VEGETATION ECOLOGY

FOREST STEWARDSHIP MANAGEMENT NOTE #41

WHAT IS VEGETATION ECOLOGY?

The term vegetation refers to all the trees and other plants growing in a given area. Vegetation ecology is the study of how these plants interact with each other, animals, the soil, topography, and climate over time. Although vegetation is the dominate feature of most natural habitats, non-vegetational features are also important; examples include: water bodies, cliffs, gravel banks, buildings, and roads (#7). Thus, vegetation should be considered as part of a larger concept of habitat types.

This Note focuses on three of the most useful concepts of vegetation ecology: composition, structure, and dynamics.

1. VEGETATION COMPOSITION - All plant species grow well in some conditions and poorly in others. Plants with similar preferences tend to grow near each other, forming recognizable vegetation types, or plant communities. Vegetation types are usually named after the dominant species (e.g., jack pine type) or group of species (e.g., lowland hardwood type). The species composition of a given area is primarily a function of its soil type (FSMN #4) and its history in terms of major disturbances (fires, wind-storms, pest outbreaks, timber harvests, agricultural uses, etc.).

2. VEGETATION STRUCTURE - Vegetation structure refers to the spatial aspects of a plant community, including the size and shape of the plants and the way they are arranged vertically and horizontally (#2). Because vegetation structure changes continuously as plants grow and die, the structure of a given area is strongly influenced by time elapsed since the last major disturbance.

VERTICAL STRUCTURE - In the vertical dimension, vegetation structure can be simple, as in a hayfield, or complex, as in a mature woodland with multiple layers of foliage. To assess vertical structure, look for the presence and nature of these layers: supercanopy (a few trees extending above the rest), canopy (overstory), understory, shrub layer, and ground layer.

HORIZONTAL STRUCTURE - In the horizontal dimension, vegetation structure should be considered within individual management units (stand scale) as well as across the whole ownership (landscape scale). At the stand scale, horizontal structure may be simple (uniform), as in a plantation, or complex (patchy, diverse, heterogeneous), as is common along woodland streams. At the landscape scale, it is important to consider not only the availability of various habitat types but also the degree to which they relate to one another (FSMN #39).

3. VEGETATION DYNAMICS - Although species composition and spatial structure define the state of vegetation at a point in time, all such states are dynamic. In the absence of major disturbance, vegetation change is somewhat predictable and is termed plant succession. However, disturbances are now known to be much more common than was once thought, and the idea that succession eventually leads to an unchanging, or "climax", community has not turned out to be very useful. Rather, most vegetation is quite dynamic as the component species respond to continuously changing conditions (#5,6,9).

WHY IS VEGETATION ECOLOGY IMPORTANT?

1. VEGETATION COMPOSITION - Natural vegetation types indicate much about the existing value of land as well as its capabilities and limitations. Wildlife and timber values are directly dependent on the species composition of the vegetation (#1,3,4; FSMN #15,40). Thus, most decisions about wildlife and timber management cannot be made without knowing the composition of the existing vegetation. References #1 and #3 provide excellent summaries of the vegetation types and other habitat features required by mammals, birds, amphibians and reptiles.

   Through management practices such as harvesting and reforestation, the vegetation of an area can be converted from one type to other types that require similar conditions. Thus, where it is desirable to establish a vegetation type that is currently lacking, knowledge of existing types and soils is needed to judge the feasibility of the type conversion (FSMN #4).

2. VEGETATION STRUCTURE - The structure of the vegetation often influences the value of an area more so than does its species composition (#8,10). Rabbits need dense brush for escape cover, regardless of the brush species. Small trees have low timber value, regardless of their species. Similarly, tree size, amount of underbrush, and other

structural features of the vegetation strongly affect the quality of recreational experiences.

Changes in the composition of the vegetation often result in major structural changes as well. For example, changing the composition of a hardwood stand by planting scattered conifers would also increase its structural complexity, and consequently, the diversity of wildlife it can support.

3. VEGETATION DYNAMICS - Because vegetation composition and structure are dynamic, maintaining the desired mix of vegetation conditions requires knowledge of the direction and rates of vegetation change, with and without human intervention. For example, sandhill cranes, bobolinks, meadowlarks, and other grassland birds will disappear if large fields become too brushy.

