

Announcement of Publications -- December 1998

Focus–Fire and Sustainability of Southern Forests

The Florida forest fires this spring and summer brought the focus of this complex phenomenon to the Eastern United States. The increasingly urban structure of the fire zone compounded the urgency. Nature has grabbed people's attention: fire is a dominant event, affecting humans and their property, animals - domestic and wild, forests, air quality, water resources, the landscape itself. At the 63rd North American Wildlife and Natural Resources Conference in Orlando, FL in March 1998, Pete Roussopoulos, Director of the Southern Research Station, and James R. Woehr, Director of the Wildlife Management Institute, co-chaired a special session, "Burning Issues and Smoke Screens: Heat and Light in Southern Forests." Roussopoulos' opening remarks included nine assertions that focus on the unique characteristics of southern forests, beginning with South's combination of high forest productivity, ecological diversity, and prominence of largely unregulated private forest ownership. Considering the fact that the South was an agricultural and logging wasteland in the early 20th century, Roussopoulos says the recovery of southern forests is "the most noteworthy testament to the success of the conservation movement that one can cite." Add the complexity of competing interests in diverse and changing resource values, the pressure on the South to be "the Nation's woodbasket," and the conflicts among jurisdictional interests of independent Federal agencies. Factor in the smoke of prescribed - or wild - fire that Roussopoulos' opening remarks address. To read the complete text of this thought-provoking publication, request number **35**.

In the session titled "Burning Issues and Smoke Screens: Heat and Light in Southern Forests," Southern Research Station scientists, Forest Service resource managers, academicians, and non-governmental organization researchers collaborated to present nine papers. The names of Forest Service authors are signified by bold type. A limited number of copies of the entire session is available by requesting number **35**.

How far could a squirrel travel in the treetops? A prehistory of the southern forest by **Paul B. Hamel** and Edward R. Buckner; request number **16**

The South's forestland – on the hot seat to provide more by **Raymond M. Sheffield** and **James G. Dickson**; request number **40**

Voices from southern forests by **H. Ken Cordell**, John C. Bliss, **Cassandra Y. Johnson**, and Mark Fly; request number **9**

People, space, and time: factors that will govern forest sustainability by **David N. Wear**, Robert Abt, and **Robert Mangold**; request number **48**

Intensive management – an the South really live without it? by **James M. Guldin** and T. Bently Wigley; request number **15**

Ecosystem restoration: fact or fancy? by **John A. Stanturf**, **Callie J. Schweitzer**, Stephen H. Schoenholtz, **James P. Barnett**, **Charles K. McMahon**, and **Donald J. Tomczak**; request number **45**

Fire and biodiversity: studies of vegetation and arthropods by S.M. Hermann, T. Van Hook, R.W. Flowers, L.A. Brennan, J.S. Glitzenstein, D.R. Streng, **J.L. Walker**, and R.L. Meyers; request number **19**

Whither wildlife without fire? by L.A. Brennan, R.T. Engstrom, W.E. Palmer, S.M. Hermann, G.A. Hurst, L.W. Burger, and **C.L. Hardy**; request number **6**

The smoke dilemma: a head-on collision! by **Gary L. Achtemeier**; **William Jackson**; Bernie Hawkins, **Dale D. Wade**, and **Charles McMahon**; unfortunately, this publication is not listed with a separate identifying publication number in this catalogue, but it is available within the composite of publications in the “Burning Issues and Smoke Screens: Heat and Light in Southern Forests” session; request number **35** and indicate if you only want to receive the publication about smoke.

Callie Schweitzer, who recently relocated from Stoneville, MS, to accept a position in the Forest Inventory and Analysis research work unit in

Asheville, NC, also delivered the following presentation during the “Restoring Bottomland Hardwood Forests” session:

What is restoring bottomland hardwood forests? A study from the Lower Mississippi Alluvial Valley; request number **39**

Those Two Certain Things

Death and taxes remain inevitable in this world of constant change. **The effects of Federal and State death and gift taxes on nonindustrial private forest lands in the Midwestern States** contains information vital to realizing the benefits of estate planning for forest landowners. Authored by Daniel M. Peters, Harry L. Haney, Jr., and John L. Greene, this publication considers changes imposed by the 1997 Taxpayer Relief Act and demonstrates the advantages of applying advanced estate planning techniques and/or donation of conservation easements in States selected to represent three different tax systems. Request number **32** to find out if you can save some money while protecting your investment in land.

The Southern Region offers **Tax Tips 1998**, a valuable annual product from Larry Bishop, of State and Private Forestry. You can download this publication from the Southern Region’s web site: www.r8web.com/spf/taxtips98.htm/ or request a copy from the Southern Region by calling 404-347-4048.

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Recent Publications -- December 1998

Achtemeier, Gary L. 1998. **A framework for standardizing flight characteristics for separating biology from meteorology in long-range insect transport.** The 23rd conf. on Agricultural & Forest Meteorology, 13th conf. on Biometeorology and Aerobiology, and 2nd Urban Environment Symp. 360-363.

Once airborne during long-range transport, to what extent is the final destination determined by the biota? It is well known that a biological mechanism initiates flight and another biological mechanism terminates flight. Therefore, efforts to answer the above question should be focused on en route insect behavior.

A strategy is proposed to isolate biology from meteorology of long-range insect transport. The scheme has four parts: 1) laboratory observations of insect flight; 2) an insect flight-level weather mode; 3) observations of the thermal stratification of the lower troposphere; and 4) observations of insects in flight. Measured temperature/rise rate relationships can be entered into a time-dependent meteorological model. The model can simulate flight elevations as functions of vertical temperature stratification for an ensemble of insects. Model results can be compared with observations of insects in flight. Similarities between observed and modeled flight levels should be attributed to temperature/rise rate dependency. Differences between observed and modeled flight levels should be ascribable to higher-order meteorological phenomena and to biological factors. Identifying and eliminating other weather factors should yield the biological component of long-range insect transport -- if any. (1)

Bechtold, W.A.; Zarnoch, S.J.; Burkman, W.G. 1998. **Comparisons of modeled height predictions to ocular height estimates.** Southern Journal of Applied Forestry. 22(4): 216-221.

Equations used by USDA Forest Service Forest Inventory and Analysis projects to predict individual tree heights on the basis of species and d.b.h. were improved by the addition of mean overstory height.

However, ocular estimates of total height by field crews were more accurate than the statistically improved models, especially for hardwood species. Height predictions from the improved equations attained the desired measurement quality objective only 57 percent of the time, while ocular estimates achieved the desired accuracy 75 percent of the time.

(2)

Berg, Erik C. 1997. **Bent Creek demonstration program.** In: Northeastern Forest Experiment Station. Communicating the role of silviculture in managing the national forests: Proceedings of the National Silviculture Workshop; 1997 May 19-22; Warren, PA. Gen. Tech. Rep. NE-238. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 153-154.

Bent Creek Research and Demonstration Forest scientists have transferred the results of research on the ecology and management of Southern Appalachian hardwoods since 1925. Since 1989, a full-time technology transfer specialist has led demonstration efforts. The demonstration program was designed to quickly transfer research results to interested users and to free scientists to conduct research. Tours of the experimental forest, a large photo point program, customized demonstration publications, short course offerings, and publications are the focal points of the Bent Creek program. (3)

Bolstad, Paul V.; Swank, Wayne; Vose, James. 1998. **Predicting Southern Appalachian overstory vegetation with digital terrain data.** Landscape Ecology. 13: 271-283.

Vegetation in mountainous regions responds to small-scale variation in terrain, largely due to effects on both temperature and soil moisture. However, there are few studies of quantitative, terrain-based methods for predicting vegetation composition. This study investigated relationships between forest composition, elevation, and a derived index of terrain shape, and evaluates methods for predicting forest composition. Trees were measured on 406 permanent plots within the boundaries of the Coweeta Hydrologic Lab, located in the Southern Appalachian mountains of western North Carolina, USA. All plots were in control

watersheds, without human or major natural disturbance since 1923. Plots were 0.08 ha and arrayed on transects, with approximately 380 m between parallel transects. Breast-height diameters were measured on all trees. Elevation and terrain shape (cove, ridge, sideslope) were estimated for each plot. Density (trees/ha) and basal area were summarized by species and by forest type (cove, xeric oak-pine, northern hardwoods, and mixed deciduous). Plot data were combined with a digital elevation data (DEM), and a derived index of terrain shape at two sampling resolutions: 30 m (US Geological Survey), and 80 m (Defense Mapping Agency) sources. Vegetation maps were produced using each of four different methods: 1) linear regression with and without log transformations against elevation and terrain variables, combined with cartographic overlay; 2) kriging; 3) co-kriging; and 4) a mosaic diagram. Predicted vegetation was compared to known vegetation at each of 77 independent, withheld data points, and an error matrix was determined for each mapping method. (4)

Bolstad, Paul V.; Swift, Lloyd; Collins, Fred; Regniere, Jacques. 1998. **Measured and predicted air temperatures at basin to regional scales in the southern Appalachian mountains.** *Agricultural and Forest Meteorology*. 91: 161-176.

