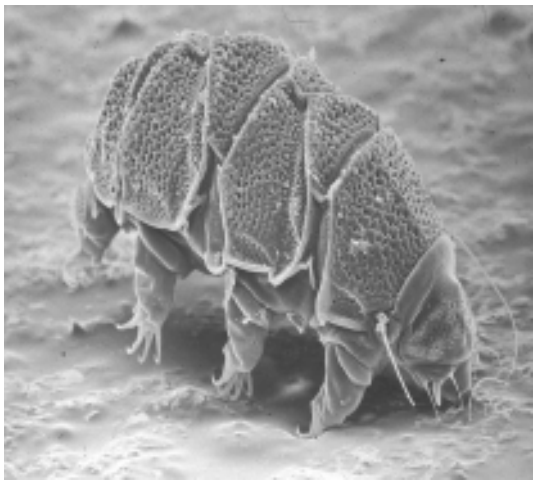
Spring Newsletter 2001

ATBI QUARTERLY

Great Smoky Mountains National Park, The Natural History Assoc., Discover Life in America, and Friends of the Smokies



Echiniscus maucci, Roan Mtn.

Hypechiniscus gladiator, Roam Mtn.

Cover photos courtesy of Diane Nelson, East Tennessee State University

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HAVE YOU SEEN THIS CREATURE?

Paul Bartels

A team of invertebrate zoologists submitted a proposal and received research funds from Discover Life in America to begin work on what might be some of the Park's least known animals. These animals live in a lost world, escaping the attention of even the most ardent naturalists. Theirs is a microscopic ecosystem, out of sight and out of mind.

These microscopic, yet complex, multicelled animals are called water bears. They are tiny organisms constituting the tiny Phylum Tardigrada. Only 900 species of tardigrades have been identified worldwide, and almost nothing is known of tardigrade distributions in the Park. Dr. Diane Nelson of East Tennessee State University, one of the world's few tardigrade experts, estimates that there may be as many as 70 species in the Park, whereas published records exist for only two. New species will certainly be discovered.

So, what does a water bear look like? They are very small, most under a millimeter in length. They can just barely be seen with the naked eye, but it takes a dissecting scope to get a good look. Taxonomic work requires 400 X and 1000 X magnification. There are two classes, the Heterotardigrada have armored plates, whereas the Eutardigrada have a thinner, unplated exoskeleton. Both are characterized by a cigar shaped body with four pairs of stubby legs, each ending with claws. Tardigrada means "slow stepper", and live tardigrades climbing slowly among the debris in the bottom of a petri dish never fail to elicit an exclamation of delight from first time observers. Among their roundworm and protist neighbors, tardigrades stand out with real charisma!

In the Park, tardigrades can be found in leaf litter and in the interstitial spaces of sand in the bottom of stream beds. They are also found in the thin film of water that covers mosses, liverworts, and lichens, and it's here that tardigrades flourish, piercing moss with stylets that can be protruded from their mouths, grazing on detritus, or preying on other smaller invertebrates. This is a bizarre habitat with frequent, unpredictable environmental disasters. Their thin, watery world frequently evaporates or becomes a deoxygenated or frozen wasteland. Yet, tardigrades thrive, with sometimes as many as 10 species and thousands of individuals in a single clump of moss. The secret to their success is their remarkable ability to undergo cryptobiosis, a kind of biological suspended animation. By replacing the water in their cells with trehalose and glycerol, they can remain in an inactive state for over 100 years! In this state they may be resistant to more severe environmental extremes than any other single organism. Perhaps a world of tardigrades, rather than cockroaches, is a better scenario for the next dark science fiction movie!

Even less is known about tardigrade ecology than their taxonomy. In general, tardigrades seem to have little host specificity for particular mosses and lichens and have very broad, sometimes cosmopolitan distributions. To date, their distribution shows no latitudinal diversity gradient. These patterns may be explained by their tolerance to a wide range of environmental conditions and wind-borne dispersal, but such little data exist that the patterns themselves are speculative. A detailed study of tardigrades in Great Smoky Mountains National Park may teach us more than we can currently imagine!

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PRESIDENT'S CORNER

Frank Harris

Spring is a special time of year and nowhere is this more evident than in our Smokies, as we watch this new beginning wend its way up slope and draw as the complex mountain topography shows us once again just why we have such a great diversity of biota. Spring is for new beginnings. A few weeks ago, Jeanie Hilten led a highly successful (and fully subscribed) workshop for new volunteers. It was so successful that a second workshop will be held to accommodate some of the overflow requests (see page 11). Later this month we will interview and hopefully select a candidate for our new position of fundraiser. This is a significant step for our organization as we seek to become fully self-sustaining financially and will no doubt bring our activities to the attention of even more folks who share our vision for DLIA and our quest to learn all species in the Smokies. Spring also is a time for a new field season to take off in earnest. What new species will be revealed this year? How many students will discover the mysteries of nature as they participate in the ATBI? As this newsletter goes to press, we will be notifying several groups that they have a mini-grant with which to begin their work in the Park. This is an exciting time!