HOW CAN VEGETATION ECOLOGY BE APPLIED IN PRIVATE WOODLANDS?

The overall purpose of land management is to develop and maintain that combination of vegetation conditions and other habitat features that will most effectively further the landowners' goals. This can be accomplished by manipulating the composition and structure of the vegetation via a wide array of cutting and planting practices.

1. CUTTING PRACTICES - Information on the purposes and methods of tree cutting practices is included in the following Forest Stewardship Management Notes:

FSMN #16, Improving Timber Stands
FSMN #17, Selecting Timber Harvesting Systems
FSMN #19, Producing Fuelwood
FSMN #20, Managing Sugarbushes
FSMN #25, Managing Wildlife Openings
FSMN #33, Managing Woodlands for Visual Quality
FSMN #37, Biodiversity
FSMN #38, Old Growth Forests
FSMN #39, Landscape Ecology
FSMN #42, Managing Too Many Deer

2. PLANTING PRACTICES - Information on the purposes and methods of planting trees and other plants is included in:

FSMN # 7, Managing Herbaceous Vegetation
FSMN # 8, Designing Plantations
FSMN # 9, Designing Windbreaks and Hedgerows
FSMN #11, Growing Woody Plants from Seed
FSMN #12, Planting Woody Seedlings
FSMN #25, Managing Wildlife Openings
FSMN #26, Managing Brush for Wildlife
FSMN #27, Designing Woody Plantings for Wildlife
FSMN #29, Managing Apple Trees for Wildlife
FSMN #33, Managing Woodlands for Visual Quality
FSMN #37, Biodiversity
FSMN #39, Landscape Ecology

3. MANAGING VEGETATION DYNAMICS - The above techniques provide the tools needed to develop the desired vegetation conditions. But two problems still exist. First, it must be realized that many habitat types last only a few years and can be recreated only through the passage of considerable time. For example, sapling stands typically last for about 15-20 years and do not appear again until the timber has reached pole or sawlog size, been harvested, and regeneration makes it through the seedling stage.

The second problem is that some goals can only be achieved if several vegetation conditions exist simultaneously in certain spatial arrangements. Thus, to maximize the benefits of landownership one must divide the available land into management units and apply cutting and/or planting practices to them according to a schedule that will provide a constant supply of the desired habitats when and where they are needed.

REFERENCES

FSMN #'s refer to other Forest Stewardship Management Notes in this series.

#1 Benyus, J.M., et al. 1992. Wildlife in the Upper Great Lakes Region: A community profile. USDA Forest Service RP-NC-301. Northwoods wildlife habitat database (RN-NC-359) also available for microcomputers.

#2 Crow, T.R., et al. 1993. Report of the scientific roundtable on biological diversity. USDA Forest Service TP-R9-CNF/NNF-93-1.

#3 DeGraaf, R.M., et al. 1992. New England wildlife: management of forested habitats. USDA Forest Service GTR NE-144.

#4 DeGraaf, R.M. 1991. Breeding bird assemblages in managed northern hardwood forests in New England. Chapter 8 in J.E. Rodiek and E.G. Bolen (eds.) Wildlife habitats in managed landscapes. Island Press.

#5 Ehrenfeld, D. 1993. Beginning again: people and nature in the new millennium. Oxford University Press.

#6 Loope, W.L. 1990. Natural forest dynamism and the maintenance of biodiversity: an exploration of agency history and approach. Michigan Academician 22(4):343-353.

#7 Premo, D. and E. Rogers. 1994. Microhabitats. A brief for the "Biodiversity Management Opportunities on Small Landholdings" workshop sponsored by the Forest Management Division, Michigan Department of Natural Resources. White Water Associates, Inc., Box 27, Amasa, MI 49903.

#8 Premo, D. and E. Rogers. 1994. Wildlife and structural diversity. A brief for the "Biodiversity Management Opportunities on Small Landholdings" workshop sponsored by the Forest Management Division, Michigan Department of Natural Resources. White Water Associates, Inc., Box 27, Amasa, MI 49903.

#9 Sampson, N. 1993. New ecology, global change, and forest politics (editorial). American Forests, May/June 1993.

#10 Short, H.L. 1985. anagement goals and habitat structure. Symposium on riparian ecosystems and their management. April 16-18, 1985, Tucson, AZ.

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