MANAGEMENT OF HARDWOOD FORESTS IN THE MID-ATLANTIC REGION: PAST, PRESENT, AND FUTURE

David A. Marquis[1]

Abstract: Hardwood forests of the Mid-Atlantic region have a multitude of values. They provide timber for furniture, paper, and other products, habitats for wildlife, water for homes and industry, and opportunities for outdoor recreation activities of many types. They dominate much of our landscape, serve as reservoirs of biological diversity, alter climate, and affect our lives in many ways that we are only beginning to understand.

As we consider the management challenges that lie ahead, we need to maintain some perspective -- both on the forests themselves and on our efforts to manage them. Present forests are largely second-growth, having originated from the period of intensive forest exploitation at the turn of the last century. Many of the trends occurring in these forests today are still the result of natural development processes in these relatively young forests. Our efforts to manage eastern hardwoods are less than 50 years old, and there have been several major shifts in management direction in that short time span. Much of our forest land has yet to receive any planned management at all.

In recent years, research has been providing increasingly sophisticated information on forest management, and much of this knowledge is being applied on those lands that are under planned management. Traditional emphasis on management primarily for timber production has been gradually shifting toward increasing recognition of other forest uses and values. Unfortunately, public perceptions of forest management and public objectives for their forests have changed much more rapidly than either forest management or research.

There are many challenges for both management and research in the years ahead. We need to incorporate a much broader range of forest values into management planning, and to devise effective ways to integrate management for that full range of uses. We need to dramatically increase the proportion of forest land under planned management. And we need to find ways to ensure that the best and most up-to-date procedures are available to practitioners and that they are used effectively. Research will need to provide much information on many and varied topics. Rather than many individual research efforts aimed at special uses and current high-visibility topics, we need to plan a long-term research program that will systematically improve our basic understanding of forest growth and regeneration processes, so that we can apply that knowledge in a wide variety of ways to meet specific resource needs.

---

[1]Principal Research Silviculturist, USDA, Forest Service, Northeastern Forest Experiment Station, Warren, PA 16365.

CENTRAL HARDWOOD FOREST RESOURCES: A SOCIAL SCIENCE PERSPECTIVE

John F. Dwyer, Herbert W. Schroeder, and Paul H. Gobster[1]

Abstract: People-forest interactions in the Central Hardwoods region are expanding in scope and importance and are generating increasing controversy. In order to manage Central Hardwoods in a manner that contributes most fully to the needs of people, it is important that we better understand the perceptions, goals, objectives, and values of forest users, owners, managers, and the concerned public.

INTRODUCTION

The Central Hardwoods are a significant forest resource, extending over some 100 million acres and providing an environment for more than one-fourth of the U.S. population. Within this broad area, geologic history, climate, and previous land use vary greatly. Many ecologically different associations of soils, water, plants and animals occur. Diverse ecosystems provide a wide range of benefits to many residents within the region and beyond. These benefits range from beautiful landscapes and opportunities to experience a wide range of distinctive natural environments, to fine wood for high quality furniture and chances to explore the past.

Our purpose in this paper is to provide an overview of the Central Hardwoods from a social science perspective, focusing on interactions between people and forest resources. We want to provide a people-oriented context for interpreting what you will hear in the Conference and to stimulate your thinking on how we can increase the contribution of Central Hardwood forests to the needs of forest users, owners, managers, and the concerned public.

HISTORY OF LAND USE

The character of the Central Hardwoods region has changed markedly over time and will change still more in the years ahead. Early settlers cleared the forest and established farms and towns. Wood was an important raw material and fuel; but land clearing often provided more than was needed, and substantial amounts were sometimes burned or left to rot. Uncontrolled fires spread across the landscape. Many woodland areas provided important forage for livestock, and overgrazing was common. By the end of the 1800's much of the

[1]Research Forester and Research Social Scientists, USDA Forest Service, North Central Forest Experiment Station, 5801 N. Pulaski Rd., Chicago IL 60646.

region had been cleared for agriculture. Substantial areas were also disrupted by surface and subsurface mining.