Frank Harris
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Mission Statement

Drawing: Nancy Lowe,
ATBI Volunteer

Discover Life in America will develop a model for research in biodiversity. DLIA will use this knowledge to develop and disseminate information to encourage the discovery, understanding, preservation and enjoyment of natural resources.

www.discoverlife.org
www.friendsofthesmokies.org
www.nps.gov/grsm/nhahome.htm

OVER $50,000 IN AWARDS PRESENTED TO ATBI RESEARCHERS

Jeanie Hilten

Grant money supplied by the Great Smoky Mountains Natural History Association and Friends of Great Smoky Mountains National Park is supporting All Taxa Biodiversity Inventory research in the Park for the 2001 season. John Morse, Discover Life in America Board member and Science Committee Co-Chair, administered the "mini-grant" program. The review panel included eight DLIA scientists. Although $50,000 was budgeted for this year, submitted proposals totaled $130,000. The granted proposals executive summaries may be viewed on the Discover Life web site: www.discoverlife.org.

Sixteen proposals were funded; six fully and ten partially. The research will encompass a variety of life forms in Great Smoky Mountains National Park, from algae to spiders. Two of this year's projects involve young people designing and conducting scientific research in the Park. Several studies include examining little known habitats such as the forest canopy and mossy seeps on rock exposures. Some of the proposals are continuations of previous and on-going work. All are coordinated with the DLIA Science Plan.

Recipients of the grants will present a written and oral report of results to date at the winter 2001 annual meeting of the ATBI, with a final report by 1 May 2002. Discover Life hopes to obtain additional sources of financial support in order to encourage the tremendous amount of research needed to complete the ATBI. Individuals and organizations interested in assisting with the funding of future ATBI research, please contact Friends of Great Smoky Mountains National Park, 865-453-2428.

Congratulations to these scientists for their awards:

Dr. Peter H. Adler and Mr. Will K. Reeves, Department of Entomology, Clemson University. Biting flies and their symbionts.
Dr. Paul J. Bartels, Environmental Studies Department, Warren Wilson College. Initial tardigrade and meiofauna inventory.
Dr. Christopher E. Carlton, Department of Entomology, Louisiana State University. Coleoptera.
Dr. R. Edward DeWalt, Illinois Natural History Survey. Abrams Creek Ephemeroptera, Plecoptera, Trichoptera.
Dr. Jeffrey R. Johansen, Department of Biology, John Carroll University. Algal species in hydroterrestrial environments.
Dr. Harold W. Keller, Central Missouri State University. Tree canopy biodiversity.
Dr. Joe B. Keiper, Cleveland Museum of Natural History, and Dr. B.A. Foote, Department of Biological Sciences, Kent State University. Diptera, selected families.
Dr. John C. Landolt, Department of Biology, Shepherd College. Slime molds.
Dr. William Moser, Invertebrate Zoology, Smithsonian Institution, and Dr. Donald Klemm, Ecosystems Research Branch, U.S. Environmental Protection Agency. Leeches.
Mr. Edward G. Riley, Department of Entomology, Texas A & M University. Nomenclature, distributions and associations of leaf beetles.
Dr. Brian G. Scholtens, Department of Biology, College of Charleston. Lepidoptera.
Dr. Michael J. Sharkey, Department of Entomology, University of Kentucky. Hymenoptera.
Mr. Jon Souders, Glen Este High School. Little River insects.
Mr. Paul Super, Great Smoky Mountains Institute at Tremont. Student interns.
Mr. Mark J. Wetzel, Illinois Natural History Survey. Oligochaetes.
Ms. Emily C. Whiteley, Department of Biology, Western Carolina University. Spiders.

Jeanie Hilten
DLIA Administrative Officer
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BEETLE BLITZ JUNE 28 TO JULY 1, 2001

Beetle specialists from around the country will converge on the Park on June 28th for the first "beetle blitz" - an organized collecting event which will combine the talents of coleopterists (the folks who study beetle identification as a career) with the enthusiasm of a dedicated group of volunteers, to collect and add to the knowledge of the beetle fauna of the Park. Information will be collected on the beetle species present and their distribution. The event will take place from the 28th of June until the first of July. In addition to collecting new material, specialists will have an opportunity to examine the material previously collected by others that is stored in the Park collections. The volunteers will have the opportunity to see the various collecting methods used by the specialists and to collect and sort additional material as well. We will have space available to sort and prepare the material each day and to engage in a variety of discussions. One group of volunteers has already received some training and more will follow. Anyone interested in joining us should contact Jeanie Hilten at <jeanie@discoverlife.org>. We look forward to seeing you at the blitz!

