The Temperate Forest Ecosystem

ITE symposium no. 20

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on
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and
Environmental Protection
Changbai Mountain Research Station
Academia Sinica
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View of temperate forest in Changbai Mountain Biosphere Reserve, north-east China (Photograph Wang Ying)

The *Institute of Terrestrial Ecology (ITE)* was established in 1973, from the former Nature Conservancy's research stations and staff, joined later by the Institute of Tree Biology and the Culture Centre of Algae and Protozoa. ITE contributes to, and draws upon, the collective knowledge of the 14 sister institutes which make up the *Natural Environment Research Council*, spanning all the environmental sciences.

The Institute studies the factors determining the structure, composition and processes of land and freshwater systems, and of individual plant and animal species. It is developing a sounder scientific basis for predicting and modelling environmental trends arising from natural or man-made change. The results of this research are available to those responsible for the protection, management and wise use of our natural resources.

One quarter of ITE's work is research commissioned by customers, such as the Department of Environment, the European Economic Community, the Nature Conservancy Council and the Overseas Development Administration. The remainder is fundamental research supported by NERC.

ITE's expertise is widely used by international organizations in overseas projects and programmes of research.

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said. "We have to let urban people know how water is stored, kept usable, moves through the environment – how air and water serve the wider community, how the ecological health of parks is related to the health of the total environment."

Hester suggested that urban parks should work toward harnessing the energies of their nearby constituents "to help us, as park employees, protect our natural resources." He observed that Director Mott "is strong for biological diversity, for threatened and endangered species," and pinpointed loss of habitat as a prime problem. "Parks are places," he said, "where visitors should be helped to understand the intrinsic value of all animal and plant life – how every organism has some ecological value and many have human benefits yet to be discovered. Parks are opportunities to explain these values – especially urban parks."

The need for social science research, posed by the changing demographics of both visitors and the National Park Service, was recognized by Sociologist William Kornblum of New York University and Don Field, NPS Social Scientist.

George B. Hartzog, Jr., a former NPS Director, challenged the group to consider the problem within NPS ranks. "A burning concern" for the Service itself, he suggested, is to examine its own commitment to the teaching mission. "I perceive," he said, "a lack of consensus within the NPS ranks as to what is our business and should we be in it?"

Dr. Field, who recently completed a survey of NPS personnel with relation to the Service, described the need for sociological research both inside and outside the Service and the imperative to "adjust our traditions to fit the 21st Century if we are to survive into that era."

If You Don't Mind Missing Christmas At Home . . .

From Joanne Michalovic in the NPS Washington Office of International Affairs comes a call for applications from interested mid-level NPS career employees to attend the **First Asian School on Conservation Biology** to be held Dec. 16-31, 1987, at the Centre for Ecological Sciences, Indian Institute of Science, Bangalore, India. Scientists, students, resource managers, and park managers from many Asian countries will attend, and the organizers have invited and will pay the expenses for one NPS mid-level employee.

Emphasis will be placed on broadening efforts to conserve the entire spectrum of biological diversity and on reconciling the demands of conservation, economic development, and subsistence needs of local people. In addition to course work and lectures on modern developments in the entire field of conservation biology, the school will include a four-day field trip to India's first biosphere reserve in the Nilgiris, South India. Within that reserve are the Bandipur Tiger Reserve, Nagarhole and Silent Valley National Parks, and Mudumali, Wynaad, and Upper Nilgiris Wildlife Sanctuaries.

The NPS participant will be expected to deliver one lecture on an appropriate topic pertaining to biological conservation in his/her field of expertise. He/she will also be expected to deliver presentations to NPS staff in the home park or region upon return to the U.S., and prepare a written evaluation of the course and experience. All travel, per diem, and course registration fees will be covered. The NPS participant must supply his/her own pocket money for incidentals.

Applications will be accepted from interested mid-level NPS career employees who have responsibility for management of natural resources/biological diversity. This could include but is not limited to resource managers, park managers, park rangers, and researchers.

All applicants must have an International Skills Roster Form and accompanying SF-171 on file with the Branch of Employee Evaluation and Staffing, Rm 2215, ATTN: International Skills Roster, P.O. Box 37127, Washington, D.C. 20013.

Selection will be made using the Skills Form and SF-171. Deadline for application is Oct. 2, 1987.

Previous overseas experience is not mandatory.