Landscape and temporal patterns of temperature were observed for local (13 station) and regional (35 station) networks in the Southern Appalachian mountains of North America. Temperatures decreased with altitude at mean rates of 7°C/km (maximum temperature) and 3°C/km (minimum temperature). Daily lapse rates depended on the method and stations used in the calculations. Average daily temperature ranges decreased as elevation increased, from 14°C at 700 m to 7°C at 1440 m, and daily temperature ranges were typically higher in spring and fall at any given station. Daily maximum temperatures above the forest canopy averaged 1.4°C higher at a south-facing station relative to a comparable northwest-facing station, and above-canopy daily minimum temperatures were depressed at a valley-bottom station. Regional regression models provided a more accurate estimate of station temperature than either kriging or local lapse models when tested using 35 National Climatic Data Center (NCDC) stations in the Southern Appalachians. Data-splitting tests yielded mean absolute errors (MAE) from 1.39 to

2.30°C for predictions of daily temperatures. Ten-year biases for an independent data set collected at four stations in the Coweeta Basin ranged from -2.87 to 2.91°C for daily temperatures, with regional regression performing best, on average. However, tests against another independent data set indicate regional regression and local lapse models were not significantly different, with mean biases averaged from -2.78 to 2.91°C for daily predicted temperatures. (5)

Brennan, L.A.; Engstrom, R.T.; Palmer, W.E. 1998. **Whither wildlife without fire?** In: Wadsworth, Kelly G., ed. Transactions of the 63rd North American Wildlife and Natural Resources conference; 1998 March 20-25; Orlando, FL. Washington, DC: Wildlife Management Institute: 402-414.

Fire is a major ecosystem process that has been pervasive across the southern forest landscape on an evolutionary time scale. Wildlife evolved in response to frequent lightning-ignited burns that shaped the biota of the Southeast. Despite the dominant role that fire has played on an evolutionary scale, the use of prescribed fire as a forest wildlife management tool remains limited, and must be expanded. In this paper, the objective is to use case histories from the scientific literature, along with previously unpublished data, to describe why use of prescribed fire is critical for the effective management of numerous wildlife species in southern forests. In the authors' view, some of the major wildlife management "problems" (i.e., many endangered and/or declining species) in the Southern U.S. are rooted in habitat loss resulting from a lack of adequate (either sufficiently frequent and/or widespread) applications of prescribed fire. (6)

Cain, Michael D.; Wigley, T. Bentley; Reed, Derik J. 1998. **Prescribed fire effects on structure in uneven-aged stands of loblolly and shortleaf pines.** Wildlife Society Bulletin. 26(2): 209-218.

Structure was assessed in uneven-aged stands of loblolly (*Pinus taeda*) and shortleaf pine (*P. echinata*) that were subjected to prescribed winter burns on cycles of 0, 3, 6, and 9 years. Vegetation assessments were made in late summer of 1990, 10 years after a single hardwood control

treatment (basal injection of non-pine woody plants >2.5 cm in groundline diameter with Tordon[®] 101 R); 1 year after the fourth 3-year burn cycle; 4 years after the second 6-year burn cycle; and 1 year after the second 9-year burn cycle. Compared to unburned controls, prescribed burning tended to increase ($P \leq 0.008$) percent ground cover from graminoids and composites. For understory woody plants that were >1 m tall but <2.5 cm diameter breast height (d.b.h.), American beautyberry (*Callicarpa americana*) had the greatest percent ground cover on burned and unburned plots. Horizontal cover between 0- and 3-m height tended to average less ($P \leq 0.002$) with more frequent prescribed burning and with shorter time since burning. There were no burn treatment differences in density ($P = 0.199$, $\beta = 0.853$) or basal area ($P = 0.477$, $\beta = 0.898$) for sapling-size stems (2.5-8.9 cm d.b.h.), but species diversity of saplings was lower ($P = 0.002$) on plots prescribe burned at 3-year intervals as compared to other treatments. (7)

Clark, Alexander, III; McAlister, Robert H. 1998. **Visual tree grading systems for estimating lumber yields in young and mature southern pine.** Forest Products Journal. 48(10): 59-67.

New visual tree grading systems for mature southern pine ≥ 35 years old and young pine < 35 years old based on number and size of branches in the lower bole are described. A series of lumber grade yield studies was conducted to test the new grading rules. A total of 214 natural loblolly pine (*Pinus taeda* L.) and shortleaf pine (*P. echinata* Mill) trees 9 to 20 inches diameter at breast height (d.b.h.) were harvested from 37-, 39-, 42-, 56-, and 73-year-old stands; 152 loblolly pine trees 9 to 18 inches d.b.h. were harvested from 22-, 25-, 27-, 34-, and 39-year-old planted stands in the Georgia Piedmont. The study trees were graded using the new rules and processed into lumber. Results show the new grading rules separated trees into three significantly different stumpage value classes based on lumber grade yield. Average stumpage value per hundred cubic feet (CCF) of sawlog was 16 percent higher for grade 1 trees compared to grade 2 trees, and that for grade 2 trees was 27 percent higher than for grade 3 trees using the rules for trees ≥ 35 years old. Average stumpage value per CCF of sawlog was 13 percent higher for grade 1 trees compared to grade 2 trees; that for grade 2 trees was 19 percent higher than for grade 3 trees using the rules for trees < 35 years

old. Regression equations are presented for estimating lumber grade yield based on tree grade, dimensions, and age. The grading systems were developed with the cooperative effort of State and Federal agencies and industry. (8)

Cordell, Ken H.; Bliss, John C.; Johnson, Cassandra Y.; Fly, Mark. 1998. **Voices from southern forests.** In: Wadsworth, Kelly G., ed. Transactions of the 63rd North American Wildlife and Natural Resources conference; 1998 March 20-25; Orlando, FL. Washington, DC: Wildlife Management Institute: 332-347.

The faces and voices of the South have been changing dramatically over the last several decades, just like the rest of the Nation. Population growth, immigration, urbanization, expanding minority proportions, a thriving economy, rising environmental sentiments, and shifts in property ownership, among many other changes, have put forest and wildlife management in a much different context than at any time in the region's history. This paper examines the changing social, economic, attitudinal, and other voices of southerners and speculates about the meaning these changing voices might have on the future of forest and wildlife management in the South. (9)

Diamond, David D. 1998. **An old-growth definition for southwestern subtropical upland forests.** Gen. Tech. Rep. SRS-21. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 7 p.

Mainly evergreen, broad-leaved forests in the Southwestern United States are restricted to the Lower Rio Grande Valley of Texas. The soils and long growing season make this region valuable cropland, and, thus, almost all of the area once occupied by this forest type has been converted to row crops. Remaining old-growth forests are usually dominated by some combination of the broad-leaved evergreen Texas ebony and a host of other species. Few quantitative studies have described the composition of this forest type, and, likewise, little is known of the dynamics. Droughts, flooding regime, and fire were large-scale disturbance factors. Now, the Rio Grande is used extensively for

irrigation, and flooding is controlled. Therefore, the presettlement water regime has been greatly altered, and vegetation of the remaining forest fragments is also adjusting to the new moisture regime. Some areas are wetter and some drier than in historical times. Many of the fragments that remain have already been incorporated into public ownership by the U.S. Fish and Wildlife Service or the Texas Parks and Wildlife Department. (10)

Elliott, Katherine J.; Boring, Lindsay R.; Swank, Wayne T. 1998.

Changes in vegetation structure and diversity after grass-to-forest succession in a Southern Appalachian watershed.

The American Midland Naturalist. 140: 219-232.