Tom Rogers, Beetle Blitz Coordinator
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Drawing: Nancy Lowe, ATBI Volunteer

Malaise trap at Cades Cove ATBI plot

ARTHROPOD INVENTORY PILOT PROJECT

Ian Stocks

"How to Conduct an ATBI", the arthropod inventory pilot-project funded by the US Geological Surey and coordinated by Drs. Charles Parker (USGS-Biological Resources Division) and Ernest Bernard (Department of Entomology and Plant Pathology, University of Tennessee), entered its second phase in mid-October, 2000. Canopy beetle traps, pitfall traps, and electric fences, which protect Malaise traps from bear and hog destruction, were installed in the remaining 10 of the 11 previously established ATBI plots. The traps, which are emptied every two weeks, will run continuously for at least the next three years. Combined with Onset® data loggers that collect temperature and humidity data readings every half hour, we expect a staggering amount of data on arthropod community structure and habitat conditions.

The plots, each of which is placed in a distinct vegetation community, will give ecologists, taxonomists, conservation biologists, and resource managers, a window into the Park's diversity. Immediately realized information includes not only species identity, but also seasonal emergence data (when does a particular species emerge or become active?), seasonal abundances (is a species present over a long or short period of time?), adult/juvenile relative abundances, male/female relative abundances, and observations of parasitism, such as mite and nematode infestations. One additional near-term result of this effort will be the first cursory estimation of the number of terrestrial invertebrate species from the major habitats of the Park. These results will be released for discussion at the next ATBI annual conference in late November, 2001.

Canopy funnel trap at Cades Cove

The "Ecological Zip-Code" method developed by Dr. Peter White, which is used to evaluate vegetation community diversity, suggests that data from the plots chosen for this phase of the inventory will represent near-maximal diversity within the Park. More importantly, several community types, such as the high elevation beech gaps and spruce-fir forests, were chosen because of their drastic decline in health. Little is known of the arthropod fauna of these and other similarly threatened communities, and intensive/extensive inventories must be done before they are completely gone from the Park landscape. For instance, a status survey conducted by Dr. Fred Coyle on the spruce-fir-moss spider (*Microhexura montivaga*) indicates clearly that the decline in the high elevation Fraser fir canopy has caused extensive damage to the forest floor community. This fragile ecosystem depends on protection afforded by Fraser fir. As similar vegetation community changes take place in the Park over the next few years, intensive surveys such as Dr. Coyle's, and intensive/extensive inventories such as this ATBI pilot project, will reveal if correlated effects are occurring in arthropod communities.

Material from the plots is sorted at the Cosby Sorting Center under the supervision of Dr. Becky Nichols (NPS) and at the University of Tennessee by Matt Petersen, Dr. Ernest Bernard, and Eric Cronin. Some groups, such as crane flies, spider wasps, Collembola, and caddisflies, are treated in-house, but the majority is distributed to specialists under the 'TWIG' (Taxonomic Working Group) system. Funding from outside agencies and some mini-grant funding from Discover Life in America is available for specialists willing to work on specific groups. Collembola identifications by Dr. Bernard indicate that roughly 15 undescribed species have been discovered since the beginning of the ATBI. Don DeFoe (NPS-GRSM Museum Curator) has identified all syrphid flies collected to date, adding many species not previously known from the Park. Identification of adult aquatic insect species will contribute significantly to an already robust database of species maintained as part of the Inventory and Monitoring Branch's ongoing program.

Taxonomists and other researchers have enthusiastically participated in this endeavor, and extensive popular press reports have cultivated a large number of volunteers willing to become involved in an array of projects, including ATBI plot maintenance, sorting, and photography. Without this kind of support, no project of this scope and importance can succeed: our thanks to all of them.

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Black bears in the Park are wild and their behavior is sometimes unpredictable. Although extremely rare, attacks on humans have occurred, inflicting serious injuries and death. Treat bear encounters with extreme caution and follow these guidelines.

BLACK BEARS AND YOU!

ENCOUNTERS ALONG THE TRAIL

Remain watchful. If you see a bear at a distance, do not approach it. If your presence causes the bear to change its behavior (stops feeding, changes its travel direction, watches you, etc.) – YOU'RE TOO CLOSE. Being too close may also promote aggressive behavior from the bear such as running toward you, making loud noises, or swatting the ground. The bear is demanding more space. Don't run but slowly back away watching the bear. Try to increase the distance between you and the bear. The bear will probably do the same. If a bear persistently follows or approaches you, typically without vocalizing or paw swatting, try changing your direction. If the bear continues to follow you, stand your ground. If the bear gets closer, begin talking loudly or shouting at it. Act aggressively and try to intimidate the bear. Act together as a group if you have companions. Make yourselves look as large as possible (for example move to higher ground). Throw non-food objects such as rocks at the bear. Use a deterrent such as a stout stick if you have one. Don't run and don't turn away from the bear. Don't leave food for the bear; this encourages further problems.

