Chapter 23.

Recreation
and Nontimber Forest Products

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Abstract—*Research on forest recreation over the last 60 years has been voluminous. Research on nontimber forest products (NTFP) has been much less voluminous. In this chapter the history of these two tracks of research has been reviewed. Not all studies are mentioned; rather, a representative selection of the subject matter is discussed. Forest recreation research had its beginnings in the late 1950s within a few southern universities and with two Federal Agencies—the U.S. Department of Agriculture Forest Service and the Economic Research Service. In these beginnings the challenge was to shed more light on who recreates, where recreation occurs, what impacts it has on the resource, and whether recreation and tourism is one way to address persistent poverty in some areas of the South. Through the 1960s and 1970s, research expanded tremendously, with greater participation among universities and public agencies. Not only were practical problems being addressed, but also advances in theory and methods were being forged as the science of forest recreation matured. Through the 1980s and 1990s, many topics of management concern and of scientific concern were addressed as outlets for recreation and leisure sciences grew and the needs for scientific information for recreation management expanded. This recreation research is reviewed in brief in the chapter that follows, as is research on NTFPs.*

INTRODUCTION

Unlike recreation research, the study of nontimber forest products (NTFP) is a relatively new topic in forestry in the South. The products of concern are forest plant materials that may include fungi, mosses, lichens, herbs, vines, shrubs, trees, or parts thereof. Only a modest amount of research dealing with NTFPs has been undertaken over the last 50 years. Most of this research has focused on describing the varied uses of the plants, their site requirements, and other botanical factors. Until very recently, within the last decade, NTFPs were not well recognized as a management concern or as a recreational or commercial pursuit. Much of the early research focused on defining and understanding how people used these products. Currently, more university and agency scientists are looking at NTFPs from management, recreational, commercial, and ecological impact perspectives.

This chapter covers research over the last five decades in the South regarding two related but mostly distinct forest uses. The first is forest recreation. The focus is to overview the research applied to understanding recreation in forest settings. The author listed first for this chapter is principally responsible for the text covering forest recreation, which, because of the vast volume of this research, is limited to brief overviews of what has been accomplished. The second topic is gathering and using NTFPs. These products are mostly plant based and do not include lumber or pulpwood. While gathering forest products is often recreational, it is different than almost all other recreational activities in that it involves removal of natural materials. The second author is principally responsible for covering research on this topic.

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Historical Overview of Outdoor Recreation Research

Prior to the Outdoor Recreation Resources Review Commission (ORRRC), which started its work in 1958 and published its results in 1962, very little forest recreation research had been done anywhere in the country, especially in the South. In fact, prior to World War II, there was little policy or management emphasis, let alone research, applied to recreational uses of forest lands, public or private. As demand for outdoor recreation grew after the war years, however, and as the U.S. economy rebounded from the war's impacts, participating in outdoor activities and taking outdoor-oriented family vacations grew rapidly. That growth sparked creation of the ORRRC and drew national attention to the need for research to better understand the implications of this fast-growing phenomenon.

As of the end of 1962, there were six known outdoor recreation research studies in progress by university faculty and graduate students in the South. At that time, a number of university park and recreation administration academic departments were creating outdoor recreation curricula throughout the region. Examples included Clemson University, North Carolina State University, the University of Arkansas, and Texas Agricultural and Mechanical University. The national visibility of the ORRRC reports gave energy and justification to these emerging programs and to building research capacity within some of them. In these early years, outdoor recreation research was underway at the University of Florida, University of Arkansas, University of Georgia, and at Virginia Polytechnic Institute and State University. The topics ranged from income earning potentials of outdoor recreation in rural areas to management evaluations of national forests and to recreation use estimation procedures (Graves 1963).

As with the universities in the South, Government agencies were just beginning to institute recreation research programs. The U.S. Department of Agriculture Forest Service (Forest Service) and Economic Research Service were early to establish recreation research programs in the South (van der Smissen 1963) and elsewhere in the country. The few scattered publications beginning to emerge from the Forest Service, primarily the Southeastern Forest Experiment Station (SEFES) with headquarters in Asheville, NC, covered use impacts on developed recreation sites, hunting and fishing use, private land access issues, and how to include recreation in forest management planning. There were two Forest Service research locations in the South. The principal one was located in Asheville, NC, and had as its primary objectives the development of methods for measuring and predicting recreation use, mitigating use impacts, and assessing aesthetic values in forest environs. A second was located in Raleigh, NC, and affiliated with the School of Forestry at North Carolina State University. Its mission was to study outdoor recreation issues on industrial and nonindustrial private land. Research of this period by the Economic Research Service in the South was primarily focused on examining the potential for earning income from rural outdoor recreation development, including forest recreation. The issue driving this work was the prevalence of low-income communities and poverty in some areas in the region.

Historical Overview of NTFP Research

Research on NTFPs is a new topic in forestry in the South. The products of concern are typically defined as plant materials harvested from forests and may include fungi, mosses, lichens, herbs, vines, shrubs, trees, or parts thereof. Many plant parts are harvested, including the roots, tubers, leaves, bark, twigs, branches, fruit, sap, and resin, in addition to the wood. Until very recently, within the last decade, NTFPs were not recognized as natural resources being harvested from the forests. Historically, the primary focus of research on these products has been on human use, botanical identification, taxonomy, and ecological distribution. Much of the early research focused on defining and understanding how people used these products.

The long history of using nontimber products gathered from the forests of southern Appalachia is not reflected in the scientific knowledge base. Native Americans used forest plants as tools, food, medicine, and religious ceremonial implements. They used bark for housing, branches and stems for utensils and tools, and wood for containers and other household products. Plants and plant products were fully integrated into and essential to their personal lives. Much of the knowledge gained from Native Americans is the foundation of the herbal medicinal industry today in the United States (Ody 1993). Over the course of three centuries, more than 400 medicinal forest products used by the Cherokee have been documented (Hamel and Chiltoskey 1975). This traditional knowledge was shared with early European settlers, who used the products for personal use, as well as in commercial trading.

During the 1800s, the United States and the NTFP industry changed dramatically. The political turmoil in the United States during the mid-1800s increased the need to explore the forests for new and substitute products. By 1863, due to port blockades, the South was in dire need of most medicinal products that previously had been purchased from abroad. A field surgeon, pulled from his duties to explore the forest resources of the Confederate States, reported finding more than 400 substitutes for medicinal plants that had been imported from Europe (Porcher 1970). Porcher (1970) reported that species "to be collected by soldiers while in service in any part of the Confederate States" included dogwood (*Cornus* spp.) as a quinine substitute, tulip poplar (*Liriodendron tulipifera* L.*)* for fevers, sweetgum (*Liquidambar styraciflua* L.) for diarrhea, and mayapple (*Podophyllum peltatum* L.) as a laxative. Beyond this cursory examination to identify potential medicinal uses, more advanced research on these products was lacking throughout most of the next century.

FOREST RECREATION RESEARCH IN THE SOUTH THROUGH THE 1980S

The following sections cover the history and accomplishments of recreation research in the South from the late 1950s through the 1980s. Five major recreation topic areas are overviewed, starting with onsite use estimation. The other four topics include visitor profiles and preferences, use impacts and carrying capacity, large-scale assessments, and a variety of other topics such as economic impacts and private land recreational access. A primary source for these descriptions is the proceedings of the Southeastern Recreation Research Conference (SERR), an annual regional conference first convened on February 6–7, 1979. The senior author of this chapter was one of the original organizers and sponsors of this conference. Although the SERR does not capture the full complement of recreation and related publications done in the South or by southern researchers, it is a good sampling and is used here as the major source. SERR was the first of a number of annual outdoor recreation research conferences now held in several regions of the country. The 24th annual SERR was held in Athens, GA, on February 20–22, 2002. Scientists known to have been engaged in recreation research in these earlier years were sent a request to forward their career publication list for use in developing the history in this chapter.

Onsite Use Estimation

This area of recreation research was one of the earliest topics of emphasis in the South, and elsewhere in the country. In the 1950s, very little was known about the amount, type, and location of forest recreation use. The most notable of the early work to help fill this knowledge gap was done by the Forest Service recreation research work unit in what was then known as the SEFES (now known as the Southern Research Station). The project was located in Asheville, NC, and George A. (Jim) James was the first of this unit's project leaders. His work in recreation use estimation methods became very well known and used nationally. His research focusing on use estimation was done cooperatively with national forests, State agencies, and the Washington Office of the Forest Service. The work progressed along two main lines—estimating use on developed recreation sites and estimating use in dispersed forest areas. The term "dispersed forest areas" refers to the general forest area accessible by trail, road, or overland, but having no other development.

Estimating use on developed sites—Research to develop reliable and cost-effective methods for estimating recreation use at developed sites received much attention in these early years of Forest Service recreation research (James 1971). Researchers designed and tested methods for estimating the amount of use, by activity, on developed sites such as campgrounds and on day-use sites such as swimming beaches. Correlated measures such as traffic flow counts or water metering were monitored to allow updates of initial onsite count estimates. Some of the earliest work drew attention to the use of pneumatic traffic counters to derive estimates of recreation visits and use (James and Ripley 1963). Monitoring traffic flows or other use indicators along with sampling actual use and users is a technique that became known as double sampling. It is an approach still much used in use estimation or other onsite studies, and it is currently being applied by the Forest Service nationally.

Advancements in these early years included correlating traffic flows using one or more traffic counters with simultaneous samples of different recreation activities and affiliated sites for ultimately deriving estimates of total use by type and site. Traffic counts were obtained using single-location counters devoted to monitoring traffic flows at the entrance to a single site. As well, monitoring proceeded using two or more traffic counters in tandem on trunk routes to a number

of developed recreation sites (James and Rich 1966). Tests showed that estimates of visits by activity could be derived for up to eight developed sites based on traffic counts along only one trunk road. An extension of double sampling on developed sites was its application to estimation of use at visitor information centers (Cordell and others 1970). In this application, regression was used to estimate relationships among use of a visitor center, use of its peripheral sites, traffic counts, volume of shuttle bus ticket sales, center entrance counts, and other variables known to be a function of the number of recreation visitors flowing through a site or area.

Since the early work by James, Cordell, and a few others in the 1960s and 1970s (James 1971), and some work in the early 1980s, little additional research to develop more efficient techniques for estimating use of developed sites has occurred (Siderelis and Tyre 1975). During the 1970s and into the early 1980s, limited testing of techniques was done by the U.S. Corps of Engineers, the National Park Service, and the Forest Service (Coughlin and others 1978). A level of accomplishment had been reached which called for synthesis of earlier work to create handbooks and guides for application of sampling techniques (e.g., Mischon and Wyatt 1979).

A modest amount of new work was underway to take advantage of emerging computer technology to assist in more efficient sampling, data collection and management, analysis, and estimation (Erickson and others 1980). A few studies sought to evaluate field applications of various sampling techniques. For example, one study looked at double sampling as it was being applied across 34 sites in Region 5 of the National Forest System (California) and found a number of misapplications and resulting errors (Tarbet and others 1982). Additional work in the 1970s and 1980s focused on establishing systems for maintaining and reporting recreation use statistics at subregional, regional, or national levels (U.S. Department of the Interior 1986). Some work focused on extending application of tested forest recreation use sampling systems to municipal settings. For example, Tyre and Siderelis (1979) reported on instant-count sampling as a technique for estimating recreation use in municipal settings. For the most part, however, the methods engineered for estimating developed-site use and the double sampling techniques developed by James and others have persisted as the accepted state-of-the-art in developed site recreation use monitoring (Tarbet and others 1982). In the 1970s and 1980s, attention and interest was beginning to shift to the more difficult job of estimating dispersed recreation use.

Recent work pertaining to use of developed sites has focused on applying existing techniques of use estimation for national applications to produce mandated national and regional reports by the Forest Service and other Agencies. In the South and nationwide, the National Park Service, U.S. Corps of Engineers, and Forest Service have in place advanced systems for estimating management area, regional, and national scale use by type of activity and season of the year. The Forest Service assembled a guidebook on "Techniques and Equipment for Gathering Visitor Use Data on Recreation Sites" (Yuan and others 1995). This publication was based largely on early research done in the South by James and his associates at the SEFES. Most recently, a national system has been developed for application on national forests and is comanaged by the Forest Service's Southern Research Station. That national system is designed to estimate recreation use across the National Forest System (English and others 2002). It includes both developed sites and dispersed areas, and like the guidebook, much of it builds upon the research done in earlier years within the SEFES.

Estimating use in dispersed areas and wilderness—In the late 1950s, the Forest Service organized and staffed a number of forest recreation research work units around the country. Fourteen problem areas were identified as high priority for these research work units (Van der Smissen 1963). Of these 14 problem areas, one was "Determination of Techniques and Procedures for Measuring Forest Recreation Use." The newly formed unit at the SEFES was ultimately assigned the lead in developing and testing methods for estimating forest recreation use. The most challenging problem facing this unit was that of conceptualizing approaches for sampling and estimating use in dispersed forest areas. Dispersed areas then and now constituted most of the acreage of the national forests, and of other public lands. It was widely thought that 70 percent of the use of public lands at that time was dispersed use, as opposed to use in developed sites such as campgrounds, visitor centers, picnic areas, and interpretive trails.

Dispersed areas (including designated wilderness) include large bodies of water, recreation roads and trails, natural lakes, rivers, open range, and general forest areas. Use of such

areas is typically of low intensity and highly dispersed and, thus, is difficult and costly to sample. Examples of dispersed activities include hiking, backpacking, birding, driving forest roads, and fishing. One of the first published studies of dispersed use was done by Cushwa and McGinnes (1964). This study revealed that a stratified random sampling approach produced good estimates of dispersed uses within an area of over 100 square miles in a portion of an eastern national forest. A second study (James and Harper 1965) extended these methods to an entire eastern national forest. Further extensions of such work included multiple dispersed areas, large bodies of water, trout streams, trails and designated wilderness areas (James 1971, James and Schreuder 1972). Because wilderness is often quite remote and unmonitored otherwise, affordable methods successfully tested included use of self-registration systems and a variety of devices for counting trail use. There was relatively little work in development of estimation techniques after the retirement of James in 1974. H. Ken Cordell, who took over as project leader in 1976, carried on the work begun by James. One advancement was testing and refining the use of directional traffic circuits using dual-input, time-interval recorders in forested areas with multiple entry and exit roads (Erickson and Liu 1982). Research sponsored by the SEFES provided an evaluation of use sampling on the Arapaho and Roosevelt National Forests and the Pawnee National Grassland (Saunders 1982). Current applications were evaluated, and updated estimates were provided to these administrative units of the National Forest System. Technology for estimating recreational use in dispersed forest settings is currently being applied nationally, employing independent regional samples by the Forest Service through the Agency's National Visitor Use Monitoring System (English and others 2002). National forests sampled in Region 8 up to the time of this writing include the National Forests of Florida, the Caribbean National Forest in Puerto Rico, the Ouachita National Forest in Arkansas, and the George Washington and Jefferson National Forests in Virginia.

Visitor Profiles, Preferences, and Behavior Studies

When the Forest Service established a national branch of Forest Recreation Research in 1957, its staff was limited and budgets were small. But the new branch was viewed as important, and with considerable field support it began to grow. Cooperative research work units were established at three universities across the country. One of the emphasis areas of this growing branch was the characterization of forest recreation visitors and their preferences for recreation sites, facilities, and services.

The need to know more about the visitor underlay many of the studies in outdoor recreation in the late 1950s and 1960s. National studies, such as those done by the ORRRC, pointed out just how little was known about the recreation participant of that time (Outdoor Recreation Resources Review Commission 1962). Use estimation studies usually devoted some peripheral attention to describing the visitors being sampled and to describing generally their preferences for amenities, facilities, and services. But the results were far from adequate, especially in probing visitor preferences for site attributes, facilities, and other characteristics important in planning and managing a recreation setting.

The SEFES established a number of studies to learn more about visitors, their characteristics, and their preferences. Included were onsite surveys of campers and users of other types of developed forest sites. Campers in that period were predominantly family or extended family groups on weekend camping trips. Some were vacationing for 2 to 3 weeks and camping at sites being studied as part of their multisite travel agenda. Camping was a fast-growing activity in the 1960s, growing nationally by 35 percent between 1960 and 1965 (Cole and Wilkins 1971). Most southern campers were middle to upper-middle income, white, and suburban, and they worked mainly in white-collar jobs.

Campers' preferences for the makeup and location of a campsite included features such as adequate space between campsites for privacy, and shaded sites close to restrooms, trails, and swimming opportunities (Cordell and James 1971, Cordell and Sykes 1969, James and Cordell 1970). Other visitor profile studies done by the Forest Service covered day users, water users, and general forest area users. Then, as today, males were much more prevalent in these types of outdoor recreation pursuits, and most recreation visitors tended to be people living within 50 miles of the areas they were using.

Other agencies doing work in the South at that time in the area of forest visitor characteristics and preferences included the National Park Service, the Tennessee Valley Authority, the U.S. Fish and Wildlife Service, the U.S. Corps of Engineers, and numerous State agencies. While

these efforts did not always focus on forest recreation, they nonetheless had direct implications for forest recreation planning and management. Studies of hikers indicated that about 7 percent of the population hiked in the 1960s. Most of those who hiked covered a distance between 1 mile to just a few miles (Lucas 1971). Hikers tended to be about evenly divided between males and females, and they tended to be young, middle income, and white, with a high school or college education. Hikers then as now preferred well-groomed trails, natural settings devoid of development, destinations for the hike that focused on some prominent natural or historical feature, and absence of crowding. Wellman and Buhyoff (1980b) reported on a study of off-road vehicle use and social conflict at Cape Hatteras National Seashore, a problem persisting today and perhaps growing. Roggenbuck (1979) conducted a field experiment that provided a usable method for evaluation of interpretive programs. Buhyoff and Wellman (1979a) studied environmental preferences, and Buhyoff and others (1979) took the study of preferences and perceptions further to report on the aesthetic effects of southern pine beetle (*Dendroctonus frontalis* Zimmermann) in southern forest landscapes. Wellman and Buhyoff (1980a) also examined and reported on the effects of regional familiarity on forest landscape preferences.

For Federal and State resource management agencies in the 1960s and 1970s, studies of hunters and anglers were very prominent and much in demand (Bond and Whittaker 1971). In these decades and in earlier decades, hunting and fishing were viewed as two of just a handful of primary forest recreation activities and were given prominence in forest management. James and others (1969) reported that in the 1960s small-game hunters' age averaged in their late 30s, while the anglers averaged in their early 40s. Most hunters and anglers had participated in these activities as youths and most had lived in rural communities in their youth. Seventy percent of the population was urban in the late 1960s, and most hunters and fishermen of that time, as now, were urban. This is a highly significant change; the majority of hunters and anglers were known to be rural in previous decades, when the South was largely an agrarian region. Both groups of forest recreationists preferred good road, trail, and water access; well-managed wildlife and fish populations; and absence of crowding.

Water recreation, especially river floating and running, was a fast-growing interest in the 1970s and into the 1980s. A number of studies examined river floaters including kayakers, canoers, rafters, inner-tube floaters, and swimmers. One such study looked at the characteristics and wild river management preferences of Chattooga River users (Howard and others 1977). Wellman and Killeen (1979) studied the status of existing research and analyzed social conflicts associated with river recreation in the Southern Appalachians for the Forest Service. Another study found that two-thirds of Chattooga River users were males and that they averaged around 30 years old, had some college education, were mostly in white-collar occupations, and had a number of previous river recreation experiences (Townsend and Tarbet 1982). River users, like other forest recreation users, preferred clean and safe recreation settings with minimal crowding, good access to areas and facilities, and lack of interuser conflicts. Roggenbuck and others[2] reported on the relationships between specialization, displacement, and depreciative behavior among canoeists on Virginia rivers. Hammitt and McDonald (1982b) studied the influences of experience level as a determinant of choices in managing recreation resources, such as rivers.

