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THE ROLE OF ECOLOGY IN THE NATIONAL PARKS

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It is safe to say that ecological considerations had almost no part in the establishment or design of any of the Canadian national parks. Many of them of course were brought into being before this aspect of science reached a stature at which it could contribute. It is equally safe to say that most of the ills that beset our national parks have an ecological component, and arise from proceeding in the absence of policy objectives framed in ecological terms, and from decisions made in ignorance of ecological alternatives and consequences.

A reading of the history of our national parks makes it clear that the predominant motive in their establishment has been the desire to maintain under public ownership, for public enjoyment, areas of unique scenic beauty or possessing other unusual natural features regarded as national treasures. Thus on this continent hot springs, geysers, stupendous canyons, badlands of special attraction, great cave systems, beaches where these are scarce, lakes in arid lands and mountains of special appeal have acted as focal points around which parks have been created.

Public enjoyment has been the avowed purpose of the parks and there can be no better. Serious questions have arisen, however, over the interpretation of this objective in more precise terms. It has been generally accepted that all forms of life should find protection in the parks and that our recreational activities should not include the so-called

"blood sports." It has been a matter of principle also that commercial destructive exploitation of any of the natural resources is inconsistent with primary objectives. Bitter controversy, however, still revolves around the appropriateness of highly organized competitive sport requiring considerable ecological alteration of the parks and catering largely to spectators.

In 1963 the United States National Park Service took a bold step forward in arranging for a thorough review of its policies with respect to the natural environment. As an outcome of its year of study, the Leopold Committee proposed that in future parks policy and practice be based upon one novel principle.

The goal of managing the national parks... should be to preserve, or where necessary to recreate, the ecologic scene as viewed by the first European visitors. As part of this scene, native species of wild animals should be present in maximum variety and reasonable abundance. Protection alone... is not adequate to achieve this goal. Habitat manipulation is helpful and often essential to restore or maintain animal numbers...

Active management aimed at restoration of natural communities of plants and animals demands skills and knowledge not now in existence. A greatly expanded research program, oriented toward management needs must be developed....

This is clearly based upon ecological considerations. It makes it obvious that the full potential of the parks can only be developed in that context, and that environmental considerations are paramount in imposing constraints on our activities within the parks.

It is my purpose to step beyond the generalizations in which principles must be couched and to refer to several more precise examples of the role of ecological science in the design and operation of parks.

It is now widely recognized that national parks have a much wider role than merely the provision of opportunity for the enjoyment of majestic scenery. Human ingenuity in designing ways of enjoying the environment is limitless and within the spectrum one identifies many forms of recreation that are appropriate to the natural or relatively unaltered environment. Beyond these, however, lie other roles not directly related to recreation. The parks serve as wildlife refuges, and, even more important, within their boundaries are preserved large segments of many ecosystems that are elsewhere rare or gone in the unaltered state. Each is an immeasurably complicated web of interrelated organisms, a treasure house of highly evolved genetic components that may some time serve man in ways not yet imagined. Each is also a store house of untapped knowledge available to researchers of the future, preserved as examples of the circumstances and mechanisms in environments unaltered by man. Each of these functions can be of almost equal concern at least in the larger parks, but wise management within today's expanded vision of the contribution of national parks to this and future generations demands a new sophistication of those responsible and a novel and more diversified supporting team of experts.

The ecologist has a vital role to play from the earliest negotiations that may lead to the establishment of a new park or altered boundaries for an existing one. It is at such times that boundaries can be adjusted to provide a maximum variety of habitat, flora and fauna, or to include areas of special value for viewing or for research. Then too the admixture of summer and winter ranges for wildlife can be considered to provide the park with control of sufficient and all necessary wildlife seasonal ranges so that it can assure survival of nucleus populations regardless of changes outside the park. At this stage also wildlife problems can be anticipated and plans made for their avoidance. Areas where misuse of land has been proceeding can be given special study and plans drawn for their exclusion, or inclusion depending upon the opportunities for redress.

