Regional Conservation Management Relative to NPS Policy and the Conservation Ethic

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Dr. Nodvin examines the inadequacies of defining historical vegetation patterns with what tools we now have. Understanding past and present vegetation diversity and distribution is a key input in carrying out the National Park Service's obligations for maintaining the integrity and diversity of natural resources. With each "new" issue (atmospheric contamination, global climate change) which may compromise biological diversity, we see much debate over whether the threat is real. What should be of concern, however, is why can we not answer the question!

.....Robert Stottlemyer

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A major objective of the National Park Service is "to preserve, protect, and restore the natural heritage of the United States" as outlined in the Organic Act of 1916. Since its delineation, an ongoing discourse has taken place within the national park and conservation biology communities regarding the interpretation and implementation of this goal. In 1963, a committee led by A. Starker Leopold considered the implications of this goal (Leopold et al., 1963). Its subsequent report proposed the concept of national parks as vignettes of the primitive America. One consequence of the report has been the expansion of a "more natural" emphasis toward park management. Natural environmental regimes (e.g., fire in Yellowstone and fluctuating water levels in Everglades) are increasingly being sought or reestablished.

Perhaps a natural extension of the "parks as vignettes" concept is the perception that national parks should serve as preserved or restored remnants of pre-Columbian Americana. The writers of the Leopold Report felt that management should be directed toward maintaining biological populations and habitats in accordance with the conservation plan for the area. They believed that the biotic associations within each park should be "maintained or, where necessary, recreated in the condition that prevailed when the area was first visited by the white man."

During the early part of this century, F. E. Clements, a well known American ecologist, and his followers championed a particular paradigm of ecology, in which each undisturbed geographic habitat was

thought to evolve into a unique community composition (or climax). This Clementsian view envisioned a set of community or vegetation units which dominated the landscape before the European settlement of the North American continent. Through a Clementsian eye, proper (i.e. natural) management would result in the "restoration" of extirpated units and the "preservation" of remaining extant units.

Another concept which has evolved and grown in acceptance is that of diversity. Biological diversity, or biodiversity as it came to be called, is usually considered to be an important attribute of natural ecosystems. In the 1960s, ecologists initiated new theoretical thrusts towards the understanding of the roles and importance of biodiversity. Many considered diversity a major factor inherent in the stability of natural ecosystems. (While probably true for some ecological communities, there are situations in which diversity does not lead to the most stable ecosystem.) Some attempts to demonstrate that biodiversity is a requisite for ecological stability, were later shown to be circular in rationale (e.g., MacArthur's mathematical treatment in which stability was *defined* as diversity). Today, for cultural, aesthetic, ecological, and management reasons, diversity is usually favored in conservation and ecological thinking.

Since biological diversity is favored in the conservation ethic, by extension habitat diversity seems favorable. Some have therefore argued that the national parks and other conservation managed lands should attempt to preserve and restore a diversity of vegetation or ecosystem types of pre-Columbian heritage.

I am an investigator of a project that has as an objective the development of tools useful in the conservation management of natural or restored lands. In developing this research, I found it both necessary and important to re-evaluate some of the conservation ideals that evolved from the Leopold Report. Originally, one proposed focus of the research project was the development of a database of managed and unmanaged lands which would relate current management to the existence of current and past vegetation types relative to the pre-Columbian realm. In attempting to pursue this idea, one of the first tasks for the project became an evaluation of both the concept and feasibility of maintaining pre-Columbian vignettes. The process resulted in not only an analysis of the practical difficulties of accomplishing this goal but also problems in the concept itself and its evolution as described above.

The concept of establishing a network of pre-Columbian vegetation types presumes that we know what those types were. First, although general vegetation patterns are known from palynological studies, specific vegetation patterns at which might be considered an ecosystem scale are rarely known, especially in non-glaciated regions where natural lakes and ponds (containing pollen records) of historic age are rare. The generalized "ecoregion" maps that currently exist are usually broad-scale presumptions of past vegetation distributions.

Second, the concept of classifying standardized vegetation types

leads to many difficulties in application. Many classification schemes (e.g., Society of American Foresters' forest types, ecoregion types, etc.) are incompatible, partly because they were developed at different map scales. The major problem, however, is that vegetation in general does not sort into distinct vegetation groupings according to the Clementsian view of climax communities. Rather, as R. H. Whittaker (1956) so eloquently demonstrated in the Great Smoky Mountains, plants are distributed independently over environmental gradients (as suggested by the American ecologist, H. A. Gleason). Thus, the vegetation types that we humans observe are mostly subjective groupings which exist at varying scales of resolution.

Third, a vegetation or ecosystem map could be used to accurately assess the status of biodiversity within a mapped area if biodiversity were directly correlated with ecosystem type. Unfortunately since biodiversity varies in its relationship to ecosystem type, such an approach will have limitations (P. White, pers. com.). While it is true that different kinds of ecosystems (e.g., spruce-fir forests) have different numbers of plants and animals than others (e.g., cove hardwood forests), much of the biological diversity of a region is contained in the rarest and most sporadically (unpredictably) distributed species and habitats. Rare habitats, such as seepage zones, wetlands, rock outcrops, and cave systems, make important contributions to biological diversity; yet since these habitats make up such a small percentage of the landscape, they usually cannot be delineated within the scales of most mapping systems. Even more importantly, the presence of these landscape features is not predictable from the major mapped ecosystem types present.