Finally, a number of studies of forest recreation visitors in the 1970s and 1980s focused on visual aspects of forest recreation experiences. For example, Hammitt and others (1984) reported research on visitors' visual perceptions and preferences along forest trails, at scenic overlooks, and along edge environments in Tennessee. In these studies, it was found that trail users preferred seeing small streams and ravines and that other users preferred varying viewpoints of interiors, edges, and exteriors of forest settings. Hull (1988) reported on the scope and accomplishment of forest visual quality management and research. Ruddell and Hammitt (1987) studied visitors to a State park to identify factors associated with preference for edge settings.

In other studies dealing with visual preferences, surveys identified the importance of seeing wildlife in the overall recreation experience. For example,

[2] Roggenbuck, J.W.; Wellman, J.D.; Smith, A.C. 1980. Specialization, displacement and definition of depreciative behavior among Virginia canoeists. 109 p. Unpublished report. Report to U.S. Department of Agriculture Forest Service, North Central Forest Experiment Station. On file with: North Central Forest Experiment Station, 1992 Folwell Avenue, St. Paul, MN 55108.

Hastings and Hammitt (1985) reported that viewing wildlife was secondary in importance only to viewing scenery. In addition to seeing wildlife, visitors also wanted information on the wildlife they saw. An example of the range of other visual quality research is work that examined the aesthetic qualities of forest trees (Cook 1972). Another example was a study of the influence that remnants of tree cutting had on overall visual quality of a forest setting (Cook and others 1985). It was found that controlling the visibility of limbs, tops, and other evidence of timber thinning by mechanically lowering their profiles improved visual quality as perceived by forest visitors. Bryan explored more broadly what Americans wanted in the way of aesthetic qualities from their forests (Bryan 1976). Buhyoff and others (1978) worked to clarify land-space architectural interpretations of people's landscape preferences, experimented with manipulating dimensionality in landscape preference judgments (Buhyoff and Riesenmann 1979), and noted seasonality bias in landscape preference research (Buhyoff and Wellman 1979b).

Use Impacts and Carrying Capacity Studies (Sites, Trails, and Rivers)

Use impacts on recreation sites—As Federal and State agencies became more and more engaged in forest recreation management through the 1950s and 1960s, and as use levels rose, greater attention was being paid to the impacts of increasing and repeated use on the vegetation, soils, and other conditions of forest recreation sites. In a number of studies, mostly by Forest Service scientists, both the deteriorating condition of developed campsites and results of tests of rehabilitation options were examined. In one study (Cordell and Talhelm 1969), trial plantings of various species of turf grass indicated that such practice would be ineffective in widespread application aimed at improving deteriorated recreation sites. Soon after the test sites were reopened to use, all varieties of planted grasses were suffering badly from trampling associated with site use. In another study, small trees and shrubs were planted on recreation sites to see if they would grow and provide visual barriers and vegetative cover (Cordell and James 1971). Results were mixed, but mostly the study showed that the benefits of planting heavily used sites are marginal because ongoing site use continues to have damaging effects. Because tests showed that plantings had little effect, researchers generally agreed that "hardening" sites with pavement, stone, or other materials is a better approach for developed sites such as campgrounds (Cordell and others 1974).

Other work focused more on the effects of use on trails and forest conditions in general. Saunders[3] studied the effects of recreational disturbance on the Southern Appalachian spruce-fir (*Picea* spp.-*Abies* spp.) forests, which were then and continue to be under pressure from a variety of insect, disease, air pollutant, and recreation use factors. Saunders (1979) further studied vegetation cover differences among randomly selected forest plots with and without recreation use. Plots with use showed impacts on vegetation and soil condition. Lockaby and Dunn (1977) also examined the impacts of sustained recreation use, but mostly they focused on forest soil properties in the eastern Piedmont. Whittaker (1978) compared the surface impacts of hiking and horseback riding in the Great Smoky Mountains National Park and found that they differed significantly in magnitude on a per-unit-of-use basis. Another study in the Great Smoky Mountains National Park (Bratton and others 1979) looked at trail erosion patterns and overall level of severity of foot traffic impact. Kuss (1982) studied the effects of footgear and boot-tread design on trail wear and this led to reconsideration of tread design by boot manufacturers. Subsequent work focused on monitoring processes (Klein and Burde 1991), including monitoring of impacts at backcountry campsites and shelters in the Great Smoky Mountains National Park.

Use capacity and management—Beyond site use impact research, little work was done on site and area capacity in the South in the decade of the 1960s. For practical management at that time, the essential ingredients of capacity decisions were knowledge of the interrelationships between management objectives, user attitudes, user preferences, and site use impacts (Lime 1976). Although not based on research done in the South, some of the most definitive work on carrying capacity, as applicable in the South as anywhere, was that synthesized by LaPage (1963) and Wagar (1964). Not until the late 1960s and 1970s did work on recreation carrying capacity again assume a high profile.

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[3] Saunders, P.R. 1977. The effect of recreational disturbance on the Southern Appalachian spruce-fir forests. 25 p. Unpublished report. Paper presented at the third annual conference on science and research in national parks, southeastern region, Gatlinburg, TN. On file with: H. Ken Cordell, Southern Research Station, 320 Green Street, Athens, GA 30602–2044.

In 1974, Hammon and others (1974a) began publishing their work on capacity of water-based recreation systems. Initially this work focused on reviewing and digesting existing published works for application to reservoir management in the Southeast. Later in 1974, they published a synthesis and systems-approach interpretation of the capacity literature as it applied to management of water-recreation systems (Hammon and others 1974b). Cordell and others (1975) published the final part of their research on water-based recreation systems the following year. They examined the interrelationships between spatial distribution of use, user satisfactions under different use levels, and apparent displacement of users. From this work it became clear that beyond some threshold of use, satisfaction and spatial distribution of use is significantly altered by increasing system use loadings. Followup application of this work was published in 1977 (Cordell 1977) in proceedings of the River Recreation Management and Research Symposium in Minneapolis. Overall findings from this research provided reservoir management guidelines and pointed out the complexity of applying standards and quantitative analysis to capacity questions. However, approaches were developed that have subsequently been adopted.

Other, more basic research was being conducted on better defining the concept of carrying capacity and its theoretical foundations. For example, Schreyer and Roggenbuck (1978) examined the influence of experience expectations on perceptions of crowding as related to the notion of social psychological carrying capacity of forest recreation areas. Noe and others (1982) examined normative responses and norm activation among off-road vehicle users within a managed seashore recreation environment. Bryan (1979) studied and published on potentials of use conflicts in outdoor recreation as a consideration in capacity planning. Smith and others (1983) studied and reported on priorities for river recreation management in the Southern Appalachians that centered on carrying capacity and other use issues. Hammitt and others (1982a) examined perceptions among users of needs for use management controls and strategies. As a result of these studies and others around the country, the concept of capacity evolved to an understanding that capacity was not some magical upper limit on recreation visits per unit of time and space, but that in addition to some range of persons per unit, it must include visitors' preferred conditions, which can vary widely across sites, conditions, and cultures (Chilman and others 1981).

Further capacity research in the South was spotty through the 1980s. Chilman was a leader in advancing the principles of and development of tools for analyzing capacity questions (Chilman and others 1989). His work advanced the concept that capacity is a desired set of conditions that emphasize quality factors. He developed and published a revised carrying capacity analysis system. This work was linked to the evolving concept of limits of acceptable change (LAC) (Stankey and others 1985). Absher studied and found valid application of LAC in planning wilderness management and capacity considerations on the Cumberland Island National Seashore (Absher 1989). Wellman and Belcher (1989) reported on the nature and importance of managerial perspectives in determining appropriate river recreation use policies for the mid-Atlantic region for the National Park Service.

Large-Scale Recreation Assessments

U.S. Public Law 85–470 established the ORRRC in 1958 (Outdoor Recreation Resources Review Commission 1962). The work of this commission was the first comprehensive, national scale assessment of outdoor recreation demand and supply in the United States. Several were to follow, many of which were done by recreation research scientists in the South in the years after 1980. On the basis of ORRRC's recommendations, a Bureau of Outdoor Recreation and the Land and Water Conservation Fund (LWCF) were created in the 1960s. To be eligible for matching grants from the LWCF, a State had to conduct and submit to the Bureau a Statewide Comprehensive Outdoor Recreation Plan (SCORP). The bureau and its successor agencies were also required to conduct and submit to the Congress a nationwide outdoor recreation plan. Both the State and national plans required comprehensive assessments, which were the source and inspiration for numerous State, regional, and national participation surveys, supply studies, demand and needs analyses, and efforts to build forecasting models. Examples of the assessment work undertaken in the South are described in the paragraphs that follow. Examples are used because this work is too voluminous to fully discuss in this chapter. Interestingly, that portion of the 1960 ORRRC national participation survey analysis that dealt with relationships between demographics and participation was done in the South by Charles Proctor at North Carolina State University (Proctor 1962).

Examples of research done at the State level in the South include work reported by Howard (1968) of Clemson University. Howard did a statewide survey of outdoor recreation facilities for the State of South Carolina. Siderelis, at North Carolina State University, conducted a modeling study to develop computerized (mainframe) techniques for forecasting recreation participation (Siderelis and Hassel 1975). Jarvis and others (1978) developed models and forecasts of recreation demand for the Upper Savannah River Basin as a part of their work to better assess future outdoor recreation demand in South Carolina. Roggenbuck (1978) conducted the outdoor recreation demand survey for the State of Virginia as a part of that State's SCORP assessment. Roggenbuck and Kushman (1980) studied riparian landowners' attitudes toward a State wild river program. Senter and McLellan (1982) examined the compatibility of data used in SCORP to describe private recreation providers for use in statewide planning. There were numerous SCORP or other statewide assessment projects in the South in the 1960s, 1970s, and 1980s. Unfortunately, most of these followed ad hoc formats so there was little State-to-State compatibility of data.

Regarding national recreation assessment research originating in the South, in 1977, the SEFES was assigned by the Washington Office to conduct nationwide and region-by-region assessments of recreation demand and supply under the authority of the 1974 Forest and Rangeland Renewable Resources Planning Act (RPA). The first report resulting from this assigned research was published in the 1980 RPA Assessment report (U.S. Department of Agriculture, Forest Service 1980). Stemming from that work was publication of a follow-on national assessment report published by the American Forestry Association (Cordell and Hendee 1982). The Forest Service's southern research work unit reported its regional and national outdoor recreation and wilderness assessment work in the "Third Nationwide Outdoor Recreation Plan" published by the Department of the Interior in 1979, the Rockefeller Outdoor Recreation Policy Review group report "Outdoor Recreation for America" in 1983, reports by the President's Commission on Americans Outdoors in 1986, and proceedings of the 1988 National Outdoor Recreation Benchmark Symposium (Siehl 1989).

In continuing to build data and research capacity for future rounds of recreation assessments, and to improve coverage of private recreation supply trends, an examination of potential conflicts between private recreational property developments and forest land ownership and management in the South was conducted (Cordell and others 1982). Wellman and others (1980) studied response rates and patterns to mailed questionnaire surveys and identified the reluctant respondent as an important survey target by examining the differences between early and late respondents. Wellman and Marans (1981) looked at the use of time budgets as an aid to research, assessments, and planning for recreation. Wellman (1987) wrote a book on wildland recreation policy, and this book included a discussion of the need for assessments in making policy and planning decisions.

For the 1985 RPA Assessment update, Cordell and Hartmann (1984) studied trends in outdoor recreation in the two decades since the original nationwide assessment done by the ORRRC between 1958 and 1960. In examining ways to assess the overall effectiveness and adequacy of supply of recreation opportunities, Cordell and English (1985) studied recreational trip distances as a criterion for defining relevant supply inventory radii. Roggenbuck and Ham (1986) examined the methods and kinds of information used in recreation management and planning as a contribution to the nationwide assessment for the President's Commission on Americans Outdoors.

Much of the above assessment work was summarized and used as background material for the 1989 RPA Assessment (Cordell and others 1990b). Papers covering work in the areas of supply conditions and trends, participation trends, demand forecasting, international demand, wilderness, and social factors in recreation trends were published in the 1988 National Outdoor Recreation Forum (Watson 1989).

In the 1990s, statewide, subregional, southern region, and national assessment work in the South continued and even accelerated. The sophistication of this research has also improved. In 1996, results of an assessment for the Southern Appalachians were published (Cordell and others 1996). In 1999, the Third Nationwide RPA Assessment of Outdoor Recreation and Wilderness was published (Cordell 1999). In 2002, the "Southern Forest Resource Assessment" was published, and included a Southwide assessment of recreation demand and supply (Cordell and Tarrant 2002). These and other research efforts over the last 2 1/2 decades have led to development of a system of data,

models, and reporting technologies that is used throughout the country and in many other countries.

Additional Recreation Research Topics of the 1980s

Assessing economic impacts—In 1984, a national meeting was convened by southern researchers to evaluate abilities to assess the economic impacts of recreation and tourism (Propst and others 1985). From that meeting came a coalition between the Forest Service, U.S. Corps of Engineers, Tennessee Valley Authority, National Park Service, National Association of State Park Directors, and other organizations to develop data collection technology and to improve input-output modeling capacity for recreation and tourism. The results of that meeting fed development and improvement of numerous onsite surveying approaches, including the Public Area Recreation Visitor Survey (PARVS) and improvement of the input-output economic accounting model. Following that very positive result, Propst and others (1986) began applying updated technology by studying trends in outdoor recreation consumer expenditures to see if visitor expenditure profiles are stable over time. Aiken (1988) looked at the regional economic impacts of visitor spending near and at the Chincoteague National Wildlife Refuge. Jackson (1988) evaluated different measurements of economic impacts associated with recreation use at U.S. Corps of Engineers projects in the South. Paterson (1988) examined the usefulness of economic impact assessment as a tool for regional tourism development. Watson and Cordell (1988) discussed use of economic impact assessments as a means for demonstrating the importance of outdoor recreation relative to other, sometimes competing, uses of natural resources. Fritschen (1989) reported on advances in measuring the economic impacts of recreation at U.S. Corps of Engineers water-resource projects, and methods of accounting for spending associated with users accessing a reservoir from places outside formally designated reservoir recreation sites. From data generated from the PARVS, Bergstrom and others (1989) examined and estimated rural economic development impacts of outdoor recreation in Georgia.

Wilderness research—From its genesis in 1964 and an initial total size of around 9 million acres, the National Wilderness Preservation System (NWPS) has grown to more than 106 million acres of public land managed by four Federal Agencies. Fifty-six percent of National Park Service lands, 20 percent of U.S. Fish and Wildlife Service lands, and 18 percent of Forest Service lands are in designated wilderness status. The Bureau of Land Management has only 5 million acres of wilderness, but has 17 million acres set aside as wilderness study areas. A modest amount of research regarding wilderness management and the status of the NWPS has been conducted in the South. Some of that work is summarized in this chapter.

Roggenbuck and Berrier (1981) studied communication techniques for dispersing wilderness campers, and in related work Roggenbuck and others (1982a) looked at the role of interpretation in managing recreational carrying capacity. Roggenbuck and others (1982b) studied wilderness management as it was practiced in the Southern Appalachians in the early 1980s.

Cordell and others (1986) summarized previous studies of visitor needs and user impacts in wilderness in the East. Watson and others (1987) examined techniques for producing accurate wilderness use estimates, using some of the dispersed-use methods described earlier in this chapter. Hartmann and others (1987) conducted regional comparisons of Forest Service wilderness users with an emphasis on eastern wilderness users and the implications for further policy and research refinement. Region-to-region differences were small. Roggenbuck and Watson (1989) summarized the wilderness recreation use situation in the region and nationally for the Outdoor Recreation Benchmark meeting held in Tampa, FL. Watson and others (1989) studied visitor characteristics and preferences on three national forest wilderness areas in the South. Most such studies were of particular wilderness areas in the South and focused on wilderness visitors. From these and other studies, much has been learned about wilderness use, wilderness visitors, and wilderness management options. Management and policy for wilderness in the region and to some extent nationally has been much influenced by the information flowing from this research.

Based in part on this earlier work, Cordell and Watson (1987) conceptualized a framework for wilderness assessments and related future research. Reed and others (1989) wrote regarding optimizing nonrecreational wilderness uses and values as a contribution to ongoing wilderness system assessment. Watson and others (1989) summarized the knowledge of the characteristics

of wilderness users. Cordell and others (1989) summarized research on marketing based on research pertaining to wilderness experiences.

Private land recreational access—As in the North, industrial and nonindustrial private land dominates in the South, relative to public land in Federal or State ownership. Most of the forest science dealing with private owners and lands has focused on timber supply potentials and the effectiveness of a variety of incentive programs for nonindustrial owners. In more recent studies, reference is given to the increasing recognition given by landowners to the amenities of their land, relative to the income-earning potentials of these lands. The rising relative importance of amenities has been acknowledged by its assuming a much higher profile in private land research (Amacher and others 2004). Research from the mid-1980s on has typically given full recognition to the rising importance of amenity values (Boyd and Hyde 1989, Hyde and Newman 1991).

Little of the early research on private lands and owners focused specifically on the issue of public recreational access or use. Of the limited research that was undertaken, prominent was research on landowner liability (Kaiser and Wright 1985, Kozlowski and Wright 1988) and access rights (Gramann and Bonnicksen 1985). Other studies examined the relationship between timber or other income-earning motives and recreation, (e.g., Jones and Self 1991).

As part of the RPA national assessment of outdoor recreation, work was begun in the South cooperatively with Clemson University to develop a national database on recreational use and access to private lands. The first resulting national survey to determine public outdoor recreation opportunities on nonindustrial private forest and rangelands was conducted in 1975–76, cooperatively with Clemson University and the Soil Conservation Service (Cordell and Stevens 1984). Based in part on this work, a study of trends in recreational access to private rural lands was reported in 1985 (Cordell and others 1985), and a study to validate procedures for the next nationwide survey of private landowners, to occur in 1985–86, was conducted in 1984 (Sale and others 1987). Results of that next national survey, done by the SEFES, were reported in several sources and used in the 1990 RPA Assessment (Cordell and Wright 1989, Wright and others 1989). In all these studies, access for persons not associated with the owner by way of family or other close personal relationship was quite limited and found to be diminishing over time in all regions of the country. In the South, this diminishing access was found in part to be offset by increased leasing by persons unrelated to the owner.

Behavior, perceptions, and motivations—A significant number of scientists studying forest recreation in the South have been trained in social psychology theory and methods. A more limited number are grounded in either sociology or economics. The makeup of studies of behaviors, perceptions, and motivations among outdoor participants reflects the disciplinary backgrounds of the scientists who conducted those studies. Some examples of the numerous examinations and rich literature on behaviors, perceptions, and motivations follow. One notable early publication was written by Bryan (1977); it concerned specialization among trout fishermen and the implications of the findings for resource management. Groves and others (1975) presented a multiframe reference approach to studying and better understanding leisure motivations. McLellan and Gahan (1976) studied recreation user characteristics and behaviors on Hartwell Reservoir in South Carolina. Hull and Buhyoff (1982) reported on the effects of distance on the perception and rating of scenic beauty. Wellman and others (1981) studied the accuracy of predictions by park managers of the motivations of visitors to two National Park Service areas. Burrus-Bammel and others (1982) reported on a study of the perceptions of hunting and hunters by various groups. Burrus-Bammel and Samuel (1984) also studied the sources of introduction to and motivations for wild animal trapping.

