
All Taxa Biodiversity Inventory

Great Smoky Mountains
National Park

Great Smoky Mountains National Park comprises more than half a million acres and serves as refuge for one of the richest and most diverse collections of plants and animals in the temperate world. This richness has led to the park's designation as an International Biosphere Reserve. Climate, topography, the north-south orientation of the mountains, large tracts of old-growth and contiguous forests, and protection as a national park have all contributed to this abundance.

But while we know the park possesses a vast and varied assemblage of life forms, there is still much we don't know in terms of the number and identity of species. Consider, for instance, that by some estimates the park possesses more than 100,000 species, excluding bacteria—yet we have identified only a small percentage of them. Because of this lack of basic resource knowledge, Park Service managers are continually hampered in their critical decision making efforts.

A new research initiative grows from the need to learn more about all of the park's varied species. Termed an All Taxa Biodiversity Inventory (ATBI), this research effort represents a comprehensive inventory of all life forms in Great Smoky Mountains National Park. It may be completed in as few as 10 years and therefore represents an intensive undertaking. Before it's finished, the project will tap the expertise of taxonomists (people who differentiate and classify plants and animals), data specialists, biologists, botanists, and ecologists, among others. Once completed, the ATBI will provide a baseline from which to measure change.

In conducting their research, these specialists will sample the park, discovering and documenting

nearly all of the species that occur there. This type of scientific survey has never been undertaken on such a scale anywhere in the world, and it will serve as a model for future projects in other national parks and protected areas. This effort is founded on the notion that knowledge is essential for effective preservation.

Threats to the Park

A number of existing and impending threats to park species reinforce the urgency for a comprehensive inventory. Several common forest ecosystems are threatened by non-native insects and diseases unintentionally imported into North America. Destructive non-natives include the balsam woolly adelgid, dogwood anthracnose, Chinese chestnut blight, Dutch elm disease, beech bark disease, hemlock woolly adelgid, and the gypsy moth. More conspicuous alien species such as wild hogs, rainbow trout, and a host of invasive vascular plants are also damaging natural systems. These unwelcome pests have already caused major forest changes, and they threaten to do even more damage in the immediate future.

The Smokies also receive some of the highest depositions of nitrates and sulfates in eastern North America. These airborne pollutants acidify the park's soils and streams. Ground-level ozone pollution in the Smokies has harmed dozens of plant species and may harm animal life as well. In addition, development on the park's periphery has accelerated at an alarming rate, fragmenting and disrupting many biological communities.

These and other threats causing serious impacts on the park's natural systems can often be ameliorated, or preferably prevented, by park managers



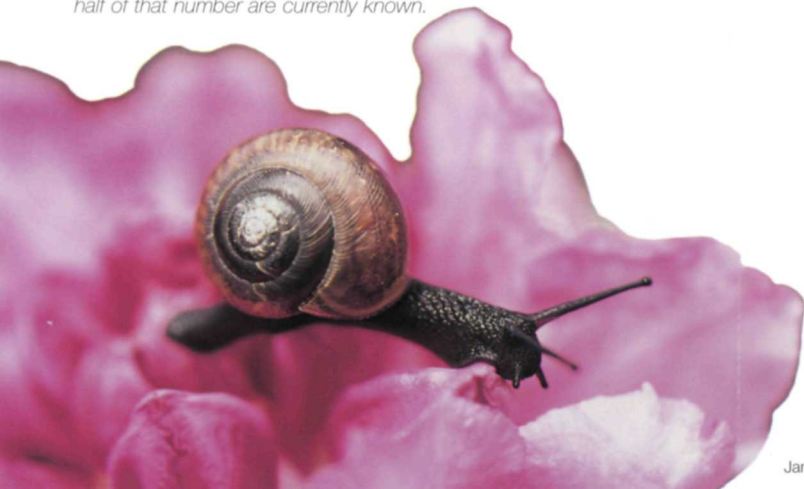
using a variety of tools. ATBI data will allow intelligent decision making as to which sites, species, and natural processes are the most important in prioritizing actions to protect park biodiversity.