To document how species richness and diversity (H') recover from severe large-scale disturbance, we report temporal patterns of species composition and diversity following grass-to-forest succession from a long-term experiment in the Coweeta Basin, western North Carolina. The original experiment -- clear-cutting, 5 yr of grass cover followed by a herbicide treatment, and abandonment in a Southern Appalachian mixed deciduous forest -- represents the most severe human disturbance in the Coweeta Basin. For several years after cessation of management, *Robinia pseudoacacia* quickly sprouted from roots and exceeded the growth rates of other species. *Liriodendron tulipifera* increased in density and basal area because of its prolific seedling establishment and rapid growth rate. Regeneration of large seeded species was mixed -- sparse for *Quercus rubra* and *Q. coccinea* and nonexistent for *Q. prinus* and *Q. velutina*. In the overstory, density-based H' increased from 1958, before grass conversion, to 15 yr and 28 yr following disturbance. In contrast, basal area-based H' had significantly declined at 15 yr, then increased at 28 yr. The initial decline in basal area based H' was attributed to a decline in evenness of species distribution (J') rather than to a change in species richness. The severe disturbance increased the abundance of early successional woody species and of herbaceous genera that tolerate open habitats, such as *Erechtites*, *Phytolacca*, and *Erigeron*. Shade-tolerant understory ferns and herbs such as *Polystichum acrostichoides*, *Dennstaedtia punctilobula*, *Galium latifolium*, and *Viola cucullata* gradually became more abundant. The 28-yr-old forest of WS6

had much lower species richness than the adjacent reference watersheds, but more than threefold higher density. (11)

English, Donald B. K.; Kriesel, Warren; Leeworthy, Vernon R; Wiley, Peter C. 1996. **Economic contribution of recreating visitors to the Florida Keys/Key West.** Silver Spring, MD: National Oceanic and Atmospheric Administration, Strategic Environmental Assessments Division. 22 p.

This report provides estimates of the economic impact that visitors to the Florida Keys have on both the Monroe County and larger South Florida regional economies. Estimates are made for output/sales, income, and employment and include both direct and secondary economic impacts. This report provides the basis for demonstrating the income-producing asset value of the natural resources of the Florida Keys/Florida Bay. (12)

Gordon, D.R.; Kubisiak, T.L. 1998. **RAPD analysis of the last population of a likely Florida Keys endemic cactus.** Florida Scientist. 61(3-4): 203-210.

The semaphore cactus in the Florida Keys has until recently been considered a disjunct location of the Jamaican *Opuntia spinosissima*. Loss of all but one population in the Keys coupled with recent suggestions that the species should be taxonomically separated from the Jamaican cactus and is, therefore, a Florida Keys endemic, makes this population of conservation concern. Random amplified polymorphic DNA (RAPD) analysis was conducted on the remaining 12 individual large stems in the wild to determine whether this small population contains multiple genotypes. Other accessions of the cactus, mainly from private collections and from the Caribbean were also included. Analysis of 42 RAPD markers reveals that all Florida accessions are closely related, with unique genotypes being separated by differences at only one to as many as five polymorphic markers (2.4 to 11.9 percent of markers). Within the wild population, seven genotypes could be uniquely identified. The Jamaican accession was separated from the Florida cacti by an average of 22 marker differences (52.3 percent of the markers). The difference of the Florida accessions from the Jamaican

accession by a large number of markers suggests possible species-level differentiation, providing additional supportive evidence that the Keys population may be one of the rarest and most threatened plants in the continental United States. (13)

Groom, Leslie H.; Mott, Laurence; Shaler, Stephen M.; and Pesacreta, Tom. [Publication date unknown]. **Effect of fiber surface and mechanical properties on the stiffness and strength of medium-density fiberboard.** In: Butterfield, B.G., ed. Microfibril angle in wood; proceedings of the International Association of Wood Anatomists/International Union of Forestry Research Organizations; 1997 November; Westport, New Zealand. [Place of publication unknown]: [Publisher unknown]: 375-387.

The mechanical properties of wood-based composites are dependent upon the properties of the wood components (e.g., wood fibers, wood strands) and the manner in which they are combined. The relationship between fiber mechanical properties and fiber-based composites has been discussed in several publications. This paper will focus primarily on the influence of fiber physical and mechanical properties on the structural performance of medium-density fiberboard. (14)

Guldin, James M.; Wigley, T. Bently. 1998. **Intensive management – can the South really live without it?** In: Wadsworth, Kelly G., ed. Transactions of the 63rd North American Wildlife and Natural Resources conference; 1998 March 20-25; Orlando, FL. Washington, DC: Wildlife Management Institute: 362-375.

Over the past five years, the public and private sectors have debated the future of forest management and its implications for the next century. In the public sector, resource managers have debated the meaning and significance of “ecosystem management,” a term coined in 1992 by then-Forest Service Chief F. Dale Robertson; he suggested that this approach to forest management would “blend the needs of people and environmental values in such a way that the National Forests and Grasslands represent diverse, healthy, productive, and sustainable ecosystems.” Resource managers in the private sector have also debated

among themselves and with their counterparts in the public sector about ecosystem management. The forest products industry's dominant view is that ecosystem management is a process with different meanings and applications, which are based on ownership and objectives.

Within the private sector, debate also has focused on the traditional application of multiple-use forestry, using the principles of sustainable forest management. Sustainability as defined by industry is about more than assuring a sustainable timber supply; it is also about sustaining the full spectrum of forest values.

Among the most prominent questions in the debates about ecosystem management and sustainability has been the role that intensive management plays as an element of a broader, nationwide forest management philosophy. The clearest advantages of plantations are immediate occupancy of a deforested site, rapid growth, and high yield. Extensive use of plantations can contribute significantly to the South's fiber supply over time. Intensively managed plantations may provide most of the world's demand for wood pulp or construction material. However, intensive management has its detractors. There are major concerns about adverse environmental effects that result from harvesting, site preparations, use of herbicides, reforestation with a single species resulting in a "monoculture" using genetically improved seedlings and reliance on short rotation lengths. Concerns also exist about the effects of clearcutting a stand within the context of a larger area – a "forest fragmentation" effect. Some suggest that the South can live without intensive management. In this paper, the authors will attempt to show that, in the context of southern forestry, intensive management is of great economic importance and can be applied in ways that have a sound ecological basis. (15)

Hamel, Paul B.; Buckner, Edward, R. 1998. **How far could a squirrel travel in the treetops? A prehistory of the southern forest.** In: Wadsworth, Kelly G., ed. Transactions of the 63rd North American Wildlife and Natural Resources conference; 1998 March 20-25; Orlando, FL. Washington, DC: Wildlife Management Institute: 309-315.

Conservation activities aimed at protecting old-growth forests; at maintaining populations of desired species groups, such as oaks (*Quercus* sp.), wild turkeys (*Meleagris gallopavo*), other game species or Neotropical migratory birds; and at increasing populations of endangered species, such as red-cockaded woodpeckers (*Picoides borealis*), Bachman's warblers (*Vermivora bachmanii*), Louisiana black bears (*Ursus americanus luteolus*), and Tennessee coneflowers (*Echinacea tennesseensis*), require a target environment. This target, often viewed as the environment at some specified past time, becomes the desired future condition. If the target can be considered a stable ecosystem that is self-perpetuating under control of natural processes, the envisioned environment is a defensible "natural" target for land-use planning. If the target is not easily regarded as "natural," but must involve cultural intervention for its appearance or persistence, the planning process must derive a target environment by some other method, one more clearly reflective of the values of the planners themselves. The authors' purpose in this paper is to suggest time periods as potential candidates for the "original" or "natural" condition of the southern forest and to evaluate the forest conditions at those times in light of knowledge of past geological and cultural conditions. (16)

Hedrick, Larry D.; Hooper, Robert G.; Krusac, Dennis L.; Dabney, Joseph M. 1998. **Silvicultural systems and red-cockaded woodpecker management: another perspective.** Wildlife Society Bulletin. 26(1): 138-147.

In 1996 Rudolph and Conner maintained that a modified even-aged silvicultural system using irregular shelterwood as the method of regenerating new stands provides greater benefits for red-cockaded woodpeckers (*Picoides borealis*) than uneven-aged systems. Their argument was confined to loblolly (*Pinus taeda*) and shortleaf (*P. ecbinata*) pine forest types and emphasized public lands. In a reply to Rudolph and Conner, Engstrom and others, also in 1996, stressed the virtues of uneven-aged management, but rather than adhering to the context established by the former authors, framed their arguments largely around longleaf pine (*P. palustris*) on private lands. This resulted in some disparate comparisons which obscured some issues and overlooked others.

