most important service a full free opportunity to all who will find in them a complete recreation, physical, mental, esthetic. In performing this service, the animal life existing within their borders constitutes a valuable asset. For the best recreative forces in nature are those which serve most quickly to call into play latent or seldom used faculties of mind and body whose exercise tends to restore to normal balance the human mechanism that has been disturbed by special or artificial conditions of living. Foremost among these forces are the living things that move and utter sounds, exhibit color and changing form, and by these qualities readily attract and hold our interest. To seek acquaintance with those primal objects of interest is to know the joy of vigorous muscular activity; better still, it is to realize the possession of the generally neglected senses of far-seeing and far-hearing, and to invite an esthetic appeal of the highest type and an intellectual stimulus of infinite resource." Surely this is a concise expression of the need for national parks, and the part that wild life takes in helping the parks fulfil their destiny.

"The principal objects in view in undertaking the survey were: To find out what species of mammals, birds, reptiles and amphibians exist, or have within modern times existed, in the circumscribed area selected for study; to learn as much as possible concerning the local distribution of each of these species, and to map out the general life areas within the region; to learn as much as time permitted of the food relations, the breeding habits, and the behavior, individually, of each of the species; and, finally, tp put all this information on permanent record, in a form accessible to, and generally assimilible by, the public, both lay and scientific."

A splendid short essay upon the interrelations of living things should not be passed without comment. In it the authors point out the necessity for dead and decaying tree trunks in the forest if such birds as the White-headed Woodpecker are to survive. In their opinion, no trees, whether living or dead, should be cut down beyond what it may be necessary to remove in building roads or for practical elimination of danger, locally, from fire. "Dead trees are in many respects as useful in the plan of nature as living ones, and should be just as rigorously conserved." "The brilliant-hued woodpeckers that render effective service in protecting the living trees from recurrent scourges of destructive insects, in other words, in keeping up the healthy tone of the forest, depend in part on the dead and even the fallen trees for their livelihood." This chapter closes with, "Nor do we approve, as a rule, of the destruction of carnivorous animals—hawks, owls, foxes, coyotes, fur-bearers in general—within the Park. Each species occupies a niche of its own, where normally it carries on its existence in perfect harmony on the whole with the larger scheme of living nature."

It is impossible to give more than a glimpse into this work, but perhaps even this brief comment will help to bring the book and the students of the subjects it treats into contact.—H. L.

BREEDING, FEEDING AND OTHER LIFE HABITS OF MEADOW MICE (*Microtus*). *By Vernon Bailey, Chief Field Naturalist, Division of Biological Investigations. (Contributions from Bureau of Biological Survey, Journal of Agricultural Research, Vol. XXVII, No. 8, Washington, D.C., February, 1924. Published by authority of the Secretary of Agriculture, with the co-operation of the Association of Land-grant Colleges. Washington, Government Printing Office, 1924, pp. 523-536, pl. 3.*

The meadow mice, field mice, or ground voles, comprise numerous species and geographic varieties, found throughout Europe, Asia and North America, mainly in temperate and boreal zones. Having a wide range of adaptation, one or two, or sometimes three or four species in a locality occupy most of the fertile areas of the United States and Canada, where they become of economic importance as farm and orchard pests.

The common species of the Ottawa region, *Microtus pennsylvanicus pennsylvanicus* (Ord.), has probably been glimpsed by every one who has walked through our fields and meadows. Adults are considerably larger than house mice, have a rougher fur of a dull brownish colour, and a short, stubby tail. Most of the small runways found in the dead grass in the spring and fall are made by this species.

Modifying factors may control breeding activities, the most important factors being food, weather, cover, proximity, and contentment, while peculiar combinations of climate in connection with some of these factors may bring about serious "mouse plagues", which may be disastrous locally, but are of minor importance in comparison with the steady drain on crops by the mice over the country at large in normal years.

Experiments in captivity have shown that the breeding activities are practically continuous, the females mating immediately after the birth of the young, producing litters of usually four at first, but, when full grown, after the first or second litter, usually six or eight at a birth. Seventeen consecutive litters have been produced by one female in captivity within a year. Another female born on March 25, produced thirteen families of young, totalling seventy-eight in number, before she was a year old. At this rate of increase,

allowing equal numbers of males and females, and the young beginning to breed at forty-six days old, the total increase from one pair, if all lived and bred, would be over one million individuals at the end of a year. If these were confined to one acre of ground, this would mean a little more than twenty mice to every square foot.