With continued economic development in the region and beyond, many of the farms were no longer competitive and cultivation ceased on substantial portions of the land. Steep hilly areas with poor soils far from markets were often the first to leave crop production. Most of these "retired" areas subsequently returned to forest. In some instances trees were planted to accelerate the conversion to forest and reduce soil erosion. Areas that had been mined were often planted with trees as part of the restoration process. Efforts to control fire, trespass, and grazing contributed to forest growth and development.

CURRENT STATE OF THE FOREST

The current tree cover reflects past cutting practices and previous land uses. Tree sizes are increasing and the growth of wood volume has exceeded removal and other losses for some time. Many Central Hardwood forests are now reaching middle age and have regained nearly all of the tree species that were originally present. All but a few of the animals have returned -- the exception being the large mammals. This is, in itself, a remarkable success story in restoring forest resources to a region.

Forests have become a prominent component of landscapes throughout the region. Forest lands are intermingled with croplands, pasture, cities, and other land uses in an intricate patchwork that varies over the region. The portion of the landscape in forest and the size of individual forest tracts are largest in the southern and eastern portions of the region. In the central and western portions, forests are found in smaller scattered tracts on farms and in cities as well as in narrow corridors along rivers, streams, and city streets. Iverson (1988) presents an interesting analysis of the Illinois landscape, including forests.

The overall extent of the forest is relatively stable and is not expected to change much in the near future. Small amounts of land shift between forest and agricultural crop production as crop prices, agricultural technology, and environmental quality standards change.

Urbanization continues to transform important acreages each year. Urban forests are significant in the region and contain many of the same Central Hardwood tree species that are found in the surrounding areas. Remnant oaks and other species are prominent in many urban parks and residential areas. Many communities have active forest management programs to replace lost trees and preserve existing trees. These programs help to create a vigorous and sustainable urban forest that will contribute to a pleasing environment. Tree planting in the region's urban centers is on the increase as a result of a number of public and private initiatives. As residential development extends into cropland, tree planting extends the urban forest into previously open areas. New plantings often emphasize "bottomland hardwoods" such as ash, basswood (linden), hackberry, red maple, and honeylocust that can withstand the alternating floods and drought that are generated by extensive impervious surfaces in the urban environment.

RESIDENTS OF THE REGION

The Central Hardwoods region is culturally diverse and it is difficult to characterize its residents. The region does not conform to ordinary political boundaries and spans all of five states and parts of 16 more. Portions of the region are often referred to as part of the "Middle Atlantic States," "Southeast," "South," "Midwest," "Plains," "Lake States," or "Central States." It is difficult to find much commonality among the residents of these diverse areas, other than that the forests in which they live, work, and play can be characterized as "Central Hardwoods."

The region includes high levels of urbanization along a corridor from Milwaukee to Pittsburgh and in a few other locations, with low population densities in many other areas -- particularly on the region's periphery. Agriculture is an important component of the landscape in the central and western portions of the region. In other rural areas mining, timber, and tourism are important to the way of life. Some of the region's residents see the forest as essential to their employment and income, while others see it as an important determinant of environmental quality and the quality of their lives. Still others see the forest playing both of these roles simultaneously and perhaps others as well.

Parts of the region have not fared well over time in terms of employment and income. Often it is the heavily forested areas that have done poorly in these respects. Local residents, entrepreneurs, and others concerned with rural America are looking to forest resources for opportunities to increase income and employment. One of the challenges that they face is identifying sustainable developments that contribute to the overall quality of rural life.

