

USDA Forest Service Southern Research Station Recent Publications Catalogue—Spring 2000

The Interior Highlands Assessment

The Interior Highlands Assessment comprises a wealth of information about the geographic area encompassing eastern Oklahoma, south-central Missouri, and northwestern-central Arkansas. The USDA Forest Service decided to “take a snapshot” of the region’s resources in 1996. Forest Service land managers and scientists from the Eastern Region, the North Central Research Station, the Southern Region, and the Southern Research Station worked together to learn from the public what this area is about and what it means to them and to gather data about the resources and their uses. The Interior Highlands Assessment team synthesized data to evaluate conditions affecting natural resources. Scientists and managers can predict trends most likely to be of significance in the future management of the area’s three national forests.

Bill Pell, Team Leader for the Interior Highlands Assessment and Acting Team Leader for Planning and Recreation on the Ouachita National Forest, took the lead for transforming the knowledge about the Ozark-Ouachita Highlands into five reports: a summary; air quality; aquatic conditions; social and economic conditions; and terrestrial vegetation and wildlife. Pell, an ecologist, says, “Close cooperation between researchers and managers was the key to successful completion of this assessment. The reports will prove invaluable for national forest planning and research purposes.” G. Samuel Foster, Assistant Director for Research in the western half of the Southern Research Station, served on the steering team and led the Station’s extensive involvement in planning, researching, developing, and producing the Ozark-Ouachita Highlands Assessment. SRS scientists participating in the assessment included Karen Lee Abt, Economics of Forest Protection and Management research work unit, Research Triangle Park, NC; Rodney L. Busby and John L. Greene, Evaluation of Legal, Tax, and Economic Influences on Forest Resource Management, New Orleans, LA; James M. Guldin, Managing Upland Forest Ecosystems in the Midsouth, Hot Springs, AR; and Melvin L. Warren, Center for Bottomland Hardwoods Research, Oxford, MS.

In preparing the Interior Highlands Assessment, authors viewed the area’s resources from different perspectives, including its 14 watersheds, terrestrial boundaries, and State counties. Federal lands comprise 13 percent of the Interior Highlands. The Forest Service manages the Ozark-St. Francis National Forest in Arkansas, the Ouachita National Forest, which extends from Arkansas into Oklahoma, and the Mark Twain National Forest in Missouri. Other Federal and State lands draw recreation visitors to the area, including the Hot Springs National Park in Arkansas. The Interior Highlands region contains a significant amount of water and timber resources and mineral deposits. Rock hounds favor the area’s quartz crystals.

Interior Highlands Assessment collaborators include the USDA Forest Service, Rocky Mountain Station; USDA Forest Service, Forest Health Monitoring; the U.S. Department of Interior, Geological Survey; the University of Arkansas, Monticello; the University of Arkansas, Fayetteville; and the University of Arkansas State Cooperative Extension. To learn more, visit the Web site for the **Interior Highlands Assessment**: www.fs.fed.us/oonf/ooha.

U.S. Department of Agriculture, Forest Service. 1999. **Ozark-Ouachita Highlands Assessment: air quality. Report 2 of 5.** Gen. Tech. Rep. SRS-32. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 57 p. (18)

U.S. Department of Agriculture, Forest Service. 1999. **Ozark-Ouachita Highlands Assessment: aquatic conditions. Report 3 of 5.** Gen. Tech. Rep. SRS-33. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 317 p. (19)

U.S. Department of Agriculture, Forest Service. 1999. **Ozark-Ouachita Highlands Assessment: social and economic conditions. Report 4 of 5.** Gen. Tech. Rep. SRS-34. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 299 p. (20)

U.S. Department of Agriculture, Forest Service. 1999. **Ozark-Ouachita Highlands Assessment: summary report. Report 1 of 5.** Gen. Tech. Rep. SRS-31. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 56 p. (21)

U.S. Department of Agriculture, Forest Service. 1999. **Ozark-Ouachita Highlands Assessment: terrestrial vegetation and wildlife. Report 5 of 5.** Gen. Tech. Rep. SRS-35. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 201 p. (22)

Alexander von Humboldt Foundation Honors Cassandra Johnson, Southern Research Station Sociologist

Through the Federal Chancellor of Germany and the President of the United States, the Alexander von Humboldt Foundation awards the *Bundeskanzler* (BUKA) or Federal Chancellor fellowship. The BUKA is awarded to young Americans to stimulate and recognize awareness of German culture in the United States and to strengthen ties between the two countries. Cassandra Johnson, social scientist in Athens, GA, was one of 10 prospective U.S. leaders in academia, business, and government who received this prestigious award for 1998 to 1999. Through professional and/or academic experiences in Germany, the BUKA scholar is expected to gain an insight into the political, economic, social, and cultural life of the Federal Republic of Germany. Johnson, who speaks German fluently, conducted research in Berlin January through September 1999. As a part of the fellowship, with other von Humboldt fellows, she also participated in a study tour of Germany, meeting with governmental, academic, business, and artistic leaders. The tour ended with a visit to the European Union in Brussels, Belgium. The fellowship period concluded with an audience with the German Chancellor, Gerhard Schröder, in Bonn.

Johnson, who joined the Forest Service in 1990, is completing a doctorate in sociology at the University of Georgia. She is a member of the Outdoor Recreation and Wilderness Assessment unit, led by Ken Cordell. This issue of *Compass* includes three publications authored or co-authored by Johnson.

Bowker, J.M.; Cordell, H.K.; Johnson, Cassandra Y. 1999. **User fees for recreation services on public lands: a national assessment.** *Journal of Park and Recreation Administration*. 17(3): 1-14. (32)

Johnson, Cassandra Y. 1998. **A consideration of collective memory in African American attachment to wildland recreation places.** *Human Ecology Review*. 5(1): 5-15. (38)

Johnson, Cassandra Y.; Bowker, J.M. 1999. **On-site wildland activity choices among African Americans and White Americans in the rural south: implications for management.** *Journal of Park and Recreation Administration*. 17(1): 21-39. (39)

On the Bookshelf

Mission: Managing Half the Nation's Water on One-third of Its Forests, with Input from More Than 125 Million People

Riparian Management in Forests of the Continental Eastern United States addresses the water wealth of the East and the complex problems and unique opportunities this region faces. In 1995 USDA Forest Service scientists Andy Dolloff, Project Leader for the Southern Research Station's Coldwater Streams and Trout Habitat Research Unit in Blacksburg, VA, Elon S. Verry of the North Central Research Station, and James W. Hornbeck of the Northeastern Research Station accepted the responsibility for defining the state-of-the-art in managing forested riparian areas. What a challenge! The Eastern U.S. contains one-third of the Nation's forests and over one-half of its water. An intricate patchwork of public and private land ownership, fragmented ecosystems, and diverse interest groups compound the issues' complexity. Twenty chapters focus on defining, classifying, and mapping riparian areas; managing for aquatic, bird, animal, and forest health; measuring human dimensions and impacts; prescribing silvicultural and harvesting options; monitoring water resources and restoring watershed health.

Michael Dombeck, Chief, USDA Forest Service, says, "The end results of most of our management actions are reflected by the health of our rivers, streams, and lakes." In the final chapter of *Riparian Management in Forests of the Continental Eastern United States*, the authors of **Riparian Area Management: Themes and Recommendations** consider the overriding themes of riparian area management and list highlights and recommendations from each chapter. They say, "Riparian management has passed from a history of intense exploitation a century ago, through recent decades of neglect, to the intense demand for shared decisions we see today. Protecting the essential links between land and water ensures quality water and quality aquatic habitats. . . . Human values and desires shape the way riparian areas are managed. Values and desires often overlap or conflict, and there is a need to find common ground. The axiom 'good stewardship is shared stewardship' is especially appropriate for riparian area management. It has given insight to complex management recommendations that consider use and the relationships among resources. Perhaps more than any other landscape feature, riparian areas focus our concept of landscape connections for fish and animal communities, for the interaction of forest regeneration with forest-site, and for the interaction of our personal economics with our personal recreation."

Forty-eight scientists and managers from the USDA Forest Service and Natural Resources Conservation Service, the Environmental Protection Agency, State and county agencies, universities, industry, non-governmental organizations, and private citizens collaborated to write *Riparian Management in Forests of the Continental Eastern United States*. The authors and editors have created an informative and highly readable book with a hungry audience—released in January, it is in its second printing. To purchase a copy for \$54.95, visit the Lewis Publishers, CRC Press, Web site at <http://www.crcpress.com>. The mailing address is CRC Press LLC, Attention: Order Entry, 2000 NW Corporate Boulevard, Boca Raton, FL 33431-9868.

