

# Project Leader's Report

Center for Forest Disturbance Science

December 2008

U.S. Forest Service - Southern Research Station - RWU 4156 - 320 Green St. Athens, GA - <http://www.forestdisturbance.net>

## Table of Contents

Face Time	1
Innovation	1
Connections	1-2
Partnerships	2
Science Highlight	3
All About Us	4
What's Up	4-5
Widgets	5-6
Calendar	7
Scoreboard	8

## Face Time

A volunteer group worked on the Arboretum at the Hitchiti Experimental Forest and Department of Natural Resources (DNR) biologists installed a bat house. The DNR plan to install a nest block for solitary bees. The Wild Turkey Federation is furnishing several thousand longleaf pine seedlings to finish planting the last of the southern pine beetle salvage areas. The weather station was updated with new sensors as part of the Georgia Forestry Commission network of fire weather stations. A group from the Georgia Wilderness Society plan to meet at the Hitchiti in January. A total of 15 people came by the office for information and 81 people signed the register to walk the Hitchiti Interpretive Trail.



## Innovation

Joe O'Brien and Mac Callaham traveled to the Jones Ecological Research Center to meet with Jones Center personnel Bob Mitchell and Kevin Hiers as well as visiting scientists Mathew Williams of University of Edinburgh in Scotland, and Greg Starr of University of Alabama. Williams is an ecosystem modeler, and Starr is an ecophysiological who specializes in eddy-flux measurements of net ecosystem carbon fluxes. The group met to discuss their proposal to measure carbon fluxes in frequently burned longleaf pine ecosystems, and to exchange informal presentations on their various research interests. O'Brien gave a short seminar on his work with fuel heterogeneity and thermal imaging technology, Callaham discussed his work on black carbon formation and fates, and Williams gave a formal seminar to the entire staff of the Jones Center, on his work modeling fire effects on carbon cycling in African savannas.

Joe O'Brien will be chairing a session focusing on the effects of heterogeneity in fuel and fire at the upcoming 7th North American Forest Ecology Workshop to be held in June at Utah State University in Logan (see Calendar). The call for abstracts has just gone out and the deadline is January 30th. If you're interested in presenting you should list the special session 'Linking fuel heterogeneity to fire behavior and effects' as your first choice when submitting the abstract. Accepted abstracts will be published in a proceedings and there will be a special issue of the International Journal of Wildland Fire for selected papers.

Scott Goodrick has been invited to participate in an effort to develop a core fire science advancement plan to guide future fire research in the United States. The US Forest Service has contracted, with the Washington Institute, for the services of Gordon Schmidt and Philip Omi to aid in the development of plans that will guide a science program to advance our knowledge of fundamental wildland fire behavior, what is referred to as core fire science. Dr. Omi will develop a plan for science needs. Dr. Schmidt will develop options for organizing and implementing the research identified in the science plan. These two separate but coordinated efforts are to be carried out with full involvement of the broad community interested in this realm of science as well as individuals and organizations involved in science program administration.

## Connections

John Stanturf attended the Forest Futures leadership meeting in Atlanta and presented the draft study plan for the Fire Meta Issue. All the meta issue managers and the sub-regional team leaders presented their latest study plans and the group discussed data needs and processes for sharing data amongst the various teams. A follow-up discussion on specific technical needs is scheduled for New Orleans in March. More information on the Forest Futures project is available on the website at <http://www.srs.fs.usda.gov/futures/>.



Tom Waldrop attended a meeting at Bent Creek Experimental Forest near Asheville to discuss preparation of a book on managing upland oaks. The meeting was organized by Pat Keyser of the University of Tennessee and other invited attendees included Dan Yaussy and Pat Brose of the Northern Research Station, Marc Abrams of Penn State University, Dave Buckley and Craig Harper of the University of Tennessee and Brian Burhans of the National Wild Turkey Federation. The group outlined chapters for the book and potential authors to contribute each chapter.

## Partnerships

Steve Hall, a PhD student at Clemson University, successfully defended his dissertation on December 2. The dissertation was entitled "Topographic Analysis and Predictive Modeling Using Geographic Information Systems" and was based on Tom Waldrop's work on using hyperspectral imaging to describe fuel loads in the southern Appalachian Mountains. This work used all of Tom's data and a portion of Tom's study plots to develop LiDAR techniques for predicting Terrain Shape Index, slope position, and presence of ericaceous shrubs. Waldrop served on Steve's graduate committee and will co-author two or more papers with him. Hall graduated from Clemson University on December 18. His talents were recognized by the Department of Defense, Office of Geospatial Intelligence where he will begin working as soon as his security clearance is complete. Steve looks forward to moving to the D.C. area soon. Congratulations to Dr. Steven T. Hall.