Fourth, a basic component of the Earth's environment and of its ecosystems is change. In the short geological time since the last glaciation, the distribution of vegetation on the Earth has changed dramatically. The independent reassortment of the distribution of each plant species in response to the changing climate and environment has likely produced a myriad of ever-changing vegetation assortments. Even if we could take a snapshot of pre-Columbian assemblages during a limited period of history, there is no reason to believe that those assemblages would be ideal for preservation today; and every reason to believe that these "historically accurate" assemblages would change over time due to natural changes in world climate.

Fifth, the rationale of preserving pre-Columbian vegetation types might be justified by the belief that the vegetation and wildlife communities at that time were "natural" and not influenced by humans. However, it is unlikely that the original native Americans had no influence on the natural ecosystems of the continent. Some suggest that the extinctions of many large mammals, which occurred after the formation of the Bering Land Bridge, was not coincidental to the appearance of humans in North America. If native peoples had such a large impact on animal populations, the North American landscape would likely have had a human signature by the time Columbus arrived in this hemisphere.

Sixth, man-induced changes in the physical, biological, and chemical climate of the Earth (e.g., global warming, air pollution and acid deposition, and exotic species introductions) make it increasingly likely that present communities and ecosystems will change in composition at ever-increasing rates, far beyond what "natural" global changes might have sown. For example, the introduction of the chestnut blight (an exotic fungus) and the resulting loss of the chestnut tree in the southern Appalachians in the early part of the century precludes the restoration of previously major vegetation types in which the chestnut was important or dominant. As another example, some have envisioned national park communities "marching beyond" current geographic park boundaries in response to global warming. Questions are now being raised as to whether currently recognized vegetation types (not to speak of pre-Columbian types) can be preserved or maintained in the face of likely climate changes which may prove to be inhospitable to the present assemblages.

In considering the above arguments, not only would the concept of locating and/or reestablishing pre-Columbian ecosystem types be difficult or impossible to obtain, but its rationale would also be difficult to defend. Yet in the absence of a paradigm in which parks can be seen or desired as vignettes of the pre-Columbian era, what should be our chosen strategy towards a conservation-based management of ecosystems? In order to develop a management strategy, we must first determine its objectives. As indicated previously, the maintenance of biodiversity would be of high priority to us. The preservation of rare or endangered species would also be preferred. The maintenance of significant populations of wild animals, including ungulates, carnivores, birds, and fish, usually is important in conservation-managed lands. And a diversity of land management options usually is desired within a landscape for aesthetic, cultural, and practical reasons.

If the changes now being predicted as a result of global climate change do come about, then the ranges of whole species will change; and the changes will occur independently for most species in different ways and at different rates. Migration and the maintenance of migration corridors will be important in maintaining animal populations and biodiversity in general. Habitat fragmentation and the influence of man-made boundaries will therefore increase. Thus, perhaps our future conservation-based policy should emphasize: (1) the development of increased coordination and flexibility among agencies in their management goals (e.g., USDA Forest Service's multiple use strategy and the National Park Service's conservation strategy) and (2) the preservation and coordinated management of a diversity of what we would call physiographic environments or landscape types.

The biological diversity of a landscape is composed of two constituents: (1) local (alpha) diversity within any one habitat type, and (2) a (beta) biodiversity among habitats (since with distance there is a turnover of species within the landscape). By maintaining a diversity of habitat types in a conservation network, we can seek to maxi-

mize biodiversity under any existing regional or global conditions. A major component of the habitat mosaic is the physical environment: moisture gradients, physical exposure, and edaphic (soil) factors. By seeking to maintain a network of diverse physiographic environments within a region (from ridge tops, to stream valleys and lowlands) and by preserving likely migration corridors and minimizing habitat fragmentation, managers will improve the chances for preserving natural lands with the conservation qualities we most desire.

The writers of the Leopold Report recognized the enormous complexities of natural ecosystems and the important role that natural processes play in maintaining the stability and diversity of these systems. However, their recommendations were made during a time when the Clementsian view prevailed (in which it was thought that if natural processes were allowed to act, perhaps with a little help from man, the original "climax" systems would rejuvenate and be retained). The Leopold Committee did not have the knowledge we have today, regarding historical and future predicted changes in global climate. Hence, any decision to attempt to maintain parks in a pristine state is part of a societal choice, not necessarily one based upon scientific rationale. Our cultural values strongly influence our desires to see parks as we believe they once were. Yet in reality we do not often know what they actually were like in the past; and even if we did, we may not be able to prevent the many changes that will inevitably occur in response to global driving forces.

The authors of a new report on research and resource management policy have provided a modified view of the national parks and the original Leopold Report (CRRM NPS, 1989). The new Gordon Report, as it is called, points out that the Leopold Commission provided a critical push toward ecological management in the National Park Service. The authors of the Gordon Report also were aware of the difficulties in interpreting the concept of parks as "vignettes of primitive America." However, they felt that "the Leopold Commission's intent was to encourage active management and not a fixation on some static primitive condition." Now that we know so much more about the state of natural systems and the potential for future changes in response to an altered climate, it is important for us to move beyond the debate of how we might restore "what was" and focus more strongly on the future state of our parks.

Acknowledgements

Support for this work was provided through a grant to the author from the Man and the Biosphere Programme through the United States MAB National Committee; by the Great Smoky Mountains National Park; and by the Southeast Region Office of the National Park Service. The author wishes to thank George Weaver, Jim Carter, Clayton Crawford, Wilson Crumpacker, and Peter White for the many discussions and comments which led to the development of this paper and James Woods for his extensive technical review of the manuscript.

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.....It is often unwise to read only the summary of a report—intent and flavor of the full report may be diluted, even lost. With those words of caution ...summaries of the «Leopold Report» and the «Gordon Report» are reprinted on pages 47 and 48 of this issue.....