Large cities are found throughout the region and Central Hardwood forests are in the "back yard" of substantial urban populations. In fact, nearly every acre of Central Hardwoods is within a half-day drive from a population center of one million or more. Second or vacation homes are increasingly popular in some portions of the region, and a significant number of individuals have moved to rural areas of the region in search of a higher quality of life. Some of these individuals are retired while others are engaged in "footloose" occupations that do not require working directly with others in a central location such as a town or a city. These developments sometimes bring changes in the social structure of some rural parts of the region.

USES OF THE FOREST

Recent trends toward short vacations or "long weekends" make outings in the Central Hardwoods especially attractive for residents of large urban centers, as does growing interest in the region's historic and cultural resources. Forest growth has yet to obscure many of the fences, roads, homesteads, towns, and factories from the past. In some instances these relics of a bygone area have become important attractions for tourists and students of history. These attractions also remind us that the forest is ever-changing as are the uses that people

make of it. In some localities traditional crafts and businesses have been revived to cater to tourists. Extensive re-creations of early environments and lifestyles such as in "Old World Wisconsin" are also popular and often featured in tourism promotions. Covered bridge festivals, maple syrup festivals, and other events that focus on the region's natural and cultural resources are major attractions.

A well-developed system of "country roads" facilitates travel throughout the region. Fall colors are a major attraction, and guides to the time and place for "peak colors" are often provided in the region's newspapers. Hunting and fishing have long been popular in the Central Hardwoods -- and are a key part of the fabric of rural life. Non-consumptive use of wildlife such as bird watching is on the increase as well. In some areas the amount of private land available for hunting is decreasing. This puts increased pressure on public lands and brings increased conflict between consumptive and non-consumptive uses of wildlife.

Overuse and conflict among users can be a significant problem with privately and publicly owned forests near urban areas, sometimes leading to the closing of those lands to particular uses. Significant issues concern how to disperse forest use, reduce conflict, and keep resources open to the public.

Past settlement and the fragmented pattern of forest lands throughout the region has limited the opportunities for wilderness experiences. However, these opportunities can be found on some of the larger tracts of public and private lands. There are designated wilderness areas on National Forests and proposals to designate additional areas.

The management of wilderness resources in the Central Hardwoods poses a number of challenges in addition to those usually associated with wilderness management. Some of these challenges are associated with the relatively small size of these areas in conjunction with adjacent or nearby developments, roads, and remnants of previous settlements, including cemeteries.

The Central Hardwoods provide some of the finest high-quality hardwood timber produced anywhere. Fine furniture, gunstocks, and other high-quality specialty items produced from Central Hardwoods timber are known throughout the world, and high-quality hardwood logs and lumber produced in the region are shipped great distances for additional processing. The scarcity of high-quality wood continues to be one of the industry's major concerns.

OWNERS OF THE FOREST

Ownership of the Central Hardwoods is highly fragmented, and three-fourths of the forest land is held by "small non-industrial private forest land owners" who have a wide range of complex goals and objectives. Alig (1990) points out the heterogeneity of non-industrial private forest owners that has been reflected in a significant amount of research:

1. The characteristics of their forest holdings vary widely.

2. Their forest management intentions and activities vary widely.

3. Many are absentee owners.

4. They are older, on the average, than the general population.

5. Their land changes hands frequently; even when it doesn't, the intentions of individual owners often change over the length of a timber rotation.

6. Many do not cite timber management as a primary land management goal.

Efforts to provide education and technical assistance to non-industrial private forest landowners have been complicated by the diversity of owners cited above, as well as lack of agreement on the most effective programs, messages, or systems of communication with those owners. These efforts are complicated by large numbers of non-industrial private forest owners who often have relatively small holdings, diverse and changing goals and objectives, and short ownership tenure. Future management and use of the Central Hardwood forests will be determined, in large part, by the large number of diverse private non-industrial landowners who will own a substantial portion of the resource. There will probably continue to be significant private and public efforts to influence the management and use of these lands by providing information, education, technical assistance, financial assistance, and other incentives aimed at producing particular goods and services. In order to plan for and change the management of these important forest lands in the years ahead, it will be necessary to predict how owners will respond to changing resources and opportunities for forest resource management and use.

