COMPASS
Recent Publications
of the Southern Research Station
Spring 2004

The Southern Research Station of the USDA Forest Service produces Compass, a quarterly catalog of recent publications and technologies. The Southern Station works with universities, other Government agencies, corporations, and non-government organizations on studies that contribute to the sustainability of southern forest resources. We employ about 150 research scientists in disciplines ranging from tree physiology to the social sciences, from genetics to landscape ecology. Each year, our scientists' names appear as authors on 500 to 600 journal articles, research papers, resource assessments, handbooks, videotapes, and computer programs.

In addition to featuring a few highlights, Compass lists our most recent publications. You can order hard copies, or download electronic versions from our Web site **(www.srs.fs.usda.gov)** by using the reference number in bold print. We welcome input on the quality of our research program and our success in offering products that meet customer needs. For more information, contact Claire Payne at 828-257-4392.

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The Center for Bottomland Hardwoods Research

Only 20 percent of the pre-European forests of the Lower Mississippi Alluvial Valley remain. Since many of these cleared lands have been abandoned or exist as marginally productive farms, tremendous conservation opportunities and challenges exist to restore the lands to productive forests, helping the economy of the area at the same time. Set in the heart of the Mississippi Delta, the **Center for Bottomland Hardwoods Research** (CBHR) generates excitement and energy much like its physical surroundings: layer upon layer of interesting topics, bound up with the people, the creatures, the land, and the culture. It would take near total immersion in their research to realize the breadth of work the scientists and technicians pursue. **Ted Leininger** leads the unit, with its main site in Stoneville at the Southern Hardwoods Laboratory, and branch locations in Oxford, MS; Starkville, MS; and Pineville, LA. The Center for Bottomland Hardwoods (SRS-4155) focuses on bottomland hardwoods and upland stream systems. Research areas include:

1. Regeneration and reproductive biology of bottomland hardwood species
2. Stand development and forest health
3. Terrestrial and aquatic fauna
4. Process and restoration

CBHR scientists are involved in more than 100 studies and 52 cooperative agreements with universities throughout the South, elsewhere in the United States, and other countries. Some projects involve:

- Regenerating forests with cottonwood nurse trees for Nuttall oak seedlings
- Detecting wetwood bacteria in red oaks
- Determining roles of wood-boring wasps as vectors of wood-decay fungi
- Underplanting beneath a partial overstory to establish cherrybark oak regeneration in a minor bottom
- Releasing suppressed cherrybark oak and green ash from overstory competition
- Inventorying freshwater mussels and crayfish on the National Forests in Mississippi to assess the effectiveness of best management practices and to address the viability of fishes and other aquatic organisms
- Measuring resistance and resilience of fish communities to extended, severe drought in Upper Coastal Plain streams

- Evaluating fish relationships with large wood in small streams
- Examining freshwater mussels' populations and habitat
- Assessing distribution and habitat use by crayfishes
- Improving methods to establish and grow bottomland hardwood forests through artificial regeneration by altering seedling environment

Discovering Pondberry

Several Stoneville projects involve pondberry (*Lindera melissifolia*), a federally listed endangered plant that grows in seasonally flooded wetlands and on the edges of sinks and ponds in only six States. Researchers are just beginning to understand the biology and ecology of pondberry and its importance within bottomland hardwood forest ecosystems. **Paul Hamel**, **Margaret Devall**, **Nathan Schiff**, and **Carl Smith** wrote *Hermit Thrush Is the First Observed Dispersal Agent of Pondberry (Lindera melissifolia).* They discovered that winter behavior of the hermit thrush constrains seed dispersal to short distances. The Center for Bottomland Hardwoods Research built a greenhouse in Stoneville in which to conduct controlled experiments examining the growth responses of pondberry to variables such as flooding and light availability. Other studies of the physiological and growth responses of pondberry to the interactive influences of flooding and light availability are being conducted in an outdoor, large-scale flooding facility about an hour's drive south of the Southern Hardwoods Laboratory. These studies are part of a multi-year project funded by the U.S. Army Corps of Engineers to learn as much as possible about the ecology, ecophysiology, population genetics, pathology, and seed biology of pondberry. Interest in this endangered species has been brought on by concern over its continued viability in the face of ongoing flood control measures in the lower Mississippi Delta.

Discerning Aromas with the Electronic Nose

The electronic nose is a chemical-sensing device containing aroma-reactive sensors capable of obtaining a digital fingerprint (aroma signature) of chemicals released from any source. The instrument can distinguish a wide range of diverse sample mixtures by their unique smells which identify the source. Most previous applications have been in industrial food production, processing, and manufacturing. For example, potato chip factories began using this electronic aroma detection (EAD) technology in the mid-1990s for quality control to maintain the unique aroma that defined their chips. Wineries have also used the electronic nose to analyze, perfect, and maintain the aroma bouquet of their wines. Southern Research Station plant pathologist **A. Dan Wilson** and colleagues **Charisse Oberle** and **Dan Lester** modified the

electronic nose's architecture (plumbing) to detect much lower concentrations of aromas produced by microorganisms. As explained in *Development of Conductive Polymer Analysis for the Rapid Detection and Identification of Phytopathogenic Microbes*, the electronic nose accumulates a reference library of aromas using an artificial neural network, a 32-sensor array, and digital pattern-recognition software to record them as electronic aroma signature patterns (EASPs). This article reports on the development of conductive polymer analysis (CPA) for the rapid identification and discrimination of phytopathogenic microbes based on their production of unique mixtures of volatile metabolites recorded as diagnostic EASPs. It sounds like *Star Trek's* Commander Data has stepped off the *Enterprise* into the 21st century.

Forestry and plant pathology applications for the electronic nose include identifying bacterial wetwood in hardwoods and diagnosing oak wilt. The electronic nose, which resembles a sophisticated hotel-room refrigerator in appearance, can identify microbes in culture and in plant tissues. Previously, most fungi have been identified by their sexual stage. Now the e-nose can complete the analysis within 10 minutes. The addition of CPA technology by Wilson and his team offers considerable potential for a wide range of applications in plant pathology from disease diagnosis and pathogen and host identification *in vitro* to detection and identification of plant pathogens *in vivo*, as well as mixed infections, toxic metabolites (toxins), and pesticides. The authors developed methods for the application of CPA as a new diagnostic tool for the detection and identification of diseases caused by plant-pathogenic bacteria and fungi. CPA also offers the potential for discriminating specific mixtures of pathogens and specific host-microbe combinations within host tissues. Finally, the rapid analysis possible with this technology could prove useful in the detection of plant and human pathogens for homeland security applications as real-time identifications become feasible using portable EAD devices.

Tracking the Cerulean Warbler

The USDA Forest Service participates in an international effort to maintain viable populations of the cerulean warbler—a forest songbird once common in the Eastern United States, now rarely seen. **Paul Hamel**, research wildlife biologist with the Center for Bottomland Hardwoods Research, provides an overview of the status of the small blue bird in *How We Can Learn More About the Cerulean Warbler (Dendroica cerulea)*. The article details the formation of the Cerulean Warbler Technical Group (CWTG) and its efforts to focus research and use the results to conserve the species. Migrating to the lower slopes of the Andes in August, cerulean warblers return in April or May to build nests in the upper canopy of forests in the Southeastern United States. Since

1966, populations of the species have declined an estimated 70 percent, with the precipitous drop being tied to fragmentation and destruction of habitat in both breeding and winter ranges. For its breeding range, the cerulean warbler needs large areas of mature deciduous forest, often along streams; in the Southeastern United States, much of this habitat has been lost to agriculture or development. In its winter range in South America, forests are also being lost to agriculture.

Hamel summarizes what is currently known about the biology of the cerulean warbler and the research questions that remain to be answered. "Cerulean warblers are very difficult to study in the field because they nest and forage in the high canopy," he says. "Fortunately, we have learned a few tricks, such as surveying from canoes and using carved wooden decoys to attract the males. We have also developed genetic tools to help us track the movement of specific populations. We are seeing a dramatic shift in range. Land use change is certainly one cause, but climate change—either short- or long-term—may also be a factor." Surprisingly little is known about the behavior and population ecology of the cerulean warbler, mostly due to the difficulty of catching females, locating nests, and observing the young. "Most glaring is our ignorance of the cerulean warbler during the non-breeding season," says Hamel. "So far, we only have two published studies from South America."

