



ATBI QUARTERLY

Great Smoky Mountains National Park, Great Smoky Mountains Association, Friends of the Smokies, and Discover Life in America



NPS Fire Effects Monitors

The first prescribed fires on the west side of the Park in the Tabcat area.



NPS Fire Effects Monitors

Another view of the prescribed burn in the Tabcat area.



The Benefits of Fire: Burning for Biodiversity

Virginia McDaniel

As is often the case with enduring truths, they first are ridiculed, then violently opposed, and finally pronounced as self-evident. So it is with the benefits of fire. We first disapproved of folks burning the forest, then we suppressed all fires (violently opposed). We now are in the process of moving into the third stage where the benefits of fire are self-evident.

John Shea, a U. S. Forest Service psychologist, interviewed southern Appalachian residents in 1939 regarding the use of fire. These people had been using fire for generations, and their feeling was that burning was the right thing to do. While their explanations may not have convinced any land manager of the benefits of fire, southerners did have ecological and economic reasons for burning. They observed that fire reduced pest insect and snake populations, maintained an open understory for hunting, and enhanced forage for game. Forest managers of the time, however, had little appreciation for burning or the ecological importance of fire and even ridiculed burning. Shea described the southerners need to burn as a "recreational and emotional impulse." He concluded that "the light and sound and odor of burning woods provide excitement for a people who dwell in an environment of low stimulation and who naturally crave excitement...Their explanation that wood fires kill off snakes, boll weevil, and serve other economic ends are something more than mere ignorance. They are the defensive beliefs of a disadvantaged culture group." Ignoring the advice of folks who lived on the land and of Native Americans who had burned it long before the arrival of Europeans, our government set about suppressing all fires on federal lands.

We are still struggling to change our beliefs and to get beyond the view that burned forest areas are ugly. What first appears to be destructive is in fact the process of renewal. We also are beginning to understand the role disturbance plays in maintaining biodiversity. Of course, too much fire appears to be as destructive as no fire at all.

continued on page 3

Chairman's Message

New Scales, New Worlds of Life

Once I flew over the Smokies in springtime in a small aircraft. Beneath me stretched slope after slope of spring's freshest early green. As I gazed down I was startled to see what looked like giant bouquets of large white flowers—and then I realized it was the Fraser magnolias in bloom. Fraser magnolia is a glorious tree—smooth gray bark, long pointed leaves with lobes at the base and a tendency to sprout new stems around the trunk. In second growth and on drier sites it may seem to be a small tree, but I have seen giants reaching 80 cm in diameter or more on moister old-growth sites. If there is one tree that struck my New England eyes as emblematic of the rich and unexpected diversity of the Smokies it was this one. Familiar northern species cap the peaks and southern species lap at the base of the mountains, but added to the mixing of geographies are species not found elsewhere.

The flowers of Fraser magnolia are most abundant on branches in the upper canopy. We catch glimpses of this flowering from below—but up in that small airplane I saw for the first time the crowns crowded with the large white flowers. At that scale, the forest seemed as crowded with flowers as a meadow. But now we zoom to the smallest scale. Discover Life in America and the All Taxa Biodiversity Inventory have revealed—now captured in compelling images that make one pause in wonder—crowded and intricate worlds of life on the surfaces of mosses, on grains of soil, on twigs in the tops of trees.

The 7th Spring of the ATBI is upon us and scientists, volunteers, and students of all ages are back to explore life's amazing diversity at many scales. As winter ended, the kingdoms of life in the Smokies—plants, animals, fungi, protists, microbes—stirred, and the Fraser magnolia buds were set again on a path to flowering. I am reminded of nature's richness and that our project is one of the most exciting scientific explorations on the planet. The Board of Discover Life in America cheers you on and looks forward to your reports.

