PROGRAM & ABSTRACTS

Measuring, Mitigating, and Managing Human Impacts in the Southern Appalachians

SAMAB 13th Annual Conference
Gatlinburg, Tennessee
November 5-7, 2002

• www.samab.org • samab@utk.edu • 865-974-4583 •
• 314 Conference Center Building, Knoxville, TN 37996-4138 •

Conference Overview

Tuesday, November 5				
8:30	National Forest Foundation Partners meeting **(Laurel A)**		Environmental Stewardship and Streamlining in Transportation Planning and Project Decision Making **(Greenbrier)**	
12:00	NFF Partners luncheon; NEPA Roundtable luncheon **(Laurel B)**; or lunch on your own			
1:30	Plenary **(Greenbrier)** Jon Loney, Robb Turner, Jerry Ryan, Opening and Introductions Michael Tollefson, Superintendent, Great Smoky Mountains, Welcome to the Smokies Gene Cleckley, Director of Field Services, South, U.S. DOT, FHWA			
3:00	The 2002 Farm Bill – Land and Resource Conservation Opportunities **(Leconte)**		Environmental Stewardship and Streamlining in Transportation Planning and Project Decision-making (continued) **(Greenbrier)**	
6:00	Reception at the Gatlinburg Aquarium			
Wednesday, November 6				
8:30	Plenary **(Greenbrier)** Bill Ross, Secretary, North Carolina Department of Environment and Natural Resources Joel Hirschhorn, Natural Resources Policy Studies Director, National Governors Association			
9:45	SAMAB Foundation Advisory Board Meeting **(Laurel B)**	Workshop: Challenges and Progress in Gateway Communities **(Laurel A)**	Workshop: Southeastern Ecological Framework: Supporting State & Local Efforts to Manage Ecological Integrity **(Greenbrier)**	Restoring Warm Season Native Grasses **(LeConte)**
12:00	Gateway communities luncheon **(Laurel A)**; or pick up box lunch for field trip; or lunch on your own			
12:30				Field trips depart:
1:00	Workshop: Challenges and Progress in Gateway Communities (continued) **(Laurel A)**		Workshop: Southeastern Ecological Framework: Supporting State & Local Efforts to Manage Ecological Integrity (continued) **(Greenbrier)**	Native Grass Restoration in Cades Cove Transportation Planning in Cades Cove Restoring Lake Sturgeon to the French Broad River **(meet in lobby of Tower Section)**
5:30	Poster Session with light hors d'oeuvres; SAMAB Awards **(Gatlinburg/Glades)**			
Thursday, November 7				
8:00	Invasive species—Impending Change to Forest Ecosystems **(Greenbrier)**		Enhancing Imperiled Aquatic Populations **(LeConte)**	
12:00	Lunch on your own			
1:30	Southern Forest Resource Assessment—Implications for the Southern Appalachians **(Greenbrier)**		Enhancing Imperiled Aquatic Populations (continued) **(LeConte)**	Hemlock Adelgid Invasion in the Southern Appalachians: If You're Not Concerned Now, You Need to Be **(Laurel A)**
2:45			Biotic Integrity and the TMDL Process **(LeConte)**	
3:45 – 4:45	Managing Non-Timber Forest Resources and Air Quality **(Greenbrier)**			

13th Annual SAMAB Fall Conference

Measuring, Mitigating, and Managing Human Impacts in the Southern Appalachians

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Presenters' affiliations are identified with their abstracts and in the "List of Presenters" section, p57.
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Wednesday, November 6				
8:30	**Bill Ross**, Secretary, North Carolina Department of Environment and Natural Resources **Joel Hirschhorn**, Natural Resources Policy Studies Director, National Governors Association			
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9:45	**SAMAB Foundation Advisory Board Meeting (Laurel B)**	**Challenges and Progress in Gateway Communities** (p21) **(Laurel A)** Chair: John Peine, USGS 9:45 John Peine, Introduction 10:00 Greg Kidd, Greater Smoky Mountains Coalition 10:20 Geoffrey Wolpert and Sue Bock, Citizen-based Community Organization 10:40 Glenn Cardwell, Community Building and Ordinances for Sustainability 11:00 Tom Talley, Community Building and Highway Design 11:20 Teresa Cantrell, Public Transportation 11:40 Bobby Thompson, Night Sky Protection	**The Southeastern Ecological Framework Workshop: Supporting State & Local Efforts to Manage Ecological Integrity** (p23) **(Greenbrier)** Chair: Rick Durbrow, US EPA Region 4 Speakers: 9:45 Cory Berish, Southeastern Ecological Framework: Synergistic Ecosystem Protection 10:30 Marc DeBree, Connecting the Dots in State Greenspace Planning 11:15 Terry Jackson, Assessing Cultural and Historical Resource Occurrence with the SEF	**Restoring Warm Season Native Grasses** (p25) **(LeConte)** Chair: Mike Ryon, Oak Ridge National Laboratory 9:45 Wes James, Native Warm Season Grass Restoration on TVA Lands in the Eastern Valley Region 10:05 Wayne Schacher, Seven Island Wildlife Refuge: From Vision to Reality 10:25 Mark Peterson, Restoration of Riparian Plant Communities on the Oak Ridge Reservation 10:45 Dana Soehn and Jenny Beeler, Meadow Restoration in Great Smoky Mountains National Park 11:05 General discussion 11:30 Discussion of Acceptability of Non-local Genotypes of Native Grasses, Lisa Huff, TDEC, facilitator
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Travis Belote, Jake Weltzin, and Richard Norby, Will Rising CO2 Levels Affect Southern Appalachian Invasive Species?

Franciel Azpurua, Bonnie Carroll, Shelaine Curd, Wolf Naegeli and Robb Turner, Southern Appalachian Information Node: Overview

Franciel Azpurua, Bonnie Carroll, Shelaine Curd, Wolf Naegeli and Robb Turner, Southern Appalachian Information Node: Appalachian Synthesis Project

Andy Brown and Pamela J. Nabors, Southern Appalachian Man and the Biosphere Foundation Citizen-Based Environmental Monitoring

Lee Buck, Paris Lambdin, and Jerome Grant, Survey of the Insect Fauna on Eastern Hemlock and Pseudoscymnus Tsugae, A Predator of the Hemlock Woolly Adelgid, Adelges Tsugae

Brian P. Burket and Jeffrey R. Duncan, Answering the Dam Question – Challenges and Solutions to Small Dams in the Southern Appalachians

Barton D. Clinton, Mark S. Riedel, and James M. Vose, Assessing Impacts of Forest Road Conditions and Management Practices On Runoff Water Quality To Streams

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Jerome F. Grant, Paris L. Lambdin, and Adriean J. Mayor, Nectar Thieves, Pollen Robbers, and Pollinators of Hybrid Azalea, Rhododendron Spp., in The Great Smoky Mountains National Park

Jean Hilten, Discover Life in America and the All Taxa Biodiversity Inventory: Science for Stewardship

Hugh Irwin, Evaluating and Mitigating the Effects of Transportation Projects on Landscape Natural Areas in the Southern Appalachians

Robert D. Keller, Hog Wild: Using GIS to Examine 27 Years of Hog Control Efforts (1976-2002) in Great Smoky Mountains National Park

Lorraine Maloof, Heather Hammett, Ramla Osman, The Southern Forest Resource Assessment: Implications for the Southern Appalachians (Assessment Questions: Terra 1, Terra 3, Aqua 5)

James B. Martin, Invasive Species in Transportation Rights of Way: "You Wouldn't Plant Kudzu, Would You?"

Carla Norwood, Index of Biotic Integrity and Community Education in the Upper Little Tennessee Watershed

Jerry S. Olson, Modeling Hemlock Ecosystems, Adelgids and Beetle Interactions

Richard C. Pais, Life Cycle and Inter-relationships of Hemlock Woolly Adelgid (*Adelges tsugae*) and *Pseudoscymnus tsugae*

Pat Parr, Jack Ranney, and Kristine Johnson, Tennessee Exotic Pest Plant Council

Scott M. Pearson and Dawn M. Dextraze, Modeling the Distribution of Forest Community Types in the South Mountains of North Carolina

Jack Ranney, SAMAB Invasive Species Initiative

Danny Trieff, Paris Lambdin, and Jerome Grant, Beetles Collected from Northern Red Oak in The Great Smoky Mountains National Park

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Gerald (Jerry) L. Ryan, District Chief for North Carolina, US Geological Survey
SAMAB Conference Chairperson, 2002 and SAMAB Executive Committee Vice-Chair Elect

Jon Loney, Manager, NEPA Administration, Tennessee Valley Authority
SAMAB Executive Committee Chair

Larry Hartmann, Chief, Resource Management and Science, Great Smoky Mountains National Park
SAMAB Executive Committee Vice-Chair, and SAMAB Executive Committee Chair Elect

Charles Van Sickle, SAMAB Foundation President

Thirteenth Annual SAMAB Conference Planning Committee

Committee Chair: Jerry Ryan, US Geological Survey
Jenny Adkins, Natural Resource Conservation Service
Jim Brown, USDA Forest Service
Harold Draper, Tennessee Valley Authority
Rick Durbrow, EPA, Region 4
Sherry Estep, SAMAB Coordinating Office
Larry Hartmann, Great Smoky Mountains National Park
Jane Johns, SAMAB Coordinating Office
Paul Mistretta, USDA Forest Service
John Peine, US Geological Survey-BRD
Gary Peeples, US Fish and Wildlife Service
Jack Ranney, Energy, Environment and Resources Center, University of Tennessee
Mike Ryon, Oak Ridge National Laboratory
Michael Spencer, Georgia Department of Natural Resources
Terry Seyden, US Forest Service, Forests of North Carolina
David Sullivan, Federal Highway Administration
Robb Turner, SAMAB Executive Director

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Federal Highway Administration
Oak Ridge National Laboratory
US Fish and Wildlife Service

Southeastern Ecological Framework Workshop Sponsored by:
Southeast Natural Resource Leaders Group

Travel Scholarships for Community Participants Provided by:
SAMAB Foundation
Appalachian Trail Park Office

Photo Credits for Cover Page:
(top) Mike Ryon.
Prescribed burning at the Oak Ridge Reservation prepares the land for native grass restoration.
(left) Water Resources Research Center.
The Water Resources Research Center led this Love's Creek stream-bank stabilization project on the property of Holston Middle School. The project was carried out under a 319 project grant to the Southeast Water Quality Forum, with the partnership of the NRCS, the Knoxville CAC Americorp team, the city of Knoxville, TVA, Knox County Schools, and the Knox County Soil and Water Conservation District.
(right) Robb Turner.
Stream biomonitoring, led by Bill McLarney, in the Little Tennessee Watershed provides information for conservation decisions at the local level.

SAMAB 13th Annual Conference

ABSTRACTS

(organized by session)

ENVIRONMENTAL STEWARDSHIP AND STREAMLINING IN TRANSPORTATION PLANNING AND PROJECT DECISION MAKING

Tuesday, November 5
Session Chair: Dave Sullivan, FHWA

Overview of National Strategic Goals for Federal Highways Programs and Implications of Executive Order No. 13274,"Environmental Stewardship and Transportation Infrastructure Project Reviews" (September 18, 2002)

David Sullivan
Federal Highway Administration

Recent developments in the Executive and Congressional branches of our Federal government point to a widely held belief that Federal Aid Highway Projects take too long to achieve environmental approvals required by various environmental laws, including the National Environmental Policy Act, and permit approvals required by a cadre of substantive natural resource laws. On September 18, 2002, President George W. Bush issued Executive Order No. 13274, on **"***Environmental Stewardship and Transportation Infrastructure Project Reviews.*" On September 19, 2002, the Senate Environment and Public Works Committee held hearings on S. B. 3031, to identify potential legislative solutions to expedite delivery of transportation projects. On September 26, 2002, Don Young (R-AK), Chairman of the House Committee on Transportation and Infrastructure, introduced The Expedite Act, H. R. 5455. These three documents agree in many particulars and would require:

- Agencies involved in review of such projects to formulate and implement administrative policy and procedures to ensure completion of transportation project reviews in a timely and environmentally responsible manner,
- Federal Aid Highway Projects and Federal Highway Administration (FHWA) programs to enhance environmental stewardship in cooperation with other agencies and project sponsors to promote protection and enhancement of the natural and human environment in the planning, development, operation, and maintenance of transportation facilities and services, and,
- FHWA to designate, and maintain, a list of high-priority infrastructure projects that should receive expedited agency reviews.

In addition, the Congressional Committee Chairmen state that they intend to legislate acceptable review time frames, designate portions of environmental information documents that are the lead responsibility of the Department of Transportation, and authorize the delegation of environmental document preparation and reviews to State Transportation agencies, when they desire such delegation.

