Natural Resources & the Economy: Hand in Hand

17th Annual SAMAB Conference

November 28-30, 2006

Holiday Inn SunSpree

Gatlinburg, Tennessee

Natural Resources and the Economy: Hand in Hand

17th Annual SAMAB Conference
November 28-30, 2006
Gatlinburg, Tennessee – Holiday Inn, SunSpree

Agenda Overview

November 28, 2006		
10:00 am - noon	Registration (Tower lobby) and Poster setup (Gatlinburg/Glades)	
1:00 pm	Opening and welcome: Pat Parr (Greenbrier)	
1:10 pm	Keynote address: Dave Wear, The Economic Benefits of Forest and Natural Resource Protection and Management (Greenbrier)	
2:15 pm	Countering the Spread of Invasives (LeConte)	Land Conservation: Successful Approaches in the Southern Appalachians (Greenbrier)
4:00 pm	Panel discussion: Public-Private Partnerships for Conserving Natural and Cultural Values in the New Rural Economy (Greenbrier)	
5:30 pm	Poster session with light h'ors douvres (Gatlinburg/Glades)	
November 29, 2006		
7:30 am	Registration opens (Tower lobby)	
8:30 am	Biofuels: Production, Availability, Use and Impacts in the Southern Appalachians (LeConte)	Development and Water Resource Planning, Information, and Impacts (Greenbrier)
11:40 pm	Lunch on your own *or* NEPA Roundtable (Laurel A)	
1:00 pm	Keynote address: Jeff Biggers, Appalachian Vanguard/Appalachian Stewards (Greenbrier)	
3:30 pm	Biofuels: Production, Availability, Use and Impacts in the Southern Appalachians (LeConte) (cont'd)	Natural Resources and Economic Opportunity (Greenbrier)
6:30 pm	Dinner reception with bluegrass, mountain music jam (all musicians invited to join in) (Calhoun's Banquet Room)	
November 30, 2006		
7:30 am	Registration opens; light continental breakfast (Tower lobby)	
8:30 am	Information for Forest, Land, and Resource Management (LeConte)	Guiding and Measuring Development in the Region (Greenbrier)
10:40 am		Water for People and the Environment (Greenbrier)
1:15 pm	Guided hike. Enjoy a late season walk, learn winter tree identification skills and view some winter birds. (meet in the Tower lobby)	

17th Annual SAMAB Fall Conference

Natural Resources and the Economy: Hand in Hand

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Holiday Inn SunSpree, Gatlinburg, Tennessee

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1:00 pm	**Opening and welcome**: Pat Parr, SAMAB Chairperson (Greenbrier)	
1:10 pm	**Keynote address**: Dave Wear, *The Economic Benefits of Forest and Natural Resource Protection and Management* (Greenbrier) (p. 13)	
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10:50 Tom Burley and John Peine. Roan Mountain and data management: Facilitating science through data and information management
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12:05 Mike Sale. Evolutionary trends in environmental flow requirements: A view from ORNL</td></tr>
<tr><td>12:30 pm</td><td colspan="2">Lunch on your own</td></tr>
<tr><td>1:15 pm – ~4:00 pm</td><td colspan="2">Guided hike. Led by Kevin Caldwell, botanist (meet in Conference Registration area in the Tower Lobby)
Enjoy a late-season walk, learn winter tree identification skills and view some winter birds</td></tr>
</table>

ACKNOWLEDGMENTS

SAMAB greatly appreciates the outstanding assistance and cooperation of the following individuals and organizations that have worked to make this conference a success:

17th Annual SAMAB Conference Planning Committee

Rick Durbrow, Conference Co-Chairperson, U.S. Environmental Protection Agency, Region 4
Jenny Adkins, Conference Co-Chairperson, USDA Natural Resources Conservation Service, Tennessee
Martha Bogle, National Park Service, Blue Ridge Parkway
Barry Clinton, USDA Forest Service, Southern Research Station
Harold Draper, Tennessee Valley Authority
Judy Francis, North Carolina Department of Environment and Natural Resources
Rob Hawk, North Carolina Cooperative Extension Service
Zoe Hoyle, USDA Forest Service, Southern Research Station
Joella Jackson, Eastern Band of Cherokee Indians, Office of Environment and Natural Resources
Gary Peeples, U.S. Fish and Wildlife Service
Sherry Redus, SAMAB Coordinating Office
Anita Rose, USDA Forest Service, Forest Inventory and Analysis

With support of the SAMAB leadership team:

Gerald L. Ryan, District Chief for North Carolina, US Geological Survey; SAMAB Executive Committee Chairperson
Patricia Dryer Parr, Reservation Manager, Oak Ridge National Laboratory; SAMAB Executive Committee Vice-chairperson
Rick Durbrow, EPA Region 4; SAMAB Executive Committee Vice-chairperson elect
Charles Van Sickle, SAMAB Foundation President
Susan Schexnayder, SAMAB Program Manager

We greatly appreciate our conference sponsors:

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17th Annual SAMAB Conference

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ABSTRACTS

(organized by session, in order of occurrence)

Keynote Address

The Economic Benefits of Forest and Natural Resource Protection and Management

November 28, 2006, 1:00 p.m. (Greenbrier Room)

Dave Wear
USDA Forest Service, Southern Research Station

Forests in the Southern Appalachians represent a kind of natural capital from which many ecological and other services derive. The long-run sustainability of forests within the region depends critically on today's choices and the legacy of long past resource uses—especially given the economic growth anticipated for this region. This presentation focuses on anticipated changes in the Southern Appalachians and on the “decision space” the region will operate within regarding the management of its natural capital.

COUNTERING THE SPREAD OF INVASIVES

November 28, 2006, 2:00-3:40 p.m. (LeConte)
Session Moderator: Nancy Fraley,
National Park Service, Southeast Exotic Pest Plant Management Team

Native Landscape Certification Program for Great Smoky Mountains Region
Jason P. Love†, Great Smoky Mountains Institute at Tremont

As a partner of Great Smoky Mountains National Park, Great Smoky Mountains Institute at Tremont recognizes the negative impacts of invasive exotic species. The park is under constant threat of exotics that infiltrate its borders from surrounding cities, towns, and rural communities. To help address this issue, Tremont has created the Native Landscape Certification Program (NLCP) to bring attention to the detrimental effects of invasive exotic plants in the park and surrounding region, as well as to promote the use of native plants in landscaping. The NLCP is a volunteer program for businesses and real estate developments in the Smoky Mountain Region. Participants in the program will be certified as having Native Landscapes if they meet certain criteria, such as using native plants in landscaping and eradicating invasive exotic plants on their property.
† *9275 Tremont Rd., Townsend, TN 37882; Jason (at) gsmit.org*

Early Detection/Rapid Responsible Monitoring Protocol at Ft. Bragg, North Carolina
Sarah Vokoun†,[1] Peter Frank,[2] and Lee Patrick
[1] *Invasive Plant Control, Inc.*
[2] *Army Corps of Engineers*

Fort Bragg and Camp Mackall in North Carolina cover approximately 113,622 and 7,935 acres, respectively. This region supports the longleaf pine ecosystem where the endangered Red-Cockaded Woodpecker thrives along with five federally endangered plant species. The installation also contains over 70 rare species. Protection of this diversity relies on the early detection and rapid response to non-native invasive plants

An Early Detection/Rapid Response is an aggressive approach to management that eradicates species in small numbers and searches for new invasive species. It is the cheapest, most efficient, and most effective way to manage non-native invasive plant species.

During the summer of 2006, Invasive Plant Control, Inc. carried out an Integrated Non-native Invasive Plant Species Management Plan developed by the US Army Engineering Research and Development Center-Construction Engineering Research Laboratory (ERDC-CERL) and in cooperation with the Fort Bragg Endangered Species Branch.

This scope of work required two different approaches to non-native invasive plant control. One is a species-specific approach targeting species suspected to be in early stages of invasion, which was the main priority of the 2006 treatments. The other approach targets high priority threatened and endangered (T&E) species sites for control of all non-native invasive plant.

Invasive Plant Control surveyed 128 previously established plots to determine the presence of thirty-eight (38) targeted non-native invasive species. Abundance of the targeted species observed within plots was recorded as a gross ocular estimate of percent foliar cover plots. Fifteen (15) of the 38 non-native invasive plant species were controlled with herbicides. An additional radius of 100

meters from the center point was searched for the 15 targeted non-native invasive plant species and if found were treated with herbicides.

Targeting small populations of specific non-native invasive plant species will effectively control aggressive non-native plant species while preserving the biodiversity of the region.

† *Invasive Plant Control, Inc., PO Box 50556, Nashville, TN 37205; sarahvokoun (at) mindspring.com*

Houston, We Have a Problem… Emerald Ash Borer: Effects in the Midwest and Threat to the Southern Appalachians

Kenneth Witt†, USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine; Cooperative Emerald Ash Borer Project

Ash trees were on the decline and no one knew why. Then in the summer of 2002 a discovery was made; an exotic green wood-boring beetle was identified. The emerald ash borer (EAB) had arrived.

Emerald ash borer is a serious pest of quarantine significance. It poses a significant risk to the ash resource in North America. If it is not contained and eradicated, the impact of Emerald Ash Borer beetle attacks on ash in North America will be similar to that of the devastation from two fungal diseases, Chestnut Blight and Dutch Elm Disease, which destroyed woodland and urban forests in the 20th century.

States that become infested could lose billions of dollars in forest products, and quarantines imposed by state and federal agencies may have serious consequences for plant and wood products industries. Severe damage may also occur within the tourist industry.

† *Cooperative Emerald Ash Borer Project, 5936 Ford Court, Suite 200, Brighton, MI 48116-8511; Kenneth.A.Witt (at) aphis.usda.gov*

A Prototype Bayesian Belief Network to Assess Effects of Hemlock Woolly Adelgid on Stream Ecosystems in the Southern Appalachians

Patricia A. Flebbe† and Danny C. Lee, Eastern Forest Environmental Threat Assessment Center, USDA Forest Service, Southern Research Station

In the southern Appalachians, hemlock can be a significant component of stream riparian zones, serving multiple functions for streams. Loss of hemlocks due to hemlock woolly adelgid (HWA) is likely to have impacts on streams through several causal pathways, including changes to stream shading, allochthonous input, and alteration of nutrient cycles. Most assessments to date have been qualitative or focused on a single pathway. Research on these impacts is underway, but studies are incomplete and not published.

When data are incomplete, Bayesian belief networks (BBN) can be used to combine available data with expert knowledge to integrate multiple pathways and assess their relative influence. BBNs have characteristics of directed graphs and probability theory. We are developing a BBN to synthesize what is known about possible effects of HWA on streams in the southern Appalachians and will present a prototype of the model. We invite scientists to contribute to the database as we further develop this model.