Hamel has been instrumental in the CWTG, an international collaboration formed to develop a proactive, broad-based strategy to conserve the cerulean warbler. "We followed the example of other ad hoc conservation groups, such as the Louisiana Black Bear Conservation Committee, in our basic philosophy of including as many partners as possible," says Hamel. "We agree to leave agendas at the door, and to keep the focus on identifying meaningful solutions through sound science, clear communication, and trust. Our hope is that this group can serve as a model for other efforts to conserve forest bird species." The partnership includes industry, State and Federal governments, nongovernmental organizations, and universities in North and South America. CWTG operates approximately around the breeding and non-breeding seasons. The breeding season group is developing a research design to document the effect of land use change and to determine which forest management methods benefit the species. The non-breeding season group, El Grupo Ceruleo, is gathering information on the winter range of the cerulean warbler by developing a network of observers and conducting an analysis of habitat in South America.

In March 2003, El Grupo Ceruleo, which includes scientists from both the breeding and non-breeding ranges, met in Ecuador to discuss the conservation of the cerulean warbler and other migratory and resident Neotropical birds and to outline research needs. The USDA Forest Service and the Nature Conservancy

provided funding for South American biologists to conduct new research on cerulean warblers in winter 2003 and winter 2004.

Research findings in North America confirm habitat loss as the main reason for the decline of cerulean warbler populations. Studies also found a growth in populations of cerulean warblers in areas where forests are regenerating. "We have some evidence that we can regenerate and manage forests to create or improve habitat for the cerulean warbler," says Hamel, "but we need to act quickly and throughout the bird's range."

27 Connor, Kristina F., ed. 2004. **Proceedings of the 12th biennial southern silvicultural research conference.** Gen. Tech. Rep. SRS-71. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 594. p.

15 Hamel, Paul B.; Dawson, Deanna K.; Keyser, Patrick D. 2004. **How we can learn more about the cerulean warbler (*Dendroica cerulea*).** The Auk. 121 (1): 7-14.

6 Lockhart, B.R. 2004. **All species have value**. Journal of Forestry. 102(1): 60.

8 Skojac, Danny; Devall, Margaret S.; Parresol, Bernard R. 2003. **Additions to the flora of Cleveland County, Arkansas: collections from Moro Bottoms Natural Area, a State-protected old-growth bottomland hardwood forest.** SIDA. 20 (4): 1731-1736.

9 Smith, Carl G., III; Hamel, Paul B.; Devall, Margaret S.; Schiff, Nathan M. 2004. **Hermit thrush is the first observed dispersal agent for pondberry (*Lindera melissifolia*).** Castanea. 69 (1): 1-8.

10 United States Department of Agriculture, Southern Research Station. 2002. **A guide to finding pondberry** [Brochure]**.** Science Update SRS-003. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. [Not paged].

34 Wilson, A.D.; Lester, D.G.; Oberle, C.S. 2004. **Development of conductive polymer analysis for the rapid detection and identification of phytopathogenic microbes.** Phytopathology. 94: 419-431.

Silvicultural Conference Delivers Results

In February 2003, the 12th Biennial Southern Silvicultural Research Conference drew more than 100 scientists, foresters, and managers to Biloxi, MS to share findings on a broad range of topics. This conference series started in 1980 to give researchers from the former Southern Forest Experiment Station and the former Southeastern Forest Experiment Station an opportunity to meet regularly. In the *Proceedings of the First Biennial Southern Silvicultural Research Conference* (GTR SO-34), the late Phil Wakely wrote,

> I have been asked to picture silvicultural research in what may seem to some of you rather primitive times. The main points I should like to bring out are: (1) the importance and value, readily apparent in those times, of the researcher's intimate personal acquaintance with the plant material being investigated; and (2) the dividends from starting some studies on spur-of-the-moment inspiration or to seize a unique opportunity, without prior clearance from the Director, the Washington Office, or the League of Nations.

Enthusiasm for science and forestry in the field and in the laboratory still drives Forest Service researchers and colleagues from other Federal agencies, State agencies, universities, industry, and professional associations. The biennial meeting continues as a vital mechanism to showcase work in a wide range of silvicultural applications. A list of articles written by Southern Station scientists follows, grouped by conference session and listed in order of appearance in the book.

Wildlife Ecology

Felix, Z.I.; Wang, Y.; Schweitzer, C.J. *Relationships between Herpetofaunal Community Structure and Varying Levels of Overstory Tree Retention in Northern Alabama: First Year Results*

Lesak, A.A.; Wang, Y.; Schweitzer, C.J. *Songbird Community Variation among Five Levels of Overstory Retention in Northern Alabama*

Kilpatrick, E.S.; Kubacz, D.B.; Guynn, D.C., Jr. [and others]. *The Effects of Prescribed Burning and Thinning on Herpetofauna and Small Mammals in the Upper Piedmont of South Carolina: Preliminary Results of the National Fire and Fire Surrogate Study* [Editor's note: Southern Station scientist T.A. Waldrop co-authored this paper.]

Fire Ecology

Callaham, M.A., Jr.; Anderson, P.H.; Waldrop, T.A. [and others]. *Litter Decomposition and Soil Respiration Responses to Fuel-Reduction Treatments in Piedmont Loblolly Pine Forests*

Outcalt, K.W.; Foltz, J.L. *Impacts of Growing-Season Prescribed Burns in the Florida Pine Flatwoods Type*

Shelburne, V.B.; Boyle, M.F.; Lione, D.J.; Waldrop, T.A. *Preliminary Effects of Prescribed Burning and Thinning as Fuel Reduction Treatments on the Piedmont Soils of the Clemson Experimental Forest*

Haywood, J.D.; Stagg, R.H.; Tiarks, A.E. *Relationship between Palmer's Drought Severity Index and the Moisture Index of Woody Debris in the Southern Coastal Plain*

Phillips, R.J.; Waldrop, T.A.; Chapman, G.L. [and others]. *Effects of Fuel-Reduction Techniques on Vegetative Composition of Piedmont Loblolly-Shortleaf Pine Communities: Preliminary Results of the National Fire and Fire Surrogate Study*

Waldrop, T.A.; Glass, D.W.; Rideout, S. [and others]. *An Evaluation of Fuel-Reduction Treatment across a Landscape Gradient in Piedmont Forests: Preliminary Results of the National Fire and Fire Surrogate Study*

Boyle, M.F.; Hedden, R.L.; Waldrop, T.A. *Impact of Prescribed Fire and Thinning on Host Resistance to the Southern Pine Beetle: Preliminary Results of the National Fire and Fire Surrogate Study*

Haywood, J.D.; Sword, M.A.; Harris, F.L. *Fire Monitoring: Effects of Scorch in Louisiana's Pine Forests*

Kuehler, E.A.; Sword-Sayer, M.A.; Haywood, J.D.; Andries, C.D. *Long-Term Effects of Season of Prescribed Burn on the Fine-Root Growth, Root Carbohydrates, and Foliar Dynamics of Mature Longleaf Pine*

Mohr, H.H.; Waldrop, T.A.; Rideout, S. [and others]. *Effectiveness of Fire and Fire Surrogate Treatments for Controlling Wildfire Behavior in Piedmont Forests: A Simulation Study*

Patterson, W.B.; Sword-Sayer, M.A.; Haywood, J.D.; Brooker, S. *Effects of Vegetation Management with Prescribed Fire on Soil Physical Properties in a Young Longleaf Pine Stand*

Renschin, M.L.; Thompson, L.C.; Shelton, M.G. *Long-term Prescribed Burning Regime Has Little Effect on Springtails in Pine Stands of Southern Arkansas*

Zebehazy, L.A.; Lanhan, J.D.; Waldrop, T.A. *Seasonal Avifauna Responses to Fuel Reduction Treatments in the Upper Piedmont of South Carolina: Results from Phase 1 of the National Fire and Fire Surrogate Study*

Natural Pine Management

Guldin, J.M.; Barnett, J.P. *Microclimatic Conditions after Reproduction Cutting in Shortleaf Pine Stands in the Ouachita Mountains*

Edwards, M.B. *Size of Coarse Woody Debris 5 Years After Girdling and Removal Treatments in 50-Year-Old Loblolly Pine Plantations*

Seifert, J.C.; Leichty, H.O.; Spetich, M.A.; Marion, D.A. *Volume, Mass, and Nutrients of Down Woody Debris Following Initial Shortleaf Pine-Bluestem Grass Restoration Activities in the Ouachita Mountains of Arkansas*

Shelton, M.G.; Wittwer, R.F. *Forecasting Shortleaf Pine Seed Crops in the Ouachita Mountains*

Forest Health

Bragg, D.C.; Shelton, M.G.; Heitzman, E. *Relative Impacts of Ice Storms on Loblolly Pine Plantations in Central Arkansas*

Leininger, T.D.; Schiff, N..; Henne-Kerr, J. *Impacts of Insect Defoliation in Cottonwood Plantations in Mississippi*

Heitzman, E.; Guldin, J.M. *Impacts of Oak Decline on Forest Structure in Arkansas and Oklahoma: Preliminary Results*

Growth and Yield

Goelz, J.C.G.; Leduc, D.J. *Reproducibility and Reliability: How to Define the Population of Trees that Represent Site Quality for Longleaf Pine Plantations*

Clark, A., III; Strub, M.; Anderson, L.R. [and others]. *Impact of Early Pruning and Thinning on Lumber Grade Yield from Loblolly Pine*

Busby, R.L.; Chang, S.J.; Pasala, P.R.; Goelz, J.C.G. *Visual Basic Growth-and-Yield Models with a Merchandising Optimizer for Planted Slash and Loblolly Pine in the West Gulf Region*

Huebschmann, M.M.; Lynch, T.B.; Lewis, D.K. [and others]. *A Bid Price Equation for Timber Sales on the Ouachita and Ozark*

National Forests [Editor's note: Southern Station scientist J.M. Guldin co-authored this paper.]

