (Tickell 1997). For these reasons, conservation of biological diversity in the Adirondacks is becoming increasingly important as issues related to air and water quality, climate change, land use and development, and invasive species continue to be threats.

An ATBI is essential to the long-term conservation and management of the Adirondacks, and citizens are critical to that outcome. Janzen and Gamez (1997) state that “the in-country democratization of biodiversity information gathering and processing is one of the key steps to rendering that biodiversity an inextricable part of the social fabric in which it must survive”. An ongoing ATBI effort in the Great Smoky Mountains National Park has shown strong links between their ATBI and developing an increased connectedness of people to the environment through citizen science efforts, inspiration from understanding the beauty of nature, increased public support for protected areas, and the potential for economically beneficial discoveries.

A thorough discussion about planning for, and maintaining, the Adirondack ATBI concluded that several critical elements are essential. Foremost, an ATBI should focus on all taxonomic groups, and it should include and encourage citizen participation, multi-faceted educational opportunities, and public / private collaboration. A recent survey (U.S. Biosphere Reserves Association 2003) underscores the need for enthusiastic support by a local constituency for biosphere reserves, such as the Champlain/Adirondack program, through public education and local participation, as well as increased communication among biosphere reserve managers. Therefore, the ATBI is designed to be supported by, and to serve, the Adirondack community, and to network with other ATBIs toward conservation of biodiversity on a global scale.

The Adirondack ATBI is:

- All Adirondacks (public and private lands within and around the Blue Line)
- All species (taxonomic groups of species)
- Spatially referenced
- Public and private
- Strong citizen involvement/science/education
- All stakeholders (including but not limited to):
  - Students
  - Educators
  - Landowners
  - Policymakers
  - Scientists
  - Visitors/tourists
  - Consumptive recreationists (hunt/fish/trap)
  - Nonconsumptive recreationists

The Adirondack ATBI is not focused on threatened and endangered species, is not limited to an academic base of support, and is not government controlled.

## Products from the ATBI

The Adirondack ATBI initiative will produce tangible results including but not limited to:

- Database (including actual data, as well as metadata on other databases of interest)
- Archived specimens
- Web site
- Maps (digital and paper)
- Reports of results, published in both scientific and popular media outlets
- Educational materials (brochures, handouts, web sites, classroom lesson plans, public presentations)
- Writings, art, music, and other celebrations of Adirondack biodiversity and culture

## An On-Line User's Guide to the Adirondack ATBI

An *On-line User's Guide* will provide basic guidance to the ATBI organizational structure and its process. While this project plan is intentionally focused on the structure of the ATBI (e.g., goals, objectives, committees), adoption of detailed protocols for the Biodiversity Survey and for Citizen Participation is expected to be an organic process especially during the early initiation of the ATBI. To bring order to this process, an *Online User's Guide* will be made available on the website. The guide will provide 1) an introduction to Adirondack ecosystems and a conservation framework to help define hierarchical sampling regimes, 2) a summary of the taxonomic working groups (TWIGs) and protocols adopted by each, 3) a summary of the biological inventory process, and 4) ways to get citizens, educators and artists involved in the ATBI through activities such as citizen science, curriculum development, community outreach, and cultural festivities.

The guide will include references to literature that describes methodological approaches used by other ATBIs. Although the ATBI is an inventory program with no prior agenda or specific management outcome in mind, the *User's Guide* may refer to or suggest pertinent research questions, monitoring programs, or uses of inventory data collected through the ATBI.

## Scientists, Citizens and ATBI Participation

A key focus of ATBI is the connection between science (information) and citizens (excitement). Engendering enthusiasm about science and awareness of the diversity and uniqueness of the Adirondack ecosystem can also result in a new generation of taxonomists, scientists and policy makers aware of their natural and cultural heritage. Celebration of Adirondack heritage through ATBI cultural and artistic products can also strengthen the sense of place-based identity.

There are clearly benefits to scientists and taxonomists from participating in an ATBI. While data gathering will continue in the Adirondack region regardless of an ATBI, the initiative will promote collaboration between scientists and institutions on questions of interest to the entire community. Well-trained volunteers can assist with data collection and organization for many scientific projects, increasing the number of samples and sites visited. Questions of data quality can be resolved with a well-designed sampling protocol, for which there are many models. The Adirondack Mountains is a large area with many dispersed groups working largely independently from one another. The ATBI can serve as an umbrella organization to coordinate researchers, leverage resources, and connect Adirondack stakeholders to others across the state, country and world.

