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The Resource Information Base for Planning

National parks are established so that visitors can discover and enjoy the beauty and grandeur of a country's scenery as well as its special physical and biological features, and so that this natural heritage can be preserved for future generations. A national park to which visitors are not admitted would not be worthy of its name, no more than would a national park where natural resources are allowed to deteriorate.

An in-depth knowledge of the resources of a national park is basic to developing the master plan, which reconciles both preservation and use. While it is recognized that there are instances where use of a park begins before the master plan is completed, this essential phase should not be delayed. Ideally, planning should precede use but intelligent planning is possible only when a detailed inventory, providing a thorough knowledge of the resources of the park, has been carried out. Of course this may be expensive, since experts in various scientific disciplines are involved, but it is not a luxury. It would be even more expensive to plan the development of an area without first obtaining precise data on the resources it contains. To proceed without such data would be to risk making irreparable mistakes which could bring about the destruction of priceless, perhaps irreplaceable, resources as well as to waste the always too-limited monies available for park management and development.

Before a national park is established, certain information will normally have been accumulated on the physical and biological resources it contains. Also, its location will be known and, usually, boundaries will have been determined. In those countries where a park is established through legislative action, and where ownership of the lands involved must be acquired by the government, much information will already have been gathered. Many times, however, this information is not detailed enough to serve as a sound basis for master planning.

Since a detailed inventory takes time to complete, it should begin as soon as possible after the park is established. In this way delay in drawing up the master plan can be avoided and the planner will not be obliged to prepare the plan on the basis of fragmentary information, as is so often the case.

An inventory of natural resources is essentially a quantitative and qualitative description of the resources as they are situated in time and space. Inventories are not new, but they are generally carried out for purposes of resource extraction or exploitation. For instance, forest inventories reveal the volume of industrial timber, geological inventories estimate the number of tons of ore, biological surveys give units of biomass, and so on. These data and the methods used to collect them have few applications in the inventory of a national park, where industrial transformation of resources has no place. It is essential that the data obtained fit the purposes to be achieved and, therefore, there must be constant reassessment of the methods used. It is especially important to seek

new methods which will yield as good or better results in less time and at less cost.

One distinguishing feature of national park inventories is that while they must concentrate on the present state of the resources, attention must be given to their past and anticipated future conditions. Because of the special purpose for which national park land is set aside, the complex processes of biological change must be thoroughly known. Their past and future conditions should have an important bearing both on the orientation of the master plan, and on resource management objectives.

The inventory must not, then, be restricted to the study of present conditions; similarly, it should not stop short at the park boundary, which rarely coincides with the boundaries of the natural communities that parks are designed to preserve. In order to be complete, the inventory should extend beyond the park limits.

An inventory of the resources in a national park comprises three distinct stages:

- preparatory work
- collection of field data
- synthesis and integration of the data

Once these stages are completed, the information must be kept up to date through continuous monitoring.

The preparatory work

In this stage, aerial photographs and basic maps are assembled, and a bibliography of all studies connected with the natural resources of the area is drawn up. This material must then be summarized and evaluated.

Aerial photographs Aerial photographs are of considerable importance in the inventory process. Photographs of suitable quality, type and scale are needed. Vertical photographs on black-and-white panchromatic film (scale 1 to 50,000) are usually recommended. Larger scale photos and other types of aerial photography, including infrared color, are often useful since they provide more detail, and sometimes special maps produced from satellite photos can be valuable.

Base maps It is essential to have very clear and accurate base maps. These documents will be used to plan the distribution of sampling units, and to locate observed features. In later stages results will be recorded on them. There are two main types of base maps: (1) the planimetric map, which merely shows hydrographic and road systems and the park boundaries; (2) the topographic map, which also shows the contours of the terrain. The planimetric map is the more useful of the two, since it is less cluttered, unless the

topographic information is essential as in the case of the parks with high mountains.