FHWA strategies and performance plans for FY2003 and beyond incorporate environmental stewardship and streamlining as major strategic priorities of the agency. Where will these actions lead us? What do these development mean to projects in environmentally sensitive areas such as the Southern Appalachians?

Arkansas Highway and Transportation Department Historic Bridge Management System

Robert W. Scoggin
Arkansas State Highway and Transportation Department

The Historic Bridge Management System (HBMS) developed by the Arkansas State Highway and Transportation Department (AHTD) utilizes innovative geographic information Systems (GIS) techniques to effectively manage the AHTD Historic Bridge Inventory and enhance mitigation during the Historic Bridge replacement process.

The HBMS has allowed AHTD to centralize all Historic Bridge data including photographs, videos, historic documents and plans into one geo-referenced database. This database allows AHTD to effectively market Historic Bridges before replacement and to monitor and analyze trends in Historic Bridge replacement by AHTD.

Transportation Planning and Permitting in the Southern Appalachians

Harold Draper
Tennessee Valley Authority

A number of major and minor transportation projects are currently under review, which if built, would likely dramatically change access and open up remote areas across the Southern Appalachian region. For example, access in the area around the Great Smoky Mountains National Park is being changed by road improvement projects in Tennessee, including the Pellissippi Parkway, Middle Creek Road, and US 321 improvements between Cosby and Johnson City. In North Carolina the US 74 project is underway to the south of the Smokies in North Carolina, involving the area between Bryson City and Andrews. Elsewhere, the US 64-Ocoee Gorge Bypass, Knoxville Beltway, US 64 east of Murphy, US 25E Corridor, Upper Cumberland Development Highway, Coalfields Expressway, Memphis-Atlanta Superhighway, and I-66 corridor projects are in various stage of evaluation. Other efforts that may affect environmentally sensitive resources include road upgrades and bridge replacement projects in several areas. Typical interactions during evaluation and permitting of road projects are reviewed, with attention to Tennessee, North Carolina, and Virginia approaches, and suggestions made for more effective participation by permitting agencies and the public in these projects.

Evaluating and Mitigating the Effects of Transportation Projects on Landscape Natural Areas in the Southern Appalachians

Hugh Irwin
Southern Appalachian Forest Coalition

Our region has experienced significant human alterations and impacts. Maintaining and restoring the conservation integrity of the southern Appalachians will require identifying and protecting remaining natural areas and reestablishing landscape connections that can serve as corridors for animal movements and adaptation during times of change, including climate alterations. The Southern Appalachian Forest Coalition is working to establish a networked system of conservation areas in the southern Appalachian region. One component of this work is to evaluate the remaining potential for natural processes in the region. Remaining unroaded areas and potential connectivity between large unroaded blocks of habitat are important elements of this potential. Results of the analysis show the remaining unroaded areas greater than 1,000 acres; greater than 10,000 acres, and greater than 25,000 acres. Potential connections between the largest of these unroaded areas are identified and evaluated. The application of this methodology to evaluating and mitigating the effects of projects, particularly transportation corridors, is assessed.

Streamlining NEPA/Section 404 Processes: A Focus on the North Carolina Ecosystem Enhancement Program

William D. Gilmore
North Carolina Offices of the Secretaries, Department of Transportation and Department of Environment and Natural Resources

This presentation addresses streamlining initiatives in North Carolina associated with NEPA/ Section 404 Merged processes. Its focus is the Ecosystem Enhancement Program involving programmatic mitigation and functional replacement systems for unavoidable impacts to waters of the United States.

North Carolina has been undergoing a revolution associated with streamlining NEPA and permits. An outgrowth of this endeavor has been the re-engineering of its integrated NEPA, Section 404 process. One aspect of this re-engineering process involved the creation of a statewide mitigation program that will remove mitigation from the critical path for permitting.

The Ecosystem Enhancement Program will involve merging mitigation functions presently undertaken in two agencies; NCDOT and NCDENR. The merging is brought about through a partnership with the US Army Corps of Engineers, the US Fish and Wildlife Service and the Environmental Protection Agency and others. The focus of the presentation will be to discuss the management systems, mitigation system changes, program size and strategies envisioned to make NC the national leader in providing quality and comprehensive mitigation from mountain to sea. The program cost is in excess of $200 million dollars involving programs provided by traditional means of planning, construction and monitoring as well as the use of private banking interests, state agencies and land trusts.

GIS-Supported Transportation Projects in Arkansas: Successes & Future Challenges

Randal J. Looney
Federal Highway Administration, Arkansas

The Southeast Arkansas Connector project (SE-Connector) of Interstate 69 (I-69) began in May 1999 after Congress designated 100 million dollars for construction and a Notice of Intent was issued for development of an Environmental Impact Statement (EIS) in support of the project. The SE-Connector will support economic development in Southeast Arkansas by connecting Arkansas to I-69, the proposed interstate highway route from Canada to Mexico. As a result, the project generated legislative and community interest.

A Geographic Information System (GIS) was developed for the project, identifying potential environmental constraints within a designated project study area. From this preliminary mapping and refinement during development of the draft EIS, a preferred corridor of 1,000 feet in width was chosen and a number of 300 foot wide alignments were identified for further study in the final EIS.

The period of time from filing the Notice of Intent to arriving at the Record of Decision was only 26 months, approximately 50% of the overall national average for transportation EIS projects. The early involvement of resource agencies and tribes, combined with GIS mapping and input from local communities and elected officials to develop the project's purpose and need, helped the project receive public acceptance and approval and in turn helped to streamline the decision-making process for the project.

GIS technology helps project sponsors and reviewers consolidate environmental and engineering data, refine the study area in order to focus review efforts, and screen project alternatives efficiently. Participating agencies and affected communities were able to select an alternative alignment with minimal impacts to wetlands, farmland soils, archaeological resources, businesses, churches, and other community properties and natural/cultural resources.

Proven successful, the SE-Connector approach will be used on other I-69 sections of independent utility in Arkansas. AHTD is also developing a GIS Unit within the Environmental Division and cooperating with other state and federal agencies in Arkansas to produce and share GIS data, and to further utilize and promote GIS during the transportation decision-making process.

Transportation and Ecosystems: Mitigating Habitat Fragmentation and Wildlife/Highway Interactions

Alexander Levy
Federal Highway Administration

A recent U.S. delegation studied European and Canadian practices and policies to connect wildlife habitat and species across a landscape fragmented by a network of highways, railways, and canals. This presentation offers observations from this interagency technology "scanning tour," and discusses practices being considered and adopted by resource agencies to lead to faster project approval with improved outcomes for ecosystems, wildlife, and the motoring public.

Recognizing habitat fragmentation as a quantifiable secondary effect of transportation infrastructure development and pursuing solutions, such as those highlighted in this intensive European tour, fosters environmental stewardship and potentially advances streamlining in transportation planning and project decision making.

THE 2002 FARM BILL – LAND AND RESOURCE CONSERVATION OPPORTUNITIES

Tuesday, November 5
Session Chair: Jenny Adkins, NRCS

Implications of the 2002 Farm Bill

Kelly Tiller and Daryll E. Ray
The University of Tennessee

This presentation is designed to summarize the 421 pages of legal speak in the Farm Security and Rural Investment Act of 2002 (the 2002 Farm Bill) in an easy-to-understand format. The presentation includes an overview of major commodity, livestock, conservation, and other provisions of the 2002 Farm Bill. The primary questions addressed by this presentation are (1) What's in the new Farm Bill? (2) How do the changes affect agricultural producers and other agricultural interests? and (3) What are the longer-run implications of the new policies now in effect? Much of the popular press coverage of the new farm bill has focused on the cost of the legislation. Cost projections and other cost considerations (such as compliance with world trade agreement commitments) are covered. Brief coverage is also given to a number of contentious issues that were either considered but not adopted in the legislation or were adopted but likely to be reconsidered before the policy's expiration in 2007.

2002 Farm Bill Conservation Programs

Donald Dotson
USDA-NRCS

The Farm Security and Rural Investment Act of 2002 (Farm Bill) represents more commitment toward conservation on private lands than any other bill in our country's history. The legislature has addressed a broad range of emerging natural resource concerns, including soil erosion, wetlands, wildlife habitat and farmland protection. Private landowners will be able to receive voluntary assistance, including cost-share, land rental, incentive payment and technical assistance.

The 2002 Farm bill provisions have been built upon past conservation program success and needs. The new farm bill provides greater access to programs by improving eligibility of landowners in addition to more cost-share provisions.

Conservation Reserve Program (CRP), Environmental Quality Incentive Program (EQIP), Wetland Reserve Program (WRP), Wildlife Habitat Incentive Program (WHIP), and Small Watershed Rehabilitation are programs which will be available in Tennessee through USDA NRCS under Farm Bill 2002. Program changes and available cost-share information will be provided.

Application of Best Management Practices Utilizing Available Cost-Share Programs

Chip Ramsey
Natural Resources Conservation Service

Available cost-share programs such as the Farm Security and Rural Investment Act of 2002 (Farm Bill), the Tennessee Department of Agriculture's Resource Conservation Fund, and other funds are being made available to landowners for installation of best management practices (BMPs) to the land. Application of practices and conservation systems are based on a resource conservation plan. This plan is developed with the landuser

and is based upon natural resource concerns and potential and the individual's needs, abilities and resources. Subsequently, the plan then becomes the primary basis for entering into available cost-share programs.

Application of BMPs utilizing programs within the Farm Bill such as the Farmland Protection Program, Wildlife Habitat Improvement Program, Environmental Quality Improvement Program, Conservation Reserve Program, Conservation Security Program, and other State and Local Programs will be discussed. Example of applied BMPs will be provided.

WORKSHOP:
CHALLENGES AND OPPORTUNITIES IN GATEWAY COMMUNITIES
Wednesday, November 6

Organizer
John Peine, USGS

Objective
Engage the communities that are "gateways" to major natural resource attractions in a discussion of issues and opportunities. Provide a forum for shared learning.

Background
Gateway communities are areas warranting particular concern due to their proximity to federal lands such as national parks, forests, parkways, rivers and recreation areas. Development associated with these areas can result in a multitude of adverse impacts. Examples of gateway communities are Gatlinburg and Pigeon Forge, gateways to Great Smoky Mountains National Park. These areas are outposts for introduction of the invasive Gypsy Moth. There is a perennial problem with nuisance wildlife behavior (black bears in Gatlinburg). The water quality of the West Prong of the Little Pigeon River is highly degraded once it leaves the park boundary. The night sky and viewshed from the park is somewhat degraded by development.

With this workshop, SAMAB hopes to expand upon its history of working with gateway communities. In Pittman Center, next to Gatlinburg, SAMAB was involved in the development of progressive planning that resulted in the establishment of means to encourage sustainable development. In 1977, SAMAB held the Community Sustainability Indicators Workshop providing guidance on how communities in the region could apply information from the Southern Appalachian Assessment.

This workshop brings together representatives from gateway communities and other organizations to share their experiences, addressing issues that adversely impact the environment, the community and/or the visitor experience. Hopefully, insight gained through these experiences will be useful to all the assembled gateway community problem-solvers.

Specific topics to be addressed are as follows:

- Topic introduction – John Peine
- Greater Smoky Mountains Coalition – Greg Kidd
- Citizen-Based Community Organization – Gatlinburg Gateway Foundation, Geoffrey Wolpert and Sue Bock
- Community Building and Ordinances for Sustainability – Pittman Center, TN, Glenn Cardwell
- Community Building and Highway Design – Townsend, Tom Talley
- Public Transportation – Cades Cove, Great Smoky Mountains National Park, Teresa Cantrell
- Night Sky Protection – International Dark Sky Association, LITELYNX, Bobby Thompson
- Nuisance Bears – Gatlinburg, TN, John Peine
- River Protection – Little River Watershed Association, Melissa Nance-Richwine
- Historic Preservation – Flat Rock, NC, Ray Shaw

- Invasive Species – Flat Rock, NC, Ray Shaw; Pittman Center, TN, Jack Ranney
- Cultural heritage – Cherokee Nation, Barbara Duncan, Cherokee Museum
- Green Energy – Gatlinburg, Gil Melear-Haugh, Clean Energy Alliance
- Economic Development – Swain County, Luke Hyde, Citizens for Economic Development in Swain County
- Viewshed Protection – Asheville and the Blue Ridge Parkway, Charles McCollough, Asheville
- Conservation-oriented Development – Balsam Mountain Trust, Cherie Pittillo

These presentations will be followed by an open discussion about future collaboration among gateway communities

WORKSHOP:
THE SOUTHEASTERN ECOLOGICAL FRAMEWORK: SUPPORTING STATE EFFORTS TO MANAGE ECOLOGICAL INTEGRITY

Wednesday, November 6

Organizer
Rick Durbrow, U.S. EPA, Region 4

Objective
The workshop demonstrates how the Southeastern Ecological Framework (SEF) and GeoBook, in the context of states' ongoing programmatic work, can aid in conservation of critical landscapes and important ecosystems.

