

## Chapter 6



## CHALLENGES TO FOREST RESOURCE MANAGEMENT AND CONSERVATION

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### Introduction

**S**outhern forests produce many ecosystem goods and services, such as clean water, timber, recreation, and wildlife. However, these forests—particularly those in the interface—are changing. Forest tract size is decreasing, and the number of forest owners is increasing. These new forest owners may have different management objectives than long-term residents, emphasizing noncommodity goods and services. At the same time, society's demands on forest resources are expanding. These changes set the stage for innovative management and conservation alternatives. This chapter begins by addressing some of the main issues affecting the management of interface forests. It then addresses the changes and challenges, new approaches and trends, and needs for five major aspects of forest resource management in the interface. Finally, we conclude with a summary of overall management needs. ►





## THE FOREST STEWARDSHIP PROGRAM

Private individuals own most of the South's forest lands, many of which need financial and technical assistance to actively manage their forests. To address these needs, Congress enacted the Forest Stewardship Program in 1990. This program has integrated multiple landowner objectives into management planning. The Forest Stewardship Program helps private landowners develop plans designed to increase the economic value of their forests while maintaining their environmental integrity for future generations. In addition, the Stewardship Incentives Program was established to provide financial assistance for conservation practices. This program could be adapted to interface forests.

## Managing Forests under Change

As rural land is converted to urban uses, the ways in which nearby private and public forests are valued and managed change a great deal. As one moves along the spectrum from rural to urban, forests become more valued for their non-commodity benefits, such as wildlife viewing and aesthetics. Managers of interface forests must be more prepared than their rural counterparts to deal with human influences and interactions.

Interface forests are changing hands. Sampson and DeCoster (2000) found that there are roughly 150,000 new landowners every year across the United States. In the South, a 12-percent increase in forest landowners was observed from 1978 to 1993 (Wear and Greis, in press). These new owners often have different management objectives than their predecessors or may not know where to go for forestry information (DeCoster 1998). Fifty-nine percent of the approximately 5 million individual nonindustrial private forest (NIPF) landowners in the South emphasize improving wildlife, water, aesthetics, and other natural components on their land as their primary or secondary objective. Only 7 percent of landowners list making money as their primary goal (see chapter 2, fig. 2.7).

Additionally, tract sizes are decreasing. Out of the approximately 5 million landowners in the South, 4.1 million own < 50 acres (Wear and Greis, in press). Traditional forest management is seldom applicable to the smaller tracts in the interface; new management options for these forests are thus required.

Managers of public forests and other large forest tracts lying close to cities are also faced with many challenges. Some of the major issues confronting managers of urban national forests (Dwyer and others 2000) are:

- ◆ Greater use of the forest;
- ◆ Pressures from adjacent owners;
- ◆ Development along their boundaries;
- ◆ Concerns over landscape views, trash, fire, invasive plants and animals;
- ◆ Higher degree of visibility to a greater population; and
- ◆ More complex planning and decisionmaking.

The composition, structure, and function of forest ecosystems in the interface are changing due to stresses such as pollution, land use conversion, and introduction of invasive exotic species (**fig. 6.1**) (see chapter 5). An example of a southern landscape-level stress is the current outbreak of the southern pine beetle (*Dendroctonus frontalis* Zimmermann). These beetles increase their populations after natural and human-caused stress events, such as droughts, hurricanes, and

***“Two thirds of the state is in forest cover. The trend is an increasing amount of forest cover. But if we could see property lines out there, we’d see many, many more forest landowners owning smaller and smaller parcels of forestland.” Virginia***

urban development (Personal communication. 2001. James Meeker, Forest Entomologist, Florida Division of Forestry, Forest Health Section, 1911 SW 34<sup>th</sup> St., Gainesville, FL 32608). Two recent outbreaks in Florida originated in urban areas and spread outward to forests in the interface (**fig. 6.2**). Management to reduce these imposed stressors on forest ecosystems will involve a landscape perspective, which includes the management of adjacent ecosystems. Most management recommendations to sustain healthy forests emphasize minimizing stress due to altered energy, species, and materials flowing into and out of ecosystems. Landscape-level management that incorporates ecological, social, and physical components of several ecosystems is necessary to solve these complex challenges to forest health (see chapter 5).

Management and conservation of forest resources in the interface are further challenged by scale. Federal laws, such as the Endangered Species Act or the Clean Water Act, may impact the whole southern region. State laws and growth management planning may affect forest ecosystems at a State level (see chapter 4). Counties also are seeking to influence their surrounding forests. In 1999, out of 102 local initiatives voted on in the United States to devote public funding to protect open space, 90 percent won approval, committing \$7.3 billion (Land Trust Alliance 2001). At local levels, developers are often seeing the benefit of green space and clustered housing, and local governments are adopting ordinances to foster forest and water resource conservation (see chapter 4). All these levels of government, citizenry, and private enterprise affect forest management at all scales from backyards to large forested tracts.



Photo by Hans Rielkerk, University of Florida

**Figure 6.1**  
The interface has many new inputs, such as invasive species and pollution.



Photos courtesy of USDA Forest Service

**Figure 6.2**  
Southern pine beetle outbreaks occur after major stress events, such as droughts, hurricanes, and urbanization.

**Figure 6.3**

As demands for water-based recreational activities increase, there are also concerns with assuring that there are adequate water supplies for wildlife and aquatic species habitat.