Peter S. White, Discover Life in America, Chairman
University of North Carolina
pswhite@unc.edu

Taxa Table Update

508 Species New to Science
3,126 New Records for the Park



Science Advisory Panel

Dr. Dan Janzen, University of Pennsylvania
Dr. Tom Lovejoy, The World Bank
Dr. Ron Pulliam, University of Georgia
Dr. Peter Raven, Missouri Botanical Garden
Dr. Edward O. Wilson, Harvard University

Board of Directors

Dr. Peter White - Chair
University of North Carolina-Chapel Hill
Dr. David Wagner - Vice-Chair
University of Connecticut
Tom Rogers - Secretary
Orkin
David Scanlon - Treasurer
Great Smoky Mountains Association

Staff

Jeanie Hliten, DLIA Administrative Officer
Anne Ramsden, Clerical Assistant
Chuck Cooper, Database Technician
Pamela Nabors, Technical Assistant

Note to Readers

The ATBI Quarterly newsletter is now available in color on our website. To sign up for notification of when the next issue is online, go to www.dlia.org/atbi/press/quarterly.html. We will keep your name in our general database, but will not send a hard copy of the newsletter to you. This will save us some money in printing and mailing -- and save a tree too!

If you wish to continue to receive the Quarterly by mail, please consider sending a donation of \$10 to Discover Life in America and mail it to Friends of the Great Smoky Mountains National Park, P.O. Box 5650, Sevierville, TN 37864-9902.

DLIA Welcomes New Part-Time Staff



Left to right: Anne Ramsden, Chuck Cooper, P.J. Nabors

Discover Life in America is glad to have the expertise and enthusiasm of new part-time staff: Anne (anne@dlia.org) is Clerical Assistant, helping with office procedures, the housing calendar, and publicity. Chuck (chuck@dlia.org) is Database Technician, assisting with the ATBI database development. P.J. (pj@dlia.org) is Technical Assistant, working on species web pages, scanning, and the image database. Welcome!

We do not yet know or comprehend all the ramifications of fire suppression, but we have several working hypotheses. Without fires, fire-dependent species are lost and fire-dependent communities change, often resulting in the loss of biodiversity. For example, botanist Alfred Schuyler had been searching for Long's bulrush (*Scirpus longii*), a New Jersey pine barrens species that hadn't been seen in 25 years, when suddenly he came across an area where it was very prevalent. It turns out that an extremely hot fire in this area in 1983 resulted in a resurgence of this fire-dependent species.

The National Park Service and other land management agencies have begun to understand that fire plays an essential role in the maintenance of many communities. In the southeastern United States, communities of particular concern are table mountain pine (*Pinus pungens*), yellow pine (*P. echinata*, *P. rigida*, *P. virginiana*) and xeric oak (*Quercus* spp.). In Great Smoky Mountains National Park, these communities are being invaded by fire-intolerant hardwoods like red maple (*Acer rubrum*), blackgum (*Nyssa sylvatica*), and white pine (*P. strobus*). As a result of increased shading and leaf litter build up, pine seedlings are not able to germinate or grow. As the overstory community changes, the herbaceous community, which is adapted to open dry habitat, also declines.

In the late 1990's, Great Smoky Mountains National Park's Fire Management program was established to reintroduce fire into these fire-dependent communities. In the western portion of the Park there are two objectives: first, reduce fire-intolerant species and promote pine seedling regeneration, and second, create habitat for the red cockaded woodpecker (*Picoides borealis*), a federally listed species that was last seen in the Park in the late 1970's. After two prescribed burns, the understory has opened up, the density of pine seedlings has increased, and the abundance of grasses and forbs

has drastically increased. The habitat is getting ready for the red cockaded woodpecker, thanks to a new look at some old practices with fire.

Virginia McDaniel
NPS Fire Effects Team Leader
virginia_mcdaniel@nps.gov



Fire backs down Wash Ridge at Catalochee.

NPS Fire Effects Monitors



Fire column on Catalochee burn site.

NPS Fire Effects Monitors

2004 Moth and Butterfly Blitz

David Wagner and Brian Scholtens



Dave Wagner examining moths attracted to a sheet illuminated with a 175 watt mercury vapor light.



Rebecca Shillett

Ron Hodges, retired from the USDA-Smithsonian, examines moths collected during 2002.

A moth bioblitz is a 48-hour plunge into one of the planet's most diverse lineages of metazoans (multicellular animals). During the blitz, entropy and chaos reign supreme; curators, amateurs, and students paw through mountains of moths, coffee is poured down like soda, and time is the enemy. Students and interested amateurs are given a unique opportunity to see as much as one-third of the Park's 2,500 Lepidoptera (moth and butterfly) species in a single day. Participants are treated to an all-out taxonomic workshop where their brains soon brim with Latin binomials, diagnostic characters, larval biologies, collecting techniques, and the copious banter pouring out of a room of sleep-deprived moth-ers.