Background
The Southeastern Ecological Framework and the companion GeoBook are tools to support and compliment state efforts to manage ecological integrity. These tools were created through systematic landscape analysis of ecological significance and the identification of critical landscape linkages. They provide a foundation for incorporating considerations of ecological integrity into many programmatic decisions. This workshop will focus on application of the tool to transportation planning, especially mitigation banking; greenspace conservation planning; and cultural resource preservation planning. You have been identified as a program director, lead, or specialist who addresses one of these areas, planning for which could be aided by these tools.

This workshop introduces the Southeastern Ecological Framework (SEF), a hub and corridor network of ecologically significant areas in the Southeast, and the SEF GeoBook, a web browser interface of geographical information system themes, and their applicability to Federal, state, and local programs. Presentations will demonstrate how these tools have been applied successfully by state agencies, and discussion will focus on how the tool can be tuned to support your programmatic decision making for ecosystem protection. Data needs, issues of scale, and other program applicability issues will be addressed in these discussions. An agenda is included.

Speakers and topics
Southeastern Ecological Framework:
Synergistic Ecosystem Protection
Cory Berish – Chief, Planning and Analysis Branch, US EPA Region 4

Connecting the Dots in State Greenspace Planning Efforts
Marc DeBree – Senior Conservation Planner, Office of Conservation and Community Affairs, North Carolina Department of Environment and Natural Resources

Assessing Cultural and Historical Resource Occurrence with the SEF
Terry Jackson – Director, Office of Decision Support Systems, Planning and Environmental Management Division, Georgia Department of Community Affairs

Innovations in Wetland Mitigation Banking
Robert Fuhler, GIS Unit Supervisor, Environmental Division, Arkansas State Highway and Transportation

SEF GeoBook: A GIS Web Interface for Program Decision Support
Rick Durbrow – Program Analyst, Planning and Analysis Branch, US EPA Region 4

RESTORING WARM SEASON NATIVE GRASS COMMUNITIES

Wednesday, November 6
Session Chair: Mike Ryon, ORNL

Native Warm Season Grass Restoration on TVA Lands in the Eastern Valley Region

Wes James
Tennessee Valley Authority

Since 1996, natural resource managers at TVA's Little Tennessee, Clinch-Powell, and Chickamauga-Nickajack Watershed Teams have been working with various partners and stakeholders to establish approximately 100 acres of native grasslands on select parcels of TVA retained land on Tellico, Norris, Watts Bar and Chickamauga Reservoirs. Our principal objectives in this effort include the eradication of non-native invasive species, enhancement of grassland wildlife habitat and the development of forage crop demonstrations. Partners and stakeholders include the Tennessee Wildlife Resources Agency, local chapters of Quail Unlimited, Inc., Native Gardens Nursery, and several agricultural licensees. Most of the newly established grasslands are on parcels that were previously or are currently under an agricultural license for the production of forage crops. Some areas are also located within established Natural Resource Management Units. Most restoration efforts have been initiated in established hayfields typically dominated by non-native tall fescue (*Festuca elatior*). These areas were sprayed with herbicides, disked, and planted with a Truax native grass drop seeder with attached cultipackers or seed rollers. In areas that could not be disked, a no-till native grass seed drill has been used following herbicide treatments. Areas planted primarily for wildlife habitat included mixtures of big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), indiangrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula*), and switchgrass (*Panicum virgatum*). Areas developed as forage crop demonstrations have been planted to single species stands of switchgrass, little bluestem, and big bluestem. Established stands are being managed with forage crop mowing rotations, controlled burns, and the use of herbicides to reduce competition. Results to date are generally positive; however individual sites present unique management challenges.

Seven Islands Wildlife Refuge: From Vision to Reality

Wayne H. Schacher
Natural Resource Services

Seven Islands Wildlife Refuge (SIWR) is a 400-acre tract of bottomland and upland habitats that form a peninsula adjacent the French Broad River, and includes several islands. SIWR is under cooperative operation by the Seven Islands Foundation, a non-profit land conservancy, and Knox County (TN) Department of Parks and Recreation.

The purpose of SIWR is for public use and recreation, with an emphasis placed on low-impact, non-consumptive, outdoor activities for the enjoyment of the wildlife diversity and natural beauty of the refuge. In July of 2001, an "Ecological Assessment" was conducted on SIWR to characterize existing land use and vegetative cover types, to identify habitats (27), and to indicate

representative botanical and zoological communities within each terrestrial habitat. Additionally, projections were made for the potential presence of listed botanical (32) and zoological (22) species, including evaluations of their habitat quality, on the refuge.

Building off the findings of the Ecological Assessment, a "Lands Management Plan" was assembled in early 2002 and is currently being implemented. The LMP will guide efforts to enhance natural community (flora and fauna) diversity on SIWR, and to coordinate habitat conversion, restoration and diversification efforts. Techniques employed to alter land use and vegetative cover types will serve to demonstrate a variety of management strategies for public and professional, educational and research benefits. General strategies within the LMP include: conversion of existing fescue-dominated, old field habitats to native warm season grasslands, enhancement of wetland habitats associated with an intermittent stream and upland pond, increased quality and complexity of riparian, and field border habitats, and directed and indirect species management initiatives.

For more information see www.naturalserve.com or email whschacher@natreserv.com.

Restoration of Riparian Plant Communities on the Oak Ridge Reservation

Mark J. Peterson
Oak Ridge National Laboratory

Narrow wetland areas or seeps often characterize the riparian zone of first-order streams on the Oak Ridge Reservation (ORR) in east Tennessee. These small riparian areas provide important ecological functions in preventing sedimentation to nearby streams, controlling flooding, improving water quality, and providing habitat for unique plants and animals. Although impacts to these communities on the ORR are avoided where possible, when such areas must be disturbed, wetland or stream restoration is often required as part of Section 401 and/or 404 of the Clean Water Act. The ORR also pursues a policy of restoring native species where possible, per Executive Order 13112. Restoration of wetland or riparian zones around streams often involves extensive planting of shrubs and trees, and may include seeding of wetland grass mixes. As part of an effort to better understand the factors affecting the success of various riparian planting regimes, select sites impacted by development or exotic invasive plants were extensively monitored. Key comparisons in these studies were plant community metrics before and after restoration, and the relationship between impacted and unimpacted sites. The monitoring results could be useful in refining mitigation techniques, providing good cost/benefit information on restoration options, and documenting rates of recovery that could help guide regulatory policy.

Meadow Restoration in Great Smoky Mountains National Park

Dana Soehn* and Jenny Beeler**
*Great Smoky Mountains National Park
**Cumberland Gap National Historic Park

Since 1995, resource managers at Great Smoky Mountains National Park have been in the process of restoring native meadows in Cades Cove. The Cove lies within a 2000-acre cultural management zone located in a large, limestone-bottomed basin. Cades Cove is intended to represent a historical time period from 1850-1920 which necessitates that cultural, recreational, and natural resources be collectively considered when managing the diverse natural communities found in the Cove. Both the cultural and natural resources have been altered by past management activities impinging on natural processes and visitors' perception of the historical scene. In the 1960s, fields in the Cove were drained, planted with nonnative tall fescue (*Fescue elatior*), and combined to form large, uniform, modern hayfields. Our objectives in efforts to restore areas of native meadow include protection and perpetuation of native species; eradication of non-native, invasive species; enhancement of wildlife habitat; and better visual representation of the settlement era. We

began restoration efforts with a 2-year pilot study designed to monitor the effects that meadow restoration would have on the established vegetation (both native and nonnative) and determine the efficiency of current restoration procedures including use of herbicide, seeding, and burning. We had previously collected seed from remnant native grasses in the Cove to provide enough material to plant the study areas (covering a total of approximately 2 acres). The results from this pilot study indicated that restoration techniques did not negatively impact native vegetation, including rare species found in the fields. Further, current restoration procedures were determined to be adequate to restore several native species, while reducing nonnative competitors. Before beginning larger restoration efforts, we have been undertaking a large-scale attempt to produce plants from a source originating in the Cove to better protect the genetic integrity of native meadow plants. We now have some of our own equipment and facilities (including a tractor, no-till seed drill, cultivator, seed harvester, greenhouse, and shadehouse) although we are still working quite closely with the USDA-NRCS National Plant Materials Center in Beltsville, MD for seed cleaning, storage, and propagation of our native materials. We are hopeful that our continued restoration efforts will enhance natural communities, better represent the cultural resources, and provide for an enjoyable visitor experience.

POSTER SESSION

Wednesday, November 6

Aquatic Insect Populations of Polluted Waters

Henry Angelopulos, Emma Garcia and Mary Beatrice Harris
Upward Bound Math and Science, Western Carolina University

The composition of macroinvertabrate assemblages has been known to change due to the affects of water pollution. Typically, the polluted areas have a lower species diversity made up of pollution tolerant species. This study investigated the affect that fecal coliform pollution had on macroinvertabrate assemblages. The study sites were located in Western North Carolina. Water samples from each site were tested for the presence of fecal coliform bacteria using the membrane filter technique and EMB agar plates. Macroinvertabrate samples from each site were collected and identified to family. In addition, the dissolved oxygen (DO), pH, total dissolved solids (TDS) and water temperature were determined at each site. The macroinvertabrate data was analyzed using the Hilsenhoff Family Biotic Index to determine the organic pollution level. Fecal coliform colonies per 100 milliliters of water were calculated and compared to statewide health standard for fecal coliform contamination. The data indicated that there was no correlation between fecal coliform levels and macroinvertabrate composition, however fecal coliform levels may have affected the species diversity. Pollution sensitive species were found at sites that had high levels of fecal coliform bacteria.

Southern Appalachian Information Node: Overview

Franciel Azpurua, Bonnie Carroll, Shelaine Curd, Wolf Naegeli and Robb Turner
Southern Appalachian Information Node Team

The Southern Appalachian Information Node (SAIN) is envisioned as a gateway to biological and related information for the region. This poster depicts the functionality of the SAIN portal (sain.nbii.gov) as an integrator of regional biological information systems, data, and projects, accomplished through multiple regional partnerships. SAIN demonstrates how information technologies can be used to help communities better understand their environment and to make decisions that support conservation of resources along with sustainable economic development.

Southern Appalachian Information Node: Appalachian Synthesis Project

Franciel Azpurua, Bonnie Carroll, Shelaine Curd, Wolf Naegeli and Robb Turner
Southern Appalachian Information Node Team

The Southern Appalachian Information Node (SAIN) and the Southern Appalachian Man and the Biosphere (SAMAB) are partnering to synthesize and disseminate inventory and monitoring information for the region. Together they have begun to work closely with local communities in North-Carolina, Tennessee, and Virginia to monitor and assess aquatic biotic communities and invasive plant species. This poster depicts how SAIN is

integrating the resultant data and maps with additional geographic information and presenting this through GIS tools for users. This information will be made available on the World Wide Web, and in the coming months, will be integrated with similar data available for the region's public lands.

Will Rising CO2 Levels Affect Southern Appalachian Invasive Species?

Travis Belote, Jake Weltzin, and Richard Norby
The University of Tennessee

Rising levels of atmospheric carbon dioxide ([CO2]) and invasions by non-native organisms are predicted to change patterns and processes of Southern Appalachian ecosystems in the near future. We are examining species composition, aboveground production, and cover of the understory plant community in ambient and elevated CO2 treatments in a free-air CO2 enrichment (FACE) facility on the Oak Ridge National Environmental Research Park. The understory plant community of this forest stand is dominated by several non-native invasive plant species including Lonicera japonica, a C3 vine, and Microstegium vimineum, an annual C4 grass. In 2001, L. japonica production was 3 times greater in elevated than ambient CO2 plots. In contrast, M. vimineum cover and production was 50% greater in ambient than elevated CO2 plots. We found a negative correlation between the two species under elevated but not ambient CO2. This pattern suggests competitive interactions between the two invasive species under elevated CO2. We conducted a field competition experiment wherein we grew M. vimineum and L. japonica alone and together under ambient CO2. Cover of L. japonica was 8 times greater in plots where M. vimineum was removed than in control plots, which suggests that M. vimineum asymmetrically competes with L. japonica under ambient CO2. Together these studies suggest that elevated CO2 may shift species' interactions from interference to competition, and that L. japonica may become more abundant and pose additional threats to native habitats as CO2 continues to rise.