Mr. Bailey found that the quantity of food eaten is astonishing. In one cage, thirty days feeding of ten mice with all the clover, cantaloupe, grain and seeds they would eat, showed that an average of 55% of the weight of each animal was eaten every twenty-four hours. This was on the richest kind of food, such as they rarely obtain in the wild satte. In another cage, during the same period, nine mice that were fed green clover, etc,, with no grain or seeds, consumed an average of 100% of their weight every twenty-four hours. This would seem more nearly their normal ration in a wild state. At 30 grammes a day, one meadow mouse would consume 10,950 grammes (23 pounds) of green food in a year, and 100 mice 2,300 pounds, or a little over a ton of green grass or clover, which would make about half a ton of dry hay.

A hundred mice to an acre is not an unusual number in meadows favourable to their habits, while in "mouse years", or during mouse plagues the number has been estimated at thousands to an acre. Even with 1,000 to the acre, it is easily shown that mice consume more vegetation ($11\frac{1}{2}$ tons) than would ordinarily grow on an acre in a year.

In thirteen closely printed pages, Mr. Bailey gives concise accounts of mouse plagues, general habits, voices, disposition, individuality, playing, fighting, sanitation, breeding habits, mating, nests, care of young, factors modifying breeding, food habits, stores, habits in captivity, quantity of food required, aggregate destructiveness, methods of control, uses, and a valuable list of literature cited.

Mr. Bailey believes that total extermination of meadow mice would be as impossible as it would be undesirable. They are firmly intrenched in many waste places where they serve to transform vegetation into food for fur-bearing carnivores, anb supply the daily bread of numerous birds of prey that agriculture could not spare without great danger from other rodent pests. In agricultural districts, the importance of keeping these mice under control and at a minimum number is clearly seen. The most economical and practical method of control is by natural enemies, i.e., hawks and owls, gulls, herons, bitterns, crows, shrikes jays, etc. Snakes and even fish help to keep them under control.

Simple cultural methods, clean fields and meadows, clean borders, roadsides, and ditch banks are a great aid in giving these natural enemies a chance to see and catch the mice, solve the problem of control by preventing occasional heavy losses, and add consiberably to the yearly farm returns.

The whole paper is an interesting account of one of our most common native mammals, frequently casually observed, but heretofore little known. It is not only a valuable biological study but an important economic contribution, and may serve as an example which might profitably be followed and applied to other of our common native mammals.—R. M. A.

A DISTRIBUTIONAL LIST OF THE BIRDS OF BRITISH COLUMBIA, *by Allan Brooks and Harry S. Swarth. Pacific Coast Avifauna, No. 17; Contribution No. 423 from the Museum of Vertebrate Zoology of the University of California. Published by the Cooper Club at Berkeley, California, September 15, 1925, pp. 158. Frontispiece in color by senior author. Map of Life Zones of province in colors and many illustrations and line maps in text.*

This is probably the most valuable scientific contribution to Canadian ornithology since the publication of the Macoun Catalogue of Canadian Birds in 1909. It should be in the hands of every student of North American Distribution and will be invaluable to the ornithologists of British Columbia and adjoining areas. The authorship assures the accuracy and thoroughness of the work. No collaboration of authorities could be happier for a Birds of British Columbia. The senior author has had a wide experience in the province and the junior author has studied deeply the broader Pacific Coast problems and has a deserved reputation for meticulous care in his work.

The general appearance of the volume is that of a model of clean and dignified typography, material and make-up. After a short Introduction, giving the general plan and methods of Authorship, follows a page of suitable "Acknowledgements". Then comes seven pages of "Previous Work in British Columbia", giving a history of ornithology in the province from the time of Captain Cook's Voyages, published in 1784, to the completion of the manuscript. Unfortunately, this does not include the important work of the two authors in the extreme northern part of the province in the summer of 1924.

A chapter on "Life Zones and Faunal Areas" of the province occupies five pages and from comment in other reviews, seems to have surprised many who did not realize the varied extent of the area in question. A map showing the Life Zones in four colors is a very valuable addition to this