

the following bequests will become effective after the death of his widow: Somerset Hospital, Somerville, N. J., \$100,000; Elizabeth General Hospital and Dispensary, Elizabeth, N. J., \$25,000. The remainder of the estate, about \$10,000,000, will be divided into three trust funds: one to maintain the family estate in New Jersey as a convalescent home for "deserving gentlewomen," one to aid such persons elsewhere and the third to be used for hospitals, medical schools, universities, colleges and similar institutions "not existing for pecuniary profit." At the end of fifty years, the trusts are to be terminated and the principal will be divided among several institutions, including the New York Post-Graduate Medical School and Hospital and the Johns Hopkins Hospital.

THE University of Cambridge, England, has received a gift from Dr. G. P. Bidder, of Trinity College, to be used for a ten-year period for the benefit of occupants of the Cambridge table at the zoological station in Naples. It has also received a grant of £5,500 from the Goldsmiths' Company for an investigation of the alloys of silver to be carried out under the direction of Dr. R. S. Hutton, professor of metallurgy, Clare College, Cambridge.

Nature states that two new research laboratories are to be built for the Council for Scientific and In-

dustrial Research of Australia, using money voted for relief of unemployment. One, at a cost of £6,000, will replace an existing small building at the Council's viticultural research station near Mildura on the River Murray, where investigations into problems of the dried grapefruits industry have been in progress for many years. The other will house the Forest Products Division, which hitherto has carried on in temporary quarters in Melbourne. The new laboratory, to cost £25,000, will be in the midst of the city's timber yards, and this should mean decided increase in the practical effectiveness of the division's work.

ALLOTMENT of \$7,500 of Hawaiian sugar processing tax funds for the purpose of initiating a soil survey in the Territory of Hawaii has been made in an order which has been signed by Secretary of Agriculture Wallace and approved by President Roosevelt. The purpose of the survey is to secure comprehensive data on the adaptability of soils in various areas in the territory, particularly to serve as a guide in the use of land for crop diversification. The survey has been recommended by the Hawaiian Agricultural Advisory Committee appointed by the Secretary of Agriculture. The Bureau of Chemistry and Soils of the Department of Agriculture, which will collaborate with the University of Hawaii, has been placed in charge of the technical work of the proposed survey.

DISCUSSION

THE SIGNIFICANCE OF FOOD HABITS RESEARCH IN WILD LIFE MANAGEMENT¹

THE term "wild life management" has taken on a meaning somewhat distinct from the older "conservation," in that it implies a less passive technique. It lays more emphasis upon the improvement and maintenance in an improved condition of environment for wild species and not so much upon the provision of sanctuaries and legal protection. This change of emphasis is entirely consistent with modern ecological thought. Meager as our knowledge may be, we are no longer so prone to assume that species may thrive in habitats unsuited to them, even if permanently protected against persecution by man.

Wild life management, as the term is used here, is not artificial propagation; it is the encouragement of wild creatures under conditions as nearly natural as possible. It does not inevitably follow that management of a species is synonymous with encouragement, though it commonly does. Broadly, management is human manipulation of wild populations and may be motivated by economic, esthetic or scientific objectives.

¹ Journal Paper No. J219 of the Iowa Agricultural Experiment Station, Ames, Iowa, Project No. 329.

The earlier efforts at management were, as might be expected, characterized by a great deal of blind groping.² This handicap has not been wholly removed from modern management either, for two chief reasons. In the first place, wild life management is beset by a formidable array of cherished popular prejudices which yield to contrary evidence with extreme slowness, if at all. Secondly, there is still a real deficiency in basic information on ecological questions.

While it may doubtless be said that many of the latter questions are unanswerable, it may be said with equal truth that many are so elementary and pertinent in relation to wild life management that their continued neglect does not flatter our sense of perspective. Intermediate between questions of these two extreme types, complex and simple, are a host of others, significant alike to pure and to applied science, at least some of which should prove amenable to investigation.