Compass includes four chapters from *Riparian Management in Forests of the Continental Eastern United States* that are authored by SRS scientists.

Dolloff, C. Andrew; Webster, Jackson R. 2000. **Particulate organic contributions from forests and streams: debris isn't so bad.** In: Verry, Elon S.; Hornbeck, James W.; Dolloff, C. Andrew, eds. Riparian management in forests of the continental Eastern United States. Boca Raton, FL: Lewis Publishers, CRC Press LLC: 125-138. (12)

Phillips, Michael J.; Swift, Lloyd W., Jr.; Blinn, Charles R. 2000. **Best management practices for riparian areas.** In: Verry, Elon S.; Hornbeck, James W.; Dolloff, C. Andrew, eds. Riparian management in forests of the continental Eastern United States. Boca Raton, FL: Lewis Publishers, CRC Press LLC: 273-286. (13)

Verry, Elon S.; C. Andrew Dolloff. 2000. **The challenge of managing for healthy riparian areas.** In: Verry, Elon S.; Hornbeck, James W.; Dolloff, C. Andrew, eds. Riparian management in forests of the continental Eastern United States. Boca Raton, FL: Lewis Publishers, CRC Press LLC: 1-22. (15)

Welsch, David J.; Hornbeck, James W.; Verry, Elon S.; and others. **Riparian area management: themes and recommendations.** In: Verry, Elon S.; Hornbeck, James W.; Dolloff, C. Andrew, eds. Riparian management in forests of the continental Eastern United States. Boca Raton, FL: Lewis Publishers, CRC Press LLC: 321-340. (16)

Hemingway Contributes to Plant Polyphenols Research

Plant Polyphenols 2: Chemistry, Biology, Pharmacology, Ecology includes selected contributions from the 3rd Tannin Conference in Bend, OR, in July 1998. Georg G. Gross, Richard W. Hemingway, Southern Research Station, and Takashi Yoshida edited this collection of international presentations. Topics include hydrolyzable tannins; condensed tannins and related compounds; biotechnology; antioxidant properties and heart disease; conformation, complexation, and antimicrobial properties; polyphenols and cancer; polyphenols in commerce; and polyphenols and ecology. The book brings together the work of chemists and biologists from a wide array of disciplines, bound by a common interest in plant polyphenols. *Plant Polyphenols 2: Chemistry, Biology, Pharmacology, Ecology* demonstrates recognition of the significance of these compounds and their increasing relevance in medically oriented disciplines.

Kluwer Academic/Plenum Publishers recognizes *Plant Polyphenols 2: Chemistry, Biology, Pharmacology, Ecology* as volume 66 in the Basic Life Sciences series. To purchase a copy, contact the publisher at <http://www.wkap.nl>.

Compass includes three chapters in *Plant Polyphenols 2: Chemistry, Biology, Pharmacology, Ecology*:

Gross, Georg G.; Hemingway, Richard W.; Yoshida, Takashi. 1999. **The 3rd tannin conference—retrospect and prospect.** In: Gross, Georg G.; Hemingway, Richard W.; Yoshida, Takashi, eds. Plant polyphenols 2: chemistry, biology, pharmacology, ecology. New York: Kluwer Academic/Plenum Publishers: 911-913. (34)

Hatano, Tsutomu; Yoshida, Takashi; Hemingway, Richard W. 1999. **Interaction of flavanoids with peptides and proteins and conformations of dimeric flavanoids in solution.** In: Gross, Georg G.; Hemingway, Richard W.; Yoshida, Takashi, eds. Plant polyphenols 2: chemistry, biology, pharmacology, ecology. New York: Kluwer Academic/Plenum Publishers: 509-526. (35)

Tobiason, Fred L.; Hemingway, Richard W.; Vergoten, Gerard. 1999. **Modeling the conformation of polyphenols and their complexation with polypeptides: self-association of catechin and its complexation with L-proline glycine oligomers.** In: Gross, Georg G.; Hemingway, Richard W.; Yoshida, Takashi, eds. Plant polyphenols 2: chemistry, biology, pharmacology, ecology. New York: Kluwer Academic/Plenum Publishers: 527-544. (41)

Pacific Rim Countries Demonstrate Research and Development Advances

Adhesive Technology and Bonded Tropical Wood Products showcases a broad range of research and development efforts related to wood adhesives and bonded-wood products being conducted in the Pacific Rim countries. Chung-Yun Hse, research forest products technician for the USDA Forest Service, Southern Research Station, edited this publication. Hse's associate editors included Susan J. Branham, USDA Forest Service, retired, and Chun Chou, Taiwan Forest Research Institute, Taipei, Taiwan, ROC. In May 1993 the Southern Research Station and the Taiwan Forestry Research Institute (TFRI) sponsored the Adhesive Technology for Tropical Woods Symposium, providing a forum in Taipei, Taiwan, ROC for researchers, producers, and consumers of wood adhesives. International participants exchanged information and ideas, stimulating new research and development related to wood adhesives and bonded-wood products.

Hse, Branham, and Chou developed the symposium's proceedings into *Adhesive Technology and Bonded Tropical Wood Products*, designated as TFRI Extension Series No. 96. Chapters address adhesives and adhesive technology; wood extractives and wood adhesion; wood properties and wood adhesion; technology of adhesive curing; and bonded tropical wood products. The Taiwan Forestry Research Institute published *Adhesive Technology and Bonded Tropical Wood Products* in Taipei, Taiwan, ROC in 1998. To obtain a copy, send a request to TFRI at 53 Nan-Hai Road, Taipei, Taiwan, ROC. The telephone number is 886 2 2381-7107, and the fax number is 886-2-2314-2234.

In 1994 the Forest Products Society published *Adhesives and Bonded Wood Products*, also co-edited by Chung-Yun Hse. This book resulted from the Adhesives and Bonded Wood Products symposium in Seattle in 1991. Bunichiro Tomita, professor at the University of Tsukuba, Japan, co-edited this publication. Susan J. Branham served as associate editor. Topics included steam press curing, bonding process variables, bonding of preservative-treated wood, recent developments in new resin systems, adhesives from renewable resources, chemistry and characterization of resins, and properties and applications of bonded wood products. To get a copy of *Adhesives and Bonded Wood Products*, write the Forest Products Society at 2801 Marshall Court, Madison, WI 53705-2295. The telephone number is 608-231-1361.

Report of Station Activities in 1999

The *Annual Report for 1999—Southern Research Station* details our use of your tax dollars; the SRS strategic framework in action; science for tomorrow's forests; our programs, people, and facilities; and the products our scientists and staffs developed this past year. Please request a copy of the Annual Report by marking **AR** on the request form.

Southern Pines Research

Cao, Quang V.; Baldwin, V. Clark, Jr. 1999. **A new algorithm for stand table projection models.** Forest Science. 45(4): 506-511.

The constrained least squares method is proposed as an algorithm for projecting stand tables through time. This method consists of three steps: (1) predict survival in each diameter class, (2) predict diameter growth, and (3) use the least squares approach to adjust the stand table to satisfy the constraints of future survival, average diameter, and stand basal area. The new method was evaluated against the Weibull parameter-recovery approach and another stand table projection method, using data from direct-seeded stands of loblolly pines (*Pinus taeda* L.). The constrained least squares method provided the best goodness-of-fit statistics (K-S, χ^2 , and an error index) that were significantly different from those produced by the other two methods. This new algorithm can be employed in cases where diameter data do not necessarily follow the Weibull distribution. (1)

Conner, Richard N.; Rudolph, D. Craig; Schaeffer, Richard R.; and others. 1999. **Relationships among red-cockaded woodpecker group density, nestling provisioning rates, and habitat.** Wilson Bulletin. 111(4): 494-498.