Southern Appalachian Man and the Biosphere Foundation Citizen-Based Environmental Monitoring

Andy Brown, SAMAB
Pamela J. Nabors, SAIN

The goal of the Appalachian Environmental Monitoring program is to develop the capacity of citizens in gateway communities of the national parks and forests in the southern Appalachians to experience firsthand important environmental issues facing their communities so they can make better decisions about their own neighborhoods and backyards and can participate more effectively in the decision-making processes of their local governments, state government, and the federal land management agencies whose borders they share. Community driven initiatives that promote wiser use of the region's natural resources and more sustainable development of mountain communities should be ultimate outcomes of this program. SAMAB will facilitate and participate in this constructive interaction by producing and disseminating data outputs for groups with whom we are engaged and hosting meetings between these different stakeholders when appropriate. Currently, SAMAB is partnering with citizen groups in seven communities in the southern Appalachians to monitor water quality and the threat of invasive exotic plants to significant natural heritage sites.

SAMAB provides technical support such as volunteer training, quality assurance of data collection, data graphics and GIS generated maps, and monitoring program design assistance to fit each community's unique local needs. While producing relevant information to serve a multitude of localities, SAMAB is uniquely positioned to construct a larger regional picture of the state of the environment in the entire southern Appalachians. This is highly useful as we all understand that environmental problems do not begin or stop at state borders.

One of SAMAB's strengths to successfully implement a useful and credible monitoring program is its ability to draw upon the professional expertise of staff biologists, planners, and other natural resource professionals of its federal agency and other Cooperative members. Cooperative members who have assisted our monitoring efforts this year include the US Forest Service, National Park Service, and Tennessee Valley Authority (TVA).

This set of posters—one for each area involved in the environmental monitoring and stewardship program—presents an overview of the program.

Survey of the Insect Fauna on Eastern Hemlock *and Pseudoscymnus Tsugae,* a Predator of the Hemlock Woolly Adelgid, *Adelges Tsugae*

Lee Buck, Paris Lambdin, and Jerome Grant
The University of Tennessee

The hemlock woolly adelgid (*Adelges tsugae Annand*) is an exotic insect pest that has devastated up to 80% of the hemlock stands in the wake of its invasion from the east coast towards the Appalachians. This invasive pest has recently been found in the Great Smoky Mountains National Park. Because of its potential impact on habitats within the Park, a project was initiated to determine the insect species associated with new and old growth eastern hemlock and to monitor the distribution and establishment of the biological control agent, Pseudoscymnus tsugae Sasaji and McClure, on infested trees.

Insects at two sites with mature hemlocks and two sites with new growth hemlocks representing high and low elevation gradients within the Park will be collected from 20 May to 1 November 2002 from trees at each site using: 1) two Malaise/pan Traps/tree suspended by a rope in three mature and three new growth trees with insects collected and processed every 14-21 days per site, 2) direct sampling by visual observations made every 7-14 days (30-40 min./tree) using a hand net and handpicking from three trees/site, and 3) pitfall traps (four traps/tree) placed into the ground around two trees/site to collect ground-inhabiting insects with samples retrieved every 14-21 days, processed, and identified. A survey for the biological control agent (P. tsugae) released at two sites was initiated on 15 September 2002 will be conducted monthly from March- October 2003. The beetle's abundance and distribution will be recorded at 10m intervals up to 100m from the release sites. Preliminary data infer a diverse assemblage of species present on hemlock with 1,697 insect specimens collected representing 39 families.

Answering the Dam Question: Challenges and Solutions to Small Dams in the Southern Appalachians

Brian P. Burket and Jeffrey R. Duncan
National Park Service, Rivers, Trails, and Conservation Assistance

The United States is home to countless obsolete, aging, and abandoned dams. No one knows exactly how many dams exist nationwide, but estimates are in the millions. State and federal inventories, such as the Nationwide Inventory of Dams, account for approximately 60,000. The vast majority are smaller dams that do not meet the minimum size requirements of state and federal inventories. Nonetheless, the presence of small dams, particularly within biologically diverse Southern Appalachian streams, represents an ongoing, unregulated, and under-appreciated impact to the region's aquatic resources. Dams of any size fragment aquatic ecosystems restricting in-stream migration, gene flow, and biophysical processes such as sediment transport. Despite this, some dams may be viewed as desirable for their historical or aesthetic values. This poster examines how existing inventories can be used to identify candidates suitable for removal and discusses potential methodologies for creating an inventory of small dams in the Southern Appalachians. In addition, we review evaluation criteria, successful state programs, and the outlook for small dam removal in the future.

Assessing Impacts of Forest Road Conditions and Management Practices on Runoff Water Quality To Streams

Barton D. Clinton, Mark S. Riedel, and James M. Vose
USDA Forest Service Southern Research Station,
Coweeta Hydrologic Laboratory

Improved and unimproved roads can be a significant source of sediment in forested watersheds. There has been a resurgence of interest in how forest roads affect stream water quality. Consequently, natural resource managers have been under considerable pressure from public and private organizations, as well as regulatory agencies, to minimize the degradation of terrestrial and aquatic resources caused by road impacts and management activities. As part of the USDA Forest Service Large-Scale Watershed Restoration Project, we quantified the sediment contribution of current road conditions and evaluated the effectiveness of BMPs and road restoration. We assessed differences in production of total suspended solids (TSS; ppm) from a variety of road surface conditions in the Chattooga River and Conasauga River watersheds in the Southern Appalachians. On the Chattooga River watershed we selected four levels of road condition: (1) a 2-yr-old paved surface (P), (2) an improved gravel surface with controlled drainage and routine maintenance (RG), (3) an improved gravel surface with erosion and sediment control structures installed and routine maintenance (IG), and (4) an unimproved poorly maintained gravel surface (UG). Sampling was conducted using custom-made overland flow collectors installed below each road surface type. Variation was high among and within road surface types. The P surface generated the least amount of TSS, which was comparable to control sites, while the UG surface generated the most. The P surface produced significantly less TSS than the UG surface, but not less than the IG and RG surfaces. Variation among road surface types was related to TSS travel distance below the road, precipitation amount, time of year, and the existence of functioning erosion and sediment control structures. On the Conasauga River watershed, we monitored sediment yield from thirteen roads to validate a cumulative effects erosion and sedimentation model. These roads represented a variety of surface types and usage levels. The results of our model validation were promising because, even though the predicted sediment yields were biased, the bias was simple and may be reduced through further model calibration and development. As observed, the model predicted sediment yield would increase with usage levels. However, the model failed to predict that two of the gated, lowest usage roads would exhibit unusually high sediment yields; levels similar to those observed on moderately trafficked roads. These roads were managed as horse trails. Care during the design and construction stages, and appropriate use and correct installation of BMPs, will minimize impacts of forest roads on aquatic and terrestrial ecosystems.

Recreating Neighborhoods: Putting the Pieces Together

Virginia Faust
NC Division of Community Assistance

A good neighborhood can be likened to a jigsaw puzzle—the picture is formed by many pieces, all of which are important. When the right mix of pieces is working together the neighborhood becomes a living place with the whole being greater than the sum of its parts. The presentation discusses some of the essential puzzle pieces that create good neighborhoods, including good design, housing choices, transportation options, integrating uses, public buildings and spaces, and infill development. It reviews basic design principles and shows examples of projects that are using these pieces to create good neighborhoods.

Nectar Thieves, Pollen Robbers, and Pollinators of Hybrid Azalea, *Rhododendron* Spp., in the Great Smoky Mountains National Park

Jerome F. Grant, Paris L. Lambdin, and Adriean J. Mayor
The University of Tennessee

Each year in mid to late June, the hybrid azaleas bloom on Gregory Bald in the Great Smoky Mountains National Park (GRSM), covering the bald with broad patches of red, orange, pink, yellow, and white flowers. These azaleas have hybridized, producing flower colors and forms not found on other balds in the GRSM. The species of azalea involved in the hybrid swarm are *Rhododendron arborescens* (Pursh) Torrey, *R. viscosum* (L.) Torrey, and *R. cumberlandense* Braun. Because of the variation in flower color of hybrid azaleas on Gregory Bald, a study was initiated in June 2000 to observe their insect visitors, and presumably pollinators. Insects were collected from hybrid azalea at Gregory Bald on 8, 11, 15 and 18 June 2000, and observations on nectaring and pollen gathering on azaleas were made on 11, 15, and 18 June between 10AM and 3PM. The study site ran along the northern margin of the bald from west to east where azaleas of varying flower color are most numerous.

Insect visitors to hybrid azalea included nectar thieves, pollen robbers, and a few species of acrobatic pollinators. Most of the insects visiting flowers of hybrid azalea were bees in the families Andrenidae, Halictidae, and Apidae. *Bombus perplexus* Cresson and several large *Andrena* species (*A. crataegi* Robertson, *A. forbesii* Robertson, and *A. nivalis* Smith) may be nectar thieves (i.e., they gathered nectar without pollinating flowers), and *Andrena cornelli* Viereck and *Evylaeus* spp. (possibly several species) may be pollen robbers (i.e., they gathered pollen without pollinating flowers). Several acrobatic bumble bees, *Bombus affinis* Cresson, *B. maculatus* Cresson, and *B.* sp. nr. *vagans* Smith, were observed gathering pollen in a manner suggesting flowers were pollinated during their visits. The European honey bee, *Apis mellifera* L., was only an occasional visitor to flowers of hybrid azalea. On the morning of 15 June while walking along the northern side of Gregory Bald, a small population of the meloid *Lytta unguicularis* (LeConte) was observed on flowers and foliage of hybrid azalea. This beetle species had not been documented in the GRSM since the early 1960s. The presence and distribution of flower types among the azalea hybrids on Gregory Bald are believed to be, at some level, pollinator directed. A better understanding of the role of pollinators in proliferation of this hybrid swarm of azaleas may enhance the biotic integrity of the bald.

Discover Life in American and the All Taxa Biodiversity Inventory

Jean Hilten
Discover Life in America, Inc.

Discover Life in America (DLIA) is the non-profit organization uniting the efforts of scientists, volunteers, teachers and students to conduct the All Taxa Biodiversity Inventory (ATBI) in Great Smoky Mountains National Park, and beyond. This survey of all life forms in the Park is yielding new knowledge about the often over-looked and little understood members of Appalachian ecosystems—from algae to moths to spiders. As the Smokies face growing threats from air pollution, invasion of exotic insects and diseases, and ever-growing pressures of development along the borders, Park managers need to direct efforts to "hot spots" of concern.

As of August, 2002, 1,882 species that are new records for the National Park have been found and an additional 289 taxa that are new (undescribed) to science. Along with the inventory work, mapping distributions of organisms and studies of ecological relationships are underway. This knowledge will contribute to scientific resource management in the Smokies, the surrounding region, and in other parks and preserves. Discover Life in America serves as a coordinator of the varied efforts and

partnerships involved in the ATBI—providing grants to researchers, organizing and training volunteer "citizen scientists", and developing educational activities.

The All Taxa Biodiversity Inventory, begun in 1998, will take from 12-15 years to complete in Great Smoky Mountains National Park. On a wider scale, the knowledge gained and methods used in the project will be a model for research in biodiversity and will encourage the discovery, understanding, preservation, and enjoyment of natural resources. To join the adventure, contact Jeanie Hilten, DLIA, at 865-430-4752 or Emily Jones, Friends of the Smokies, at 865-453-2428.

Evaluating and Mitigating the Effects of Transportation Projects on Landscape Natural Areas in the Southern Appalachians

Hugh Irwin
Southern Appalachian Forest Coalition

Our region has experienced significant human alterations and impacts. Maintaining and restoring the conservation integrity of the southern Appalachians will require identifying and protecting remaining natural areas and reestablishing landscape connections that can serve as corridors for animal movements and adaptation during times of change, including climate alterations. The Southern Appalachian Forest Coalition is working to establish a networked system of conservation areas in the southern Appalachian region. One component of this work is to evaluate the remaining potential for natural processes in the region. Remaining unroaded areas and potential connectivity between large unroaded blocks of habitat are important elements of this potential. Results of the analysis show the remaining unroaded areas greater than 1,000 acres; greater than 10,000 acres, and greater than 25,000 acres. Potential connections between the largest of these unroaded areas are identified and evaluated. The application of this methodology to evaluating and mitigating the effects of projects, particularly transportation corridors, is assessed.

Hog Wild: Using GIS to Examine 27 Years of Hog Control Efforts (1976-2002) in The Great Smoky Mountains National Park

Robert D. Keller
The University of Tennessee at Chattanooga

No abstract.