Ecology and Physical Developments

It is in this area that the concerns and competence of the ecologist and the regional planner converge as each seeks for the constraints that principle and environment place upon their responsibilities. In any region some forms of habitat will be relatively scarce, others abundant. In the Rocky Mountain area, for example, the low elevation grassland slopes and the shrublands that are the winter ranges of the large game animals are in short supply while conifer forest is present in abundance. Under these circumstances recreational developments, highways, aircraft landing strips, campsites and all the trappings of human use should be undertaken in the conifer stands wherever possible, leaving the grass and shrubland for their more valuable purpose. In neither Banff nor Jasper Parks has this rule been followed with the result that hundreds of acres of valuable winter ranges have been consumed by roads whose primary purpose is to take people through the parks—not to provide enjoyment of them.

The development of nature ways, low speed, winding

byways for low density use, offer opportunity for fruitful collaboration between the planner, ecologist and engineer. Only the ecologist can specify the areas these byways should traverse. Their primary purpose is to provide recreational enjoyment, not transportation routes, and the engineer's task is to facilitate the primary purpose with all the skill and imagination given him. Meadows where game may be viewed will be skirted, salt licks and bedding grounds will be approached from the appropriate side, choice groves of trees will be left intact, ecological areas reserved for study will be by-passed entirely, fills and excavations will be kept to a minimum, hills and curves are a feature of the landscape to be enjoyed and lived with in sensitivity—not seen as a challenge to the bulldozer. Straight stretches of road are to be avoided like the plague, unless they serve the recreational objective, they invite speed and boredom. Where lake shores or river banks are approached the objective becomes minimum disturbance for maximum artistic exposure of scenery and ecological diversity. The peak or glacier framed by trees, the beaver pond, the pondweed bed where moose will be seen morning and evening, exposed just enough and from the best directions for viewing and photography. Many small turnouts will be essential where one or two cars (not more!) may pull off the roadway to better enjoy the scene. There is no such by-way in our parks today; to develop several would be a major contribution to national enjoyment. I would urge that the first one be named after the engineer with the skill and imagination to meet the challenge that the ecologist presents to him. He will be a rare species worthy of such commemoration.

After 38 years spent in our parks, I become progressively depressed by the complete failure of the highway engineers to respond to the unique demands inherent in national park roadways.

A subject of increasing concern is the impact of the environment of growing hordes of people. Trampling accelerates erosion, changes the characteristics of the flora, frequently to the encouragement of introduced weeds.

In Canada we have not yet identified the central ecological goals in our park management. Those adopted in the United States are worthy ones, even if difficult to attain. It is urgent that we define our own objectives as without them we are merely groping our way from one problem to the next with nothing on which to focus in deciding between alternative routes. Inevitably an ecological policy will involve us in new demands for information. To guide a flora into predetermined ways requires detailed understanding of the processes of biological change with succession, and the determination of the critical factors in the environment that guide and govern the changes. The trick is to steer the processes toward our objectives without appearing to intrude. Many details of human interaction with the environment in our national parks have been discussed by the Canadian Audubon Society in its brief to the House of Commons Standing Committee on Northern Affairs and National Resources (1966).

Wildlife in the National Parks

I have already proposed that one of the conditions to be provided in the design of a national park within which seasonally migratory large game are a feature, is the control over the winter ranges necessary to provide for the survival of nucleus populations exclusively within the park.

At the same time we have become aware recently of the vexing problem presented by excessive populations of certain large herbivores that develop under park protection. The elk is a frequent problem animal as it seems to lack some of the sensitive mechanisms certain other species possess that

permit them to respond to crowding by reduction of reproductive rate short of starvation. The occurrence of big game populations in excess of range capacity present problems of an ecological nature—overgrazed rangelands on which the more fragile plants are exterminated, accelerated succession into unpalatable species, erosion of hillsides and the exclusion of herbivores that compete less successfully. The removal of the surplus brings troubles largely political in nature. So far we have not encountered the bitter jurisdictional debates that have beset our American colleagues, and in Canada surpluses have been successfully removed by park officials with maximum devotion to the objectives and minimum disturbance to other life.