Past research has identified the characteristics of private forest landowners, their goals, and their receptivity to government programs aimed at influencing the management and use of their holdings. What we do not yet understand is how landowners will actually manage and use their land in the years ahead -- how they will implement their goals and objectives and make use of public programs and incentives and the markets that become available to them. Will they follow up on tree planting with sound protection and forest improvement efforts over the long haul? When their forest stands contain large trees and when good markets are available, will they be interested in selling timber -- and if so under what conditions such as price and expected disruption of the forest environment? Under what circumstances will forest management programs initiated by one owner be carried out by subsequent owners? Will owners be willing to make their lands accessible to various types of users, and under what circumstances (i.e., what activities, restrictions, fees)? Will individual landowners be interested in cooperating with other landowners (public and private) to provide habitat for wildlife, attractive landscapes, or opportunities for recreation? How can esthetically or environmentally sensitive forests near urban areas be better protected from development pressures? What mechanisms will be most effective for implementing cooperation in managing the Central Hardwoods landscape? The fragmented nature of public forest

ownership in the region, particularly the National Forests, makes the key question one of cooperative approaches to management of public resources as well.

MANAGING THE FOREST

Management of the Central Hardwoods is complex and poses major challenges to managers and users. The diverse plant and animal communities found throughout the region make it difficult to predict how the forest will change over time with or without various forms of manipulation or other management strategies. While trees and other plants tend to regenerate well, obtaining vegetation of a particular species or species mix on a particular site at a specified time continues to be a problem that resists solution despite heroic efforts by managers and researchers. Control of fires in the forest and restrictions on the use of herbicides and timber cutting make it difficult to create many of the conditions that are thought to be desirable for regeneration, growth, and development of particular forest types.

The character of the forest and its uses and users varies across the region, often making it difficult to transfer management techniques and research results from one area to another. Oak management in the Missouri Ozarks has important linkages to the management of oaks in the Forest Preserves and residential landscapes around Chicago; but there are important differences as well. Some of these differences have their origins in the biology/ecology of the forests in these areas; others arise from the different values and expectations of those who own or live in and near these forests.

Landscape Ecology

The intricate patchwork of forests, cropland, cities, and other land uses complicates the production of timber and the management of wildlife habitats, esthetics, and environments for outdoor recreation. In managing Central Hardwoods there has recently been increased attention to "landscape ecology" which focuses on the distribution of and relationships between landscape elements over time and space. At the Seventh Central Hardwood Conference, Tom Crow (1989) pointed out that tract size has a "major control over the physical and biological characteristics of an individual ecosystem." He presented examples of the minimum size woodlot that has at least 50 percent chance of supporting a breeding population of each of 16 species of birds. The results ranged from 20 to 200 acres. This is important information for managing the highly fragmented Central Hardwood resource. Hopefully, we can extend the analysis to other species of animals, and include the role of connecting corridors and proximity to other tracts in maintaining a breeding population.

Human Habitat

But what are we are learning about habitat requirements for the increasing numbers of people who use the forest environment? What is the minimum size tract for a squirrel hunter, a mushroom picker, a ginseng gatherer, a hiker, or an individual in search of solitude? We know that some of these activities can be enhanced by a mixture of dense tree cover, open areas, wetlands, etc.; but what exactly is the best configuration of land use and vegetative cover for each activity -- or even the minimum requirement? For example, driving for pleasure is a major use of forest lands in the region, but what mixture or pattern of forest and open areas is most preferred by users? What role does the opportunity to experience cultural resources play in the desirablity of drives through particular areas? What kinds of human artifacts or impacts of forest management do individuals who drive for pleasure find objectionable?