The Southern Forest Resource Assessment: Implications for the Southern Appalachians (Assessment Questions: Terra 1, Terra 3, Aqua 5)

Lorraine Maloof, Heather Hammett, and Ramla Osman
Upward Bound Math and Science, Western Carolina University

Amphibian populations have been declining in recent decades, causing alarm throughout the scientific community. Because amphibians are considered to be bioindicators of environmental health, and because there is growing interest in classifying and preserving biodiversity, The Great Smoky Mountains National Park and the All Taxa Biodiversity Inventory are gathering data on the size, range, and diversity of salamanders at Purchase Knob. Data from our study will be used by the Park for this end. We captured, weighed (g), measured (mm), identified, and injected the salamanders that met our requirements. We collected ninety-six salamanders and marked thirty-two of those. Of those marked, six died. We caught more aquatic than terrestrial salamanders. From the 75m x 4m terrestrial plot and the 75m x 4m aquatic plot, the following genera and species of salamander were identified: Desmognathus wrighti, D. quadramaculatus, D. ocoee, D. monticola, D. imitator, D. santeetlah, Eurycea wilderae, Gyrinophilus porphyriticus, Plethodon metcalfi, and Pseudoriton rubber.

Our study posed the question as to whether Visible Implant Elastomer marking had negative effects on salamanders. We concluded that most observed negative effects might have had more to do with the lack of experience of the injector. Six percent of the marked, recaptured salamanders were marked in either 2000 or 2001, indicating the VIE mark does last. However, we recommend elastomer injection be done by an experienced individual while the salamander is anesthetized. We also recommend a continuation of the twenty-four hour hold before releasing marked salamanders to further verify the physical condition of both the elastomer marks and the salamanders.

The Lincoln-Peterson Index, a statistical test that estimates population sizes for the capture-recapture method, will be applied to future data by Upward Bound research groups and compared to the Lincoln-Peterson results from data collected in 2000 in an effort to estimate aquatic and terrestrial population sizes at Purchase Knob.

Invasive Species in Transportation Rights of Way: "You Wouldn't Plant Kudzu, Would You?"

James B. Martin
Institute for Transportation Research and Education, NC State University

On October 15, 2002, the Center for Transportation and the Environment at the Institute for Transportation Research and Education, North Carolina State University held a national teleconference on "Invasive Species in Transportation Rights of Way: "You Wouldn't Plant Kudzu, Would You?" The poster presents the results of that teleconference.

Vegetation managers are responsible for more than 12 million acres of land in transportation rights of way in the United States. In 1994 Executive Order 13112 required vegetation managers to ensure the prevention and control of "invasive species." Because highway corridors crisscross the nation, they are often blamed as pathways for the spread of invasive plant species, which are harmful to agriculture, human health, and/or the natural environment. A Cornell University study in 2001 estimated that the U.S. loses $23 billion annually due to invasive impacts. This broadcast will provide an overview of the national problem presented by invasive plant species, review FHWA's expectations for Federal-aid highways, examine current state and local solutions and best practices, and present resources for more information.

The session was moderated by Bonnie Harper-Lore, Restoration Ecologist with the Federal Highway Administration, Washington, DC. Panelists included

- Ira Bickford, Roadside Vegetation Manager, Utah Department of Transportation
- Craig Dusablon, Landscape Coordinator, Vermont Agency of Transportation
- Sheilah Kennedy, Noxious Weed Control Manager, Okanogan County, State of Washington
- Daryl Smith, Director, Native Roadside Vegetation Center, University of Northern Iowa
- Dave Thomas, Vegetation Management Specialist, U.S. Forest Service

Index of Biotic Integrity and Community Education in the Upper Little Tennessee Watershed

Carla Norwood
Little Tennessee Watershed Association

This poster describes and interprets the methodology, application and efficacy of the Upper Little Tennessee River Watershed Project, which uses a volunteer-driven biomonitoring project to support the conservation of aquatic biodiversity. The poster will highlight the results of twelve years of Biomonitoring data in a GIS map, interpret this data in terms of overall watershed trends and supply a case study of how the biomonitoring has been used in conjunction with water quality improvement actions.

The Upper Little Tennessee River Watershed Project is administered by the Little Tennessee Watershed Association

(LTWA) and has pioneered the application of stream biomonitoring, based on the concept of biotic integrity, by citizen groups in the southern Appalachian region. The project, which covers the upper Little Tennessee River watershed in Swain and Macon Counties, North Carolina and Rabun County, Georgia, began as a fortuitous meeting of local concern and TVA's interest in expanding their monitoring efforts into headwater watersheds and communities. In addition to its local applications, the project currently serves as an example and training facility for watershed groups throughout the SAMAB/TVA area.

Under a local project director, field work is largely carried out by local volunteers. The information gained is applied to identification and solution of stream problems, proposing solutions and evaluating corrective efforts. Equally important, on a long-term basis, is the environmental education aspect of a project involving approximately 150 volunteers and 25 landowners annually.

Modeling Hemlock Ecosystems, Adelgid and Beetle Interactions

Jerry S. Olson
Global Patterns Company

Systems ecology relates data about hemlock stands and changes, insect pests, and beetles, to aid biological control of alien invaders. Relevant ecological models concern:
1) probabilities of persistence or change among forest cover types and
2) rates or transfers of biomass that underlie stability or change. These help evaluate **probable consequences** of adelgids' invasions over SAMAB and wider landscapes. Decimating shade-tolerant conifers now threatens broad ranges of altitude and habitat—more than balsam wooly adelgid had done for the endemic Fraser fir on the highest summits.

Budget equations for
input rates – output rates = net rate of change for system compartments simulate maintenance and changes in steps of lumping ecosystem parts:
a. Basic Module. Plant-soil subsystems include ***green shoots, stems, roots, litter and humus)***—the core template of "SimCYCLE, i.e. Simulating CYcling of Carbon in Land Ecosystems" (Takehisa Oikawa and students of Japan's Tsukuba University). Initially these covered all parts, with rapid or slower turnover. Or core template can be reserved for the faster parts, with the following extra state variables for specific live or dead materials that interact differently.
b. A common denominator for forest and herbaceous ecosystems adds five more state variables: ***groundcover, reproductive parts, explicit (herbivorous) consumers, excreta*** and ***decomposers*** of these and plant residues.
c. A third "twist" of a helical list of compartments for forest biomass dynamics includes: ***layered canopy foliage, woody stems, coarser roots*** and *more* ***resistant humus and its decomposers.*** Essential features of SimCYCLE are shared with an Oak Ridge National Laboratory (ORNL) model of W. Mac Post et al.: "LoTEC," for Local Terrestrial Ecosystem Carbon or "GTEC" for Global and continental model grids (9 or more of these 15 pools).
d. "Tsuga-1" now needs to simulate more process, within hemlock or mixed stands. Processes include hemlock's ***evergreen shoots,*** invading ***wooly adelgid*** pests, ***beetles*** including those preying on pests and at least one ***additional consumer*** group (birds other omnivores?), and a nearly ***"inert" humus*** pool (possibly with charcoal). This fourth module thus extends an abstract model structure with 5 compartments per twist. Each *starts with a green productive* compartment and ends with *humus storage* of biomass and C. Combinations of short and elaborated models should stimulate basic ecological research, policy and management by diverse specialists and a wider public. Extensions can be explicit about biodiversity too. Priorities for collaborative work—among agencies and between continents—deserve urgent actions.

Life Cycle and Inter-relationships of Hemlock Woolly Adelgid (*Adelges tsugae*) and *Pseudoscymnus tsugae*

Richard C. Pais
Ecoscientific Solutions, LLC

The hemlock woolly adelgid (*Adelges tsugae)* has a complex life cycle highlighted by summer aestivation. This poster will demonstrate the life-cycle with live adelgids present for observation in all life-cycle stages. A significant and exclusive predator of adelgid, *Pseudoscymnus tsugae*, is now being released by federal and state agencies as well as private landowners as a biological control for hemlock woolly adelgid. This poster will also demonstrate the life cycle synchrony of *Pseudoscymnus tsugae* with hemlock woolly adelgid as well as captive breeding techniques. Live samples of *Pseudoscymnus tsugae* in all life cycle stages will be present for observation.

Modeling the Distribution of Forest Community Types inthe South Mountains of North Carolina

Scott M. Pearson and Dawn M. Dextraze
Mars Hill College

The abundance and distribution of forest community types in the Jacob Fork watershed of the South Mountains was estimated with a spatially explicit model. Field surveys were conducted to collect data on vegetation communities at pre-determined locations. The community type at each location was determined using a cluster analysis based on importance values of tree species. The community types were segregated by landscape position as measured by elevation and landform index. These differences likely represent responses to a moisture gradient. Distance to stream and slope were not useful predictors of community type. A map of predicted community type was developed using a color infrared aerial photograph (used to distinguish deciduous and evergreen canopy and shrub layers) and relationships with terrain. The most widespread community type was hemlock-white pine-rhododendron (coverage=35%) while xeric pine-heath was the least common (5%). Cove hardwood, oak-maple, oak-hickory, mixed deciduous-pine, and xeric oak-pine types were also mapped. The xeric oak-pine and pine-heath types have been recognized as fire-dependent. There was 83% agreement between field data and predictions of the model. Misclassification errors could be attributed to the spatial resolution and accuracy of the terrain-based metrics which were derived from a digital elevation model (DEM) with 28-m cells. This activity provided practical, hands-on learning for undergraduate students and a useful product for natural resource managers at South Mountains State Park.

SAMAB Invasive Species Initiative

Jack Ranney
SAMAB Initiative Leader;
University of Tennessee

SAMAB has been collaborating with many partners to better understand the biological and policy situation with invasive plants in the southern Appalachian region, to increase awareness of invasive plants among key stakeholders, and to help mobilize action to manage invasive plant threats. Six tasks are now underway with products emerging now and over the next two to three years. The tasks involve (1) working with the green industry to find alternatives to invasive plants, (2) training volunteers to inventory and control invasive plants, (3) expanding SAMAB's invasive species website, (4) developing posters and brochures, (5) facilitating collaboration among federal agencies in the development of their invasive species management plans, and (6) assisting others in education efforts in schools and elsewhere. Immediate products coming out of these efforts are invasive plant identification flash cards, numerous workshops, posters, an improved website, a picture gallery, training materials, and a data management system, to name a few.

Tennessee Exotic Pest Plant Council

Pat Parr,* Jack Ranney,** Kris Johnson†
*ORNL, TN EPPC President; **University of Tennessee, TN EPPC Vice President;
†GSMNP, TN EPPC Past President

Exotic pest plants have major impact on biodiversity and heavy economic impacts on resource management and tourism. The Tennessee Exotic Pest Plant Council (TN EPPC) is one of the leading exotic pest plant councils in the country and cooperates with SAMAB in education and outreach efforts. It is organized to promote increased education and awareness about the specific threats and management of exotic invasive plants in Tennessee's natural areas. Important contributions have been the production of an invasive plant management manual, holding workshops and symposia, a reviewed and published list of exotic invasive plants, videos, symposia reports, and various brochures. The website is www.tn-eppc.org. Please join the TN EPPC and learn more about what you can do to help fight exotic invasive plants.

Beetles Collected from Northern Red Oak in the Great Smoky Mountains National Park

Danny Trieff, Paris Lambdin, and Jerome Grant
The University of Tennessee

The beetles associated with northern red oak, Quercus rubra L. in the Great Smoky Mountains National Park were collected and identified. Beetles were sampled at three sites (Bee Tree Ridge, Mount Sterling, and Rich Mountain) representing elevation gradients ranging from 823 to 1,377 meters. The canopy of one random tree per site was sampled monthly from August 1992 to June 1995 using a Dyna-fog Golden Eagle fogger. Beetle specimens (1,476) were collected, processed, identified, and data recorded into a Biota® database. Species diversity was assessed using the Shannon-Weiner Diversity Index. The 203 species identified represented 45 families; however, only 42.2% of the beetle families were found at all three sites. Species richness, which averaged 93 beetle species per site, ranged from 69 species at Mount Sterling to 124 species at Rich Mountain. A significant ($\div 2=17.856$, df=2, $P<0.005$) difference was noted for the number of species found at Rich Mountain compared to the other sites. Also, Rich Mountain had significantly ($\div 2=166.298$, df=2, $P<0.005$) higher numbers of specimens (713) followed by Bee Tree (398) and Mount Sterling (365). However, Shannon-Weiner diversity values were highest (3.70) at the highest elevation site (Bee Tree Ridge) and lowest (3.04) at the low elevation site (Rich Mountain). Eleven beetle pest species, represented by 403 (27.36%) specimens, were collected. Specimens of the Asiatic oak weevil, Cyrtepistomus castaneus (Roelofs), were found at all sites and comprised 18.68% of all beetles collected. Sixty-four species of Coleoptera not previously recorded in the national park were identified representing a 5.5% increase to the All Taxa Biodiversity Inventory database.

INVASIVE SPECIES – IMPENDING CHANGE TO FOREST ECOSYSTEMS

Thursday, November 7

Session Chair: Jack Ranney, UT Energy, Environment, and Resources Center

Update on Some Invasive Species: Asian Lognghorn Beetle, Emerald Ash Borer, Bark Beetles, Gypsy Moth, and Sudden Oak Death

Steve Oak and Don Duerr
USDA Forest Service

No abstract.