The authors examined red-cockaded woodpecker (*Picoides borealis*) food provisioning rates of nestlings during the 1992 and 1993 breeding seasons on the Vernon Ranger District of the Kisatchie National Forest in Louisiana. Provisioning rates were monitored at nest trees in moderate (9.8 groups/2 km radius, n = 10) and low (5.9 groups/2 km radius, n = 10) density populations. Habitat around each cluster was measured within three radii (100 m, 400 m, and 800 m) to evaluate the possible influence of habitat quality on group density and nestling provisioning rates. The scientists tested the null hypothesis that habitat quality and provisioning rates would be similar in areas with different densities of woodpecker groups. They failed to detect differences in nestling provisioning rates between woodpecker groups in moderate versus low group densities. Woodpecker groups from areas where group densities were moderate attempted to nest significantly more often than woodpecker groups occurring in low densities. Hardwood midstory vegetation was more abundant in areas with low woodpecker group density. Old-growth pines, which are known to be important for cavity excavation, were present in habitat around cavity-tree clusters of moderate-density groups, but generally absent in areas where group density was low. Woodpecker group density may be related to hardwood midstory conditions and the abundance and spatial distribution of remnant old pines. (2)

Diner, Alex M. 1999. **Direct mechanical dispersion and in vitro culture of fusiform rust fungus single basidiospores.** Mycologia. 91(6): 1102-1103.

Single basidiospores of *Cronartium quercuum* f. sp. *fusiforme* were cast from telia suspended over a solidified nutritional medium affixed to an operating orbital shaker. Spores thus mechanically dispersed and isolated, germinated to develop single-genotype colonies. (3)

Diner, A.M. 1999. **XIII Genetic transformation of *Pinus palustris* (longleaf pine).** In: Bajaj, Y.P.S. Transgenic trees. Biotechnology in Agriculture and Forestry, vol. 44. Heidelberg: Springer-Verlag Berlin: 185-192.

Longleaf pine (*Pinus palustris* Mill.) is an important softwood species in the Southeast United States. In presettlement times, this species occupied extensive, pure stands throughout the Atlantic and Gulf Coastal Plains from southeastern Virginia to eastern Texas, as well as south throughout the northern two-thirds of Florida. Its range also includes the Piedmont Ridge and Valley, and Mountain Provinces of Alabama and Georgia.

Historically, longleaf pine was the premier timber and naval stores tree, a fact which resulted in its virtual disappearance from extensive regions. Its value as a timber species remains high; it shows excellent form and good wood qualities, as well as resistance to fusiform rust, the most damaging disease of Southern US three-needle pines.

An aspect of longleaf pine which negatively affects its relative reforestation value is its grass stage, during which its first 5 years of growth remains essentially limited to root development. This stage is also characteristically expressed for several years by adventitious micropropagules generated in vitro, although a few genotypes have shown precocious and rapid shoot elongation. Notwithstanding the

obstacles to seedling growth presented by the grass stage, however, the value of this tree has compelled widespread reforestation efforts.

Current perspectives for value-added longleaf pine genetic transformants

relate to both disease resistance and early shoot growth. The major microbial disease of this species is brown-spot needle blight (*Scirrhia acicola*), which causes severe defoliation and death to grass-stage seedlings. Other commercially important microbial diseases include pitch

canker (*Fusarium moniliforme* var. *subglutans*), annosus root rot

(*Heterobasidion annosum*), and cone rust (*Cronartium strobilinum*). Longleaf pine suffers attack by a variety of defoliating insects, including both adult (*Colaspis pini* Barber) and larval [(*Neodiprion lecontei* (Fitch); *Dendroctonus terebrans* (Oliv.); *Hylobius pales* (Hbst.); *Pachylobius picivorus* (German); *Dioryctria* spp.; *Laspeyresia* spp.)] insect forms. Because vector systems exist for plant transformation to such as chitinase and BT toxin syntheses, opportunities for transformation of longleaf pine for pest resistance are potentially available. Indeed, the whole-tree *Larix* transformant has been regenerated expressing BT toxin synthesis, suggesting that *Pinus* may be similarly transformed. Moreover because shoot growth restriction in grass-stage plants is a probable result of endogenous plant growth regulator (PGR) control, transformation of tissues for modified PGR synthesis, followed by regeneration of the plant, may provide early shoot elongation in the whole-tree transformant.

Longleaf pine shows great genetic variation in those traits affecting survival, growth, and disease resistance, suggesting its useful candidacy for clonal propagation. Rooting of cuttings is possible, but unreliable. Grafting is now the most common method used to establish seed orchards. However, methods are available for longleaf pine somatic embryogenesis, which allow opportunity for genetic manipulation and regeneration of the transformed regenerant. Since tissues of several species of pines have been transformed using biolistics, and this author was successful in regenerating *Larix* whole trees from *Agrobacterium*-induced transformants, both procedures for genetic transformation were undertaken using longleaf pine. (4)

Hanula, James L.; Franzreb, Kathleen E.; Pepper, William D. 2000. **Longleaf pine characteristics associated with arthropods available for red-cockaded woodpeckers.** Journal of Wildlife Management. 64(1): 60-70.

Red-cockaded woodpeckers (*Picoides borealis*) forage on the boles of living pine trees for a variety of arthropods. To assess the availability of prey under differing stand conditions, the authors sampled arthropods that crawled up the boles of 300 living longleaf pine trees (*Pinus palustris*) ranging in age from 20 to 100 years with passive traps over a 1-year period. The scientists identified, counted, oven-dried, and weighed >50,000 arthropods in 22 orders and 470 genera. The most diverse orders were the Coleoptera (beetles), Araneae (spiders), and Hymenoptera (ants, wasps, and bees). The most abundant orders were the Homoptera with large numbers of aphids (Aphididae) and the Hymenoptera with large numbers of ants (Formicidae). The Coleoptera and Araneae accounted for the greatest available biomass. Overall, arthropod biomass/tree increased with increasing stand age up to approximately 65 to 70 years, but arthropod biomass/ha was highest in the youngest stands. Abundance and biomass of arthropods on each tree bole were positively correlated with bark thickness and tree diameter, and negatively correlated with basal area (m²/ha). Arthropod biomass differed among seasons, with the highest arthropod biomass occurring in winter and spring. The authors found no correlation of diversity, abundance, or biomass of arthropods on the tree bole with site index, the numbers of herbaceous plant genera in the understory, the number of herbaceous plant stems, or the percentage of ground covered by herbs. Stand characteristics, such as average bark thickness and diameter, associated with increased arthropod abundance and biomass on the bark are positively correlated to tree age, but these relationships would change with management practices that either accelerated or slowed tree growth. (5)

Haywood, James D. 1999. **Durability of selected mulches, their ability to control weeds, and influence growth of loblolly pine seedlings.** New Forests. 18: 263-276

Several mulches of natural, synthetic, or blends of natural and synthetic fibers were tested around newly planted loblolly pine (*Pinus taeda* L.) seedlings on a sheared and windrowed site in central Louisiana, U.S.A. The vegetation was primarily winter annuals, some residual grasses and forbs, and sparse woody regrowth. Study 1 was rotary mowed just prior to planting in March 1992, and 35 mulches and an untreated check were established. In Study 2, 15 mulches and an untreated check were established in a 1-year-old rough in March 1993. In both studies, a single loblolly pine seedling formed each plot established in a randomized complete block design, with 10 blocks as replicates. Each block was planted with a separate open-pollinated loblolly pine family.

Nearly all mulches had deteriorated to some extent after three growing seasons. Synthetic mulches were generally more durable than the natural or natural/synthetic mulches. Mulching eliminated the established vegetation and germinants, and vegetation did not readily reestablish following the deterioration of a mulch. The soil seed bank apparently was not sufficient to regenerate areas that

were once covered with mulch, and many of the natural materials deteriorated into a fibrous cover that acted like a natural litter layer. Both of these residual weed control effects—insufficient soil seed bank and formation of a fibrous cover—were important in stopping vegetation from reestablishing after a mulch had deteriorated. After three growing seasons, the loblolly pine seedlings generally grew better if mulches were used. (6)

Laves, Kevin S.; Loeb, Susan C. 1999. **Effects of southern flying squirrels *Glaucomys volans* on red-cockaded woodpecker *Picoides borealis* reproductive success.** *Animal Conservation*. 2: 295-303.

Anecdotal data gathered from many populations suggest that southern flying squirrel (SFS, *Glaucomys volans*) use of the endangered red-cockaded woodpecker's (RCW, *Picoides borealis*) nest and roost cavities may negatively affect RCW populations. The authors conducted a controlled experiment to determine the effects of SFS's on RCW reproductive success. During the 1994 and 1995 breeding seasons, SFS's were removed from 30 RCW clusters and 32 clusters served as controls. SFS's were the most frequently encountered occupants of RCW cavities and used 20 to 33 percent of RCW cavities in control and treatment clusters over both years. Treatment groups produced significantly more successful nests (≥ 1 fledgling) than control groups in 1994. In 1995 however, there was no difference in the number of successful nests. In both years, RCW groups nesting in treatment clusters produced significantly more fledglings than groups in control clusters in each of four experimental areas, averaging approximately 0.7 additional fledglings per nesting group. Loss of entire clutches or broods, possibly as a result of predation or abandonment, was a major factor limiting reproduction in control groups in 1994. In contrast, differences in partial brood loss appeared to be the cause of differential fledging success in 1995. Usurpation of RCW roost cavities by SFS's may have placed greater energetic demands on RCW's for cavity defense or thermoregulation, thus reducing energy available for reproduction. Results show that SFS use of RCW cavities during the breeding season has a significant impact on RCW's and that management of RCW populations should include activities that either minimize SFS populations in RCW clusters or limit access of SFS's to RCW cavities. (7)

Otrosina, William J.; Bannwart, Diane; Roncadori, Ronald W. 1999.