## Sensitive and Proprietary Data

We recognize the importance of data sharing, confidentiality, and ownership issues. Therefore, the Adirondack ATBI Steering Committee agrees to the following:

1. Creation and maintenance of a comprehensive library of data, metadata and specimens for use by ATBI partners, scientists, and others, with the assurance that
2. Data and information identified as sensitive or proprietary are not redistributed to others and that requests for information are redirected to the owners of those data.

Sensitive data are designated as such by the data originator/owner. Sensitive data are to be viewed only to the database manager. Distribution of sensitive data, excluding metadata documentation, to Consortium members is outside the administrative capacity of the ATBI as the facilitator. Access to sensitive data is available via direct agreement with the data owner.

Proprietary data will be held strictly confidential and shall not be disclosed to any third party in any manner, in whole or in part. Standard of care given to maintaining confidentiality will be at least a reasonable standard of care. Upon completion of the project, proprietary data will be maintained by ATBI only with written agreement of the owner.

Exclusions: Proprietary information does not include any portion of data that: (a) at the time of disclosure is in the public domain, (b) was unknowingly acquired from an organization other than that claiming proprietary interest, (c) was not accompanied by written declaration of proprietary status at the time of transmission to ATBI.

## **Committees**

Throughout the project plan several standing committees are referenced. These committees along with those not referenced in the main body are part of the *Organizational Structure of the Adirondack ATBI* (Appendix A), and are as follows:

Advisory Council  
Steering  
Science  
Education  
Community Outreach  
Finance  
Database

## **Project Plan Themes and Goals**

The Project Plan is the primary guiding document for the Adirondack ATBI. The Adirondack ATBI will document and synthesize past scientific work, heighten interest in ongoing work, and employ a systematic approach to collecting biological diversity information into the future. We define two themes for this Project Plan, which articulate key elements for successful, long-term implementation of the plan. The goals are not discrete from one another but are integrated and overlap. The two themes and six goals within them are:

### Theme 1: Biodiversity Survey

Goal 1.1: Biodiversity Inventory within an Ecosystem and Conservation Framework

Goal 1.2: Coordination among Taxonomic Working Groups (TWIGs) and the Biodiversity Inventory Process

Goal 1.3: Development and Maintenance of a Temporally and Spatially-referenced Database

Goal 1.4: Coordination with other ATBIs

### Theme 2: Citizen Participation

Goal 2.1: Community Involvement and Active Citizen Participation

Goal 2.2: Appreciation of Place-Based Biodiversity through Art, Culture and Community

## Theme 1: Biodiversity Survey

### Goal 1.1: Biodiversity Inventory within an Ecosystem and Conservation Framework

The central goal of all ATBI programs is an inventory, or survey, of all living organisms, from mammals and birds to reptiles, insects, bacteria, and fungi that are found within a particular study area. Using the results of this work, scientists are able to pinpoint the habitats of various species, and describe the physical and ecological conditions in which they live.

An ecosystem framework is the natural systems (wetlands, lakes, streams, etc) and the conservation systems are the public vs. private, public land types and private zoning designations.

While we have much information on some species and some places, little is known about vast numbers of species, and many regions of the Adirondacks have not been inventoried. An ATBI would identify and fill those gaps in knowledge by providing guidance to scientists working in the Adirondacks. ATBI surveys usually discover many species never previously recorded from an area; and, in many cases, several species completely new to science are discovered.

Most ATBIs, including the Adirondack program, are not specifically designed to assess the size or health of plant and animal populations or assess biological integrity of ecosystems. However, information gained in the ATBI process can be used in conjunction with other studies to make these initial assessments and to provide measures of biological attributes used to monitor changes in species, communities or ecosystems over time. The general health of the environment could be determined by using the presence or absence of “indicator” species or by using a suite of community attributes.

Scientific identification of individual plants, animals, and primitive life forms is a technically demanding process that requires the oversight and input of professional taxonomists. Nevertheless, interested laypersons can play an important role in gathering specimens for later identification, and in some cases they can be trained to make initial identifications that facilitate the work of the experts.