† *1650 Ramble Road, Blacksburg, VA 24060; pflebbe (at) fs.fed.us*

See posters on this topic, page 21.

LAND CONSERVATION: SUCCESSFUL APPROACHES IN THE SOUTHERN APPALACHIANS

November 28, 2006, 2:00-3:40 p.m. (Greenbrier)
Session Moderator: Anita Rose,
USDA Forest Service, Forest Inventory and Analysis

TVA Lands Policy
Michael Dobrogosz†, Tennessee Valley Authority

In September 2006, the TVA Board Community Relations Committee (CRC) presented a draft TVA Lands Policy to the full TVA Board for review. After a 30 day public comment period and a full review of all comments, the CRC anticipates presenting a final recommendation for Board consideration at the November Board meeting. This presentation highlights the specific land-related issues written into the draft policy.
† *mjdobrog (at) tva.gov*

The Foothills Land Conservancy: Land Preservation, Conservation Easements and New Tax Benefits
Edward Clebsch†, Foothills Land Conservancy

The Foothills Land Conservancy is a citizen's organization dedicated to land preservation in the foothills of the Great Smoky Mountains and their surroundings. It was chartered in 1985, and opened an office in 1992. It has protected about 16,000 acres, of which about 6,000 are in conservation easements. The rest was purchased and donated to Great Smoky Mountains National Park and Tennessee Wildlife Resources Agency.

Conservation easements will be briefly explained. The recently enacted Pension Act of 2006 included a rider that significantly increase the tax benefits to donors of property. It has caught the attention of potential donors, including developers.
† *Foothills Land Conservancy, 614 Sevierville Road, Maryville, TN 37804; eclebsch (at) foothillsland.org.*

Landcare: A Popular Movement that Integrates Economic and Social Benefits with Natural Resource Stewardship
Jim Stokoe†, Land-of-Sky Regional Council

Landcare is a conservation movement that brings local communities, private corporations and government agencies together to support hands-on action to promote sustainable land and water management. Landcare combines the social ethic of personal responsibility for the environment and "neighbors helping neighbors" with scientific management of working lands, good group process and ecosystem restoration. An effort to start a landcare movement in the United States is rapidly gaining momentum. Land-of-Sky Regional Council in Asheville, North Carolina is part of that effort.

A landcare group is a community-based group of volunteers working on conservation projects that contribute to environmental, social and economic outcomes. Landcare delivers triple bottom line benefits to local communities, participating landcare groups and corporate sponsors.

This presentation describes landcare and its triple bottom line approach; provides an update on the emerging landcare movement in

the US; and summarizes landcare activities in the region.
† *Land-of-Sky Regional Council, 25 Heritage Drive, Asheville, NC 28806; jim (at) landofsky.org*

The Reasons Why We're Organizing in the Name of Landcare in Grayson County
Jerry Moles†, New River Land Trustt

Dramatic changes are underway in where and the ways natural resources are being produced, processed, and distributed. Demand for value added steps increases the opportunity for local communities through cooperative ventures to receive a higher return on their land, labor, and management services. Further, through local investment, more wealth can be retained in the hands of the people living in rural communities. LandCare, as first developed in Australia, guides community activities towards readily accepted goals, the triple bottom-line of LandCare: (1) better financial return for rural landowners and labor, (2) vibrant and healthy landscapes and waterways, and (3) communities empowered and capable of taking care of their own. A collaborative group has emerged to implement LandCare in Southwest Virginia and includes the New River Land Trust, the Office of Congressman Rick Boucher, the Office of the Virginia Secretary of Agriculture, Robert Bloxom, the Colleges of Agriculture and Life Sciences and of Natural Resources at Virginia Tech, the Conservation Management Institute of Virginia Tech, Virginia and Grayson County Farm Bureaus, New River Soil & Water District, New River Highlands Resource Conservation & Development Council, Carroll/Grayson Cattle Producers Association, USDA Natural Resource Conservation Service, and the gracious and wonderful people of Grayson County who know that the present is momentary and the future is in their hands. The reasons why the people are organizing is based upon their understanding of their financial position at the moment and the capabilities of improving their income from land, labor, and management through improved farming and forestry practices. The path to the present is described from the perspective of LandCare.
† *New River Land Trust, P.O. Box 11057, Blacksburg, VA 24062-1057; jmoles (at) igc.org*

See posters on this topic, page 21

Panel Session
PUBLIC-PRIVATE PARTNERSHIPS FOR CONSERVING NATURAL AND CULTURAL VALUES IN THE NEW RURAL ECONOMY

November 28, 2006; 4:00-5:30 p.m. (Greenbrier)
Organizer and moderator: Judy Francis,
North Carolina Department of Environment and Natural Resources

Panel Participants
Maynard Taylor, Burke County Commissioner;
Marc Collins, Burke County Planning Director;
Susie Hamrick Jones, Foothills Conservancy of North Carolina;
Troy Lucas, Crescent Resources LLC; Paul Carson, Superintendent of NPS Overmountain Victory National Historic Trail

BACKGROUND: The job of protecting natural and cultural resources and stimulating regional economic activity is often presented as and "either – or" scenario. The result of this false dichotomy is that local decision-makers, private property owners, and public land managers often have difficulty in communicating goals and achieving results that are mutually supportive and fruitful. Lack of collaboration in addressing these issues will never provide the comprehensive solutions that can benefit our land and our citizens in the meaningful ways we all so desperately need. Each of us can learn from the experience of successful partnerships created to address such scenarios and advocate similar relationships in our own endeavors.

PRESENTATION CONTENT: This presentation will consist of a PowerPoint show and panel discussion regarding a case study (Lake James in Burke County, NC) of a public - private partnership in western North Carolina. The members of the panel consist of an elected local official, a land use planner, a local land trust, a private property owner, and a public land manager. Each panel member will describe his or her role in the process and explain how other members of the panel were necessary to accomplish collective goals. The partnership resulted in the addition of over 9000 acres of land deemed to be prime real estate being purchased or donated for public purposes (including a major state park expansion) as well as an economic stimulus package determined to generate more than 2400 permanent jobs in the region and infuse over $2,000,000 annually into the local economy. It also resulted in the establishment of conservation zoning districts which will ensure that future development in the area will compliment and enhance the scenic, environmental, and historic attributes of the area for both residents and visitors alike. The facilitator will conclude the discussion with comments regarding a new initiative currently being conceptualized by the One North Carolina Naturally Program and the North Carolina Department of Commerce to encourage "place-based" economic initiatives that will protect natural resources while enriching local economies through creative partnerships. We hope the experience we share will inspire the conference audience to think "outside the box" to develop collaborative partnerships to accomplish their goals for environmental integrity and regional prosperity.

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POSTER SESSION

November 28, 2006; 5:30-7:00 p.m. (Greenbrier)
Organizer and moderator: Gary Peeples, U.S. Fish & Wildlife Service

Underwater Video Mapping for River Habitat Mapping in the Big South Fork National River and Recreation area.
Paul Ayers†, Department of Biosystems Engineering and Soil Science
University of Tennessee

BISO (Big South Fork NRRA) was established to protect the last free-flowing segment of the Cumberland River on the Cumberland Plateau. The river is home to one of the most diverse freshwater mussel fauna in the United States and five mussels are federally listed as endangered. GPS-based underwater video mapping was used to acquire georeferenced under and above water video footage to define river habitat. GIS-based river habitat maps georeferencing river depth, river characteristics (pool, riffle, run), and substrate were developed along approximately 20 miles of the Big South Fork of the Cumberland River.
†2506 EJ Chapman Drive, Knoxville, TN 37996; ayers (at) utk.edu

Using Underwater Video Mapping to Define Optimal Habitat for Threatened and Endangered Fish Repopulation in the Great Smoky Mountain National Park.
Paul Ayers†, Department of Biosystems Engineering and Soil Science
University of Tennessee

This project involves the development of habitat maps for 4 federally-listed fish species in Abrams Creek (GRSM) utilizing GPS-based underwater video mapping and image georeferencing techniques. River habitat classifications were determined and utilized to develop river habitat maps. Underwater river surveys were conducted on approximately 16 miles of Abrams Creek from Rabbit Creek to Chilhowee Lake.
†2506 EJ Chapman Drive, Knoxville, TN 37996; ayers (at) utk.edu

Pigeon River Benthic Macro-invertebrate Surveys in 2005 Denote Improved Water Quality
Melinda J. Wilson Bousfield† and J. Larry Wilson, Department of Forestry, Wildlife & Fisheries, University of Tennessee

The Pigeon River Recovery Project (BRRP) is an ongoing effort to help restore native aquatic species to the Pigeon River in both Tennessee and North Carolina. In fall of 2005, the restoration project endeavored to ascertain and demonstrate an improvement in water quality of the Pigeon River. Bio-assessment via benthic macro-invertebrate surveys was used to gauge the change in the Pigeon's waters since the late 1990's. Benthics are less mobile than fishes and are better indicators of water quality in some regards since they live in and on the river's substrate. Comparison of the 2005 survey with previous benthic surveys shows an upward trend in species composition in many of the invertebrate taxa. These data were collected in conjunction with a Blue Ridge Paper Inc. (Canton, NC) funded project to assess of the composition of fish and benthic organisms in the Pigeon River in North Carolina and Tennessee. Preliminary data analyses indicate

substantial increases in the number of invertebrate taxa over the past decade.
†*274 Ellington Plant Sciences Bldg, Knoxville, TN 37996-4563; mjwilson (at) utk.edu*

Fort Loudoun Lake Association
Mark Campen†, Fort Loudon Lake Association, Tennessee Izaak Walton League

The Fort Loudoun Lake Association's goal is to give people who live, work and recreate on Fort Loudoun Lake a voice in protecting and enhancing the economic benefits and quality of life values of clean water. The organization was established on July 27, 2006, emerging from the goals and focus of the TN Izaak Walton League. Our services focus on addressing the water quality impacts of trash, debris and soil erosion. We work with land owners, businesses, local, state, federal agencies and all other individuals and groups that have influence on Fort Loudoun reservoir to conserve one of our regions most valuable resources.
† *956 Volunteer Landing Lane, Box 12, Knoxville, TN 37915; mark (a) tnike.com*

Variation in Riparian Zone Structure and Function in Southern Appalachian Headwater Catchments
Barton Clinton†, USDA Forest Service

Riparian zone structure and function and how they vary within and among catchments is at the center of an on going debate about the protection of critical aquatic and terrestrial processes and habitats. In the southern Appalachians, little has been done to characterize this variation. We were interested in the effectiveness of prevailing stream-side buffer widths; 30 and 100 m, at mitigating upland timber harvesting activities. In this presentation we show pretreatment variation during the first season in coarse woody debris (CWD), soil CO2 evolution, and litter fall dynamics along the stream side - upland gradient on four sites within 1st order headwater catchments. Soil CO2 evolution showed distinct differences between near stream locations and upland locations driven by differences in available soil carbon (C), and soil temperature and moisture. Percent soil C in the A horizon explained the majority of the variation in soil CO_2 flux rates along the gradient on some sites, whereas soil temperature and moisture were more important on others. Litter fall varied along the gradient in terms of timing, species, and amount. Oak species were predominant on the upland sites and typical riparian species such as *Liriodendron tulipifera*, *Magnolia* spp., *Tsuga canadensis*, and *Betula lenta* predominated in the near stream locations. *Acer rubrum* was present on all positions along the gradient. In addition, small woody debris inputs were greatest at the extremes of the gradient. These differences in the timing and amounts of inputs may explain variation observed in other processes and fluxes. Site to site variation observed in this study illustrates the need for on site evaluations versus rigid applications of standard buffer widths.
†*USDA Forest Service, Southern Research Station, Coweeta Hydrologic Lab, Otto, NC; bclinton (a) fs.fed.us*

The Role of Unroaded Areas and Areas of Low Road Density in Water Quality Issues in Western North Carolina
Hugh Irwin†, Southern Appalachian Forest Coalition

Roads have been widely recognized in the scientific literature as having a profound effect on the landscape and are one of the primary risks for a variety of environmental impacts.