Upland Hardwoods—Natural Regeneration

Spetich, M.A.; Graney, D.L. *Modeling 9-Year Old Survival of Oak Advance Regeneration Under Shelterwood Overstories*

Berg, E.C.; Van Lear, D.H. *Yellow-Poplar and Oak Seedling Density Responses to Wind-Generated Gaps*

Hardwood Intermediate Treatments

Michalek, A.J.; Lockhart, B.R.; Lowe, M.W.; Williams, R.A. *Diameter-Growth and Epicormic Branching Response of an East Texas Bottomland Red Oak Stand 3 Years after Thinning and Fertilization*

Stelzer, E.L.; Chambers, J.L.; Meadows, J.S.; Ribbeck, K.F. *Leaf Biomass and Acorn Production in a Thinned 30-Year-Old Cherrybark Oak Plantation*

Schweitzer, C.J. *First-Year Response of an Upland Hardwood Forest to Five Levels of Overstory Tree Retention*

Dimov, L.D.; Lockhart, B.R.; Chambers, J.L. *Individual Oak Tree Growth in Southern Bottomland Hardwood Stands (Preliminary Results)*

Longleaf Pine

Haywood, J.D.; Bauman, T.A.; Goyer, R.A.; Harris, F.L. *Restoring Upland Forests to Longleaf Pine: Initial Effects on Fuel Load, Fire Danger, Forest Vegetation, and Beetle Populations*

Kush, J.S.; Meldahl, R.S.; Boyer, W.D. *Factors Affecting Survival of Longleaf Pine Seedlings*

Hainds, M.J.; Barnett, J.P. *Container-Grown Longleaf Pine Seedling Quality*

Pine Plantation Silviculture

Grebner, D.L.; Busby, R.L. *How Are Short Rotation Woody Crops Affected by Institutional Factors in the Southern United States?*

Site Amelioration and Productivity

Scott, D.A.; Tiarks, A.E.; Sanchez, F.G. [and others]. *Forest Soil Productivity on the Southern Long-Term Soil Productivity Sites at Age 5*

Pine Planting, Stocking, Spacing

Barnett, J.P.; Brissette, J.C. *Stock Type Affects Performance of Shortleaf Pine Planted in the Ouachita Mountains Through 10 Years*

Ecophysiology

Tang, Z.; Chambers, J.L.; Sword, M.A. [and others]. *Reapplication of Silvicultural Treatments Impacts Phenology and Photosynthetic Gas Exchange of Loblolly Pine*

Sword-Sayer, M.A.; Tang, Z. *Long-Term Root Growth Response to Thinning, Fertilization, and Water Deficit in Plantation Loblolly Pine*

Connor, K.F.; Sowa, S. *Physiology and Biochemistry of Desiccating White Oak and Cherrybark Oak Acorns*

Grayson, K.J.; Wittwer, R.F.; Shelton, M.G. *Distribution of Mature Cones, Conelets, and Old Cones in Shortleaf Pine-Oak Stands After an Uneven-Aged Regeneration Cut*

Guo, Y.; Shelton, M.G. *Effects of Light Regimes on the Biomass and Morphological Characteristics of 2-Year-Old Cherrybark Oak Seedlings*

Moreau, B.; Gardiner, E.S.; Stanturf, J.A.; Fisher, R.K. *Estimating Leaf Nitrogen of Eastern Cottonwood Trees with a Chlorophyll Meter*

Sung, S-J.S.; Otrosina, W.J.; Zarnoch, S.J. *Seasonal Sucrose Metabolism in Longleaf Pine Tree Stem Cambial Tissues*

Bottomland Hardwoods—Natural Regeneration

Lockhart, B.R.; Michalek, A.J.; Lowe, M.W.; Williams, R.A. *Regeneration Development 3 Years After Thinning and Fertilization in An East Texas Bottomland Hardwood Stand (To Manage or To Regenerate: Can We Do Both?)*

McLeod, K.W.; McLeod, Burke, M.K. *Photosynthetic Potential of Laurel Oak Seedlings Following Canopy Manipulation*

Grell, A.G.; Shelton, M.G.; Heitzman, E. *Influences of Elevation on Overstory Species Composition in an Old-Growth Bottomland Hardwood-Loblolly Pine Forest in Southern Arkansas*

Schiff, N.M.; Connor, K.F.; Devall, M.S. *Germination Conditions for Poison Ivy*

Bottomland Hardwoods—Artificial Regeneration

Sung, S-J.S.; Kormanik, P.P.; Zarnoch, S.J. *Flush Development Dynamics in First-Year Nursery-Grown Seedlings of Eight Oak Species*

Kormanik, P.P.; Sung, S-J.S.; Kormanik, T. [and others]. *Northern Red Oak from Acorns to Acorns in 8 Years or Less*

Devall, M.S.; Schiff, N.M.; Skojac, S.A. *Outplanting of the Endangered Pondberry*

Gardiner, E.S.; Hodges, J.D.; Fristoe, T.C. *Flood Plain Topography Affects Establishment Success of Direct-Seeded Bottomland Oaks*

Schweitzer, C.J. *Monitoring and Assessment of Tree Establishment in the Wetlands Reserve Program in the Lower Mississippi Alluvial Plain*

Ware, B.P.; Gardiner, E.S. *Partial Cutting and Establishment of Artificial Nuttall Oak Regeneration in the Mississippi Alluvial Plain*

27 Connor, Kristina F., ed. 2004. **Proceedings of the 12th biennial southern silvicultural research conference.** Gen. Tech. Rep. SRS-71. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 594. p.

On the Bookshelf

Forests in a Market Economy

Forests in a Market Economy demonstrates how economic principles can be used to analyze forest policy issues across existing and developing market economies. **Karen Lee Abt**, Southern Research Station, and Erin O. Sills, North Carolina State University, edited the book. Twenty-three contributors apply marketing concepts to improve understanding of public policy in the contentious arena of forest management. Policy makers and forest owners increasingly concern themselves with a wide range of forest outputs, including ecosystem services, amenities,

recreation, and fuel wood, as well as timber. *Forests in a Market Economy* addresses:

- traditional and modern areas of concern in forest policy
- the status of the world's forests and research on private forest management
- timber production, primarily from United States forest lands, and markets
- multiple use management, considering diversity of forest owners and outputs
- valuation of non-market benefits

You can purchase this book from Kluwer Academic Publishers at www.wkap.nl/books.com.

Planning at the Landscape Scale

Landscape can define a view visible in one frame or a scale broad enough to encompass time, space, and life forms. With landscape ecology, the old method of nailing down a problem gave way to interdisciplinary approaches and exploration of possibilities. Non-sustainable resource use and population growth led to conditions that could no longer be understood or described at stand levels. The issues got bigger and the stakes got higher. Interdisciplinary research and management brought many tools and perspectives together to find solutions—at least pathways to solutions. **Hermann Gucinski**, who retired from the Southern Research Station as assistant director, co-edited *Proceedings: Views from the Ridge—Considerations for Planning at the Landscape Scale*. The 1999 conference, sponsored by the USDA Forest Service, Pacific Northwest Research Station, and the Western Forestry and Conservation Association, addressed these issues:

- managing landscapes when everyone has a different perspective
- approaching landscape management from aquatic, terrestrial, and socioeconomic viewpoints
- characterizing landscape management

To receive a copy of *Proceedings: Views from the Ridge—Considerations for Planning at the Landscape Scale*, contact the Pacific Northwest Station (pnw_pnwpubs@fs.fed.us or 503.808.2138) and ask for GTR PNW-596.

Southern Pine Ecosystems

1 Miller, D.R.; Borden, J.H. 2003. **Responses of *Ips pini* (Say), *Pityogenes knechteli* Swaine, and associated beetles (Coleoptera) to host Monoterpenes in stands of lodgepole pine.** Journal of Entomological Science. 38(4): 602-611.