It is sometimes possible to plan the park boundary so that part of the winter range of each herd lies outside and excess animals can be removed by public hunting. This was possible on the east boundary of Waterton Lakes Park and helped to reduce the elk problem there. However many wintering populations develop such close allegiance to parts of the winter range that they refuse to move out even when feed is better elsewhere. This can complicate attempts to manage excess numbers of some species.

Major predators such as wolf, grizzly and mountain lion present special problems that have not yet been solved. They are important elements in the park faunas, but only the very large parks are large enough to provide the total range necessary for the maintenance of viable populations. Wolves present the largest problem due to their mobility. One wolf marked by me in the Rocky Mountain parks was recaptured more than 100 miles from the den range. The park populations of these species are becoming increasingly valuable as they dwindle and vanish over much of the rest of Canada. Already the national parks provide the best opportunities for studying these mammals in order to acquire the information essential to their conservation.

With these species each park has its own problems to be solved as an outcome of local research that exposes the available alternatives. The occasional accidents involving grizzly bears present special problems, because of their emotional content that tests the resolve and ingenuity of management. We have paid too little serious attention to the various ways of avoiding such accidents. I urged such studies 25 years ago, but to my knowledge the task has yet to be assigned.

Both for large herbivores and their carnivorous predators buffer strips between the parks and adjacent agricultural or ranching areas help to prevent conflicts of interest. However, parks elsewhere (vide Nairobi) have had to fence potentially troublesome boundaries and that solution may become more widely necessary here. Elk Island Park adopted it years ago. Fenced parks, however, present ecological problems of their own as under these conditions it becomes even more difficult to manage the total environment in the direction of re-establishment and maintenance of primitive conditions and there's more tendency to adopt a "ranch" concept of big game.

Changes in plant cover can produce ecological problems of a different category. The inexorable march of forest succession onto the critical winter ranges of the Bow and Athabasca valleys in Banff and Jasper Parks is gradually bringing us closer to some difficult decisions. Many of these winter ranges owe their existence to forest fires. They support a substantial part of the wintering populations of elk and deer as well as bighorn and moose. Their proximity to main highways makes the game easily accessible for viewing; it also makes it possible to apply 100 percent fire control and to frustrate the normal mechanism for periodically setting back forest to grassland. Thus succession is steadily returning these ranges to spruce and pine in which feed

potential is low and visibility obscured. We should be actively studying the alternative means for setting back the succession and maintaining the grasslands. If we don't, the wildlife stocks will be sharply reduced and the enjoyment of them will become more difficult. Yet the purposeful use of fire in a national park is hard to accept and at this stage we must admit that we lack the skill and knowledge to use it. The potential ecological consequences of various forms of action will be an essential element in such research.

Ecology and Human Health

Two aspects of this subject are of particular concern—the impact of wildlife upon domestic water supplies and the presence of animal parasites and diseases that can also attack man. Many mountain streams flow through heavily used winter ranges and drain bottomland well populated with beaver. Conventional water treatment can provide water safe for human consumption despite its load of animal excrement. But some planning that provided for the use of streams that did not emerge from densely occupied animal ranges could lessen or avoid the conflict of interest.

Some of our parks harbor sylvatic strains of plague, Rocky Mountain fever, tularemia as well as *Echinococcus*—all of them potentially transferrable to man. Here again a thorough knowledge of the biology of these organisms can be used to direct human use of the park in places and ways that minimize the risk.

It is quite obvious that the full spectrum of objectives available to a national park can only be achieved by the studied involvement of ecological considerations at each stage of the planning and operation. No planning team can be fully effective if it lacks or ignores ecological data. The day to day operations will have constant demand for similar information. Even such hallowed precincts of the engineer as the location and design of roads, campsites, townsites, trails, refuse disposal can no longer be left to decisions based solely on engineering data. All have environmental consequences, and all should acknowledge constraints arising from their role in the overall objectives of the parks. Habitat management and the maintenance of full diversity within the living environment, the maximum opportunity for varied levels of sophistication in the enjoyment of the living organisms and the preservation of the genetic materials and the unaltered natural environments with their potential for new knowledge and future benefits to man; must be central to enlightened parks policy today.



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