These impacts include erosion, sedimentation, mass wasting, degradation of water quality, alteration of surface and subsurface hydrology, constraints on movement of aquatic and terrestrial species, alteration of physical channel dynamics, isolation of floodplains, constraints on channel migration, facilitation of the spread of exotic species and pests, and constraints on the movement of aquatic and riparian components including large woody debris, fine organic matter, and sediment. Many of these impacts

are direct or indirect impacts on the aquatic and riparian resource. These environmental effects have been well documented, and a number of mitigation strategies have been used to reduce or address these impacts to some extent.

It has also been recognized that unroaded areas and areas with low road density tend to have fewer and less severe impacts to their aquatic and riparian resources. In fact many unroaded areas are recognized by state and federal rankings for their high stream and water quality and the health of the watersheds.

We have used both qualitative and quantitative measures of stream quality, water quality, and watershed health to compare unroaded and low density areas in Western North Carolina to areas of higher road density.

We will look at the efficacy and limitations of some of the strategies used to mitigate the effects of roads. The social benefits played by areas of low road density are investigated, and the implications for management and preservation of unroaded and low road density areas are examined.

† SAFC, 46 Haywood Street, Suite 323, Asheville, NC 28801; hugh (at) safc.org

Experiences in Water Quality Education

Brackin Kirkland†, Center for Learning and Investigation in Mountain Backcountry Ecosystems (CLIMBE), Montreat College

The Center for Learning and Investigation in Mountain Backcountry Ecosystems (CLIMBE) provides educational opportunities for high school students in North Carolina who have an interest in environmental science. Sixty 8-12th grade students participate annually in an intensive summer-long program studying the mountain watershed ecosystems of the greater Mt. Mitchell area. Student participants live in the backcountry at remote research stations and collect ecological data in four watersheds along an elevational gradient ranging from 2,500 to 5,500 feet.

Scientific field studies are needed to investigate the critical environmental factors threatening the air, water, and forests in these unique ecosystems. The data collected includes stream water chemistry, aquatic macroinvertebrates, stream physical characteristics, salamander and snail diversity, insect diversity, and vegetation. This data is submitted to the NC Department of Environment and Natural Resources and will be used to establish a baseline for the long-term ecological monitoring of these watershed ecosystems.

CLIMBE follows established scientific protocols for data collection created by the Stream Monitoring Information Exchange, a program run by Clean Water for North Carolina. Ultimately, the program provides young scientists with hands-on experiences in field data collection, analysis and reporting as well as collaboration with Ph.D. scientists. After spending time learning about these watersheds, our hope is that students will become advocates and researchers for watershed protection in their own communities.

CLIMBE is funded by Burroughs Wellcome.

† U 310 Gaither Circle, Box 855, Montreat, NC 28711; kirklandjb (at) montreat.edu

Invasive Exotic Plants: A Threat to Artisan Natural Resources

Linday Majer†, Equinox Environmental, Inc.

Traditional Cherokee artistry relies on native plants and resources found in the Southern Appalachian Region such as river cane, bloodroot, black walnut, and white oak. For centuries, artists have employed techniques that create beautiful and functional pieces using natural resources found in their local environments. This tradition is important both culturally and economically to the Eastern Band of Cherokee Indians.

SAMAB has partnered with the Revitalization of Traditional Cherokee Artisan Resources (RTCAR) in training Cherokee artisans and staff of the Eastern Band of Cherokee Indians to identify and control invasive exotic plants on their lands. Initially through workshops, SAMAB has trained citizens and artisans how to identify invasive exotic plants, and worked with resource

management specialist to improve their expertise on plant identification, control methods, and data collection procedures. SAMAB is now working with the Cherokee Natural Resources staff, artisans, and landowners in developing "management prescriptions" for specific sites to tackle invasions that inhibit native plants, artisan resources, and other natural areas on tribal lands. Through education, awareness, outreach, cooperation, and control, native plants invaluable to the tradition of Cherokee artisans can be preserved.

In addition to SAMAB staff, this project has involved Cherokee artisans, EBCI staff from the Office of Environment and Natural Resources and the Cultural Resources/Historic Preservation Office, Equinox Environmental as consultant to SAMAB, the Southeast Exotic Pest Plant Management Team, the Cooperative Extension Service office in Cherokee, and the Great Smoky Mountains National Park's Vegetation Management Division. The project is funded by the National Forest Foundation and the Cherokee Preservation Foundation's Revitalization of Traditional Cherokee Artisan Resources Program.

†*Equinox Environmental, Inc., 37 Haywood Street, Suite 100, Asheville, NC 28801; Lindsay (at) equinoxenvironmental.com*

Yellowfin Shiner: An Exotic Fish Threatens the Integrity of Western North Carolina and Upper Georgia Stream Systems

William McLarney[1], Brent Martin†[2], and Pamela Nabors[3]

[1] *Little Tennessee Watershed Association*

[2] Land Trust for the Little Tennessee

[3] *TVA, NBII-SAIN*

The yellowfin shiner, *Notropis lutipinnis* (Jordan and Brayton) is native to most of the Atlantic drainages of Georgia and South Carolina, and may also be native to the upper Chattahoochee and Coosa River drainages, which empty into the eastern Gulf of Mexico. It was first documented for a Mississippi drainage stream (Little Tennessee River just north of the North Carolina/Georgia line in 1988. It was subsequently found to be widespread and abundant in the Georgia portion of the Little Tennessee watershed, where local fishery personnel assumed it was a native species.

In fact, *N. lutipinnis* gives strong indication of being an invasive exotic in the Little Tennessee system. In 17 years of biomonitoring of the Little Tennessee and its tributaries above Fontana Reservoir, we have seen it steadily expand its range downstream in the mainstem and upstream in tributaries. In 1990, the first year of concerted monitoring, it was fairly common in North Carolina as far downstream as Coweeta Creek (about 9 miles below the state line); a single specimen was taken from Cartoogechaye Creek, 8 miles further downstream. It was not until 1997 that it began to appear below Lake Emory, a small impoundment at Franklin, North Carolina. In 2006 we encountered a single specimen in Tellico Creek, which flows into the Little Tennessee over 40 miles from the Georgia line.

We have observed what appear to be hybrids of *N. lutipinnis* with at least 4 other cyprinid species, and it also appears to compete with native cyprinids, particularly the Tennessee shiner, *Notropis leuciodus*. In support of the competition thesis, we present graphs showing relative abundance of *N. lutipinnis* and *N. leuciodus* at 5 frequently monitored sites over the period 1990-2006. We conclude that this exotic species is a significant threat to the integrity of stream systems in the upper Little Tennessee River watershed of North Carolina and Georgia.

†*Land Trust for the Little Tennessee, PO Box 1148, Franklin, NC 28744-1148, bmartin (at) ltlt.org*

Seventy Years of Development of the First Planned Forest Regeneration Study in the Southern Appalachian Mountains

W. Henry McNab† and David L. Loftis, USDA Forest Service, Southern Research Station

"What can be done with Southern Appalachian cut-over areas?" was the question asked by pioneer forest researcher Jesse Buell in 1928 as he began planning for a

regeneration study in the newly established Bent Creek Experimental Forest, near Asheville, NC. Timber stands common on national forest lands at that time were under stocked and consisted largely of poor quality, crooked, and decayed trees. That type of condition resulted mainly from 100 years of homesteading and commercial utilization that favored harvesting the desirable, best trees but leave standing the less desirable trees, which claimed growing space in the future stands. Buell needed information on the type of cutting that would be most beneficial to regenerate the low-quality stands and improve potential value of the future timber stands. That was a time when forest research was just beginning and aside from observations of conditions resulting from commercial logging on national forests, little was known about the subsequent development of cut-over areas and particularly harvest cutting done with the primary objective of regenerating a new stand.

Three types of harvesting treatments were made: diameter limit, selection, and clearcutting; a check plot was established also where no logging was done. The four unreplicated cutting treatments were installed in oak dominated stands in January 1931, on adjacent tracts that averaged about 8 acres. Growth of trees in each stand was followed for 20 years when initial assessments were made. Evaluation of two treatments, diameter-limit and selection, was ended and results were published. Observations continued, however, on the clearcut and check treatments. At age 40, in 1970, the clearcut tract had developed into a productive stand of well-formed small poletimber trees (between 5 and 11 inches dbh) consisting mainly of oaks, with a few sawtimber size yellow-poplars on the lower slope. At 70 years of age, in January 2000, the timber stand on the clearcut tract was similar to the check treatment: both areas had about 140 trees per acre and basal areas of about 105 sq ft/ac. Merchantable cubic and board feet volume was slightly greater in the check stand.

Periodic inventories continue although interests have broadened beyond silviculture and now include questions of a more ecological nature, such as acorn production for wildlife and growth of individual trees. A popular hiking trail extends through the aesthetically pleasing forest of medium to large trees. Except for a sign identifying this historically important research area, most hikers are unaware that this diverse forest of over 30 shrub and tree species was completely bare of vegetation greater than 1-foot in height 70 years earlier. Other better designed studies that utilize replicated treatments have shown results similar to this forerunner of regeneration studies. These two historic tracts installed by Buell, however, continue to provide valuable demonstration of one method for even-aged regeneration of southern Appalachian hardwood forests.

† *USDA Forest Service, 1577 Brevard Road, Asheville, NC 28806; hmcnab (at) fs.fed.us*

The Work of the Tennessee Interfaith Power and Light

Shannon Miller†, Tennessee Interfaith Power and Light

The Tennessee Interfaith Power and Light organization seeks to involve congregations of faith as stewards of God's creation by promoting and implementing energy conservation, energy efficiency, renewable energy, and related sustainable life practices.