In an attempt to bring sharper focus to the issues, Hedrick, Hooper, Krusac, and Dabney offer the following thoughts. The context for argument is the management of all southern pine forest types on national forest lands for red-cockaded woodpecker recovery. (17)

Hemingway, R.W. 1998. **Exploring the conformations of polyflavanoids – an approach to understanding the significance of tannins.** In: [Proceedings] Polyphenols 96; 1996 July 15-18; Bordeaux, France. Paris: INRA: 81-103.

Reflection on 25 years of research at the USDA Forest Service Laboratory in Pineville, LA suggests that at least a third and possibly closer to half of the research done on polyflavanoids is in one or another way connected with attempts to understand the conformational properties of these compounds. The concentration on definition of the preferred conformations and conformational flexibility of polyflavanoids is due to the belief that both the commercial and ecological significance of polyflavanoids rest, to large degree, on the relationship of conformation with the complexation of these compounds with other biopolymers (particularly proteins and carbohydrates).

This review is not prompted by the notion that all the problems have been solved but rather that scientists have entered a new and exciting phase of tannin chemistry where both NMR and computational approaches have grown to considerable power at the same time when tannin research is increasingly being focused more on the biological significance of these compounds.

In this review, Hemingway has summarized both the research conducted at the Forest Service's Pineville laboratory and the work done by partners and colleagues who have collaborated at various laboratories around the world. The author limits this review to milestones that he considers to be the most important parts of that effort, what he thinks is now known, and some discussion of what he believes are priority issues that need attention. If scientists are to more fully understand the biological significance of condensed tannins, and particularly their complexation with other biopolymers, they must continue to advance the understanding of the conformational preferences and flexibility of these compounds,

particularly the free phenols in water, for which only limited data are now available. (18)

Hermann, S.M.; Hook, T. Van; Flowers, R.W.; and others. 1998. **Fire and biodiversity: studies of vegetation and arthropods.** In: Wadsworth, Kelly G., ed. Transactions of the 63rd North American Wildlife and Natural Resources conference; 1998 March 20-25; Orlando, FL. Washington, DC: Wildlife Management Institute: 384-401. (Ed. note: J. L. Walker is the Southern Research Station (SRS) author for this publication.)

The authors summarize and update the state of knowledge for some components of prescribed fire in the southeastern Coastal Plain, with a primary focus on effects of season of burn on plants and arthropods. Specifically, the authors: 1) briefly explain season of fire terminology; 2) present a short synopsis of how fire regimes affect trees and groundcover vegetation in Coastal Plain pine forests; 3) review relevant arthropod literature; 4) discuss preliminary data from ongoing studies on season of burn on arthropods, including consideration of resources for pollinators (especially fall migrating butterflies); and 5) consider prescribed fire management in light of biodiversity issues. (19)

Kilgo, John C.; Sargent, Robert A.; Miller, Karl V.; Chapman, Brian R. 1997. **Landscape influences on breeding bird communities in hardwood fragments in South Carolina.** Wildlife Society Bulletin. 25(4): 878-885.

Results from studies on the effects of forest fragmentation on bird communities in urban-agricultural landscapes may not be applicable to forested landscapes such as the Southeastern Coastal Plain. During 1993-1994, we measured parameters of avian communities in the Coastal Plain of South Carolina in hardwood stands surrounded by agricultural habitat (field-enclosed stands; FES) and in hardwood stands surrounded by pine (*Pinus* spp.)-forested habitat (pine-enclosed stands; PES). Total species richness was greater in FES than PES in both years ($P < 0.001$) and was associated positively with stand area in both treatments. Neotropical migrant species richness did not differ between

treatments ($P > 0.05$), but was associated positively with stand area. Total bird abundance was greater in FES than in PES ($P < 0.001$). Abundance of tufted titmouse (*Parus bicolor*), Carolina wren (*Thryothorus ludovicianus*), and northern cardinal (*Cardinalis cardinalis*) was greater ($P < 0.01$) in FES than PES in \geq year, and abundance of red-eyed vireo (*Vireo olivaceus*) and summer tanager (*Piranga rubra*) was greater ($P < 0.02$) in PES than FES in 1 year. Ten species had greater probabilities of occurrence in FES than PES ($P < 0.05$), whereas red-eyed vireo was the only species more likely to occur in PES than in FES. Wood thrush (*Hylocichla mustelina*) and ovenbird (*Seiurus aurocapillus*) occurred in PES but not in FES. The presence of a surrounding pine forest apparently increased the suitability of PES for some area-sensitive species, but decreased suitability for several edge species. (20)

Kindscher, Kelly; Holah, Jenny. 1998. **An old-growth definition for western hardwood gallery forests.** Gen. Tech. Rep. SRS-22. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 12 p.

Western hardwood gallery forests are found across an extremely large, diverse geographical area that encompasses the Great Plains in the United States and Canada. Remnant forests of this type still exist in the "Prairie Peninsula," which historically projected an eastern finger into Ohio. The forests are restricted to floodplains of major rivers and are in sharp contrast to the surrounding prairie. The name "gallery" forest refers only to forests that form a corridor of trees along river systems in the region. Disturbances associated with flooding, such as water and ice scouring, as well as soil deposition, are required for the establishment of cottonwood and willow stands, pioneer species of this type. Today, the historic hydrology of all Great Plains rivers has drastically changed with the creation of dams and other flood-control measures. The western hardwood gallery forest has changed as well, with composition shifting from shade-intolerant species, such as cottonwood and willow, to shade-tolerant species, such as green ash. Consequently, there is little regeneration of this forest type. (21)

Kluender, R.; Lortz, D.; McCoy, W.; Stokes, B.; Klepac, J. 1997.
Productivity of rubber-tired skidders in southern pine forests.
Forest Products Journal. 47(11/12): 53-58.

Sixteen stands were harvested at intensities (proportion of basal area removed) ranging from 0.27 to 1.00. Logging contractors used one or two rubber-tired cable and/or grapple skidders. Harvested sites were similar in slope, tree size, and stand composition. Thirteen of the stands had even-aged structures while the other three were uneven-aged. Skidding time per cycle was directly related to skidder type, distance, and number of stems hauled, and inversely related to harvest intensity. Skidding productivity (grapple skidder, per productive hour) was sensitive to distance, stem size, number of stems in a load, and harvest intensity. Productivity was more sensitive to tree size than harvesting intensity. (22)

Kluender, R.; Lortz, D.; McCoy, W.; Stokes, B.; Klepac, J. 1997.
Removal intensity and tree size effects on harvesting cost and profitability. Forest Products Journal. 48(1): 54-59.

Sixteen stands were harvested at intensities (proportion of basal area removed) ranging from 0.27 to 1.00. Logging contractors used chain saws and rubber-tired skidders. Harvested sites were similar in slope and tree size. Harvest cost per hundred cubic feet of wood (CCF) was inversely related to harvest intensity and tree size. Harvesting profitability per CCF was near zero when removing trees averaging less than 8 inches diameter at breast height (d.b.h.). Harvest intensity had the greatest influence on profitability in small-diameter timber. Harvest profitability was greatest when removing large trees at high levels of harvesting intensity. Because of the differences in average tree size removed by different harvesting prescriptions, some prescriptions were more profitable than others. Most profitable for harvesting contractors in our study was single-tree selection in an uneven-aged stand. Less profitable were selection in an even-aged stand, clear cutting, and shelterwood harvests, in that order. Selection at low removal intensities with small trees removed would always be the least favored harvest method with the equipment spreads we observed. Average removed tree size needed to be at least 8 inches d.b.h. to break even. (23)

Knoepp, Jennifer D.; Tieszen, Larry L.; Fredlund, Glen G. 1998. **Assessing the vegetation history of three Southern Appalachian balds through soil organic matter analysis.** Res. Pap. SRS-13. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 12 p.

The history of Southern Appalachian grassy balds has long been a topic of speculation. Two types have been identified: those completely covered by grass and those occupied by a mixed-hardwood overstory with a grassy herbaceous layer. Three areas historically known as balds were identified in the Wine Spring Ecosystem Project Area. Each is currently under a different management regime. The objective of this assessment was to determine the vegetative history of these balds through soil organic matter (SOM) analysis. Soil was collected from each horizon through the profile on the bald sites using a nearby forest for reference. The $\delta^{13}\text{C}$ values were determined for the green vegetation, litter, and soils of the bald sites and reference forests. Samples were selected for determination of phytolith and charcoal content and for ^{14}C dating. The $\delta^{13}\text{C}$ value of plant tissues varies with photosynthetic pathway and plant type, providing a distinctive signature in SOM. Significant shifts in SOM $\delta^{13}\text{C}$ values with depth in the profile would suggest changes in site vegetation. Organic matter analysis indicated that two of the bald sites were never completely covered by grass without a woody component. The third bald may have undergone a vegetative shift in more recent times. Data also suggest that a vegetative shift may have occurred on two of the reference forest sites. (24)

Kolka, Randall K.; Wolf, Ann T. 1998. **Estimating actual evapotranspiration for forested sites: modifications to the Thornthwaite Model.** Res. Pap. No. SRS-6. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 7 p.