Photos courtesy of USDA Forest Service



## REDUCING RUNOFF

Some new approaches for reducing runoff are initiated at the planning and design phases of development and include incorporating less impervious surfaces and cluster development, which results in more green space. Austin, TX, for example, has developed environmental protection and management plans for 11,000 acres of greenbelt to preserve such unique water bodies as Barton Springs, a park with a natural limestone pool in the center of Austin.

## Managing Water Resources

**Changes and challenges**—Forests play a critical role in the earth’s water cycle. About 80 percent of the Nation’s fresh water originates in forests. Forests absorb water, refilling underground aquifers. They cool and cleanse the water, slow storm runoff, reduce flooding, sustain watershed stability and resilience, and provide critical habitat for fish and wildlife (U.S. Department of Agriculture, Forest Service 2000). These benefits are threatened, however, when forests are converted to other uses (see chapter 2, fig. 2.14).

Traditionally, water-quality concerns in the South have revolved around activities such as mining, livestock operations, agriculture, and some forestry activities. The loss of forest land to urban land uses, however, has a far greater affect on water quality (Minahan 2000). Today urbanization is the most pressing land use issue affecting water quality and quantity. The growing population of the South is demanding ever-larger water supplies. Large metropolitan areas, such as Atlanta, GA, rely on upland watersheds to supply their water. In addition, increasing numbers of people are settling and recreating on the primary watersheds for large cities (Minahan 2000). Demand for water-based recreation is also increasing, and there are concerns with assuring adequate water supplies for wildlife and aquatic species habitat (fig. 6.3).

*“ . . . Whatever happens upstream impacts the downstream area. So if you have a fellow that builds a pond on the headwaters and it warms the water, then the folks downstream don’t have trout in their stream.” Georgia*

With demands for water increasing, allocation issues present significant challenges for resource managers, scientists, and citizens. Serious conflicts are emerging over allocation of high-quality, abundant flows of water for many purposes (U.S. Department of Agriculture, Forest Service 2000). Increased demands for water also place increased pressure on public lands, such as national forests, to protect water supplies while at the same time providing recreation opportunities.

When forests at the interface are replaced by impervious surfaces, such as buildings, paved streets, and parking lots, the water cycle is interrupted with some of the following consequences:

- ◆ Infiltration of water into soil decreases;
- ◆ Stormwater runoff increases, and it must be managed and accommodated in sewers, canals, or other structures;
- ◆ Water quality decreases as pesticides, fertilizers, trace metals, and other pollutants are concentrated in the runoff;
- ◆ Shallow and deep infiltration decreases;
- ◆ Erosion of unprotected soils increases, leading to sedimentation in streams and rivers; and
- ◆ Evaporation of water decreases as does its associated cooling effect.

Other concerns from urbanization are the increased need for wastewater treatment and the effects of septic system failures on water quality. To delay the need for sewer system extensions and improvements in interface areas, many residential areas install densely placed septic tanks that are highly susceptible to failures and are the chief contributor of fecal coliform contamination (Minahan 2000). This contamination can result in economic and human health concerns. Nonpoint-source pollution is also a major concern. Sources are widely dispersed across the landscape and are difficult to pinpoint or regulate. Thus, the challenge is to balance population growth and economic needs with the protection of human health and water resources. There is also the challenge of educating those upstream about the “downstream effect”—helping people to realize that what they do on their land affects those who use water downstream.

Managing forest ecosystems at a watershed scale is a pressing challenge for resource managers. Previous land management decisions often were made independent of other human activities on watersheds. Consequently, the cumulative effect of incremental changes in land cover was never assessed, and water quality and quantity declined. To effectively manage water resources, a watershed approach is mandatory. A watershed approach provides a framework to design the optimal mix of land covers, minimize the effects on water resources, and coordinate management priorities across land ownerships. The challenges of managing on a watershed scale, however, are many. Most management strategies are not on a scale commensurate with issues at the watershed scale. Local control or management for system components often takes precedence over systemwide needs. Data are not collected and analyzed on watershed scales. Similarly, the scale of monitoring is too small. There is also a lack of long-term commitment to assess cumulative effects, and it often is not economically feasible to study, manage, and restore at such large scales (Naiman 1992).

Needs—Research is needed to discover:

- ◆ Accurate information on how much water comes off forested lands (including national forests), where it flows, and how it is used;
- ◆ Long-term hydrological impacts and changes to water at the interface [efforts like the Baltimore Ecosystem Study are needed (Doheny 1999)];
- ◆ The role that urban forests play in improving water quality and quantity;



## NATURESCAPING FOR CLEAN RIVERS

The program “Naturescaping for Clean Rivers” seeks to improve the quality and reduce the quantity of water reaching storm drains and eventually the aquatic systems in Portland, OR. Workshops teach homeowners how to establish and manage their landscape with native plants that require much less water, fertilizers, chemicals, and mowing.

## WATERSHED PROTECTION AND FLOOD PREVENTION PROGRAM

The U.S. Department of Agriculture, Natural Resources Conservation Service, Watershed Protection and Flood Prevention Program works through local government sponsors and helps participants solve natural resource and related economic problems on a watershed basis. Projects include watershed protection, flood prevention, erosion and sediment control, water supply, water quality, fish and wildlife habitat enhancement, wetlands creation and restoration, and public recreation in watersheds of 250,000 or fewer acres (Minahan 2000).