Joe O'Brien has been invited to join a team investigating the role of disturbance in encouraging preferred forage species in the winter range of Kirtland's warbler (*Dendroica kirtlandii*). Little is known of the bird's habitat preferences in the Bahamas and Dominican Republic where they spend the non-breeding season. A concentration of birds was found on the island of Eleuthera in the Bahamas foraging heavily on early successional shrubs. The team will investigate how to encourage these shrub species in degraded habitats, pastures, utility corridors and in fallow agricultural lands on Eleuthera. The team is headed by Dr. Joseph Wunderle of IITF and consists of several Bahamian stakeholders, USFWS and The Nature Conservancy.



Nancy Herbert reports on the Steering Committee for the National Forests in North Carolina (NFsNC) to engage partners in identifying and working on ecological restoration projects on the Nantahala/Pisgah NF. Two meetings were held this past summer (John Stanturf presented at one and Tom Waldrop attended the other) and information can be obtained from the website at <http://www.cs.unca.edu/nfsnc/restoration/restoration.htm>. The group came up with eight focus areas that the NFsNC later combined into the following six areas:

- Stream systems and watersheds
- Rare native communities and threatened and endangered species
- Fire-dependent and fire-adapted ecosystems
- Diversity in low diversity forest stands
- Viable native plant communities by controlling invasive species
- Wildlife habitat

The NFsNC plans to work toward these restoration goals using their Rapid Assessment project areas. This process is described on the website above and includes maps with areas delineated on the ground. Rapid Assessment project areas have been identified for 2009 and for 2010. The District Rangers associated with each of these Rapid Assessment areas is being asked to identify potential restoration projects related to one or more of these six priority restoration focus areas (listed above). In the short-term, the issues of hemlock woolly adelgid and invasive species were two topics with widespread support in the summer workshops, and some special topics will likely receive attention when the Rapid Assessment project area includes a resource that is in need of restoration (e.g., Roan Mountain Highlands and Table Mountain pine).

## Science Highlight

### Darwin's Worms

February 12, 2009 will be the 200th anniversary of Charles Darwin's birth. Although we recognize that there will likely be hundreds (or even thousands) of celebrations recognizing this momentous date in history, we thought that we here at CFDS might throw one more log on the fire, and mark Darwin's birthday with a Science Highlight on (what else?) earthworms. It is true that most of the Darwin celebrations on Feb 12th will be taking place in Evolution Departments and Molecular Biology Departments at universities across the globe, and this is certainly appropriate, given Darwin's contributions concerning natural selection and the resulting seminal understanding of the process of evolution and speciation. After all, it would not be too much to say that the entire discipline of modern biology is based on these principles. Nevertheless, there is another sub-discipline of biologists who regard Darwin as the "father" of their particular line of inquiry, who will also find cause to celebrate the great man's birthday: the earthworm biologists.

Most people are not aware that in addition to his seminal works on natural selection, Darwin wrote one of the first scholarly works on earthworm biology and behavior, "The Formation of Vegetable Mould Through the Action of Worms," published in 1881. This was the last book that Darwin published in his lifetime, and is based on the collected observations made over nearly 40 years on earthworm behavior.



View of the original worm stone, with Mac Callaham's feet. Note that the stone is almost completely buried and its top surface is now flush with the soil surface. The grounds-keeper at Down House now clears the grass away from the stone, or it would not be visible at all. The metal showing in the center of the stone is the attachment point for Horace Darwin's instrument which monitored the rate of subsidence.