Biological Control of Kudzu

Darryl Jewett
USDA Forest Service

Kudzu was introduced to the United States during middle of the 19th century as an ornamental. During first half of the 20th century, approximately 1/3 million acres were planted to feed livestock and for erosion control. Presently, extension agents report more than one-million acres of kudzu distributed among approximately 700 counties. Kudzu kills trees by climbing up their boles and into their canopies, out-competing them for light. Infestations cost commercial forests approximately $48.00 per acre annually and compromise the integrity of valuable natural resources. Recently, dense infestations of kudzu are reported to interfere with military exercises in North Carolina, South Carolina, and Virginia. Although the largest and most dense infestations of kudzu have been documented in the southeastern United States, small infestations have appeared recently in the Pacific North West, the Great Plains, and the North East. Herbicides generally are used to manage small, isolated populations of kudzu.

Obstacles exist, however, to managing extensive infestations with herbicides. The most important are concerns for applicator safety and cost. In response to obstacles concerning use of herbicides, professionals have considered supplements, including biological control. Presently, exploration for biological control agents is ongoing in China, the country to which kudzu is native. So far, a variety of insects associated with kudzu have been identified. Among them are a sawfly, *Arge similis* Vollenhoven; two weevils, *Depaurus* sp. and *Alcides trifidus* Pascoe; and two Chrysomelids, *Brachyphora nigro-vittata* Jacoby and *Gonioctena tredecimmaculat*a. More refined study of these insects continues, which includes establishing a comprehensive list of economically and ecologically important plants in the United States on which their host range will be tested and quantifying their impact on kudzu plants. Pathogens also may be used for managing infestations of kudzu. One pathogen encountered during surveys in China is an imitation rust called *Synchitrium puerariae* and it interferes with translocation of water and nutrients throughout a plant. The mechanistic relationship between this fungus and kudzu is being studied.

Alterations in Stand-Structure in the Great Smoky Mountains National Park Spruce/Fir Forests

Michael R. Mancusi and N. S. Nicholas
Tennessee Valley Authority

The southern Appalachian red spruce, *Picea rubens* (Sarg.)/Fraser fir, Abies fraseri (Pursh) Poir., ecosystem has been infested by the balsam woolly adelgid, *Adelges piceae* (Ratz.), for several decades. A study was initiated in 1990 in the Great Smoky Mountains National Park to monitor permanent plots on five high elevation mountain peaks for changes in overstory and understory spruce/fir stands. Fir live basal area has decreased almost 60% since pre-adelgid infestation in the spruce/fir forest. In the past decade fir live basal area has decreased by 4.3% while the density increased by 25.8%. Mortality rates have decreased substantially for all four dominant overstory species. The age structure of most fir stem size classes has decreased significantly suggesting an accelerated growth rate in response to reduced competition in the overstory. These stands have a higher proportion of fir and are younger and more even-aged than similar sites documented in the past. Past studies show that in dense even-aged stands adelgid outbreaks often cause considerably higher mortality than mixed, uneven-aged stands. The future of this young cohort of understory trees will be in jeopardy once it reaches maturity. A dense even-aged forest could create the ideal habitat for the adelgid, causing another explosive outbreak.

Keystone with a Vengeance: Effects of an Exotic Species, European Wild Boar (*Sus scrofa Linneaus*), on the Vegetational Structure and the Small-Mammal Community on the Oak/Hickory Forests of Great Smoky Mountains National Park

Robert D. Keller
The University of Tennessee at Chattanooga

I compared vegetational characteristics and small mammal communities of two similar oak/hickory forests: one occupied by the European wild boars (*Sus scrofa* Linneaus) within the boundaries of the Great Smoky Mountains National Park, and one in similar areas outside of park boundaries where wild boars are absent.

For vegetational comparisons, I used oak/hickory abundance and species diversity to compare overstory, sapling and seedling components. For structural comparison, I used ground coverage, stems per unit area, and ground surface area disturbance associated with wild boar occupation.

I determined that oak/hickory abundance and species diversity of the overstory components were not significantly different. However, oak/hickory abundance and species diversity of the sapling and seedling components were significantly lower in areas occupied by the wild boars. In the sapling and seedling components, oak/hickory abundance and species diversity appear to be positively correlated with the presence of ground cover and negatively correlated with disturbance. Presence of the wild boars has resulted in 1) disruption of the normal vegetational recruitment cycle of mast producing species, 2) reduction of vegetational diversity, and 3) reduction of ground cover in the oak / hickory forests of the Great Smoky Mountains National Park.

To determine effects of coexistence with the wild boars on the small mammal communities, I used the most prevalent small mammal in the oak/hickory forest, *Peromyscus leucopus*, as an indicator species. I examined the density of the indicator species in relation to mast production, average weight, number of juveniles present, number of reproductively mature individuals, and dispersal to compare the two populations.

Small mammal community comparisons indicate that coexistence with the wild boars has a significant negative effect on the indicator species population inhabiting the Great Smoky Mountains National Park. Another small mammal, the eastern chipmunk (Tamias striatus), appears to be completely absent from the Great Smoky Mountains National Park survey location where wild boar densities have been the highest. Results were consistent with initial predictions that

preferential mast consumption by wild boars, coupled with collateral rooting damage, has a deleterious effect on the small mammal community.

Land use History, Landscape Context, and the Abundance of Exotic Plant Species in the Ivy Creek Watershed, North Carolina

Scott M. Pearson and Alan B. Smith
Mars Hill College, Biology Dept.

Anthropogenic land uses and landscape-level patterns of habitat can affect local abundances of native and exotic species. We used several field data sets to ascertain whether the presence and abundance of exotic plant species in forest stands were correlated with past land uses and whether these relationships were also dependent on the surrounding landscape matrix. Three categories of land use history were used: post-agricultural, post-logging, and least-disturbed forests. Exotic plants were much more prevalent in post-agricultural forest stands than in stands with other land use histories. Moreover, the presence of exotic species was greater in forest fragments surrounded by landscapes with an agricultural history than in stands in landscapes without a history of clearing for farm uses. Exotic species in these latter landscapes were mostly limited to roads and other severely disturbed areas. Some species, such as oriental bittersweet, had a discontinuous distribution with obvious centers of abundance.

Natural Aliens: An Environmental History of Invasive Species in the Southern Appalachians

Donald Edward Davis
Dalton State College

Non-native plant and animal species were introduced to the Southern Appalachian region as early as the 16th Century. This presentation will address the environmental history of invasive species in the Southern Appalachians and will focus on the many historical and cultural reasons for their introduction. Data will be drawn largely from my book *Where There Are Mountains: An Environmental History of the Southern Appalachians* (University of Georgia Press, 2000). The presentation will also attempt to show the relevance of environmental history to exotic species management.

SAMAB Invasive Species Initiative

Jack Ranney
SAMAB Initiative Leader
University of Tennessee, Energy, Environment and Resources Center

SAMAB has been collaborating with many partners to better understand the biological and policy situation with invasive plants in the southern Appalachian region, to increase awareness of invasive plants among key stakeholders, and to help mobilize action to manage invasive plant threats. Six tasks are now underway with products emerging now and over the next two to three years. The tasks involve (1) working with the green industry to find alternatives to invasive plants, (2) training volunteers to inventory and control invasive plants, (3) expanding SAMAB's invasive species website, (4) developing posters and brochures, (5) facilitating collaboration among federal agencies in the development of their invasive species management plans, and (6) assisting others in education efforts in schools and elsewhere. Immediate products coming out of these efforts are invasive plant identification flash cards, numerous workshops, posters, an improved website, a picture gallery, training materials, and a data management system, to name a few.

ENHANCING IMPERILED AQUATIC POPULATIONS

Thursday, November 7
Session Chair: Gary Peeples, U.S. Fish & Wildlife Service

Biomonitoring as a Tool for Conservation in the Little Tennessee Watershed

Bill McLarney
Little Tennessee Watershed Association

The Upper Little Tennessee River Watershed Project, administered by the Little Tennessee Watershed Association (LTWA) has pioneered the application of stream biomonitoring, based on the concept of biotic integrity, by citizen groups in the southern Appalachian region. The project, which covers the upper Little Tennessee River watershed in Swain and Macon Counties, North Carolina and Rabun County, Georgia, began as a fortuitous meeting of local concern and TVA's interest in expanding their monitoring efforts into headwater watersheds and communities. Beginning in 1989, the principal source of support has been TVA; beginning this year an expanded project also receives support from the National Forest Foundation and SAMAB Foundation. In addition to its local applications, the project currently serves as an example and training facility for watershed groups throughout the SAMAB/TVA area.

Under a local project director, field work is largely carried out by local volunteers, and information is applied to identification and solution of stream problems, proposing solutions and evaluating corrective efforts. Equally important, on a long-term basis, is the environmental education aspect of a project that involves ca. 150 volunteers and 25 landowners annually.

This year, in addition to formalizing the training aspect through sponsoring visits to other volunteer watershed projects in the area, the LTWA will prepare a comprehensive "State of the Streams" report for the upper Little Tennessee watershed, with a color-coded map (see our poster presentation) which permits local citizens and other concerned parties to identify the status of particular stream reaches, and biotic integrity trends in these reaches. Examples of trends, corrective measures and evaluation are provided.

Rare Species Restoration in the Appalachians

Richard Kirk
Nongame/Endangered Species Program
The Tennessee Wildlife Resources Agency

Tennessee is home to over 1,400 species of wildlife. The Tennessee Wildlife Resources Agency (TWRA) recognizes 189 of these species as endangered, threatened, or in need of management. Of these listed rare species 75% are aquatic. Much of TWRA restoration efforts are focused on aquatic species. The TWRA, through partnerships, is involved in several rare species restoration projects in the Appalachian region of East Tennessee. These projects include Lake Sturgeon restoration of the Upper Tennessee River, restoration of various freshwater mussel and snail species of the upper Tennessee River and Conasauga River, and the restoration of the Bog Turtle in Upper East Tennessee.

Captive Refugia and Propagation Work for Freshwater Mussels at the Warm Springs NFH, Warm Springs, GA

Carlos Echevarria
US Fish & Wildlife Service

Freshwater mussels are among the most endangered animal in the U.S. The Flint River Basin historically contained 29 species of mussels, but only 22 species are believed to exist today. Five of these species are considered either endangered or threatened under the Endangered Species Act. In June 2000, long stretches of Spring Creek, Miller County, GA (Southwest Georgia), which is an area of tremendous mussel diversity in the Flint River system went dry. Thousands of dead mussels, fishes, turtles, crayfish, and snails littered the creek bed. Service biologists organized a major salvage effort to save as many of the mussel species as possible, including several hundred individuals of two federally endangered species; shiny-rayed pocketbook (*Lampsilis subangulata*) and oval pigtoe (*Pleurobema pyriforme*). Approximately 1,375 live mussels were salvaged from the few remaining pools and patches of mud. The mussels were transported to the Warm Springs National Fish Hatchery where temporary facilities were set-up to hold them. Two weeks later, a permanent building was completed to hold and study the mussels throughout the year. The hatchery staff conducted water quality studies and tried to mimic their habitat to acquire information on how to maintain mussels in captivity, how to propagate certain species, and how to identify potential host species for mussel glochidia. During June 2001, after normal stream flows returned, hatchery and Ecological Services staff marked approximately 1,050 of the surviving mussels at Warm Springs for additional monitoring. The mussels were returned then to the original salvage sites within Spring Creek. A total of 1,123 of the salvaged mussels survived one year of captivity at the hatchery.

In 2001, while adult mussels were in captivity, propagation techniques were developed, glochidia were collected from several species, and transformed juveniles were collected, and kept alive for six months. Juveniles from two surrogates: *Villosa lienosa* (Little Spectaclecase) and *Villosa vibex* (Southern rainbow) of endangered species and one federally listed species, the *Lampsilis subangulata* (Shiny-rayed pocketbook), were successfully stocked after six weeks in captivity in three different locations within Spring Creek. Total numbers of juveniles stocked: Shiny-rayed - 5,582, Southern rainbow - 2,627 and Little spectaclecase - 940. Another twenty thousand juveniles mussels were retained in the lab for additional work.

Studies have continued throughout FY-02 in host identification, amount/rate of glochidia infestation, adult and juvenile nutrition, transportation, captive refugia, water quality, marking, and monitoring, and other evaluation techniques.

Historical Review of Efforts to Restore Four Federally Protected Fish Species to Abrams Creek, Great Smoky Mountains National Park.

Patrick L. Rakes and J. R. Shute
Conservation Fisheries, Inc.