A biological inventory will have its greatest value if performed systematically within an ecosystem and conservation framework that is a spatially-explicit sampling scheme, hierarchically nested within a landscape context. The framework will guide our sampling site choice, and help us map out where we've been and where to sample next in different ecosystems. Existing frameworks that define ecosystem units will provide taxonomic working groups, researchers, and managers of natural resources with a means to analyze species, populations, and community structure and function in a manner relevant to local and landscape-level environmental conditions. An *Online User's Guide to the Adirondack ATBI* will define the ecosystem and conservation framework. It will help us focus sampling on certain ecosystems. We should use existing boundaries to help us determine the sampling scheme (Forest Preserve units, watersheds, etc.).

#### *Objectives of Goal 1.1*

Objective 1.1.1: Use existing or develop existing hierarchical frameworks within which systematic inventories can be cataloged and analyzed

Objective 1.1.2: Organize species and ecological community distributions within a spatially-referenced database using GIS and other modeling tools

- Factor in past and current land use, current condition

Objective 1.1.3: Design the inventory to link to or lead to existing monitoring frameworks

- Populate matrix of species and spatial gaps
- Output includes maps and spatially-referenced database

## Goal 1.2: Coordination among Taxonomic Working Groups and the Biodiversity Inventory Process

Coordination among taxonomic working groups (TWIGs) will be performed by a Science Committee. (Organization of TWIGs is outlined in a companion document). The Science Committee will:

- 1) Seek taxonomists and professional scientific societies to perform work in the Adirondacks,
- 2) Spatially and temporally catalog work by taxonomists across TWIGs
- 3) Promote collaboration among groups to work within the referenced ecosystem units,
- 4) Promote efforts in under-sampled areas and under-represented groups,
- 5) Develop guidelines for citizen-based efforts and formal scientific efforts,
- 6) Establish fellowship and sabbatical support for scientist and graduate students,
- 7) Identify satellite field facilities that can offer support and equipment for taxonomic work, and
- 8) Provide updates to a central coordinator location to collectively track, catalog, and report multiple ongoing and future efforts to all interested parties.

The *basic inventory process* will be performed by the TWIGs with guidance from the Science Committee. This will be defined in *The User's Guide to the Adirondack ATBI*. The basic premise behind the inventory process is that field protocols must be

- 1) Repeatable
- 2) Performed in a standardized manner acceptable to the science community
- 3) Performed at spatially and temporally referenced locations
- 4) Focused on maximizing distribution and abundance information according to ecosystem and conservation framework
- 5) Available to interested parties.

Additionally, each TWIG will identify within the protocols the appropriate manner in which citizens can become involved and the level of guidance needed.

TWIGs will:

- 1) Designate the proper authority/reference for identifying species
- 2) Train field workers to sample all taxa
- 3) Coordinate sampling and data collection
- 4) Deliver data to ATBI coordinator
- 5) Analyze data for spatial and temporal patterns, life history information, and so on

Field protocol for taxonomic groups will specify a minimum level of sampling detail appropriate to the logistics of sampling effort and citizen involvement. Four levels within sampling units appropriate to each taxonomic are defined as follows: 1) presence-absence, 2) relative abundance, 3) population estimate, and 4) complete census. These will be defined in *The User's Guide to the Adirondack ATBI*, also.

### Objectives of Goal 1.2

Objective 1.2.1: Adopt field sampling protocols from other ATBI TWIGs

Objective 1.2.2: Adopt database structure and procedures for population and maintenance of database

Objective 1.2.3: Populate and maintain database; allow data entry by authorized users

Objective 1.2.4: Coordinate sampling and Bioblitzes

Objective 1.2.5: Engage and keep museums, research facilities, professional groups and governmental agency leadership (task of Outreach Committee)

Objective 1.2.6: Help to define the degree to which taxonomic groups have or have not been represented in inventories, and to identify the spatial gaps in taxonomic inventories

Objective 1.2.7: Identify past and currently-sampled plots or areas and determine where to sample for future collections

**Goal 1.3: Development and Maintenance of a Temporally and Spatially-referenced Database**

The Database Committee will create a data repository that makes disparate data sources compatible with new information. A database that contains species names, locations, and images will permit the archival and analysis of the taxonomic diversity of the Adirondack Park. Served as a digital database over the internet, state-of-the-art biological inventory data will be accessible to scientists, land managers, educators, and citizens to aid land management decisions, and increase citizen involvement in the scientific uniqueness of the Park.