A previously coded version of the Thornthwaite water balance model was used to estimate annual actual evapotranspiration (AET) for 29 forested sites between 1900 and 1993 in the Upper Great Lakes area. Approximately 8 percent of the data sets calculated AET in error. Errors were detected in months when estimated AET was greater than potential

evapotranspiration. Annual climate variability led to errors in accrued soil water storage, which led to errors in the calculation of AET. Two hydrologically justifiable modifications were made to correct errors resulting from the use of the original coded Thornthwaite model. The first modification allows for soil water accumulation throughout the year, whereas the second allows for oversaturated soil conditions in the spring. The modified program appears to be robust for any temperate climate condition. (25)

Leeworthy, Vernon R.; Bowker, J.M. 1997. **Nonmarket economic user values of the Florida Keys/Key West**. Silver Spring, MD: National Oceanic and Atmospheric Administration, Strategic Environmental Assessments Division. 41 p.

This report provides estimates of the nonmarket economic user values for recreating visitors to the Florida Keys/Key West that participated in natural resource-based activities. Results from estimated travel cost models are presented, including visitor's responses to prices and estimated per person-trip user values. Annual user values are also calculated and presented and are used along with estimates of activity person-days to derive estimates of activity-based user values. Estimates of annual user values are used to estimate the asset value of the resources of the area for visitor's outdoor recreation uses. The report discusses the general uses of nonmarket economic use values and gives an example by putting the costs of water quality improvement and protection for the Florida Keys/Key West into perspective. (26)

Liu, Feipeng P.; Rials, Timothy G.; Simonsen, John. 1998. **Relationship of wood surface energy to surface composition**. *Langmuir*. 14: 536-541.

The wood cell wall is composed of cellulose, lignin, hemicelluloses, and extractives. Thus, the surface energy of the wood material must be some combination of the surface energies of these components. The influence of extractives on wood surface chemistry can be important in diverse industrial applications, such as coating, pulping, and wood-based composites. In this study, pine wood meal was subjected to heating,

washing with toluene, and extraction with acetone/water, dichloromethane, and ethanol/benzene. The surface properties and composition were then determined by Fourier transform infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS), and inverse gas chromatography (IGC). The dispersive component of the surface free energy, the enthalpy, the entropy, and the acid/base interactions were calculated from IGC measurements and compared to the surface composition as revealed by XPS. Heating and washing with toluene altered surface properties only slightly. Extraction of wood meals with acetone/water, dichloromethane, and ethanol/benzene appeared to partially and selectively remove most extractives from the wood, resulting in an increased dispersive component of the surface energy, increased acidity, and increased basicity. The surface energy appeared to be related to the distribution of surface oxygen-containing functional groups. (27)

Lortz, D.; Kluender, R.; McCoy, W; and others. 1997. **Manual felling time and productivity in southern forests.** Forest Products Journal. 47(10): 59-63. (Editor's note: B. Stokes and J. Klepac are the SRS co-authors for this publication.)

Sixteen stands were harvested by either clearcut, shelterwood, group selection, or single-tree selection methods. Three of the stands had uneven-aged structure. The other 13 were typical, mature, even-aged stands. Harvest intensity (proportion of basal area removed) ranged from 0.27 to 1.00. Harvested sites were similar in slope, average diameter at breast height (d.b.h.), and pre-harvest diameter distributions. Logging contractors used 1 to 3 sawyers with production chain saws on all 16 tracts. There was no difference in production rate between sawyers on the same stand. Factors affecting total felling time (in decreasing order of importance) were d.b.h. of harvested stems, inter-tree distance, and harvest intensity. Total felling time (including walk, acquire, fell, and limb-top times) was inversely related to harvesting intensity and directly related to stem d.b.h. and inter-tree distance. Felling productivity was found to be highest under high intensity harvests of large trees and lowest under low intensity harvests of small trees. Productivity was more sensitive to stem diameter than harvest intensity. (28)

Martinat, P. J.; Solomon, J. D.; Leininger, T. D. 1996. **Survivorship, development, and fecundity of buck moth (Lepidoptera: Saturniidae) on common tree species in the Gulf Coast urban forest.** Journal of Entomological Science. 32(2): 192-203.

Hemileuca maia maia (Drury), the buck moth, is abundant in urban areas of the Gulf Coast region where it defoliates oaks. However, the extent to which the buck moth can survive on other tree species common in the southern urban forest has not been reported. In the laboratory, the authors studied the suitability and acceptability to larvae of 14 common tree species in New Orleans and determined the extent to which larvae were able to switch to species other than oak midway in their development. Larvae had greater survival, pupal weight, and fecundity, as well as reduced development time, on live oak, water oak, black oak, and black cherry than on green ash, sugarberry, sweetgum, red maple, a deciduous ornamental magnolia, American holly, tallow tree, crapemyrtle, mulberry, and black willow. Larvae showed some ability to switch from oak to some non-oak species; but fecundity, pupal weights, and development time were affected as assessed from the time of switch. The implications of these findings are discussed in terms of outbreak dynamics of the moth in urban forests. (29)

Moore, Marianne V.; Pace, Michael L.; Mather, John R.; and others. 1997. **Potential effects of climate change on freshwater ecosystems of the New England/Mid-Atlantic Region.** Hydrological Processes. 11: 925-947. (Editor's note: Patricia A. Flebbe is the SRS co-author for this publication.)

Numerous freshwater ecosystems, dense concentrations of humans along the eastern seaboard, extensive forests, and a history of intensive land use distinguish the New England/Mid-Atlantic Region. Human population densities are forecast to increase in portions of the region at the same time that climate is expected to be changing. Consequently, the effects of humans and climatic change are likely to affect freshwater ecosystems within the region interactively. The general climate, at present, is humid continental, and the region receives abundant precipitation. Climatic projections for a 2 x CO₂ atmosphere, however, suggest warmer and drier conditions for much of this region. Annual temperature increases

ranging from 3 to 5°C are projected, with the greatest increases occurring in autumn or winter. According to a water balance model, the projected increase in temperature will result in greater rates of evaporation and evapotranspiration. This could cause a 21 and 31 percent reduction in annual stream flow in the southern and northern sections of the region, respectively, with greatest reductions occurring in autumn and winter. The amount and duration of snow cover is also projected to decrease across the region, and summer convective thunderstorms are likely to decrease in frequency but increase in intensity.

The dual effects of climate change and direct anthropogenic stress will most likely alter hydrological and biogeochemical processes, and, hence, the floral and faunal communities of the region's freshwater ecosystems. For example, the projected increase in evapotranspiration and evaporation could eliminate most bog ecosystems, and increases in water temperature may increase bioaccumulation, and possibly biomagnification, of organic and inorganic contaminants. Not all change may be adverse. For example, a decrease in runoff may reduce the intensity of ongoing estuarine eutrophication, and acidification of aquatic habitats during the spring snowmelt period may be ameliorated.

Recommendations for future monitoring efforts include: (1) extending and improving data on the distribution, abundance, and effect of anthropogenic stressors (non-point pollution) within the region; and (2) improving scientific knowledge regarding the contemporary distribution and abundance of aquatic species. Research recommendations include: (1) establishing a research center(s) where field studies designed to understand interactions between freshwater ecosystems and climate change can be conducted; (2) projecting the future distribution, activities, and direct effects of humans within the region; (3) developing mathematical analyses, experimental designs, and aquatic indicators that distinguish between climatic and anthropogenic effects on aquatic systems; (4) developing and refining projections of climate variability such that the magnitude, frequency and seasonal timing of extreme events can be forecast; and (5) describing quantitatively the flux of materials (sediments, nutrients, metals) from watersheds characterized by a mosaic of land uses. **(30)**

Overdevest, Christine; Green, Gary P. 1994. **Forest dependence and community well-being: a segmented market approach.** Society and Natural Resources. 8: 111-113.