- ◆ Interactions among multiple land uses and cumulative effects over time across large landscapes;
- ◆ Information to relate water-quality standards to the effectiveness of individual control measures;
- ◆ The connections between water-quality standards and specific non-point-pollution sources;
- ◆ New strategies for managing mixed-ownership watersheds;
- ◆ Methods for large-scale watershed restoration;
- ◆ Methods of developing land with water conservation in mind;
- ◆ Ways to retain natural attributes such as streams, springs, ponds, wetlands, and lakes;
- ◆ New conservation practices and methods for reusing wastewater; and
- ◆ Information about the use of riparian buffers around streams in interface and urban situations.

Educational efforts and collaborative approaches should center on:

- ◆ Improved public awareness and general understanding of watershed issues, how their everyday actions affect water quality and quantity, and the value of reducing water consumption and improving conservation efforts;
- ◆ Long-term stewardship programs that include identification of impact sources, monitoring, annual clean-up outings, streamside and lake-shore vegetation maintenance, and restoration projects;
- ◆ Programs for developers that demonstrate new designs, plans, and cost savings associated with less impervious surfaces and better stormwater management;
- ◆ Wetland and riparian buffer protection programs;
- ◆ Demonstration cost-sharing projects that encourage landowners to minimize nonpoint-source pollution by using best management practices; and
- ◆ Collaborative partnerships among potential and existing water users at watershed scales to achieve long-term, sustainable watershed health (U.S. Environmental Protection Agency 1998).

## Managing for Traditional Forest Products

**Changes and challenges**—Southern forests make up 40 percent of U.S. timberland, and the forest industry employs more than 660,000 people in the South. Indirectly, the industry accounts for another 1.7 million jobs in the region (Faulkner and others 1998) (**fig. 6.4**). Projections show that the South will continue to be the Nation's leading source of timber, and there are great opportunities to increase timber production on private forests (Cubbage and others 1999). While they are providing traditional forest products, such as timber and fiber, these forests also help maintain areas in green space and provide many other ecosystem goods and services. However, when these lands are within the interface, their management and conservation become increasingly difficult.

The South has a high portion of forests near metropolitan areas where many interface forests are located. Dwyer and others (2000) found that the South had the most cities with forests within 50 miles than any other part of the United States. The highest rural land prices are found in these metropolitan counties, which bring about a corresponding increase in the costs of producing timber there. Because of this, selling interface forests for real estate can be more profitable for both industry and NIPF owners than timber production (see chapter 3). The perceived impermanence of land use in the interface can discourage landowners from making long-term forestry investments in metropolitan counties (Wear and others 1999).

For these reasons, it is not surprising that studies are indicating that timber production decreases the closer forests are to urban areas. Wear and others (1999) report that there is little opportunity for practicing forestry for timber production near population densities of 150 people per square mile or more. Another study in Mississippi and Alabama also illustrated that proximity to urban land uses, higher population densities, and proximity to urban centers all lead to lowered timber-harvesting rates (Barlow and others 1998). For timber production to remain relevant in the interface, private landowners must be able to afford to retain and manage these forests for both timber and the noncommodity goods and services that they provide.

As more people are in close contact with traditional forest management practices, there is more potential for conflict between people who hold different sets of perceptions and values over how or if forests should be managed (Vaux 1982). Public concerns over forest management practices range from environmental concerns over erosion, herbicide use, and maintaining an adequate tree cover to complaints about noise and dust from forestry operations. Increasingly these public concerns are translating into the development of local ordinances that regulate forestry practices (see chapters 4 and 7). This can impact the amount of timber available and the cost of transporting it. Recent studies have shown, however, that a majority of both the general public and NIPF owners support environmental protection and even regulation if necessary (Bliss and others 1993, 1997).

The challenge is for local governments, industry and NIPF owners, and the public to work together to develop innovative solutions that meet the needs of all of the involved stakeholders. Working with the public to demonstrate how sound forest management protects environmental values is critical. The collaboration of forest industry with local units of government can lead to productive relationships that benefit both industry and public interests. These relationships can help increase awareness of the benefits of retaining land in working forests while assuring that citizens' concerns are taken into account.

Because of the changing economic and sociopolitical environment in the interface, traditional forest management may need to be adapted to these special conditions to maintain relevance. Modified practices may include changes in harvest size and location and the use of shelterwood and partial cuts. The use of fire and herbicides for removing understory may also be limited (Bradley 1984). The challenge is to adapt forestry practices to the changing conditions and transitioning values in the interface while maintaining the cost effectiveness of management. Otherwise, the landowner may be forced to consider more profitable options (Bradley 1984).

Where timber production is not an option, nontimber commodity products may be viable alternatives for landowners. Examples of such products include pine straw, firewood, nuts, and medicinal plants. These products may have more relevance for owners of small tracts (see chapter 7). However, much still needs to be known about their management and market potential.<sup>1</sup> Managing forests for carbon sequestration also has potential in the interface. The challenge for foresters



Photo by Tim White, University of Florida

**Figure 6.4**  
Forest industry in the South produces commodities valued in excess of \$90 billion, employs more than 660,000 people, and indirectly accounts for another 1.7 million jobs (Faulkner and others 1998). However, challenges for managing forest lands for traditional forest products in the interface are growing.