In many instances people have very specific requirements that are not provided for because we lack knowledge about habitats for people. The Central Hardwood Notes (U.S. Forest Service 1989) present 13 notes on wildlife habitat; but only 3 dealing with recreation and esthetics. Furthermore, those 3 contain only general guides for planning and do not cite any actual studies. Similarly the proceedings of the Seventh Central Hardwood Conference contains 54 papers; but only one of the titles mentions wildlife and only one mentions recreation.

Important characteristics of habitats for people go beyond the configuration of the landscape discussed above to the actual composition of the forest as well as the character of associated development. What species mix in the overstory and in the ground cover is preferred by hikers? What kinds of interpretation are appropriate to enhance various uses of the forest? What is the importance of being able to see deer while driving through a forested area? How important are den trees and other signs of wildlife to hikers? How important are large trees and an undisturbed understory for those seeking solitude? What kinds of roads and trails are preferred by various users? What efforts, if any, need to be undertaken to reduce the apparent impact of road building and timber harvesting in particular environments?

Preferred habitats in urban forests may differ markedly from those in rural parts of the region. Ouestions about the management of trees and forests also take on a decidedly different perspective when issues focus on the urban landscape: What densities and spatial arrangements of trees do people prefer in urban park settings? What role does vegetation play in people's perceptions of urban park safety? To what extent do trees contribute to the attractiveness of residential street corridors and home landscapes? What are the desirable and undesirable attributes of street tree species commonly planted in municipal forestry programs? What variations in urban forest preferences and needs exist among important subgroups of the urban population, for example, older adults and ethnic minorities? Some progress has been made in addressing these kinds of questions (see Schroeder 1989, for a review of this research), but we have much yet to learn.

A fundamental problem is that we do not have basic guides for the management of forest stands for use by people, including esthetics, recreation, cultural resources, etc. Considerable research has been directed towards the development of silvicultural systems for production of hardwood trees that have traditionally commanded high prices in the timber market. However, it is not all that clear that the users of the forest environment prefer stands composed of these same species or that they find the harvest and silvicultural systems that are used to generate them to be acceptable. What is needed is a silviculture for recreation, esthetics, and other forest uses. The alternative to the development of these systems is a forced choice between intensive timber production of "high value" species on one hand, and complete prohibition of vegetation management on the other.

We are pleased to see two presentations at this conference dealing with the scenic and recreational aspects of Central Hardwoods management. The paper by Ribe considers the esthetics of timber harvesting, while the paper by Hollenhorst et. al. focuses on the esthetic and recreational impacts of the gypsy moth. Additional work along these lines that helps us understand public perceptions of and response to forest management options will be most helpful.

Visual Quality

Esthetic values of the Central Hardwoods region rank high among forest management issues that concern local residents and visitors. Conflicts and controversy over forest harvesting activities often have their roots in esthetic judgments of what is seen on-the-ground. The scenic appeal of the region also enhances people's enjoyment of developed and dispersed outdoor recreation activities. Management of the appearance of forest sites and areas is an important component in providing a quality recreation experience.

Programs that address visual quality management recognize the need to look at the esthetics of forests from both regional and stand perspectives. The U.S. Forest Service's "Visual Management System" identifies several different landscape character types that define the variety of land, water, vegetation, and cultural patterns found in the region (U.S. Forest Service 1980). In the Central Hardwoods, topography ranges from broad, flat areas of glacial drift to highly dissected ridges and valleys; water features include many small streams as well as major rivers and large reservoirs; forest vegetation includes many species and community types from oak savannahs to extensive pine forests; and cultural patterns reflect not only a rich history, but current strong ties to the land. These broad scale characteristics help define the region's unique visual characteristics and "sense of place."