Goals

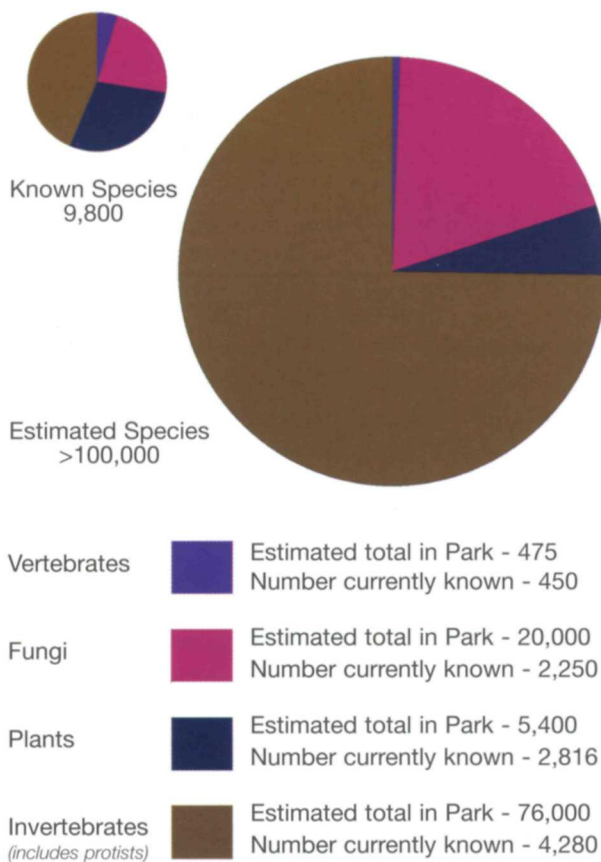
The park must complete its all-species inventory as soon as possible if it hopes to preserve the greatest number of resources and acquire the knowledge necessary to make better-informed management decisions. Specifically, the goals of the inventory are to:

- ◆ Complete a comprehensive "checklist" of life forms in the park.
- ◆ Gather data to create initial range maps for each park species. These maps, based on extrapolations from sampled habitats, will be crucial for the protection of natural resources.
- ◆ Compile natural history information on each species, including its relative abundance, its response to various climatic conditions, photographs of each of its life stages, its role in the greater ecosystem, its relationship with other species, and digital recordings of its calls or sounds.
- ◆ Organize the information gathered and make it available to scientists, educators, land managers, students, and all other interested parties via the World Wide Web and other media.

Forest snail, Mesodon sp., on Catawba rhododendron. An estimated 200 species of mollusks live in the park, though only half of that number are currently known.



Less Than Ten Percent of the Park's Estimated 100,000 Species are Currently Known



Partnerships

The National Park Service cannot hope to complete the inventory independently. It will take many partners—universities and colleges, museums, other government agencies, and volunteers to complete the ATBI within the target deadline of 10 to 15 years. Fortunately, many partners have expressed a strong interest in participating. As a result, a nonprofit organization formed from the park's non-government partners called Discover Life in America will work with the National Park Service and other interested agencies to design the project, make the necessary field collections, process and identify specimens, analyze and archive data, and maintain Web pages of resulting information.

Because of the number of participating partners, one the project's greatest challenges will be efficiently coordinating the efforts of the many institutions, agencies, groups, and individuals who will be involved.

Additional Benefits

Although inventory participants are primarily interested in protecting the Great Smoky Mountains National Park, several important byproducts of an all-species inventory will expand and increase the project's overall value.

Education

Students at several levels will not only enjoy access to the resulting information, they will also learn by participating in supervised programs. Involvement by interested students will include field work, sorting specimens, and building Web pages.