Forestry activities, such as timber production and processing, are important economic activities in many rural communities. Yet the research on the relationship between forest dependence and community economic well-being is inconclusive. This article examines the relationship between forest dependence and county per capita income and poverty in rural Georgia. Forest dependence is conceptualized according to Averitt's theory of the dual economy. Core dependence, in other words, dependence on well-capitalized pulp and paper firms, is expected to affect county-level economic well-being differently than dependence on periphery forest industry or high timberland concentrations. Regression analyses show that core forest industries are positively related to county per capita income, while periphery industries have no significant effect and timberland concentration is negatively related to per capita income and positively related to the poverty rate. (31)

Peters, Daniel M.; Haney, Harry L., Jr.; Greene, John L. 1998. **The effects of federal and state death and gift taxes on nonindustrial private forest lands in the midwestern states.** Forest Products Journal. 48(9): 35-44.

This paper summarizes Federal estate taxes and the death taxes of the 14 Midwestern States, with attention given to special provisions that apply to forestry and related land uses. Additionally, changes imposed by the 1997 Taxpayer Relief Act that must be considered in estate planning are introduced. A hypothetical family with a \$3.5 million gross estate is followed through the death of both spouses, to show the effect of basic and advanced estate planning techniques in States selected to represent three different tax systems. Basic estate planning techniques can reduce or eliminate Federal and State death taxes on estates of \$1.2 million or less in taxable value. Advanced estate planning techniques, i.e., gifting, minority discounts, special use valuation, and deferral and extension, can further reduce the death tax burden for larger estates. Use of advanced techniques reduced the present value of Federal and State death taxes on the hypothetical family by over 75 percent compared with basic

techniques. In cases where an estate cannot meet the requirements for use of advanced techniques, donation of conservation easements can be used to reduce the death tax burden. A conservation easement donation combined with gifting reduced the present value of death taxes on the hypothetical family by approximately 60 percent over basic planning techniques. (32)

Reich, Peter B.; Walters, Michael B.; Ellsworth, David S.; and others. 1998. **Relationships of leaf dark respiration to leaf nitrogen, specific leaf area and leaf life-span: a test across biomes and functional groups.** *Oecologia*. 114: 471-482. (Editor's note: James M.. Vose is the SRS co-author for this publication.)

Based on prior evidence of coordinated multiple leaf trait scaling, the authors hypothesized that variation among species in leaf dark respiration rate (R_d) should scale with variation in traits such as leaf nitrogen (N), leaf life-span, specific leaf area (SLA), and net photosynthetic capacity (A_{max}). However, it is not known whether such scaling, if it exists, is similar among disparate biomes and plant functional types. The authors tested this idea by examining the interspecific relationships between R_d measured at a standard temperature and leaf life-span, N, SLA and A_{max} for 69 species from four functional groups (forbs, broad-leaved trees and shrubs, and needle-leaved conifers) in six biomes traversing the Americas: alpine tundra/subalpine forest, Colorado; cold temperate forest/ grassland, Wisconsin; cool temperate forest, North Carolina; desert/shrubland, New Mexico; subtropical forest, South Carolina; and tropical rain forest, Amazonas, Venezuela. Area-based R_d was positively related to area-based leaf N within functional groups and for all species pooled, but not when comparing among species within any site. At all sites, mass-based R_d (R_{d-mass}) decreased sharply with increasing leaf life-span and was positively related to SLA and mass-based A_{max} and leaf N (leaf N_{mass}). These intra-biome relationships were similar in shape and slope among sites, where in each case we compared species belonging to different plant functional groups. Significant $R_{d-mass}-N_{mass}$ relationships were observed in all functional groups (pooled across sites), but the relationships differed, with higher R_d at any given leaf N in functional groups (such as forbs) with higher SLA and shorter leaf life-span. Regardless of biome or functional group, R_{d-mass} was well

predicted by all combinations of leaf life-span, N_{mass} and/or SLA ($r^2 \geq 0.79$, $P < 0.0001$). At any given SLA, R_{d-mass} rises with increasing N_{mass} and/or decreasing leaf lifespan; and at any level of N_{mass} , R_{d-mass} rises with increasing SLA and/or decreasing leaf life-span. The relationships between R_d and leaf traits observed in this study support the idea of a global set of predictable interrelationships between key leaf morphological, chemical, and metabolic traits. **(33)**

Rials, T.G.; Wolcott, M.P. 1998. Morphology-property relationships in wood-fibre-based polyurethanes. *Journal of Materials Science Letters*. 17: 317-319.

Many of the advances in material performance over the last decade can be attributed to developments in multicomponent polymer systems and, specifically, to multiphase materials such as incompatible polymer blends and fibre-reinforced composites. In these types of material, performance properties are not often dominated by the interphase that defines the transition region from one pure phase to another. Although typically a minor component, the interphase effectively determines the mechanism and efficiency of stress transfer between the components that make up the material system. With the potential for chemical reaction across the interface, complications exist when viewing the material as an incompatible polymer blend or a reinforced polymer composite. One example of this type of composite is polyurethanes incorporating a lignocellulosic fibre. This class of natural fibre is characterized by a hydroxy-rich surface that may react with the isocyanate group of the urethane formulation. Wood-fibre polyurethanes that incorporate synthetic polyols are of interest because of the versatility that is afforded by urethane chemistry and the possibility of alternative market developments for wood composites. At the same time, research on this material may provide additional insight into the complexities of the fibre-polymer interfacial structure. In this report, preliminary results on the phase morphology of wood-fibre-urethane composites are presented. In addition, the effect of fibre and polyol characteristics on interfacial quality is discussed. **(34)**

Roussopoulos, Peter J. 1998. **Opening remarks; special session 4. Burning issues and smoke screens: heat and light in southern forests.** In: Wadsworth, Kelly G., ed. Transactions of the 63rd North American Wildlife and Natural Resources conference; 1998 March 20-25; Orlando, FL. Washington, DC: Wildlife Management Institute: 305-308.

In Roussopoulos' opening remarks he included nine assertions about southern forests: 1) that their characteristics are unique; 2) that they recovered from abusive agricultural practices and exploitive forest extraction in the 19th and early 20th centuries; 3) that they are brand new; 4) that social forces driving change will intensify at all scales; 5) that the emerging global concern over sustainability will become the central issue driving public debate over natural resource management, and that the South will become the stage on which the sustainability issue will play out most visibly in our Nation; 6) that ensuring sustainability vis-a-vis southern forests will require a dynamic blend of intensive management for commodity and certain experiential values; 7) that the never-to-return nature of southern forest dynamics presents conceptual challenges for ecosystem restoration; 8) that fire is perhaps the most important forest management tool for southern forests and smoke is the most critical barrier to its use; and 9) that conflicts among jurisdictional interests of independent Federal agencies pose the most pressing challenge for southern forests. (35)

Editor's note: A limited number of copies of the entire set of papers in the "Burning Issues and Smoke Screens: Heat and Light in Southern Forests" session is available. Please refer to the article beginning on page 1 for more information.

Rudis, Victor A. 1998. **Regional forest resource assessment in an ecological framework: the Southern United States.** Natural Areas Journal. 18(4): 319-332.

Information about forest resources grouped by ecologically homogeneous area can be used to discern relationships between those resources and ecological processes. The author used forest resource data from 0.4-ha plots, and data on population and land area (by county), together with a global-to-local hierarchical framework of land areas with similar

ecological potential to assess extant forest resources in the Southern United States. Because each data source differed in resolution and types of information, Rudis referenced all to a common county land unit. He also characterized and tested the importance of other resource indicators by ecological province. Data were largely from U.S. Forest Service Forest Inventory and Analysis surveys for the Southern United States (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, east Oklahoma, South Carolina, Tennessee, east Texas, and Virginia). Findings described differences by Province in the proportion of forest types, public land, private land, protected forests, forest plantations, disturbances, and human uses. Analysis of resource value indicators showed significant differences among Provinces in livestock grazing, selected recreation, wildlife habitat, timber resources, and vulnerability to urban and agricultural influences. Ecological perspectives suggested a need to tailor forest resource analysis, planning, and incentive programs and focused attention on selected disturbances and complementary and competing uses. (36)

Saenz, Daniel; Conner, Richard N.; Shackelford, Clifford E.; and Rudolph, D. Craig. 1998. **Pileated woodpecker damage to Red-cockaded Woodpecker cavity trees in Eastern Texas.** The Wilson Bulletin. 110(3): 362-367.