There were a wide array of places and recreation settings where behavior, perceptions, and motives were studied. In 1982, Mulligan and others reported on the interactive effects of outdoor noise and visible aspects of vegetation on behavior in urban settings. Noe and others (1982) examined perception of conflict between off-road vehicle and non-off-road vehicle users in a leisure setting. Ruddell and Hammitt (1985) studied motives for visiting a South Carolina State park and provided interpretations for visual management of park edge environments. English and Cordell (1985) conducted a cohort-centric analysis of outdoor recreation participation trends and found significant cohort effects on participation behavior changes. A comprehensive coverage of studies done on behaviors in the South in the 1980s is too voluminous to cover in this chapter, but suffice it to say that this work has had profound impacts on forest recreation management in the region.

RESEARCH IN THE 1990s

Following is an overview of some of the outdoor recreation and related research published between 1990 and 2002. Much of it was sponsored by Federal Agencies, some by State agencies, and other by private interests.

Broad-Scale Assessments

In 1990, broad-scale assessment work was continuing, mostly stemming from the Forest Service's RPA assessment work. Cordell and others (1990b) produced their third nationwide assessment of outdoor recreation and wilderness demand and supply trends. Findings indicated rapid and continuing recreation demand growth in the United States. An important finding was that participation is growing at significantly different rates among different ethnic groups, in different regions, and between different activities. In 1991, as national and regional demand and supply assessment work progressed, focus moved to technical aspects such as methods and data for assessing demand and supply (Cordell and Bergstrom 1991), estimating demand functions (Peterson and Cordell 1991), and inventory approaches for broad-scale database development (Burkiewicz 1991). In the 1990s as never before, there was growing awareness of the unprecedented social change taking place, and studies were being initiated to look at the consequences of these changes. For example, Murdock and others (1992) studied the implications of demographic change for fisheries management and fishing.

A number of assessment studies dealt with marketing and markets for outdoor recreation. Examples include English and others (1993) reporting on regional market projections, Miles and others (1993b) studying a proposed segmentation framework for outdoor recreation markets, Bayless and others (1994) assessing the market demand for wildlife viewing sites, and Miles and others (1993a) reviewing environmental attitude scales and their utility in consumer marketing. As updates to the 1990 RPA Assessment, Cordell and others (1993) studied the effects of rural land subdivision on public recreation access, and English and Cordell (1993) examined the utility of the Marion Clawson concept of effective recreation opportunity indexing, an important step in assessing the adequacy of supply. In the early 1990s, use of Geographic Information Systems (GIS) in outdoor recreation planning and assessment was taking hold. One of the early works was by Chubb and Hammitt (1993), who developed a GIS procedural manual for the Blue Ridge Parkway. In 1994, additional broad-scale assessment work by Bergstrom and others (1994) examined the use and potential future of the RPA assessments of outdoor recreation among managers and policy personnel in the Forest Service. During 1995 and 1996, a number of studies were reported that dealt with identifying who the recreation participants and potential participants are as information essential to effective marketing. Bixler and others (1995a) wrote concerning getting the novice into natural environments as a way of introducing a broad base of the population to those environments.

In 1995 and 1996, broad-scale assessment work continued, with Cordell and others (1995) reporting on long-term outdoor recreation participation trends, Flather and Cordell (1995) publishing an analysis of historical and anticipated trends in wildlife-related recreation activities, Cordell and others (1996) assessing the demographic and economic changes underway in the Southern Appalachians, and Hayden and others (1996) assessing outdoor recreation demand and supply in the Southern Appalachian region. This last work was part of the comprehensive Southern Appalachian Assessment of forest resources. Other studies in 1995 and 1996 included Lewis and others (1995), which segmented outdoor recreation markets using behavioral data, and Hull and others (1996), which dealt with the ebb and flow of brief leisure experiences. In 1997, Cordell and others (1997b) profiled participants in fish- and wildlife-related outdoor recreational activities in the United States, Teasley and others (1997) studied the use of private lands in the United States for outdoor recreation, and Cordell and others (1998a) described trends in outdoor recreation and their implications for private land management in the East. The third national survey of private landowners was done in 1996 and used in the 2000 RPA Assessment, as well as being published in other places (Teasley and others 1999). Hull (2000) looked at romantic biases in natural areas recreation management and has written extensively about the concept and application of forest aesthetics (Hull and others 2000).

As a result of the nationwide surveying of public participation for the RPA assessment, several spinoff studies were published. They included Cordell and others (1999) describing the rapid and substantial growth in popularity of birding in the United States, based on the National Survey on Recreation and the Environment (NSRE) data;

Cordell and Super (2000) describing trends in Americans' outdoor recreation participation across a wide range of activities; and Fly and others (2000) looking at knowledge of and attitudes, which were mostly favorable, toward wilderness in the Southern Appalachian ecoregion. Followup studies of recreation participation, and especially participation in birding, included estimating recent trends in participation by Cordell (2001) and by Cordell and Herbert (2002). Fedler and Ditton (2001) looked at factors associated with taking up or dropping out of recreational fishing participation. Other broad-scale research included Robertson and Hull (2001), which reported a case study of the nature of landscape perceptions at Whitetop Mountain. It also included publication of work to assess public understanding of nature, especially local knowledge of what constitutes natural forest conditions (Hull and others 2001).

Social Group Differences

The growing diversity of the population in the region prompted a number of studies of social group differences. Recreation participation differences by race were studied by Brown (1994) and Miles and others (1994) who studied African-American participation patterns in forest and other wildland outdoor recreation activities. Bixler and others (1995b) looked at negative perceptions of natural environments among various social groupings, especially by race, and how these perceptions related to preferences for outdoor activities. Floyd and others (1995) studied the effect of race on environmental and recreation preferences, and Ditton (1996) reported on work aimed at understanding diversity among largemouth bass anglers. Betz and others (1998) compared amenity uses and recreational access among social strata making up U.S. private landowners, Bowker and Leeworthy (1998) studied the effects of ethnicity in recreation demand estimation, and Johnson and others (1998) examined marginality and ethnicity in outdoor recreation in the rural South, and compared inner city and rural residents. Tarrant and Shafer (1998) compared preferred experiences and setting conditions of eastern and western wilderness areas.

In the later 1990s, Tarrant and Cordell (1999) helped bring more visibility to the issue of environmental justice in recreation management by looking at the spatial distribution of outdoor recreation sites relative to residence locations of different social groups. Johnson and Bowker (1999) compared onsite wildland activity choices among African-Americans and white Americans in the rural South and described the management implications of their findings. Bowker and others (1999) conducted a national assessment of the use and predicted effects of user fees for recreation services on public lands, including equity considerations. English and others (2000) continued to study economic effects of dependence on tourism on communities in the rural South and elsewhere. Bixler and Morris (2000) identified factors differentiating participants in water-based wildland recreation from nonparticipants and interpreted the implications of this work for recreation activity instruction provided to different social groups. Porter and Tarrant (2001) conducted a case study of environmental justice related to Federal tourism sites in southern Appalachia; Cordell and others (2002) examined cultural emphasis on recreation and the environment; Hunt and Ditton (2002) described freshwater fishing participation patterns among racial and ethnic groups in Texas; Krause (2001) described the roles played by dogs in solo recreation by women; and Johnson and others (2001) examined constraints on outdoor recreation by race, gender, and rural dwelling across regions of the country.

Economic Studies

As a follow-on to the important work of the 1980s to improve data and models for economic impact research, a number of secondary economic effects studies were reported. These included Bergstrom and others (1990b) who looked at economic impacts of State parks on State economies in the South; Clonts and others (1991) who studied economic impacts of hunting land access; and Cordell and others (1990a) who estimated the economic effects of river recreation use on local economies in the Southern Appalachians. Bergstrom and others (1990a) looked at the economic impacts of recreational spending on rural areas of the South. All of these studies found modest income and employment multipliers and modest overall income and employment impacts.

Economic impact research continued in the early 1990s, and began to focus more on applications of technological improvements brought about by the work done in the 1980s. Examples include Cordell and others (1991), who looked at the effects of outdoor recreation on State and local economies in the South; Lee and Propst (1994), who studied the benefits of segmentation to reduce variance in estimates of spending profiles;

Watson and others (1991), who studied the impacts of resource-based tourism on local economies; and Cordell and others (1992), who estimated economic growth stimulus from State park management. Other economic impact studies in the early 1990s included Betz and Perdue (1993), on the role of amenity resources in rural development. English and Bergstrom (1994) studied the links between recreation site development and regional economic impacts. Hawks and Bowker (1994) estimated the local economic impacts of lake recreation in northern California using approaches developed in assessing lake recreation impacts in western North Carolina.

Later in the 1990s, Bergstrom and others (1996) studied the effects of reservoir aquatic plant management on recreational expenditures and regional economic activity, again using some of the same approaches used in the earlier research in western North Carolina. In 1995, English questioned the widespread belief that resource-based recreation was a major solution for rural economic growth because of limited impacts often associated with rural recreation. English and Thill (1996) assessed methods for estimating regional economic impacts of recreation travel where survey data are limited. Cordell and others (1997a) estimated the economic effects on the regional economies of the Rocky Mountains and Appalachians of outdoor recreational visits and spending associated with use of Forest Service sites. English (2000) calculated confidence intervals for regional economic impacts of recreation by bootstrapping visitor expenditures, a much needed addition since most impact estimates do not consider confidence intervals on the estimates. English and others (2000) also examined tourism dependence among counties in rural America. In all of the above cited studies, as with numerous other studies not covered here, economic impact and interdependency effects were found to be important to local economies; but unless the recreation visitation is substantial and sustained throughout the heavy-use season and the rest of the year, and unless the local economy is reasonably diverse and well developed, those effects are almost always modest.

Other economic studies focused on demand for and valuation of outdoor recreation experiences and sites. Prominent examples included work based on results from the 1990 RPA Assessment, such as Bergstrom and Cordell (1991), which reported an analysis of the demand for and value of outdoor recreation in the United States, and Cordell (1992), which reported on amenity, conservation, and environmental values in the United States. Other "demand" studies looked at revenue capture potentials from charging fees (Teasley and others 1993), measurement of recreation benefits using contingent valuation and the question whether the payment vehicle matters (Bowker and others 1993), and recreation use values for alternative reservoir water-level management scenarios (Cordell and Bergstrom 1993). Bowker and others (1994) looked at sensitivity of contingent valuation estimates of recreation trips to the elicitation approach used, and English and Bowker (1994) examined an alternative technique for estimating the demand for river outfitter services. Choi and others (1994) studied the influence of various intervening variables in recreation substitution decisions, an area important in valuation and other behavioral studies. Siderelis and Moore (1995) estimated the net benefits of recreation use of rail trails.

In the second half of the decade of the 1990s, Bowker and others (1996) estimated values for guided rafting trips on southern rivers, and Siderelis and others (1995) developed a boating choice model for the valuation of lake access. Economics research during 1997 and 1998 indicated progress in methods and attention to important resource issues. Examples included Bowker and others (1997), who conducted a demand analysis of off-road motorized recreation; Leeworthy and Bowker (1997), who estimated nonmarket economic user values in the environmentally sensitive Florida Keys; Bhat and others (1998), who tested an ecoregional approach to the economic valuation of land- and water-based recreation in the United States; and Siderelis and Moore (1998), who estimated the influence of site preference variables on recreation demand. Bowker and others (1998) studied benefits transfer and count data travel cost models. Zawacki and others (2000) used a travel cost analysis to examine nonconsumptive wildlife-associated recreation participation, and Siderelis and Moore (2000) developed approaches for incorporating perceptions by users of site quality into recreation travel cost models. In all of the above demand and valuation research, net benefits were found to be substantial, valuation methods reliable, and recreation demand overall somewhat price sensitive.

Motivations, Perceptions, and Behaviors

Studying recreation use, users, motivations, perceptions, and other aspects of participation in the outdoors continued as an important topic

in the 1990s. Roggenbuck and others (1990a) studied the learning benefits from leisure. Hull (1990) studied mood as a product of leisure, its causes and its consequences. Chilman and others (1991) reported on design of recreation monitoring systems using participant observers. Cornell and Leary (1991) examined family participation in developed camping. Patterson and Hammitt (1990) studied back-country encounter norms, actual encounters, and their relationship to wilderness solitude. Van Cleave and others (1991) looked at attitudes of summer visitors to the Great Smoky Mountains region. Roggenbuck and others (1991) applied encounter norms in a study of river float trips and as a result questioned the use of the social norms concept. Hull (1991) contributed research on mood as a product of leisure and as a predictor of visitor satisfaction. Caldwell and others (1994) studied zoo visitors' satisfactions. Bixler and others (1992) examined restrictive and nonrestrictive approaches in recreation management. Hammitt and Shafer (1992) analyzed visual dimensions for parkway planning. Stewart and Hull (1992) compared the post hoc and real-time construct validity of the concept of satisfaction. Adams and Hammitt (1993) reported on behavior in relationship to interpretive encounters with wildlife. Hammitt and Patterson (1993) looked at use patterns and solitude preferences of shelter users in back country. Shafer and Hammitt (1993) examined effects of management conditions on wilderness recreation experiences. In 1994, Fedler and Ditton reported on angler motivations in fisheries management. Hammitt and others (1994) studied approaches to identifying and predicting visual preferences for Southern Appalachian forest recreation vistas. Hull and Michael (1994) looked at the relationship between nature-based recreation, mood change, and stress restoration. Rutlin and Hammitt (1994a) examined functions of privacy in the Ellicott Rock Wilderness. Rutlin and Hammitt (1994b) also surveyed users and use patterns of Ellicott Rock Wilderness visitors.

Schneider and Hammitt (1995) studied visitor response to outdoor recreation conflicts. Shafer and Hammitt (1995) examined congruency among wilderness experience dimensions, condition indicators, and user coping behaviors. Examples of later visitor studies included Frauman and others (1997) on the application of means-end theory to understanding interpretive service users, and Noe and others (1997) on park user perceptions of resource and use impacts. Research covering river recreation included Tarrant and others (1997), who examined the effects of situational and personal factors in measuring perceived crowding for high-density river recreation; Tarrant and English (1996), who developed a crowding-based model of social carrying capacity for application to recreational boating; and Hammitt and Lin (1997), who examined the literature on establishing use-level standards for river recreation. Onsite use studies included Symmonds and others (1999) on recreational carrying capacity for managing mountain bike use in the Southern Appalachians, and Thigpen and Siderelis (2001) on the use of paddle trails in coastal North Carolina. Walker and others (1998) studied onsite optimal experiences and their relationship to offsite benefits. Tarrant and others (1999) provided a summary of onsite research on motivations, attitudes, preferences, and satisfactions among outdoor recreationists. Onsite studies included Schuster and Hammitt (2000) on stress experienced by visitors and reported hassles in the Shining Rock Wilderness Area and Schuster and others (2001) on rock climbers' attitudes toward the management and use of bolts. Siderelis and Moore (2000) studied and modeled the effects of perceptions of site quality as a determinant of recreation trip choices.

Wilderness Research

Wilderness continued as a topic of focus in the 1990s. Roggenbuck and others (1990b) examined the wilderness classification process and its application to land management. Hammit and Patterson (1991) considered coping behaviors in relation to wilderness users' desire for greater privacy. Hammitt and Dulin (1991) reported on the significance of encounters with wildlife during wilderness visits. Roggenbuck and others (1993) reviewed relevant research on defining acceptable use, resource, and other conditions for wilderness. Hammitt and Rutlin (1995) developed use encounter standards and estimated relational curves for evaluating achieved privacy in wilderness. Tarrant and others (1995) identified factors affecting visitor evaluations of the noise and visual intrusiveness of aircraft overflights of wilderness.

In 1997 and 1998, a moderate amount of wilderness research was done in the South. Tarrant and Shafer (1997) looked for uniformity of condition indicators used in wilderness management; Walker and others (1998) studied the relationship between onsite experiences and offsite benefits; Hammitt and Rutlin (1997) wrote concerning how well visitors achieved privacy in wilderness; and Johnson and Bowker (1997)

presented data on wilderness awareness and potential participation in wilderness recreation across diverse social groups. In other research, Cordell and others (1998b) examined survey results indicating how the public values wilderness. Cordell and Teasley (1998) reported on estimated recreational trips to wilderness, using the NSRE. Cordell and Stokes (2000) wrote about the importance of wilderness as a social value held broadly across the U.S. population, while Hammitt and Schuster (2000) speculated on potential for growth of wilderness use in the next 100 years. Roggenbuck and Driver (2000) provided an article on the benefits of nonfacilitated, i.e., individual, uses of wilderness. Fly and others (2000) examined knowledge of and attitudes toward wilderness among persons living in the Southern Appalachian region. A national assessment of the values of wilderness began in 2003 and is being led by the Forest Service research group in Athens, GA.

Methods

Studies were also progressing to develop research tools. For example, Chubb and others (1991) reported on work using GIS technology for integrating multiple management datasets; Henderson (1994) reported on the growing use of qualitative data methods; Chilman and others (1994) developed approaches for monitoring off-road vehicle riding areas; Janiskee and others (1994) reported on inventories of rails-to-trails resources; and Siderelis and Roise (1991) developed optimal strategies for managing park operations.

Also being reported were advances in methods and theory. For example, tests for homogeneity across waves of mail surveying were reported by Choi and others (1992); tests for the validity of photo-based scenic beauty judgments were reported by Hull and Stewart (1992); Hull and Stewart (1992) also reported on their examination of the construct validity of the concept of satisfaction; and work was completed that examined recreation specialization as a social conceptualization (Ditton and others 1992). Further work on specialization included investigation of the relationship between constraints and specialization (Norman 1992). Wood and others (1996) identified the determinants of satisfaction for participants where quality deer management is practiced. Research evaluating recreation opportunities and visual aspects included Buhyoff and others (1995), which examines the validity and reliability of expert visual assessment approaches.

Later in the 1990s, several additional studies were carried out. Tarrant and English (1996) estimated a crowding-based model of social carrying capacity to be applied to river recreational boating management. Siderelis and Perrygo (1996) applied the concept of recreation benefits to neighboring sites for assessing riparian rights. Overdevest and others (1997) operationalized place attachment through mapping and planning for place values on national forests. Buhyoff and Miller (1998) evaluated an expert system for assessing visually perceived values of landscapes. Borrie and others (1998) studied the use of verbal reports by study subjects in recreation research. During 1999 and 2000, methods studies included Tarrant (1999), on variability of a perceived crowding scale, and Tarrant and Green (1999), on the validity of outdoor recreation as a predictor of environmental attitudes. Tarrant and Cordell (1999) employed GIS technology to analyze the environmental justice implications of the spatial distribution of outdoor recreation sites in the Southern Appalachians. Porter and Tarrant (2001) extended our understanding of the usefulness of GIS in studying environmental justice related to Federal tourism sites in southern Appalachia.