The scale of the base map will depend on the area under study and on the level desired. Whatever the scale chosen, however, it should be used consistently throughout all the thematic studies.

The selective bibliography The bibliography will represent the balance sheet of present knowledge and will permit the planning of the inventory in a manner that avoids duplication. Bibliographic research should not be limited to published studies; unpublished reports by organizations involved in research on the area's natural resources should also be consulted. Once the bibliography is drawn up, it is essential to keep it up to date by adding any recently completed studies.

Data collection

Environmental components can be classified under several different headings.

Physical components:

- climate
- the bed rock, the soil, surficial deposits and landforms
- water

Biotic components:

- plants
- wildlife
- man

In conducting an inventory of these components, two different approaches can be used. One can either (1) carry out thematic studies in which each of the components is considered individually,

or, (2) do an integrated inventory, that is, a simultaneous and coordinated inventory of several components considered together.

Although we much prefer the integrated approach, we shall first proceed to examine each component separately and attempt to show what aspects must be considered in the preparation of the master plan.

Climate Climate has considerable effect, not only on the park environment but also on the rate of visitation and the way the park is used. It is therefore important to have at least some general climatic data before proceeding to prepare the plan.

Frequently there will be an existing network of weather stations in the park or its immediate vicinity from which the necessary information on local climate can be obtained or from which some inferences can be drawn. Sometimes one or more stations are needed to complete the network; sometimes the entire network must be built from scratch. It is at times desirable to carry out special microclimatic studies before deciding on the location of campsites, beaches and ski slopes in order to ensure visitors a maximum of comfort and safety.

Geological and geomorphological studies This brings us to the study of soil and subsoil, surficial deposits and landforms. Studies of all these features are invaluable to the planner. Their results will enable him to locate the sites in which the geological history of the park may be interpreted and to show and explain to visitors any features of special interest. Also, such studies help the planner to determine where facilities should be located, once he has considered important engineering criteria and other factors such as risk of erosion, landslides, faults or cave-ins and to compaction tolerance.

The biophysical land classification breaks down the area into homogeneous landscape units on the basis of soils, surface deposits, landforms, climate and vegetation. The large numbers refer to landscape classification units, and the small numbers to sub-types.

Photo: Auyuittuq National Park, Parks Canada





Above: Wildlife is the main attraction at many national parks. Planners must know what species are present and their numbers, as well as their habitat requirements and particular needs. Rare or endangered species should receive special attention. These black rhinoceroses in Ngorongoro Crater, Tanzania, a prime wildlife area, were photographed by the author. Right: Studies of geomorphological features enable planners to locate sites of special interest to scientists and visitors.

Photo: Banff National Park, Parks Canada.



Water Generally, a water survey will begin with the demarcation of the various drainage basins. The next step is to measure the length, surface area, volume and rate of flow of the various waterways in the area and of any basins of particular interest. Lastly, the physical, chemical, and biological characteristics of the water are determined. We must know about features such as hot springs, geysers, glaciers, mineral springs, bathing spots, and waterfalls because of their recreational potential.

Sources of drinking water should also be identified and ways should be found to ensure that the presence of visitors will not result in the deterioration of water quality.

Plant life It is difficult to exaggerate the importance of studies of vegetation in any national park inventory. If only one environmental component of a national park were to be studied, its plant life would obviously be the prime candidate. Generally, vegetation provides shelter and food for a variety of animals; it reflects the nature of the climate, soils, surface deposits and other environmental conditions and at the same time it clothes the land in an infinite range of textures and colors.

In surveys of plant life it is communities or associations rather than species that should be considered. In addition to the phytosociological characteristics that are usually described in such studies, data should be collected on the relative tolerance of each community to visitor activities, its educational potential and its long term stability. If the composition of the plant community is changing with time, the planner will have to be aware of it; he will have to know how the community is likely to evolve and at what rate it will do so.

Every effort should be made to identify rare or endemic plants

or communities because special protective measures, such as limiting or excluding public use, will have to be enforced in the areas where they grow.