Restoration efforts in Abrams Creek, beginning in 1986, involving reintroductions of four federally protected fish will be reviewed. These include: the smoky madtom, Noturus baileyi; the yellowfin madtom, Noturus flavipinnis; the duskytail darter, Etheostomapercnurum; and the spotfin chub, Erimonax (formerly Cyprinella) monachus. A historical summary of all stockings will be presented along with monitoring results. Successes and problems will be discussed along with future plans for the project.

Genetic Origin Characterization of Wild Brook Trout Populations in North Carolina

Peter F. Galbreath, James C. Borawa, Lee W. Sherrill, III, and Nathan D. Adams
North Carolina Wildlife Resources Commission

Since 1990, the North Carolina Wildlife Resources Commission (NCWRC) has conducted intensive sampling of mountain streams in western North Carolina to develop a database describing the distribution of trout species within the region. As part of this effort, the NCWRC has also coordinated efforts to determine the genetic origin of the wild brook trout populations. Brook trout native to this region (south of the New River watershed in Virginia) comprise a strain (race) which is genetically distinct from those native to the northern portion of the species' range. However, supplementation of NC streams has been performed over the previous century with hatchery stocks, each of which has a northern origin(s). To an unknown extent, these hatchery brook trout established themselves and/or interbred with the native brook trout. The result is that within NC, wild brook trout populations are made up of fish which are either: native Southern Appalachian strain, solely hatchery-derived northern strain, or of mixed genetic origin. As of August 2002, a total of 207 wild brook trout populations had been sampled and tissues subjected to protein electrophoretic analyses useful in making a genetic origin determination. Of the 207 populations, 75 (36%) are native Southern Appalachian strain, 21 (10%) are hatchery-derived northern strain, and 111 (54%) are of mixed genetic origin, although significant differences in these percentages exist between basins (Atlantic versus Mississippi drainage) and between watersheds within basins. This information will be used when considering particular populations/streams for protection and/or restoration efforts. Sampling and analysis of additional populations in collaboration with Western Carolina University (WCU) is ongoing. Also, research to measure physiological and behavioral differences between Southern Appalachian and naturalized northern strain populations has been initiated at WCU.

Propagation of Endangered Freshwater Mussels at the Freshwater Mollusk Conservation Center, Virginia Tech

Jess W. Jones and Richard J. Neves
Virginia Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife Sciences, Virginia Tech

The Freshwater Mollusk Conservation Center was the first in the United States to produce, culture, and release endangered juvenile mussels. Initial research to identify host fishes, develop production techniques, and test culture technology required roughly 10 years of experimentation by a cadre of graduate students. The first endangered juvenile mussels were released in 1997, and releases have occurred in each subsequent year to rivers in Tennessee and Virginia. In 2002, a total of nearly 108,000 endangered juveniles of 7 species were released into the Clinch, Powell, and North Fork Holston rivers. Since 1997, more than 366,000 endangered mussels of 10 species have been released, funded by contracts from various agencies. A grant from the National Fish and Wildlife Foundation in 2000 provided funds to construct a small facility dedicated to the conservation of endangered mollusks on the campus of Virginia Tech. With the additional space provided by this new facility, we hope to increase the number of species and rivers to benefit from our propagation program.

Biological Restoration of Two East Tennessee Tailwaters Following Water Quality Improvements at Hydroelectric Plants

Edwin M. Scott Jr.
Tennessee Valley Authority

Biotic communities in the lower segments of the French Broad and Holston river improved as a result of Tennessee Valley Authority's (TVA) Reservoir Releases Improvements (RRI) program in the mid 1990s.

RRI improved water quality by providing minimum flows of oxygenated water from Douglas and Cherokee dams, thereby helping fish and other aquatic species by providing more favorable year-round conditions. For species which historically occurred in the upper Tennessee River system, but are unlikely to return on their own, federal and state agencies, universities, and environmental groups are working together on reintroduction efforts.

To date, state-endangered lake sturgeon, spiny riversnails, and 13 non -imperiled mussel species have been released into Douglas and Cherokee tailwaters.

If monitoring shows success of these ongoing efforts, they could be expanded to include additional state and federally listed aquatic species.

Using Satellite Imagery and GIS Analysis to Guide Reforestation Efforts on Mined Lands in the Clinch and Powell River Valleys

Brad Kreps
The Nature Conservancy – Clinch Valley Program

The Nature Conservancy's Clinch Valley Program works in Southwest Virginia and Upper East Tennessee to protect the watersheds of the Clinch, Powell, and Holston Rivers. The free-flowing portions of these rivers provide habitat for 19 species of rare fish and are the sole remaining sanctuary for a collection of globally rare freshwater mussels. In the past decade, The Nature Conservancy has implemented a variety of conservation strategies including land acquisition, stream bank restoration, conservation forestry, mussel propagation, ecotourism, and sustainable community development.

This talk will focus on the geographic analysis component of The Nature Conservancy's ongoing assessment of the potential for reforestation and carbon sequestration on abandoned and partially reclaimed mined lands in the upper Clinch and Powell River Valleys. Aquatic conservation targets in these areas are threatened by run-off from previously mined lands and reforestation is viewed as an important tool for curbing negative impacts and enhancing the viability of rare species.

Analysis of Lands at TM and ETM images from 1987, 1995, and 2002 has been the principle tool for identifying and assessing change on abandoned and reclaimed mined lands in Southwest Virginia. These previously mined areas are the potential reforestation sites being targeted by the Nature Conservancy and its partners. Once identified on the landscape, these sites are combined with other spatial data and analyzed in a GIS to assess their relative degree of environmental impact and to rank their potential for attracting investors to support reforestation and carbon sequestration projects. The overall goal of the GIS analysis is to prioritize mined sites in such a way that reforestation efforts can be carried out systematically to achieve maximum ecological benefit. In the context of this project, the potential for integrating image analysis and Geographic Information Systems into overall conservation planning will be discussed.

Aquatic Restoration and Enhancement in a Regulated River: An Example of a Collaborative Effort from the Lower Little Tennessee River Basin

Mark A. Cantrell
U.S. Fish and Wildlife Service

Natural resource managers face many difficulties in assessing impacts of existing projects, including hydroelectric facilities built in the early 1900's in areas where pre-project fish assemblages were not sampled. Assessing impacts of flow regulation and reservoir-induced habitat fragmentation without pre-project information requires managers to define objectives for restoration based on indirect evidence of the pre-project status of the system and knowledge of modern constraints which may extend beyond the boundaries of a given project. I summarize the challenges we encountered and strategies used to develop recommendations for aquatic

restoration for the Cheoah River, a tributary to the lower Little Tennessee River in North Carolina. We focused on fish and mussels to define objectives for flow regime restoration. We used detail fish distributional information from the literature, sampling records, and museum collections, as well as comparisons of physiographic and other characteristics of sister drainages in the area to derive a list of known and possibly occurring species from the two regulated rivers which are currently bypassed. We attempted to infer this natural fish assemblage, along with relicensing studies for the Tapoco Project, a system of four dams between TVA's Fontana and Tellico projects, to form a basis for recommending changes in flow and temperature regimes to restore systems to a more natural state, and judge the potential impact of operational changes proposed for other reasons. For example, thermal regimes of flows restored to bypassed reaches will significantly influence how fish assemblages respond. Flow delivery to the Cheoah River (e.g, cold-deep or warm-shallow reservoir outlets) and thermal alterations of the Little Tennessee River by hypolimnetic Fontana discharge are thus important considerations for managing these systems. Other flow-related questions involve provision and scheduling of flows for whitewater recreation in the Cheoah River, and dominance of the Little Tennessee River hydrograph by TVA operations. Natural resource agencies have requested flow regimes with seasonal variation and periodic (annual and multi-annual) disturbance events in order to improve aquatic and riparian conditions and restore functions of more natural patterns of flow regime variability. Following habitat restoration with natural-like flow releases, some species, excluded by these projects for many decades, may still be unable to recolonize target areas due to migration barriers or lack of nearby source populations. We expect that reconstruction of a target assemblage will require translocation of Little Tennessee genetic stock. These restoration targets should be regarded as scientific hypotheses, and the means used to approach them viewed as large-scale experiments amenable to verification, and where feasible, adaptive management.

BIOTIC INTEGRITY AND THE TMDL PROCESS

Thursday, November 7

Session Chair: Mike Spencer, Georgia Department of Natural Resources

Using Geographic Information Systems to Support Total Maximum Daily Load Development in Georgia

Thomas Litts, Patti Lanford, Brian Shaner, Robby Bowen, and James Dowd
Georgia Department of Natural Resources, Wildlife Resources Division

The Georgia Department of Natural Resources Stream Survey Team (GaDNR-SST) assesses fish communities in wadeable streams throughout Georgia, using Index of Biotic Integrity (IBI), the modified Index of Well-being (IWB), and a habitat assessment. The IBI is used in conjunction with these other indices to help identify point and non-point source pollution in support of the GaDNR Environmental Protection Division's (GaDNR-EPD), Total Maximum Daily Load program.

To date, the GaDNR-SST has surveyed more than 600 streams in the Southeastern Plains, Piedmont, and Ridge and Valley ecoregions of Georgia. Geographic Information Systems (GIS) interfaced with an external relational database management system have enabled the GaDNR-SST develop and maintain a comprehensive database representing this sampling effort. The GaDNR-SST has developed custom software using Environmental Systems Research Institute's (ESRI) Arcview, the Avenue Scripting Language, Microsoft Access and Visual Basic for Applications (VBA) to automate many of the tasks associated with this process including data entry, database management, IBI and IWB scoring, watershed delineation, and report generation.

Ongoing U.S. EPA TMDL-related Projects in the South

David Melgaard, U.S. EPA, Region 4

No abstract.

THE SOUTHERN FOREST RESOURCE ASSESSMENT: IMPLICATIONS FOR THE SOUTHERN APPALACHIANS

Thursday, November 7
Session Chairs: Paul Mistretta and Jim Brown, USDA Forest Service

Aquatic Animals and Their Habitats

Jim Herrig* and Peggy Shute**
*USDA Forest Service, Cherokee National Forest; **Tennessee Valley Authority

The diversity of aquatic species: crustaceans, insects, mussels, snails, fish, amphibians, and reptiles, in the South is practically unrivaled in any comparably-sized area in the world. The global significance of this diversity cannot be overstated. However, many of these species are imminently threatened with extinction.

The exceptional species diversity within this limited area has lead to a high degree of endemism. Impacts to aquatic communities from sediment, dam construction, groundwater depletion, and water pollution which in other areas would cause only localized extirpation may, actually cause total extinction for some of these species in the South.

Raising public awareness and increasing scientific research into the taxonomy and life histories of these animals is vitally important to their survival. Protection and restoration of key aquatic habitats along with augmentation and re-introduction of imperiled species must be supported by governmental and private organizations as well as the public.

Changing Demographics, Outdoor Recreation, Values, and Attitudes

H. Ken Cordell* and Michael A. Tarrant**
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The South's forests are both important to, but at the same time in the path of the region's growth. Research on social change for the Southern Forest Resources Assessment shows that rapid population growth and changing demographics are fueling growth of recreation demands and adding stresses on public and private forests. Concurrent with population and demand growth have been significant value and attitudinal changes among both land-owning and non-owning residents of the region. Southerners are clearly becoming greener. An opportunity to mitigate stresses on southern forests may lie in tapping Southerners' growing environmentalism to form effective cooperatives involving public and private interests and forestry professionals.

Population growth and diversification, land development, growing demand for recreation, and changing values are prominent among the many social changes that will most certainly shape the future of the South's forests and their management. The Southern Forest Resource Assessment (SFRA) addressed population and demographic changes in the region, land use changes, attitudes and values of Southerners toward forests and their management, and the effect of forests and

their uses on quality of life in the South. This presentation summarizes the demographic, recreation demand, value, and attitude trends uncovered by the SFRA.

Forest Health

James D. Ward and Paul A. Mistretta
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Both native and exotic insects and diseases affect southern forest health and vitality and therefore have ecological and economic effects. In addition there are abiotic factors, such as climate change and air pollution, which may interact with and sometimes exacerbate the dynamics of insect and disease outbreaks. The Southern Forest Resource Assessment (SFRA) addressed questions regarding the health of forest ecosystems and the management of identified potential problems. This presentation focuses on current and potential future pest problems and implications for forest management in the Appalachian sub-region.

Terrestrial Ecosystems and Wildlife Conservation

Margaret Katherine Trani (Greip)
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Southern population and economic growth are putting pressure on wildlife species and the communities that support them. Loss of habitat is the primary reason why 132 southern terrestrial vertebrate species are of conservation concern. In addition, other factors such as environmental contaminants, exploitation, development, stream modification, and wetland degradation are contributing to this concern. A high proportion of rare forest communities are imperiled to some degree; fourteen have suffered an estimated ninety-eight percent loss of area since European settlement. In the midst of continued regional population growth, biological diversity is emerging as a critical conservation issue.