View of the Down House from the back garden

Most of the experiments described in this book were conducted at the family's country home, Down House, in County Kent, south of London, and Darwin made many long-term natural history observations on the estate and in the surrounding countryside. One of the now-famous observations made at Down House dealt with how the burrowing and casting activities of earthworms resulted in the burial of objects on the soil surface over time. When the Darwins first moved into Down House in 1842, a field just behind the house had been recently tilled and seeded into pasture. Darwin's children referred to this plot as "The Great Stony Field" because of the abundant flint nodules that had been turned up and deposited on the soil surface, but by the time of the publication of the earthworm book, there were no longer any stones visible on the soil surface – the earthworms had buried them! Another unappreciated feature of Darwin's personality is that he was a dedicated family man. Ever the experimentalist, Darwin seized upon the stone burial observations and set up an experiment with the help of his youngest surviving son, Horace. The experiment is known as "The Worm Stone Experiment," and consisted of a large cylindrical stone that Darwin placed in the garden of Down House which he monitored over a period of several years using an instrument that he built with Horace, carefully documenting the rate at which the stone subsided into the soil. Imagine how well Horace would have competed in the County Kent Middle School science fair... Incidentally, Horace Darwin grew up to be an engineer and builder of scientific instruments, and was founder of The Cambridge Instrument Company.



Mac Callaham posing with Randal Keynes, OBE, at the site of the new Great Stony Field Experiment.

Faithful readers of the CFDS Project Leader's Report will recall that Mac Callaham traveled to Great Britain in Spring of 2007, where he began several long-term earthworm-related collaborations with colleagues at the University of Central Lancashire, in Preston, and one of these collaborations was initiated at the Down House Estate. Randal Keynes, OBE, is the great-great-grandson of Charles Darwin and is on the Board of Trustees for the Charles Darwin Trust. Keynes has spearheaded efforts to win the designation of World Heritage Site for the Down House Estate, and part of his vision for the Estate is that it remains a site of active research. Through arrangements with Keynes and Toby Beesley, head grounds-keeper at Down House, Callaham and colleagues were able to recreate the "stony field" scenario in the very field where Darwin made his original observations! With a few new twists, including variations in stone size, weight, and density, and the benefit of statistically defensible experimental design, we hope that in 20 short years, we will be able to get added value from one of the longest-term earthworm related study sites in the world!



*Man Is But A Worm.* This editorial cartoon published in Punch Magazine in 1882 demonstrates that Darwin's book on earthworms was not as controversial as his previous works on natural selection, but it still provided pundits of the day with a good joke. In the cartoon, an earthworm (probably *Lumbricus terrestris*) is crawling out of Chaos and making its way up the evolutionary ladder, culminating in a caricature of Darwin himself. (Image from Wikipedia Commons, public domain).

## All About Us

🌲 The Annual CFDS Christmas Party and staff meeting was held this year without musical accompaniment (certain unnamed staff members of exceptional ability got stage fright). Our new Assistant Director, Kier Klepzig attended the staff meeting, participated in the festivities, and networked with staff.

🌲 Two Length of Service Awards were presented at the staff meeting. David Combs was honored for 25 years and Helen Mohr for 10 years.



From left to right: Kier Klepzig, Tom Waldrop, and Helen Mohr



David Combs (left) receives his length of service award from Mac Callaham (right).

🌲 Rick Reitz, Fire Tech Transfer Specialist, will leave and take up his new duties as District Ranger in January.

🌲 Christa Dagley, Research Forester, has taken leave to seek employment with the Forest Service in California.

🌲 Yong Liu and John Stanturf were invited to participate in a customer panel for the British journal Nature. They agreed to participate in a monthly e-surveys.

## What's Up

🌲 Sally Collins, Associate Chief, has been named by Secretary of Agriculture Shafer to head the new USDA Office of Ecosystem Services and Markets (OESM). Organizationally, OESM will be located within the Office of the Secretary providing direct access to the Secretary. Coupled with this announcement is the creation of a federal government-wide Conservation and Land Management Environmental Services Board to assist the Secretary of Agriculture in the development of new technical guidelines and science-based methods to assess environmental service benefits which will in turn promote markets for ecosystem services including carbon trading to mitigate climate change.

🌲 Chief Kimbell announced other leadership changes. Hank Kashdan, currently Deputy Chief for Business Operations, replaces Collins as Associate Chief. Former Southern Regional Forester Chuck Meyers is named as the Deputy Chief for Business Operations. Within Research and Development, Susan Conard retires in January.

🌲 At the Southern Research Station, Assistant Director Carol Whitlock retires in January. Station Engineer Jay Hundley moves to the Department of Defense. Staff Assistant Nancy Walters will go on a one-year detail to the Pacific Southwest Research Station at the request of Deanna Stouder, Director, to serve as an internal consultant.