Root-infecting fungi associated with a decline of longleaf pine in the southeastern United States. *Plant and Soil*. 217: 145-150.

A 35-year-old longleaf pine stand exhibited trees in various stages of decline. A study was conducted to determine root-infecting fungi and other abnormalities associated with varying degrees of crown symptoms. A four-class crown symptom rating system was devised according to ascending symptom severity. *Leptographium procerum* and *L. terebrantis* were significantly associated with increasing crown symptom severity. *Heterobasidion annosum* was also isolated in higher frequency as crown symptoms increased. Also, evidence of insects on roots increased as did amount of resinosis observed. Edaphic and silvicultural factors may interact with these pathogens and insects to pose a pathological limitation on longer-term management objectives. Further research is needed to determine relationships among various edaphic, silvicultural, and biological factors associated with the decline syndrome on this site. (8)

Saenz, Daniel; Collins, Christopher S.; Conner, Richard N. 1999. **A bark-shaving technique to deter rat snakes from climbing red-cockaded woodpecker cavity trees.** *Wildlife Society Bulletin*. 27(4): 1069-1073.

Saenz, Collins, and Conner developed a bark-shaving technique to deter rat snakes (*Elaphe obsoleta*) from climbing red-cockaded woodpecker (*Picoides borealis*) trees as an aesthetically pleasing, more cost-effective, and safer alternative to other snake excluder devices. The authors used a drawknife to carefully shave the bark around the circumference of 4 treatment trees in a 1-m-wide band to eliminate any furrows or rough surfaces, without cutting into the cambium. Four control trees were not altered. The scientists tested their method from April 1997 to August 1997 and found that shaved trees were nearly 100 percent effective in preventing rat snakes from climbing (n = 40 climbing attempts), whereas control trees were successfully climbed (n = 20 climbing attempts) on each attempt. One shaved barrier was crossed by one snake 14 weeks after the barrier was initially created. The bark had roughened from tree growth. After the researchers reshaved the barrier, the snake was unable to cross the barrier again. Despite loss of effectiveness over time, the shaved barriers can provide red-cockaded woodpeckers a head-start in developing their own defenses against rat snake predation in a manner that is more natural in appearance than other snake-excluder devices. (9)

Schiff, Nathan M.; Schiefer, Terence L. 1999. **New Blattode records from Mississippi and Alabama.** *Entomological News*. 110(4): 240-242.

Pseudomops septentrionalis is reported from seven counties in Mississippi dating back to 1987. These records suggest a gradual range extension hypothesis for this species rather than the accidental human transport hypothesis proposed to explain an apparently isolated population in Auburn, AL. *Panchlora nivea* is reported from four counties in Mississippi, including two early records considered to be adventive introductions with bananas. *Plectoptera picta* is reported from Alabama for the first time. (10)

Wetlands, Bottomland Hardwoods, and Streams

Burke, Marianne K.; Lockaby, B. Graeme; Conner, William H. 1999.

Aboveground production and nutrient circulation along a flooding gradient in a South Carolina Coastal Plain forest.

Canadian Journal of Forest Research. 29: 1402-1418.

Relative to effects of flooding, little is known about the influence of hydrology-nutrient interactions on aboveground net primary production (NPP) in forested wetlands. The authors found that nutrient circulation and NPP were closely related along a complex physical, chemical, and hydrologic gradient in a bottomland hardwood forest with four distinct communities. Aboveground biomass, NPP, biomass partitioning to stem production, growth efficiency, and soil macronutrient availability were greatest in the flooded zone, possibly because of the stable hydrologic regime. In the wet transition zone, trees were least productive, nutrient use efficiency was highest, and N retranslocation from foliage before abscission was "complete." Wet and dry transition zones had the lowest litterfall quality. Soil organic matter was negatively correlated with extractable NH₄-N plus NO₃-N before in situ incubations and positively correlated with litterfall lignin/N ratios. Lignin/P and C/N ratios were positively correlated with exchangeable soil Ca and Mg, cation exchange capacity, and clay content, and negatively correlated with extractable soil P. The scientists concluded that periodic flooding and associated widely fluctuating soil chemistry resulted in disequilibrium between the plant community and environmental conditions, which led to nutrient deficiency and low NPP in the transition zones compared with the continuously flooded and mesic zones. (11)

Dolloff, C. Andrew; Webster, Jackson R. 2000. **Particulate organic contributions from forests and streams: debris isn't so bad.** In: Verry, Elon S.; Hornbeck, James W.; Dolloff, C. Andrew, eds. Riparian management in forests of the continental Eastern United States. Boca Raton, FL: Lewis Publishers, CRC Press LLC: 125-138.

It is clear that the input of "debris" from terrestrial plants falling into streams is one of the most significant processes occurring at the interface of terrestrial and stream ecosystems. Organic matter—leaves, twigs, branches, and whole trees—provides energy, nutrients, and structure to streams flowing through forests. A host of vertebrate and invertebrate animals has adapted to life in flowing waters and depends on leaves and wood for food and habitat. Accumulations of leaves and wood also create refuges from the extremes of drought and flood and modify the downstream movement of sediment.

Despite all that we know about the importance of organic matter in streams, all too often wood and leaves in streams have been viewed as a liability at worst and a nuisance at best. Even the terms we use to describe it—debris, for example,—suggest something cast off or discarded. Although excessive amounts of organic matter have negative impacts in streams, such as lowering dissolved oxygen, buildup of toxic substances, and blocking fish migration, most problems are local rather than symptomatic of a [an] underlying pathology. All of these reasons aside, the main reason for our aversion to wood and leaves in streams is far more basic: it just plain looks bad! But for diverse, productive invertebrates and fish, for preservation of natural sediment and water regimes, and for overall stream health, terrestrial plant debris is not only desirable but essential.

The task in this chapter is to outline what we know about the functions and values of leaves and wood in streams. In doing so we hope not only to dispel the common misconceptions that wood debris in streams is undesirable, but also to instill the concept of organic matter as an asset to be husbanded. (12)

Phillips, Michael J.; Swift, Lloyd W., Jr.; Blinn, Charles R. 2000. **Best management practices for riparian areas.** In: Verry, Elon S.; Hornbeck, James W.; Dolloff, C. Andrew, eds. Riparian management in forests of the continental Eastern United States. Boca Raton, FL: Lewis Publishers, CRC Press LLC: 273-286.

Forest streams, lakes, and other water bodies create unique conditions along their margins that control and influence transfers of energy, nutrients, and sediments between aquatic and terrestrial systems. These riparian areas are among the most critical features of

the landscape because they contain a rich diversity of plants and animals and help to maintain water quality and terrestrial and aquatic habitats. These fragile areas are easily disturbed, and caution is needed whenever forest management occurs within them. Riparian areas are often linear features of variable width that have high edge-to-area ratios but generally occupy only a small part of the landscape. However, the linear nature of riparian areas means that resource managers and loggers, either through active management or the need to gain access to a site, will invariably come into contact with these features. Therefore, the proper management tools are needed to maintain the functions of riparian areas and minimize disturbance to the terrestrial and aquatic systems.

Best Management Practices (BMP's) are developed to prevent or minimize the adverse impacts of forestry activities on water quality while permitting the intended forest management activities to occur. They serve as the cornerstone for most State water quality protection programs. Possibly the earliest effort to establish BMP guidelines was the "Criteria for Managing the National Forests in the Appalachians" (1971) by Regions 8 and 9 [Southern Region and Eastern Region, respectively] of the USDA Forest Service. The development of BMP programs has been a collaborative effort among State agencies and organizations (both public and private) and Federal agencies to identify practices that reflect the particular physiographic, economic, technical, and political considerations of each State. Monitoring has shown nationally that compliance with BMP's is relatively high. However, by definition, BMP's were designed to protect water quality, not the other functions and values of riparian areas. We need to move beyond BMP's based solely on water quality to address these additional functions and values.