NTFP RESEARCH IN THE SOUTH

Southern forests provide many products that are plant based, but that are not timber. Long before advanced technology existed to harvest timber, people collected natural forest materials for various uses. While research on timber harvesting and managing forests for wood products expanded greatly during the 20th century, studies of nontimber products and uses were few. Today, many local collectors can track their heritage and relationship with NTFPs back several generations. The collection and trade of these products are important to the economies of Appalachian and other southern households and communities. But, in addition, the plants are also critical components of healthy forest ecosystems. Over the last decade, demand for and collection of nontimber products has increased significantly. Because of this increased demand, there has been growing concern about the sustainability of NTFPs and the effects of increasing harvesting on ecosystem sustainability.

Defining NTFPs

NTFPs are plants, parts of plants, fungi, and other biological materials that are harvested within and on the edges of natural, manipulated,

or disturbed forests. They may include fungi, moss, lichen, herbs, vines, shrubs, or trees. Many different plant parts are harvested, including roots, tubers, leaves, bark, twigs and branches, fruit, sap and resin, and wood (Chamberlain and others 1998). One useful method of classifying these products organizes them into four major product categories:

1. Culinary products include mushrooms, ferns, and the fruits, leaves, and roots of many plant species. Perhaps the most important of the Southeast's culinary forest products are ramps (*Allium tricoccum* Ait.). Another important culinary species, black walnut (*Juglans nigra* L.), which is native to the Eastern United States, also is used in the medicinal and dietary supplement industry.
2. Wood-based NTFPs are produced from trees or parts of trees, but not commercially sawn wood. Some of the more important wood-based NTFPs include the stems of sassafras (*Sassafras albidum* Nutt.) for walking sticks, willow (*Salix* L.) stems for furniture, and the knees of cypress (*Cupressus* L.) for carvings.
3. Floral and decorative products include crooked-wood [*Lyonia ferruginea* (Walt.) Nutt.] from the forests of Florida to compliment dry flower arrangements, grapevine for wreaths and baskets, and galax (*Galax urceolata* L.) for a variety of uses. Moss harvested from hardwood forests of Appalachia is used domestically and exported to the European floral industry.
4. Medicinal forest products include roots and herbaceous materials from more than 50 plant species, and are used for a variety of medicinal or dietary applications.

Research

A modest amount of research dealing with NTFPs has been undertaken over the last 50 years. Most of this research has focused on describing the varied uses of the plants, their site requirements, and other botanical factors. Some of the more popular products have had extensive research, although most of the research focuses on areas tangential to forestry and forest management. For example, there is a large body of knowledge about the medicinal uses of plant species, but forest managers lack basic knowledge about the population biology and ecology of many of the plants that are harvested as nontimber products.

A modest amount of research has focused on personal use and recreational collection of nontimber products. Prominent among recent work is the 2000–01 NSRE conducted by the Forest Service. Specific questions were asked of respondents to the NSRE concerning their gathering of products from forests (Cordell and Tarrant 2002). The specific trigger question asked was, "During the past 12 months, did you gather mushrooms, berries, firewood, or other natural products?" In the South, 31 percent of the respondents reported that they gather natural products. Of these, almost 54 percent did their gathering activity in a forest setting. Over 96 percent did their gathering for personal use and only 2 percent did it for income. Nine percent of gatherers collected mushrooms, 47 percent picked berries, 73 percent collected firewood, 35 percent collected rocks and minerals, 43 percent tree materials, and 43 percent herbs and flowers. Among the many miscellaneous things gathered were insects, feathers, walnuts, arrowheads, gold, moss, pine needles, Spanish moss, water, wild honey, and sea shells. Over the last 12 months, 29 percent had gathered on 3 or fewer days; 34 percent had gathered on 4 to 10 days; and about 11 percent had gathered on 30 or more days.

The demographics of people collecting for personal use are enlightening. Forty-two percent of the people gathering were male and 58 percent were female. Thirty percent were under age 35 and 20 percent were 55 years or older. Eighty-six percent were white, 9 percent black, 3 percent Hispanic, 2 percent American Indian, and the remaining < 1 percent Asian Americans. By income, the largest group (36 percent of gatherers) earned between $25,000 and $50,000 per year. The next largest group earned between $50,000 and $75,000 (about 17 percent). Those earning < $15,000 per year made up just over 1 percent of all gatherers in the South. Forty-one percent of gatherers live in rural areas and 59 percent in urban areas. Almost 12 percent of gatherers had less than a high school education; and 59 percent had some college, up to a doctorate.

Other research has looked at the major products resulting from gathering. The large number and diversity of plant species that yield NTFPs make this research challenging. Krochmal and others (1969) identified more than 125 medicinal plant species specific to Appalachia. Botanists of the Forest Service estimate that approximately 35 species of medicinal plants are collected for commercial purposes in the National Forests in North Carolina (National Forests

in North Carolina 2000). Discussions with medicinal plant dealers in the region reveal that approximately 50 species native to the area are commonly collected. Culinary forest products include mushrooms; ferns; tubers, e.g., ramps; and the fruits and leaves of more than a dozen species. The number of forest species harvested to produce wood-based nontimber products is equal to the number of species of trees, shrubs, and vines that grow in the region. Floral products include more than 50 species of moss and lichen, several species of berries, ground covers, vines, and twigs and stems of numerous species.

Overall, research on NTFPs is modest. Beyond basic taxonomic identification, little information has become available to aid forest management decisionmaking. Some of the more popular products, such as ginseng (*Panax quinquefolium* L.), have been the focus of some literature. But this work has centered mostly on cultivation and folk history (Davis 1997, Hankins 2000, Hufford 1997). Robbins (1998) provides an overview of ginseng, but emphasizes markets, trade, regulations, and the need for conservation. In reports to the U.S. Fish and Wildlife Service, Gagnon[4] [5] examines the sustainability of ginseng and goldenseal (*Hydrastis canadensis* L.) and provides recommendations for monitoring of wild populations. Other species, such as galax, bloodroot (*Sanguinaria canadensis* L.), and pine straw (*Pinus elliottii* Englem. and *P. palustris* Mill.), all of which are important nontimber products, have received much less research.

Galax, also known as wandflower and beetleweed, is native to the southeastern portion of the United States. The single round or heart-shaped leaves are preferred in floral arrangements as background foliage (Noland 1997). Most literature concerning the ecology of galax focuses on its distribution, range, and habitat (Evans 2000, Fern 1997–2000, Hathaway 2002, Horticopia 2001, Reed 2001). Several studies have examined the genetic makeup of the plant (Burton and Husband 1999, Nesom 1983). One of the distinguishing characteristics of galax is its distinct odor; yet according to Amoroso (2002), the source of the odor is still unknown.

Bloodroot, an ephemeral spring-blooming herbaceous perennial, is found throughout Southern Appalachian forests. Like the literature on galax, most of the literature concerning this important medicinal plant has focused on botanical aspects. The flowers of bloodroot have 8 to 10 petals, significantly more than those of other species in the Papaveraceae family (Lehmann and Sattler 1993). According to Lehmann and Sattler (1993), these extra petals replace some of the stamens in a process known as homeosis. The dispersal of bloodroot seeds is based on a symbiotic relationship with ants (Marshall and others 1979) that feed on a lipid-rich appendage called an elaiosome. After consuming the elaiosome, ants discard the intact and viable remaining portion of the seed in their underground nests, which increases germination and reproduction of the plant (Beattie and Culver 1982, Handel 1976, Hendershot 2002). Seeds that are "planted" in the nests are safe from predation, can avoid competition with parent plants, and have access to essential nutrients (Czerwinski and others 1971, Heithaus 1981, Pudlo and others 1980). While the bright red sap exuded from the roots of bloodroot is the desired product, the alkaloids found in the sap can be poisonous, causing nausea, vomiting, and dizziness or fainting (Russell 1997). Bennett and others (1990) found that plants located in the Southern Appalachian forests have higher concentrations of active ingredients than those found along the West Virginia-Pennsylvania border.

As is common with most NTFPs, the greatest amount of literature about bloodroot concerns its medicinal values (Fern 1997–2000, Haughton 2003, Plyler 2001–2002). Cough lozenges can be made by mixing root sap and maple syrup (Miller 1988, Sanders 1995). According to Grieve (1931), Haughton (2003), and Plyler (2001–2002), small doses have been used to stimulate heart rate and may help in combating heart disease. A profusion of clinical studies have debated the effectiveness of bloodroot products to inhibit plaque and gingivitis (e.g., Drisko 1998, Hannah and others 1989, Harper and others 1990, Kopczyk and others 1991). In the early 1990s, bloodroot was used as an active ingredient in a commercial toothpaste (Damm and others 1999).

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[4] Gagnon, D. 1999. An analysis of the sustainability of American ginseng harvesting from the wild: the problem and possible solutions. 53 p. Unpublished report. Final report to the Office of Scientific Authority of the U.S. Fish and Wildlife Service. Groupe de recherché en écologie forestière. Université du Québec à Montréal. On file with: Southern Research Station, 1650 Ramble Road, Blacksburg, VA 24060-6349.

[5] Gagnon, D. 1999. A review of the ecology and population biology of goldenseal, and protocols for monitoring its population. 27 p. Unpublished report. Final report to the Office of Scientific Authority of the U.S. Fish and Wildlife Service. Groupe de recherché en écologie forestière. Université du Québec à Montréal. On file with: Southern Research Station, 1650 Ramble Road, Blacksburg, VA 24060-6349.

Ramps are perhaps the most common spring edible among NTFPs. Several studies have examined soil factors, mycorrhizal status, root anatomy, and the phenology of ramps and related species (Andersson 1993, Brundrett and Kendrick 1988, DeMars 1996, Whanger and others 2000). Other research has looked at the chemistry of the edible portion to identify the active ingredients (Calvey and others 1997, Carotenuto 1996). Botanical observations, demographic studies, and examination of ecological patterns of wild populations have been undertaken (Hanes 1953, Hanes and Ownbey 1946, Jones and Shildneck 1980, Nault and Gagnon 1993). Some aspects of the plant's pollination ecology and biomass production have been examined (Nault and Gagnon 1987, 1988). Rock[6] and Nantel and others (1996) have studied population viability and the impact of harvesting.

Research on pine straw is better developed than that on many other nontimber products. Silvicultural guidelines for pine straw management in the Southeastern United States are readily available (Duryea and Edwards 1992, Morris and others 1992, Woodland Owner Notes 1995). A significant amount of research has looked at the impact of pine straw raking on associated vegetation (Kelly 1996, Litton 1994, Wild 1993, Wolters 1972). While Litton (1994) and Kelly (1996) focused their research on the impact of removing longleaf pine straw on plant populations, Wild (1993) examined the effects of removal on slash pine (*P. elliottii* Englem.) growth and soil productivity. Wolters (1972) found no significant effect of pine straw mulch on southern bluestem (*Andropogen* spp.) production. Other research has examined the potential of pine straw in agroforestry systems (Blanche and Carino 1997, Blanche and others 1997, Brauer and others 2002).

Collection as a commercial activity has been studied only lightly and, thus, little exists in the way of formal estimates of the value of the various NTFP markets in this region. There are some data that illustrate the economic importance of these products. In 1996, collectors of black walnut were paid more than $2.5 million.[7] One company located in rural southwest Virginia and specializing in pine roping had sales in excess of $1.5 million in 1997 (Hauslohner 1997). A volunteer fire department in western North Carolina generates approximately 35 percent of its budget from its annual ramp festival. Based on 2001 prices, the average wholesale value of ginseng harvested from the southern forests exceeds $18.5 million. Certainly, the aggregate value of NTFPs to the Appalachian economy far exceeds these examples.

Although ginseng can be found growing naturally from north Georgia to Southern Canada, this popular medicinal plant is collected primarily from the Appalachian region. Based on data from the U.S. Fish and Wildlife Service, wild ginseng harvested in seven States accounted for approximately 82 percent of the harvest from 1978 through 1998. Of those States, West Virginia, Kentucky, Tennessee, and North Carolina account for approximately 47 percent of all forest-harvested ginseng. The others, i.e., Indiana, Ohio, and Virginia, account for approximately 35 percent.

These States also have higher than average unemployment rates and proportions of people below the poverty level. For example, the proportion of people in Kentucky below the poverty level exceeds the national average by 3 percentage points (U.S. Census Bureau 2002). The unemployment rate in that State is almost three times the average for the entire country. In North Carolina, Kentucky, Tennessee, and Virginia, the average unemployment rate is more than 3 percentage points above the national average. Clearly with such high unemployment, the possibility of supplementing family income by collecting and selling NTFPs must be attractive to local inhabitants.

Research regarding forest management for NTFPs is in its infancy. Chamberlain (2000) and Chamberlain and others (2002) have examined management of national forests in the Eastern United States for these products. The goal of this research was to broaden understanding of issues affecting management. Only 7 of 32 forest management plans for eastern national forests addressed NTFPs. Of the eastern national forests with management plans for NTFPs, only the National Forests in Florida are located in the South. The management plan for Florida's national forests acknowledged the need for research to develop a system to deal with the increasing demand for gathering products.[8]

[6] Rock, J. 1996. The impact of harvesting ramps (*Allium tricoccum* Ait.) in Great Smoky Mountains National Park. [Not paged]. Unpublished manuscript. On file with: Great Smoky Mountains National Park, 107 Park Headquarters Rd., Gatlinburg, TN 37738.

[7] Personal communication. 1998. J. Jones, Manager, Hammons Products Company, 105 Hammons Drive, Stockton, MO 65785.

[8] U.S. Department of Agriculture. 1985. Land and resource management plan. [Not paged]. On file with: National Forests in Florida, 325 John Knox Road, Suite F-100, Tallahassee, FL 32303.

Chamberlain and others (2002) also examined the attitudes and perspectives of forest managers at several administrative levels to estimate the constraints on improving management of these forest products. Fundamentally, four critical problems impede efforts to improve management. These are (1) lack of knowledge about the biology and ecology of the flora from which these products originate, (2) the diverse nature of the products and their collectors, (3) a severe lack of market knowledge, and (4) insufficient personnel and fiscal resources to assign to management. Until these obstacles are overcome, NTFPs management will remain ad hoc, at best.

Although Chamberlain found a lack of management effort toward NTFPs, there are initiatives underway to better understand these products. Federal Agencies that manage forest lands in North Carolina have initiated projects to examine harvesting impact on galax populations. The office of the National Forests in North Carolina has proposed a study to determine growth and yield of several NTFPs, including galax (Kauffman and others 2001). At this time, no results are available, but informal monitoring has been undertaken. The foundation for the study is recognition that there had been a major increase in the issuance of galax permits over the last 5 years. Because of this, there are concerns that patches of galax are being stripped of large leaves faster than the rate of regeneration. Kauffman and Danley[9] argue that the restricted harvesting season should decrease the trampling of young leaves and provide time for larger leaves to harden off. They recommend annual checks be made in the spring to determine if the season needs to be modified.

The National Park Service has the only study actually underway to examine the impact of harvesting galax leaves. Ulrey[10] established permanent sample plots along the Blue Ridge Parkway. In all, thirty-two 1-m square plots were established in 2001. Locations for these plots were selected based on three criteria: (1) no evidence of collection, (2) some evidence of collection, and (3) well-developed patch. Treatments included removing as many large leaves (> 3 inches) as possible. Harvested leaves were weighed and counted, and remaining leaves were counted. Removal rates were calculated by comparing harvested leaves to the number of leaves retained in each plot. Although insufficient time has passed to provide definitive results, discussions with the principal investigator of this project indicate that the impact of harvesting on populations is insignificant.

PARTING OBSERVATIONS AND POINTS TO PONDER

Recreation Research

Recreation research done in the South by scientists employed in the South has been highly productive. Since 1960 and inspired in part by the ORRRC of that time, a number of highly important and intriguing areas of inquiry have been undertaken. In the beginning, problems of economic development in impoverished areas, use impacts on forest recreation sites, and estimating recreation use were focal areas. Indeed over the years since 1960, research and application have shown that for all three of these problem areas, we pretty much understand the problems and have research-provided tools or knowledge to address them. Forest-based outdoor recreation as an economic development tool to address poverty is not very effective—too seasonal and too leaky for most rural economies. Managing use impacts in forest recreation sites requires site hardening and visitor flow management because planting grasses, shrubs, and other vegetation does not hold up. And, we have tools for estimating recreation use at developed and dispersed areas, if only we had the will and dollars to implement those tools more broadly.

Research has provided a pretty clear picture of who forest recreation visitors are, what they want to have and see, and how satisfied they are under different circumstances. We understand their opinions about fees and how they might react to a variety of use-regulatory measures and information systems. We did enough studies of crowded or environmentally sensitive sites to develop reasonably good principles to guide management within social, physical, and ecological capacities. Indeed, research applied across a broad spectrum of use and activity situations has provided good understanding of the phenomenon of crowding and acceptable or unacceptable encounters with other users.

[9] Kauffman, G.; Danley, D. 2001. Restriction on galax gathering season. [Not paged]. Unpublished internal report. On file with: National Forests in North Carolina, P.O. Box 2750, Asheville, NC 28802.

[10] Ulrey, C. 2001. Summary of first year (2001) results from galax removal study. 4 p. Unpublished report. On file with: Southern Research Station, 1650 Ramble Road, Blacksburg, VA 24060–6349.

To assist planners, policy analysts, policy setters, and legislators at all levels, including private investors and business managers, research has provided a succession of broad-scale recreation demand and supply and social assessments to help make visible recent and likely future trends. Tools, data, and findings measuring the effectiveness of the spatial distribution of supply, forecasting likely future demand, and examining the social equity aspects of different potential management scenarios have been provided. Long- and short-term trends have been described in laborious detail, as have participation patterns across different parts of the region, and different regions of the country. Access to private lands, as well as to public lands, has been examined and described, as have trends in access.

Methods for and studies estimating the value of sites and site attributes contributing to outdoor recreation also are among the benefits of recreation research in the South. Tradeoff analysis and cost-benefit analysis are the processes in which these values estimates are most appropriately applied. A spinoff benefit of valuation research is the ability to predict effects on visitation of different pricing policies (a hot topic now) and predict who might be impacted most or least by pricing. Another spinoff benefit is being able to predict revenue likely to occur with different pricing policies. Underlying all the above research, which is worthy of far more description and praise than is offered here, is a continuous flow of new and improved methods for doing research. Better and more realistic assumptions, better measurement scales, more sensitive input-output models, and a plethora of other advancements have made recreation research more effective and more credible. But what of the future? Where does recreation research need to go from here? The following are points to ponder as we set sail into the 21st century.

There is a wealth of research-based knowledge on hand concerning a variety of forest recreation topics and problem areas. Not everything that is needed and certainly not all that will be needed to fully address the mass of emerging new problems and complexities will be found in the literature of the past. But, contained between the title on page 1 and the last publication listed in the literature cited section on the last page of a large and rich volume of literature, estimated at roughly 6 to 8 times the number of recreation publications cited in this chapter; i.e., 1,200 to 1,500 journal articles, proceedings articles, book chapters, books, etc., is a huge amount of knowledge. Have we adequately applied this knowledge? Likely, the answer is no. At least we feel we have not. There is a crying need to synthesize, interpret, and make more accessible our research findings. It is a fact that managers, planners, business managers, and others in provider roles will not conduct literature reviews, nor are they likely to read research papers. Let us not kid ourselves. The most likely scenario with most research publications is that three peers read it in the beginning, and since then six graduate students read them for use in dissertations. Overall, maybe a total of 10 ever read the typical research article, including the one that the author sent to mom. A priority for the near future in recreation research, then, is to assemble, organize, study, interpret, and design a delivery system to put our research to work. Dr. Michael Rauscher has developed and is implementing the idea of a research encyclopedia. Look up a concept, such as fees, and via hyperlinks, access relevant research written at a level applicable broadly. As well, research literature should be interpreted collectively to ascertain broadly applicable principles and guidelines.