🌲 Mike Messina has accepted the position of Director of the School of Forestry and Wildlife at the Pennsylvania State University. Mike was formerly professor and Associate Dean at Texas A&M.

🌲 Congratulations are in order to several collaborators. Wendell Haag, Research Aquatic Ecologist in Oxford, Mississippi received the Presidential Early Career Scientist award and David Wear, Project Leader and Research Economist at Research Triangle Park, North Carolina received the Deputy Chief's Distinguished Science award. Chad Oliver, Pinchot Professor at Yale University, was named a Fellow of the Society of American Foresters. Jim Burger, the Garland Gray Professor of Forestry at Virginia Tech, retired and was named Professor Emeritus.

🌲 Coastal Louisiana Ecosystem Assessment and Restoration (CLEAR) is based at the Louisiana State University's School of the Coast & Environment and is a collaborative effort among state, federal, and university scientists and engineers. CLEAR provides scientific evaluation for restoration management. The staff at the Integration and Application Network (IAN) at the University of Maryland has collaborated on various CLEAR science communication products, including a series of newsletters. Most recently, IAN staff has contributed to the development of a new website for CLEAR, which highlights their modular approach to restoration and provides a searchable database of their extensive publication list. The CLEAR site is at <http://www.clear.lsu.edu/>. IAN has symbol libraries that contain over 1500 custom made vector symbols (in 32 categories) designed specifically for enhancing science communication skills. The libraries are designed primarily for use with Adobe Illustrator (requires version 10 or better), however they also offer eps and svg versions for non-Illustrator users. The symbols allow diagrammatic representations of complex processes to be developed easily with minimal graphical skills.

🌲 The IAN site is at <http://ian.umces.edu/>. Auburn University launched the Center for Longleaf Pine Ecosystems. More information is available at <http://wireeagle.auburn.edu/news/592>. Lisa Samuelson and Mike Clardy are the contacts.

🌲 Ecosystem Marketplace launched two new tools—the Forest Carbon Portal and a global Forest Carbon Project Inventory. The Forest Carbon Portal is a clearinghouse of information, resources, news, and events in the terrestrial carbon markets, and fills a similar but more focused niche than that of the role EcosystemMarketplace.com plays for the environmental markets. Housed on the Forest Carbon Portal, the Forest Carbon Project Inventory is a geo-referenced, global inventory of projects selling land-based (not just forestry) carbon credits into both the regulated and voluntary markets. ([www.forestcarbonportal.com](http://www.forestcarbonportal.com)).

🌲 The National Aeronautics and Space Administration (NASA) is working on a concept called the Model Web as a path towards gradual development of a modeling infrastructure to help predict and assess change and answer “what if” questions; creating such a modeling infrastructure is a long-term vision. A model web is composed of existing, loosely coupled models that developers have retrofitted for interoperability and that communicate using web services. The web would grow incrementally, organically, and opportunistically within a simple framework of guidelines and standards, much like the World Wide Web. Interested in adding your model? Contact Gary Geller, NASA Ecological Forecasting Program, [gary.n.geller@jpl.nasa.gov](mailto:gary.n.geller@jpl.nasa.gov).

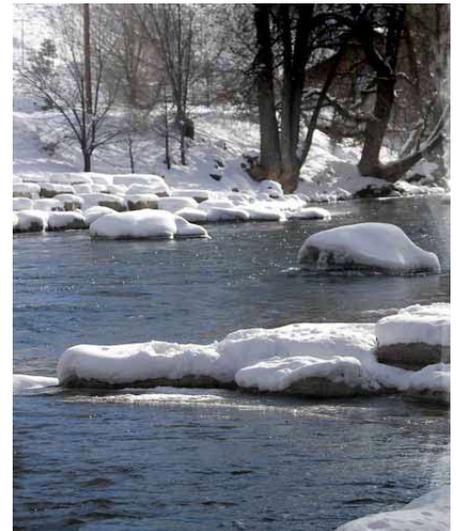
🌲 IUCN has undertaken a situation analysis to identify needs and gaps in its organizational capacity to address disasters and climate change adaptation. Different types of disasters, such as recurrent flooding versus conflict-related disasters, have required regional offices and thematic programs to develop a variety of responses. In addressing community vulnerability and resilience to disasters and climate change, IUCN recognizes that strong partnerships are required between donors, governments, disaster management authorities and environmental authorities. IUCN is already working closely with UNEP and ISDR to advance common goals under the Partnership for Environment and Disaster Risk Reduction (<http://www.prevention-web.net>). Several regional partnerships to coordinate environment and disaster reduction actions have been initiated, such as the recently created 3 IC, or IUCN Innovation Project: “Vulnerability and Resilience: Learning Lessons and Integrating Ecosystems into Assessment and Response.” The project sets out to improve IUCN’s capacity to assess and address the impacts of climate change and disasters on vulnerable communities. In doing so, the project will also develop an innovative strategy for capturing lessons learned from IUCN’s programme and project implementation, and develop innovative metrics to assess ecosystem-related elements of community vulnerability. IUCN will be expanding its use of CRiSTAL, a Community Risk Assessment Tool, and working with programmes such as Mangroves for the Future to address disaster risk reduction.