## THE FOREST LEGACY PROGRAM

The Forest Legacy Program works in partnership with States to protect environmentally sensitive forest land from conversion to nonforest uses through acquisition and conservation easements (Beauvais 2000). States develop plans that identify environmentally important private forests facing urbanization. These targeted private forests are then eligible for matching funds from Federal and non-Federal sources of up to 75 percent for the acquisition of conservation easements (see chapter 4). Most of the Forest Legacy Acquisition Projects to date have been in the Northeastern and Western United States; but North Carolina, South Carolina, Tennessee, Virginia, Georgia, and Alabama are participating, and Kentucky is beginning the planning process.

*“Issue one for me that deals with forestry is the issue of gypsy moths and the problem of spraying for gypsy moths. I was almost sued for spray going onto someone else’s property, which is almost impossible to prevent when you’re spraying by air. You’re trying to save your own investment, yet you run the risk of legal problems from the public at large.” Virginia*



## CARBON SEQUESTRATION

Carbon dioxide (CO<sub>2</sub>) in the atmosphere is increasing globally and is the principal contributor to global warming. The two main sources of CO<sub>2</sub> are the burning of fossil fuels and deforestation (Houghton and others 1996). Catastrophic fires in the interface, caused by large fuel buildups, rapidly release large amounts of CO<sub>2</sub>. Forest ecosystems store carbon, and exchanging them for asphalt and concrete lowers carbon (C) sequestration. Urban trees often are less healthy and are slower growing than those in natural forests, contributing very little to C sequestration (Rowntree and Nowak 1991). Young, fast-growing forests accumulate C at a greater rate than old forests (Clausen and Gholz 1999). If healthy, fast-growing interface forests can be sustained, C sequestration can be one of their global contributions. Forests at the interface also cool and shade structures in the summer, reducing fossil fuel consumption.

is to adapt to these diverse management needs and scales. Adapting will require new skills, knowledge, and tools.

Small parcels, multiple owners, and conflicting objectives complicate coordinated management on larger ecosystem scales, such as watersheds. Management across ownerships can ensure healthy ecosystem function while providing the desired goods and services of forests. Partnerships among private landowners and private organizations can help overcome the challenges of managing on a landscape scale.

Needs—Research is needed to develop:

- ◆ Models for managing across multiple ownerships and technologies that address a wider variety of management objectives;
- ◆ Effective options for maintaining working forests in the interface (see chapter 4);
- ◆ Workable solutions for managing the increasing number of small NIPF parcels;
- ◆ Ways to market forestry information and services for small tracts;
- ◆ Techniques for incorporating new neighbors into forestry decisionmaking;
- ◆ Management and market potential of nontimber forest products;
- ◆ Alternatives to public policies that discourage forest management (see chapters 3 and 4);
- ◆ Technologies for identifying critical forest lands for conservation efforts; and
- ◆ Costs and benefits of different forest management schemes in the interface.

Tools, incentives, collaboration, and education needs include:

- ◆ Adoption of the National Coalition for Sustaining America’s Nonfederal Forests’ (2000) Report recommendations proposing education, research, extension, and outreach for stewardship of private forests;
- ◆ Landscape- or community-level partnerships and cooperatives for forest management;

<sup>1</sup>Virginia Polytechnic Institute and State University, Center for Forest Products Marketing and Management. 2001. Non-timber forest products. <http://www.sfp.forprod.vt.edu>. [Homepage].



- ◆ Economic incentives and compensation to forest landowners for providing public values, such as riparian buffers or protection of endangered species as well as timber production;
- ◆ Targeting forestry programs addressing a range of management objectives for all sizes of tracts; and
- ◆ Educating the citizens in the interface about the importance of forests and the benefits accrued from conserving and managing them.

## Managing Fire

**Changes and challenges**—Fire is one of the most visible and demanding issues facing the wildland-urban interface. Recent wildfires in the West and South have caused millions of dollars of property damage to homes, forests, and rangeland. With decades of fuel buildup and the increasing numbers of people moving to the interface, the challenges of preventing and suppressing fires have increased, and the ability to use fire to maintain and enhance ecological processes has decreased. Temporarily successful fire suppression efforts have led to hazardous fuel buildups across the country. Fire exclusion has also produced a range of forest health and wildlife problems, such as critical epidemic insect and disease conditions and species extinctions (Wade and others 1998).

Prescribed fire is one method for removing combustible fuels and reducing the risk of uncontrolled wildfire. It also can maintain, enhance, and restore processes in fire-dependent ecosystems (Wade and others 1989) (**fig. 6.5**). The use of prescribed fire in the interface may be limited, however, due to the perceptions and attitudes of the public. Many people may not understand its benefits or may decide that the benefits are not worth the risks involved with its application. Many public health and safety issues are associated with burning. Fires can get out of control. They can reduce visibility on highways. Ash may drift into swimming

*“The ecosystems we have here are dependent on fire. If you don’t control the density and the fuel loads with prescribed fire, when they do burn, we are not going to stop them.” Florida*

pools, and smoke from fire may reduce air quality (see chapter 8). Another challenge regarding the potential use of fire is that many landowners of tracts in the interface do not want to manage their forests at all (see chapter 2). Community development standards may also encourage unsafe fire conditions.