Most injuries from black bear attacks are minor and result from a bear attempting to get at people's food. If the bear's behavior indicates that it is after your food and you're physically attacked, separate yourself from the food and slowly back away. If the bear shows no interest in your food and you're physically attacked, fight back aggressively with any available object — the bear may consider you as prey! Help protect others — report all bear incidents to a park ranger immediately! Above all, keep your distance from bears!

ENCOUNTERS IN CAMP

The best way to avoid bears is to not attract them. Keep cooking and sleeping areas separate. Keep tents and sleeping bags free of food odors; do not store food, garbage or other attractants (i.e., toothpaste, soap, etc.) in them. A clean camp is essential to reducing problems. Pack out all food and litter; don't bury it or try to burn anything.

Proper food storage is required by regulation. Secure all food and other attractants at night or when not in use. Where food storage devices are present, use them; otherwise, place all odorous items in your pack. Select two trees 10-20 feet apart with limbs 15 feet high. Using a rock as weight, toss a rope over a limb on the first tree and tie one end to the pack. Repeat this process with the second tree. Raise the pack about six feet via the first rope and tie it off. Then pull the second rope until the pack is up at least 10 feet high and evenly spaced; it must be four feet or more from the nearest limb.

THE LINK BETWEEN GEOLOGY, GIS, AND ATBI PLOTS

Scott Southworth

INTRODUCTION

The geology of Great Smoky Mountains National Park (GRSM) shaped the range of topography, watersheds, and soils that host the plant and animal communities. These communities are established on the landscape as a function of climate, elevation, and the composition and chemistry of underlying materials. Specific bedrock and surficial material units in GRSM are known to have different soils, flora, and fauna. Examples include mollusks on limestone, purple spurge on gneiss regolith, cardamine, yellowood, and bunchflower on meta-sandstone boulder fields, and rare communities on mafic, ultramafic, and sulfidic rocks. Geology may be a useful tool to correlate and test relationships between plants and animals and help select All Taxa Biodiversity Inventory (ATBI) plots.

Since 1993, the United States Geological Survey (USGS) has conducted bedrock and surficial geologic mapping in GRSM to provide this important geographic information system (GIS) data layer to support Inventory and Monitoring, Resource Management, and Interpretation programs within the Park. The ATBI could benefit from this digital spatial database of types of bedrock, transported surficial deposits, soil, and topographic data in a GIS.

BEDROCK AND LITHOGEOCHEMICAL MAPS

The geology of GRSM was first mapped and studied from 1946 to 1954 (King and others, 1968). This out-of-print map is currently being revised by on-going field investigations. Detailed data is accessible via the World Wide Web:

- http://geology.er.usgs.gov/eespteam/smoky/cades_cove/Cades_Cove_WP/introduction.htm
- http://geology.er.usgs.gov/eespteam/smoky/cades_cove/Cades_Cove_WP/introduction.htm
- http://geology.er.usgs.gov/eespteam/Mtleconte/
- http://geology.er.usgs.gov/eespteam/Mtleconte/

These maps will be part of a regional ArcInfo database from near Knoxville, TN, southeast to near Waynesville, NC.

Although these geologic maps show units based on geologic age and named rock packages termed "formations", the units can also be grouped based on chemical and soil attributes which result from different mineral abundance and chemical composition. These "lithogeochemical" units help portray different soil types, differing acid neutralization capacity (ANC) of streams (a measure of their sensitivity to acidification), and may be a useful tool to help describe the distribution of plants and animals. Thus far, ATBI plots cover at least 8 of the 10 distinct lithogeochemical units defined below. Three of the units are homogeneous (numbers 1-4 below), whereas 6 units have heterogeneous characteristics (numbers 5-10 below) that make them more complex:

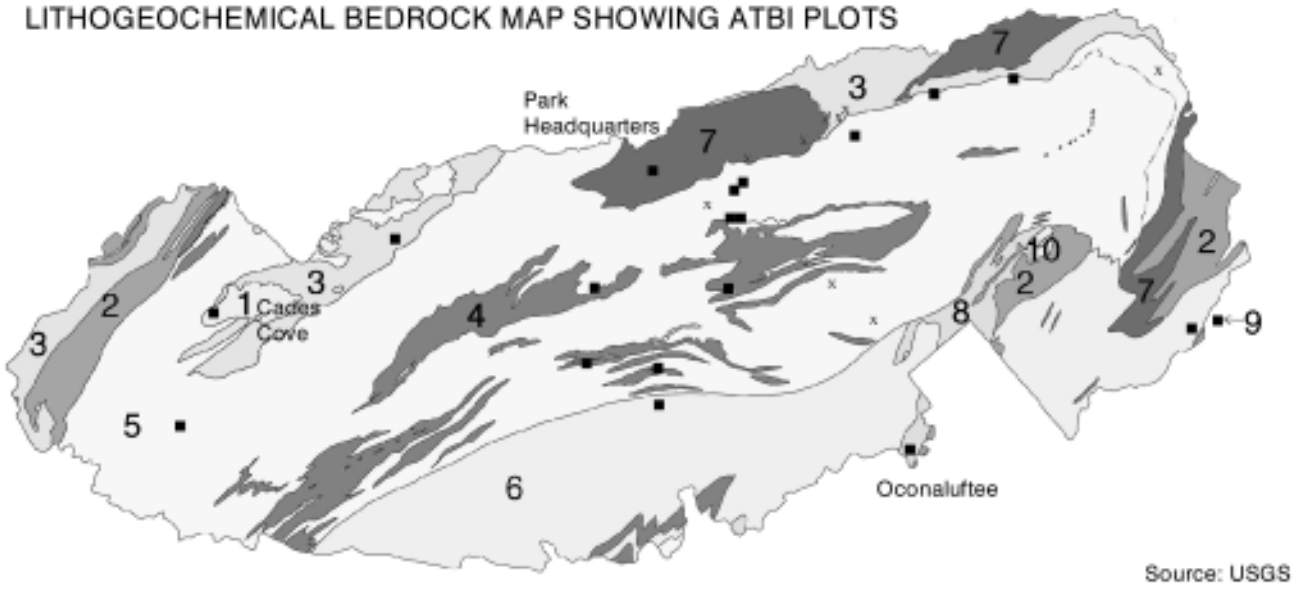
1- Calcium carbonate-rich rocks (Cades Cove plot on Jonesboro Limestone)
2- Quartzose rocks
3- Shale (Tremont plot on Metcalf Phyllite)
4- Carbonaceous sulfidic slate and shale (Indian Gap plot and maybe Double Springs plot on Anakeesta Formation)
5- Coarse feldspar-rich metasandstone interbedded with sulfidic metashale and slate (Albright Grove, Brushy Mountain, Clingmans Dome, Double Springs, Goshen Prong, Gregory Bald, Mount LeConte Blvd., Mount LeConte 2, Ramsay Cascades, Snakeden Ridge, and Trillium Gap plots on Thunderhead Sandstone)
6- Coarse feldspar-rich metasandstone interbedded with quartz-muscovite-garnet schist (Andrews Bald and Cataloochee plots on Copperhill Formation)
7- Fine to medium grained metasandstone interbedded with metasiltstone (Twin Creeks plot on Roaring Fork Sandstone)
8- Coarse quartz-feldspar-biotite granitoid gneiss (Oconaluftee plot)
9- Biotite-muscovite schist, gneiss, hornblende gneiss, and amphibolite schist and gneiss (Purchase Knob plot)
10- Ultramafic rocks

To test plant and animal relationships on a greater variety of bedrock units, ATBI plots should be considered for areas underlain by quartzite (Longarm Quartzite from Cherokee to Cataloochee and parts of the Chilhowee Group along the Foothills Parkway), shale (Pigeon Siltstone between Greenbriar Cove and Waterville and shale of the Chilhowee Group along the Foothills Parkway), and ultramafic rocks [ultramafic rocks and amphibolite within the granitoid gneiss unit (near Smokemont and Balsam Mountain)].

SURFICIAL MATERIAL

In the Park, surficial material, which covers bedrock, far exceeds the amount of exposed bedrock. Most of the surficial material has been transported and deposited by water (alluvium) and gravity (colluvium and debris flows), and therefore was not derived from nor is it related to the underlying bedrock unit. Deposits of similar origin are also different as the parent bedrock changes. Colluvium for example, includes coarse boulders derived from Thunderhead Sandstone along Newfound Gap Road south from Sugarlands, as well as apron-like fans of cobbles of Hesse Quartzite west of Look Rock and the Foothills Parkway. Different types of surficial deposits, listed below, may have their own ecosystem yet only half of them are currently represented by ATBI plots:

- Modern, broad flood plain deposits of alluvium (Oconaluftee and Cades Cove plots)
- Coarse material in debris terraces incised by modern streams (Twin Creeks and Albright Grove plots)
- Bedrock cut fluvial terraces (Goshen Prong plot)
- Debris flow chutes and deposit
- Sinkholes, residuum, and fine and coarse colluvial fans deposited at different levels in windows underlain by carbonate
- Fine and coarse colluvium on slopes



1 Calcium carbonate-rich rocks
2 Quartzose rocks
3 Shale
4 Carbonaceous sulfidic slate and shale
5 Coarse feldspar-rich metasandstone interbedded with sulfidic metashale and slate
6 Coarse feldspar-rich metasandstone interbedded with quartz-muscovite schist
7 Fine to medium grained metasandstone interbedded with metasiltstone
8 Coarse quartz-feldspar-biotite granitoid gneiss of the basement complex
9 Biotite-muscovite schist, gneiss, horneblende gneiss, and amphibolite schist and gneiss of the basement complex
10 Ultramafic rocks

TOPOGRAPHIC POSITION

ATBI plots could test the effect of topographic elevation, position, aspect, and steepness of each lithogeochemical and surficial unit. ATBI plots cover a range of elevations; three are less than 2000 ft above sea level (asl), three are between 2000 and 3000 ft asl, two are between 3000 and 4000 ft asl, four are between 4000 and 5000 ft asl, and three are over 6000 ft asl. A variety of slope aspects are represented; four plots are situated at or near drainage divides, four plots are in the southern part of GRSM and 11 plots are situated in the north. Slope position and steepness are represented by two plots on open ridge tops (balds), at least one plot is on a ridge crest, and about four are found in coves.