All State BMP programs recognize the importance of retaining some form of riparian management zone (RMZ) with management options that minimize impacts to the water resource. Achieving BMP compliance in these areas generally requires greater care, reduced physical intrusion (e.g., skid trails, roads, equipment) into the riparian management zone, and often reduced levels of harvest (e.g., thinning, uneven-aged management) or no harvest at all. It also requires preharvest planning that considers the landowner's management objectives. The BMP's discussed in this chapter pertain to lands where silvicultural or other forest management activities are planned and conducted. This chapter will describe the management issues of concern, water bodies that are addressed by traditional BMP's, RMZ options, and approaches to the development of RMZ guidelines that move beyond BMP's and address issues other than the protection of water quality. (13)

Smithson, Elizabeth B.; Johnston, Carol E. 1999. **Movement patterns of stream fishes in a Ouachita Highlands stream: an examination of the restricted movement paradigm.** Transactions of the American Fisheries Society. 128: 847-853.

The restricted movement paradigm (RMP), which states adult fish do not move out of a pool or restricted stream reach, does not fully define the movements of stream fishes. Although stream fishes may spend the majority of their time in a home pool, they also make regular exploratory trips away from the home pool. Recapture of Ouachita Highlands stream fish marked with passive integrated transponder (PIT) tags showed that the majority of the uniquely marked fish in this study were in the pools of initial collection. The following percentages of marked fish were recaptured outside the pool of initial collection: 12 percent of creek chub *Semotilus atromaculatus*; 33 percent of blackspotted topminnow *Fundulus olivaceus*; 12 percent of green sunfish *Lepomis cyanellus*; and 14 percent of longear sunfish *Lepomis megalotis*. Standard lengths and weights did not differ significantly between nonmobile and mobile recaptured fish, and patterns of multiple recaptures indicated exploratory, round-trip movements. Such regular exploratory trips suggest that the area of use by and critical habitat for stream fishes may be greater than commonly estimated. (14)

Verry, Elon S.; Dolloff, C. Andrew. 2000. **The challenge of managing for healthy riparian areas.** In: Verry, Elon S.; Hornbeck, James W.; Dolloff, C. Andrew, eds. Riparian management in forests of the continental Eastern United States. Boca Raton, FL: Lewis Publishers, CRC Press LLC: 1-22.

The challenge of managing for healthy riparian areas means coming to grips with our heritage, understanding how the land and streams change, dealing with diverse and divisive issues, learning to read the land and rivers, expanding our set of management tools, and, most important, seeing with the vision of community. It is our purpose to bring an understanding of riparian values and riparian functions to a community vision of place, a landscape that holds ponds and lakes, grows forests, and gives of itself in a river that runs through it. This is a place where living includes both work and play, where working the land means improving the watershed's landscape. (15)

Welsch, David J.; Hornbeck, James W.; Verry, Elon S.; and others. **Riparian area management: themes and recommendations.** In: Verry, Elon S.; Hornbeck, James W.; Dolloff, C. Andrew, eds. Riparian management in forests of the continental Eastern United

States. Boca Raton, FL: Lewis Publishers, CRC Press LLC: 321-340. **Editor's Note: C. Andrew Dolloff, SRS Project Leader, co-wrote this chapter and co-edited *Riparian Area Management: Themes and Recommendations*.**

“The end results of most of our management actions are reflected by the health of our rivers, streams, and lakes.” Michael Dombeck, Chief, USDA Forest Service

In this final chapter [of *Riparian Management in Forests of the Continental Eastern United States*], we consider the overriding themes of riparian area management and list highlights and recommendations from each chapter.

Riparian forest management is concerned with the water as well as the forest. The combination of water and forest is both a feature of the landscape, and a priority in our values that has focused resource management on riparian issues. Riparian management has passed from a history of intense exploitation a century ago, through recent decades of neglect, to the intense demand for shared decisions we see today. Protecting the essential links between land and water ensures quality water and quality aquatic habitats.

Human values and desires shape the way riparian areas are managed. Values and desires often overlap or conflict, and there is a need to find common ground. The axiom “good stewardship is shared stewardship” is especially appropriate for riparian area management. It has given insight to complex management recommendations that consider use and the relationships among resources. Riparian areas should receive “active” management, with “hands-off” being one option.

Riparian areas are difficult to define and delineate. Physical or biological criteria seldom allow finding a location where one might comfortably say “My right foot is in the riparian area, and my left foot is not.” Perhaps more than any other landscape feature, riparian areas focus our concept of landscape connections for fish and animal communities, for the interaction of forest regeneration with forest-site, and for the interaction of our personal economics with our personal recreation. Each of our disciplines (wood, water, wildlife, fisheries, recreation, farming, and transportation) finds reasons to sharpen its perception of interdisciplinary management in a landscape framework with multiple owners. This connected landscape is where land ownership and community stewardship tests the boundary between private rights and States rights. **(16)**

Southern Appalachians Research

Nilsen, Erik T.; Walker, John F.; Miller, Orson K.; and others. 1999. **Inhibition of seedling survival under *Rhododendron maximum* (Ericaceae): could allelopathy be a cause?** American Journal of Botany. 86(11): 1597-1605. **Editor's Note: Barton D. Clinton, research ecologist at the Coweeta Hydrologic Laboratory in Otto, NC, is the SRS author for this publication.**

In the Southern Appalachian Mountains a subcanopy species, *Rhododendron maximum*, inhibits the establishment and survival of canopy tree seedlings. One of the mechanisms by which seedlings could be inhibited is an allelopathic effect of decomposing litter or leachate from the canopy of *R. maximum* (*R.m.*) on seed germination, root elongation, or mycorrhizal colonization. The potential for allelopathy by *R.m.* was tested with two bioassay species (lettuce and cress), with seeds from four native tree species, and with three ectomycorrhizal fungi. Inhibitory influences of throughfall, fresh litter, and decomposed litter (organic layer) from forest with *R.m.* (+*R.m.* sites) were compared to similar extractions made from forest without *R.m.* (–*R.m.* sites). Throughfall and leachates of the organic layer from both +*R.m.* and –*R.m.* sites stimulated germination of the bioassay species above that of the distilled water control, to a similar extent. There was an inhibitory effect of leachates of litter from +*R.m.* sites on seed germination and root elongation rate of both bioassay species compared with that of litter from –*R.m.* sites. Native tree seed stratified in forest floor material from both forest types had a slightly higher seed germination rate compared with the control. A 2-yr study of seed germination and seedling mortality of two tree species, *Quercus rubra* and *Prunus serotina*, in field plots showed no significant influence of litter or organic layer from either forest type. Incorporating *R.m.* leaf material into the growth medium in vitro depressed growth of one ectomycorrhizal species but did not affect two other species. Leaf material from other deciduous tree species depressed ectomycorrhizal growth to a similar or greater extent as leaf material from *R.m.* In conclusion, *R.m.* litter can have an allelopathic effect on seed germination and root elongation of bioassay species as well as some ectomycorrhizal species. However, this allelopathic affect [effect] is not manifest in field sites and is not likely to be an important cause for the inhibition of seedling survival within thickets of *R.m.* **(17)**

Interior Highlands Research

U.S. Department of Agriculture, Forest Service. 1999. **Ozark-Ouachita Highlands Assessment: air quality. Report 2 of 5.** Gen. Tech. Rep. SRS-32. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 57 p.

This publication provides information about the atmospheric conditions in and near the national forests in the Ozark-Ouachita Highlands: the Mark Twain in Missouri, the Ouachita in Arkansas and Oklahoma, and the Ozark-St. Francis National Forests in Arkansas. This report includes information about particulate matter, visibility, ozone concentrations, and acid deposition in the Ozark-Ouachita Highlands Assessment area. (18)

U.S. Department of Agriculture, Forest Service. 1999. **Ozark-Ouachita Highlands Assessment: aquatic conditions. Report 3 of 5.** Gen. Tech. Rep. SRS-33. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 317 p.

This publication provides citizens, private and public organizations, scientists, and others with information about the aquatic conditions in or near national forests in the Ozark-Ouachita Highlands: the Mark Twain in Missouri, the Ouachita in Arkansas and Oklahoma, and the Ozark-St. Francis National Forests in Arkansas. This report includes water quality analyses, status of aquatic species, aquatic and riparian habitat conditions, water laws and policies, effects of human activities, and water resource usage and trends in the Ozark-Ouachita Highlands Assessment area. (19)

U.S. Department of Agriculture, Forest Service. 1999. **Ozark-Ouachita Highlands Assessment: social and economic conditions. Report 4 of 5.** Gen. Tech. Rep. SRS-34. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 299 p.