We will use a GIS as a general framework for keeping an ongoing record of all collecting activities and for mapping the locations for species collected and observed. We will also be able to identify over- and undercollected areas and compare more accessible to less accessible sites. We will identify hot spots of diversity and areas sensitive to change. We will model and predict species distributions, as well as to pick areas to test such maps in the field.

Once the database is created it will be 'populated' with existing taxonomic information for the Adirondacks. A great deal of taxonomic information has been collected in the Adirondacks by organizations such as the NYS Museum, the NY Natural Heritage Program, the NYS Amphibian and Reptile Atlas, NYS Breeding Bird Atlas, the US Forest Service Forest Inventory Analysis program, and research projects recorded in the NYS DEC Temporary Revocable Permit GIS database, among others. These data will be incorporated into the database when feasible, resulting in one central Adirondack database. The Adirondack ATBI database will be structured to allow for future data inputs as the ATBI grows.

*Objectives of Goal 1.3*

Objective 1.3.1: Create and maintain an inventory database

- Populate with existing data and new field data. Existing databases will be explored and crosswalks will be created
- Ensure the metadata and descriptions are in the User's Guide

Objective 1.3.2: Create a database that has a user-friendly front end (Graphical User Interface) different access points and levels for different users

Objective 1.3.3: Use a GIS to help develop a *User's Guide* to collecting within an ecosystem and conservation framework in the Adirondacks (*User's Guide* contains the protocols and metadata/descriptions)

#### **Goal 1.4: Collaboration with other ATBIs**

ATBIs occur throughout the United States and in other countries. Communication and coordination with these ATBIs will be beneficial to our ATBI support, field protocols, database management, and promotion of the value and benefits of ATBIs to humans. To date, the Adirondack ATBI Initiative has benefited greatly through the assistance and wisdom of scientists from the Great Smoky Mountains National Park (especially Keith Langdon and Becky Nichols). One goal of the Adirondack ATBI will be to create and maintain open communication with other ATBIs and work collaboratively in a broader global sense to promote conservation of biological diversity. The developing ATBI Alliance will serve in this capacity.

##### *Objectives of Goal 1.4*

Objective 1.4.1: Interact with ATBIs nationwide to share: strategies, successes, and resources

Objective 1.4.2: Collaborate as appropriate with ATBIs to share data and results on the process

Objective 1.4.3: Underscore the relationship of ATBI and human connection to biological diversity

Objective 1.4.4: Assist others in developing ATBIs

## Theme 2: Citizen Participation

### Goal 2.1: Citizen Involvement and Active Participation

The Adirondack ATBI will rely heavily on community involvement and citizen participation. The Education Committee and the Communication and Outreach Committee will identify and list the ways in which citizens (including groups, educators, individuals, etc.) can become involved and actively participate in all stages of the ATBI, including but not limited to inventory, education, and administration. This will be outlined in *The User's Guide to the Adirondack ATBI*. Thus, when an interested party asks, "How can I participate?" a list of activities or contacts can be provided. These lists could be part of the promotional materials produced to raise awareness of the ATBI. The Education Committee will help organize local educational events around the park at various locations (e.g., Adirondack Park Visitor Interpretive Centers, etc.).

#### *Objectives of Goal 2.1*

Objective 2.1.1: Develop a means by which volunteers, citizens' groups, and landowners can become connected with scientists and assist with field sampling, processing of field samples on site or at specimen processing centers, data processing, ATBI administration and promotion

Objective 2.1.2: Develop and coordinate activities that provide learning opportunities about biodiversity for a diverse citizenry and for participants at all educational levels (at all age levels and including both trained and amateur naturalists). The Education Committee is responsible for this Objective

Objective 2.1.3: Make the results of the ATBI (exclusive of proprietary, sensitive, or otherwise inappropriate material) available to a wide variety of media and comprehensible to citizens, decisionmakers and visitors of the Adirondacks through the Community Outreach Committee

Objective 2.1.4: Encourage use of ATBI information in local decision making by landowners, organizations, and government agencies

## **Goal 2.2: Appreciation of Place-Based Biodiversity through Art, Culture and Community**

The focus of this goal is to identify ways to link science with the artistic and cultural milieu that characterizes the Adirondacks. Appreciation of biological diversity and natural environments and connection to the land are common themes expressed by writers, painters, photographers, and singers in the Adirondacks. In many respects, these people are the story-tellers who will help the Adirondack ATBI to realize the mission and vision of the project. Rockwell Kent, William H.H. Murray, Bob Marshall, and other early artists, writers, and explorers were instrumental in creating interest in the Adirondack region and making it accessible to people. Their work, like Aldo Leopold's and others' contributions, serve to inspire many naturalists and conservationists today. It is this spirit that we wish to capture and use to effectively make the ATBI part of the visible and subtle fabric of life in the Adirondacks.