The Lepidoptera TWIG (Taxonomic Working Group) of Great Smoky Mountains National Park's All Taxa Biodiversity Inventory has conducted bio-blitzes during the summers of 2000 and 2002. In July of 2000 we recorded over 800 species of Lepidoptera, including over 300 which were new records for the Park. Included were several undescribed species and one new genus of tineid moth. Our second blitz in June of 2002 documented over 860 total species, including about 150 new to the Park. More than 8,000 voucher specimens were pinned and placed in public institutions as a result of the first two blitzes.

The Lepidoptera TWIG has documented over 1,500 species of moths and butterflies from Great Smoky Mountains National Park, and our database contains more than 15,000 individual records, nearly all of which are geo-referenced. A major push in the coming blitz will be to add a minimum of 3-5,000 geo-referenced records to the Park's database.

The main collecting effort will commence on 19 July at 3:00 pm when more than 30 scientists, students, and volunteers will deploy their light traps throughout the far reaches of the Park. Once again, we hope to employ llama teams to get our traps (and batteries) up to two of the Park's high elevation balds. As in past years we will meet at the Sugarlands training room at 8:00 am on the 20th to begin the Herculean task of sorting and identification of moths. A new dimension that will be added to this blitz will be the vouchering of DNA material for one or two individuals of each moth species that we can get authoritatively identified by one of the attending systematists. This DNA material will be a valuable resource for any systematist working on eastern North American moths and will make it possible to correlate unknown larval stages with known adult species.

As in past blitzes, we hope to have a strong outreach and educational component. High school, undergraduate, and graduate students are especially encouraged to attend, participate, learn and enjoy the experience. Teachers, educators, and schools will be welcomed (and likely put to work). Interested parties should contact David Wagner.

David Wagner
University of Connecticut
dwagner@uconnvm.uconn.edu

Brian Scholtens
College of Charleston
scholtens@cofc.edu

Diatoms? Why Diatoms?

Susan Makosky

Usually the first question from an ATBI volunteer who is helping me collect algae/diatoms in Great Smoky Mountains National Park (GSMNP) is, "Why study something that you can't even see with your own eyes? Diatoms? Why diatoms?" With the invention of the microscope, Victorian gentlemen would congregate around this instrument in their parlors just to admire the jewel-like beauty and diversity of the diatom. The famous biologist Charles Darwin wrote, "Few objects are more beautiful than the minute siliceous cases of the diatomaeae."

Diatoms (Class Bacillariophyta), a group of microscopic algae, are not only aesthetically beautiful, but their biological global importance is even more dramatic. Few people recognize the fact that diatoms, including both freshwater and marine, are estimated to remove nearly half of all the carbon dioxide (a greenhouse gas) from the earth's atmosphere by photosynthesis. That's more than all the tropical rain forests, temperate forests, and grasslands combined! Likewise, diatoms produce globally at least 25% of the oxygen we need to breathe!

Diatoms are utilized as environmental indicators in streams and rivers when assessing a watershed's biological integrity. Many state and federal Environmental Protection Agency staff use diatoms, along with fish and aquatic insects, to biologically monitor streams. Like fish and aquatic insects, individual species of diatoms can signal pollution. Certain species are pollution tolerant, while others are more pollution sensitive. Temperature, light levels, nutrient resources, pH, and toxic materials can also dictate diatom community distribution, and they respond quickly to environmental changes. Diatoms are an excellent biomonitor because of their short generation time, doubling their population (primarily asexually through binary fission) about once a day (that's almost 100 million in a month). Due to this short generation time, diatoms are one of the first to recolonize an area after an environmental disturbance.