The existing body of research literature, then, is highly valuable and contemporarily applicable. But forest recreation is not static. New problems arise, the face of the user changes, and the social and economic environment within which everything operates evolves. We see a number of research problem areas needing attention (and funding). These are:

- Democracy and a free country is better than any of the alternatives. However, with this freedom and with free enterprise and resulting differentials of wealth and income can develop inequities in access to forest recreation opportunities, public and private. Associated with access are any number of cultural, legal, or physical barriers that differ in type and degree across southern society. Some of these barriers involve fear, such as women may feel in solo recreation.
- New forms of recreation participation and burgeoning development of new equipment for forest recreation participation feeds conflicts already extant between uses and users. A vivid example is motorized uses of forest roads and trails. Walking, biking, and horseback riding users are not compatible and cannot compete with motorized users. Walkers cannot compete with bikers. Bikers cannot compete with horseback riders. And so on. More use, more

varied forms of use, and greater diversity of users will ensure that this problem of conflict will only heighten in the future.

- Growing use, use in areas where it never used to occur, concentrated use in certain areas, and shrinking places to recreate are among the factors that will contribute to increasing impacts on forest recreation sites. Especially sensitive are wildlife populations at certain times of the year, riparian areas, habitats for threatened and endangered plant and animal species, and fragile or pristine features, such as rock cliffs. Managing use and understanding capacities will continue as a problem begging for research attention.
- A virtual explosion of new outdoor clothing, sports equipment, transport and sport vehicles, means of traversing the landscape, and other technological developments has been occurring in this region and in the Nation. Site designs, management guidelines, information flows, and accommodations often are not well matched to modern needs and expectations.
- One of the needs most often mentioned by recreation users is that of access to better information. Information on hazards, locations of places of interest, interpretation of natural and historical aspects of forest sites, and any number of other aspects of forest areas is high in demand by the recreating public. Especially growing in priority is providing conservation education opportunities offsite, onsite, and in association with recreation visits. Information programs, interpretation, and conservation education need to be integrated, and research is needed to guide that integration.

The population of the South is changing with the times and changing as a result of a tide of immigrants from other cultures. Research regarding public attitudes and values associated with forests, forest management, and forest recreation has not kept pace with these changes. Often managers are left to guess what the public voice would say if it were invited to sit at the management decision table this year, next year, or 10 years down the road.

Recreation seekers come to forested areas and rural places in part, maybe in very large part, to see and experience rural and natural landscapes. Ceaseless development and sometimes insensitive management choices affect the character, sometimes the ecosystem functioning, and sometimes, in the eye of the visitor, the quality of these landscapes. Research can shed light on these impacts and perceptions of them.

The processes of forest recreation planning and decisionmaking can be laborious and highly challenging. This is especially so when it is necessary to step back to conduct comprehensive planning across a broad spectrum of management and policy options. Simplified frameworks and procedures for planning, including accessing and using large demand and supply databases, are needed. A critical aspect of such planning is assurance that the public is heard from and understood at local, subregional, and regional levels.

Exposure to media, entertainment fantasies, international travel, different cultures, and a host of other personality shaping factors ensure that there is an ongoing evolution in the makeup and priorities of forest visitors. Understanding trends in motivations and expectations and linking recreation to improving other aspects of life, e.g., fitness and health, are increasingly important.

As society changes and our knowledge of and association with the land seem to diminish, there are increasing questions about the place of a NWPS for this region, and Nation. Wilderness is much more than a recreation resource. It represents much more than an ecosystem as in the eyes of an ecologist. Needed is better understanding of the value and the social, economic, and welfare aspects of wilderness and trends in these aspects.

In forest recreation, science-based planning and management is much needed—in our view, needed much more than at any previous time. Many charged with recreation planning do not have the background, resources, data, and information to come anywhere near fully accomplishing their charge. Highly focused research with minimal duplication and maximum partnering is needed. And, more and more this research needs to provide turn-key data and information systems for direct application in management, investment, and planning.

NTFPs Research

Research for NTFPs is needed in three main areas. The first relates to the sustainability of forest resources and the communities that depend on those resources. Sustainability cannot be achieved without a concerted effort to improve our scientific knowledge of the ecological dynamics of the plant species being harvested. Second, the

long-term maintenance of household and local economies that depend on nontimber products will be in jeopardy unless the true value and impact of harvesting is understood. Third, the social and cultural threads of community fabric that have evolved through generations will be lost if research is not undertaken to find ways to sustain this way of life while improving forest management.

Ecological issues, if not addressed, could result in long-term or permanent decline in biological diversity. The science-based knowledge does not exist to ensure that current harvest levels are ecologically sustainable. Research is needed to examine and determine the effects of harvesting on local plant populations, as well as the impact on associated forest ecosystems. Basic knowledge of the population dynamics of most NTFPs is required. Further, baseline inventory data and regular monitoring of populations are essential in developing sustainable forest management strategies. Standardized protocols for inventory and monitoring for nontimber products is severely lacking. Current supplies, as well as regeneration rates, are key elements in determining sustainable harvest levels, and yet remain unknown. Management decisions will continue to be based on incomplete and perhaps inaccurate information until the science has been done to answer some very fundamental questions.

In general, NTFP economies remain a mystery. Unlike timber, the economic value of NTFPs is not defined nor fully understood. The volumes and values of NTFPs are not reported, documented, or monitored, although the overall value of some sectors, e.g., herbal medicines, is partially documented. Economic and market data are essential for setting fair and equitable rates for collection permits. Knowledge of the value to rural communities and households also is lacking, and yet this information is needed to influence policies for sustainable forest management. Policymakers and decisionmakers need to be knowledgeable about the economic importance of NTFPs to rural communities. Accurate and reliable data on the supply and demand for NTFPs is essential to determine sustainable economic harvest levels.

Traditional ecological knowledge is critical in understanding the fundamentals of NTFP management. Many collectors have a long history and strong cultural ties to these products. Research is needed to document collection methods, techniques, local knowledge on resource accessibility, and other knowledge that could be used to develop socially and ecologically acceptable management approaches.

To improve the science-based knowledge concerning NTFPs to a level where sufficiently reliable information is available to forest managers will require a shift in institutional commitments. This institutional transformation will involve nurturing collaboration between varied disciplines, such as getting botanists, ecologists, foresters, and forest products marketing professionals to work together to determine standardized protocols and management approaches. To ensure that research is grounded in the social fabric and that subsequent protocols and policies are socially acceptable, sound social science and improved institutional arrangements also are needed.

LITERATURE CITED

The recreation and wilderness research literature cited in this paper is listed. Following separately later is the nontimber products literature.

Forest Recreation Research Literature

Absher, J.D. 1989. Applying the LAC model to National Park Service wilderness. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute for Behavioral Research: 143–152.

Adams, A.E.; Hammitt, W.E. 1993. Visitor behavior in relationship to interpretive encounters with wildlife. Journal of Interpretation. 4(5):18–23.

Aiken, R. 1988. Regional economic impact analysis for the Chincoteague National Wildlife Refuge. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Department of Recreation and Leisure Studies: 2–3.

Amacher, G.S.; Conway, M.C.; Sullivan, J. 2004. Nonindustrial forest landowner research: a synthesis and new directions. In: Rauscher, H. Michael; Johnsen, Kurt, eds. Southern forest science: past, present, and future. Gen. Tech. Rep. SRS–75. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 241–252.

Bayless, D.S.; Bergstrom, J.C.; Messonier, M.L.; Cordell, H.K. 1994. Assessing the demand for designated wildlife viewing sites. Journal of Hospitality and Leisure Marketing. 2: 75–93.

Bergstrom, J.C.; Cordell, H.K. 1991. An analysis of the demand for and value of outdoor recreation in the United States. Journal of Leisure Research. 23(1): 67–86.

Bergstrom, J.C.; Cordell, H.K.; Ashley, G.A. [and others]. 1989. Rural economic development impacts of outdoor recreation in Georgia. Res. Rep. 567. Athens, GA: The Georgia Agricultural Experiment Station, University of Georgia. 10 p.

Bergstrom, J.C.; Cordell, H.K.; Ashley, G.A.; Watson, A.E. 1990a. Economic impacts of recreational spending on rural areas: a case study. Economic Development Quarterly. 4(1): 29–39.

Bergstrom, J.C.; Cordell, H.K.; Langner, L. 1994. RPA assessment of outdoor recreation: past, current, and future directions. Gen. Tech. Rep. SE–87. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 30 p.

Bergstrom, J.C.; Cordell, H.K.; Watson, A.E.; Ashley, G.A. 1990b. Economic impacts of State parks on State economics in the South. Southern Journal of Agricultural Economics. 22: 69–78.

Bergstrom, J.C.; Teasley, R.J.; Cordell, H.K. [and others]. 1996. Effects of reservoir aquatic plant management on recreational expenditures and regional economic activity. Journal of Agricultural and Applied Economics. 28(2): 409–422.

Betz, C.J.; Cordell, H.K.; English, D.B.K. [and others]. 1998. Comparison of amenity uses and recreational access among social strata of U.S. private landowners [Abstract]. In: Book of abstracts: culture, environment, and society. Columbia, MO: University of Missouri-Columbia: 203–204.

Betz, C.J.; Perdue, R.R. 1993. The role of amenity resources in rural recreation and tourism development. Journal of Park and Recreation Administration. 11(4): 15–29.

Bhat, G.; Bergstrom, J.; Teasley, R.J. [and others]. 1998. An ecoregional approach to the economic valuation of land- and water-based recreation in the United States. Environmental Management. 22(1): 69–77.

Bixler, R.D.; Carlisle, C.L.; Floyd, M.F. 1995a. Wayfinding aids: getting the novice into the woods. Legacy: The Journal of the National Association for Interpretation. 6: 25–29.

Bixler, R.D.; Hammitt, W.E.; Floyd, M.F. 1995b. Negative perceptions of natural environments and preference for outdoor activities. In: Proceedings of the 1995 northeastern recreation research symposium. Gen. Tech. Rep. NE–218. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 81–83.

Bixler, R.D.; Morris, B. 2000. Factors differentiating water-based wildland recreationists from nonparticipants: implications for recreation activity instruction. Journal of Park and Recreation Administration. 18: 54–72.

Bixler, R.D.; Noe, F.P.; Hammitt, W.E. 1992. Restrictive and non-restrictive management of park visitors. Journal of Environmental Systems. 21: 335–348.

Bond, R.S.; Whittaker, J.C. 1971. Hunter-fisherman characteristics: factors in wildlife management and policy decisions. In: Recreation symposium proceedings. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 128–134.

Borrie, W.T.; Roggenbuck, J.W.; Hull, R.B. 1998. The problem of verbal reports in recreation research. Tourism Analysis. 2: 175–184.

Bowker, J.M.; Cordell, H.K.; Hawks, L.J. 1993. Measuring recreation benefits with CV: does payment vehicle matter? In: Policy and forestry: design, evaluation, and spillovers. Durham, NC: Duke University: 155–159.

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

Bowker, J.M.; English, D.B.K.; Bergstrom, J.C. 1998. Benefits transfer and count data travel cost models: an application and test of a varying parameter approach with guided whitewater rafting. UGA Fac. Ser. 97–03. Athens, GA: University of Georgia. 25 p.

Bowker, J.M.; English, D.B.K.; Donovan, J.A. 1996. Toward a value for guided rafting on southern rivers. Journal of Agricultural and Applied Economics. 28(2): 423–432.

Bowker, J.M.; Leeworthy, V.R. 1998. Accounting for ethnicity in recreation demand: a flexible count data approach. Journal of Leisure Research. 30(1): 64–78.

Bowker, J.M.; Miles, M.P.; Randall, E.J. 1997. A demand analysis of off-road motorized recreation. In: Proceedings of the Association of Marketing Theory and Practice, expanding marketing horizons into the 21st century. Statesboro, GA: Georgia Southern University: 387–391.

Bowker, J.M.; Souter, R.A.; Clemmons, J.R. 1994. Sensitivity of contingent value surplus estimates to elicitation approach: further evidence. In: Proceedings, southeastern recreation research conference. Gen. Tech. Rep. SE–90 Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 37–43. Vol. 15.

Boyd, R.G.; Hyde, W.F. 1989. Forestry sector intervention: the impacts of public regulation on social welfare. Ames, IA: Iowa State University Press. 295 p.

Bratton, S.P.; Hickley, M.G.; Graves, J.H. 1979. Trail erosion patterns in the Great Smoky Mountains National Park. Journal of Environmental Management. 3: 431–445.

Brown, M. 1994. Ethnic differences in outdoor participation patterns among older adults. In: Proceedings, southeastern recreation research conference. Gen. Tech. Rep. SE–90. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 1–6. Vol. 15.

Bryan, C.H. 1976. What Americans want from their forests: a sociological view. In: Auburn forestry forum series. Auburn, AL: Auburn University. 8 p.

Bryan, C.H. 1977. Leisure value systems and recreational specialization: the case of trout fishermen. Journal of Leisure Research. 9: 174–187.

Bryan, C.H. 1979. Conflict in the great outdoors: toward understanding and managing for diverse sportsmen preferences. Sociol. Stud. Ser. 4. Tuscaloosa, AL: University of Alabama, Bureau of Public Administration. 99 p.

Buhyoff, G.J.; Leuschner, W.A.; Wellman, J.D. 1979. Southern pine beetle affects aesthetic values of forest landscapes. Southern Journal of Applied Forestry. 3(3): 48–49.

Buhyoff, G.J.; Miller, P.A. 1998. Context reliability and internal validity of an expert system to assess landscape visual values. Artificial Intelligence Systems. 12(1): 76–82.

Buhyoff, G.J.; Miller, P.A.; Hull, R.B.; Schlagel, D.H. 1995. Another look at expert visual assessment: validity and reliability. Artificial Intelligence Applications. 9(1): 112–120.

Buhyoff, G.J.; Riesenmann, M.F. 1979. Experimental manipulation of dimensionality in landscape preference judgements: a quantitative validation. Leisure Sciences. 2(3): 221–238.

Buhyoff, G.J.; Wellman, J.D. 1979a. Environmental preferences: a critical analysis of a critical analysis. Journal of Leisure Research. 11(3): 215–218.

Buhyoff, G.J.; Wellman, J.D. 1979b. Seasonality bias in landscape preference research. Leisure Sciences. 2(2):181–190.

Buhyoff, G.J.; Wellman, J.D.; Harvey, H.; Fraser, R.A. 1978. Land-space architects interpretations of people's landscape preferences. Journal of Environmental Management. 6(3): 255–262.

Burkiewicz, T. 1991. The national coastal recreation inventory project (NCRIP): a topology and distribution of commercial outdoor recreation opportunity in the Southeastern States. In: Proceedings, southeastern recreation research conference. Gen. Tech. Rep. SE–89. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 30–39. Vol. 13.

Burrus-Bammel, L.L.; Bammel, G.; Gallo, K. 1982. Perceptions of hunting and hunters. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Ecology: 253–263.

Burrus-Bammel, L.L.; Samuel, D. 1984. Source of introduction and motivations for trappers. In: Proceedings of the southeastern recreation research conference. [Place of publication unknown]: [Publisher unknown]: 80–89.

Caldwell, L.L.; Andereck, K.L.; Debbage, K. 1994. Predicting zoo visitor satisfaction. In: Proceedings, 1991 southeastern recreation research conference. Gen. Tech. Rep. SE–89. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 22–29. Vol. 13.

Chamberlain, J.; Bush, R.; Hammett, A.L. 1998. Non-timber forest products: the other forest products. Forest Products Journal. 48(10): 10–19.

Chilman, K.; Foster, D.; Everson, A. 1991. Designing recreation monitoring systems: some comments on the participant observer design. In: Proceedings, 1990 southeastern recreation research conference. Gen. Tech. Rep. SE–67. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 163–172. Vol. 12.

Chilman, K.; Ladley, J.; Wikle, T. 1989. Refining existing recreational carrying capacity systems: emphasis on recreational capacity. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute for Behavioral Research: 118–123.

Chilman, K.; Vogel, J.; Conley, J. 1994. Monitoring and evaluation of an off-road vehicle riding area in Kentucky. In: 1991 southeastern recreation research conference. Gen. Tech. Rep. SE–89. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 55–63. Vol. 13.

Chilman, K.C.; Marnell, L.F.; Foster, D. 1981. Putting river research to work: a carrying capacity strategy. In: Some recent products of river recreation research. Gen. Tech. Rep. NC–63. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Experiment Station: 56–61.

Choi, S.; Ditton, R.B.; Matlock, G.C. 1992. Homogeneity across mail survey waves: a replicated study. Journal of Leisure Research. 24: 33–51.

Choi, S.; Loomis, D.K.; Ditton, R.B. 1994. Understanding the influence of selected variables in recreation substitution decisions. Leisure Sciences. 16:143–159.

Chubb, R.; Hammitt, W.E. 1993. Blue Ridge Parkway GIS procedures manual. Final Project Report. Atlanta: National Park Service, Southeast Regional Office. 27 p.

Chubb, R.M.; Hammitt, W.E.; Noe, F.P. 1991. How a geographical information system serves as an integrative management tool for multiple data sets. Final Project Report. Atlanta: National Park Service, Southeast Regional Office. 16 p.

Clonts, H.A.; Randall, S.A.; Wallace, M.S.; Stribling, H.L. 1991. Economic and social impacts of hunting land access. In: Proceedings of the southeastern recreation research conference. Gen. Tech. Rep. SE–67. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 109–122. Vol. 12.

Cole, G.L.; Wilkins, B.T. 1971. The camper. In: Recreation symposium proceedings. Upper Darby, PA, U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 105–112.

Cook, W.L.; Anderson, L.M.; English, D.B.K. 1985. Top-lopping after thinning southern pine: effects on visual quality. In: Proceedings: southeastern recreation research conference. Statesboro, GA: Georgia Southern College, Department of Recreation and Leisure Services: 57–66.

Cook, W.L., Jr. 1972. An evaluation of the aesthetic quality of forest trees. Journal of Leisure Research. 4: 293–302.

Cordell, H.K. 1977. Managing river recreation use other than rationing. In: Proceedings of the river recreation management and research symposium. Gen. Tech. Rep. NC–28. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 407–411.

Cordell, H.K. 1992. Amenity, conservation, and environmental uses and values: the United States perspective. In: Proceedings, Pacific rim forestry - bridging the world. Bethesda, MD: Society of American Foresters: 19–24.

Cordell, H.K. 1999. Outdoor recreation in American life: a national assessment of demand and supply trends. Champaign, IL: Sagamore Publishing. 449 p.

Cordell, H.K. 2001. Birds and birding soar. Wild Bird. 15(4): 13.

Cordell, H.K.; Bergstrom, J.C. 1991. A methodology for assessing national outdoor recreation demand and supply trends. Leisure Sciences. 13(1): 1–20.

Cordell, H.K.; Bergstrom, J.C. 1993. Comparison of recreation use values among alternative reservoir water-level management scenarios. Water Resources Research. 29(2): 247–258.

Cordell, H.K.; Bergstrom, J.C.; Ashley, G.A.; Karrish, J. 1990a. Economic effects of river recreation on local economies. Water Resources Bulletin. 26(1): 53–60.