† *317738 (at) redjellyfish.net*

The Use of Native Plants to Reconstruction Wildlife Openings in the Southern Appalachians

April Pallette[1] and W. T. Rankin†[2]
[1] Department of Environmental Studies, UNC-Asheville, Asheville, NC
[2] Nantahala National Forest, Highlands, NC

In the southern Appalachians, the creation and management of wildlife openings for early successional species is a common practice. The majority of openings are established and maintained as non-native grass and forb communities, dominated by species such as orchard grass (*Dactylis glomerata*), tall fescue (*Festuca arundinaceae*), browntop millet (*Panicum ramosum*), sericea lespedeza (*Lespedeza cuneata*), and ladino white clover

(*Trifolium repens*). In addition, in the early 80's non-native shrubs such as autumn olive (*Elaeagnus umbellata*), and multiflora rose (*Rosa multiflora*) were planted to provide wildlife with soft mast and cover.

Due to high resource availability, the non-native shrubs have become invasive in wildlife openings, and a threat to the surrounding ecosystem. In addition, the vegetative structure of the non-native grass and forb community is homogeneous and could increase predator accessibility and visibility. As a result, wildlife openings could be functioning as ecological sinks, where mortality rate offsets reproductive. To reduce the spread of invasive shrubs and provide wildlife with vegetative heterogeneity, we plan to reconstruct five wildlife openings in the Nantahala National Forest using native plants.

Native warm season grasses and native forbs interspersed with native soft mast species should create a community with maximum structural and food web support for early successional species. To provide wildlife with suitable structure, we designed openings to provide micohabitat needs, such as displays, foraging, resting, nesting, predator avoidance, and reproduction. Native grasses were chosen because they grow more sparsely, allowing wildlife to find food more easily and escape faster from predators. We also plan to establish and maintain native shrubs and vines in openings, creating diverse vegetative structure that would protect wildlife from predators and inclement weather.

To provide wildlife with abundant food, we plan to reconstruct the openings using a variety of native soft mast species. Desirable native soft mast species (i.e. *Vaccinium, Vitis, Rubus, Rhus, Smilix, Prunus*) already present in the seed bank will be encouraged and maintained in the openings. To replace autumn olive, we plan to purchase native species such as *Crataegus senta* from local nurseries.

This project should decrease the abundance of invasive, non-native plants in the national forest, and provide wildlife managers with alternative strategies for constructing wildlife openings without non-native species. The planning phase for the project has been completed, and implementation will begin fall 2007.

† *Nantahala National Forest, Highlands RD, 2010 Flat Mountain Rd., Highlands, NC 28741; drankin (at) fs.fed.us*

Air Quality in the Great Smoky Mountains

Duncan St. Clair†

The Organic Act of 1916 created the National Park Service to provide for the benefit and enjoyment of the people and protect and preserve for future generations. The Clean Air Act Amendment of 1977 stipulates that Class One Federally protected areas be among the cleanest in the America. Great Smoky Mountains National Park was created in 1934. Yet despite nearly 75 years as a National Park and almost 30 years as a designated Class One Federally Protected area, attempts to prevent air pollution and exotic pests from destroying the Park's unparalleled biological diversity have been unsuccessful. Airborne pollution from outside the Park creates a public health hazard for visitors and has destroyed Park vistas by nearly 75 percent.

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Introduced Biological Control Insects on Non-target Thistles in the Southern Appalachians, Tennessee

Gregory J. Wiggins†[1], *Jerome F. Grant*[1], *Paris L. Lambdin*[1], *John B. Wilkerson*[2], *and Jack W. Ranney*[3]

[1] *Department of Entomology and Plant Pathology, University of Tennessee*

[2] *Department of Biosystems Engineering and Soil Science, University of Tennessee*

[3] *Institute for a Secure and Sustainable Environment, University of Tennessee*

While useful in many integrated pest management programs, concern is growing that introduced biological control agents will eventually begin feeding on non-target species. Two European weevils (*Rhinocyllus conicus* and *Trichosirocalus horridus*) have been

introduced against musk thistle (*Carduus nutans*). Although effective against this exotic weed in some areas, *R. conicus* has been documented to feed on native *Cirsium* thistles in the north central and western U.S., and *T. horridus* has been observed at low levels on native *C. discolor* in Virginia. Feeding of these weevils in meristems, buds, and flowers of non-target species may impact plant reproduction, especially when combined with impacts of other native endophagous insects that feed on thistles. A study was initiated in spring 2004 to 1) investigate the impact, both on native and introduced thistle species, of the two introduced European weevils, and 2) evaluate the incidence of other endophagous insects that utilize meristems and receptacles of thistle species in Tennessee. Populations of native *Cirsium* species (*C. altissimum*, *C. carolinianum*, *C. discolor*, *C. horridulum*), as well as exotic thistles (*C. vulgare*, *C. arvense*, and *Carduus nutans*) were identified, and plants from sites in each of 15 counties were collected from the field, taken to the laboratory, and examined for herbivory by head and rosette weevils. While native endophages were observed in significantly greater numbers on native plants, approximately 6% of all native plants collected were infested with *T. horridus*. Additionally, about 4.5% of plants collected (n=157) and 4.3% of plants observed in the field (n=254) in the Great Smoky Mountains National Park during spring 2006 were infested with *T. horridus***.** Educational programs detailing both the benefits and drawbacks to biological control need to be targeted towards managers and landowners, so that informed decisions can be made on how to manage land holdings.

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BIOFUELS: PRODUCTION, AVAILABILITY, USE, AND IMPACTS IN THE SOUTHERN APPALCHIANS

November 29, 2006, 8:30 a.m. – 5:00 p.m. (LeConte)

Biodiesel: Feedstocks, Economic Impacts, Environmental Benefits and Concerns, Fossil Fuel Displacement, Politics and Tax Incentives
Brian Winslett†, Blue Ridge Biofuels, LLC

This presentation introduces biodiesel and a full range of considerations, including

- Positive and negative attributes for use and handling
- Emissions profile
- Biodiesel versus hybrid vehicles
- Environmental benefits and concerns
- Can we displace all our petroleum with biofuels?
- How biodiesel is made
- Feedstock supply logistics
- Economic impact of biofuels
- Tax incentives and politics of biofuels
- Biofuels and the future

† *Blue Ridge Biofuels; 109 Roberts Street, Asheville, NC 28801; brian (at) blueridgebiofuels.com*

Ethanol: Past, present and future
Jonathan Overly†, East Tennessee Clean Fuels Coalition

Corn has helped ethanol grow to “beginner status” as a fuel in the United sTates. Other raw maerials will be needed to fulfill ethanol’s potential here. This presentation will look at how we’ve gotten to today, and what lies ahead for ethanol production in the U.S.
† *ETCFC, 311 Conference Center Building, Knoxville, TN 37996-4134; jgoverly (at) utk.edu*

Biofuel Distribution: Successes and Challenges
Philip Freels†, Regal Fuels

† *Phillipfreels (at) regalfuels.com*

The Land-of-Sky Clean Vehicles Coalition
Bill Eaker†, Land-of-Sky Regional Council

The Land-of-Sky Regional Council is working to expand biofuels use in western North Carolina and will soon receive designation as a Department of Energy Clean Cities participant.
† *25 Heritage Drive, Asheville, NC 28806; bill (at) landofsky.org*

The East Tennessee Clean Fuels Coalition
Jonathan Overly†, ETCFC and The University of Tennessee

The East Tennessee Clean Fuels Coalition (ETCFC) is a group of people who live, work and play in East Tennessee, who are working together to reduce dependence on foreign oil and improve regional air quality and sustainability. It is a voluntary effort focused on using cleaner, American fuels.

The ETCFC is a participant in the DOE's national Clean Cities program, which works toward these goals by furthering the use of alternatives to gasoline and diesel in the transportation sector. The alternative fuels include biodiesel, electricity, ethanol, hydrogen, natural gas and propane. These fuels are between 90% and 100% domestically

produced, versus crude oil, for which the U.S. requires about 60% foreign supply (only 40% domestically produced).
† *ETCFC, 311 Conference Center Building, Knoxville, TN 37996-4138; jgoverly (at) utk.edu*

Biofuel production using local feedstocks for business and agricultural sustainability
John Brichetto†, Northington Energy

Northington Energy is beginning construction of a million-gallon biodiesel production facility in east Tennessee. Through cooperation of the Cooperative Extension Service, farmers who previously grew tobacco, will be contracted to provide feedstock for biofuel production.
† jhbrichetto (at) yahoo.com

Southeast Diesel Collaborative: The Role of Biodiesel in Air Quality Improvement Strategy
Alan Powell†, US EPA Region 4

The Southeast Diesel Collaborative is a voluntary, public-private partnership involving leaders from federal, state and local government, the private sector and other stakeholders in Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina and Tennessee. The Southeast Diesel Collaborative is part of the Environmental Protection Agency's National Clean Diesel Campaign. The goal of this partnership is to improve air quality and public health by encouraging the use of clean, renewable energy and technology and by reducing diesel emissions from existing engines and equipment from the agriculture, heavy construction and on-road sectors.

To date, over $26 Million has been spent on diesel emission reduction strategies in SE through public and private funds. This funding is involved in 115 total project encompassing school buses, long haul trucks, municipal fleets, waste haulers, railroad operations, biodiesel production and sale and off road equipment. The presentation focuses on the goals of the collaborative and innovative efforts that have taken place to increase the use of Biodiesel as part of an overall air quality strategy.
† 61 Forsyth St., Atlanta, GA 30303; powell.alan (at) epa.gov

"Tweetsie 21" 21st Century Bio-Fuel Powered Rail Service for Northeast Tennessee
Joel Goodman†

The rural, agricultural region of northeast Tennessee has traditionally drawn much of its economic stability from the agricultural sector. Beef & dairy cows, tomatoes, strawberries, corn, hay, soybean, and tobacco are grown by family farms and locally-owned corporate operations. A handful of dairies still grace the landscape.

But times are changing. And as sprawl consumes an ever-increasing amount of the green space that makes Northeast Tennessee so special, more and more farms are being consumed by growing housing subdivisions, highways, strip malls, mini-marts, and big-box stores. Even our ridge tops and mountaintops are being cleared of the forests that have so long defined them, scarred more and more by road and power line cuts, communication towers, coal mining, and timbering for paper and lumber. If the coal-fired power plants being proposed for southwest Virginia and western North Carolina come to fruition without further ecological guidance in managing mining, more of Tennessee's hills will be scarred by quarries that will supply millions of tons of limestone to new coal plants in neighboring states.

Times need to change for the better. Alternatives to automotive transit and truck freight consuming fossil fuels need to be developed.