We conducted seven experiments in stands of mature lodgepole pine in southern British Columbia to elucidate the role of host volatiles in the semiochemical ecology of the pine engraver, *Ips pini* (Say) (Coleoptera: Scolytidae), with particular reference to the behavioral responses of predators and competing species of bark beetles. Our results demonstrated that the attraction of *Ips pini* and the bark beetle predators *Lasconotus complex* LeConte (Colydiidae), *Thanasimus undatulus* (Say), (Cleridae) and a *Corticeus* sp. (Tenebrionidae) were increased by 3-carene. In contrast, attraction of the bark beetle *Pityogenes knechteli* Swaine (Scolytidae) to ipsdienol was interrupted by 3-carene and α-pinene. Attraction of *L. complex* to ipsdienol was increased by γ-terpinene, a compound attractive to the mountain pine beetle, *Dendroctonus ponderosae* Hopkins (Scolytidae). Terpinolene interrupted the attraction of *I. pini* to ipsdienol.

2 Eckhardt, Lori G.; Goyer, Richard A.; Klepzig, Kier D.; Jones, John P. 2004. **Interactions of *Hylastes* species (Coleoptera: Scolytidae) with *Leptographium* species associated with loblolly pine decline**. Journal of Economic Entomology. 97 (2): 468-474.

Hylastes spp. (Coleoptera: Scolytidae) were evaluated as potential vectors of *Leptographium* spp. fungi. Bark beetles were trapped from stands of loblolly pine, *Pinus taeda* L., exhibiting a range of decline symptoms in central Alabama. Under controlled conditions, field-collected adult *Hylastes salebrosus* Eichoff (Coleoptera: Scolytidae) and *Hylastes tenuis* Eichoff (Coleoptera: Scolytidae), which had been surface sterilized and inoculated with *Leptographium terebrantis* Barras & Perry and *Leptographium serpens* (Goid.) Wingfield, transmitted the fungi into 100 percent of wounded and unwounded loblolly root sections with which they were confined. None of the sterilized and uninoculated beetles transmitted any *Leptographium* spp. to roots. Significantly more *H. salebrosus* and *H. tenuis* brood emerged from roots infected with *Leptographium* species than from sterile roots, indicating an enhancement of *Hylastes* reproduction.

Wetlands, Bottomlands, and Streams Ecosystems

3 Burke, Marianne K.; King, Sammy L.; Gartner, David; Eisenbies, Mark H. 2003. **Vegetation, soil, and flooding relationships in a blackwater flood plain forest.** Wetlands. 23 (4): 988-1002.

Hydroperiod is considered the primary determinant of plant species distribution in temperate flood plain forests, but most studies have focused on alluvial (sediment-laden) river systems. Few studies have evaluated plant community relationships in blackwater river systems of the South Atlantic Coastal Plain of North America. In this study we characterized the soils, hydroperiod, and vegetation communities, and evaluated relationships between the physical and chemical environment and plant community structure on the flood plain of the Coosawhatchie River, a blackwater river in South Carolina, USA. The soils were similar to previous descriptions of blackwater flood plain soils but had greater soil N and P availability, substantially greater clay content, and lower soil silt content than was previously reported for other blackwater river flood plains. Results of a cluster analysis showed there were five forest communities on the site, and both short-term (4 years) and long-term (50 years) flooding records documented a flooding gradient: water tupelo community > swamp tupelo > laurel oak = overcup oak > mixed oak. The long-term hydrologic record showed that the flood plain has flooded less frequently from 1994 to present than in previous decades. Detrended correspondence analysis of environmental and relative basal area values showed that 27 percent of the variation in overstory community structure could be explained by the first two axes; however, fitting the species distributions to the DCA axes using Gaussian regression explained 67 percent of the variation. Axes were correlated with elevation (flooding intensity) and soil characteristics related to rooting volume and cation nutrient availability. Our study suggests that flooding is the major factor affecting community structure, but soil characteristics also may be factors in community structure in blackwater systems.

4 Coyle, David R. 2002. **Effects of clone, silvicultural, and miticide treatments on cottonwood leafcurl mite (Acari: Eriophyidae) damage in plantation *Populus*.** Population Biology. Environmental Entomology. 31 (6): 1000-1008.

Aculops lobuliferus (Keifer) is a little known pest of plantation *Populus* spp. which is capable of causing substantial damage. This is the first documented occurrence of *A. lobuliferus* in South Carolina. Previous anecdotal data indicated clonal variation in *Populus* susceptibility to *A. lobuliferus* damage. A damage rating scale was created to monitor mite damage in 2000-2001 in a short-rotation woody crop plantation; damage descriptions and seasonal phenology also were recorded. Foliar damage and terminal mortality were monitored on two *Populus deltoides* Bartr. clones, ST66 and S7C15, receiving one of three silvicultural treatments

(irrigated [I], fertilized [F], or I+F), or no treatment (control). In 2001, early season foliar damage ratings were significantly higher on clone S7C15; however, damage on clone ST66 was greater after miticide treatments later in the year. Terminal mortality did not differ between clones. Silvicultural treatment significantly affected foliar damage levels in both clones. Trees receiving I+F and F treatments had higher damage ratings than did trees receiving irrigation alone or the control at times. Clone S7C15 trees receiving fertilizer had significantly less terminal mortality than their nonfertilized counterparts. Application of a commercially available miticide significantly reduced *A. lobuliferus* damage levels. This study demonstrates that *A. lobuliferus damage* levels can be influenced by *Populus* clone and silvicultural treatment. Foliar and terminal damage levels observed in this study indicate the potential for substantial economic impact of *A. lobuliferus* on plantation *Populus*. Although an effective control method may be to select and plant resistant *Populus* clones, chemical control remains a viable option.

5 DeSteven, Diane; Toner, Maureen M. 2004. **Vegetation of Upper Coastal Plain depression wetlands: environmental templates and wetland dynamics within a landscape framework.** Wetlands. 24 (1): 23-42.

Reference wetlands play an important role in efforts to protect wetlands and assess wetland condition. Because wetland vegetation integrates the influence of many ecological factors, a useful reference system would identify natural vegetation types and include models relating vegetation to important regional geomorphic, hydrologic, and geochemical properties. Across the United States Atlantic Coastal Plain, depression wetlands are a major hydrogeomorphic class with diverse characteristics. For 57 functional depression wetlands in the Upper Coastal Plain of South Carolina, we characterized the principal vegetation types and used a landscape framework to assess how local (wetland-level) factors and regional landscape settings potentially influence vegetation composition and dynamics. Wetland sites were stratified across three Upper Coastal Plain landscape settings that differ in soils, surface geology, topography, and land use. We sampled plant composition, measured relevant local variables, and analyzed historical transitions in vegetative cover types. Cluster analysis identified six vegetation types, ranging from open-water ponds and emergent marshes to closed forests. Significant vegetation-environment relationships suggested environmental "templates" for plant community development. Of all local factors examined, wetland hydrologic regime was most strongly correlated with vegetation type, but depression size, soil textural type, and disturbance history were also significant. Because hydrogeologic settings influence wetland

features, local factors important to vegetation were partly predictable from landscape setting, and thus wetland types were distributed non randomly across landscape settings. Analysis of long-term vegetation change indicated relative stability in some wetlands and succession in others. We developed a landscape-contingent model for vegetation dynamics, with hydroperiod and fire as major driving variables. The wetland classification, environmental templates, and dynamics model provide a reference framework to guide conservation priorities and suggest possible outcomes of restoration or management.

6 Lockhart, B.R. 2004. **All species have value**. Journal of Forestry. 102(1): 60.

The author discusses the values of American hornbeam (*Carpinus caroliniana),* also known as ironwood, blue-beech, or muscle-wood. He details the benefits provided by American hornbeam, though frequently referred to as a weed. Lockhart provides the context in which less desirable species can benefit the forest and the species for which the land is being managed.

7 Rummer, Bob. 2004. **Managing water quality in wetlands with forestry BMPs.** Water, Air, and Soil Pollution: Focus. 4: 55-66.

Forested wetlands are uniquely critical areas in forest operations that present special challenges to protect water quality. These locations are a direct interface between the impacts of forest operations and water. Best Management Practices (BMPs) are designed to minimize nonpoint source pollution, but much of the science behind current guidelines is based on an understanding of erosion processes in upland situations. In wetlands and around temporary stream crossings, redirection of flow, sedimentation processes, and alterations of flow velocity become important. Existing forested wetland BMPs appear to adequately address water quality protection. If existing BMPs became prescriptive regulations, however, there is potential for misapplication and unintended ecological impacts.

8 Skojac, Danny; Devall, Margaret S.; Parresol, Bernard R. 2003. **Additions to the flora of Cleveland County, Arkansas: collections from Moro Bottoms Natural Area, a State-protected old-growth bottomland hardwood forest.** SIDA. 20 (4): 1731-1736.