Photo by Larry Korfmeck, University of Florida

**Figure 6.5**

Prescribed fire is one tool that fire managers can use to remove combustible fuels and reduce the risk of uncontrolled wildfire.



### THE FOREST BANK™

The Nature Conservancy’s Center for Compatible Economic Development was created in 1995 to develop new businesses, land uses, and products that help achieve conservation goals (Gilges 2000). One of its programs, The Forest Bank™, aims to form partnerships with private landowners to protect the ecological health and natural diversity of working forests while ensuring long-term economic productivity (Dedrick and others 2000). Landowners who deposit or transfer their right to grow, manage, and harvest trees are ensured a sustainably managed working forest, a dividend payment, and the right to withdraw the value of their timber in cash. The Virginia pilot study has deposits of over 650 acres of forest at a value of \$750,000.



## FLORIDA WILDFIRE MITIGATION PROGRAM

After the 1998 wildfires, the Florida Division of Forestry developed a Wildfire Mitigation Program, which includes four Wildfire Management Teams and public information officers to address hazard fuel reduction in the wildland-urban interface. Each regional team is responsible for reducing fuel accumulations in and around communities with subdivisions. They also help to suppress wildfires. The public information officers contact individuals and homeowner associations to describe the benefits of the program and discuss aspects of making their homes "FireWise." They also help identify potential areas for hazardous fuel reduction. Public awareness and education is a key factor in this program (Rhea 2000).

Because of these issues, fire management cannot be the same in the interface as in rural areas. In the South, a vast majority of land is privately owned. A dense road network in the interface provides many firebreaks; but it also brings people into forests. In the West, on the other hand, the Federal Government owns most of the undeveloped land, and the network of roads is not as well developed (Achtemeier, in press). Weather and fuel characteristics that may be optimal for burning hazardous fuel loads or for restoring wildlife habitat in rural areas may not be practical in the interface. For example, prescriptions for achieving optimal fire intensities, fuel consumption, and completeness of burn may need to be compromised to avoid excessive smoke production that could enter neighboring communities or cross highways. Different firing techniques and ignition patterns may also be needed in the interface. Although objectives for rural and interface prescribed burning may be similar, priorities shift in the interface due to human health, safety, and liability concerns. Because of this, smoke management becomes a major priority in the interface.

Where prescribed fire is not a viable option, mechanical, biological, and chemical fuel reduction methods may be needed. Although these methods may effectively reduce hazardous fuels, evidence suggests that only prescribed fire can mimic historical ecosystem processes, such as lightning (Heinselman 1973) (see chapters 5 and 8). Other methods, particularly herbicide use, may face stiffer public opposition than the use of fire or may need to be used in combination with fire to be effective (Brennan and others 1998). With any method, regular retreatment is needed to prevent hazardous fuel buildup.

Many of the homes that have sprung up in the interface are built with little consideration for fire risk or protection. Roofing and siding materials are flammable, addresses are poorly marked, access to water supplies is limited, and access for fire emergency vehicles is poor (Perry 1985). Vegetation may be allowed to grow right up to the sides of homes, with little thought for the associated risks of the building fuel loads. Fuel buildups near structures are particularly troublesome where vacation and second homes lacking year-round maintenance predominate.

The risk of fire increases as more forested and rural areas are opened up to human influences (Rice 1987). Some of these ignitions may be accidental, while many are due to arson. In either case, the frequency and risk of catastrophic wildfires grows. Firefighting agencies must have a higher degree of readiness to respond to fires in the interface due to these factors and the increased values at risk that come with urbanization (Rice 1987). All of these factors have made wild-fire protection and suppression increasingly dangerous and difficult.

Fire suppression priorities and strategies also change in the wildland-urban interface. The policy of Federal and State agencies has been to first protect life and structures and then natural resources (Cortner and Lorensen 1997). The problem is that most forest fire suppression personnel are inadequately prepared for fighting structural fires, whereas municipal fire departments are not always fully trained or equipped for wildland fire suppression (Davis 1986). The challenge is to combine structural and wildland fire expertise on interface fires and provide cross-training opportunities and effective cooperation across firefighting agencies (see chapter 8).

Needs—Research is needed to (also see chapter 8):

- ◆ Determine public perceptions about prescribed fire and wildland fire, including the barriers to actions that can reduce the risk of wildland fire;
- ◆ Develop effective strategies for delivering fire prevention messages;

- ◆ Understand the role and influence of local public policy in creating or preventing interface fire-related conflicts;
- ◆ Develop effective fire ordinances, land use planning policies, and incentives for reducing fire risks to residences;
- ◆ Improve prediction of air quality and visibility impacts from smoke;
- ◆ Develop models that incorporate weather and elevation data to better predict and monitor smoke;
- ◆ Determine the extent and frequency of traffic problems created by smoke from prescribed fire and wildland fire;
- ◆ Improve and validate fire weather and fire behavior prediction models;
- ◆ Evaluate firing and ignition techniques for prescribed burning in the interface;
- ◆ Develop effective fuel reduction burning parameters including mechanical, chemical, and biological treatments and fuel reduction combinations;
- ◆ Improve understanding of the costs, benefits, and tradeoffs of different fuel reduction methods;
- ◆ Determine the effectiveness of firewise landscaping designs/structures, including plant and mulch flammability, and structure ignitability characteristics; and
- ◆ Develop guidelines for southern land and homeowners for assessing and mitigating fire risk around their homes.