The proposal to be unveiled in this short talk will be –like the Mount Washington Cog Railway in New Hampshire – among the first rail passenger line powered by bio-diesel in the country, if not the world. We have nicknamed it, "Tweetsie 21" – a 21st Century version of

the passenger and freight line that used to wind through the mountains of our beautiful Upper East Tennessee landscape.

Tweetsie 21. "Tweetsie 21" is a Bio-Fuel Transportation Demonstration Project consisting of a prototype bio-fuel-powered, Diesel Multiple Unit, light rail "trolley", fueled by recycled and crop-produced bio-diesel fuel and utilizing all the existing tracks of the East Tennessee & Western North Carolina Railway, (Locally known as ("The Tweetsie") and a remaining Johnson City portion of the old Clinchfield / CSX trackage. The ET&WNC short-line is now owned and operated by Genesee - Wyoming. There is currently an MPO-funded study, mandated to address the cost feasibility of re-developing commuter and freight traffic between the cities of Johnson City and Elizabethton.

The overall concept of the plan is to showcase a cost efficient light-rail mass transit system running on sustainable / renewable fuels generated by recycled by-products filtered and prepared in regionally-operated shops and regionally-grown farm products converted to bio-diesel in regional processing facilities.

This project shares the goals of several public policy mandates:

- It folds into Tennessee Governor Bredesen's Executive Order #33, which establishes a Task Force to explore the development and distribution of bio-fuels;
- It supports President Bush's statement made at the signing of the 2005 Energy Bill that "every time we use a home-grown fuel … we're going to be helping our farmers, and at the same time, be less dependent on foreign sources of energy";
- It controls sprawl by lessening the need for more new highway construction cutting through our beautiful (and economically valuable) landscape;
- It protects air quality (a) by promoting the use of environmentally-friendly fuels and (b) by relieving vehicular congestion on roadways;
- It promotes regional employment (a) on the farm by increasing demand for oil-producing crops, and (b) in the manufacturing sector where crops would be converted to bio-fuels and where used cooking oils and tallow would be processed into bio-fuels;
- It increases the profitability of the region's farmers by expanding the consumption of their products by local energy markets.

This project integrates easily into and exemplifies what can be done to achieve our important national goal of becoming more energy independent by expanding the availability and use of alternative energy sources – bio-diesel being a major component of that program.

The rail motive power to be used is based on a still-to-be-designed relatively lightweight, self-propelled diesel rail car based on a reconfigured heavyweight highway road-truck frame, mounted on traditional railroad trucks, utilizing modified existing school bus bodies. This would yield two diesel-powered transit cars tied back to back. Already-existing traditional, though heavier, self-propelled rail cars—such as the Budd RDC type, for example, or others—could also be utilized. Bio-fueled versions of the Diesel Multiple Units envisioned in the Raleigh-Durham, North Carolina, Triangle Park Plan might also be utilized by "Tweetsie 21".

First Tennessee Bio-Fuels Project. The First TN Bio-Diesel Project (FTBP) is a progressive proposal that will protect northeast Tennessee's bucolic landscape, provide our region with the energy it needs to prosper, and stimulate the industrial and agricultural economies by creating demand for farm products that yield diesel fuel oil substitutes.

As an operation, the FTBP would be a sister project and a supplier to the First Tennessee Inter-modal Proposal and "Tweetsie21" by providing the rail transit system with the regionally-processed reclaimed cooking-oil/grease and regionally-grown and converted bio-diesel fuels which will serve as the energy for the motive power.

A small fleet of bio-fueled tanker collection trucks to collect grease, used cooking oils and tallow from regional businesses that have these items as by-products, and to pick-up and deliver fuel from the processing facilities to the train yard, will

constitute the manufacturing and fuel distribution / transportation portion of the proposed project. Bio-Diesel produced in excess of “Tweetsie21” needs will be sold and transported to heating oil dealers and blenders and resellers of B-5 to B-100 transportation products.

The bio-fuel processing facility will include filtration and purification operations that will prepare the grease, used cooking oils and tallow for blending with petroleum-derived diesel oil. Proximity of the processing plant to “Tweetsie21” tracks is desirable and possible.

The FTBP will also have as one of its mandates the securing of sufficient supplies of regionally-produced bio-fuels for use by all forms of public transportation, including school buses. This aspect of the proposal will stimulate the region’s production of several crops, especially soy bean, which currently has a deficit market. Whenever possible, the commuter rail vehicles, as well as the regional municipal transit systems, should have available to them a supply of the regionally manufactured bio-fuels.

† *300 Buffalo Street, Johnson City, TN; joel (at) joelgoodman.us*

NEPA ROUNDTABLE

November 29, 2006, 11:40 a.m. – 1:00 p.m. (Greenbrier)
Organizer and Moderator: Harold Draper, TVA

The roundtable discussion—an annual activity of the SAMAB Environmental Coordination committee—will focus on ongoing NEPA developments. After an overview of 2006 NEPA developments, each participant will have an opportunity to discuss special interests they have about environmental decision making and what can be done to improve the implementation of NEPA in the Southern Appalachians.

DEVELOPMENT AND WATER RESOURCE PLANNING, INFORMATION, AND IMPACTS

November 29, 2006, 8:30 – 11:40 a.m. (Greenbrier)
Session Moderator: Carol Chandler, USDA NRCS

The Role of Unroaded Areas and Areas of Low Road Density in Water Quality Issues in Western North Carolina
Hugh Irwin†, Southern Appalachian Forest Coalition

Roads have been widely recognized in the scientific literature as having a profound effect on the landscape and are one of the primary risks for a variety of environmental impacts.

These impacts include erosion, sedimentation, mass wasting, degradation of water quality, alteration of surface and subsurface hydrology, constraints on movement of aquatic and terrestrial species, alteration of physical channel dynamics, isolation of floodplains, constraints on channel migration, facilitation of the spread of exotic species and pests, and constraints on the movement of aquatic and riparian components including large woody debris, fine organic matter, and sediment. Many of these impacts are direct or indirect impacts on the aquatic and riparian resource. These environmental effects have been well documented, and a number of mitigation strategies have been used to reduce or address these impacts to some extent.

It has also been recognized that unroaded areas and areas with low road density tend to have fewer and less severe impacts to their aquatic and riparian resources. In fact many unroaded areas are recognized by state and federal rankings for their high stream and water quality and the health of the watersheds.

We have used both qualitative and quantitative measures of stream quality, water quality, and watershed health to compare unroaded and low density areas in Western North Carolina to areas of higher road density.

We will look at the efficacy and limitations of some of the strategies used to mitigate the effects of roads. The social benefits played by areas of low road density are investigated, and the implications for management and preservation of unroaded and low road density areas are examined.
† SAFC, 46 Haywood Street, Suite 323, Asheville, NC 28801; hugh (at) safc.org

Examining the Impacts of Watershed Development on Water Quality In Norris Lake, Tennessee
Agnes M. Vanderpool†, Hamilton School of Arts and Sciences, Lincoln Memorial University

With more than 800 miles of shoreline, the Norris Reservoir is a sizeable freshwater reservoir and an important economic resource to the economies of at least five counties in East Tennessee. Constructed in 1936 by the Tennessee Valley Authority as the first in a series of reservoirs stretching from East Tennessee into northern Alabama, the hydroelectric facility at Norris Dam provides electric power for the Tennessee River Valley region and beyond. Norris Lake is fed by two tributary rivers of the Tennessee River, the Clinch and Powell Rivers. Recreational and fishing activities on Norris Reservoir provide an important source of income for the five east Tennessee counties that surround the lake, Claiborne, Union, Anderson, Grainger and Campbell counties. In addition, the lake and its

watershed provide a major source of wildlife habitat including nesting sites for the bald eagle, white-tailed deer and numerous species of small mammals. Previous analyses of water quality in Norris Lake by the U.S. EPA, Tennessee Wildlife Resources Agency and the Tennessee Valley Authority have found that water quality in Norris Lake is well within EPA guidelines for safe human recreation and for support of aquatic life. Recent concerns about changes in the water quality of the Norris Reservoir have arisen due to the increased pace of watershed development occurring around the lake. Watershed activities can have significant impacts on the quality of a receiving body of water. Disturbances to a watershed such as residential or commercial land development can contribute to significant amounts of nutrient loading in a body of water due to the loss of protective vegetation on the shore and alteration of the natural landscape. Nutrient loading leads to eutrophication of aquatic systems which can alter the entire ecology of a lake.

Shoreline development in the Norris Lake watershed has been accelerating over the past five years. Recent activities include the construction of several housing and condominium projects, the development of two golf courses that have shoreline access to the lake and the increasing size and utilization of public marinas with restroom facilities located either on the water or in close proximity to the lake. In the spring of 2006, a study was begun to examine impacts on water quality in Norris Lake at specific sites of watershed disturbance including housing developments and marinas. Water samples from study sites are collected monthly and analyzed for chemical and biological indicators of quality. Analyses include enteric bacteria, phytoplankton genera, temperature and dissolved oxygen profiles, pH, turbidity, ammonia nitrogen, nitrate and phosphate levels. Samples are collected from both shallow littoral zones and from pelagic off-shore zones. Analyses of samples taken from areas of the lake with watershed disturbance will be compared to samples taken from reference areas of the lake with little or no watershed disturbance. Statistical analyses, now underway, will determine if the water quality indicators in areas of the lake with watershed disturbance are significantly different from those of undisturbed areas.

† *Lincoln Memorial University, 6965 Cumberland Gap Parkway, Harrogate, Tennessee 37752; Aggy.Vanderpool (at) lmunet.edu*

Conservation Planning Tools: A New Partnership for the Southeast

Andy Carroll†, , Department of Biological and Environmental Sciences, University of Tennessee at Chattanooga

In 2005, the Southeast Watershed Forum (SEWF) initiated a survey of protected lands and waters for the greater southeast United States region. This survey, part of an initiative supported by a broad range of government and nonprofit partners, is designed to delineate previously unmapped protected lands and ecological restoration efforts. In 2006, the SEWF partnered with the US Geological Survey's National Biological Information Infrastructure (NBII) program to provide the technical and biogeographical consultation needed to effectively communicate project data. With assistance from the NBII Southern Appalachian Information Node, survey results and agency datasets are compiled into a database for distribution through an online GIS application. Project outcomes are designed to: 1) foster greater collaboration among organizations by sharing common data 2) provide access to a database of current initiatives, such that leveraging of funds may occur 3) involve local communities in comprehensive planning efforts 4) demonstrate GIS solutions for low-resource organizations and 5) identify land and water protection gaps.