An annotated list of 38 additions to the vascular flora of Cleveland County, Arkansas is presented. The additions presented were collected from Moro Bottoms Natural Area, a State-protected old-growth bottomland hardwood forest located in the northwest region of the county.

9 Smith, Carl G., III; Hamel, Paul B.; Devall, Margaret S.; Schiff, Nathan M. 2004. **Hermit thrush is the first observed dispersal agent for pondberry (*Lindera melissifolia*).** Castanea. 69 (1): 1-8.

We investigated dispersal opportunities for the endangered pondberry, *Lindera melissifolia* (Lauraceae). In 199 hours of observation at 5 fruiting colonies in the Delta National Forest, Sharkey County, Mississippi, we recorded 82 bird species in the vicinity of a colony. Of these, 12 were observed on pondberry plants, and two consumed ripe pondberry fruits. Of these, the northern cardinal, *Cardinalis cardinalis* (Cardinalidae), was a seed predator. The other, hermit thrush, *Catharus guttatus* (Turdidae), was a dispersal agent for the plants. Numbers of fruits declined rapidly after hermit thrushes arrived in October and no fruits remained by January. Winter behavior of hermit thrushes constrains their dispersal of seeds to short distances. Without establishment of additional colonies, pondberry dispersal by birds to unoccupied patches of suitable forest is unlikely.

10 United States Department of Agriculture, Southern Research Station. 2002. **A guide to finding pondberry** [Brochure]**.** Science Update SRS-003. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. [Not paged].

This brochure describes pondberry (*Lindera melissifolia*) characteristics, distribution, and habitat. It includes images of blooms, fruit, and mature plants. The brochure provides pictures and descriptions of spicebush and swamp privet to help the reader distinguish these plants from the endangered pondberry.

Mountain and Highland Ecosystems

11 Bartman, Chad E.; Parker, Kathleen C.; Laerm, Joshua; McCay, Timothy S. 2001. **Short-term response of Jordan's salamander to a shelterwood timber harvest in Western North Carolina.** Physical Geography. 22 (2): 154-166. [Editor's note: The USDA Forest Service, Southern Research Station sponsored this research.]

The effects of shelterwood cutting on the abundance of Jordan's salamander (*Plethodon jordani*) in Western North Carolina were examined during 1997 and 1998. Terrestrial salamander assemblages were sampled before, immediately after, and one year after timber harvest on control and treatment plots to estimate abundance. We also surveyed salamanders immediately after the harvest along transects radiating out from cut plots to determine whether cutting triggered salamander emigration from disturbed plots.

Both before and after timber harvest, the site was strongly dominated by Jordan's salamander. No significant effects of initial shelterwood cutting on Jordan's salamander abundance were apparent after timber harvest. Abundance of this species decreased from pre-cutting to post-cutting sampling on both control and treatment plots, which likely reflected the drought that characterized both post-cutting sampling periods, but not pre-cutting sampling. No emigration of salamanders from the cut plots was detected after timber harvest. These findings suggest that at a stand scale, shelterwood harvests may pose less of a short-term threat to salamander populations than clearcutting, but more study is necessary to assess broad-scale tradeoffs between harvest yield and biological impacts associated with alternative timber harvest methods.

12 Burt, Tim; Swank, Wayne. 2002. **Forests or floods?** Geography Review. 15 (5): 37-41.

This article shows how experiments at the Coweeta Hydrologic Laboratory in North Carolina have deepened our understanding of the ways in which forested catchments respond to land use change. Drainage-basin hydrology is a popular topic. Human impact on stream discharge as a result of changes in vegetation cover is an important theme. [Editor's note: Wayne Swank, retired Southern Research Station scientist, co-authored this paper.]

13 Callaham, Mac A., Jr.; Hendrix, Paul F.; Phillips, Ross J. 2003. **Occurrence of an exotic earthworm (*Amynthas agrestis*) in undisturbed soils of the Southern Appalachian Mountains, USA.** Pedobiologia. 74: 466-470.

This study documents the occurrence of an aggressive invasive earthworm species in undisturbed forest soils of the Southern Appalachian Mountains of northern Georgia, USA. Earthworms were sorted from samples collected in pitfall traps that had been set in mature, mesic oak-hickory forests in remote, high elevation locations across northern Georgia. Specimens were continuously collected in these traps over the course of the summer and autumn of 1993, and more than 600 earthworms were collected from 35 different trapping sites. There were at least 9 different earthworm taxa collected during the study, including three species not native to North American soils (*Amynthas agrestis*, *Octolasion tyrtaeum*, and *O. cyaneum*). The majority of earthworms collected in the study were *A. agrestis*. Because large numbers of *A. agrestis* were trapped at a single site, we made measurements of individuals in an attempt to examine the reproductive status of *A. agrestis* at that site over time. Small numbers of *A. agrestis* were trapped in July and August, peak abundance occurred in September, and there was a decline in abundance through November, to zero trapped in December. Sexually mature adults

were first trapped in small numbers in late August, but made up 80 percent of the total population by mid September, and 100 percent of the population in October and November.

14 Coleman, David C.; Hunter, Mark D.; Hutton, John [and others]. 2002. **Soil respiration from four aggrading forested watersheds measured over a quarter century.** Forest Ecology and Management. 157: 247-253. [Editor's note: Lloyd Swift, Jr., retired Southern Research Station scientist, co-authored this paper.]

Soil respiration was measured in four aggrading, forested second-growth watersheds in the Southern Appalachians using an identical method (alkali absorption) at intervals 23 and 24 years apart. Seasonal trends were similar, with mid-summer maxima and winter minima. Amounts of carbon dioxide evolved were higher in the recent measurements (1995) compared to the earlier ones (1971-1972), despite similar soil water and temperature regimes. The overall trend across all four watersheds may reflect changes in organic matter levels and subsequent root growth.

15 Hamel, Paul B.; Dawson, Deanna K.; Keyser, Patrick D. 2004. **How we can learn more about the cerulean warbler (*Dendroica cerulea*).** The Auk. 121 (1): 7-14.

A sense of urgency attends the study of species of concern, like the cerulean warbler (*Dendroica cerulea*). Sharpened by Robbins and others in 1992 and Hamel in 1992, such concern prompted the U.S. Department of the Interior, Fish and Wildlife Service (USFWS) to commission a status assessment of the cerulean warbler. Shortly after the status review was published, a petition was delivered to the USFWS urging that the species be listed as "threatened" under the Endangered Species Act of 1973. The account of the cerulean warbler in the *Birds of North America* series also appeared that year. Substantial attention is currently focused on the species, and the Cerulean Warbler Technical Group (CWTG) was formed in 2002.

This article's overview consists of two parts. The first attempts to summarize current knowledge and suggest productive avenues to pursue in our efforts to understand the biology and conserve populations of cerulean warblers. The second part summarizes the structure and priorities of the CWTG, an organization that can spur and facilitate research and conservation action directed at this species and serve as a model for conservation of other forest birds.

16 Riedel, Mark S.; Vose, James M. 2002. **Forest road erosion, sediment transport, and model validation in the Southern**

Appalachians. In: Proceedings: second federal interagency hydrologic modeling conference. Reston, VA: United States Interagency Advisory Committee on Water Data, Subcommittee on Hydrology: 1-12.

The Conasauga River Watershed, located in northern Georgia and southern Tennessee, has one of the most diverse aquatic ecosystems in this region and is currently being considered for designation as a Wild and Scenic River. The Conasauga River also serves as a major source of drinking water for numerous large cities. Due to the close proximity with the cities of Knoxville, Atlanta, and Chattanooga, intensive public usage, and the high quality of this aquatic resource, the United States Department of Agriculture (USDA) Forest Service has designated the Conasauga River as one of the twelve large-scale watershed restoration projects in the Nation. This is warranted as the Conasauga River is experiencing excessive sedimentation from the erosion of private agricultural lands, streambanks, and forest roads. We are working with an erosion model, the Sediment Tool, to facilitate decision-making in the restoration of forest roads. The Sediment Tool and its parent model, the Watershed Characterization System (WCS), were developed by the U.S. Environmental Protection Agency (EPA). The Sediment Tool is a spatially explicit, GIS-based, finite element, lumped parameter model which generates estimates of soil erosion, sediment routing, and sediment yield. We applied WCS along segments of 13 mountain roads in the Conasauga Watershed. The segments provide replication of road types under a variety of usage levels, road base materials, and slopes. We sampled overland flow from each segment for total suspended solids (TSS) and surveyed all pertinent road characteristics. While we were able to qualitatively calibrate the model, predicted sediment yields were typically much greater than observed data. Model results improved with digital elevation model (DEM) and computational grid resolution. Error analysis indicated that model sensitivity is limited by the governing equations within the model and the resolution of the input data. The model currently employs the universal soil loss equation (USLE) to estimate soil erosion and empirical sediment yield equations to transport sediment. These empirical equations were not developed for application on aggregate road surfaces. DEM resolution will also present problems in routing the sediment to streams. Streams in the study areas are only one to three meters wide. Flood plains adjacent to these streams are typically four or five meters wide and frequently trap sediment-laden runoff before it reaches the streams. Current efforts to improve upon the model include an adaptation of the process-based Water Erosion Prediction Project (WEPP) model and attainment of finer resolution DEM data that will more accurately represent the road surfaces.