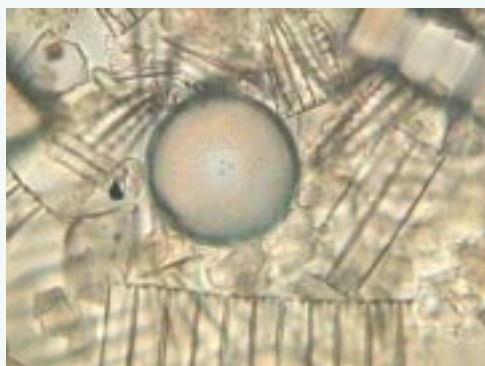
As the base of the food chain, diatoms are cosmopolitan in their abundance within almost all types of aquatic habitats. Basically, wherever there is light and moisture, diatoms exist. Diatoms can live in dimmer areas than most algae because they contain carotenoids and xanthophylls, pigments which aid in photosynthesis at decreased light levels. Many diatoms can survive drought-like conditions. These aerophilic diatoms can withstand dry niches due to adaptive mechanisms, such as cell size reduction, stored chrysolaminaran (an oily food reserve characteristic of all diatoms), and motility due to an internal

raphe structure (characteristic of most bilaterally symmetric diatoms), which has been shown to exude slime to push the diatom deeper into its substrate.

Within Great Smoky Mountains National Park, I have sampled creeks, streams, waterfalls, seeps, wetlands, bogs, swamps, ditches, lakes, and even slimy rock faces for my diatom research. When sampling for diatoms, one looks for yellow-brown slime. At each site, diatom slime is brushed from rocks, pipetted from sediments, and even collected from moss or liverworts.

My ultimate research goal is expressed best by Aldo Leopold (Sand County Almanac), "Only those who can think like a mountain, can transcend their own intermediate interests to grasp the exquisite and venerable interconnectiveness between all organisms." Since 1999 my research has added 60 published new diatom species reports for GSMNP. An additional DLIA research paper in conjunction with Dr. Rex Lowe will be published soon on the diatom genus, *Pinnularia*, which will almost double the amount of *Pinnularia* species known to GSMNP!

Susan Makosky
scenedesmussusan@aol.com
Bowling Green State University



Radially symmetric diatom (in center), *Orthoseira roeseana*, collected from the NC side of GSMNP from Big Creek.

Susan Makosky, Nikon light microscope: magnified 1000X



A diverse assemblage of diatoms from the TN side of the Park from Hen Wallow Falls area.

Susan Makosky, Nikon light microscope: magnified 1000X

\$60,000 in Awards Presented to ATBI Researchers

Jeanie Hilten

Grant money supplied to Discover Life in America by the Great Smoky Mountains Association and Friends of Great Smoky Mountains National Park is supporting All Taxa Biodiversity Inventory research in the Park for the 2004 season. Dr. John Morse, Discover Life in America Board member and Science Committee Co-Chair, administers the grant program, now in its fifth year. The review panel included seven DLIA scientists. Requests totaled \$67,247 for the \$60,000 budgeted for this year. The granted proposals' executive summaries may be viewed on the Discover Life website: <http://www.dlia.org/>

Fifteen proposals were funded for research which will delve into a variety of life forms in Great Smoky Mountains National Park, including aphids, ants, aquatic worms, beetles, grasshoppers, lichens, micro-fungi, fruit flies, and tardigrades. One of this year's projects involves teachers and students designing and conducting scientific research in the Park. Educational workshops and bio-quests for lichens and for Lepidoptera were funded as well. Some of the proposals are continuations of previous and on-going work, and all are coordinated with the Discover Life in America Science Plan.

Recipients of grants will present a written and oral report of results to date at the December, 2004 annual meeting of the ATBI, with a final report by March 1, 2005. They will contribute geo-referenced data and send voucher specimens to the Park and other authorized collections. Individuals and organizations interested in assisting with the funding of future ATBI research please contact Steve Bohleber, <steve@bohleberlaw.com>, DLIA Board member and chair of the Development Committee.