More information on can be obtained from Neville Ash, Head, Ecosystems Management Programme. ([Neville.Ash@ucn.org](mailto:Neville.Ash@ucn.org))

🌲 A very interesting article on sustainability indicators was posted on the Encyclopedia of Earth (van de Kerk, Geurt and Arthur R. Manuel (Lead Authors); Graham Douglas (Topic Editor). 2008. “Sustainable Society Index.” In: Encyclopedia of Earth. Eds. Cutler J. Cleveland (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment). [Published in the Encyclopedia of Earth December 29, 2008; Retrieved January 6, 2009]. [http://www.eoearth.org/article/Sustainable Society Index](http://www.eoearth.org/article/Sustainable_Society_Index)).

The abstract follows: “When we were looking for a suitable yardstick to measure the level of sustainability of a country a suitable instrument could not be found. Although the main existing indexes were examined we had to conclude that none of them seem to fit our needs completely. The main shortcomings are a limited definition of sustainability, a lack of transparency or high complexity and an absence of regular updates. For this reason, a new index – the Sustainable Society Index (SSI) – has been developed. The SSI integrates the most important aspects of sustainability and quality of life of a national society in a simple and transparent way. Consisting of only 22 indicators, grouped into 5 categories, it is based upon the definition of the Brundtland Commission, extended to the Brundtland+ definition by explicitly including the social aspects of human life.

Using data from public sources, the SSI was initially developed for 150 countries and published in 2006. In 2008 the first of two-yearly updates was published with results for 151 countries for which the SSI could be calculated. The resulting SSI scores on a scale of 0 to 10 allow a quick comparison between countries as is shown on the world map [not shown]. The underlying data, some of which are included in this article, allow in-depth analysis of the differences between countries. Two-yearly updates enable to follow developments over time. Although the time lap is relatively short, the results of the SSI-2006 and SSI-2008 seem to indicate a slight improvement in the worldwide average score. This article outlines the development of the SSI and the calculation methodology and gives the main results. It also summarizes the need for further research and development of the SSI.”



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# Calendar

2009

**Jan 11-15:** 24th Tall Timbers Fire Ecology Conference, Tallahassee, FL; <http://www.talltimbers.org/news/24thFEconference.html>

**Mar 10-12:** Climate Change: Global Risks, Challenges and Decisions; Copenhagen, Denmark; <http://www.climatecongress.ku.dk>

**\*Mar 12-14:** Innovation and New Horizons in Tree Nursery Stock Production and Forest Restoration - From Research to Business, Rome, Italy; <http://www.preforest.eu> or <http://www.vivaitorsanlorenzo.it>

**\*Apr 1-4:** Association of Southeastern Biologists annual meeting, Birmingham, Alabama

**Apr 12-16:** Annual conference of U.S. Regional Association, International Association for Landscape Ecology (US-IALE), "Coupling Humans and Complex Ecological Landscapes" Snowbird, Utah; <http://www.usiale.org/snowbird2009>

**Apr 16-18:** International conference "Forestry, Wildlife and Wood Sciences for Society Development," 90th anniversary of the Forestry Faculty in Prague, Czech University of Life Sciences, Prague; <http://www.czu.cz/forestry>

**May 14-15:** Conference on Ecology and Management of High-Elevation Forests in the Central and Southern Appalachians; Snowshoe Mountain Resort, Slatyfork, WV [http://www.forestry.caf.wvu.edu/wvu\\_divforestry/](http://www.forestry.caf.wvu.edu/wvu_divforestry/)