17 Vose, James M.; Geron, Chris; Lockaby, B. Graeme [and others]. 2002. **Restoration effects on biogeochemistry and aquatic systems** [Abstract]. In: Gardiner, Emile S.; Breland, Lynne J., comp. Proceedings of the IUFRO conference on restoration of boreal and temperate forests—documenting forest restoration knowledge and practices in boreal and temperate ecosystems. Frederiksberg, Denmark: Danish Centre for Forest, Landscape, and Planning: 122-123.

The abstract elaborates on the acceleration of restoration efforts to mitigate or enhance key components of watershed ecosystems that regulate biogeochemical cycling and associated aquatic components. The authors note that biogeochemical processes are complex because they operate at a variety of spatial and temporal scales (e.g., near-instantaneous soil chemical reactions vs. bedrock weathering). Restoration of biogeochemical processes and aquatic systems is inherently scale dependent. A conceptual and analytical framework must be developed to assess thresholds of response and recovery at a variety of spatial and temporal scales. This conceptual and analytical framework has important implications for restoration, providing a tool for prioritizing the location and intensity of restoration efforts and a framework for measuring success. The resistance and resilience model of ecosystem response to disturbance is one potential conceptual framework for evaluating restoration success for enhancing biogeochemical cycles and aquatic systems. The model can be used as a conceptual construct for evaluating spatial and temporal aspects of current ecosystem condition, desired ecosystem condition, and systems response. While the resistance-resilience model provides the conceptual framework, analytical tools—modeling, GIS, and remote sensing—are required to quantify spatial and temporal responses.

Large-Scale Assessment and Modeling

18 Coyle, David R.; Amrine, James W., Jr. 2004. **New collection records and host range of the cottonwood leafcurl mite, *Tetra lobulifera* (Kiefer) Acari: Eriophyidae), in the USA.** International Journal of Acarology. 30 (1): 3-8.

The cottonwood leafcurl mite, *Aculops lobuliferus* Keifer, 1961, is renamed as *Tetra lobulifera* (Keifer). This eriophyid mite is capable of inflicting substantial damage on plantation- and native-grown cottonwoods (*Populus* spp.). We report new State and County collection records from the Eastern and Northwestern United States, as well as new host records, including *Populus grandidentata* Michx. (big-tooth aspen), for this pest. This updates the established geographic range of *T. lobulifera*, and demonstrates its ability to utilize other host plants in the genus *Populus* for development.

19 Kilgo, John C.; Moorman, Christopher E. 2003. **Patterns of cowbird parasitism in the Southern Atlantic Coastal Plain and Piedmont.** Wilson Bulletin. 115 (3): 277-284.

Until recently, little information was available on patterns of brood parasitism by brown-headed cowbirds (*Molothrus ater*) in the Southeastern United States, a region into which cowbirds expanded their range only during the last half of the 20th century and where their abundance is relatively low. We compiled parasitism data from several published and unpublished studies conducted in Georgia and South Carolina from 1993-2000 to examine levels of brood parasitism and determine frequent host species. The combined dataset included 1,372 nests of 24 species reported in the literature to have been parasitized by cowbirds. The parasitism rate on all species combined was 8.2 percent. Considering only those species that served as hosts in these studies (n = 12), the parasitism rate was 9.3 percent. Seven species were parasitized at rates ≥ 10 percent. Based on the extent of parasitism (among studies and locations), their relative abundance, and the sample size of nests, prairie warblers (*Dendroica discolor*), hooded warblers (*Wilsonia citrina)*, yellow-breasted chats (*Icteria virens*), and indigo buntings (*Passerina cyanea*), all shrub nesters, appear to be the most important cowbird hosts in the region. Parasitism on some species reported as frequent hosts elsewhere was extremely low or not documented. We conclude that the impact of brood parasitism on the seasonal fecundity of hosts in the region probably is minimal, but additional work is warranted on species of concern, such as the painted bunting (*Passerina ciris*).

20 Loomis, John; Wohlgemuth, Pete; Gonzalez-Caban, Armando; English, Donald. 2003. **Economic benefits of reducing fire-related sediment in southwestern fire-prone ecosystems.** Water Resources Research. 39 (9): WES 3-1—3-8.

A multiple regression analysis of fire interval and resulting sediment yield (controlling for relief ratio, rainfall, etc.) indicates that reducing the fire interval from the current average 22 years to a prescribed fire interval of 5 years would reduce sediment yield by 2 million cubic meters in the 86.2 square kilometer Southern California watershed adjacent to and including the Angeles National Forest. This would have direct cost savings to Los Angeles County Public Works in terms of reduced debris basin clean out of $24 million. The net present values of both 5- and 10-year prescribed fire intervals are positive. However, given other multiple use objectives of the USDA Forest Service, a 10-year prescribed fire interval may be more optimal than a 5-year fire interval.

21 Owubah, Charles E.; Le Master, Dennis C.; Bowker, J.M.; Lee, John G. 2001. **Forest tenure systems and sustainable forest management: the case of Ghana.** Forest Ecology and Management. 149: 253-264.

Adoption and implementation of sustainable forestry practices are essential for sustaining forest resources, yet development of effective politics and strategies to achieve them are problematic. Part of the difficulty stems from a limited understanding of the interaction between obtrusive forest policies and indigenous tenure systems and how this affects sustainable forest management. This study uses a market framework to analyze the relationships between individual components of forest tenure and sustainable forestry practices. Data from 21 rural communities in the forest belt of Ghana are used to evaluate theoretical propositions. Logistic regression models are used to predict willingness to engage in the preservation of indigenous, economically valuable trees, conservation of natural forests, and establishment of forest plantations. The number of farmers engaged in sustainable forestry practices is small. While most tenure variables behaved as expected, security of tenure and exclusiveness are less important to the practice of sustainable forestry. Farmers, in their role as potential producers, perceive preservation of indigenous, economically valuable trees and conservation of forests as having a net cost to them, especially if compensation is not paid for damage to crops resulting from logging operations of concessionaires. Current statistics in Ghana provide few incentives for farmers to engage in sustainable practices. The study also provides recommendations for forest tenure systems to function effectively.

22 Riitters, Kurt H.; Wickham, James D.; Coulston, John W. 2004. **A preliminary assessment of Montreal process indicators of forested fragmentation for the United States.** Environmental Monitoring and Assessment. 91: 257-276.

As part of the United States 2003 National Report on Sustainable Forests, four metrics of forest fragmentation—patch size, edge amount, inter-patch distance, and patch contrast—were measured within 137 744 non-overlapping 5625 ha analysis units on land-cover maps derived from satellite imagery for the 48 conterminous States. The perimeter of a typical forest patch is about 100 m from the perimeter of its nearest neighbor, except when there is not much forest, in which case that distance is 200 to 300 m. A typical analysis unit has from 10 to 40 percent as much forest edge as it could possibly have, given the amount of forest present. Most analysis units contain a large number of patches that are less than one hectare in size, and about 10 percent contain one or more 2000 to 5000 ha patches. Forest often defines

the background landscape, and patch contrast is generally either very high or very low in eastern regions and intermediate in western regions. Many research needs were identified by this experimental analysis of available data and metrics.

23 Wade, Timothy G.; Wickham, James D.; Nash, Maliha S. [and others]. 2003. **A comparison of vector and raster GIS methods for calculating landscape metrics used in environmental assessments.** Photogrammetric Engineering & Remote Sensing. 69 (12): 1399-1405. [Editor's note: Southern Station scientist Kurt H. Riitters co-authored this paper.]

GIS-based measurements that combine native raster and native vector data are commonly used in environmental assessments. Most of these measurements can be calculated using either raster or vector data formats and processing methods. Raster processes are more commonly used because they can be significantly faster computationally than vector, but error is introduced in converting vector data to raster. This conversion error has been widely studied and quantified, but the impact on environmental assessment results has not been investigated. We examined four GIS-based measurements commonly used in environmental assessments for approximately 1000 watersheds in the State of Maryland and Washington, D.C. Each metric was calculated using vector and raster methods, and estimated values were compared using a paired t-test, Spearman rank correlation, and cluster analyses. Paired t-tests were used to determine the statistical significance of quantitative differences between methods, and Spearman rank correlation and cluster analyses were used to evaluate the impact of the differences on environmental assessments. Paired t-test results indicated significant quantitative differences between methods for three of the four metrics. However, Spearman ranks and cluster analyses indicated that the quantitative differences would not affect environmental assessment results. Spearman rank correlations between vector and raster values were greater than 0.98 for all comparisons. Cluster analyses resulted in identical assignment for 88 percent to over 98 percent of watersheds analyzed among vector and various raster methods.