Congratulations to these scientists:

Paul Bartels, Warren Wilson College: *Continued Inventory of Phylum Tardigrada*

Richard Baird, Mississippi State University: *Microfungi of American Beech, Fraser Fir, and Eastern Hemlock*

Matthew Dakin: *Survey of the Suborder Caelifera*

Colin Favret, Illinois Natural History Survey: *Expanding our Knowledge of the Aphids of the Park*

John B. Heppner, Florida State Collection of Arthropods: *Biodiversity of Day-flying Micro-moths of GSMNP*

Harold Keller, Central Missouri State University: *Lichen Bio-Quest in Great Smoky Mountains National Park*

Paul Marcum, Illinois Natural History Survey: *Search for New and Rare Vascular Plants and Lichens*

Michael Pogue, Smithsonian Institution: *Noctuidae (Lepidoptera) of GSMNP*

Edward Riley, Texas A&M University: *Continuation of Leaf Beetle Inventory*

Nathan Sanders, University of Tennessee: *Ant Diversity in Great Smoky Mountains National Park*

Brian Scholtens, College of Charleston: *Lepidoptera BioBlitz 2004*

Charles Staines: *Inventory of Five Families of Beetles (Insecta: Coleoptera) in GSMNP*

Gary Steck and Bruce Sutton, Florida Department of Agriculture: *Tephritid Flies of Great Smoky Mountains National Park*

Paul Super, Great Smoky Mountains National Park: *Teacher Enrichment Internship*

Mark Wetzel, Illinois Natural History Survey: *To Continue an Inventory of Freshwater Oligochaeta (Annelida) in GSMNP*

2004 NSF Award

Biodiversity and Ecology of Tree Canopy Biota in Great Smoky Mountains National Park. Principal investigator: Harold Keller, Central Missouri State University. Abstract on the National Science Foundation (NSF) website - www.nsf.gov



ATBI-DLIA Calendar of Events 2004



Jeanie Hilten

Coming this spring are many programs related to the All Taxa Biodiversity Inventory, presented by DLIA, the Park, or our Partners. Mark these events on your calendar and stay tuned for more details about our Annual Conference in December. See the website at www.dlia.org for more detailed information, to learn about DLIA's volunteer "project teams", and to sign up for activities. Contact Jeanie Hilten, 865-430-4752 or Jeanie@dlia.org

Saturday, May 22: Fern Foray 1, 9:00am-4:00pm. This is the first of the Fern Forays for 2004 and will probably be in the Cades Cove area. Meeting place TBA. These trail surveys are coordinated by Dr. Patricia Cox, botanist with TVA's Natural Heritage Program, and DLIA Board member. Forays are fun and very educational for anyone who loves plants. Be prepared to be out in the field, rain or shine, and bring water, lunch, good walking shoes, and rain gear. Participants are encouraged to attend one of the DLIA training sessions beforehand. See other dates on this calendar. To sign up, contact Pat Cox at pbcox@tva.gov

Saturday, June 12: Fern Foray 2, 9:00am-4:00pm. Meeting place TBA. To sign up, contact Pat Cox at pbcox@tva.gov

Saturday, June 19 - Sunday, June 20: Lichen Workshop and Bio-Quest. Class, field and lab activities, and collecting centered at Great Smoky Mountains Institute at Tremont. Led by Dr. Harold Keller, (keller@cmsu1.cmsu.edu), Central Missouri State University, and other renowned lichenologists.

Friday evening, June 25 - Saturday, June 26: "Owlet" Moth (Noctuidae) Workshop and Bio-Quest. Instruction and field work led by Dr. Michael Pogue, USDA, Smithsonian Institution, (mpogue@sel.barc.usda.gov). Centered at the University of Tennessee's Greenbrier Field Station. Teachers, high school students, and volunteers sign up with Jeanie Hilten.

Saturday, July 10: Fern Foray 3, 9:00am - 4:00pm. Meeting place TBA. To sign up, contact Pat Cox at pbcox@tva.gov

Monday, July 12 - Saturday, July 17: Fungi Foray. Sugarlands Training Room and elsewhere in the Park. This event will be in conjunction with mycological society meetings and will involve volunteers assisting scientists in the

field and lab. The "FungiMap" project will be a part of the work. Only about 2200 fungi have been identified in the Park and it is estimated there may be as many as 20,000 species. Contact Jeanie or Paul Super at paul_super@nps.gov or 828-926-6251.

Friday, July 16: Slime Mold Workshop, Great Smoky Mountains Institute at Tremont, 9:00am-5:00pm. Dr. Steve Stephenson of the University of Arkansas will lead this class aimed at citizen scientists. There will be an introductory presentation, field sessions and the opportunity to view and photograph these fascinating organisms through the microscope. Contact Jeanie to be put on the waiting list.