One of the most fundamental phases of ecological research pertaining to wild life management is the study of the food habits of animals. This should not

² Aldo Leopold, "Game Management," pp. 3-21. *Scribner's*, 1933.

be confined solely to the identification of what animals eat, however deficient our knowledge may still be even in that respect. Our knowledge of the general food habits of lower vertebrates is inadequate for immediate needs, and this is also true for many birds and mammals of obvious economic importance.

General food habits studies constitute a necessary groundwork for the more specialized research that may profitably follow. The most useful single technique for extensive investigation at present seems to be that of stomach examination, supplemented by, or combined with, whatever field observations and fecal or pellet analyses may be advantageous. Frequently emphasis may be placed upon one of the minor techniques in the attack of specific problems, such as pellet analyses for the study of some owls.³

Great as may be our immediate need for vastly more general food habits data, probably greater needs may be served by diversification and intensification of food habits investigations. The realization of these potentialities should be of extreme significance to the progress of ecological science as a whole, as well as to that particular branch known as wild life management.

In planning management of any species, not only do we need to know what it eats, but also what foods it has access to, especially under changing conditions. We need to know more about what determines availability of foods; more about the influence of adaptations, experience, preferences and physiological demands on feeding tendencies of animals; and about what foods are essential to the existence of a species and what are incidental or conceivably detrimental.

The sound administration of a waterfowl or shorebird or any other sort of wild life refuge is dependent on adequate information on these points. The refuge may provide proper food for the desired species, but it may not. Perhaps something may reasonably be done to correct food deficiencies, perhaps not. At any rate, the wild life administrator is not likely to find it to his disadvantage to know something about what he is trying to do; and on many subjects he can know only through the research of others.

Understanding of the basic problem of predation, of which we have very great need, involves intensive research on food habits and on factors governing food habits of predatory species. Stimulation of local research would be particularly in keeping with the growing trend in conservation thought toward the conclusion that enlightened and truly effective predator control should attempt far more than at present to make game, poultry, etc., difficult for predators to get rather than to attempt great reduction in numbers by

drastic campaigning against the predatory species themselves.

Here, too, we need to know much more than what a species may eat. What are the adaptations of a predatory species for capturing and handling prey and what are the adaptations of the prey for defense or escape? What factors importantly affect the relative security or vulnerability of prey? What difference does predation actually make to the prey species, anyway? The fact that a species suffers a certain amount of predation—even conspicuous or heavy predation—does not necessarily mean that it is controlled or that its population levels are appreciably affected thereby.⁴

Work in this general direction is gradually gaining headway through the activities of a number of colleges and universities, some of the more advanced state fish and game departments and other private or public agencies. Agricultural colleges have recently displayed increasing recognition of the opportunities for constructive programs centering about local researches on specific wild life problems and in several instances have been making adjustments as rapidly as their budgets have permitted.

The Division of Food Habits Research of the U. S. Biological Survey has participated creditably in practically every substantial movement of consequence to wild life management in the country, despite its small staff and limited funds. It seems more than a little ironical that this division with its highly trained personnel, its unmatched reference collections and its strategic possibilities as an ecological clearing house should be the perennial target of crippling economies, with occasionally its very existence threatened.

In short, from the standpoint of one interested in wild life management and foreseeing the great development that will surely occur, it is apparent that the necessary supporting researches into the food habits of organisms are barely entering the tremendous field of significant endeavor that awaits. Continued progress may call for refinement and elaboration of techniques and for a greater breadth of vision on the part of the workers, but not less for greater understanding and appreciation on the part of the public. The intrinsic value and promise of the science alike are boundless, and support for it should be forthcoming in generous measure.

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MASTODON AND OTHER REMAINS AT AURORA, ILLINOIS

FINDING of mastodon parts and other material during recent months will contribute items of interest

³ Paul L. Errington, *The Condor*, 34: 75-86, 1932.

⁴ Paul L. Errington, *Ecology*, 15: 2, 110-127, 1934.