Forest managers have an important role to play in maintaining and enhancing the regional visual character of the Central Hardwoods. For example, National Forest visual management programs look at "variety" as an indicator of visual quality, and in many cases (e.g., road corridor planning) aim to increase variety through manipulation of forest vegetation (U.S. Forest Service 1974). This may not be the best policy, however, for forest management in the Central Hardwoods. The visual variety of the region is already very high, and National

Forests offer some of the few places where extensive blocks of forest land can be viewed. In many cases public groups desire to see a greater continuity in forest cover, which has led some Forests to make more extensive use of silvicultural systems that promote a continuous forest cover.

In cases where it may not be possible to assemble or manage extensive forest areas, corridor management programs can help integrate fragmented land ownership and interpret regional visual resources to the public. The Forest Service's "Scenic Byways" program is a successful example of a corridor approach to visual management, and several Byways have been designated on National Forests in the region since the program was initiated in 1988. National Forest Scenic Byways showcase exceptional scenic corridors within a Forest, and tie together areas or sites of recreational, historic, scientific, and cultural significance. Public perceptions of forest management often depend on information, and the Byways program provides forest managers an opportunity to interpret vegetation management and other multiple use management activities.

Much of the research on public perceptions of visual quality has taken place at the stand level, focusing on the attributes of forests that are viewed at close range and can be manipulated by managers. In contrast to the regional scale landscape dimensions such as landform and cultural patterns mentioned previously, indicators of near-view forest visual quality often relate directly to vegetation management practices. Ribe's (1991) research on the visual quality of Northern Hardwood stands shows the importance the public places on such factors as slash removal and maintaining large diameter trees to enhance visual quality or mitigate the visual impacts of timber harvesting. Multivariate statistical techniques used in studies such as this allow managers to estimate the relative importance the public places on different forest attributes, and to look at tradeoffs between alternative management objectives. This research can also help to model and estimate the changes in visual quality over time after harvesting or stand treatment activities have taken place (Ribe 1991, Palmer 1990).

Few forest visual preference studies have focused specifically on Central Hardwoods timber types or on the forest management issues that have gained momentum in the region. There is evidence that models developed in one region have some degree of generalizability when applied elsewhere (Ribe 1990); but there are unique characteristics of the Central Hardwoods forest and landscape for which more research is needed. At the stand level, we need better information on public perceptions of uneven-aged management techniques, as well as on even-aged silvicultural systems such as deferment cutting that have an intended esthetic goal. Site quality changes dramatically within the Central Hardwoods region, and managers need better information on the effects that post-harvest treatments may have on accelerating the "visual recovery" of sites after harvesting. We also need better information about regional visual quality issues in the Central Hardwoods, so that managers have a better idea of how public forest lands are perceived in the context of the surrounding landscape. The forests form an essential part in the visual character of the region, and a coordinated approach is needed in order to maintain and enhance the sense of place that exists there.

Diverse Viewpoints and Values

Public involvement in decisions about management and use of the region's National Forests has revealed very strong interest in the Central Hardwoods by groups at the local, regional, and national levels. Throughout the region there is a tradition of strong local ties to public and private forest lands. Regional and national interests are becoming increasingly significant. Reconciling the often conflicting perceptions, demands, and expectations found at these levels of interest has proved to be a major challenge. Increasing public concern over environmental quality and the management of public resources has added to the debate which shows clear signs of extending to other public lands and perhaps private holdings as well. The diversity of Central Hardwood forests, the multitude of uses/benefits provided, the difficulty of regenerating particular species, and debate over appropriate methods for regenerating stands on particular sites have fueled the controversy. The intense debate over the management and use of public forest lands in the region has been characterized by terms such as "polarized," "extreme," "urban-rural conflict," and "no middle ground." Many look to "new forestry," "new persepectives," and entirely new management approaches such as "landscape ecology" for solutions.