Sunday, July 18 - Saturday, July 24: Lepidoptera Quest, Sugarlands Training Room and elsewhere in the Park. This will be the third ATBI moth and butterfly "blitz" in the Smokies. Trained volunteers will assist researchers and there will be educational opportunities for teachers and students. Interested scientists contact Dave Wagner dwagner@uconnvm.uconn.edu.

Wednesday, July 28 - Tuesday, August 3: Leaf Litter Blitz, Sugarlands Training Room and elsewhere. Search for beetles and other organisms of the leaf litter and soil in a variety of plant communities. Volunteers and teachers contact Jeanie. Scientists contact Chris Carlton, at ccarl@lsu.edu

Saturday, August 14 - Monday, August 16: All Taxa Biodiversity Challenge—Mount LeConte Trip with Great Smoky Mountains Institute at Tremont. Learn about and assist with the ATBI while enjoying the awe-inspiring hikes to and from the LeConte lodge, spectacular views, hearty meals, and a cozy bed. Visit the website www.gsmit.org/Programs/leconte.html or call 865-448-6709 for more information.

Saturday, August 21: Fern Foray 4, 9:00am-4:00pm. Meeting place TBA. To sign up, contact Pat Cox at pbcox@tva.gov

Friday, September 17 - Sunday, September 19: High School Science Consortium at Great Smoky Mountains Institute at Tremont. Join other high school teachers and students at Tremont to conduct real research in the national park. Call 865-448-6709 for more information.

2004 Mycological Society of America (MSA) Annual Meeting

The 2004 annual MSA meetings will take place Saturday, July 17 through Wednesday, July 21, on the campus of the University of North Carolina at Asheville. These meetings will coincide with the annual meeting of the North American Mycological Association (NAMA), the banner organization for over 60 local clubs for amateur and professional mycologists across North America. NAMA will meet from Wednesday, July 14 through Sunday, July 18. In addition to regular annual meeting activities of each society, several joint NAMA-MSA workshops and forays are planned under the aegis of the Great Smoky Mountains All Taxa Biodiversity Inventory (ATBI). These workshops will be part of a continuing collaboration sponsored by the National Park Service involving MSA and NAMA members. A symposium on Southern Appalachian Biodiversity will also be jointly hosted by NAMA, MSA and the Discover Life in America (DLIA) program operating in Great Smoky Mountains National Park.

Contact Information:

MSA 2004 Local Arrangements Committee

Rytas Vilgalys, (Chair) - fungi@acpub.duke.edu

Dennis Drehmel (NAMA contacts) -

dcdrehme@acpub.duke.edu

Larry Grand (Forays/Workshops) - larry_grand@ncsu.edu

A special session of the MSA annual meeting will be a symposium entitled **Tree Canopy Biodiversity in Great Smoky Mountains National Park** scheduled for Sunday, July 18, from 2:00 to 5:00 pm. The keynote speaker will be H. Bruce Rinker, Director of Research and Conservation, Stark Botanical Research Center, Marie Selby Botanical Gardens. Also scheduled to speak are: Keith Langdon, the Park's Coordinator of Inventory and Monitoring; Harold Keller of Central Missouri State University; H. Thorsten Lumbsch, Department of Botany, the Field Museum of Natural History; and Barbara Reynolds, Department of Environmental Studies, University of North Carolina-Asheville. A complete program for this event and for the entire MSA Annual Meeting may be found on their website www.msafungi.org.

Park's Science Center Delayed

Keith Langdon reports that selection of the contractor for the new science center construction has been delayed, but is hopeful that the process is in the final stages. Negotiations on modifications are underway. Problems encountered include the final selection of wastewater treatment design for the building. Keith believes that the contractor will be selected soon and construction should begin shortly thereafter. Clearing of vegetation for the parking area has been completed, as well as clearing for the actual building foundation.



D.S. Tappan

sp. *Clavicornia pyxidata*



D.S. Tappan

Cinnabar-red Chanterelle, sp. *Cantharellus cinnabarinus*

Images courtesy of Deb Tappan - www.dstappan.com