GEOLOGY AND GIS

A GIS can be used to select ATBI plots and analyze the spatial correlation of flora, fauna, soils, surficial deposits, bedrock, and topographic position. The spatial correlative studies may help to answer questions about the relationships between one or more variables of the natural environment. Does the underlying bedrock affect flora and fauna in areas with transported material? These areas include, for example, fans of slope deposits of metasandstone, metasiltstone, and phyllite that have been reworked by flowing water of Abrams Creek in Cades Cove, and metasandstone colluvium on ultramafic rocks near Smokemont. Small watersheds underlain by sulfidic rocks (Anakeesta and Wehutty Formations) have been affected by debris flow activity over the last 50 years. Some other questions are: Do adjacent watersheds that drain natural exposures of the same bedrock contain similar aquatic fauna and flora? How much does the orographic affect (north-facing slope versus south-facing slope) influence flora and fauna on areas underlain by the same units? How great is the effect of climate and elevation on unique soils and plants? A combination of factors no doubt contributes to the ecosystem. Several unique geologic settings are proposed for ATBI sample plots:

- Areas of high cliffs of massive Thunderhead Sandstone on the north- and west-facing slopes of Mt. LeConte that have waterfalls adjacent to boulder fields
- Areas of debris flow scars (modern and ancient) in areas of Anakeesta Formation north and east of Newfound Gap—the slides occur in both black sulfidic slate and light chloritoid slate, and they are very different rocks
- Areas underlain by ultramafic rocks
- Areas of exposed limestone
- Areas of extensive fan-shaped deposits of boulders
- Shale barrens in the northwest part of the foothills

Although the entire regional geologic database is several years away from completion, please contact me with questions or comments of how geology can help identify distinctive sites to enhance your ATBI research.

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SCIENTIFIC RESEARCH AND COLLECTING PERMITS IN NATIONAL PARKS

Keith Langdon

In the past, scientific collecting in units of the National Park system was easy. Researchers called or wrote the Superintendent for a permit. A park's interest in research findings varied; larger parks were often interested, smaller parks less so. When some parks tried to "get a handle" on research status, or obtain a research report, they were sometimes rebuffed or ignored. In general, lack of interest by many parks, and sporadic responses from scientists meant neither side was acting fully as partners.

In an attempt to remedy a situation that had been entrenched for years, the federal regulations (specifically, Title 36 of the Code of Federal Regulations, section 2.5) that interpret Congressional statutes were revised in 1984 to be much more stringent. For instance, all specimens remain the property of the government and must have government labels when placed on "indefinite loan" to various museums.

Many park professionals feel that, although well intentioned, the revision was so stringent as to inhibit scientific work in national parks. I know our discussions in ATBI meetings run strongly to that argument. It also creates much more paperwork for the parks and for all of the cooperating institutions.

The natural resource staff in our Washington Office produced an updated revision that would address all the onerous provisions, and give individual Superintendents the flexibility to "convey" specimens to *bona fide* museums. But recently, our solicitors have made the valid point that if we open up the issue of "giving away" property, we will have to contend with many special interest groups, some of whom will want to collect for reasons that have nothing to do with science or park protection.

This issue is finally getting the attention it deserves and is on a path to being corrected. In early February, I sent an inquiry about this issue to all Great Smokies' researchers. I received about 45 responses, all of which were forwarded to Washington. It was of particular assistance in clarifying what concerns needed to be focused on, BUT it seems we will have to live with the current regulations for one more year. It will take several months to affect a revision and we are not sure of the mechanism or components at this point. Also, the new administration is concerned about the flurry of new regulations proposed in the waning days of the previous administration, and has placed a temporary moratorium on new federal regulations.

PLEASE BEAR WITH US, while we (at several national parks) work with our Washington Office staff, Department of Interior solicitors and other groups to remedy this complex legal problem. In the meantime, e-mail me at <keith_langdon@nps.gov> if you have specific questions about your project. Thanks for your patience!

Keith Langdon, Inventory and Monitoring Coordinator,
Great Smoky Mountains National Park

NEW PERMIT SYSTEM FOR NPS

Parks have a new collection permit system that is web-based and centrally operated. There have been typical glitches associated with new software, but most of these have been fixed. Permits are now issued once for multiple years, reducing paperwork. Also, a unique permanent study number is issued. This number can be used on plot markers in the field to reduce confusion. There are other changes as well. Contact Janice Pelton at <janice_pelton@nps.gov> if you have specific questions. The web site for permit applications is: http://science.nature.nps.gov/research.