Education, tools, and skills needed include:

- ◆ Expansion of fire education programs for homeowners;
- ◆ Cross training and enhanced collaboration among wildland and structural firefighting agencies;
- ◆ Education and outreach messages about fire for the media and local politicians;
- ◆ Collaborative efforts and stronger planning partnerships between stakeholders involved in fire prevention and suppression;
- ◆ Fire education at the grade school level region wide, emphasizing differences between wildland fire and prescribed fire;
- ◆ Education programs at the college level that emphasize wildfire and prescribed fire, communication skills, conflict resolution, political science, and land use planning in the wildland-urban interface;
- ◆ Awareness of and involvement in community-based land use planning and policy issues that affect the wildland-urban interface; and
- ◆ Hazard rating systems for interface conditions.



## URBAN-WILDLAND INTERFACE ADVISORY BOARD

The Urban-Wildland Interface Advisory Board in Birmingham, AL, has been dealing with interface fire issues for over 8 years. Members represent a variety of agencies, including those involved in firefighting, local policymaking, and planning. This advisory board has worked to provide training and activities for professionals and private citizens in interface areas in Alabama. They provide an annual award called “Fire-Safe in the Interface” to individuals or groups that have promoted fire safety in the interface.

**Table 6.1—Participation in recreational activities in the South in 1995 and projected increases for 2010, 2030, and 2050**

Recreational activity	Number of participants 1995	Projected increase		
		2010	2030	2050
	<i>Million</i>	<i>----- Percent -----</i>		
<b>Water based</b>				
Canoeing	4.20	79	16	34
Motorboating	15.50	13	33	59
Nonpool swimming	23.30	15	37	64
Rafting/floating	4.90	1	4	18
Visiting a beach	37.70	20	48	76
<b>Wildlife related</b>				
Fishing	20.20	11	24	38
Hunting	6.50	82	68	64
Wildlife viewing	34.20	22	54	86
<b>Land related</b>				
Backpacking	3.60	8	23	42
Hiking	11.30	17	45	78
Biking	15.20	22	55	95
Picnicking	27.40	21	52	80
Sightseeing	33.90	25	61	96

Source: Bowker and others 1999.



**GREENWAYS**

One way to meet increased recreation demand on public land is through creative mechanisms for acquiring greenways in and near cities, such as local acquisition of open space by local units of government and through land trusts (see chapter 4). With over 5,000 active greenways in the United States, these open-space corridors may be the most significant recreation management change and trend in outdoor recreation in the last 10 years (Betz and others 1999, McMahon 1999). These corridors originate from grassroots efforts by citizens to have green space close to where they live (Betz and others 1999). Some unique characteristics of greenways are their local management and leadership and the partnerships that must be formed to create them (Betz and others 1999). Greenways may be created and managed as connections between natural areas (with an ecological objective), as purely recreation areas, or both.

**Managing Recreation**

**Changes and challenges**—Most outdoor recreation activities have been growing steadily in the South over the last few years, and recreation has become a significant part of southern lifestyles (Cordell and Tarrant, in press). A national assessment of demand and supply trends concludes that participation in outdoor recreation will continue to increase nationally, with the greatest percentage increases in the South (Cordell and others 1999a). Southern recreation activities, such as wildlife viewing, hiking, and biking, are expected to increase between 18 and 96 percent by the year 2050 (table 6.1) (see chapter 2).

While recreation demand is growing, the opportunities for recreation on non-industrial private forests are decreasing. As a result, pressure will increase to accommodate recreation demands on public lands, which already have significant budget and capacity constraints (Cordell and Tarrant, in press). The challenge for recreation planners and managers is to provide high-quality recreation experiences while sustaining the quality of natural resources. The soil, for example, must be managed to avoid erosion, compaction, and other degradation under heavy recreation pressures (fig. 6.6). The interface land is especially under pressure due to its proximity to large urban populations and declining recreation opportunities in cities.



Photo courtesy of USDA Forest Service

**Figure 6.6**

Increased demand on public recreational facilities in the wildland-urban interface can lead to overuse of trails and camping sites, resulting in erosion and compaction of the soil.

Providing high-quality recreation opportunities for inner-city residents is another challenge. As recreation opportunities decline in inner cities and force people to look beyond the city limits, many inner-city residents with limited resources or disabilities may be left without access to recreation facilities and services (Cordell and others 1999b) (fig. 6.7).

With the unprecedented increases in ethnic, racial, and age diversity in the South (see chapter 2), recreation managers must consider the needs and expectations of the different groups using wildland-urban interface recreation sites. For example, Gramann and Floyd (1991) found that Mexican-Americans rated “doing something with your family” and “doing something with your children” significantly higher than non-Hispanic Whites as favorite outdoor activities.

*“We’re moving into a multicultural society, and I don’t think we [natural resource professionals] have changed to reflect that.” Mississippi*

Managers must also possess skills to communicate not only with people of different cultures (Magill and Chavez 1993), but also for communicating with people that hold diverse values and perceptions about how the land should be used and managed. As forest recreation demand grows, there is more potential for conflict between different recreation user groups utilizing the same areas. Four-wheel drive enthusiasts, for example, are likely to clash with hikers over how backcountry areas should be used (Cordell and Tarrant, in press) (see chapter 7). The challenge is to plan and facilitate diverse recreation experiences for the variety of user groups by including them in decisionmaking processes and helping them to find ways to share access opportunities.