Part of the controversy has focused on clearcutting as a method of harvest/regeneration. Many people object to the seeming destruction of the forest environment that accompanies clearcutting, and are concerned over possible long-term degradation of the environment. Others see clearcutting as a viable option for removing timber and developing the kind of forest environment they think forest users are seeking. Still others are fearful of the outcome of no cutting and intensive fire control on the character of the forest. The complexity of the regeneration, growth, and development of Central Hardwood stands as well as uncertainty over the outcome of various harvest/regeneration systems adds to the debate. The controversy is intensified when individuals have a personal stake in the results, such as is the case with hunters, hikers, wilderness campers, loggers, and those who work in wood-using industries.

One of the factors that makes management of Central Hardwood forests difficult is that professional resource managers, special interest groups, and the general public have very different backgrounds and viewpoints with respect to forest management. Research carried out by Joanne Vining of the Institute for Environmental Studies at the University of Illinois, in cooperation with the North Central Forest Experiment Station, is investigating some of these differences. In this research, members of different groups were given written scenarios about a hypothetical Central Hardwood forest management conflict. The conflict involved a request by local timber interests to expand timber harvesting using clear-cutting. After reading the scenario, participants filled out rating scales to indicate the kind and intensity of emotions experienced while reading the scenario, and the perceived importance of 10 different management goals for Central Hardwood forests.

The participants represented three groups: members of a regional chapter of a major environmental organization, employees of the Mark Twain National Forest, and members of the general public in Champaign-Urbana, Illinois. One third of the people in each group were asked for their own responses to the emotion and goal scales. The rest were asked to predict

how they thought a member of one of the other two groups would respond to the items. In this way, the study addressed not only differences in the emotions and attitudes between the three groups, but also the accuracy with which members of any one group perceived the emotions and attitudes of members of the other groups.

With respect to both emotions and goal importance, the public responses were more similar to the environmental group's than to the forest managers'. The public and the environmental group expressed higher levels of anger, distress, and fear and lower levels of happiness than did the Forest Service employees. Forest Service employees placed greater importance on timber harvesting and local employment, and lower importance on roadless area management and wilderness preservation than did either the public or the environmental group.

Both Forest Service employees and the environmental group members underestimated the extent to which the public would feel distressed, nervous, angry, alert, and afraid while reading the scenario. Forest Service employees and environmental group members also seriously underestimated the importance that the public placed on wilderness and roadless areas.

These results suggest that differences in emotions and attitudes and inaccuracies in perceptions of how different groups respond to issues may hinder the resolution of resource management conflicts in the Central Hardwoods region. Managers are trained to approach resource issues in a dispassionate and analytical way, while the public and special interest groups are more likely to adopt an intuitive and emotional viewpoint. The vehemence with which many members of the public respond to forest resource issues reflects the importance that forest environments have for them. In the course of our research over the last decade it has become increasingly clear that many people feel powerful psychological ties to forests and trees (Dwyer, Schroeder, and Gobster 1990). The effect of natural environments on people can be measured physiologically in the form of a strong relaxation response (Ulrich 1984). In our research at the Morton Arboretum near Chicago, people have reported a variety of ways in which trees and forests add meaning and value to their lives. The emotions that people experience with trees and forests can be very profound, and sometimes take on a religious or spiritual quality. Trees and forests often appear in the myths and folklore by which diverse cultures have symbolically expressed their deepest values and their connections to the world around them. It is no wonder that issues involving the management (and particularly the cutting) of forests become emotionally charged!

These strong emotional and intuitive ties to forest environments must not be ignored or disdained, even when they clash with scientific training and judgment. The Forest Service's "New Perspectives" programs calls for expanding our concepts of forest values beyond the traditional economic values associated with commodities that are bought and sold in the marketplace. Much of the discussion of New Perspectives at present centers on biological values such as biodiversity and sustainability, but the deep psychological values of forests are equally crucial. Failure to consider these values will result in continued intense emotional clashes between professional resource managers and the publics they serve.