TAXON	SPECIES NEW TO SCIENCE (UNDESCRIBED)	SPECIES NEW TO PARK*
Slime molds:		
Myxomycetes	3	78
Dictyostelids	1	3
Protostelids	2	19
Fungi	1 (new genus)	0
Algae:		
Greens	0	33
Chrysophytes	0	4
Diatoms	2 ?	86
Dinoflagellates	0	5
Blue-greens	0	11
Reds	0	2
Vascular Plants	1 ?	0
Mollusks	2	3
Earthworms	4	1 ?
Crustaceans:		
Copepods	17	4
Bathynellaceans	1	0
Millipedes	1	0
Arachnids:		
Spiders	38	400+
Harvestmen	0	1
Collembola	20	60
Odonata	0	19
Neuroptera	0	17
Trichoptera	5	26
Lepidoptera	0	408
Diptera	5	0
Amphibians	0	2
Mammals	0	1
TOTALS:	**103**	**1183**

* Numbers do not include species new to science

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PURCHASE KNOB OFFERS UNIQUE EDUCATIONAL LINKS WITH ATBI

Chris Stein

I first read about the ATBI project in a National Parks and Conservation Magazine article (Spring 1998) while working in the South Pacific. The article particularly caught my attention because I had just applied for a ranger position at the Park. I couldn't help but think, if I'm fortunate to be selected for the Smokies job, this ATBI project will probably be pivotal to the future of the Park's educational programs and I could be a part of it. Exciting stuff! I thought that by using the ATBI as a springboard we could educate people about Park resources in such a way that they would naturally want to protect this special place forever -- the mission of the National Park Service.

As it turns out, I was fortunate to be given the opportunity to work at the Smokies. More importantly, when I arrived I found a whole group of dedicated people who felt like I did, that the ATBI can, and should, play a key role in the Park's interpretive (educational) offerings.

In the National Park Service, the word "interpretation" means "to share the park story with visitors." There is an old interpretive adage that states: *"Through interpretation, understanding. Through understanding, appreciation. Through appreciation, protection."* As the saying goes, once people understand "why" park resources are important, they will want to protect them. This is why education is so important to the whole ATBI effort. This massive project is not just a scientific undertaking, it is just as much an educational undertaking, one with unlimited educational possibilities. Some opportunities are being prototyped at the Park on a daily basis (see ATBI Quarterly Autumn Newsletter article by Paul Super, and Winter Newsletter article by Susan Sachs).

In 1999, former National Park Service (NPS) Director Robert Stanton announced the NPS Natural Resource Challenge. A goal of the Challenge is to further professionalize resource management activities of the NPS so park managers have the best scientific information available to them before making decisions affecting the park's environment. In effect, with the launching of the Great Smoky Mountains ATBI in 1998, we got a one year head start on the Natural Resource Challenge. Like the Challenge, a goal of the ATBI is to learn as much as we can about the Smokies so intelligent resource management decisions can be made. With this goal comes tremendous educational possibilities.

Although there are many educational programs taking place around the Park with an ATBI-spin placed on them, one project, in particular exemplifies the goals of both the ATBI and the NPS Natural Resource Challenge -- that is, the Purchase Knob Learning Center located in Haywood County, North Carolina within the eastern boundary of the Park. Purchase Knob was officially selected as one of the NPS's first five Learning Centers funded by Natural Resource Challenge money. As an official Learning Center, the Park will receive $225,000 every year to establish a science/education center at Purchase Knob. Scientists will be able to conduct research at this high elevation site (5,000 feet) and students of all ages will be encouraged through educational programs to help scientists collect

Landscape view from Purchase Knob

Purchase Knob House

useful data. The more these students understand the Park's resources, the more they will want to protect them. Who knows; with the Learning Center we may even be able to inspire a future scientist or educator.

Although it will take a phased, three year construction program to implement the Purchase Knob Learning Center short-range plans, educational programs will take place there this spring, summer, and fall. Examples of these integrated science and education programs include:

- Upward Bound Math and Science Program, in which high school students from the Southeast design their own research projects under Park direction
- Curriculum-based field trips for middle school students. For example, through a grant from the National Park Foundation and Exxon Corporation, a unit for 8th grade students was developed involving students collecting data for a long-term salamander monitoring project and an insect inventory
- Ongoing research projects, such as the construction of an air quality bio-monitoring garden in conjunction with Appalachian State University, and a fungus foray to inventory species for the ATBI in partnership with DLIA

I encourage all readers to find out more about, or offer your suggestions for, educational possibilities associated with the ATBI. We realize that we've just scratched the surface. The bottom-line is, although it's more of a gut feeling at this time rather than through scientific assessment methods (which we're working on), we feel confident that science and education programs developed using the ATBI-springboard will make a difference in people's lives and help nurture better earth citizens.