Photo courtesy of USDA Forest Service

**Figure 6.7**

Programs, such as the Atlanta-based community project, the Urban Tree House, provide outdoor recreational opportunities for inner-city residents.

Needs—Research is needed to:

- ◆ Continually assess and track recreation markets, cultural preference trends, and opportunities for recreation on urban, interface, and rural land;
- ◆ Determine the importance of private lands, greenways, and urban forests for recreation, especially to serve the urban public and take the pressures off other natural areas outside the city;
- ◆ Identify and monitor forested areas in the South where recreation participation is likely to place increased pressures on forest resources;
- ◆ Assess impacts of recreation on natural resources, such as vegetation, soils, and wildlife;
- ◆ Identify critical areas in need of rehabilitation and protocols for effective rehabilitation in interface situations;
- ◆ Identify the diversity of recreation experiences desired by user groups and how user perceptions influence the quality of their experiences; and
- ◆ Identify factors that limit effective communication between recreation managers and the diversity of user groups.

Educational needs are:

- ◆ Training courses for future recreation managers that prepare them for the social and political dimensions of their work;
- ◆ Continuing education opportunities for current managers; and
- ◆ Involvement of diverse user groups in the development of education programs, planning, and management objectives, emphasizing their role in managing and protecting resources.



## HABITAT RESTORATION

Ecological restoration and management of wildlife habitat is essential for the health of natural communities and the conservation of biodiversity. Many species depend on particular stages of succession and their related disturbances. The Florida scrub-jay (*Aphelocoma coerulescens*), for example, inhabits pine/oak scrub ecosystems in central Florida. This bird requires a low shrub layer, bare ground, and a few scattered trees, avoiding canopied areas. To manage habitat for this rare bird, conservation groups such as The Nature Conservancy have reintroduced periodic fires that maintain the stage of succession needed by scrub-jays.

## Managing and Conserving Wildlife

**Changes and challenges**—Southern forests boast an abundance of wildlife, and wildlife-associated recreation is becoming increasingly popular, with 34 million people participating each year (Faulkner and others 1999). Popular wildlife recreation activities in the South include viewing and photographing wildlife, as well as fishing and hunting (see chapter 2, table 2.4). Urbanization and other human influences often destroy, degrade, or fragment wildlife habitat (see chapter 2, fig. 2.15). These changes are the major contributors to declines in wildlife populations and biodiversity worldwide (Swisher and others 2000) (see chapter 5). The consensus among conservation biologists is that direct habitat destruction is the greatest threat to biodiversity at both the species and ecosystem levels, and is the major factor threatening 80 percent or more of the species listed under the Federal Endangered Species Act (Noss and Peters 1995). As the wildland-urban interface expands, managers must address many new wildlife conservation and management challenges.

The most significant wildlife challenge in the wildland-urban interface is conserving, managing, and restoring wildlife habitat. The interface contains patches that can range from backyards, to small pocket parks, to larger forested tracts. The size, shape, and spatial relationships of patches in the landscape affect the structure and function of ecosystems (Dale and others 2000). For example, many

*“The wildlife is being squeezed into smaller and smaller areas or into areas where there is little space . . .” Virginia*

studies have shown that the larger the habitat patch, the greater the number of wildlife species present (Adams 1994). Connecting small forest patches to larger reserves with corridors is especially valuable for wildlife. In one urban wildlife habitat conservation strategy, core habitat reserves with minimal human influences are established. To prevent isolation of these reserved areas, corridors are maintained to link core reserves to each other. The result is an integrated network of habitats. Surrounding the core areas are buffers in which resource management and recreation activities occur (Adams 1994).

Another important wildlife conservation strategy is to preserve all the processes that affect wildlife populations and communities, not just site size and connectivity. The site history, the types of adjacent land uses, and current influences should be taken into account when developing wildlife conservation plans (Nilon and Pais 1997).

Urban interface areas have a large proportion of edge habitats—transitions between two ecosystems (see chapter 5). Soft edges with different layers of vegetation are more favorable to wildlife than hard edges in which forest and grass are adjacent. With the increase of forest/development edges, there is a corresponding increase in edge-adapted species, such as deer and quail, and predator species, such as skunks and raccoons. Forest interior species decline (Nilon and others 1995). Increases in predator species and parasitism can result in higher rates of predation of some species (Andren and Angelstam 1988). Also, as more people move to interface areas, there is an increase in domestic animals, such as cats, which can have devastating effects on many native species, particularly on small birds and mammals (Clifton 1992).

While populations of some species are decreasing in the interface, others are rapidly increasing, causing serious challenges for wildlife managers. White-tailed deer (*Odocoileus virginianus*) populations, for example, have exploded in some parts of the South (see chapter 5), leaving many communities searching for solutions. Citizen complaints have ranged from annoyance about damage to ornamental shrubs and property, to safety concerns about deer-vehicle collisions, and health concerns about the transmission of Lyme disease to humans by deer ticks (Fitzwater 1989, Franklin 1997). At the same time, many interface residents enjoy observing deer and other wildlife near their homes (fig. 6.8). Balancing local residents’ desires to increase their wildlife contact with their concerns about nuisance and human health problems is a major challenge for wildlife managers in the interface. They must be able to deal not only with people-wildlife conflicts but also people-people conflicts.

