THE ECOLOGY OF FOREST RECREATION:

A FRAMEWORK FOR RESEARCH IN CENTRAL HARDWOOD FORESTS 1/

Herbert W. Schroeder 2/

Abstract.--This paper discusses ecological concepts that may help us to understand recreation behavior in central hardwood forest environments. Treating recreation and biological processes as interrelated components of the total ecosystem may make it easier to integrate recreation with timber and other resources in the management of central hardwood ecosystems.

The Eastern Region of the USDA Forest Service has developed an interdisciplinary approach to implementing Forest Plans, which it calls "Integrated Resource Management" (IRM). This approach requires specialists in different resource disciplines to work as a team to "coordinate and integrate planning actions consistent with the principles of the Multiple Use Sustained Yield Act" (Forest Service 1985). To accomplish their purpose, the interdisciplinary team needs to know how the management of any one forest resource will affect other resources. For this reason, research needs to examine interactions between different resources and uses in forest ecosystems. In other words, Integrated Resource Management requires that research also be integrated across disciplinary lines, and not compartmentalized into isolated disciplines.

Differences in technical language and concepts often hinder the integration of research across disciplinary lines, even when processes under study in different disciplines have features in common. In particular, there appear to be many similarities between the processes studied by ecologists and those studied by recreation researchers in forest environments. Recreationists have specific "habitat" requirements. They move through ecosystems and landscapes in much the same way as wildlife species, interacting with each other and with their biological and physical surroundings. Therefore, it may be useful to examine recreation behavior in the light of ecological concepts, models, and theories.

The application of ecological concepts to humans is not new. Most ecology texts contain sections on human population growth, pollution, and resource depletion (e.g. Kormondy 1984, McNaughton and Wolf 1973). Human ecology is a well-established field, and has developed useful analyses of how human cultures and settlements function and interact with their physical and biological surroundings (e.g. Boyden et al. 1981). In the field of recreation research, there is growing recognition that human recreation behavior must be understood in relation to the environment in which it takes place, and that the concepts and theories of ecology may contribute to that understanding (Machlis et al. 1981, Field et al. 1985, Hammitt 1983).

Casting models of recreation in conceptual terms similar to models of wildlife and other ecosystem components may give us new insight into the nature of recreation behavior and its relation to the environment in which it occurs. At the same time it will be easier for recreation scientists to communicate with biologists and resource managers, and to link their research with models and data about biological aspects of natural resource recreation settings. This paper outlines a conceptual framework for the study of recreation behavior, using concepts from the field of ecology, with some examples and suggestions for forest recreation research in the central hardwood region.

ACTIVITIES

Recreation behavior occurs in repeatable and identifiable patterns, called "activities." Ideally, a recreationist can be classified according to the activity she or he is engaged in, and may be regarded as a member of a distinct population of individuals engaged in that activity. Although this is not always true, it is a useful assumption from which to start. The unit of analysis is not the individual per se, but the individual engaged in a specific activity. If an

---

1/ Paper presented at the Seventh Central Hardwood Forest Conference. (Carbondale, Illinois, March 5-8, 1989).

2/ Herbert W. Schroeder is a research social scientist with the USDA Forest Service, North Central Forest Experiment Station, Chicago, Illinois.

individual switches from one activity to another, he or she thereby becomes a member of a different population.

In the central hardwoods region several important activities are easy to identify, such as hunting, fishing, hiking, camping, river floating, picnicking, and motorized trail use. Other activities are less easily observed and identified (for example mushroom gathering), but are nevertheless important forest uses for some people. A first step in an integrated recreation research program for central hardwoods would be to identify which activities are most important, and which should be the subject of management efforts to enhance recreation opportunities.

ADAPTATION AND NICHES

Recreation activities are adapted to their settings in much the same way that biological organisms and their behaviors are adapted to their environments. Individuals will engage in a recreation activity only as long as they obtain sufficient satisfaction from the activity. The "fitness" of an activity in a particular setting is a measure of how enjoyable that activity is under the conditions of the setting. If the activity is unsuited to the setting (e.g. downhill skiing on flat terrain) satisfaction will be absent, and the activity will not take place. Thus a process akin to natural selection operates on recreation behavior; and activities either become adapted to the specific settings in which they take place, or they cease to occur.