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A HCP (Habitat Conservation Plan) for the Cumberlands: Addressing Development and T&E Species Locally

Emily Saunders†, Department of Forestry Wildlife & Fisheries, University of Tennessee

Through a partnership between the University of Tennessee's Department of Forestry, Wildlife and Fisheries and The Nature Conservancy, a Habitat Conservation Plan (HCP) is being explored for the Cumberland Plateau in northern Tennessee and southern Kentucky. This presentation describes the basics—what an HCP is and how they came to be used—and the specific work our team is doing.

Generally, an HCP is a means to integrate the use and conservation of natural resources associated with Threatened and Endangered (T&E) species. Under the Endangered Species Act it is illegal to harm (also called "take") T&E species or their habit. An HCP becomes a partnership between a resource user and the U.S. Fish & Wildlife Service that allows resources to be used and take to occur as long as the species impacts of the take are mitigated and minimized through an approved habitat conservation plan. Examples of HCP holders include private landowners, government municipalities, state agencies, corporations, and non-profit organizations.

More than ever, there is a need for constructive solutions that seek to promote biodiversity conservation while enabling sustainable use of natural resources in the Cumberland Plateau and Mountains. In the coming years, economic development pressures will continue to stress and fragment land and aquatic habitats if careful planning is not conducted. Unplanned development can often adversely impact wildlife and the habitats on which they depend, which can also affect long-term economic security and quality of life for area residents. HCPs present a viable method to resolve the sometimes conflicting objectives associated with using and conserving natural resources.

An HCP process brings together scientific and technical expertise, information and funding resources, and interagency collaboration to address problems at the local scale, enabling a more comprehensive, cooperative, and proactive approach to T&E species than the regulatory framework provides. HCPs are comprehensive and science-based, adaptive and flexible, collaborative and empowering, and locally implemented and enforced.

Though our team is focusing on three different land uses in the Cumberlands, this presentation is focused primarily on the HCP for water resource use. Water resources in the Cumberlands are significant with regard to both supply and quality of water as the area continues to grow at a rapid pace. This process is a voluntary one, and it is up to the stakeholders (in this case local officials and others) to decide whether to move forward with an HCP. Our work with the HCP process facilitates stakeholders' willingness and understanding of the HCP.

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Pigeon River Recovery Project: 2006

Joyce A. Coombs†[1], J. Larry Wilson,[1] and Jonathon Burr[2]
[1] University of Tennessee, Department of Forestry, Wildlife and Fisheries
[2] Tennessee Department of Environment and Conservation, Water Pollution Control

The Pigeon River Recovery Project has re-introduced 12 fish species (over 14,000 individuals) as well as substantial numbers of snails and mussels into the Pigeon River in Tennessee and North Carolina. During the past five years, fish have been collected from tributaries to the Pigeon River, reference streams within the French Broad basin, and from the upper reaches of the Pigeon River itself. To assess survival of relocated species, fluorescent visible implant elastomer (VIE) tags were employed to tag darter species, which were easily observed by snorkelers. A second re-introduction site was added in 2005 to both the TN and NC portions of the Pigeon, upstream of the original sites. Monitoring surveys over the past two years have

documented gilt (*Percina evides*), bluebreast (*Etheostoma camurum*), and stripetail (*E.kennicotti)* darters and mountain madtoms in the Pigeon River near Newport, TN. During the fall of 2005, a snorkel survey was conducted of the lower Pigeon River (~5 miles) downstream of the release site. At nearly every riffle snorkeled, both sexes of healthy gilt darters of every age were found inhabiting the cobbles. The gilt darter appears to be successfully re-colonizing the Pigeon River in TN. In North Carolina, three shiners (mirror - *Notropis spectrunculus*, telescope - *N. telescopus*, silver - *N. photogenis*) and the gilt darter of the five originally re-introduced species have been collected during monitoring efforts. Some of these shiners have been found over two miles upstream of their release site. Conservation Fisheries Inc. propagated the first tangerine darters (*P. aurantiaca*) in captivity in 2005 and has produced over 100 young in 2006 with the goal of re-introducing it into North Carolina and Tennessee.

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Water Quality Trading—Tools for Water Quality Improvement in the Tennessee Valley

Suzanne Fisher† and Greg Brodie, TVA

The EPA defines water quality trading as a market-based approach that allows one source to meet its regulatory obligations by using pollutant reductions created by another source that has lower pollution control costs. The presentation explores situations in which EPA supports trading, including those that speed the implementation and reduce the cost of implementing total maximum daily loads (TMDLs) for nutrients, and those that provide greater environmental benefit than would be achieved by existing regulation. This presentation explores how trading might be implemented in the Tennessee Valley, including potential partners, valuing the units of trade and other features.

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See posters on this topic, page 21

NATURAL RESOURCES AND ECONOMIC OPPORTUNITY

November 29, 2006, 2:50 – 5:20 p.m. (Greenbrier)
Moderator: Rob Hawk, NC Cooperative Extension Service

Non-Timber Forest Products in the Appalachian Economy

James Chamberlain†, USDA Forest Service, Southern Research Station, National Agroforestry Center

The Southern Appalachian forests are the source of many non-timber forest products (NTFPs). They are made from resources that grow under the forest canopy as trees, herbs, shrubs, vines, moss and even lichen. They occur naturally in forests or may be cultivated in farm forestry settings. The collection, trade and use of these products have been integral to rural economies since Europeans settled in the region. NTFPs may be marketed with little processing, such as dried roots and herbs, graded and bundled leaves and twigs, or live plants. Some are processed into finished products, such as carvings, walking sticks, jams, jellies, tinctures, or teas. Over the last decade, interest in this segment of the forest industry has grown tremendously, yet very little is known about the materials collected, the people who collect them, or the enterprises that produce and market them. NTFP enterprises are found throughout the south, and may be small family owned operations with a few employees or may be an individual gatherer or craft person. This presentation examines results of breaking research on an overlooked portion of Southern Appalachia's natural resources and their importance to the region's economy. It presents estimated distribution of NTFP enterprises, by major product category, throughout the southern region. Examples of the economic contributions of this segment of the forest products industry are presented. Issues and concerns regarding the regular collection of data concerning this valuable industry are discussed.

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Appalachian Silvopastures: Managing Hills for Gold

Charles M. Feldhake†, USDA-ARS Appalachian Farming Systems Research Center

A major thrust for the USDA-ARS Appalachian Farming Systems Research Center has been to improve the economic viability of hill land farms in an ecologically responsible way.

One approach has been to study silvopasture systems as a way to increase and diversify farm income. Trees can be added to pasture to produce a variety of wood, animal fodder, nuts, and fruits depending on the objectives of the land manager without seriously compromising forage-based income. These additional farm products can provide feedstock for local value-added enterprises. Trees can also provide environmental services such as microclimate modification, reduction of off-site soil nutrient loss, and increased wildlife habitat.

Initial research focused on how various tree species and spatial systems affected solar radiation partitioning and microclimate modification within pasture. Subsequently efforts expanded to understanding how forage production and animal performance responded to these systems. Recently an ecological approach has been added to increase knowledge of how these systems function in relation to litter decomposition, soil

development, and nutrient cycling relative to open pasture and native forests. Studies on litter decomposition have included how litter type and microclimate affect microarthropods, beetles, and salamander populations.

Research results look promising and silvopasture systems may provide a useful management tool that can benefit small farms and rural communities.

† *1224 Airport Rd., Beaver, WV 25813; charlie.feldhake (at) ars.usda.gov*

Farming in the Woods

Robert Eidus†, North Carolina Ginseng & Goldenseal Company

Historically, humans "farmed" in a manner that worked with the natural processes of the forests. We have since confined farming to large areas that we greatly disturb, and we have largely lost sight of the fact that our forests offer economic opportunities apart from tree harvesting. Furthermore, we have lost the language and lifestyle that allows us to make full use of the forests. Reclaiming the full potential of farming in the woods offers a way of life and way of making a living that is sustainable from economic, natural resource, and quality of life perspectives.

The presentation addresses "farming in the woods" that employs the principles of permaculture and avoidance of monoculture, chemicals and machinery to grow and harvest native plants like ginseng and goldenseal, for which there is a healthy market. Eagle Feather Farm, is a NC Department of Agriculture certified nursery that demonstrates the viability of farming in the woods.

† *North Carolina Ginseng & Goldenseal Company, 300 Indigo Bunting Lane, Marshall, NC 38753; eidus (at) madison.main.nc.us*

River Cane (*Arundinaria gigantea L.*): A Key Species for Environmental and Cultural Preservation

David Cozzo†, Revitalization of Traditional Cherokee Artisan Resources (RTCAR)

River cane once covered a large portion of the bottomland areas of the Southeastern United States. Various factors led to the decline in canebrakes, mostly due to its propensity to thrive in a highly productive habitat. It is now estimated that less than 2% of the original canebrakes are still extant and, while *A. gigantea* is not an endangered species, canebrakes are an endangered habitat. Canebrakes serve several important ecological functions including wildlife habitat, protection of the riparian habitat, and mitigation of agricultural runoff. River cane was also one of the most important materials of the southeastern Native Americans, providing housing, bedding, utensils, and containers. Today, river cane is still an essential material in the preservation of the Cherokee artistic traditions. The restoration and expansion of extant canebrakes and the development of new canebrakes will be a beneficial addition to both the environmental preservation of the southern Appalachian region and the Cherokee efforts towards cultural preservation.

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Be Loyal, Buy Local

Roy Settle†, USDA-NRCS Appalachian Resource Conservation & Development Council

In 2002 the Appalachian RC&D Council in Northeast TN made a commitment to purchase whenever possible items grown, crafted and made in the region. The Board felt that they could increase the impact of their projects by truly supporting local businesses and farms. After developing an extensive list of suppliers ranging from fresh meat, produce, lumber, textiles and arts & crafts, etc. they realized they had just scratched the surface. In order to really make an impact the information that had been gathered needed to be shared with the public.

In December 2004 **www.LocalGoods.org** was born. For the initial launch, the site focused on those items suitable for holiday giving. Since that time the list has grown to over 200 vendors growing, making and selling

goods like value added food products, fresh produce, brick, lumber, locally sewn T-shirts, blue jeans & overalls, fabric tote bags, hand-made canoes, fly rods, violins, soft drinks, candy, baked goods and much more.

USDA Rural Development provided a $20,000 Rural Business Enterprise Grant to revise the website in 2005. Funds are being gathered to add to the regional database that extends to neighboring RC&D areas and launch a large scale media campaign. Vendors can enter their data online to create their free listing at the website. Response from product makers and shoppers has been positive as we connect our communities. The regional focus is Northeast Tennessee and Southwest Virginia.

To support the project and promote the local vendors the RC&D Council wholesale buys large quantities of honey, jam, jelly, candy sauces and other items for gift baskets during the holidays. A growing interest is coming from groups hosting meetings who want to give Presenters and Door Prize winners a truly local gift basket.