### *Objectives of Goal 2.2*

Objective 2.2.1: Encourage the celebration of Adirondack biodiversity with writing, art, and other cultural "products"

Objective 2.2.2: Bring writers, photographers and other artists into the biological inventory process in ways that help document the process and highlight the cultural significance of the ATBI

Objective 2.2.3: Explore ways to incorporate art and culture to fit curricula and meet NYS educational standards.

Objective 2.2.4: Demonstrate the historical connection of human culture, including indigenous peoples, in the Adirondacks with various aspects of biological diversity

## Literature Cited

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## **Appendix A: Organizational Structure of the Adirondack ATBI**

Advisory Council - Stakeholder groups represented here

- Advise the ATBI, no directives are issued

Coordinator – Funded staff position

- Reports to and carries out directives from Exec. Committee
- Coordinates activities of committees and Advisory Council

Executive Committee/Steering Committee

- Make decisions for the ATBI, issue directives
- Keep the ATBI committees and organizational leaders excited

Science Committee – made of scientific experts

- Organize Taxonomic Workgroups (TWIGs)
- Promote collaboration a) between scientists and b) between scientists and citizens
- Keep the scientists engaged and excited
- Maintain list of scientific experts
- Assist with identification of facilities for scientists (e.g., housing, laboratory, equipment)

Education Committee

- Organize school activities/instructor workshops
- Coordinate with schools/VICs/colleges/universities

Community Outreach Committee

- Identify specific stakeholders, especially business, industry, landowners
- Customize message to stakeholders
- Develop materials and handouts
- Develop web site
- Maintain list of volunteers

Finance Committee

- Oversee budget
- Identify funding opportunities
- Distribute budget to ATBI scientists and educators

Database Committee

- Design structure based on existing models
- Identify existing datasets for incorporation
  - Collect metadata
  - Consider issues of data ownership and public access to information
  - Plan for links to partners' data. If partners' datasets are not stored long-term by ATBI, how and where are they stored and accessed?
  - Populate matrix of spatial gaps and taxonomic groups

## Appendix B: Supporting Documentation for Model ATBI and Data Collection Projects

### Great Smoky Mountain National Park ATBI:

<http://www.discoverlife.org/nh/tx/Insecta/Odonata>

Interpretive and natural history information, as well as links to photo database and other information.

### New York Natural Heritage Program (database not online):

A database of rare species and communities across New York State. Attributes of interest include:

Element Occurrence Code; scientific name, common name; point or occurrence location; site description; sensitivity rating; and specimen ID.

### Cornell University Plant Pathology Database:

<http://ppathw3.cals.cornell.edu/CUPpages/CUP.html>

A taxonomic and photographic database. Attributes of interest include: specimen phylogeny, type status, locational information, substrate, name of collector, date of collection, person who verified specimen, and narrative notes by the collector.

### Cornell University Insect Collection: <http://www.entomology.cornell.edu/CUIC?index.html>

A taxonomic database. Attributes of interest include: specimen phylogeny, date, location, type status, type of preservative, number of specimens, sex of specimen, location of specimen in the collection, notes of the collector.

### Great Smoky Mountains ATBI - Mollusks: [http://www.biosci.ohio-state.edu/~mollusks/OSUM2/smokies\\_atbi.htm](http://www.biosci.ohio-state.edu/~mollusks/OSUM2/smokies_atbi.htm)

A taxonomic database. Attributes of interest include: specimen phylogeny, date, location, and type status, type of preservative.

Code and ethics of collecting: <http://www.afn.org/~iori/oincolgl.html> and [http://powell.colgate.edu/wda/Code\\_for\\_Collecting.htm](http://powell.colgate.edu/wda/Code_for_Collecting.htm)

### Instructions on digital scanning and photograph procedures:

<http://www.dragonflies.org/>

List of Odonate experts worldwide: <http://www.afn.org/~iori/oinemail.html>