This publication provides information about the social and economic conditions in and near the national forests in the Ozark-Ouachita Highlands: the Mark Twain in Missouri, the Ouachita in Arkansas and Oklahoma, and the Ozark-St. Francis National Forests in Arkansas. This report includes an archeological and historical background, describes demographic conditions and trends and communities, provides an economic profile, discusses recreation, timber, minerals, range, and other important resources in the Highlands, and examines attitudes, values, and public opinions about natural resources. (20)

U.S. Department of Agriculture, Forest Service. 1999. **Ozark-Ouachita Highlands Assessment: summary report. Report 1 of 5.** Gen. Tech. Rep. SRS-31. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 56 p.

This publication summarizes four other reports prepared as part of the Ozark-Ouachita Highlands Assessment. The summary report addresses social and economic conditions and trends, aquatic conditions, air quality, and terrestrial vegetation and wildlife of the Highlands in Arkansas, Oklahoma, and Missouri. (21)

U.S. Department of Agriculture, Forest Service. 1999. **Ozark-Ouachita Highlands Assessment: terrestrial vegetation and wildlife. Report 5 of 5.** Gen. Tech. Rep. SRS-35. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 201 p.

This publication provides citizens, private and public organizations, scientists, and others with information about terrestrial animals, plants, and biological communities in and near the national forests in the Ozark-Ouachita Highlands: the Mark Twain in Missouri, the Ouachita in Arkansas and Oklahoma, and the Ozark-St. Francis National Forests in Arkansas. The document examines the status and trends of vegetation, plant and animal populations, forest management, and biological threats to forest resources in the Highlands. (22)

Large Scale Assessment and Modeling Research

Harms, William R.; Whitesell, Craig D.; DeBell, Dean S. 2000. **Growth and development of loblolly pine in a spacing trial planted in Hawaii.** Forest Ecology and Management. 126: 23-24.

Loblolly pine (*Pinus taeda* L) was planted at four square spacings (1.8, 2.4, 3.0, and 3.7 m) on the Island of Maui in 1961, and measured periodically for 34 years. Patterns of stand growth and development were examined and compared with yield model estimates of stand characteristics of plantations of the same initial spacings, ages, and site index in the Southeastern United States. The Hawaiian plantings had much higher survival at all spacings and sustained high diameter growth in the face of intense competition. At age 34, the 1.8 m spacing had 1585 stems/ha averaging 24.1 m tall and 28.8 cm d.b.h.; the widest spacing (3.7 m) had 725 stems/ha, 26.1 m tall, and 38.2 cm d.b.h. The highest basal areas (~100 m²/ha) were double maxima attained in the Southeastern United States and were reflected in similar differences in volume yields. The Hawaiian plantings demonstrate that growth potential of loblolly pine is far greater than is apparent from observations on plantations in its native habitat. To capture this potential in other situations, research must identify the tree, stand, and environmental characteristics associated with low mortality rates and high diameter growth in Hawaii, and, conversely, the factors that limit loblolly's potential in the Southeastern United States. (23)

Kost, Michael A.; DeSteven, Diane. 2000. **Plant community responses to prescribed burning in Wisconsin sedge meadows.** *Natural Areas Journal*. 20(1): 36-45.

In northern temperate regions, sedge meadows dominated by the tussock-sedge *Carex stricta* Lam. (Cyperaceae) were historically a fire-maintained community type. In two Wisconsin natural areas (Lulu Lake and Summerton), the authors assessed the effects of time since prescribed spring burning on plant composition and aboveground biomass in eight sedge meadows representing a partial chronosequence of zero to seven years since burning, plus no burning. They recorded plant species cover in line-intercept transects and measured live biomass and litter in sample plots along transects. Responses were prominent during the first two years after burning. In the Lulu Lake meadows, live biomass and annual forb cover reached their highest values during the first growing season after burning, whereas cover and frequency of perennial forbs were elevated for two seasons. Plant litter was removed by burning but returned to preburn levels in one to two years. In the Summerton meadows, where seven years had elapsed since the last fire, burned and unburned meadows did not differ in live biomass, litter, or relative cover of plant life-forms. It appears that periodic burns do not cause major shifts in the relative dominance of sedges and grasses, which are long-lived clonal perennials. However, because litter removal promotes recruitment of shorter-lived forbs, prescribed fire can enhance sedge meadow diversity by allowing plant species with different life histories to temporarily share dominance with the more abundant graminoids. Periodic seed inputs by forbs to the wetland seed bank may be a desirable fire management objective for maintaining sedge meadow diversity. (24)

Lemly, A. Dennis. 1999. **Selenium impacts on fish: an insidious time bomb.** *Human and Ecological Risk Assessment*. 5(6): 1-13.

A selenium time bomb situation is developing in the United States and elsewhere that may result in substantial impacts on fish populations. The selenium time bomb has three components: (1) high food-chain bioaccumulation; (2) steep toxic response curve for fish; and (3) insidious mode of toxicity. If the threshold for selenium toxicity is exceeded, the time bomb explodes and a cascade of events is set into motion that will result in major ecosystem disruption. Several human-related factors are emerging that are capable of igniting the fuse of the time bomb by increasing waterborne concentrations of selenium and providing conditions favorable for bioaccumulation. Some of these factors are (1) mobilization of selenium due to open-pit phosphate mining; (2) use of constructed wetlands to treat selenium-laden wastewater from oil refineries and agricultural irrigation; (3) landfill disposal of seleniferous fly ash from coal-fired power plants; and (4) mobilization of selenium from animal feedlot wastes. Collectively, these threats may be sufficient to cause widespread, unanticipated toxic effects in fish populations. Only environmentally sound risk assessments followed by prudent management actions can defuse the selenium time bomb—once it explodes, it is too late to avoid significant impacts. (25)

Schmoldt, Daniel L.; Peterson, David L. 2000. **Analytical group decision making in natural resources: methodology and application.** *Forest Science*. 46(1): 62-75.

Group decision making is becoming increasingly important in natural resource management and associated scientific applications, because multiple values are treated coincidentally in time and space, multiple resource specialists are needed, and multiple stakeholders must be included in the decision process. Decades of social science research on decision making in groups have provided insights into the impediments to effective group processes and on techniques that can be applied in a group context. Nevertheless, little integration and few applications of these results have occurred in resource management

decision processes, where formal groups are integral, either directly or indirectly. A group decision-making methodology is introduced as an effective approach for temporary, formal groups (e.g., workshops). It combines the following three components: (1) brainstorming to generate ideas; (2) the analytic hierarchy process to produce judgments, manage conflict, enable consensus, and plan for implementation; and (3) a discussion template (straw document). Resulting numerical assessments of alternative decision priorities can be analyzed statistically to indicate where group member agreement occurs and where priority values are significantly different. An application of this group process to fire research program development in a workshop setting indicates that the process helps focus group deliberations; mitigates groupthink, nondecision, and social loafing pitfalls; encourages individual interaction; identifies irrational judgments; and provides a large amount of useful quantitative information about group preferences. This approach can help facilitate scientific assessments and other decision-making processes in resource management. (26)

Inventory and Monitoring Research

Brown, Mark J. 1999. **Florida's forests, 1995**. Resour. Bull. SRS-48. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 83 p.

Between 1987 and 1995, timberland area in Florida decreased by 2 percent to less than 14.7 million acres. Timberland under nonindustrial private ownership increased 2 percent to 7.2 million acres, and public ownership increased 16 percent to 2.8 million acres. However, timberland controlled by forest industry decreased by 16 percent to 4.6 million acres. Pine plantations now account for 32 percent of the State's timberland, the highest proportion in the South. Volume of softwood growing stock increased almost 5 percent to 9.4 billion cubic feet, and volume of hardwood growing stock increased nearly 10 percent to more than 5.9 billion cubic feet. Net annual growth of softwood growing stock increased 9 percent to 532 million cubic feet, and that of hardwood increased 14 percent to 161 million cubic feet. Average annual removals of softwood growing stock changed little at 473 million cubic feet, whereas hardwood removals increased 33 percent to 88 million cubic feet. (27)

Prestemon, Jeffrey P.; Holmes, Thomas P. 2000. **Timber price dynamics following a natural catastrophe**. American Journal of Agricultural Economics. 82: 145-160.