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See also posters on this topic, page 21

INFORMATION FOR FOREST, LAND, AND RESOURCE MANAGEMENT

November 30, 2006, 8:30 a.m. – 12:00 pm (LeConte)
Moderator: Terry Seyden, USDA Forest Service, National Forests of North Carolina

A Fast and Reliable Hard Mast Index from Acorn Presence-Absence Tallies

Cathryn Greenberg†[1] and Gordon S. Warburton[2]
[1] *USDA Forest Service, Bent Creek Experimental Forest*
[2] *North Carolina Wildlife Resources Commission*

Acorn crop sizes vary considerably among oak (Quercus) species, years, and places, which directly affect oak regeneration, and wildlife species that depend on acorns for food. Many methods have been developed to index sizes of acorn crops. However, use of different visual survey methodologies makes comparisons among states difficult. We used 21 years of acorn data from visual surveys conducted in western North Carolina to develop predictive equations for hard mast indices based on the proportion of trees bearing acorns. We also assessed minimum sample sizes required to achieve specific levels of precision when estimating the proportion of trees bearing acorns. We found that the proportion of trees bearing acorns and percentage of oak crowns with acorns are correlated and function synchronously to affect acorn crops. We used the proportion of trees bearing acorns, calculated from visual surveys of acorn presence-absence to create predictive equations to determine hard mast indices. The proportion of trees bearing acorns alone was also an indicator of crop size. However, a standardized protocol for assigning acorn presence-absence must be used to ensure that hard mast indices or estimates of the proportion of trees bearing acorns are consistent among geographic locations and years. By substituting this faster and simpler survey method over the labor-intensive counting of twigs and acorns used in some other visual survey methods, land managers can use the time savings to sample more trees within oak subgroups or local areas to improve hard mast index accuracy. Our hard mast index method provides land managers with a reliable method for predicting hard mast indices that are comparable to past estimates for states using the Whitehead method, thus providing continuity in tracking long-term acorn production patterns. Because the proportion of trees bearing acorns can also be used as a stand-alone index of acorn production, state and federal agencies can easily standardize their hard mast surveys, thus ensuring that acorn production data are comparable at local, regional, or national scales.

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Impacts of Climate Change on Tennessee Forests

Donald Hodges[1], Virginia Dale[2], and Jonah Fogel[1]
[1] *The University of Tennessee, Department of Forestry, Wildlife and Fisheries*
[2] *Oak Ridge National Laboratory, Environmental Sciences Division*

Forests of Tennessee are diverse and have been affected by land use and management, nonnative species, outbreaks of native insects, and natural disturbances. The forests in Tennessee are likely to experience further changes in future decades due to climate

change and related factors. This presentation describes a study initiated to assess the potential effect of these changes on the state's forested ecosystems and on socio-economic variables due to the environmental changes. Specifically, a spatially explicit model of current and future forest conditions will be used to identify potential changes in forest characteristics such as forest type distribution, growth, and insect and disease outbreaks. Economic impacts of climate change will be assessed for changes in the forest products industry and forest-based recreation. The forest products effects will be estimated by determining the effects of the changes in composition and structure on the sustainability of the state's forest industry, including estimates of changes in forest sector output and employment, yield, secondary impacts within related sectors, and the sustainability of the industry sector. Estimating the economic effects of climate change on recreational use will be accomplished primarily through projections of future climate scenarios and the potential effects on recreational demand and availability.

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The Case for Regional Climate Change Adaptation Planning

Bruce Tonn[1]†, Jared Ball[1], Florian Gast[1], Sarah Kenehan[2], Brandon Waite[1]
[1] Department of Political Science, University of Tennessee, Knoxville
[2] Department of Philosophy, University of Tennessee, Knoxville

This paper assesses the potential impacts of climate change on a non-coastal urban area (Knox County, TN) in the Southeastern United States. It is found that increasing heat, storm activity, and droughts can substantially impact human health, the local economy, and the environment of this community in numerous manners. It is also found that this urban area has no ability to mitigate the impacts of climate change and only a limited ability to implement policies and programs to adapt to climate change. Major energy system, water resource, air quality, transportation system, forest fire management, and bioregional planning decision-making capabilities reside with other parties, including federal and state agencies and numerous private sector organizations. It is concluded that regional climate change adaptation planning is needed to help municipalities and counties adapt to climate change in proactive and cost efficient manners. Several recommendations to establish regional climate change adaptation planning are presented. To further facilitate effective adaptation to climate change, amendments to several federal environmental and other relevant laws are also proposed.

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Appalachian Trail Environmental Monitoring Program

John Peine[1]† and Tom Burley[2]
[1] USGS Southern Appalachian Field Laboratory
[2] Institute for a Secure and Sustainable Environment, University of Tennessee, Knoxville and NBII-Southern Appalachian Information Node

The subject program, whose goal is to establish a mega-transect to monitor environmental health on a continental scale, has made dramatic progress during the initial planning stage this year. A charter and technical framework has been established as well as a series of working groups associated with various thematic dimensions of monitoring: vegetation, birds, invasive species, water, air quality and climate change, policy and education, visitor use and impact, data management, and citizen science. Numerous Federal, State, NGO, and University partners comprise the working group membership. An advisory committee has also been established for strategic guidance.

A symposium is scheduled to be held November 9-11, 2006 at the Shepherdstown, WV, U.S. Fish and Wildlife Service National Conservation Training Center to refine the

monitoring goals, objectives, monitoring protocols, and launch strategy. Sixty five people representing a variety of partners and interest groups have been invited to attend and many more are involved in the various work groups. The entire process is being facilitated via the USGS-NBII-Portal Appalachian Trail Environmental Monitoring Community. All documents, conference calls, and discussion groups associated with the project are posted on the AT Community. Michael Fay, who famously created a continental scale transect across central Africa documenting biological diversity, will be the keynote speaker for the Symposium. John Peine is a member of the Core Organizing Team. There is great potential for SAMAB to play a key role in facilitating this initiative over the long term.

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Roan Mountain and Data Management: Facilitating Science through Data and Information Management

Tom Burley[1]† and John Peine[2]
[1] Institute for a Secure and Sustainable Environment, University of Tennessee, Knoxville and NBII-Southern Appalachian Information Node
[1] USGS Southern Appalachian Field Laboratory

Good science and decision making are enabled by quality data and information. Quality data and information are influenced by the data management practices used during their lifecycle. With budget cutbacks and limited resources, no one can afford to have their data and information marginalized by improper management. The NBII-Southern Appalachian Information Node Roan Mountain project addresses a long-standing critical need of the Roan Highlands for a standard methodology approach for management of biological data and information in this high elevation hotspot of rare and threatened species. The agencies engaged in management activities on Roan include the U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, The Nature Conservancy, Southern Appalachian Highlands Conservancy, and the TN and NC state heritage programs. The Data Management Toolkit currently under development will be utilized to help facilitate adaptive natural resources management and science through standardization and consideration of the various components that make up the full lifecycle of a dataset. When these components are not adequately addressed or documented, the value of the database is drastically compromised for both adaptive resource management and science.

During the first project year, the Toolkit was used as a means to evaluate the utility of two priority legacy datasets related to adaptive management of grassy balds on Roan Mountain over nearly 20 years. This next project year will focus on documenting additional legacy datasets and gaining feedback on the Toolkit from the several agency partners involved in adaptive natural resource management and science. In addition, an analysis will be made to devise a potential strategy to institutionalize utilization of the Toolkit. The 2007 SAMAB Conference theme will be a Summit on the Summits and will be held at East Tennessee State University. Adaptive management on the Roan Mountain massif will provide a case study of managing and monitoring high elevation communities Appalachian Mountains.

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GUIDING AND MEASURING DEVELOPMENT IN THE REGION

November 30, 2006, 8:30 a.m. – 12:00 pm (Greenbrier)
Moderator: Barry Clinton, USDA Forest Service, Coweeta Hydrological Laboratory

Building Outside the Box -Sustainable Building in the Southeast
Margo Farnsworth†, Cumberland River Compact

Increasingly, growth and development have become concerns for ever-growing numbers of citizens Increased use of water, more impermeable surfaces and loss of habitat is creating or expanding water quality concerns, flooding/drought cycles and decreasing aquatic biodiversity.

The Cumberland River Compact has worked with a coalition of developers, organizations and agencies from the U.S. Green Building Council to the World Wildlife Fund, TVA and others to promote regional awareness and increase accessibility to sustainable design principles and practices that improve quality of life as our communities grow.

What started as an EPA Targeted Watershed Initiative project to build three water and energy friendly houses has turned into over 60 residential units already built and pledges for over 1,000 water-friendly homes; and given citizens of the Cumberland Basin resources needed to implement environmentally sound building and remodeling decisions. Citizen-led sustainable practices and expectations are the best incentive for larger developers and project planners to incorporate more sustainable design in large scale developments. The project has taken the mystery out of green building and made it a viable choice and reality throughout the region.
† *screendoor (at) bigfoot.com*

Growth Readiness in the Southern Appalachians
Joel Haden†, TVA

Communities are wrestling with the unintended consequences of new development on water quality. Local governments, particularly in smaller communities, are often ill prepared with resources or policies to address regulatory requirements that come with the influx of population and commerce. Recognizing this need, TVA and its partners are delivering Growth Readiness programs to empower local government officials. Program participants learn how to cultivate support within their community for addressing development's impact on water quality. They learn how to build consensus for choices that reduce this impact while allowing growth. In the past two years, program efforts have focused in Tennessee where officials from over 270 of the state's 480-plus communities have participated. Of those participating, 200 communities have evaluated their development policies and forty of these have changed their policies. Work in pilot communities has begun in Kentucky, Virginia and Georgia.
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Measuring Landscape Change

Mark Cantrell[1]†, Neil Thomas[2], Carolyn Fryberger[3], Pete Kennedy[4], and DJ Gerken[5]
[1] USFWS, Asheville
[2] Resource Data, Inc.
[3] University of North Carolina Asheville
[4] Haywood Community College, Natural Resources Division
[5] Southern Environmental Law Center, Asheville

The USFWS, Environmental Leadership Center at Warren Wilson College, Resource Data, Inc, UNCA and other associates have been investigating methods to measure change regionally. With the availability of cadastral data for most counties in North Carolina we now have a regional data source that is (1) reliable and measurable across the region, (2) highly resolved to the parcel level, (3) updated annually and (4) often provides an historic view into landscape development patterns since settlement.