The fitness of an activity in relation to its environment leads to the ecological concept of "niche" (Hutchinson 1957). Perhaps the simplest definition of a recreation niche would be "the set of environmental conditions under which a particular activity is able to occur." Some activities have developed different specialized forms that are adapted to different niches. Downhill and cross-country skiing are good examples of this. In the central hardwoods region some activities have specialized niches; for example, canoeing and tubing require river corridors with sufficient water depth and flow, and hiking requires trails of sufficient length. Hunting and fishing are obviously tied to the presence of game and fish species. Other activities have much broader niches. For example, the new all-terrain vehicles (ATV's) can travel on roads and trails, overland, and even in stream beds.

Research can help establish which physical, biological, and social factors are important in creating suitable niches for various recreation activities, and how these factors are influenced by management activities and recreational use. Some environmental factors have impacts on certain specific activities, while other factors may contribute to the quality of habitat for a wide variety of activities. For example, visual quality is an important environmental attribute that can enhance the enjoyment of virtually any activity done in a forest. Because timber harvesting in central hardwoods has a major impact on the appearance of the landscape, research on users' perceptions of managed timber stands should be a high priority in this region. A knowledge of the visual outcomes of alternative management practices, particularly even-age versus uneven-age management, would be valuable input to the forest planning process.

Niches must also be defined in terms of time. Certain activities take place only during certain seasons of the year, and most people find weekends to be the most suitable time of the week for recreational excursions into the forest. Monitoring use levels in important recreation habitats, such as the Ozark National Scenic Riverways, to detect patterns in use over time of day, day of the week, and season of the year can provide useful information for managing high-use recreation environments (Chilman et al. 1986, Marnell et al. 1978).

POPULATION DYNAMICS

Growth and interaction of populations is a topic of major concern in ecology. The growth rates of wildlife populations are governed by biological processes of reproduction and mortality. For populations of people engaging in recreation activities, the main processes governing population dynamics are not biological but psychological, i.e. the number of people engaging in an activity at a particular place and time is the outcome of individual preferences and choices. Nevertheless, the population dynamics of recreation may have features in common with the dynamics of biological populations.

Recreation research has produced models for predicting how people will choose among recreation sites having various attributes. The models are usually static, that is, they describe the probability of choice at a single point in time, assuming that the attributes of the sites are given and fixed. Ecological population models, on the other hand, are dynamic (May 1974). They describe a population's rate of change, based on the attributes of the environment and other populations, and trace the growth and decline of interacting populations. Recreation choice models could also be extended to represent dynamic interactions among populations of recreationists engaging in different activities.

PERCEPTIONS OF DYNAMIC ENVIRONMENTS

The dynamic, or time-related, factor also enters into visual quality issues. Most existing research on forest landscape esthetics has looked at the scenic quality of individual scenes at a single point in time. To truly understand the visual outcomes of timber management, however, this research must incorporate the full time span of the timber management cycle. For example, everyone knows that clearcuts are unattractive immediately after harvest, but how does the scenic quality of

the cut change as the forest regenerates? How does the public perceive these gradual changes in the forest? To answer these questions, research should examine ways of linking models of scenic perception to growth and yield models for forest stands.

COMPETITION AND CONFLICT

Ecologists classify interactions among populations according to how the presence of one population affects another. Some common types of interaction include predation, competition, parasitism, and mutualism. It is possible to think of recreational analogues for all of these, but competition is probably the most significant form of interaction among populations of recreationists. Competition may be direct, as when the behavior of people engaged in one activity is antagonistic or offensive to people in other activities, or it may be indirect, as when two otherwise compatible activities must compete for the same space and other resources.

When the niches of two activities overlap, meaning that some combinations of environmental factors provide suitable habitats for both the activities, competition or conflict may arise. An example of this in the central hardwoods region is motorized versus nonmotorized travel. As previously mentioned, use of ATV's is increasing in a variety of settings, creating conflict with other activities once dominant in these settings. Competition from motorized use may force activities such as hiking out of areas that have become popular for ATV users. This may be viewed as part of a process of succession, leading towards a high-density "climax" recreational community that includes only activities that are tolerant of noise and high use levels. Management can intervene to halt this successional process and maintain some environments for noise- and crowd-intolerant activities by imposing regulations, limiting use, and closing roads. One question for research in this area is to determine the "limits of acceptable change," that is, what signs of human use can be tolerated in primitive areas before these areas become unsuitable for wilderness-oriented activities (Stankey et al. 1985).