Cordell, H.K.; Bergstrom, J.C.; Hartmann, L.A.; English, D.B.K. 1990b. An analysis of the outdoor recreation and wilderness situation in the United States: 1989–2040. Gen. Tech. Rep. RM–189. Ft. Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 113 p.

Cordell, H.K.; Bergstrom, J.C.; Teasley, R.J.; Maetzold, J.A. 1998a. Trends in outdoor recreation and implications for private land management in the East. In: Proceedings and invited papers, natural resources income opportunities on private lands conference. College Park, MA: University of Maryland Cooperative Extension Service: 4–10.

Cordell, H.K.; Bergstrom, J.C.; Watson, A.E. 1992. Economic growth and interdependence effects of State park visitation in local and State economies. Journal of Leisure Research. 24(3): 253–268.

Cordell, H.K.; Betz, C.J.; Green, G.T. 2002. Recreation and the environment as cultural dimensions in contemporary American society. Leisure Sciences. 24: 13–41.

Cordell, H.K.; English, D.B.K. 1985. Recreational travel distances to define supply inventory radii. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute for Behavioral Research: 1–7.

Cordell, H.K.; English, D.B.K.; Bergstrom, J.C. [and others]. 1991. The effects of outdoor recreation activities on State and local economies. In: Enhancing rural economies through amenity resources. State College, PA: Pennsylvania State University: 57–78.

Cordell, H.K.; English, D.B.K.; Randall, S.A. 1993. Effects of subdivision and access restrictions on private land recreation opportunities. Gen. Tech. Rep. RM–231. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 21 p.

Cordell, H.K.; Gramann, J.H.; Albrecht, D.E. [and others]. 1985. Trends in recreational access to private rural lands. In: Proceedings 1985 national outdoor recreation trends symposium II. Atlanta: U.S. Department of the Interior, National Park Service, Southeast Regional Office: 164–184.

Cordell, H.K.; Gray, J.; Flamm, B.; Gartner, W.C. 1989. Marketing the wilderness experience: oil and water? In: Managing America's enduring wilderness resource: a conference. Minneapolis: University of Minnesota Press: 651–660.

Cordell, H.K.; Hammon, G.A.; Graham, J. [and others]. 1975. Capacity of water-based recreation systems—part iii: methodology and findings. Rep. 90. Raleigh, NC: Water Resources Research Institute of the University of North Carolina. 109 p.

Cordell, H.K.; Hartmann, L.A. 1984. Trends in outdoor recreation in the two decades since ORRRC. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute for Behavioral Research: 1–41.

Cordell, H.K.; Helton, G.; Peine, J. 1996. Communities and human influences in Southern Appalachian ecosystems: the human dimensions. In: Southern Appalachian Man and the Biosphere (SAMAB): the Southern Appalachian Assessment Social/Cultural/Economic Tech. Rep. Rep. 4 of 5. Atlanta: U.S. Department of Agriculture, Forest Service, Southern Region: 17–85.

Cordell, H.K.; Hendee, J.C. 1982. Renewable resources recreation in the United States: supply, demand and critical policy issues. Washington, DC: American Forestry Association. 88 p.

Cordell, H.K.; Herbert, N.G.; Pandolfi, F. 1999. The growing popularity of birding in the United States. Birding. 31(2): 168–176.

Cordell, H.K.; James, G.A. 1971. Supplementing vegetation on Southern Appalachian recreation sites with small trees and shrubs. Journal of Soil and Water Conservation. 26(6): 235–238.

Cordell, H.K.; James, G.A.; Griffith, R.F. 1970. Estimating recreation use at visitor information centers. Res. Pap. SE–69. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 8 p.

Cordell, H.K.; James, G.A.; Tyre, G.L. 1974. Grass establishment on developed recreation sites. Journal of Soil and Water Conservation. 29(6): 268–271.

Cordell, H.K.; Kriesel, W.; Bergstrom, J.C. 1997a. Economic effects on Rocky Mountain and Appalachian regional economies of outdoor recreational visitors to USDA Forest Service sites. UGA Fac. Ser. 97–07. Athens, GA: University of Georgia. 19 p.

Cordell, H.K.; Legg, M.H.; Cathey, K.E. 1986. Visitor needs and user impact. In: Wilderness and natural areas in the Eastern United States: a management challenge. Nacogdoches, TX: Stephen F. Austin University: 210–212.

Cordell, H.K.; Lewis, B.; McDonald, B.L. 1995. Long-term outdoor recreation participation trends. In: Proceedings of the fourth international outdoor recreation & tourism trends symposium & the 1995 national recreation resource planning conference. Minneapolis: University of Minnesota: 35–38.

Cordell, H.K.; Senter, H.F.; Ragatz, R.L. 1982. Potential conflicts between private recreational property development and forest land management in the South. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Ecology: 123–141.

Cordell, H.K.; Stevens, J.H., Jr. 1984. A national survey to determine public outdoor recreation opportunities on nonindustrial private forest and range lands. In: Proceedings of conference on nonindustrial private forests: a review of economic and policy studies. Durham, NC: Duke University: 327–333.

Cordell, H.K.; Super, G.R. 2000. Trends in Americans' outdoor recreation. In: Trends in outdoor recreation, leisure, and tourism. New York: CABI Publishing: 133–144.

Cordell, H.K.; Sykes, C.K. 1969. User preferences for developed-site camping. Res. Note SE–122. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 6 p.

Cordell, H.K.; Talhelm, D.R. 1969. Planting grass appears impractical for improving deteriorated recreation sites. Res. Note SE–105. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 2 p.

Cordell, H.K.; Tarrant, M.A. 2002. Forest-based outdoor recreation. In: Wear, David N.; Greis, John G., eds. Southern forest resource assessment. Gen. Tech. Rep. SRS–53. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 269–282.

Cordell, H.K.; Tarrant, M.A.; McDonald, B.L.; Bergstrom, J.C. 1998b. How the public views wilderness. International Journal of Wilderness. 4(3): 28–31.

Cordell, H.K.; Teasley, J. 1998. Recreational trips to wilderness: results from the USA national survey on recreation and the environment. The International Journal of Wilderness. 4(1): 23–27.

Cordell, H.K.; Teasley, R.J.; Bergstrom, J.C. [and others]. 1997b. Profile of participants in fish and wildlife related outdoor recreational activities in the United States. UGA Fac. Ser. 97–09. Athens, GA: University of Georgia. 64 p.

Cordell, H.K.; Watson, A.E. 1987. A framework for wilderness assessment and research. In: Proceedings for the national wilderness research conference: issues, state-of-knowledge, future directions. Gen. Tech. Rep. INT–220. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station: 63–68.

Cordell, H.K.; Wright, B.A. 1989. Public recreational access to private lands: an update on trends and the foreseeable future. Trends. 26(2): 15–18.

Cordell, K.; Herbert, N. 2002. The popularity of birding is still growing. Birding Magazine. February: 54–61.

Cordell, K.; Stokes, J. 2000. The social value of wilderness: a Forest Service perspective. International Journal of Wilderness. 6(2): 23–24.

Cornell, C.; O'Leary, J.T. 1991. Family participation in auxiliary activities associated with developed camping. In: 1990 southeastern recreation research conference. Gen. Tech. Rep. SE–67. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 131–140.

Coughlin, R.E.; Berry, D.; Cohen, P. 1978. Modeling recreation use in water-related parks. Tech. Rep. R–78–1. Vicksburg, MS: U.S. Army Corps of Engineers, Waterways Experiment Station. 55 p.

Cushwa, C.T.; McGinnes, B.S. 1964. Sampling procedures and estimates of year-round recreation use on 100 square miles of the George Washington National Forest. In: Transactions of the North American wildlife and natural resources conference. Washington, DC: Wildlife Management Institute: 457–465.

Ditton, R.B. 1996. Understanding the diversity among largemouth bass anglers. In: Multidimensional approaches to reservoir fisheries management. Bethesda, MD: American Fisheries Society: 135–144.

Ditton, R.B.; Loomis, D.K.; Choi, S. 1992. Recreation specialization: re-conceptualization from a social worlds perspective. Journal of Leisure Research. 24: 79–85.

English, D.B.K. 1995. Issues in using resource-based recreation for rural development. In: Rural America: a living tapestry. Gen. Tech. Rep. NE–228. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 4–7.

English, D.B.K. 2000. Calculating confidence intervals for regional economic impacts of recreation by bootstrapping visitor expenditures. Journal of Regional Science. 40(3): 523–539.

English, D.B.K.; Bergstrom, J.C. 1994. The conceptual links between recreation site development and regional economic impacts. Journal of Regional Science. 34(4): 599–611.

English, D.B.K.; Betz, C.; Young, J.M. [and others]. 1993. Regional demand and supply projections for outdoor recreation. Gen. Tech. Rep. RM–230. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 39 p.

English, D.B.K.; Bowker, J.M. 1994. An alternative technique for estimating the demand for river outfitter services. In: Forest economics on the edge. Athens, GA: University of Georgia, School of Forest Resources: 253–259.

English, D.B.K.; Cordell, H.K. 1985. A cohort-centric analysis of outdoor recreation participation changes. In: Proceedings of the southeastern recreation research conference. Statesboro, GA: Georgia Southern College, Department of Recreation and Leisure Services: 93–110.

English, D.B.K.; Cordell, H.K. 1993. Effective Recreation Opportunity Set (EROS) index: a computable measure of recreation supply. Res. Pap. SE–286. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 11 p.

English, D.B.K.; Kocis, S.M.; Zarnoch, S.J. [and others]. 2002. Forest Service national visitor use monitoring process: research method documentation. Gen. Tech. Rep. SRS–57. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 14 p.

English, D.B.K.; Marcouiller, D.W.; Cordell, H.K. 2000. Tourism dependence in rural America: estimates and effects. Society & Natural Resources. 13: 185–202.

English, D.B.K.; Thill, J.C. 1996. Assessing regional economic impacts of recreation travel from limited survey data. Res. Note SRS–2. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 8 p.

Erickson, D.L.; Liu, C.J. 1982. Traffic recorders in dispersed recreation use estimation. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Ecology: 77–84.

Erickson, D.L.; Liu, C.J.; Cordell, H.K. [and others]. 1980. RECAL: a computer program for generating samples for recreation use estimation. Gen. Tech. Rep. SE–19. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 11 p.

Fedler, A.J.; Ditton, R.B. 1994. Understanding angler motivations in fisheries management. Fisheries. 19(4): 6–13.

Fedler, A.J.; Ditton, R.B. 2001. Dropping out and dropping in: a study of factors for changing recreational fishing participation. North American Journal of Fisheries Management. 21: 283–292.

Flather, C.H.; Cordell, H.K. 1995. Outdoor recreation: historical and anticipated trends. In: Wildlife and recreationists: coexistence through management and research. Washington, DC: Island Press: 3–16.

Floyd, M.F.; Outley, C.W.; Bixler, R.D.; Hammitt, W.E. 1995. Effect of race environmental preference, and negative affect on recreation preferences. http://www.indiana.edu/~lrs/lrs95/mfloyd95.html. [Date accessed: September 25, 2003].

Fly, J.M.; Jones, R.E.; Cordell, H.K. 2000. Knowledge of and attitudes toward wilderness in the Southern Appalachian ecoregion. In: Wilderness science in a time of change conference. RMRS–P–15–VOL–2. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, [Rocky Mountain Research Station]: 201–204.

Frauman, E.; Norman, W.C.; Klenosky, D. 1997. The application of means-end theory to understanding interpretive service users. In: Abstracts from the 1997 leisure research symposium. Ashburn, VA: National Recreation & Parks Association: 66.

Fritschen, J.A. 1989. Measuring the economic impacts of recreation at Corps of Engineers waster resource projects. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute for Behavioral Research: 44–55.

Gramann, J.H.; Bonnicksen, T.M. 1985. Recreational access to private forests. Journal of Leisure Research. 17(3): 234–240.

Graves, P.F. 1963. Resource-oriented recreation research projects at the universities and State universities and State experiment stations. In: Proceedings of the national conference on outdoor recreation research. Ann Arbor, MI: Ann Arbor Publishers: 57–69.

Groves, D.L.; Kahalas, H.; Erickson, D.L. 1975. A multiframe reference approach to leisure motivation. Social Behavior and Personality. 3(1): 65–69.

Hammitt, W.E.; Dulin, J.N. 1991. Outdoor recreation and interpretive encounters with wildlife. In: Proceedings, National Interpretation Association national conference. Fort Collins, CO: National Association for Interpretation: 142–145.

Hammitt, W.E.; Keyes, B.; Ruddell, E. [and others]. 1984. Visual perception studies of forest recreational environments. In: 1983 southeastern recreation research conference. [Place of publication unknown]: [Publisher unknown]: 55–67.

Hammitt, W.E.; Lin, C.C. 1997. Establishing use level standards for river recreation: a literature search. Final Project Report. Cleveland, TN: U.S. Department of Agriculture, Forest Service, Cherokee National Forest. 35 p.

Hammittt, W.E.; McDonald, C.D. 1982a. Social group participation and its importance as a variable in examining management control preferences of stream floaters. In: Proceedings of the southeastern recreation research conference, 1980–1981. Athens, GA: University of Georgia, Institute of Ecology: 227–236.

Hammitt, W.E.; McDonald, C.D. 1982b. User experience level as a determinant in managing recreation resources. In: Abstracts from the 1982 symposium on leisure research. Alexandria, VA: National Recreation and Parks Association: 55.

Hammitt, W.E.; Patterson, M.E. 1991. Coping behavior to avoid visitor encounters: its relationship to wilderness privacy. Journal of Leisure Research. 23(3): 225–237.

Hammitt, W.E.; Patterson, M.E. 1993. Use patterns and solitude preferences of shelter users in Great Smoky Mountains National Park. Journal of Environmental Management. 38: 43–53.

Hammitt, W.E.; Patterson, M.E.; Noe, F.P. 1994. Identifying and predicting visual preference of Southern Appalachian forest recreation vistas. Journal of Landscape and Urban Planning. 29: 171–183.

Hammitt, W.E.; Rutlin, W.M. 1995. Use encounter standards and curves for achieved privacy in wilderness. Leisure Sciences. 17(4): 245–262.

Hammitt, W.E.; Rutlin, W.M. 1997. Achieved privacy in wilderness. International Journal of Wilderness. 3(1): 19–24.

Hammitt, W.E.; Schuster, R.M. 2000. Wilderness use in the next 100 years. International Journal of Wilderness. 6(2): 12–13.

Hammitt, W.E.; Shafer, C.S. 1992. Visual resource analysis for segment 8-D of the Foothills Parkway, Great Smoky Mountains National Park. Report for U.S. Department of Energy, Oak Ridge National Laboratory. 30 p. On file with: Martin Marietta, 2710 Wycliff Road, Raleigh, NC 27607–3033.

Hammon, G.A.; Cordell, H.K.; Moncrief, L.W. [and others]. 1974a. Capacity of water-based recreation systems–part I: the state of the art, a literature review. Rep. 90. Raleigh, NC: Water Resources Research Institute of the University of North Carolina. 49 p.

Hammon, G.A.; Cordell, H.K.; Moncrief, L.W. [and others]. 1974b. Capacity of water-based recreation systems–part II: a systems approach to capacity analysis. Rep. 90. Raleigh, NC: Water Resources Research Institute of the University of North Carolina. 46 p.

Hartmann, L.A.; Watson, A.E.; Cordell, H.K. 1987. Regional comparison of Forest Service wilderness users: implications for policy and research. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Community and Area Development: 145–158.

Hastings, B.C.; Hammitt, W.E. 1985. Public preferences and perceptions toward wildlife viewing. In: Proceedings of the southeastern recreation research conference. Statesboro, GA: Georgia Southern University, Department of Recreation and Leisure Services: 49–56.

Hauslohner, A.W. 1997. Couple builds green empire with pine-roping outfit. Roanoke [VA] Times. December 6, Metro Edition, A (col. 1).

Hawks, L.J.; Bowker, J.M. 1994. Estimating the local economic impact of lake recreation in northern California. In: Proceedings of the southeastern recreation research conference. Gen. Tech. Rep. SE–90. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 29–35. Vol. 15.

Hayden, L.; Hendricks, S.; Bowker, M. [and others]. 1996. Outdoor recreation demand and supply in the region. In: Southern Appalachian Man and the Biosphere (SAMAB): the Southern Appalachian Assessment Social/Cultural/Economic Tech. Rep. Rep. 4 of 5. Atlanta: U.S. Department of Agriculture, Forest Service, Southern Region: 139–179.

Henderson, K.A. 1994. Considerations in using qualitative approaches in studying leisure, recreation, tourism, and natural resources. In: 1991 southeastern recreation research conference. Gen. Tech. Rep. SE–89. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 78–83. Vol. 13.

Howard, G.E. 1968. Statewide survey of outdoor recreation facilities. Columbia, SC: South Carolina Department of Parks, Recreation and Tourism. 58 p.

Howard, G.E.; Bethea, J., Jr.; Keger, D. [and others]. 1977. Characteristics and wild river management preferences of the Chattooga River users. In: Abstracts of research papers, 1977 Alliance for HPER. Washington, DC: American Alliance for Health, Physical Education, and Recreation. 36 p.

Hull, R.B. 1988. Forest visual quality management and research. In: Outdoor recreation benchmark 1988: Proceedings of the national outdoor recreation forum. Gen. Tech. Rep. SE–52. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 485–498.

Hull, R.B. 1990. Mood as a product of leisure: causes and consequences. Journal of Leisure Research. 22: 99–111.

Hull, R.B. 1991. Mood as a product of leisure: causes and consequences. In: Benefits of leisure. State College, PA: Venture Publishing: 249–262.

Hull, R.B. 2000. Moving beyond the romantic biases in natural areas recreation. Journal of Leisure Research. 32(1): 54–57.

Hull, R.B.; Buhyoff, G.J. 1982. Distance and scenic beauty: a nonmonotonic relationship. Environment and Behavior. 15: 77–91.

Hull, R.B.; Michael, S. 1994. Nature based recreation, mood change, and stress restoration. Leisure Sciences. 17: 1–14.

Hull, R.B.; Michael, S.E.; Walker, G.J.; Roggenbuck, J.W. 1996. Ebb and flow of brief leisure experiences. Leisure Sciences. 18: 299–314.

Hull, R.B.; Robertson, D.; Buhyoff, G.; Kendra, A. 2000. What are we hiding behind the green curtain? Forestry aesthetics reconsidered. Journal of Forestry. 98(7): 34–38.

Hull, R.B.; Robertson, D.; Kendra, A. 2001. Public understandings of nature: a case study of local knowledge about 'natural' forest conditions. Society and Natural Resources. 14: 325–340.

Hull, R.B.; Stewart, W.P. 1992. Ecological validity of photo-based scenic beauty judgments. Journal of Environmental Psychology. 12: 101–114.

Hunt, K.M.; Ditton, R.B. 2002. Freshwater fishing participation patterns of racial and ethnic groups in Texas. North American Journal of Fisheries Management. 22: 52–65.

Hyde, W.F.; Newman, D.H. 1991. Forest economics and policy analysis: an overview. World Bank Discuss. Pap. 134. Washington, DC: The World Bank. 92 p.

Jackson, R.S. 1988. Measurement of economic impacts associated with recreation use of Corps projects. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Department of Recreation and Leisure Studies: 4–7.

James, G.A. 1971. Inventorying recreation use. In: Recreation symposium proceedings. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 78–95.