Please address any questions to Joanne Michalovic, Office of International Affairs, 202/343-7063.

Reserve Designs in a Landscape Context: Another Slant in the Continuing Debate

By Joseph E. Means and Sarah E. Greene

Quinn et al. (*Park Science,* Fall, 1985) are gathering interesting data relating habitat island size to number of species. Subsequent discussion by Bratton (*Park Science,* Winter, 1986), White (*Park Science,* Spring, 1986), and Quinn and van Riper (*Park Science,* Summer, 1986) has emphasized factors in addition to reserve size that are important to design of nature reserve systems. We raise a question about the appropriateness of some of the data of Quinn et al. to their hypothetical choices of reserve system designs, and suggest that reserve systems should be designed within a landscape context.

One goal of Quinn et al.'s paper is to provide data bearing on the question of whether "a few large areas . . . (or) a number of smaller tracts, equal in area to the larger ones" (p. 6) (note the narrow range of reserve sizes) will conserve more biological diversity. Yet the natural island, experimental grassland, and marine systems they describe have a wide range of reserve sizes, an important structural difference. Their grassland experiment compares reserves that differ 16-fold in size in **one** reserve system. In this system, the large islands (and probably the surrounding landscape – a very large source of organisms) help maintain diversity on small islands because animals – and probably plants – can move among islands. For example, the larger population sizes on large islands may make them the source for a large proportion of the recent colonists on small islands. Thus the structure (here, the range of island sizes) of the reserve system is probably important to the number of species on islands in each size class.

A similar difference exists in the structure of the natural island systems they describe and alternative reserves designed by human beings. The authors compare numbers of species on the largest islands (at least in the Galapagos and Hawaiian archipelagos) with those on the other smaller islands. But the species diversity on the islands in each size class results in part from species interchange in archipelago ecosystems that include a wide range of island sizes. Interchange will be less important in the Hawaiian archipelago because the islands are farther apart.

The marine system comprised of "reserves" of hard substrate on a sandy flat also contains a wide range of reserve sizes. The constant influx of propagules of all species from the ocean is another important difference between this system and Quinn et al.'s hypothetical choices of reserve systems.

The data discussed by Quinn et al. contribute to this scientific field but are not directly applicable as a guide to choosing among reserve systems comprised of similar-sized reserves when the goal is to conserve maximum biological diversity. Though data from natural islands suitable for addressing this question probably are quite rare, experiments can be designed that directly address this point.

Our second point is that each reserve system is part of an encompassing landscape-wide ecosystem with which it has many interactions – no reserve is an isolated island. The previous discussion and a short list of interactions illustrate the point. Some species will use resources outside reserves, crossing boundaries frequently, and some would maintain healthy populations even without reserves. Although certain species prefer edges, interior species may need large buffers to avoid the modified edge environment (scale of meters to hundreds of meters) or the influx of predators or competitors from the non-reserve landscape. Interchange among reserves can occur if distances and adequate travel corridors (when needed) allow species movement. Pest populations, such as defoliating insects, may build up in the surrounding landscape and then enter reserves. These interactions depend on the composition, sizes, and shapes of different units in the landscape pattern, and importantly, they change as the mosaic changes. Reserve systems therefore should be designed to function as part of the encompassing landscape ecosystem and to anticipate temporal changes in this landscape.

In the United States, many National Parks abut other extensive federally managed lands. The USDA Forest Service typically manages large landscapes (relative to National Parks) and controls a contiguous pattern of habitat patches and corridors in a dynamic state. They must manage for a wide range of values, including timber, recreation, water, wildlife, and range. National Park Service managers have different goals and options, usually managing one or two reserves within a larger landscape over which they have little or no control. Design (and management) of reserve systems and single reserves, and management of adjacent lands would benefit from close coordination and long-term commitment among all managers of the landscape.

Studies of population biology and island biogeography to be applied to reserve systems must be put in a landscape context. From this perspective, differences in structure (see discussion of grassland and natural island systems above) and context (see discussion of marine system above) become apparent. The emerging field of landscape ecology (see for example **Landscape Ecology** by R. Forman and M. Godron, 1986, Wiley, and 'Landscape Ecology' by D. Urban et al., 1987, **Bioscience** 37(2): 119-127) and tools for analyzing information in a spatial context (such as geographic information systems) promise to be of increasing value in this effort.

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