LANDSCAPE ECOLOGY

Another area of ecology that may be applicable to recreation in central hardwoods is landscape ecology (Forman and Godron, 1986). This field is concerned with the spatial structure and function of landscapes, particulary in regard to the movement of organisms, energy, and substances between ecosystems. Outdoor recreation frequently involves movement, both as travel to reach a suitable recreation site and as part of the recreation activity on the site. The emerging principles of landscape ecology may therefore help us to understand the spatial aspects of recreation behavior. For example, landscape ecology concepts may be useful in determining the size and shape of habitat necessary to maintain certain recreation activities, and in understanding the effect of landscape heterogeneity on the diversity and spatial distribution of activities in an area.

One aspect of central hardwood landscapes is the ownership pattern within the forest. National Forests in this region are a patchwork of private and public land. This restricts opportunities for activities, such as wilderness backpacking, that require unrestrained movement through large areas isolated from human influence. Many of the landscape principles being developed for managing wildlife species may also apply to recreation activities, such as using corridors to link patches of habitat and provide a greater continuous range for movement.

Larger scale landscape issues are also important for visual management in central hardwoods. Over a period of years, even-age management creates a patchwork landscape of different age stands. How is this landscape perceived by people traveling through it? In comparing the esthetic impacts of alternative timber management approaches (e.g. even- and uneven-age systems), it will be important to consider not only perceptions of individual stands, but also perceptions of the larger scale landscapes that are composed of those stands.

CONCLUSION

In this paper I have suggested some ways that recreation research could use concepts of ecology to address problems in the recreational use of central hardwood forest ecosystems. Ecology may provide a theoretical framework for tying together disparate areas of recreation research. Developing an ecological viewpoint towards human users in the forest environment may also help to bridge the disciplinary gap between biologists and recreation researchers and facilitate integrated research and management of central hardwood forests.

REFERENCES

Boyden, S., S. Millar, K. Newcombe, and B. O'Neill. 1981. The ecology of a city and its people: The case of Hong Kong. 437 p. Australian National University Press, Canberra.

Chilman, K.C., D. Foster, and A. Everson. 1986. A carrying capacity rationale and supporting data for river use planning. 14 p. Paper presented at Conference on Science in the National Parks, July 13-18, 1986. Colorado State University, Fort Collins, Colo.

Field, D.R., M.E. Lee, and K. Martinson. 1985. Human behavior and recreation habitats: Conceptual issues. 16 p. Paper presented at First North American Riparian Conference, April 16-18, 1985, Tucson, Ariz.

Forest Service, USDA. 1985. Working together for multiple use: Integrated resource management. 27 p. National Forest System, Eastern Region, Milwaukee, Wis.

Forman, R.T.T. and M. Godron. 1986. Landscape ecology. 619 p. Wiley, N.Y.

Hammitt, W.E. 1983. Toward an ecological approach to perceived crowding in outdoor recreation. Leisure Sciences 5:309-320.

Hutchinson, G.E. 1957. Concluding remarks. Cold Spring Harbor Symposium on Quantitative Biology 22:415-427.

Kormondy, E.J. 1984. Concepts of ecology (3rd ed.). 298 p. Prentice Hall, Englewood Cliffs N.J.

Machlis, G.E., D.R. Field, and F.L. Campbell. 1981. The human ecology of parks. Leisure Sciences 4:195-212.

Marnell, L.F., D. Foster, and K. Chilman. 1978. River recreation research conducted at Ozark National Scenic Riverways 1970-1977: A summary of research projects and findings. 139 p. National Park Service, Van Buren, Missouri.

May, R.M. 1974. Stability and complexity in model ecosystems. 265 p. Princeton University Press, Princeton, N.J.

McNaughton, S.J. and L.L. Wolf. 1973. General ecology. 710 p. Holt, Rinehart, and Winston, N.Y.

Stankey, G.H., D.N. Cole, R.C. Lucas, M.E. Petersen, and S.S. Frissell. 1985. The limits of acceptable change (LAC) system for wilderness planning. USDA Forest Service General Technical Report INT-176. 37 p. Intermountain Forest and Range Experiment Station, Ogden, Utah.