Inventory and Monitoring

24 Rudis, Victor A. 2003. **Comprehensive regional resource assessments and multipurpose uses of forest inventory and analysis data, 1976-2001: a review.** Gen. Tech. Rep. SRS-70. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 129 p.

Reported is a compilation of over 1,400 literature citations and a review of selected subjects that constitute an integrated

knowledge base for comprehensive forest resource assessments with regional, field sample-based forest inventory data. The focus of the report is on nontraditional and novel technical uses tied to the U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis (FIA) field surveys published or in press between 1976 and July 2001. Briefly noted are pioneering studies that link FIA data with air pollution, biomass, dead wood, esthetics, geographic context (geographic information systems and satellite remote sensing), nearby nonforest influences (operability, roads), owner attitudes, range (agroforesty and livestock use), recreation, tropical inventories, water quality (soils and hydrology), vegetative habitat typing, and wildlife. All known M.S. theses and Ph.D. dissertations associated with FIA data since 1976 are included, regardless of subject matter. Also incorporated are citations of collected works concerning integrated assessments and multidisciplinary surveys and representative citations associated with economics, global climate change, remote sensing, sampling designs, tropical forest resources, and traditional timber resource assessments. The literature review suggests assessments are "comprehensive" for issues in selected regions and chosen resource assessments. Multidiscipline involvement, multipurpose uses of nontraditional data, and analysis of resources other than timber are variable. Nontraditional measurements and models, with some exceptions, have been provincially rather than nationally applicable and not well coordinated among regions. Recommended are ways to accelerate progress toward comprehensive assessments and cost-effective multipurpose uses.

Foundation Programs

25 Bowker, J.M.; Newman, David H.; Warren, Robert J.; Henderson, David W. 2003. **Estimating the economic value of lethal versus nonlethal deer control in suburban communities.** Society and Natural Resources. 16: 143-158.

Negative people/wildlife interaction has raised public interest in wildlife population control. We present a contingent valuation study of alternative deer control measures considered for Hilton Head Island, SC. Lethal control using sharpshooters and nonlethal immuno-contraception techniques are evaluated. A mail-back survey was used to collect resident willingness-to-pay (WTP) information for reduced deer densities and consequent property damage. Residents are unwilling to spend more for the nonlethal alternative. The estimated WTP appears theoretically consistent as increasing levels of abatement for both lethal and nonlethal alternatives demonstrate diminishing marginal benefits. Over 60 percent of respondents bid zero regardless of control measure, suggesting a referendum would fail. However, only half of these zero bidders expressed no problem with deer, while the other half bid zero because of distaste for the control alternative, safety

concerns, or doubt about effectiveness. Inclusion of these responses as legitimate zero bids depressed mean WTP estimates from 22 to 31 percent.

26 Coleman, M.D.; Coyle, D.R.; Blake, J. [and others]. 2004. **Production of short-rotation woody crops grown with a range of nutrient and water availability: establishment report and first-year responses.** Gen. Tech. Rep. SRS-72. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 21 p.

Many researchers have studied the productivity potential of intensively managed forest plantations. However, we need to learn more about the effects of fundamental growth processes on forest productivity; especially the influence of above- and belowground resource acquisition and allocation. This report presents installation, establishment, and first-year results of four tree species (two cottonwood clones, sycamore, sweetgum, and loblolly pine) grown with fertilizer and irrigation treatments. At this early stage of development, irrigation and fertilization were additive only in cottonwood clone ST66 and sweetgum. Leaf area development was directly related to stem growth, but root production was not always consistent with shoot responses, suggesting that allocation of resources varies among treatments. We will evaluate the consequences of these early responses on resource availability in subsequent growing seasons. This information will be used to: (1) optimize fiber and bioenergy production; (2) understand carbon sequestration; and (3) develop innovative applications such as phytoremediation; municipal, industrial, and agricultural wastes management; and protection of soil, air, and water resources.

27 Connor, Kristina F., ed. 2004. **Proceedings of the 12th biennial southern silvicultural research conference.** Gen. Tech. Rep. SRS-71. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 594. p.

Ninety-two papers and 36 poster summaries address a range of issues affecting southern forests. Papers are grouped in 15 sessions that include wildlife ecology; fire ecology; natural pine management; forest health; growth and yield; upland hardwoods—natural regeneration; hardwood intermediate treatments; longleaf pine; pine plantation silviculture; site amelioration and productivity; pine nutrition; pine planting, stocking, spacing; ecophysiology; bottomland hardwoods—natural regeneration; and bottomland hardwoods—artificial regeneration.

28 English, Donald B.K.; Kocis, Susan M.; Arnold, J. Ross [and others]. 2003. **The effectiveness of visitation proxy variables in**

improving recreation use estimates for the USDA Forest Service. Journal for Nature Conservation. 11: 332-338.

In estimating recreation visitation at the national forest level in the United States, annual counts of a number of types of visitation proxy measures were used. The intent was to improve the overall precision of the visitation estimate by employing the proxy counts. The precision of visitation estimates at sites that had proxy information versus those that did not is examined. Results show that using visitation proxy information reduces sampling needs by about 25 percent. Characteristics of the types of visitation proxy information that performed best and worst are discussed.

29 Henderson, David W.; Warren, Robert J.; Newman, David H. [and others]. 2000. **Human perceptions before and after a 50 percent reduction in an urban deer herd's density.** Wildlife Society Bulletin. 28 (4): 911-918. [Southern Station scientist J. Michael Bowker co-authored this paper.]

Overabundant white-tailed deer (*Odocoileus virginianus*) populations in urban and suburban areas can be controversial because of potential damage to landscape vegetation, deer-vehicle collisions, and fear over transmission of tick-borne diseases. Herd reduction is often proposed to solve these problems; however, the ability of human residents to accurately perceive a herd reduction has not been demonstrated. We used mail surveys to study effects of a 50 percent localized deer herd reduction on the perceptions of residents in 2 areas (one control, one treated) on Hilton Head Island, South Carolina, over 2 time periods (before vs. after herd reduction). Residents in the treated area perceived a decrease ($p \leq 0.001$) in the relative abundance of deer using their yards after the herd reduction; residents in the control area (where no deer were removed) did not. Residents in the treated area reported seeing about 50 percent fewer deer after the herd reduction ($p < 0.001$); residents in the control area saw about the same number of deer. Nonpermanent residents did not perceive the herd reduction that was noticed by permanent residents. Residents in both the control and treated areas wanted to see fewer deer in their yard in the future. Residents did not report a decrease in the money required to replace plants damaged by deer during our one-year study. Our results indicate that costs to implement deer-herd reduction programs in urban and suburban areas may be justified based on the benefits perceived by the residents.

30 Johnson, Cassandra Y.; Bowker, J.M. 2004. **African-American wildland memories.** Environmental Ethics. 26: 57-75.

Collective memory can be used conceptually to examine African-American perceptions of wildlands and black interaction with such places. The middle-American view of wildlands frames these terrains as refuges—pure and simple, sanctified places distinct from the profanity of human modification. However, wild, primitive areas do not exist in the minds of all Americans as uncomplicated or uncontaminated places. Three labor-related institutions—forest labor, plantation agriculture, and sharecropping—and terrorism and lynching have impacted negatively on black perceptions of wildlands, producing ambivalence toward such places among African Americans.

31 Kabir, Mohammed F.; Schmoldt, Daniel L.; Araman, Philip A. [and others]. 2003. **Classifying defects in pallet stringers by ultrasonic scanning.** Wood and Fiber Science. 35 (3): 341-350.