Bioprospecting

Scientists are increasingly looking for new medicines, natural pest controls, and other useful products derived from the natural world. Once discovered and screened for efficacy, natural compounds are often synthesized in laboratories. Although not a focus of this project, discovery of organisms which might possess medically or commercially valuable properties could be a byproduct. Potential gains from such use may be significant. For example, the DNA-fingerprinting technique used in genetics and criminal investigations originated from work on a single species of bacteria found only in a hot spring in Yellowstone

Park archives house an incredible and varied collection of beetles, yet it barely scratches the surface of Coleoptera diversity. Scientists estimate that 8,800 species of beetles may live in the park, though only 657 species are currently known.

National Park. The patent rights for the DNA-analysis technique are now worth hundreds of millions of dollars.

Taxonomy

Due to the emphasis placed on molecular biology during the last few decades, the United States and most other countries have suffered critical losses of professional taxonomists. Without the ability to identify organisms and understand their genetic relationships, all biological field work is impeded. The participation of so many taxonomists in the park's ATBI is expected to energize the science of taxonomy in general and help train a new generation of professionals.

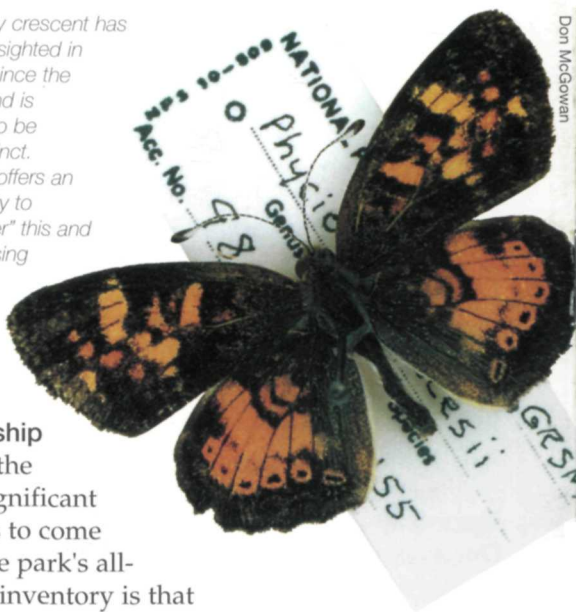
Science

The ATBI will help define and predict such things as: To what degree is a major national park a refuge for the nation's biodiversity? How reliable are our predictions about species per area? When comparing old growth to second growth forest, has the eastern U.S. already lost a significant percentage of its species? How will the discovery of species new to science, and those found to be more abundant than previously thought, affect listings and "down listings" of rare species? What factors influence biodiversity and abundance at different scales? Are there reliable "indicator" species for natural communities that should be used in monitoring programs? How can the tools and methods used in the ATBI be applied in other reserves? These are but a few issues of scientific interest that the ATBI can help answer.

Twenty nine species of salamanders, like this Blackchin red salamander, live in the park. This is the most diverse salamander population anywhere in the world.



The Tawny crescent has not been sighted in the park since the 1930s, and is believed to be locally extinct. The ATBI offers an opportunity to "rediscover" this and other missing species.



Leadership

One of the most significant benefits to come from the park's all-species inventory is that it will serve as both model and impetus for similar surveys in other national parks, federal lands, and protected lands worldwide.

Participants

The park will develop a cooperative agreement with the non-profit Discover Life in America organization to conduct the inventory. Federal agencies are not allowed to be officers in the new organization, but will be on-the-ground partners in inventory activities. Initial partners are biology professors at over 25 universities, museum-based taxonomists, non-government organizations, and state and federal agencies. There is also a growing number of citizens, retired researchers, educators, students, and other interested individuals who have volunteered their services.

A two-year period of pilot work will begin in March, 1999 to refine sampling and data protocols before beginning full operations.

For Additional Information

Visit our homepage at www.discoverlife.org or at www.nps.gov/grsm/index.htm

Or write to: ATBI
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