Chris Stein, Resource Education Chief
Great Smoky Mountains National Park
chris_stein@nps.gov

DISCOVER LIFE VOLUNTEERS GATHER FOR SPRING TRAINING

Jeanie Hilten

Tom Rogers,the Beetle Blitz coordinator, shows a beetle collection to ATBI Volunteers.

Jeanie Hilten (DLIA) shows volunteers the ATBI plots on GIS maps

Becky Nichols,NPS entomologist (L), explains how a Malaise trap functions

Forty enthusiastic volunteers met on Saturday, March 10, 2001 at Great Smoky Mountains Institute and Twin Creeks Natural Resource Center to learn about the All Taxa Biodiversity Inventory and ways to contribute their skills. Participants came from throughout East Tennessee as well as neighboring North Carolina communities and from as far away as Atlanta and Nashville. Some people had already given hours of help to Discover Life, but many were new "recruits". All are talented and knowledgeable.

The day's program entailed both indoor and outdoor sessions designed to give an understanding of how volunteers will assist the ATBI. National Park Service entomologist Becky Nichols presented the objectives and the current status of the biological inventory. Jeanie Hilten of DLIA outlined the volunteer organizational structure and specific 2001 projects. Park Law Enforcement Ranger Steve Kloster discussed Smokies backcountry safety. Details of this season's activities and training were highlighted so volunteers would be able to choose which programs to join.

- Ian Stocks with the University of Tennessee talked about the "Adopt-a-Plot" plans which involves collecting samples from arthropod traps on ATBI plots.
- Tom Rogers, of Orkin Pest Control, summarized the upcoming Beetle Blitz, and together, with Becky Nichols, reviewed taxonomic activities at the Sorting Center.
- Kevin Fitz Patrick, Photography Team Leader, discussed organizing species web page pictures and field photography of scientists in action.
- Volunteer Jim Lowe talked about the use of the Park's trail system and GPS in order to map trees, ferns, snails, and distributions of other organisms.
- Pat Cox of the University of Tennessee Botany Department reviewed the plans for a fern survey this summer.
- Judy Dulin of Pi Beta Phi Elementary School highlighted some of the ways teachers and students could participate in both field and classroom projects.
- Jeanie Hilten called for help with the search for snowbank myxomycetes later this spring and also mentioned the need for volunteers for scientist hosting, ATBI house cleaning, and for communications, promotional projects, and office work.

In the afternoon, the group traveled to Twin Creeks where they were introduced to some of the field and laboratory scientific methods of the ATBI. They met briefly in a couple of their chosen Project Teams to make further plans and note needs for further training. The full day ended with a group picture of (almost) everyone and the awarding of certificates. Thank you to all staff and volunteers for giving your time and talents!

Jeanie Hilten, DLIA Administrative Officer
jeanie@discoverlife.org
Photos on pages 10-11 by Kemp Davis, ATBI Volunteer

SECOND ATBI VOLUNTEER TRAINING DAY SET

A second training day is scheduled for Saturday, May 12, 2001 at the Sugarlands Visitor Center Training Room and Twin Creeks. Anyone interested should contact Jeanie Hilten soon, as there is limited space. Scientists: if you would like volunteer help with this season's research, please call me at 865-430-4752 and I will make the arrangements. Volunteers, please be sure to contact me at 865-430-4752.

Jeanie Hilten, DLIA Administrative Officer
jeanie@discoverlife.org

Volunteer training takes place in the field. Here, volunteer Liz Domingue (R) explains ATBI plot monitoring

Note to ATBI Quarterly Authors

Thanks for contributing your articles and illustrations. We welcome short news stories (from 200 to 700 words). Please send your document as a MS Word or WordPerfect file. Photographs and drawings may be sent as .TIFF files attached to your e-mail message. The deadline for the summer newsletter is June 15th.

Ruthanne Mitchell, Newsletter Coordinator
cwmitchell@ntown.com

Park Law Enforcement Ranger Steve Kloster gave ATBI volunteers backcountry safety tips at the March training session.

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DISCOVER LIFE IN AMERICA
T-SHIRTS, MUGS, AND MOUSE PADS FOR SALE

Show your support for the All Taxa Biodiversity Inventory (ATBI)! A colorful biodiversity design created by the Great Smoky Mountains Natural History Association is beautifully depicted on T-Shirts, mugs, and mouse pads. The items were produced by the folks at Over Your Head Productions for Discover Life in America. Items may be purchased from Jeanie Hilten.

T-Shirts come in S, M, L, XL, and XXL and are printed on a white or natural colored cotton shirt and cost $12.00 for S-XL and $14.00 for XXL. Mugs are $6.00 and mouse pads are $8.00. Please include a donation to cover the cost of shipping. To order, call 865-430-4752 or e-mail jeanie@discoverlife.org.

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