Detecting and classifying defects are required to grade and sort pallet parts. Use of quality parts can extend the life cycle of pallets and can reduce long-term cost. An investigation has been carried out to detect and classify defects in yellow-poplar (*Liriodendron tulipifera* L.) and red oak (*Quercus rubra* L.) stringers using ultrasonic scanning. Data were collected for sound and unsound knots, bark pockets, decay, holes, and wane using rolling transducers in a pitch-catch arrangement. Data from eight ultrasonic variables—energy, pulse length, time of flight (TOF) amplitude, TOF energy, TOF centroid, energy value, energy pulse value, and peak frequency—were used to classify defects. Three different types of classifiers were used to categorize defects—a multi-layer perceptron network (MLP), a probabilistic neural network (PNN), and a k-nearest neighbor (KNN) classifier. Mean values for the energy variables demonstrated statistically significant differences between clear wood and defects and among defect types. Mean values for the TOF variables did not differ significantly between clear wood and knots. All three types of classifiers were able to distinguish defected from clear wood in oak with accuracies above 95 percent; accuracies for yellow-poplar were somewhat lower for the MLP and PNN classifiers. Among the defect classes, decay exhibited the highest recognition rate for both yellow-poplar and oak. Wane and holes in oak were readily confused owing to their common loss of transducer contact. Overall accuracy at the data-point level varied from 69 to 78 percent. Simple post-processing operations are expected to improve that substantially. Based on accuracy performance alone, the MLP and KNN appear equally preferable for this task.

32 Schulze, Dana Madsen; Walker, Joan L.; Spira, Timothy P. 2002. **Germination and seed bank studies of *Macbridea alba* (Lamiaceae), a federally threatened plant.** Castanea. 67 (3): 280-289.

Macbridea alba (Lamiaceae) is a federally threatened plant endemic to Florida. Seedlings are rarely observed in natural populations, but seed production has been documented. We assessed the germinability of dry-stored seeds and of experimentally buried seeds, and sampled soil to detect a persistent seed bank. More than 20 percent of recorded seeds germinated prior to collection, either within the calyx (viviparous seedlings) or after dispersal into the collection bag. This pre-collection germination indicated that a significant percentage of seeds lack innate dormancy. An estimated 87 percent of dry-stored seeds were germinable for 6 months following dispersal, but viability of dry-stored and of buried seeds was negligible after 1 year. No seedlings emerged from soil that was field collected just prior to seed dispersal, indicating no persistent seed bank. Seed viability does not appear to limit establishment, but dry conditions coincident with likely autumn establishment may limit seedling safe site availability.

33 So, Chi-Leung; Via, Brian K.; Groom, Leslie H. [and others]. 2004. **Near infrared spectroscopy in the forest products industry.** Forest Products Journal. 54 (3): 6-16.

Improving manufacturing efficiency and increasing product worth requires the right combination of actions throughout the manufacturing process. Many innovations have been developed over the last several decades to achieve these goals. Innovations typically work their way backwards in the manufacturing process, with an increasing level of monitoring occurring at the end of a production line. There exists, however, an ever-increasing array of tools available to forest products manufacturers that allow rapid assessment of material and product variables throughout the manufacturing process. A technology that shows great potential in all facets of material assessment is near infrared (NIR) spectroscopy. The potential for NIR technologies has not gone unnoticed by the wood research community and there are scores of national and international laboratories developing appropriate applications. The rapid assessment of solid wood properties using NIR spectra is a fast-growing field that has broad implications in relation to wood quality and, ultimately, tree improvement. NIR as a means of online monitoring during the manufacturing process has also spurred many laboratories to examine potential applications for wood composites. It is probable that this type of monitoring will lead to increase in efficiency and profits.

34 Wilson, A.D.; Lester, D.G.; Oberle, C.S. 2004. **Development of conductive polymer analysis for the rapid detection and identification of phytopathogenic microbes.** Phytopathology. 94: 419-431.

Conductive polymer analysis, a type of electronic aroma detection technology, was evaluated for its efficacy in the detection, identification, and discrimination of plant-pathogenic microorganisms on standardized media and in diseased plant tissues. The method is based on the acquisition of a diagnostic electronic fingerprint derived from multisensor responses to distinct mixtures of volatile metabolites released into sampled headspace. Protocols were established to apply this technology specifically to plant disease diagnosis. This involved development of standardized cultural methods, new instrument architecture for sampling, sample preparation, prerun procedures, run parameters and schedules, recognition files and libraries, data manipulations, and validation protocols for interpretations of results. The collective output from a 32-sensor array produced unique electronic aroma signature patterns diagnostic of individual microbial species in culture and specific pathogen-host combinations associated with diseased plants. The level of discrimination applied in identifications of unknowns was regulated by confidence level and sensitivity settings during construction of application-specific reference libraries for each category of microbe or microbe-host combination identified. Applications of this technology were demonstrated for the diagnosis of specific disease systems, including bacterial and fungal diseases and decays of trees; for host identifications; and for determinations of levels of infection and relatedness between microbial species. Other potential applications to plant pathology are discussed with some advantages and limitations for each type of diagnostic application.

Research Work Units

Location & Project Leader	Unit	Name & Web Site	Phone
Asheville, NC David Loftis	4101	Ecology and Management of Southern Appalachian Hardwood Forests **www.srs.fs.usda.gov/bentcreek**	828-667-5261
Athens, GA John Stanturf	4104	Disturbance and the Management of Southern Pine Ecosystems **www.srs.fs.usda.gov/disturbance**	706-559-4315
Athens, GA Paula Spaine	4505	Insects and Diseases of Southern Forests **www.srs.fs.usda.gov/4505**	706-559-4285
Athens, GA Ken Cordell	4901	Assessing Trends, Values, and Rural Community Benefits from Outdoor Recreation and Wilderness in Forest Ecosystems **www.srs.fs.usda.gov/trends**	706-559-4264
Auburn, AL Charles McMahon	4105	Vegetation Management Research and Longleaf Pine Research for Southern Forest Ecosystems **www.srs.fs.usda.gov/4105**	334-826-8700
Auburn, AL Robert Rummer	4703	Biological/Engineering Systems and Technologies for Ecological Management of Forest Resources **http://www.srs.fs.usda.gov/forestops**	334-826-8700
Blacksburg, VA Andrew Dolloff	4202	Coldwater Streams and Trout Habitat in the Southern Appalachians **www.trout.forprod.vt.edu**	540-231-4016
Blacksburg, VA Philip Araman	4702	Integrated Life Cycle of Wood: Tree Quality, Processing, and Recycling **www.srs4702.forprod.vt.edu**	540-231-4016

Research Work Units

Location & Project Leader	Unit	Name & Web Site	Phone
Charleston, SC Carl Trettin	4103	Center for Forested Wetlands Research **www.srs.fs.usda.gov/charleston**	843-727-4271
Clemson, SC Susan Loeb	4201	Endangered, Threatened, and Sensitive Wildlife and Plant Species in Southern Forests **www.srs.fs.usda.gov/4201**	864-656-3284
Coweeta, NC James Vose	4351	Evaluation of Watershed Ecosystem Responses to Natural, Management, and Other Human Disturbances	828-524-2128
Knoxville, TN James Perdue	4801	Forest Inventory and Analysis **www.srsfia.usfs.msstate.edu**	865-862-2027
Monticello, AR James Guldin	4106	Managing Upland Forest Ecosystems in the Midsouth **www.srs.fs.usda.gov/4106**	870-367-3464
Nacogdoches, TX Ronald Thill	4251	Integrated Management of Wildlife Habitat and Timber Resources **www.srs.fs.usda.gov/wildlife**	936-569-7981
New Orleans, LA James Granskog	4802	Evaluation of Legal, Tax, and Economic Influences on Forest Resource Management **www.srs.fs.usda.gov/4802**	504-589-6652
Pineville, LA James Barnett	4111	Ecology and Management of Even-Aged Southern Pine Forests **www.srs.fs.usda.gov/4111**	318-473-7215

Research Work Units

Location & Project Leader	Unit	Name & Web Site	Phone
Pineville, LA Kier Klepzig	4501	Ecology, Biology, and Management of Bark Beetles and Invasive Forest Insects of Southern Conifers **www.srs.fs.usda.gov/4501**	318-473-7232
Pineville, LA Les Groom	4701	Utilization of Southern Forest Resources **www.srs.fs.usda.gov/4701**	318-473-7268
Raleigh, NC Steven McNulty	4852	Southern Global Change Program **www.sgcp.ncsu.edu**	919-513-2974
Research Triangle Park, NC Kurt Johnsen	4154	Biological Foundations of Southern Forest Productivity and Sustainability **www.rtp.srs.fs.usda.gov/soils/soilhome.htm**	919-549-4092
Research Triangle Park, NC Greg Reams	4803	Forest Health Monitoring **http://willow.ncfes.umn.edu/fhm/fhm_hp.htm**	919-549-4014
Research Triangle Park, NC David Wear	4851	Economics of Forest Protection and Management **www.rtp.srs.fs.usda.gov/econ**	919-549-4093
Saucier, MS Floyd Bridgwater	4153	Southern Institute of Forest Genetics	228-832-2747
Starkville, MS Terry Wagner	4502	Wood Products Insect Research **www.srs.fs.usda.gov/termites**	662-338-3100
Stoneville, MS Ted Leininger	4155	Center for Bottomland Hardwoods Research **www.srs.fs.usda.gov/cbhr**	662-686-3154

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