The proportion of the U.S. population that hunts and supports traditional game management activities is dropping, while more people are watching, hearing, seeing, and otherwise enjoying wildlife (Cordell and others 1999a). While hunting can help control burgeoning wildlife populations, it may not be accepted by local interface residents. Additionally, safety concerns or laws and regulations administered by State and local governments may prevent hunting (Stout and others 1997). Other methods of control, such as contraceptives, may be one answer but can be expensive and may be opposed by local animal activist groups (Fosgate 2001, Warren and others 1995).



Photo by Linda Robinson

**Figure 6.8**  
The program Landscaping for Wildlife, developed by the Florida Cooperative Extension Service, gives homeowners guides for managing and landscaping their backyards for wildlife.



## LANDSCAPING FOR WILDLIFE

Some new programs are encouraging landscaping of backyards and neighborhoods to recreate habitats for wildlife in urban and interface communities. One program developed by the Florida Cooperative Extension Service gives homeowners guides for managing and “landscaping for wildlife” (fig. 6.8). The National Wildlife Federation Backyard Wildlife program is a national certification program that encourages everyone from homeowners to teachers and community leaders to consider wildlife needs when planning their landscapes.

Wildlife managers must be able to adapt management to include both consumptive and nonconsumptive uses (Curtis 1978) and be aware of local public attitudes towards wildlife conservation and management. They must also take steps to actively involve stakeholders from a diversity of backgrounds into policy and management decisionmaking processes and programs (Decker and Chase 1997).

Needs—Research is needed to:

- ◆ Develop models that identify and evaluate valuable wildlife habitats for local planning, design, and management;
- ◆ Identify management options for trails and linear greenways (corridors) for multiple uses including wildlife;
- ◆ Improve techniques and guidelines for ecological restoration and adaptive wildlife management;
- ◆ Identify relationships between patch habitat history and plant species composition and structure, and determine how these relationships influence wildlife populations;
- ◆ Identify mechanisms by which adjacent land use practices and human activities influence patch habitats and animal populations;
- ◆ Determine how wildlife species use habitats in urban areas and the range of wildlife habitats in which species reside;
- ◆ Develop models for joint action by local, State, and Federal Governments working with private and grass-roots organizations to plan and establish landscape-level initiatives;
- ◆ Discover how to lessen people-wildlife and people-people conflicts at the interface and incorporate stakeholders into decisionmaking; and
- ◆ Survey public attitudes and perceptions about wildlife management and conservation strategies.

Education needs include:

- ◆ Information to educate new interface residents about the environment that they are moving into, about minimizing negative human-wildlife interactions, and about greater tolerance for living with wildlife;
- ◆ Programs to show neighborhoods and communities how to enhance and support their wildlife populations;
- ◆ Programs for planners and developers to illustrate how to sustain and manage ecosystems and incorporate ecological principles when faced with growth and development; and
- ◆ Outreach programs for the many stakeholders involved in conserving and managing wildlife resources to encourage cooperation and collaboration.

Tools and skills needed by wildlife managers include:

- ◆ The ability to work closely with community members, landscape architects, planners, engineers, developers, and the public;
- ◆ Knowledge of how to use public meetings, surveys, and advisory groups for assessing public opinion on local wildlife issues (this



information can be used in public education efforts and future management decisionmaking); and

- ◆ The ability to reconcile the competing interests that different stakeholders have regarding wildlife resources.

## Conclusion

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Forests in the South are changing in their ownership, tract size, and many ecological qualities, making new adaptive management strategies essential. These forests are influenced by a large number of stakeholders with diverse interests who must be involved in management decisions. The major ecological goods and services that these forests provide are in peril as are many rare forest ecosystems, which are becoming part of the interface. Adaptive management regimes must be applied across the landscape. Government agencies, industry, nonprofit organizations, and citizenry need to be involved and to find alternatives to many of our current customs and approaches. There are some promising new approaches and solutions, but more scientific knowledge is needed to find practical solutions to local problems. Some of the major themes for sustaining and managing these forests are to promote and support:

- ◆ Sound stewardship,
- ◆ New policies,
- ◆ New market-based solutions,
- ◆ Landscape-level management solutions,
- ◆ Incentives for management,
- ◆ Research,
- ◆ Dissemination of existing research findings,
- ◆ Technical assistance, and
- ◆ Improved and expanded education efforts.

Some additional overall needs are:

- ◆ Landscape-level management plans for forest ecosystems;
- ◆ Collaborative partnerships between private and public managers for conducting landscape-level management;
- ◆ Ways to grow without degrading and fragmenting our forested landscape and ways to link ecological principles to land use planning, decisionmaking, and management;
- ◆ Identification of the most important, imperiled ecosystems to conserve and manage;
- ◆ Improved scientific knowledge and information about forest ecosystems in fragmented landscapes;
- ◆ Identification of human perceptions, uses, and values related to urban and interface forests;

- ◆ Recognition that intensive forest management is necessary in rural areas to meet our future timber supply and to take the pressure off natural areas and other open spaces;
- ◆ Packaging technical information for various stakeholders; and
- ◆ Education of and collaboration among multiple stakeholders including developers, forest landowners, policymakers, citizens, and natural resource professionals.

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