SUMMARY AND CONCLUSIONS

The Central Hardwoods will be increasingly important to residents of the region and beyond for an even wider range of goods and services than in the past. The extent and distribution of the resource is likely to remain relatively stable. Public interest in Central Hardwood forests will remain high and perhaps increase. "Commodity" uses such as timber and mining will continue, and the region will produce some very fine hardwoods. Use of the forest environment for recreation, a scenic backdrop, or a place to live will continue to increase in importance over time. People's psychological ties with trees and forests will increase. Urban forests will increase in significance as a component of the urban environment. Forest ownership is likely to remain fragmented, with "non-industrial private landowners" holding a large portion of the resource for a wide range of complex goals. Farm ownerships are likely to continue to decline as a portion of the forest land, and forest owners will live on the land, in nearby towns, and in more distant areas. Locations near major urban centers and in especially attractive areas will be increasingly popular for second and retirement homes as well as residences for "footloose" households that are not tied to particular locations. Recreation and tourism will increase in the region, with major concentrations of activity and development in especially attractive areas and near urban centers or major highways. Viewing wildlife and exploring historic and cultural resources will be increasingly important aspects of outdoor recreation.

Management of Central Hardwoods will continue to be a major challenge, given the diversity of sites, species, ownerships, uses, and interests involved. Public perceptions and values as well as the goals and objectives of landowners will increasingly guide forest resource management. There will continue to be conflicts among the various interests in these valuable resources, with resolutions coming only from better understanding of the perceptions, values, viewpoints, and beliefs of those involved. A rigorous research program will be needed to help managers understand how the forest is likely to respond to various changes, as well as what people expect from the forest environment and the goods and services that forests provide.

LITERATURE CITED

Alig, Ralph J. 1990. Non-industrial private forests: Timber supply for an uncertain future. West. Wild. 16:11-14.

Crow, Thomas R. 1989. Landscape ecology: An eclectic science for the times. In: Proceedings of the Seventh Central Hardwood Conference. pp. 30-34. USDA For. Serv. GTR NC-132.

Dwyer, John F., Schroeder, Herbert W., and Paul H. Gobster. 1990. The significance of urban trees and forests: Toward a deeper understanding of values. Proceedings: Sustainable Cities: A Symposium on the Preservation and Restoration of Urban Biodiversity. Chicago Academy of Sciences, October 4-6, 1990. (in press).

Hollenhorst, Steven M., Brock, S. M., Freimund, W. A., and M. J. Twery. 1991. Effects of gypsy moth infestation on near-view aesthetic preferences and recreation behavior intentions. In: Proceedings: Eighth Central Hardwood Forest Conference, State College PA, March 4-6, 1991 (in press)

Iverson, Louis R. 1988. Land use changes in Illinois: The influence of landscape attributes on current historic land use. Land. Ecol. 2:45-61.

Palmer, James F. 1990. Aesthetics of the northern forest: The influence of season and time since harvest. In: Proceedings of the Northeastern Recreation Researchers Conference, pp. 185-190. USDA Forest Service GTR NE-145.

Ribe, Robert G. 1990. A general model for understanding the perception of scenic beauty in northern hardwood forests. Land. Jour. 9:86-101.

Ribe, Robert G. 1991. The scenic impact of key forest attributes and long-term management alternatives for hardwood forests. In: Proceedings: Eighth Central Hardwood Forest Conference, State College PA, March 4-6, 1991. (in press).

Schroeder, Herbert W. 1989. Environment, behavior, and design research on urban forests. IN. Advances in Environment. Behavior, and Design. Vol 2. Ed. E.V. Zube and Gary T. Moore. pp. 87-117. Plenum Publishing Company.

U.S. Forest Service. 1989. Central Hardwood Notes. North Central Forest Experiment Station, St. Paul MN.

U.S. Forest Service. 1980. Landscape Management Handbook. Milwaukee WI: USDA Forest Service Eastern Region (Region 9)

U.S. Forest Service 1974. National forest landscape management Volume two, Chapter one: The visual management system. Agricultural Handbook No. 462, Washington D.C.: U.S. Government Printing Office.