

(g) accommodation of the youth hostel type where young people can spend their own holidays inexpensively, thus giving those who first come to the parks in organized parties easy opportunity to return again on their holidays.

All this would tend to develop the positive side of the National Parks activities and this is certainly highly desirable whilst also helping to incorporate them into the general life of the community and its educational development.

5. CONCLUSION

In conclusion, I would welcome criticism and suggestions, particularly in regard to future developments and the source of the various needs noted in the last section. The Uganda National Parks would also be most interested to learn what is being done in other territories in this matter, and how these various problems are being tackled elsewhere. In this way experience can be pooled for the basic problems, though different in degree, are in fact of general application throughout Africa.

Note.—The above paper was presented for discussion at the East and Central African Fauna Conference, Entebbe, 1956.

MANAGEMENT OF NATURE RESERVES IN THE U.S.A.

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In the United States there are the following principal categories of nature reserves: national parks, national forests, national wildlife refuges and Taylor Grazing Act districts.

In national parks nature is left to her own devices, unless interference is essential, to control, for example, a superabundance of grazing animals which are ravaging their food supply. Trees are not cut, nor dead ones removed. Roads and buildings are made as inconspicuous as possible. Wildlife refuges are managed for the benefit of the species for which they have been established, usually upland or water birds. National forests were originally established for watershed protection and timber supply. They are now managed for many purposes; for example, timber supply, wildlife and recreation. These are attempted in most of the reserves, but this multiple use is difficult and usually one use or other predominates. Taylor Grazing Acts districts, established under the Act of that name, are managed so as to limit

grazing to whatever the land can bear. Other uses—timber, wildlife, recreation—are being increasingly considered in them.

METHODS OF MANAGEMENT

The following methods are of general application; others, specially applicable to water and marsh areas, are considered separately below. Management, which should be carried out as little as possible, and should be preceded by research, may be divided into control of vegetation, control of wildlife and control of mankind.

Control of Vegetation.—Burning is a valuable management tool, especially where rainfall is heavy and vegetation lush, and where a dense, woody plant cover, of little use to wildlife, would otherwise quickly spread over the land. It is used under carefully controlled conditions.

Cutting is used in forest reserves mainly to favour the more valuable trees at the expense of the less valuable. In wildlife refuges it may provide grassy areas interspersed with islands of cover, which are of great value to wildlife but costly to maintain.

Spraying may be either destructive of all vegetation or selective. Knowledge of its eventual effect on vegetation and wild life is still meagre. It is rightly used only with great caution.

Re-vegetation, by sowing or planting, is a valuable means of restoring burnt, overgrazed or eroded land. High cost limits its use.

Control of Wildlife is the most debated form of management in nature reserves. There is usually sufficient food inside reserves during the summer months for herbivorous animals such as deer. But in winter they must come down from the highlands and compete with domestic stock for vegetation. Hunting, where public sentiment has allowed it to be sufficiently extensive, has been successful in keeping the herbivores in bounds, but the problem remains.

Predator control is practised locally and to a limited extent. Its value when the habitat is in good condition is questionable.

Control of Mankind.—More than 50 million people visit the national parks yearly, 40 million the national forests and 5 million the wildlife refuges. These vast numbers have, in the most popular areas of the major parks, caused changes in the vegetation which have persisted. The National Park Service has received an increase of funds to deal with this problem.

Accommodation for parties is being arranged either outside the parks or far from the chief attractions. At present permits to visit nature reserves are not, in general, required, nor are any charges made. The permit question is being considered and there

is an increasing tendency to expect people to pay something towards maintaining the facilities they enjoy.

AQUATIC AND MARSH RESERVES

Any of the methods of management already mentioned can be applied to aquatic reserves and marshes. Controlled burning, for instance, may be used to prevent marshes becoming overgrown and useless for waterfowl. Spraying may be employed against such aggressive species as the water hyacinth. Some methods are peculiar to such reserves. Aquatic plants are extremely sensitive to variations in the water level and manipulation of that level may be used to favour desirable species. On some refuges the water level is lowered in early summer to allow seeds of food plants to germinate on the exposed mud flats. These areas can produce enormous quantities of seed for winter use by wildfowl, especially when they can be flooded at the time the birds arrive. In the wintering areas of California, land is planted with rice or other highly productive aquatic plants and left for the birds. Marginal areas are similarly planted with other grains. Production of these special foods is usually accompanied by the use of scaring devices and airplanes to herd the birds from man's crops to wildlife areas.

The cost of machinery for the control of water levels may be more than that of the land itself.

Underwater cutting machines may be used to control reeds and rushes, but again the cost is very high. *Controlled grazing* by cattle has, in many refuges, proved an inexpensive means of keeping marshes open for waterfowl.

RESEARCH

It is important to emphasize the necessity of research in every problem of reserve management. Besides enough money and people to carry out the work, it is essential :—

- (1) That there should be administrative control of the area throughout the whole period required.
- (2) That an unmanaged " control " area is available for comparison with the area of research.
- (3) That there is authority to manage land, vegetation and wild population as may be required by the project.
- (4) That there is freedom from human interference. Research and management must march hand in hand.

(*Note.*—The above article is a shortened version of a paper presented by Dr. Gabrielson at the 1956 Meeting of the International Union for Conservation of Nature and Natural Resources.—ED.)