James, G.A.; Cordell, H.K. 1970. Importance of shading to visitors selecting a campsite at Indian Boundary Campground in Tennessee. Res. Note SE–130. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 5 p.

James, G.A.; Cordell, H.K.; Barick, F.B. [and others]. 1969. Small-game hunting on western North Carolina wildlife management areas: importance and use of forest roads and trails. Wildlife in North Carolina. 33(1): 10–12.

James, G.A.; Harper, R.A. 1965. Recreation use of the Ocala National Forest in Florida. Res. Pap. SE–18. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 29 p.

James, G.A.; Rich, J.L. 1966. Estimating recreation use on a complex of developed sites. Res. Note SE–64. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 8 p.

James, G.A.; Ripley, T. 1963. Instructions for using traffic counters to estimate recreation visits and use. Res. Pap. SE–3. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 12 p.

James, G.A.; Schreuder, H.T. 1972. Estimating dispersed recreation use along trails and in general undeveloped areas with electric-eye counters. Res. Note SE–181. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 8 p.

Janiskee, R.L.; Schmid, J.F., Jr. 1994. Rails-trails in South Carolina: inventory and prospect. In: 1991 southeastern recreation research conference. Gen. Tech. Rep. SE–89. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 48–54. Vol. 13.

Jarvis, J.P.; Senter, H.F.; Brantley, H. [and others]. 1978. Forecast of recreation demand for the Upper Savannah River Basin. Clemson, SC: Clemson University, Departments of Mathematics, Science, and Recreation and Park Administration. 52 p.

Johnson, C.Y.; Bowker, J.M. 1997. Wilderness awareness and potential participation: a logit analysis. In: Natural resources and the environment: community development issues conference. Tuskegee, AL: Tuskegee University, College of Agricultural, Environmental and Natural Sciences: 273–280.

Johnson, C.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.

Johnson, C.Y.; Bowker, J.M.; Cordell, H.K. 2001. Outdoor recreation constraints: an examination of race, gender, and rural dwelling across regions. Southern Rural Sociology. 17: 111–133.

Johnson, C.Y.; Bowker, J.M.; English, D.B.K.; Worthen, D. 1998. Wildland recreation in the rural South: an examination of marginality and ethnicity theory. Journal of Leisure Research. 30(1): 101–120.

Jones, M.A.; Self, D.R. 1991. Recreational incentives in the adoption of a forest land management program by non-industrial private landowners. In: Proceedings of the southeastern recreation research conference. Gen. Tech. Rep. SE–67. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 123–130. Vol. 12.

Kaiser, R.A.; Wright, B.A. 1985. Recreational use of private lands: beyond the liability hurdle. Journal of Soil and Water Conservation. 40(6): 478–481.

Klein, J.M.; Burde, J.H. 1991. Monitoring impacts at backcountry campsites and shelters at Great Smoky Mountains National Park. In: Proceedings of the southeastern recreation research conference. Gen. Tech. Rep. SE–67. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 29–36. Vol. 12.

Kopczyk, R.A.; Abrams, H.; Brown, A.T. [and others]. 1991. Clinical and microbiological effects of a sanguinaria-containing mouthrinse and dentifrice with and without fluoride during 6 months of use. Journal of Periodontology. 62(10): 617–622.

Kozlowski, J.C.; Wright, B.A. 1988. The supply effect of recreational lands and landowner liability. In: Outdoor recreation benchmark 1988: Proceedings of the national outdoor recreation forum. Gen. Tech. Rep. SE–52. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 27–29.

Krause, K. 2001. Women and canines: a perspective into (re)opening female solo outdoor recreation opportunities. Clemson, SC: Clemson University. 79 p. M.S. thesis.

Kuss, F.R. 1982. The effects of footgear impacts on wildland trail wear. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Ecology: 165–180.

La Page, W. 1963. Some sociological aspects of forest recreation. Journal of Forestry. 61: 32–36.

Lee, J.; Propst, D.B. 1994. Segmentation as a means of reducing variance in visitor spending profiles at Corps of Engineers lakes. In: Proceedings of the southeastern recreation research conference. Gen. Tech. Rep. SE–89. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 11–21. Vol. 13.

Leeworthy, V.R.; Bowker, J.M. 1997. Nonmarket economic user values of the Florida Keys/Key West. Washington, DC: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Ocean Resources Conservation and Assessment. 41 p.

Lewis, B.; Cordell, H.K.; Miles, M.P.; Tarrant, M. 1995. Segmenting the dynamic outdoor recreation market: a preliminary analysis of marketing implications from the 1993–1994 national survey of recreation and the environment. In: Proceedings, association of marketing theory and practice: expanding marketing horizons into the 21st century. Syracuse, NY: LeMoyne College: 378–379.

Lime, D.W. 1976. Principles of recreational carrying capacity. In: Proceedings of the Southern States recreation research applications workshop. Gen. Tech. Rep. SE–59. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 122–134.

Lockaby, B.G.; Dunn, B.A. 1977. Impact of sustained recreation use on forest soil properties. In: Agronomy abstracts. Madison, WI: American Society of Agronomy: 182.

Lucas, R.C. 1971. Hikers and other trail users. In: Proceedings of the forest recreation symposium. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 113–122.

McLellan, R.; Gahan, L. 1976. User characteristics and behavior, Hartwell Reservoir, 1974–1975. Tech. Rep. Clemson, SC: Clemson University, Department of Recreation and Park Administration. [Not paged].

Miles, M.P.; Fickle, C.; Munilla, L.S. [and others]. 1993a. A review of environmental attitude scales and their utility to consumer marketing. In: The Institute of Management Sciences, Southeastern Chapter Proceedings: twenty-ninth annual meeting. Florence, SC: Francis Marion University: 169–171.

Miles, M.P.; McDonald, B.; Capella, L.M.; Cordell, H.K. 1993b. A proposed segmentation framework for the outdoor recreation market. Journal of Nonprofit & Public Sector Marketing. 1(1): 51–69.

Miles, M.P.; Ritzel, F.H.; Cordell, H.K. [and others]. 1994. African American participation in wildland outdoor recreation. Journal of Nonprofit & Public Sector Marketing. 2(4): 63–75.

Mischon, R.M.; Wyatt, R.C. 1979. A handbook for conducting recreation surveys and calculating attendance at Corps of Engineers projects. Tech. Rep. R–79–1. Vicksburg, MS: U.S. Army Corps of Engineers, Waterways Experiment Station. [Not paged].

Mulligan, B.E.; Goodman, L.S.; Faupel, M. [and others]. 1982. Interactive effects of outdoor noise and visible aspects of vegetation on behavior. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Ecology: 265–279.

Murdock, S.H.; Backman, K.; Ditton, R.B. [and others]. 1992. Demographic change in the 1990's and the twenty-first century: implications for fisheries management. Fisheries. 17(2): 6–13.

National Forests in Florida. 1985. Land and resource management plan. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [Not paged].

Noe, F.; Hammitt, W.E.; Bixler, R.D. 1997. Park user perceptions of resource and use impacts under varied situations at three national parks. Journal of Environmental Management. 49: 323–336.

Noe, F.P.; Hull, R.B.; Wellman, J.D. 1982. Normative response and norm activation among off road vehicle users within a seashore environment. Leisure Sciences. 5: 127–142.

Noe, F.P.; Wellman, J.D.; Buhyoff, G.J. 1982. Perception of conflict between off-road vehicle and non off-road vehicle users in a leisure setting. Journal of Environmental Systems. 11(3): 223–233.

Norman, W.C. 1992. An investigation of the relationship between leisure constraints and the recreation specialization of current participants. In: Caldwell, L.L.; Riddick, C.C., eds. Abstracts from the 1992 symposium on leisure research. Arlington, VA: National Recreation and Park Association: 43.

Ody, P. 1993. The complete medicinal herbal. New York: DK Publishing. 192 p.

ORRRC. 1962. Outdoor recreation in American life. Washington, DC: U.S. Government Printing Office. 246 p.

Overdevest, C.; McNally, M.; Hester, R. 1997. Operationalizing place attachment: mapping and planning for place values on national forests. In: Integrating social science and ecosystem management conference. Gen. Tech. Rep. SRS–17. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 98–102.

Paterson, R. 1988. Economic impact assessment: a tool for regional tourism development. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Department of Recreation and Leisure Studies: 8–9.

Patterson, M.E.; Hammitt, W.E. 1990. Backcountry encounter norms, actual reported encounters, and their relationship to wilderness solitude. Journal of Leisure Research. 22(3): 259–275.

Peterson, G.L.; Cordell, H.K. 1991. Estimating recreation demand functions: experience with the public area recreation visitor survey. Annals of the American Fisheries Society Symposium. 12: 316–337.

Porter, R.; Tarrant, M.A. 2001. A case study of environmental justice and Federal tourism sites in Southern Appalachia: a GIS application. Journal of Travel Research. 40(1): 27–40.

Proctor, C.H. 1962. Dependence of recreation participation on background characteristics of sample persons in the September 1960 national recreation survey. ORRRC Study Rep. 19. Washington, DC: U.S. Government Printing Office, National Recreation Survey: 77–94. Append. A.

Propst, D.B.; Cordell, H.K.; Holocek, D.E. [and others]. 1986. Trends in consumer expenditures and public investments for outdoor recreation. In: Proceedings, national outdoor recreation trends symposium II. Atlanta: U.S. Department of the Interior, National Park Service: 201–222.

Propst, D.B.; Gavrilis, D.G.; Cordell, H.K. [and others]. 1985. Assessing the secondary economic impacts of recreation and tourism: work team recommendations. In: Assessing the economic impacts of recreation and tourism. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 52–63.

Reed, P.; Cordell, H.K.; Freilich, H.R. 1989. Optimizing nonrecreational wilderness uses and values: recommendations and strategies for the next ten years. In: Wilderness benchmark 1988: Proceedings of the National Wilderness Colloquium. Gen. Tech. Rep. SE–51. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 216–219.

Robertson, D.; Hull, R.B. 2001. Which nature? A case study of Whitetop Mountain. Landscape Journal. 20: 1–10.

Roggenbuck, J.W. 1978. Virginia outdoor recreation demand survey. Blacksburg, VA: School of Forestry and Wildlife Resources, Virginia Polytechnic Institute and State University. 63 p.

Roggenbuck, J.W. 1979. The field experiment: a suggested method for interpretive evaluation. Journal of Interpretation. 4:(1): 9–11.

Roggenbuck, J.W.; Berrier, D.L. 1981. Communication to disperse wilderness campers. Journal of Forestry. 79(5): 295–297.

Roggenbuck, J.W.; Driver, B.L. 2000. The benefits of nonfacilitated uses of wilderness. In: Proceedings: wilderness science in a time of change: wilderness as a place for scientific inquiry. Proc. RMRS–P–15–Vol. 3. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 33–49. Vol. 3.

Roggenbuck, J.W.; Ham, S.H. 1986. Use of information and education in recreation management. In: A literature review: the President's Commission on Americans Outdoors. Washington, DC: U.S. Government Printing Office: 59–71.

Roggenbuck, J.W.; Hammit, W.E.; Berrier, D.L. 1982a. The role of interpretation in managing recreational carrying capacity. Journal of Leisure Interpretation. 17(1): 7–20.

Roggenbuck, J.W.; Kushman, K.G. 1980. Riparian landowners' attitudes toward a State wild river program. Journal of Forestry. 78(2): 91–93.

Roggenbuck, J.W.; Loomis, R.J.; Dagostino, J.V. 1990a. The learning benefits of leisure. Journal of Leisure Research. 22(2): 112–124.

Roggenbuck, J.W.; Stankey, G.H.; Roth, D.M. 1990b. The wilderness classification process. In: Wilderness management. 2d ed. Golden, CO: North American Press and Fulcrum Publishing: 123–156.

Roggenbuck, J.W.; Watson, A.E. 1989. Wilderness recreation use: the current situation. In: Outdoor recreation benchmark 1988: Proceedings of the national outdoor recreation forum. Gen. Tech. Rep. SE–52. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 346–356.

Roggenbuck, J.W.; Watson, A.E.; Stankey, G.H. 1982b. Wilderness management in the Southern Appalachians. Southern Journal of Applied Forestry. 6(3): 147–152.

Roggenbuck, J.W.; Watson, A.E.; Williams, D.R. 1993. Defining acceptable conditions in wilderness. Environmental Management. 17(2): 187–197.

Roggenbuck, J.W.; Williams, D.R.; Bange, S.P. [and others]. 1991. River float trip encounter norms: questioning the use of the social norms concept. Journal of Leisure Research. 23(2): 133–153.

Ruddell, E.J.; Hammitt, W.E. 1985. Motives for visiting a State park: implications for management of edge environments. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute for Behavioral Research: 67–73.

Ruddell, E.J.; Hammitt, W.E. 1987. Prospect refuge theory: a psychological orientation for edge effect in recreation environments. Journal of Leisure Research. 19(4): 249–260.

Rutlin, W.; Hammitt, W.E. 1994a. Functions of privacy in the Ellicott Rock Wilderness. In: 1993 southeastern recreation research conference. Gen. Tech. Rep. SE–90. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 19–28. Vol. 15.

Rutlin, W.R.; Hammitt, W.E. 1994b. Ellicott Rock Wilderness visitor study: a survey of users and use patterns. Final Project Report. Columbia, SC: U.S. Department of Agriculture, Forest Service, Sumter National Forest. 91 p.

Sale, E.P.; Cordell, H.K.; Allen, J.F. 1987. Validation of survey procedures for the national private landowner survey. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Community and Area Development: 111–114.

Saunders, P.R. 1979. Vegetation cover differences of random forest plots with and without recreation use. Unpublished paper presented at South Carolina Academy of Science annual meeting, Columbia, SC.

Saunders, P.R. 1982. Monitoring and reporting recreation use: a case study. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Ecology: 143–158.

Schneider, I.E.; Hammitt, W.E. 1995. Visitor response to outdoor recreation conflicts: a conceptual approach. Leisure Sciences. 17(3): 223–234.

Schreyer, R.M.; Roggenbuck, J.W. 1978. The influence of experience expectations on crowding perceptions and social psychological carrying capacities. Leisure Sciences. 1(4): 373–394.

Schuster, R.M.; Hammitt, W.E. 2000. Effective coping strategies in stressful outdoor recreation situations: conflict on the Ocoee River. In: Wilderness science in a time of change conference. Proc. RMRS–P–15. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 167–174. Vol. 4.

Schuster, R.M.; Thompson, J.G.; Hammitt, W.E. 2001. Rock climbers' attitudes toward the management and use of bolts. Environmental Management. 29(3): 403–413.

Senter, H.F.; McLellan, R.W. 1982. An analysis of the compatibility of State-by-State private sector SCORP information. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Ecology: 1–11.

Shafer, C.S.; Hammitt, W.E. 1993. Management conditions and indicators of importance in wilderness recreation experiences. In: 1993 southeastern recreation research conference. Gen. Tech. Rep. SE–90. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 57–67. Vol. 15.

Shafer, C.S.; Hammitt, W.E. 1995. Congruency among wilderness experience dimensions, condition indicators, and user coping behaviors. Leisure Sciences. 17(4): 263–279.

Siderelis, C.; Moore, R. 2000. Incorporating users' perceptions of site quality in a recreation travel cost model. Journal of Leisure Research. 32(4): 406–414.

Siderelis, C.; Roise, J. 1991. An optimal apportionment strategy for park operations. Journal of Park and Recreation Administration. 9(2): 48–58.

Siderelis, C.D.; Brothers, G.L.; Rea, P. 1995. A boating choice model for the valuation of lake access. Journal of Leisure Research. 27(3): 264–283.

Siderelis, C.D.; Hassel, W. 1975. FORPAR: a computerized technique to forecast recreation participation. Athens, GA: University of Georgia, Institute of Community and Area Development. 18 p.

Siderelis, C.D.; Moore, R. 1995. Outdoor recreation net benefits of rail-trails. Journal of Leisure Research. 27(4): 344–359.

Siderelis, C.D.; Moore, R. 1998. Recreation demand and the influence of site preference variables. Journal of Leisure Research. 30(3): 301–318.

Siderelis, C.D.; Moore, R. 2000. Incorporating users' perceptions of site quality in a recreation travel cost model. Journal of Leisure Research. 32(4): 406–414.

Siderelis, C.D.; Perrygo, G. 1996. Recreation benefits of neighboring sites: an application to riparian rights. Journal of Leisure Research. 28(1): 18–26.

Siderelis, C.D.; Tyre, G.L. 1975. Estimating recreation use. Georgia Recreator. 4(2): 20–22.

Siehl, G.H. 1989. Developments in outdoor recreation policy since 1970. In: Outdoor recreation benchmark 1988: Proceedings of the national outdoor recreation forum. Gen. Tech. Rep. SE–52. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 10–21.

Smith, A.C.; Wellman, J.D.; Roggenbuck, J.W. [and others]. 1983. Priorities for river recreation management in the Southern Appalachians. Southern Journal of Applied Forestry. 7(4): 185–190.

Stankey, G.H.; Cole, D.N.; Lucas, R.C. [and others]. 1985. The limits of acceptable change (LAC) system for wilderness planning. Gen. Tech. Rep. INT–176. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 37 p.

Stewart, W.P.; Hull, R.B. 1992. Satisfaction of what? Post hoc versus real-time construct validity. Leisure Sciences. 14: 195–209.

Symmonds, M.C.; Hammitt, W.E.; Quisenberry, V.L. 1999. Managing mountain bike use for recreational carrying capacities. Environmental Management. 25(5): 549–564.

Tarbet, D.; Cordell, H.K.; Schreuder, H.T. 1982. An evaluation of the double sampling technique for estimating recreation use. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Ecology: 85–96.

Tarrant, M.A. 1999. Variability of the perceived crowding scale: a research note. Leisure Sciences. 21(2): 159–164.

Tarrant, M.A.; Bright, A.D.; Smith, E. [and others]. 1999. Motivations, attitudes, preferences, and satisfactions among outdoor recreationists. In: Outdoor recreation in American life: a national assessment of demand and supply trends. Champaign, IL: Sagamore Publishing: 403–431.

Tarrant, M.A.; Cordell, H.K. 1999. Environmental justice and the spatial distribution of outdoor recreation sites: an application of geographic information systems. Journal of Leisure Research. 31(1): 18–34.

Tarrant, M.A.; Cordell, H.K.; Kibler, T.L. 1997. Measuring perceived crowding for high density river recreation: the effects of situational conditions and personal factors. Leisure Sciences. 19(2): 97–112.

Tarrant, M.A.; English, D.B.K. 1996. A crowding-based model of social carrying capacity: applications for recreational boating use. Journal of Leisure Research. 28(3): 155–168.

Tarrant, M.A.; Green, G.T. 1999. Outdoor recreation and the predictive validity of environmental attitudes. Leisure Sciences. 21(1): 17–30.

Tarrant, M.A.; Haas, G.E.; Manfredo, M.J. 1995. Factors affecting visitor evaluations of aircraft overflights of wilderness. Society and Natural Resources. 8: 351–360.

Tarrant, M.A.; Shafer, C.S. 1997. Condition indicators for distinct wilderness: is there uniformity? International Journal of Wilderness. 3(4): 29–33.

Tarrant, M.A.; Shafer, C.S. 1998. A comparison of preferred experiences and setting conditions in one eastern and one western wilderness area. In: Kulhavy, D.L.; Legg, M.H., eds. Wilderness and natural areas in Eastern North America. Nacogdoches, TX: Stephen F. Austin State University, A Center for Applied Studies in Forestry Publication: 200–204.