Catastrophic shocks to existing stocks of a renewable resource can cause long-run price shifts. With timber, these long-run price shifts may be accompanied by a short-run price drop due to salvage. Hurricane Hugo damaged 20 percent of southern pine timber in the South Carolina Coastal Plain in 1989. To estimate the short- and long-run effects of the hurricane on the prices of timber stocks, the authors estimated an intervention model of the residuals of cointegration of South Carolina sawtimber and pulpwood stumpage prices with prices of similar products from other regions. Modeling revealed a 30 percent negative price spike due to salvage and a long-run enhancement effect, leading to prices that are 10 percent to 30 percent higher than they would have been had Hugo not occurred. (28)

Schweitzer, Callie Jo. 1999. **Forest statistics for central Tennessee, 1998**. Resour. Bull. SRS-47. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 60 p.

This report summarizes a 1998 inventory of the forest resources of a 23-county area of Tennessee. Major findings are highlighted in text and graphs; detailed data are presented in 51 tables. (29)

Schweitzer, Callie Jo. 1999. **Forest statistics for Tennessee's Plateau Counties, 1999**. Resour. Bull. SRS-49. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 60 p.

This report summarizes a 1999 inventory of the forest resources of a 16-county area of Tennessee. Major findings are highlighted in text and graphs; detailed data are presented in 51 tables. (30)

Foundation Programs Research

Absher, James D.; McCollum, Daniel W.; Bowker, J.M. **The value of research in recreation fee project implementation.** Journal of Park and Recreation Administration. 17(3): 116-120.

In a survey of Forest Service managers responsible for implementation of recreation fee programs, research skills were perceived to provide little benefit to business or communications planning. A majority of managers reported, however, that they used research data they collected or contracted for when developing and implementing their fee programs. They rated the usefulness of that information very high relative to other sources used. Few reports of formal studies prior to fee implementation suggest that a substantial part of the research that occurred was very casual in nature. Since implementation, most managers are not collecting any information to help evaluate success or failure of the fee program to accomplish program objectives. (31)

Bowker, J.M.; Cordell, H.K.; Johnson, Cassandra Y. 1999. **User fees for recreation services on public lands: a national assessment.** Journal of Park and Recreation Administration. 17(3): 1-14.

A portion of the 1995 National Survey on Recreation and the Environment examined public opinion toward user fees as a means of funding recreation services on public lands, including campgrounds, boat ramps, trails, picnic areas, historic sites, restrooms, parking areas, special exhibits and presentations, visitor centers, and other facilities. Respondents were offered five choices to fund these services, including fees only, fees and taxes, taxes only, don't provide the service, and don't know. Sample frequencies indicated that over 95 percent of the respondents felt that fees or a combination of fees and taxes should be used to fund at least one of the services. Boat ramps, campgrounds, and special exhibits drew the most support for user fees, with over 80 percent of respondents indicating that user fees should be charged to cover at least part of the costs of providing these services. User fees were least favored for picnic areas, historic sites, and restrooms. Restrooms were the only case in which less than 50 percent of the public favored the use of fees to cover at least part of the provision costs. The only service for which at least 50 percent of the public did not feel taxes should be used at least in part to cover the costs of provision was for boat ramps.

Logistic regression models were used to examine the socioeconomic factors explaining support for fees. The model included variables on age, ethnicity, income, household size, education, gender, and region of the country. Findings were somewhat mixed. However, in a general fee model and in a number of specific service models, income and ethnicity surfaced as significant explanatory variables, indicating that concerns about fairness in the implementation of fees are not unfounded. Moreover, a number of regional differences emerged, indicating differing levels of support for user fees around the country. (32)

Diner, Alex. 1999. **Somatic embryogenesis in forestry: A practical approach to cloning the best trees.** In: Wheeler, Robert, ed. Under the canopy; forestry and forest products newsletter of the Alaska Cooperative Extension. Fairbanks, AK: University of Alaska Fairbanks Cooperative Extension Service: 7-8.

Trees as well as humans have two basic cell types based on genetic content: somatic cells and gametic or reproductive cells. Somatic cells, such as skin cells or the sapwood cells in a tree, have at least twice (2n) the base set of chromosomes. The reproductive cells (gametic cells) have a single (n) set of chromosomes. (33)

Gross, Georg G.; Hemingway, Richard W.; Yoshida, Takashi. 1999. **The 3rd tannin conference—retrospect and prospect.** In: Gross, Georg G.; Hemingway, Richard W.; Yoshida, Takashi, eds. Plant Polyphenols 2: Chemistry, Biology, Pharmacology, Ecology. New York: Kluwer Academic/Plenum Publishers: 911-913.

The editors reflect on the three tannin conferences, the state of this evolving body of knowledge, the growing community of scientists involved in this work, and prospects for the future. (34)

Hatano, Tsutomu; Yoshida, Takashi; Hemingway, Richard W. 1999. **Interaction of flavanoids with peptides and proteins and conformations of dimeric flavanoids in solution.** In: Gross, Georg G.; Hemingway, Richard W.; Yoshida, Takashi, eds. *Plant Polyphenols 2: Chemistry, Biology, Pharmacology, Ecology*. New York: Kluwer Academic/Plenum Publishers: 509-526.

Although the physiological roles of tannins and related polyphenols in plants have not yet been clarified, their ability to form complexes with proteins or related biopolymers has been correlated with some protection of the plants from predators such as animals, insects, and microbes. Similarly, commercial uses of tannins, especially in the leather

and brewing industries, are also based on their binding with proteins.

Pharmacological properties of tannins have been investigated based on recent advances in the structural study of tannins in medicinal plants, and various actions of tannins including antitumor and antiviral effects have been revealed. These effects are attributed to interactions with

certain biomolecules in organisms, too.

Most of these effects are dependent on the chemical structures or molecular shapes of tannins. Therefore, clarification of the molecular conformations of tannins and related polyphenols is requisite to understanding the process of molecular interaction of tannins with the biomolecules. Here we summarize our reports on the conformational analyses of dimeric flavanoids related to condensed tannins and interaction of these flavanoids with peptides. Because molecular conformations of oligomeric flavanoids in the free phenolic form in solution with the biologically significant solvent (water) had not yet been characterized, we focused our efforts on definition of the conformations of the natural free phenols in aqueous solutions. (35)

Heslop-Harrison, J.S. (Pat); Brandes, Andrea; Taketa, Shin; and others. 1997. **The chromosomal distributions of Ty1-copia group retrotransposable elements in higher plants and their implications for genome evolution.** *Genetica*. 100: 197-204. (Editor's note: Robert L. Doudrick is the SRS author of this publication.)

Retrotransposons make up a major fraction - sometimes more than 40 percent—of all plant genomes investigated so far. The authors have isolated the reverse transcriptase domains of the Ty1-copia group elements from several species, ranging in genome size from some 100 Mbp to 23 000 Mbp, and determined the distribution patterns of these retrotransposons on metaphase chromosomes and within interphase nuclei by DNA:DNA *in situ* hybridization. With some exceptions, the reverse transcriptase domains were distributed over the length of the chromosomes. Exclusion from rDNA sites and some centromeres (e.g., slash pine, 23 000 Mbp, or barley, 5500 Mbp) is frequent, whereas many species exclude retrotransposons from other sites of heterochromatin (e.g., intercalary and centromeric sites in broad bean). In contrast, in the plant *Arabidopsis thaliana*, widely used for plant molecular genetic studies because of its small genome (c. 100 Mbp), the Ty1-copia group reverse transcriptase gene domains are concentrated in the centromeric regions, colocalizing with the 180 bp satellite sequence pAL1. Unlike the pAL1 sequence, however, the Ty1-copia signal is also detectable as weaker, diffuse hybridization along the lengths of the chromosomes. Possible mechanisms for evolution of the contrasting distributions are discussed. Understanding the physical distribution of retrotransposons and comparisons of the distribution between species is critical to understanding their evolution and the significance for generation of the new patterns of variability and in speciation. (36)

Johnsen, Kurt H.; Flanagan, Lawrence B.; Huber, Dudley A.; Major, John E. 1999. **Genetic variation in growth, carbon isotope discrimination, and foliar N concentration in *Picea mariana*: analyses from a half-diallel mating design using field-grown trees.**

The authors performed genetic analyses of growth, carbon isotope discrimination ($\delta^{13}\text{C}$), and foliar N concentration using a half-diallel subset of a 7×7 complete diallel planted on three sites ranging in water availability. Trees were 22 years old. Heritabilities; general and specific combining abilities; as well as phenotypic, genetic, and environmental correlations were calculated using the best linear unbiased prediction and restricted maximum-likelihood methods. The four traits measured showed variable levels of genetic control. The calculated heritabilities for the traits were as follows: height, 0.39 ± 0.22 (estimate \pm SD); diameter, 0.14 ± 0.10 ; $\delta^{13}\text{C}$ value, 0.54 ± 0.26 ; and foliar N, 0.00. Phenotypic correlations were moderate ($r = -0.35$), genetic correlations were strong ($r = -0.97$), and environmental correlations were weak ($r = -0.18$) between height growth and $\delta^{13}\text{C}$. The strong negative genetic correlation between $\delta^{13}\text{C}$ and growth supports earlier work with a subset of families indicating photosynthetic differences caused genetic variation in $\delta^{13}\text{C}$. Inbreeding greatly decreased growth while not impacting $\delta^{13}\text{C}$. High heritability, lack of inbreeding depression, and low environmental correlations indicate that a major proportion of $\delta^{13}\text{C}$ genetic control may be relatively simple.