† *US Fish & Wildlife Service, 160 Zillicoa Street, Asheville, NC 28801; Mark_A_Cantrell (at) fws.gov*

A Cadastral-Based Development Change Analysis of the French Broad River Basin of Western North Carolina

Carolyn Fryberger†, Environmental Studies Department, University of North Carolina at Asheville

This analysis was undertaken to generate much-needed change data for land use planning in Western North Carolina. Data created by this analysis describes how counties in Western North Carolina are changing, and specifically how smaller regions, such as watersheds, are being impacted. This information can be used as a tool in land use decision-making processes, and can also help groups such as the US Fish and Wildlife Service prioritize management areas. Additionally, this base of change information can be combined with other data layers to investigate more specialized questions regarding issues such as water quality, conservation planning and the effect of development on species habitat. The research was funded by US Fish and Wildlife Service, with additional institutional support from Warren Wilson College

† *cfryberger (at) gmail.com*

Landslide Hazards and Landslide Hazard Mapping in North Carolina

Richard M. Wooten†, Rebecca S. Latham, Anne C. Witt, Kenneth A. Gillon, Thomas J. Douglas, Stephen J. Feumeller, Jennifer B. Bauer
North Carolina Geological Survey

In September 2004, intense rainfall from the remnants of Hurricanes Frances and Ivan triggered at least 140 slope movements (landslides) that caused five deaths, destroyed 27 homes, and disrupted transportation throughout western North Carolina. Back-to-back tropical storms in 1916 and 1940 set off hundreds of debris flows in the region. High intensity summer storms and single tropical depressions can trigger slope movements, especially when antecedent moisture conditions are high as in November 1977 when a tropical system caused over 60 debris flows near Asheville.

Increased development on mountain slopes exposes more people to slope movement hazards. The 2005 Hurricane Recovery Act authorized the NCGS to begin county-scale slope movement hazard mapping for 19 mountain counties. Preliminary maps are made using a GIS-based (Geographic Information System) debris flow susceptibility model. Remote imagery and LiDAR (Light Detecting And Ranging) digital elevation models are used to map slope movements and slope movement deposits. Targeted field studies aim to verify initial model results, input parameters, and preliminary maps. Field data are used to refine the models and produce final GIS maps.

Slope movement hazard maps are complete for Macon County, location of the fatal September 16, 2004 Peeks Creek debris flow. The GIS maps show slope movements and slope movement deposits, relative hazard rankings for debris flow initiation areas, and

downslope hazard areas for potential debris flow pathways. An aggressive mapping schedule calls for completing 2-3 counties per year. Statewide information on geohazards is available at http://www.geology.state.nc.us, and slope movement locations at http://www.nconemap.org.

Cooperative efforts are underway with the U.S. Forest Service, National Weather Service, National Park Service, U.S. Geological Survey, and universities to refine criteria for issuing landslide hazard advisories, and to conduct research on slope movement hazards in western North Carolina.

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WATER FOR PEOPLE AND THE ENVIRONMENT

November 30, 2006, 11:15 a.m. – 12:30 pm (Greenbrier)
Moderator: W. Scott Gain, USGS Tennessee Water Science Center

Regionalized Predictors of Ecological Flow Requirements for the Management of Tennessee Streams
W. Scott Gain, U.S. Geological Survey, Tennessee Water Science Center

The ecological consequences of streamflow alteration have been recognized for many years, but until recently were rarely considered in decisions concerning surface-water regulation, surface-water withdrawals, and watershed development. Although we possess a number of site- and species-specific models to evaluate the response of aquatic ecosystems to hydrologic alteration, those tools can be time consuming and expensive to apply and are difficult to relate to the overall ecological health of streams. As our collective awareness of the intrinsic value of aquatic resources grows, we face new questions about how to most effectively balance the value of water for ourselves and our environment. Answers to these questions will require new kinds of information and new ways of evaluating and weighing the relative value of water among various needs.

The U. S. Geological Survey, in cooperation with The Nature Conservancy, the Tennessee Wildlife Resources Agency, and the Tennessee Department of Environmental and Conservation has initiated a new study designed to provide a baseline hydro-ecological characterization of stream systems in Tennessee to support decision-making processes in the future. Our focus in this study is first to identify a commonly held set of hydrologic characteristics (or conceptual model) by which hydrology can be related to ecological health. Second, we will develop spatially-explicit, predictive models of hydro-ecological characteristics based on regional and basin-specific geographic descriptors. Third, we will evaluate how predicted characteristics for numerous sites across the state can be used to inform and facilitate resource-allocation decisions. The initial scope of this study will include the Tennessee and Cumberland River watersheds which drain approximately 60,500 square miles in Virginia, Tennessee, Georgia, Alabama, Mississippi, and Kentucky. It will be completed in about three years.
† *USGS Tennessee Water Science Center, 640 Grassmere Park, Suite 100, Nashville, TN 37211; wsgain (at) usgs.gov*

TVA's Reservoir Operations and Minimum Flow Objectives
Charles E. Bohac, Tennessee Valley Authority

Over 30 years ago, the Tennessee Valley Authority (TVA) began to evaluate flow and dissolved oxygen conditions in tailwater areas below its dams. TVA found both to be undesirable at some projects at some times. Since then TVA developed a number of techniques to enhance minimum flow and dissolved oxygen concentrations. In the past 16 years, TVA also conducted two extensive evaluations of its reservoir operating system that included the evaluation of minimum flow objectives. This presentation summarizes TVA's advancements in flow and dissolved oxygen enhancement and the role of minimum flow in the two system evaluations.

Evolutionary Trends in Environmental Flow Requirements: A View from ORNL

Michael J. Sale†, Environmental Science Division, Oak Ridge National Laboratory

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Looking to the Future2006

Plan of Action Resulting from the 2006 SAMAB Spring Planning Meeting

One of SAMAB's greatest strengths is its ability to bring people and organizations together around a common issue, and this year's Spring Planning Meeting saw many new faces joining the historical SAMAB participants. Thanks to those new faces and pertinent sessions, led by engaging facilitators, energy was particularly high at this year's Spring Planning Meeting, an event typically used to outline SAMAB's work priorities. At the conclusion of the meeting, a definite course was charted for the coming months in four key areas:

Invasive Species

Long an innovative leader in monitoring invasive plants, SAMAB committed to moving forward on developing early detection and rapid response methods to combat invasive species in the region, especially plants. As a first step, a workshop will be held to lay the groundwork for identifying, improving and developing detection and response tools, and reaching consensus on region-wide priorities. SAMAB will continue its role in fostering cooperation among agencies and organizations and including citizens in the monitoring and control of invasives.

In-stream Flow

There were several key issues identified in the field of in-stream flow that require further exploration: the economic issues surrounding in-stream flow, including valuing the ecosystem functions of flow and the economic impact of users who take direct from streams; reaching agreement on what in-stream flow parameters to measure and how to measure them; planning to reconciling competing flow interests; filling in data gaps; what tools do resource managers need to incorporate the best information into decision making; increasing our understanding of biological flow requirements; and seeking ways to involve the public in flow issues. SAMAB is coordinating a team to look at these issues and develop a plan that will outline research and policy needs in regard to in-stream flow. This plan will help focus future research and funding efforts. Additionally, there will be a working session at the fall conference on in-stream flow issues, and the work of this team.

People and the Land

Recognizing that SAMAB's strength in sustainable development lies in the resources of its member agencies, including programs designed to aid conservation on private lands, and making those resources as available as possible to private land owners and local governments, SAMAB is moving ahead on creating a web-based tool that will identify expertise, resources, and programs within SAMAB member agencies, as well as success stories of local conservation efforts, and make them accessible to local governments.

Forest Health and Stewardship

There are many ideas about what forest stewardship encompasses: active management and its tools; conservation, urban and forest planning; conserving biodiversity; habitat connectivity; human dimensions like a sense of place; and understanding the role of disturbances—human and natural. SAMAB is exploring ways to improve understanding of these dimensions of forest stewardship and work across ownership boundaries to promote forest stewardship, especially in light of changing land ownership patterns in the southern Appalachians. SAMAB also is considering ways to expand the Little Tennessee Perspectives initiative – a Macon County, NC project that identified what residents value about their community, how the landscape is changing, and the community's vision for the future.

SAMAB

Activities Update, FY 2006

Successful cooperation toward stewardship and sustainable development of natural, economic and cultural resources, since 1988

The Southern Appalachian Man and the Biosphere (SAMAB) Cooperative is a partnership of federal and state agencies that helps to identify and implement resource management and sustainability initiatives that are broad in scope and span natural, political and geographical boundaries. Its non-profit partner, the SAMAB Foundation, facilitates citizen-centered activities that complement the Cooperative's focus and advance community and private stewardship of resources. SAMAB is a tool to enhance member agency programs, and its recent activities reflect key initiatives of participating member agencies.

Invasive Species. SAMAB has led regional public education efforts—pamphlets, newsletter articles and the SaveOurHemlocks.org website—on hemlock woolly adelgid and developed an environmental review template that agencies are using for environmental assessments of HWA treatment. SAMAB is now developing an outreach program aimed at the public and agency and private campground operators to help prevent the introduction of emerald ash borer in the southern Appalachians.

SAMAB has been an innovative leader in involving citizens in monitoring invasive plants, and in helping to control their spread. In 2005, the SAMAB program of citizen environmental monitoring generated more than 200 hours of community inventorying and monitoring of invasive exotic plants and water resources in areas of North Carolina, Virginia and Tennessee. In close coordination with the US Forest Service, SAMAB is implementing a second level of monitoring using plots that will help assess which invasive plants are most capable of penetrating the forest.

SAMAB has just released an activities guide for middle school teachers and students that addresses invasive plants in the southern Appalachians.

The Eastern Band of Cherokee Indians is working with SAMAB to improve awareness and management approaches to invasive plants on the Qualla Boundary. Special emphasis is placed on preserving native plants for traditional uses.

Water. Recent SAMAB activities have produced two community teams of water-quality monitors focused on springs and high-value resource waters along the Appalachian Trail. This monitoring and the invasive plant monitoring were early pushes toward using the Appalachian Trail as a transect to integrate regional environmental monitoring, a project now being pursued by the Appalachian Trail Conservancy.

SAMAB has just begun to coordinate an interagency team to outline research and policy needs in regard to in-stream flow in the Southeast to help focus future research and funding efforts.

Sustainability. Growing out of a series of SAMAB organized discussions among community planners and natural resources managers about their information needs, a NBII-funded website—Best Practices in Biocomplexity and Sustainability at http://www.nbii.gov/datainfo/bestpractices/—features examples of development, planning and other practices that communities in the southern Appalachians are employing to work toward sustainability. SAMAB is now working to better associate agency programs with these practices and ideas to aid their adoption.

Coordination, Communication and Partnering. SAMAB holds two annual meetings: a spring meeting to examine the most pressing needs of the southern Appalachian region and explore ways interagency cooperation can address these needs; and a large fall conference where member agencies and other scientists, resource managers, and community partners share what they are doing to address these needs. The 2005 conference focused on the intersection of cultural and natural resource stewardship; the 2006 conference will focus on the link between good stewardship of the land and a strong economy.