Land Use and Timber Outlook

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From 1700 to 1930, land clearing for agriculture and timber production completely restructured southern ecosystems. Since the 1940s there has been little net change in forest area in the South. However, there have been large offsetting changes: forests have been converted to urban and agriculture uses in some places, and agricultural land has been converted to forests in others. Forecasting models indicate that 31 million forest acres will be lost to urbanization between 1992 and 2040. Most forest loss is expected to be concentrated in the eastern part of the South. These losses are forecast to be partially offset by conversion of 25 million acres from agricultural land to forestland in the same time frame.

Between 1953 and 1997, the South's timber production more than doubled, its share of US production increased from 41 to 58 percent, and its share of world production increased from 6.3 to 15.8 percent. The region now produces more timber than any other country in the world. The mix of wood products from the South is diverse. The largest categories include softwood sawlogs, softwood pulpwood, and hardwood pulpwood.

Timber market models forecast that timber production in the United States will increase by about one-third between 1995 and 2040. Nearly all of this growth will come from the South, where production is forecast to increase 56 percent for softwoods and 47 percent for hardwoods.

HEMLOCK ADELGID INVASION IN THE SOUTHERN APPALACHIANS: IF YOU'RE NOT CONCERNED NOW, YOU NEED TO BE

Thursday, November 7
Session Chair: Carroll Schell, Great Smoky Mountains National Park

Hemlock Woolly Adelgid and the Disintegration of Hemlock Ecosystems

Richard A. Evans
Delaware Water Gap National Recreation Area

Hemlock woolly adelgid (*Adelges tsugae*), a non-native insect from Asia, was found within Great Smoky Mountain National Park in the spring of 2002. Hemlock woolly adelgid (HWA) causes defoliation and mortality of eastern hemlock (*Tsuga canadensis*) trees, especially when other stressors such as drought conditions also exist. Eastern hemlock is the most shade tolerant tree in the eastern United States, and has justifiably been called the "redwood of the East." HWA was found within Delaware Water Gap National Recreation Area (DWG NRA) back in 1989. Research and monitoring conducted in DWG NRA since 1993 has indicated that decline of eastern hemlock forests will bring about major ecological changes and loss of biodiversity. Late successional, ecologically distinctive eastern hemlock forests can disintegrate into common "weed patches."

Defoliation and mortality of hemlock forests means the loss of distinctive habitat and microclimates, and reduced local and landscape scale biodiversity. The plant species most likely to expand in declining hemlock stands are mainly hardwoods and invasive alien species that will not provide habitat or ecological functions anything like those of eastern hemlock. Regeneration of native tree species may not even occur in areas with intensive browsing by white-tailed deer (*Odocoileus virginianus*). The distribution and abundance of a number of neo-tropical migrant and other bird species will very probably decline with hemlock forest decline. The temperature and hydrologic regimes of small streams within hemlock dominated watersheds or riparian areas will probably become less stable; in particular, these streams will become warmer and more likely to dry-up in summer. The distribution, abundance, and condition of native brook trout will probably decline, and the diversity of aquatic insects in small streams draining hemlock forests will probably decline. Rates of nitrogen mineralization and nitrification will increase in affected areas. Nitrate and cation (e.g. ammonium, Ca, Mg, Al) leaching in soil will increase, possibly leading to significant export of these nutrients to streams, and depletion of soil nutrients.

Biocontrol agents and pesticides should be used judiciously to suppress HWA populations and maintain hemlock tree health. Active and innovative vegetation management will be necessary to try to mitigate effects of hemlock decline, prevent invasions of non-native plants, and restore the ecological conditions as much as possible in affected hemlock stands.

The History of HWA Infestation at Shenandoah National Park, and What We Have Learned

James Akerson
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Shenandoah National Park was impacted early in the east-coast infestation. The hemlock woolly adelgid (HWA) was discovered at Shenandoah in 1984 during a hemlock borer epidemic associated with a drought cycle. Attempted control methods have included acephate injection, dicrotophos injection, horticultural oil plus water spray, insecticidal soap plus water spray, and imidacloprid injection.

The summary of the Shenandoah National Park forest health survey 1990/91-to-present indicates that hemlock tree health has declined steadily. Contributing factors to this decline include hemlock woolly adelgid, mild winters that did not suppress HWA populations, and several drought cycles. The summary of risk assessment (geographical & silvicultural modeling done in cooperation with USGS-BD) indicates that typically suitable hemlock sites inhibit HWA development longer than harsher sites. Therefore, higher elevation, northern-facing, sideslopes have lower tree mortality risk than other sites.

The future of hemlock at Shenandoah National Park is better for individual hemlocks than for hemlock stands or groups. Transport of HWA from tree to tree by breeze kiting and upon mammals and birds is enhanced in hemlock groups.

The Impact of the Hemlock Woolly Adelgid in New Jersey 1988-2002

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The hemlock woolly adelgid (HWA) is negatively impacting hemlock stands in New Jersey and mortality in the most heavily infested stands is increasing and is above 90% in some plots. The longer and the more times that a stand has been heavily infested, the greater the mortality. Tree mortality shows up 5-6 years after a stand has been heavily infested the first time, the HWA population crashes and the remaining trees recover. The HWA increases its population again, and the mortality substantially increases. It has taken about ten to twelve years from the initial heavy infestation to see mortality level of over 90% in certain stands. Other factors are involved such as site conditions, water supply, and secondary pests, but the one factor that is consistent across the stands where the mortality is the greatest is a heavy population of HWA. The USFS crown rating of foliage transparency increased in the monitored stands as the HWA population increased. At a threshold of 60% crown transparency, the tree mortality in the stands increased significantly. There are15-20 remaining moderately impacted hemlock stands in New Jersey and they are primarily in the northwestern corner of the state.

Approximately 250,000 Pseudoscymnus tsugae (Coleoptera: Coccinellidae) have been released in New Jersey since 1998 in an effort to control the hemlock woolly adelgid. Approximately an additional 240,000 have been sent to other states. The beetles have successfully overwintered and reproduced in New Jersey but due to a drop in adelgid populations and a decline in hemlock tree health over much of the state, it is too early to evaluate their eventual effectiveness. When P. tsugae are released, they disperse upwards and outwards as the season progresses.

Hemlock Woolly Adelgid Monitoring And Management in Great Smoky Mountains National Park

Glenn Taylor and Scott Kichman
Great Smoky Mountains National Park

The non-native hemlock woolly adelgid, Adelges tsugae (Annand) was first discovered in the 20-mile section of Great Smoky Mountains National Park in spring 2002. Since then, park resource managers have been using integrated pest management techniques for control and geographic information systems to document new hemlock woolly adelgid infestations, assess severity and extent

of infestation and determine appropriate treatment techniques. This management method creates a digital record for future evaluation that includes site information and a treatment log.

A Landscape Analysis of Hemlock Decline in New Jersey

Denise D. Royle
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Eastern hemlock (Tsuga canadensis) in New Jersey and neighboring states has been seriously damaged by the feeding activity of an introduced insect pest, the hemlock woolly adelgid (Adelges tsugae). Knowing where the hemlocks are located and to what extent they have been affected by the adelgid is a crucial step in managing the hemlock forest ecosystem. In this presentation I will summarize 1) the mapping and monitoring of hemlock forest condition across the Highlands landscape of northern New Jersey using multiple dates of remotely sensed data and change detection techniques; 2) spatial and temporal patterns of hemlock decline; and 3) analyses exploring the effects of site factors on the rate of change (decline, improvement) in hemlock condition.

Hemlock Woolly Adelgid Management– Proven Strategies and New Horizons

Rusty Rhea
USDA Forest Service, Forest Health Protection

Hemlock woolly adelgid, Adelges tsugae, an insect pest species native to Asia, was first identified in the eastern United States in the early 1950s near Richmond, Virginia. Since then this introduced insect pest has become well established in hemlock forests from New England into the southern Appalachian Mountains. This tiny insect pest threatens the existence of natural stands of eastern and Carolina hemlock throughout their range. Significant impacts to the hemlock resources in Connecticut, Virginia, and New Jersey foretell the future of this important tree species across the range. Hemlocks play an important role in many settings throughout eastern North America. Hemlock is an important ornamental and landscape tree as well as a keystone species in many unique forested ecosystems. Eastern hemlock species in natural settings occur on a multitude of sites but are often found in riparian areas where they play a vital and in many cases irreplaceable role. The adelgid has the potential to eliminate both Carolina and eastern hemlock from their natural settings. Once infested by the hemlock woolly adelgid (HWA) it is eminent that the hemlock tree will succumb to the adelgid and die. Intervention is possible and the protection of hemlocks in ornamental settings is possible. This protection is achieved via chemical insecticides. An array of insecticide alternatives is available for treating hemlocks in these settings, including foliar sprays and systemic treatments. The keys to using chemicals to control adelgid infestations are early detection of the adelgid infestations and rigorous timely treatment programs. Unfortunately the majority of the hemlocks in the east are not candidates for chemical control. There are no feasible chemical treatment options for natural settings. This is due to many factors including accessibility, economics, and environmental constraints. Within these natural areas we must rely on other, more sensitive methods. To date the emphasis for developing control possibilities for forests has concentrated on biological control. The use of native or non-native predator insects or pathogens seems to hold the most promise for controlling adelgid populations in natural settings. There has been some progress in the area of predatory insects capable of limiting adelgid populations. Projects are underway to evaluate these potential biological control candidates. These projects are in various stages and range from many field releases to laboratory testing. Through continued research and rigorous study scientists may find the means to control and manage the HWA and maintain this valuable hemlock resource.

MANAGING NON-TIMBER FOREST RESOURCES AND AIR QUALITY

Thursday, November 7
Session Chair: Paul Mistretta, USDA Forest Service

Non-Timber Forest Products: The Need to Measure, Mitigate and Manage Human Impact on These Resources

James L. Chamberlain
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Although not covered in the Southern Forest Resource Assessment, non-timber forest products (NTFPs) provide significant social, ecological and economic benefits to the people and forests of Southern Appalachia. Non-timber forest products include hundreds of species collected for medicinal purposes; dozens of species harvested for the floral and landscape industry, numerous edible plants, as well as an assortment of plants and plant parts for crafts. Local people have harvested products, other than timber, for personal use and to supplement their income since the first European settlers migrated to the Appalachian Mountains. Today, the sale of non-timber forest products generates tens of millions of dollars for the region's economy. Local people, living in economically depressed counties, rely on NTFPs to provide extra earnings. Many civic groups generate much needed income by digging ramps (wild onions) and organizing festivals around these malodorous spring herbs. Non-timber forest products are a thread of the fabric that makes up the social structures of the Southern Appalachians. Traditional knowledge about NTFP uses and management practices has passed through generations within families. The gathering of some NTFPs is a spring ritual among community members, and a chance for intergenerational bonding. And yet, there is growing concern that uncontrolled and non-managed harvesting is having serious and possibly irreversible ecological impact on plant populations. This last year, the Great Smokey Mountain National Park banned ramp digging. Working with industry representatives, the U.S. Forest Service has implemented a restricted season on galax, a ground cover harvested for the floral industry. Serious consideration is being given to terminating the export of ginseng roots, which would fundamentally shut down digging. These actions, although they may be necessary to preserve the species, will have significant social and economic impact.

There is an urgent need to determine, minimize and manage the human impact of NTFP harvesting. There are few standardized methods to measure the impact of harvesting on plant populations, but those studies that have been done hold great promise. Very little effort has been made to either mitigate or manage harvesting. This presentation examines the issues that impede efforts to measure, mitigate and manage non-timber forest products harvesting in Southern Appalachia. It proposes actions that can be undertaken to improve management of southern forests to conserve non-timber forest resources.

Visibility Improvement – State and Tribal Association of the Southeast (VISTAS)

Jim Renfro
Great Smoky Mountains National Park

The organization called Visibility Improvement - State and Tribal Association of the Southeast (VISTAS) represents 10 states plus local and tribal agencies in the southeastern United States for the purposes of regional planning associated with the management of regional haze, visibility, and related air quality issues. VISTAS is a collaborative effort managed and funded under the Southeastern States Air Resource Managers, Inc. (SESARM). VISTAS will conduct the technical analyses and modeling necessary to support the development of State and Tribal air quality implementation plans (SIP and TIP) by the individual states and tribes as required by the regional haze rule. Stakeholders are encouraged to participate in the VISTAS workgroups to provide input into the design and implementation of the technical analyses.

This presentation will evaluate existing spatial and temporal trends in visibility and fine particulate matter across the VISTAS region and the role of meteorology in those trends. Composition of fine particulate matter will be presented as a function of different seasons of the year, rural vs. urban location, and coastal versus upland typography.

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