**\*May 31-Jun 9:** 2nd International Summit on Hurricanes and Climate Change, Corfu, Greece; <http://www.aegeanconferences.org/>

**Jun 10-11:** Carbon in Northern Forests: Integration of Research and Management Traverse City, MI <http://forest.mtu.edu/cinff/>

**\*Jun 10-12:** The Conference on the Inland Impacts of Tropical Cyclones, hosted by the Metro Atlanta Chapter of the American Meteorological Society and National Weather Association, Atlanta, Georgia; <http://www.ametsoc.org/chapters/atlanta/iitc.html>

**Jun 15-19:** National Silviculture Workshop, Integrated Management of Carbon Sequestration and Biomass Utilization Opportunities in a Changing Climate, Boise, Idaho

**\*Jun 22-26:** 7th North American Forest Ecology Workshop, Logan, Utah; <http://www.nafew2009.org/>

**Jun 29-Jul 3:** 6th International Symposium on Ecosystem Behavior, BIOGEMON 2009, Helsinki, Finland; <http://www.environment.fi/default.asp?contentid=298085&lan=EN>

**Jul 12-15:** 12th Biennial Conference of the Soil Ecology Society, with the Society of Nematologists, Burlington, Vermont; <http://www.uvm.edu/conferences/sonsesconference/>

**Aug 2-7:** Ecological Society of America Annual Meeting, Albuquerque, New Mexico <http://www.esa.org/albuquerque>

**Aug 4-8:** First World Congress of Environmental History, Copenhagen, Denmark; <http://www.wceh2009.org>

**Aug 16-21:** 10th International Congress of Ecology (INTECOL), Brisbane, Australia; <http://www.intecol10.org/>

**Aug 23-28:** Society for Ecological Restoration International World Congress, Perth, Western Australia <http://www.seri2009.com.au>

**\*Aug 23-29:** World Congress of Agroforestry, Nairobi, Kenya; <http://www.worldagroforestry.org/wca2009/>

**Sep 20-25:** International Conference on Multipurpose Forest Management: Strategies for Sustainability in a Climate Change Era, Niigata, Japan; <http://www.keiri.fr.a.u-tokyo.ac.jp/multiFM/>

**Sep 30-Oct 4:** Society American Foresters Annual Meeting, Orlando, Florida

**Oct 8-11:** First meeting of the Association for Environmental Studies and Sciences, Madison, Wisconsin; <http://aess.info/>

**Oct 13-16:** 2nd International Conference on Wind Effects on Trees, Meteorological Institute, Albert-Ludwigs University, Freiburg, Germany; <http://www.wind2009.uni-freiburg.de/>

**Oct 18-25:** World Forestry Congress, Buenos Aires, Argentina; [http://www.wfc2009.org/index\\_1024.html](http://www.wfc2009.org/index_1024.html)

**\*Nov 7:** Genomics of Forest and Ecosystem Health in the Fagaceae (Beech Family), Research Triangle Park, North Carolina; [http://forest-biotech.org/fagaceae\\_2009.php](http://forest-biotech.org/fagaceae_2009.php)

**Nov 1-5:** Soil Science Society of America Annual Meeting, Pittsburgh, PA

**Nov 30-Dec 4:** 4th International Congress of the Association for Fire Ecology, Savannah, GA <http://www.fireecology.net/congress09/home>

2010

**May 25-28:** Third EastFIRE Conference, George Mason University, Fairfax, VA

**Aug 1-6:** Ecological Society of America Annual Meeting, Pittsburgh, Pennsylvania

**Aug 23-28:** XXIII UFRO World Congress, Seoul, Republic of Korea <http://www.iufro2010.com/>

**Aug 1-6:** Ecological Society of America Annual Meeting, Pittsburgh, Pennsylvania

**Oct 31-Nov 4:** Soil Science Society of America Annual Meeting; Long Beach, California

**Nov 15-19:** VI International Conference on Forest Fire Research; Coimbra, Portugal [http://www.fire.uni-freiburg.de/course/meeting/2010/1st\\_announcement.pdf](http://www.fire.uni-freiburg.de/course/meeting/2010/1st_announcement.pdf)