The authors surveyed all known red-cockaded woodpecker (*Picoides borealis*) cavity trees (n = 514) in the Angelina National Forest in eastern Texas for pileated woodpecker (*Dryocopus pileatus*) damage. They compared the frequency of pileated woodpecker damage to red-cockaded woodpecker cavity trees in longleaf pine (*Pinus palustris*) habitat to damage in loblolly (*P. taeda*)-short leaf (*P. echinata*) pine habitat. The authors also examined the effectiveness of restrictor plates in deterring pileated woodpecker enlargement of red-cockaded woodpecker cavities. Pileated woodpecker damage was significantly greater in longleaf pine habitat than in the loblolly-shortleaf pine habitat, in spite of census results showing similar abundance levels of pileated woodpeckers in the two forest types. The authors suggest that limited numbers of snags in the longleaf habitat may focus pileated woodpecker excavation on red-cockaded woodpecker cavity trees, whereas a greater amount of mid-story vegetation in the loblolly-shortleaf pine habitat may serve to reduce

visibility, thereby lowering pileated woodpecker detection and destruction of red-cockaded woodpecker cavities. Restrictor plates were very effective in preventing pileated woodpecker enlargement of cavities. While restrictor plates are useful for protecting red-cockaded woodpecker cavities, they should be used only in small populations when cavities are in short supply. The pileated woodpecker plays an important role, especially in the longleaf ecosystem, which is a relatively cavity-barren environment, by providing nesting sites for larger secondary cavity users, such as American kestrels (*Falco sparverius*), eastern screech-owls (*Otus asio*), and fox squirrels (*Sciurus niger*). (37)

Schaberg, Paul G.; Perkins, Timothy D.; McNulty, Steven G. 1997.

Effects of chronic low-level N additions on foliar elemental concentrations, morphology, and gas exchange of mature montane red spruce. Canadian Journal of Forest Research. 27: 1622-1629.

The authors evaluated the influence of protracted low-level nitrogen (N) fertilization on 29 morphological, physiological, or chemical parameters measured on mature red spruce (*Picea rubens* Sarg.) growing within 10 study plots on Mount Ascutney, VT. For 8 consecutive years prior to this study, each plot received one of five treatments: 0, 15.7, 19.8, 25.6, or 31.4 kg N·ha⁻¹·year⁻¹. In comparison to plant material from control plots, trees that received N fertilization had fewer but longer and heavier needles, and higher rates of shoot water loss than trees from control plots. N fertilization resulted in increased foliar N concentrations, and reductions in foliar Ca and Mg concentrations to potentially deficient levels. Although no differences in chlorophyll content, chlorophyll fluorescence, or net photosynthesis were evident, N fertilization was associated with increased levels of respiration. Respiration rates were not correlated with foliar N concentrations, suggesting that the influence of N treatment on respiration was indirect. In contrast, respiration levels were negatively correlated with foliar Ca and Mg concentrations. Although the authors have no direct evidence that they are related, the N-induced alterations in foliar cation and respiration levels that were found may help account for N-induced reductions in tree growth and increases in mortality previously reported for this site. (38)

Schweitzer, Callie Jo. 1998. **What is restoring bottomland hardwood forests? A study from the Lower Mississippi Alluvial Valley.** In: Wadsworth, Kelly G., ed. Transactions of the 63rd North American Wildlife and Natural Resources conference; 1998 March 20-25; Orlando, FL. Washington, DC: Wildlife Management Institute: 147-155.

The interest in changing the use of the Lower Mississippi Alluvial Valley (LMAV) floodplain has been gathering momentum. Recent changes in Federal farm programs, heightened awareness of the value of forested wetlands and increasingly productive farming practices have allowed for consideration of land use changes. Marginal agricultural land in the LMAV, cleared at the time of soaring soybean prices, is no longer looked upon as being favorable only for agriculture. These lands, usually deemed marginal because of seasonal high water, are being offered for reforestation. These once forested tracts of land are being converted from row agriculture back to some form of a bottomland hardwood ecosystem. The author discusses reforestation efforts in the LMAV and offers recommendations based on work within the 1992 Wetland Reserve Program contracts and on-site evaluations. (39)

Sheffield, Raymond M.; Dickson, James G. 1998. **The South's forestland – on the hot seat to provide more.** In: Wadsworth, Kelly G., ed. Transactions of the 63rd North American Wildlife and Natural Resources conference; 1998 March 20-25; Orlando, FL. Washington, DC: Wildlife Management Institute: 316-331.

Forests of the Southern United States range from tropical/subtropical forests on the southern extremities of the region, oak savanna forests on the western fringe, to central hardwood forests, and high elevation boreal forests in the north. Upland and bottomland hardwood, southern pine, and mixed pine-hardwood forests are found on the more moderate sites between these extremes. The South's forests have been and continue to be molded by a myriad of natural agents and human activities that affect forest values and functions, as well as the relative mix of forest benefits. The pressure on the region's forests to provide more of everything is strong and escalating each year. Major contributors to this pressure include a growing and increasingly non-rural population and increased demand on the region's forests to supply more of the wood products

consumed by this Nation. Conflict over what southern forests should be and how they are managed highlight the need for a sound understanding of the current status of these forests. The authors provide an overview of the current status of southern forests, document changes that have taken place during the latter half of the 20th century, and offer some assessment of effects on forest wildlife communities. (40)

Shupe, Todd E.; Hse, Chung Y.; Choong, Elvin T.; Groom, Leslie H. 1998. **Effect of wood grain and veneer side on loblolly pine veneer wettability.** Forest Products Journal. 48(6): 95-97.

Research was initiated to determine the effect of veneer side (tight or loose), and wood grain (earlywood or latewood) on the wettability of loblolly pine veneer. Contact angle measurements were performed with phenol-formaldehyde resin and distilled water. The resin and distilled water showed slightly higher contact angle mean values on the latewood portion for both the tight side and loose side. The distilled water showed lower contact angle mean values on the loose side compared to the corresponding resin values on the loose side. This difference is largely attributable to the differences in the surface tension of these two wetting materials, and the ability of the distilled water to more easily penetrate on the loose side of veneer. (41)

Smith, David R.; Schiff, Nathan M. 1998. **The genera *Macroxyela* Kirby and *Megaxyela* Ashmead (Hymenoptera: Xyelidae) in North America.** Proceedings of the Entomological Society of Washington. 100(4): 636-657.

Five species of *Megaxyela*, including *Megaxyela alisonae*, n. sp., and two species of *Macroxyela* occur in North America. *Macroxyela bicolor* MacGillivray is a **new synonym** of *Macroxyela ferruginea* (Say). The species are keyed, described, and illustrated, and biological information is summarized. Hosts include hickory, pecan, and elm. (42)

Souter, R.A.; Bowker, J.M. 1996. **A note on nonlinearity bias and dichotomous choice CVM: implications for aggregate benefits**

estimation. *Agricultural and Resource Economics Review*. April: 54-59.

It is a generally known statistical fact that the mean of a nonlinear function of a set of random variables is not equivalent to the function evaluated at the means of the variables. However, in dichotomous choice contingent valuation studies, a common practice is to calculate an overall mean (or median) by integrating over offer space (numerically or analytically) an estimated logit or probit function in which sample mean values for the concomitant variables are used. The authors demonstrate this procedure to be incorrect and statistically test the procedure against the correct method for nonlinear models. Using data resulting in a well-behaved logit model, the authors reject the hypothesis of congruence between the two means. Such a finding should be considered in future single response dichotomous choice CVM studies, particularly when aggregation is of interest. (43)

Stanturf, John A.; Schweitzer, Callie J.; Gardiner, Emile S. 1998.
Afforestation of marginal agricultural land in the lower Mississippi River Alluvial Valley, U.S.A. *Silva Fennica*. 32(3): 281-297.

Afforestation of marginal agricultural land in the Lower Mississippi Alluvial Valley (LMAV) relies on native species, planted mostly in single-species plantations. Hard mast species such as oak and pecan are favored for their value to wildlife, especially on public land. Successful afforestation requires an understanding of site variation within floodplains and matching species preferences and tolerances to site characteristics, in particular to inundation regimes. Soil physical conditions, root aeration, nutrient availability, and moisture availability during the growing season also must be considered in matching species to site. Afforestation methods include planting seedlings or cuttings, and direct-seeding. Both methods can be done by hand or by machine. If good quality seedlings are planted properly and well cared for before planting, the chances for successful establishment are high but complete failures do occur. Mortality and poor growth are caused by many factors: extended post-planting drought or flooding; poor planting or seeding practices; poor quality seed or seedlings; animal depredation; or herbicide drift from aerial application to nearby cropland. More species can be

planted, even on continuously flooded sites. Direct-seeding, while limited to heavy-seeded species (oaks and hickories), costs less than 50 percent of planting seedlings. Growth varies considerably by soil type; most bottomland hardwoods grow best on silt loam and less well on clay soils. Up to 200 000 ha of land in the LMAV subject to spring and early summer backwater flooding could be afforested over the next decade.