Wildlife Wildlife constitutes the main attraction in many parks and wildlife inventories are therefore of particular importance.

There are no general rules for conducting inventories of animal life in parks. The experts should always be relied on to decide themselves what species and aspects should be studied in each particular situation.

The planner's needs will not be met by a mere list of species and data on their relative abundance. He must know the distribution of the species, its migratory movements, its special requirements, the size of its territory and certain behavioral traits if he is to plan park features or activities in such a way that visitors can observe as many animals as possible during their stay in the park.

Not all categories of animals and not all species can be studied to the same extent. The choice of those which should receive more attention is not easy. The tendency is always to take the greatest interest in the most spectacular or visible species, but this approach is not always the best. Is it not important to know the characteristics of a tiny but rare insect, or one which poses a hazard to the health of visitors, as it is to know those of elephants or other big game? Planners must also be aware of any rare or endangered species in a national park and their special requirements; special studies should be made of these.

Man Although the main concern in any national park inventory is its natural resources, experts in archaeology and history should also be asked to study the area. They will be able to de-

termine whether there are any sites which should be preserved and which, without protection, could be destroyed during development work.

Probably because of the abundant natural resources in national park land, areas once inhabited by prehistoric men are often found. A new park may contain sites of great value, the destruction of which would seriously set back efforts to understand the history of mankind. Initially, the main concern should be to identify such sites rather than to begin excavations, which demand a great deal of expert time and effort. Whatever information is obtained can later be made the subject of public interpretive programs, in which primitive man's relationship with the environment can be explained to visitors.

The integrated inventory The integrated inventory has many advantages. Not only does it mean a saving in time and money, but also it gives a more comprehensive view of the environment.

One method that is very suitable for use in national park resources inventories is biophysical land classification (Lacate, 1969). With this method, the area is broken down into homogeneous landscape units on the basis of data on climate, soils, subsoils, surface deposits, landforms and vegetation.

Since preservation of the pristine landscapes is a major objective of national parks, is it not quite logical to use a method which gives results in terms of landscape units?

Not all environmental components are considered in biophysical classification and, therefore, if this technique is used, the aspects that were initially disregarded, such as human history, for example, must subsequently be studied in order to complete the inventory. A biophysical land classification provides a very useful basis for stratifying the sampling in inventory or monitoring efforts.

Synthesis of the data

Once the inventory work is finished one cannot simply hand the mass of data to the planner and expect him to derive much useful information from it. The planner usually has neither the time to combine the data into a coherent whole nor the means of doing this. This stage, the most important one in the entire survey, must be entrusted to a specialist, an expert or interdisciplinary team to analyze and organize the various collections into a unified whole.

The final synthesis of the information must contain a minimum of words and an abundance of illustrations, especially maps. The maps must be easy to read and attractive, and the planner must be able to carry out analyses without having to redraw them. Maps drawn on transparent film, which are particularly useful in land use planning, should be available. In a book which no planner can afford to overlook, McHarg (1969) shows a whole range of maps that are of use in planning and explains how certain of them can be overlaid to draw up a rational zoning plan. The information given to the planner should, first and foremost, clearly show the "preservation value" of resources, their relative fragility and stability, educational and recreational potential, and compatibility with the various types of use and development generally required in a national park.

These maps will be bound, preferably in a ring binder, to form the atlas of park resources. Every possible effort will be needed to keep the atlas up to date, because it will be the main source of information on which to base the master plan and conservation and utilization plans for the park's resources.

The importance of keeping this basic resource bank up-to-date cannot be overemphasized. For all their inviolable character, park resources do change with the passage of time and so does visitor use. Also, additional and more refined data are always being accumulated. In these circumstances, master plans may need change as well, since they are basic to good management and both should always be based on the best information available.

The inventory will be used for a long time and will serve many different purposes; it should be done well, it should be done to last, as best it can, and it should be done at the outset.

References

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