Teasley, R.J.; Bergstrom, J.C.; Cordell, H.K. 1993. Assessing the revenue-capture potential from recreational fees. In: Proceedings of the 1993 southeastern recreation research conference. Gen. Tech. Rep. SE–90. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 7–17.

Teasley, R.J.; Bergstrom, J.C.; Cordell, H.K. [and others]. 1997. The use of private lands in the U.S. for outdoor recreation: results of a nationwide survey. UGA Fac. Ser. 97–19. Athens, GA: University of Georgia. 102 p.

Teasley, R.J.; Bergstrom, J.C.; Cordell, H.K. [and others]. 1999. Private lands and outdoor recreation in the United States. In: Outdoor recreation in American life: a national assessment of demand and supply trends. Champaign, IL: Sagamore Publishing: 183–218.

Thigpen, J.; Siderelis, C. 2001. North Carolina Coastal Plains paddle trails initiative: the State of North Carolina coastal paddling survey. Sea Grant Publ. UNC–SG–01–06. Raleigh, NC: North Carolina State University, North Carolina Sea Grant. 81 p.

Townsend, C.T.; Tarbet, D.D. 1982. Attitudes of Chattooga River users. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Ecology: 207–226.

Tyre, G.L.; Siderelis, C.D. 1979. Instant-count sampling: a technique for estimating recreation use in municipal settings. Leisure Science. 2(2): 173–179.

U.S. Census Bureau. 2002. Poverty in the United States: 2001. http://www.census.gov/hhes/www/poverty.html. [Date accessed: September 30, 2003].

U.S. Department of Agriculture, Forest Service. 1980. An assessment of the forest and range land situation in the United States. Washington, DC: U.S. Government Printing Office. 631 p.

U.S. Department of the Interior, National Park Service. 1986. Federal recreation fee report. Washington, DC: U.S. Government Printing Office. [Not paged].

Van Cleave, R.L.; Franz, C.P.G.; Franz, D.L., Jr. [and others]. 1991. Attitudes, perceptions, and characteristics of summer visitors to the Great Smoky Mountains region. In: 1990 southeastern recreation research conference. Gen. Tech. Rep. SE–67. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 141–162. Vol. 12.

Van der Smissen, B. 1963. Summary of forest recreation research. In: Proceedings of the national conference on outdoor recreation research. Ann Arbor, MI: U.S. Department of the Interior, Bureau of Outdoor Recreation. 240 p.

Wagar, J.A. 1964. The carrying capacity of wildlands for recreation. Forest Science Monograph. 7. 23 p.

Walker, G.; Hull, R.B.; Roggenbuck, J.W. 1998. On-site optimal experiences and their relationship to off site benefits. Journal of Leisure Research. 30(4): 453–471.

Watson, A., comp. 1989. Outdoor recreation benchmark 1988: Proceedings of the national outdoor recreation forum. Gen. Tech. Rep. SE–52. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 498 p.

Watson, A.E.; Cordell, H.K. 1988. Achieving a "standing" for outdoor recreation through secondary economic impact assessments. The Journal of Physical Education, Recreation and Dance. April: 55–56.

Watson, A.E.; Cordell, H.K. 1991. Impacts of resource-based tourism on local income and employment. Gen. Tech. Rep. RM–196. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 46–56.

Watson, A.E.; Cordell, H.K.; Hartmann, L.A. 1989. Characteristics of wilderness users in outdoor recreation assessments. In: Proceedings, national symposium on social science in resource management. Corvallis, OR: Oregon State University, College of Forestry: 1–10.

Watson, A.E.; Roggenbuck, J.W.; Odum, G. 1987. Wilderness use estimates. In: Proceedings of the southeastern recreation research conference. Athens, GA: University of Georgia, Institute of Community and Area Development, Recreation Technical Assistance Office: 127–134.

Wellman, J.D. 1987. Wildland recreation policy: an introduction. New York: John Wiley. 278 p.

Wellman, J.D.; Belcher, E.H. 1989. Managerial perspectives on determining appropriate river use. Final report. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 115 p.

Wellman, J.D.; Buhyoff, G.J. 1980a. Effects of regional familiarity on landscape preferences. Journal of Environmental Management. 11: 105–110.

Wellman, J.D.; Buhyoff, G.J. 1980b. Off-road vehicle use and social conflict at Cape Hatteras National Seashore. Contract CX5000071235. Blacksburg, VA: Virginia Polytechnic Institute and State University. 155 p.

Wellman, J.D.; Dawson, M.S.; Roggenbuck, J.W. 1981. Park managers' predictions of the motivations of visitors to two National Park Service areas. Journal of Leisure Research. 14(1): 1–15.

Wellman, J.D.; Hawk, E.G.; Roggenbuck, J.W.; Buhyoff, G.J. 1980. Mailed questionnaire surveys and the reluctant respondent: an empirical examination of differences between early and late respondents. Journal of Leisure Research. 12(2): 164–173.

Wellman, J.D.; Killeen, K. 1979. Problem analysis of social conflicts associated with river recreation in the Southern Appalachians. Final report. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 83 p.

Wellman, J.D.; Marans, R.W. 1981. The value of time budgets in research and planning for recreation populations. Journal of Environmental Systems. 11(4): 325–340.

Whittaker, P.L. 1978. Comparison of surface impact by hiking and horseback riding in the Great Smoky Mountain National Park. Great Smoky Mt. NP Manage. Rep. 24. Gatlinburg, TN: U.S. Department of the Interior, National Park Service, Uplands Field Research Laboratory. 32 p.

Wood, G.; Guynn, D.; Hammitt, W.E. [and others]. 1996. Determinants of satisfaction for participants of quality deer management. Wildlife Society Bulletin. 24(2): 318–324.

Wright, B.A.; Cordell, H.K.; Brown, T.L. 1989. Public recreational access: a national study of policies and practices of private landowners. In: Social science in natural resource recreation management. Boulder, CO: Westview Press: 181–198.

Yuan, S.; Maiorano, B.; Yuan, M. [and others]. 1995. Techniques and equipment for gathering visitor use data on recreation sites. Tech. Rep. 9523–2838–MTDC. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology Development Center. 76 p.

Zawacki, W.T.; Marsinko, A.; Bowker, J.M. 2000. A travel cost analysis of nonconsumptive wildlife-associated recreation in the United States. Forest Science. 46(4): 496–506.

Nontimber Forest Products Literature

Amoroso, J. 2002. Wild ideas: the odor of Galax. Chinquapin. 10(2): 12.

Andersson, M.E. 1993. Aluminium toxicity as a factor limiting the distribution of *Allium ursinum* (L.). Annals of Botany. 72: 607–611.

Beattie, A.; Culver, D.C. 1982. Inhumation: how ants and other invertebrates help seeds. Nature. 297(5868): 627.

Bennett, B.C.; Bell, C.R.; Boulware, R.T. 1990. Geographic variation in alkaloid content of *Sanguinaria canadensis* (Papaveraceae). Rhodora. 92(870): 57–69.

Blanche, C.A.; Brown, M.A.; Knowles, R.L. 1997. Pine straw production: a new component of selected silvopastoral systems. Agricultural Research Service. http://www.nal.usda.gov/ttic/tektran/data/000008/55/0000085578.html. [Date accessed: September 30, 2003].

Blanche, C.A.; Carino, H.F. 1997. Pine straw harvesting as an agroforesty enterprise: financial and nutritional impact. http://www.nal.usda.gov/ttic/tektran/data/000008/76/0000087657.html. [Date accessed: September 30, 2003].

Brauer, D.; Blanche, C.A.; Feldhake, C.; Schumann, C. 2002. Evaluating forestry product quality: agroforestry systems to produce alternative complimentary crops. 4 p. http://marketingoutreach.usda.gov/info/99Manual/forestry.htm. [Date accessed: September 24, 2003].

Brundrett, M.C.; Kendrick, B. 1988. The mycorrhizal status, root anatomy, and phenology of plants in a sugar maple forest. Canadian Journal of Botany. 66: 1153–1173.

Burton, T.L.; Husband, B.C. 1999. Population cytotype structure in the polyploid *Galax urceolata* (Diapensiaceae). Heredity. 82: 381–390.

Calvey, E.M.; Matusik, J.E.; White, K.D. [and others]. 1997. Allium chemistry: supercritical fluid extraction and LC-APCI-MS of thiosulfinates and related compounds from homogenates of garlic, onion and ramp. Identification in garlic and ramp and synthesis of 1 propanesulfinothioic acid S-Allyl Ester. Journal Agricultural Food Chemistry. 45(11): 4406–4413.

Carotenuto, A.; Feo, V.; Fattorusso, E. 1996. The flavonoids of *Allium ursinum* . Phytochemistry. 41(2): 531–536.

Chamberlain, J.; Bush, R.; Hammett, A.L. 1998. Non-timber forest products: the other forest products. Forest Products Journal. 48(10): 2–12.

Chamberlain, J.L. 2000. The management of national forests of Eastern United States for non-timber forest products. Blacksburg, VA: Virginia Polytechnic Institute and State University, College of Natural Resources. 250 p. Ph.D. dissertation.

Chamberlain, J.L.; Bush, R.J.; Hammett, A.L.; Araman, P.A. 2002. Eastern national forests: managing for non-timber products. Journal of Forestry. 100(1): 8–14.

Czerwinski, Z.; Jakubczyk, H.; Petal, J. 1971. Influence of ant hills on meadow soils. Pedobiologia. 11: 277–285.

Damm, D.D.; Curran, A.; White, D.K.; Drummond, J.F. 1999. Leukoplakia of the maxillary vestibule—an association with Viadent? Oral and Maxillofacial Pathology. 87(1): 61–66.

Davis, J. 1997. Ginseng: a production guide for North Carolina. Raleigh, NC: North Carolina Cooperative Extension Service. 11 p.

DeMars, B.G. 1996. Vesicular-arbuscular mycorrhizal status of spring ephemerals in two Ohio forests. Ohio Journal of Science. 96(4/5): 97–99.

Drisko, C.H. 1998. The use of locally delivered doxycycline in the treatment of periodontitis: clinical results. Journal of Clinical Periodontology. 25(11, part 2): 947–952.

Duryea, M.; Edwards, J. 1992. Pine straw management in Florida's forests. University of Florida Circ. 831. 9 p. http://www.sfrc.ufl.edu/Extension/pubtxt/cir831.html. [Date accessed: September 24, 2003].

Evans, E. 2000. *Galax aphylla*. Wildflower/Plant Fact Sheets/Consumer Horticulture. http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/wildflowers/galax_aphylla.html. [Date accessed: September 24, 2003].

Fern, K. 1997–2000. The species database. http://www.comp.leeds.ac.uk/pfaf/D_intro.html. [Date accessed: September 24, 2003].

Grieve, M. 1931. A modern herbal. New York: Harcourt, Brace & Company. 888 p. 2 vol.

Hamel, P.B.; Chiltoskey, M.U. 1975. Cherokee plants and their uses: a 400 year history. Sylva, NC: Herald Publ. Co. 65 p.

Handel, S.N. 1976. Dispersal ecology of *Carex pedunculata* (Cyperaceae), a new American mymecochore. American Journal of Botany. 63: 1071–1079.

Hanes, C.R. 1953. *Allium tricoccum* Ait., var. Burdickii, var. nov. Rhodora. 55: 243.

Hanes, C.R.; Ownbey, M. 1946. Some observations on two ecological races of *Allium tricoccum* in Kalazoo County, Michigan. Rhodora. 48: 61–63.

Hankins, A. 2000. Producing and marketing wild simulated ginseng in forest and agroforestry systems. Virginia Coop. Ext. Publ. 354–312. 7 p. http://www.ext.vt.edu/pubs/forestry/354_312/354_312.html. [Date accessed: September 30, 2003].

Hannah, J.J.; Johnson, J.D.; Kuftinec, M.M. 1989. Long-term clinical evaluation of toothpaste and oral rinse containing sanguinaria extract in controlling plaque, gingival inflammation, and sulcular bleeding during orthodontic treatment. American Journal of Orthodontics and Dentofacial Orthopedics. 96: 199–207.

Harper, D.S.; Mueller, L.J.; Fine, J.B. [and others]. 1990. Effect of 6 months use of a dentifrice and oral rinse containing sanguinaria extract and zinc chloride upon the microflora of the dental plaque and oral soft tissues. Journal of Periodontology. 61(6): 359–363.

Hathaway, W. 2002. Galax or beetleweed. Hathaway's virtual trail, hilltop trail-10. http://www.pcs.k12.va.us/vtrail/galax.htm. [Date accessed: September 25, 2003].

Haughton, C. 2003. Purple sage herb profiles. http://www.purplesage.org.uk/. [Date accessed: September 25].

Hauslohner, A.W. 1997. Couple builds green empire with pine-roping outfit. Roanoke [VA] Times. December 6, Metro Edition, A (col. 1).

Heithaus, E.R. 1981. Seed predation by rodents on three ant-dispersed plants. Ecology. 62(1): 136–145.

Hendershot, D. 2002. The naturalist's corner. Smoky Mountain [NC] News. April 3. http://www.smokymountainnews.com/issues/04_02/04_03_02/out_naturalist.html. [Date accessed: September 25, 2003].

Horticopia, Inc. 2002. *Galax urceolata*. Horticopia plant information. http://www.hortpix.com/pc1904.htm. [Date accessed: September 25, 2003].

Hufford, M. 1997. American ginseng and the culture of the commons. The Library of Congress, American Folklife Center, Folklife Center News, Washington, DC. Winter-Spring. Vol. XIX (1&2). http://loc.gov/folklife/fcn/WinterSpring97.txt. [Date accessed: September 25, 2003].

Jones, A.G.; Shildneck, P. 1980. A note on the distribution of wild leek in Illinois. Academy of Science. 72(3): 56–59.

Kauffman, G.; Danley, D.; Simon, S.; McNab, W.H. 2001. Experimental harvest of fraser-fir, log moss, and galax: determining growth and yield. In: USFS forest botanical products program of work: maintaining sustainability and responding to socio-economic needs in the Southern Appalachians. http://www.cs.unca.edu/nfsnc/resources/forest_botanicals.pdf. [Date accessed: October 30, 2003].

Kelly, L.A. 1996. Short-term effects of longleaf pine straw raking on plant diversity and community dynamics in Croatan National Forest, North Carolina. Raleigh, NC: North Carolina State University. 206 p. Ph.D. [thesis].

Krochmal, A.; Walters, R.S.; Doughty, R.M. 1969. A guide to medicinal plants of Appalachia. Res. Pap. NE–138. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 291 p.

Lehmann, N.L.; Sattler, R. 1993. Homeosis in floral development of *Sanguinaria canadensis* and *S. canadensis* 'multiplex' (Papaveraceae). American Journal of Botany. 80(11): 1323–1335.

Litton, C.M. 1994. Impact of a pine straw raking regime on the vegetation and litterfall of a natural longleaf pine (*Pinus palustris* Mill.) ecosystem. Raleigh, NC: North Carolina State University. 96 p. M.S. thesis.

Marshall, D.L.; Beattie, A.J.; Bollenbacher, W.E. 1979. Evidence for diglycerides as attractants in ant-seed interaction. Journal of Chemical Ecology. 5: 335–344.

Miller, R.A. 1988. Native plants of commercial importance. Grants Pass, OR: OAK, Inc. 343 p.

Morris, L.A.; Jokela, E.J.; O'Connor, J.B. 1992. Silvicultural guidelines for pinestraw management in the Southeastern United States. Georgia For. Res. Pap. 88. Georgia Forestry Commission. 11 p. http://www.gfc.state.ga.us/Publications/Educational/WoodUtilization/GFRP88.pdf. [Date accessed: September 30, 2003].

Nantel, P.; Gagnon, D.; Nault, A. 1996. Population viability analysis of American ginseng and wild leek harvested in stochastic environments. Conservation Biology. 10: 608–621.

National Forests in North Carolina. 2000. Forest botanicals: a program of work. Asheville, North Carolina. 35 p. http://www.cs.unca.edu/nfsnc/resources. [Date accessed: September 26, 2003].

Nault, A.; Gagnon, D. 1987. Some aspects of the pollination ecology of wild leek, *Allium tricoccum* Ait. Plant Species Biology. 2: 127–132.

Nault, A.; Gagnon, D. 1988. Seasonal biomass and nutrient allocation patterns in wild leek (*Allium tricoccum* Ait.), a spring geophyte. Bulletin of the Torrey Botanical Club. 115: 45–54.

Nault, A.; Gagnon, D. 1993. Ramet demography of *Allium tricoccum* , a spring ephemeral, perennial forest herb. Journal of Ecology. 81: 101–119.

Nesom, G.L. 1983. Galax (Diapensiaceae): geographical variation in chromosome number. Systematic Botany. 8: 1–14.

Noland, D. 1997. Galax leaves. Introduction to floral design: cut flower identification and use. http://classes.aces.uiuc.edu/NRES107/galax.htm. [Date accessed: September 26, 2003].

Ody, P. 1993. The complete medicinal herbal. New York: DK Publishing. 192 p.

Plyler, Sheri C. 2001–2002. Indian Spring herbal encyclopedia. http://www.indianspringherbs.com/index.htm. [Date accessed: September 26, 2003].

Porcher, F.P. 1970. Resources of the southern fields and forests. 2d ed. New York: Amo Press. 601 p.

Pudlo, R.J.; Beattie, A.J.; Culver, D.C. 1980. Population consequences of changes in an ant-seed mutualism in *Sanguinaria canadensis*. Oecologia. 146: 32–37.

Reed, D. 2001. Galax (*Galax urceolata*). Wildflowers of the Eastern United States. http://www.2bnthewild.com. [Date accessed: September 26, 2003].

Robbins, C. 1998. American ginseng: the root of North America's medicinal herb trade. Washington, DC: TRAFFIC North America. 94 p.

Russell, A.B. 1997. Poisonous plants of North Carolina. North Carolina State University, Department of Horticultural Science. http://www.ces.ncsu.edu/depts/hort/consumer/poison/poison.htm. [Date accessed: September 30, 2003].

Sanders, J. 1995. Hedgemaids and fairy candles: the lives and lore of North American wildflowers. Camden, ME: International Marine/Ragged Mountain Press. 232 p.

U.S. Census Bureau. 2002. Poverty in the United States: 2001. http://www.census.gov/hhes/www/poverty.htmlhttp://www.census.gov/hhes/www/poverty01.html. [Date accessed: September 30, 2003].

Whanger, P.D.; Ip, C.; Polan, C.E. [and others]. 2000. Tumorigenesis, metabolism, speciation, bioavailability, and tissue deposition of selenium in selenium-enriched ramps (*Allium tricoccum*). Journal of Agricultural and Food Chemistry. 48(11): 5723–5730.

Wild, C.M. 1993. Effects of pine straw removal on slash pine (*Pinus elliottii*) growth and soil productivity. Gainesville, FL: University of Florida. 65 p. M.S. thesis.

Wolters. G.L. 1972. Responses of southern bluestems to pine straw mulch, leachate, and ash. Journal of Range Management. 25(1): 20–23.

Woodland Owner Notes. 1995. Producing longleaf pine straw. North Carolina Coop. Ext. Ser. 5 p. http://www.ces.ncsu.edu/nreos/forest/woodland/won-18.html. [Date accessed: September 30, 2003].