**Sept. TBD:** International Poplar Society Symposium, Orvieto, Italy.

**2011 International Year of the Forests**

**\*May 9-13:** International Fire Congress, South Africa; <http://www.wildfire2011.org/>

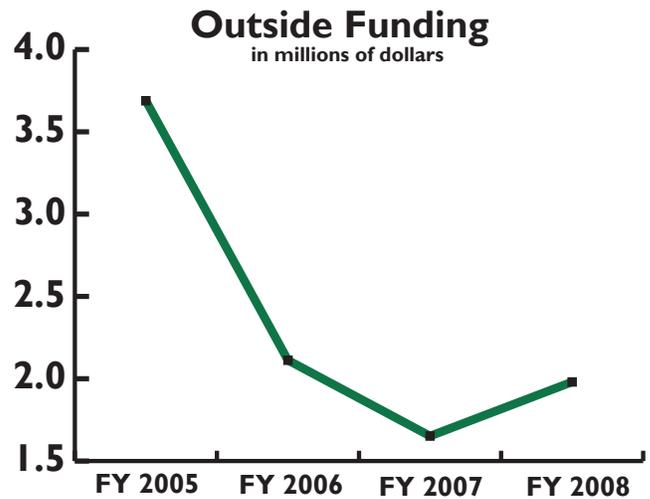
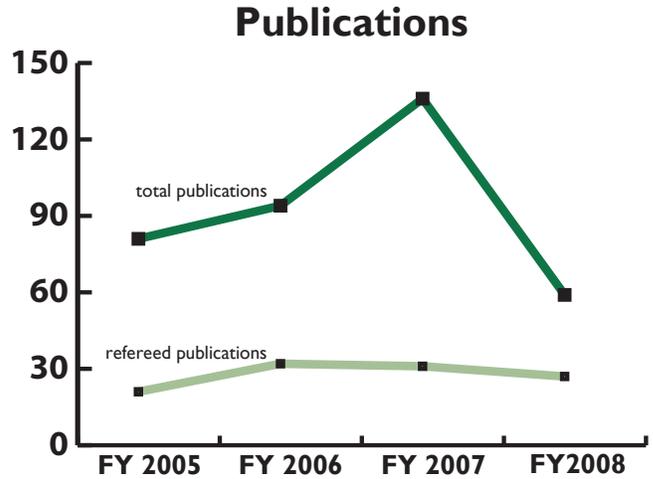
**Aug 7-12:** Ecological Society of America Annual Meeting, Austin, Texas

**Oct 14-20:** Soil Science Society of America Annual Meeting; San Antonio, Texas

**TBD:** IUFRO Wind and Trees Conference, Athens, Georgia; Chris Peterson, University of Georgia to organize

# Scoreboard

Category	FY2009
Number of Refereed Journal Publications	12
Number of Non-Refereed Publications (include abstracts)	10
Total Number of Publications	22
Number of Tours	12
Number of Short Courses/Training	5
Number of Invited Presentations to Scientific Organizations	2
Number of Invited Presentations to Lay Organizations	16
Number of Volunteer Presentations to Scientific Organizations	11
Number of Technology Transfer Activities (other than above)	28
Number of Tools Developed	0
Outside Funding	\$70,000



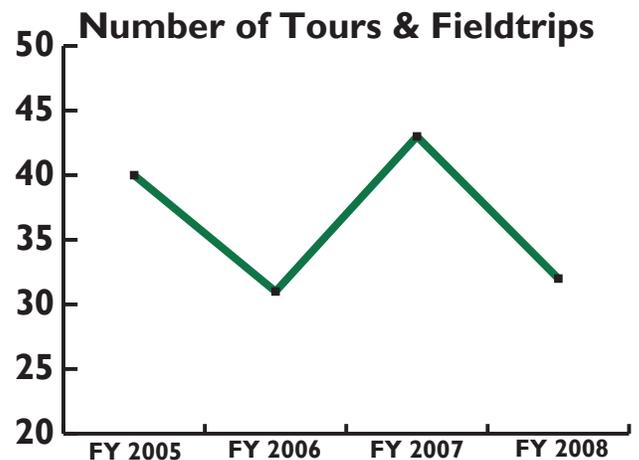
*A sampling of our annual holiday feast.*



*Joe O'Brien runs to be the first in line.*



*Kathy Johnston and Rebecca Garner sit down to a rare home cooked meal for the college students.*



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Layout & Design by: Rebecca Garner