Because $\delta^{13}\text{C}$ is highly heritable, highly genetically correlated to growth, less environmentally sensitive than growth, and has the possibility of early selection, the trait is a good candidate trait for indirect selection for growth. (37)

Johnson, Cassandra Y. 1998. **A consideration of collective memory in African American attachment to wildland recreation places.** *Human Ecology Review*. 5(1): 5-15.

This study examines the effect of race on place attachment to wildland areas. It is generally assumed that African Americans have a more negative impression of wildlands, compared to white ethnic groups. Studies from past decades report that blacks show less aesthetic preference for wildland, unstructured environments and are also less environmentally aware than whites. While it is assumed that blacks are wildland averse, few studies have considered some of the sociohistorical factors that may have contributed to the formation of such attitudes. One possibility is that blacks' collective "memory" of sociohistorical factors such as slavery, sharecropping/Jim Crow, and lynching may have contributed to a black aversion for wildland environments. Racial differences in aesthetic appreciation of wildlands are tested with a place attachment scale developed by Williams and others using confirmatory factor analysis and structural equation modeling. The data are from a 1995 survey of residents in a rural, southern county in the Florida panhandle. Results show significant racial variation, with African Americans having less attachment to wildland recreation areas. Sex and age are also significant predictors of place attachment. (38)

Johnson, Cassandra Y.; Bowker, J.M. 1999. **On-site wildland activity choices among African Americans and White Americans in the rural south: implications for management.** *Journal of Parks and Recreation Administration*. 17(1): 21-39.

Johnson and Bowker compare wildland activity choices for a sample of rural African Americans and Whites who visited wildland settings in and around the Apalachicola National Forest. The authors also look at intra-racial (same race, different gender) variations for activity participation. This research extends previous research focused on the visit/not visit wildland question by examining activity choice by race and gender for those who do visit. Results show no racial differences for consumptive activities like fishing and hunting; however, African Americans are significantly less likely than Whites to participate in most forms of nonconsumptive activities like camping and hiking. Greater gender differences in activity participation were found for Whites than for African Americans. The authors discuss management implications and ways forest managers may attract more African Americans to participate in forest-based outdoor recreation. This includes target marketing strategies that promote fishing and group activities on the Apalachicola National Forest. (39)

McGraw, Gerald W.; Hemingway, Richard W.; Ingram, Leonard L., Jr.; and others. 1999. **Thermal degradation of terpenes: camphene, Δ^3 -carene, limonene, and α -terpinene.** *Environmental Science & Technology*. 33: 4029-4033.

Emissions from wood dryers have been of some concern for a number of years, and recent policy changes by the Environmental Protection Agency have placed emphasis upon the gaseous emissions that lead to the formation of particulate matter as small as $2.5\ \mu\text{m}$ diameter. In this qualitative study, camphene, Δ^3 -carene, limonene, and α -terpinene were thermally degraded in the presence of air to determine the number and kind of oxidative degradation products that might be expected under drying conditions used in processing wood products. Various chromatographic methods were used to isolate the products for proof of structure by NMR and/or GC-MS. The degradation products resulted from dehydrogenations, epoxidations, double bond cleavages, allylic oxidations, and rearrangements. A number of compounds not previously associated with the thermal degradation of these terpenes were identified. (40)

Tobiason, Fred L.; Hemingway, Richard W.; Vergoten, Gerard. 1999. **Modeling the conformation of polyphenols and their complexation with polypeptides: self-association of catechin and its complexation with L-proline glycine oligomers.** In: Gross, Georg G.; Hemingway, Richard W.; Yoshida, Takashi, eds. *Plant Polyphenols 2: Chemistry, Biology, Pharmacology, Ecology*. New York: Kluwer Academic/Plenum Publishers: 527-544.

Over the past 10 years, several scientific thrusts have come together in

the study of flavanoids that make it possible to move forward into the study of complexation between polyphenols and polypeptides. Enhanced understanding of the conformational properties of flavanoid monomers and polyflavanoids through molecular modeling, combined with the detailed NMR experimental data now in the literature, provide the foundation. Recent work using conformational searching techniques with the GMMX protocol has shown additional detail about the distribution of pseudo equatorial and pseudo low-energy axial conformers in the ensemble, as shown in figure 1. This leads to information about the relationship between the conformer ensemble and the Boltzmann averaged NMR proton coupling constants that one would expect to observe in a solution. Figure 1 also illustrates the pseudo equatorial to axial transformation that takes place in all catechin or (+)-catechin-(4-8)-(+)-catechin (B3) dimer complexes during the conformer searches and which would also be expected to occur in solution. Interest continues to further understand the details about this conformer distribution, as well as in the prediction of complexation of tannins with metal ions and proteins. Although the GMMX software has given many interesting results, it is limited in handling cases that require systematic conformational searching of molecules combined in a complex. In addition, there are no solvent model options.

Recent NMR studies on procyanidin dimers and NOE results of the complexation of L-proline-glycine compounds with (+)-catechin and polyflavanoid dimers have given data to help guide computational studies. Couple this with the improved molecular computational software available, and it becomes possible to explore complexation searching conformational space through Monte Carlo and molecular dynamics protocols using water as a solvent. The importance of this is highlighted by the renewed interest in its pharmacological characteristics such as the antiviral and antitumor behavior of tannins and other polyphenols, as well as reported interaction of polyphenols with proteins in aqueous solutions. In this chapter, the authors explore computational models for molecules such as L-proline-glycine and glycl-L-prolyl-glycl-glycine ion (GPGG ion) interacting with (+)-catechin and (+)-catechin-(4-8)-(+)-catechin (B3) to form complexes. These results are compared to the close-contact positions obtained from NOE NMR experiments in aqueous solution. The complex structures found using conformational search methods are discussed in terms of the specific hydrophobic and hydrophilic interactions observed. (41)

Vozzo, J.A.; Patel, R.; Terrell, A. 1999. ***In vivo digital phyto imaging (IDPI) in Juglans nigra seeds.*** In: Marzalina, M.; Khoo, K.C.; Jayanthi, N.; et al., eds. *Recalcitrant seeds: Proceedings of the conference; IUFRO seed symposium 1998; 1998 October 12-15; Kuala Lumpur, Malaysia.* Kuala Lumpur, Malaysia: Forest Research Institute Malaysia: 74-80.

A major disadvantage of conventional seed radiography is that the resulting image will not distinguish full-viable seeds from full-nonviable. Empty seeds will imbibe sufficient water to appear full, but these are easily distinguished by radiography before imbibition. Full seeds, both viable and nonviable, have 25 to 35 percent moisture content when freshly collected. This is sufficient water to confuse interpretation due to radiopacity of water density. While the full-viable seeds will germinate, the full-nonviable ones will not germinate due to physiological rather than morphological conditions, even while they maintain a moisture content sufficient to support germination.

Speculation points to distribution and availability of free water and fat as promising factors to determine if an otherwise healthy seed will germinate. Magnetic resonance imaging (MRI) will determine these distributions.

MRI is a nondestructive, noninvasive method suitable to seed research and ultimate germination of viable seeds. Although it is a widely used medical procedure, there are only limited applications to tree seed physiology.

Specific differences reported in this paper are primarily the distribution and abundance of mobile hydrogen (H^+) protons in bulk free water and in lipid molecules or parts of long chains. The difference in images was obtained by using fat and water suppression techniques utilizing the small differences in resonant frequencies between H^+ in bulk water and lipids.

(42)