(44)

Stanturf, John A.; Schweitzer, Callie J.; Schoenholtz, Stephen H. 1998. **Ecosystem restoration: fact or fancy?** In: Wadsworth, Kelly G., ed. Transactions of the 63rd North American Wildlife and Natural Resources conference; 1998 March 20-25; Orlando, FL. Washington, DC: Wildlife Management Institute: 376-383.

Ecological restoration is generally accepted as the reestablishment of natural ecological processes that produce certain dynamic ecosystem properties of structure, function, and processes. But restore to what? The most frequently used conceptual model for the restoration process is the shift of conditions from some current (degraded) dynamic state to some past dynamic state, generally that presumed to have occurred prior to European settlement. The authors find an alternative conceptual model more helpful, that of the self-renewal – rehabilitation – restoration continuum. In this model, the state of the forest ecosystem can range from “natural” to “degraded” and can be affected by reversible or irreversible changes. As the forest moves from a natural to a degraded state, the ability of a manager to prevent irreversible changes decreases, and the cost of intervention increases non-linearly. The need for restoration presumes a loss of ecosystem function, for example, by clearing of the forest and conversion to agriculture. A continuum model avoids the problem of precisely specifying an endpoint for restoration, and offers a context for landowners with management objectives other than preservation to contribute to ecosystem restoration.

Restoration of the myriad communities of bottomland hardwoods and the diverse communities of longleaf pine is the subject of intense interest in the Southern United States. The authors examine some common myths about restoration of these forest ecosystems from the perspective of a continuum model. The potential for restoration of bottomland hardwood

ecosystems to the Lower Mississippi River Valley has barely been tapped. If current funding levels are maintained, close to 200,000 ha could be restored over the next decade. The bulk of this will be on private land enrolled in the Wetlands Reserve Program, a Federal incentive program. In contrast to forested wetlands, the major blocks of remaining longleaf pine ecosystems are on public lands, and restoration activities are planned or underway on many of these lands across the South. Private landowners, however, can be voluntary partners in conserving these ecosystems in a mixed ownership mosaic. Much research is in progress to sharpen understanding of the economic as well as the ecological values of longleaf pine and bottomland hardwood ecosystems. (45)

Tomita, Bunichiro; Hse, Chung-Yun. 1998. **Phenol-Urea-Formaldehyde (PUF) co-condensed wood adhesives.** International Journal of Adhesion & Adhesives. 18: 69-79.

The reaction of urea with methylolphenol under acidic conditions was investigated. The alternating copolymer of urea and phenol could be synthesized by the reaction of urea and 2,4,6-trimethylolphenol. The reactions of urea with polymethylolphenol mixtures also were investigated by changing the reaction conditions, such as the molar ratio and acidity. The co-condensates were analyzed by carbon-13 nuclear magnetic resonance spectroscopy to determine the ratios of co-condensation.

Another synthetic method to obtain co-condensed resins was developed by reacting phenol with UF concentrate, which is a type of urea-formaldehyde resin prepared with a high molar ratio of formaldehyde to urea (F/U) such as greater than 2.5. Further, it was found that resol-type co-condensed resins can be synthesized by alkaline treatment of the co-condensed resins that were once prepared under acidic conditions. The curing process and thermal properties of resol-type co-condensed resins were investigated by torsional braid analysis. The co-condensed resins displayed almost the same curing behavior and heat resistance as a commercial resol. Their adhesive performance against plywood was evaluated by conducting a cyclic 4 h boil test and a 72 h boil test. The

plywood test results passed the requirements for JAS special-grade structural plywood. (46)

Waldrop, Thomas A., ed. 1998. **Proceedings of the ninth biennial southern silvicultural research conference.** Gen. Tech. Rep. SRS-20. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 628 p.

One hundred seventeen papers, 3 abstracts, 2 poster summaries, and 1 summary address a range of issues affecting southern forests. Papers are grouped in several categories, including tree improvement and nursery technology, site preparation, vegetation management, site classification, longleaf pine silviculture, nutrient dynamics, silvicultural systems, intermediate management, hardwood regeneration, pine and pine-hardwood regeneration, impacts of harvesting and site preparation, pine nutrition management, physiology, plant and structural diversity, growth and yield, stand development and dynamics, and measurement and research methods. (47)

Wear, David N.; Abt, Robert; Mangold, Robert. 1998. **People, space, time: factors that will govern forest sustainability.** In: Wadsworth, Kelly G., ed. Transactions of the 63rd North American Wildlife and Natural Resources conference; 1998 March 20-25; Orlando, FL. Washington, DC: Wildlife Management Institute: 348-361.

People and their social organizations are the most substantial agents of change in forested ecosystems throughout the world. Even in the developed countries in the temperate latitudes, ongoing growth, and the transformation of economies continue to reshape forested landscapes. Resulting changes in both the extent and the structure of forests hold consequences for ecological function and environmental health. Accordingly, it is important to understand how people have and may further change the condition of forested landscapes in order to gauge the prospect for forest sustainability.

Specifically, a better understanding of how people make choices regarding land and resources in pursuit of various benefits is needed.

The cumulative human impact on landscapes is a consequence of all individual choices intended to pursue individuals' goals in response to the general scarcity of goods and services produced by lands in the region. This is especially true in the U.S. South where nearly all land is held by private owners. This paper examines the definition and use of indicators of change in forest conditions and how they might be adapted to monitor processes of change. In particular, the authors examine the two principle vectors of change in forested ecosystems, land use and timber management, and how these changes might be adequately monitored. The authors find generally that broad-scale indicators of sustainability may, at best, be devoid of information; at worst, they may mislead. The paper discusses challenges for measuring forest conditions, especially in a way that connects human actions with ecological consequences. (48)

Yeakley, J.A.; Swank, W.T.; Swift, L.W.; and others. 1998. **Soil moisture gradients and controls on a southern Appalachian hillslope from drought through recharge.** *Hydrology and Earth System Sciences*. 2(1): 41-49.

Soil moisture gradients along hillslopes in humid watersheds, although indicated by vegetation gradients and by studies using models, have been difficult to confirm empirically. While soil properties and topographic features are the two general physiographic factors controlling soil moisture on hillslopes, studies have shown conflicting results regarding which factor is more important. The relative importance of topographic and soil property controls was examined in an upland forested watershed at the Coweeta Hydrologic Laboratory in the Southern Appalachian mountains. Soil moisture was measured along a hillslope transect with a mesic-to-xeric forest vegetation gradient over a period spanning precipitation extremes. The hillslope transect was instrumented with a time domain reflectometry (TDR) network at two depths. Soil moisture was measured during a severe autumn drought and subsequent winter precipitation recharge. In the upper soil depth (0-30 cm), moisture gradients persisted throughout the measurement period, and topography exerted dominant control. For the entire root zone (0-90 cm), soil moisture gradients were found only during drought. Control on soil moisture was due to both topography and storage before drought. During

and after recharge, variations in soil texture and horizon distribution exerted dominant control on soil moisture content in the root zone (0-90 cm). These results indicate that topographic factors assert more control over hillslope soil moisture during drier periods as drainage progresses, while variations in soil water storage properties are more important during wetter periods. Hillslope soil moisture gradients in Southern Appalachian watersheds appear to be restricted to upper soil layers, with deeper hillslope soil moisture gradients occurring only with sufficient drought. (49)

Zhang, Daowei; Liu, Junchang; Granskog, James; Gan, Jianbang. 1998. **China: changing wood products markets.** Forest Products Journal. 48(6): 14-20.

In the 1980's, China emerged as the world's second largest importer of forest products and the second largest importer of U.S. forest products. However, U.S. wood products exports to China declined nearly 93 percent from 1988 to 1996, from \$448 million to \$33 million. Little is known about the reasons that caused this decline. Less is probably known about the forestry and wood products market in China than most other U.S. trading partners.

A consulting report by Ernst & Young for American Forest & Paper Association explored a strategy for expanding exports of U.S. forest products to China; however, its data and information are limited to 1993 to 1994. Other studies of the wood products market in China by DBC Associates, the National Forest Products Association, and Waggener are dated, and reports by the USDA Foreign Agriculture Service are mostly anecdotal.

This article will describe the recent trends of China's wood products imports and communicate the results of interviews with major wood products importers in China regarding the competitiveness of U.S. wood products in China. (50)