

in the form of the Prairie Chicken. Although this interpretation may take away much of the glamour and romance attaching to the Heath Hen, nevertheless the last bird on Martha's Vineyard has fired our imagination and has served to focus public attention on the necessity of taking immediate positive steps for the conservation of our wild life. If this bird serves as a warning of what may happen to other game-birds, the thousands of dollars expended by the State and various organizations and individuals will not have been spent in vain.

Bowdoin College, Brunswick, Maine.

PROGRESS OF CONSERVATION IN CANADA¹

By HOYES LLOYD

To BEGIN with, it is desirable to outline Canada's organization for conservation. The nine provinces and the Yukon Territory have control of game matters within their boundaries with certain definite exceptions. The North West Territories are administered by a Branch of the Department of the Interior, which Branch also has jurisdiction over game matters in the Territories. The chief exceptions to this general rule are, first, that the Department of the Interior administers the Migratory Bird Treaty throughout Canada, and, second, that the same Department has charge of the National Parks of Canada, which, in addition to affording complete protection for some of the finest scenic wonders of the Dominion, also serve as sanctuaries for wild life.

The protection of the wild life of Canada is of national importance, and so the Dominion authorities have sought to coördinate all efforts toward wild-life conservation, whether these fell within Provincial or Dominion jurisdiction. One of the principal means of forwarding this unification of effort has been the practice in vogue for the last ten years or so of calling conferences of Provincial and Dominion Game officials. These conferences have been under the auspices of the Department of the Interior, and the Department has defrayed the expenses incurred by Provincial administrations in sending representatives to these conferences. The agenda for each

¹Read at the joint meeting of the Northeastern Bird-Banding Association and the Federation of the Bird Clubs of New England, held at Boston, Massachusetts, January 16, 1931.

conference has included practically all the field of conservation, and since the proceedings were entirely confidential, each representative felt himself at liberty to discuss problems of the time freely and frankly. After long experience with these conferences it has been evident that small difficulties which had become magnified through slight misunderstandings rapidly disappeared when they were discussed before a gathering of this kind. Interspersed through the programme of these conferences have been papers and addresses by specialists on various subjects relating to conservation, and these have opened up new thoughts and served as focus points for discussions. A good many of these formal presentations to the conferences have been made public from time to time.

Before discussions which led to the Migratory Bird Treaty received the approval of the Dominion authorities, each of the Provinces of Canada was consulted, and practically unanimous agreement respecting the Treaty was reached before it was ratified. The understanding with the Provinces in connection with the administration of the Treaty was that each Province would amend its own game laws to conform with it, and enforce the Treaty in enforcing Provincial law. This was done to avoid duplication of staffs as between Provinces and the Dominion. In most parts of Canada this understanding is still in effect, although in some sections where the Provincial law is not yet in conformity with the Treaty a Dominion staff is employed. In addition, the Dominion has helped by patrols in remote sections, such as the north shore of the Gulf of St. Lawrence, and all officers and men of the Royal Canadian Mounted Police are empowered to enforce the Migratory Bird Treaty and the law based upon it throughout Canada.

Perhaps the greatest progress to be noted in bird-protection is the result of increased knowledge of birds. A few years ago it was difficult, if not impossible, to ascertain even the names of the common birds. I know one Canadian naturalist who as a young man named all the common birds of his vicinity with names that he had invented himself. Taverner's two bird books—"Birds of Eastern Canada" and "Birds of Western Canada"—have probably done more than any other single factor in spreading a knowledge of the bird-life of Canada throughout our country. Of course every other possible means of publicity has been employed to tell about birds and the need for their protection. Through lectures thousands and tens of thousands of people have been reached. One of the most interesting endeavors along this line has been the effort to reach camps of young people and tell them in the

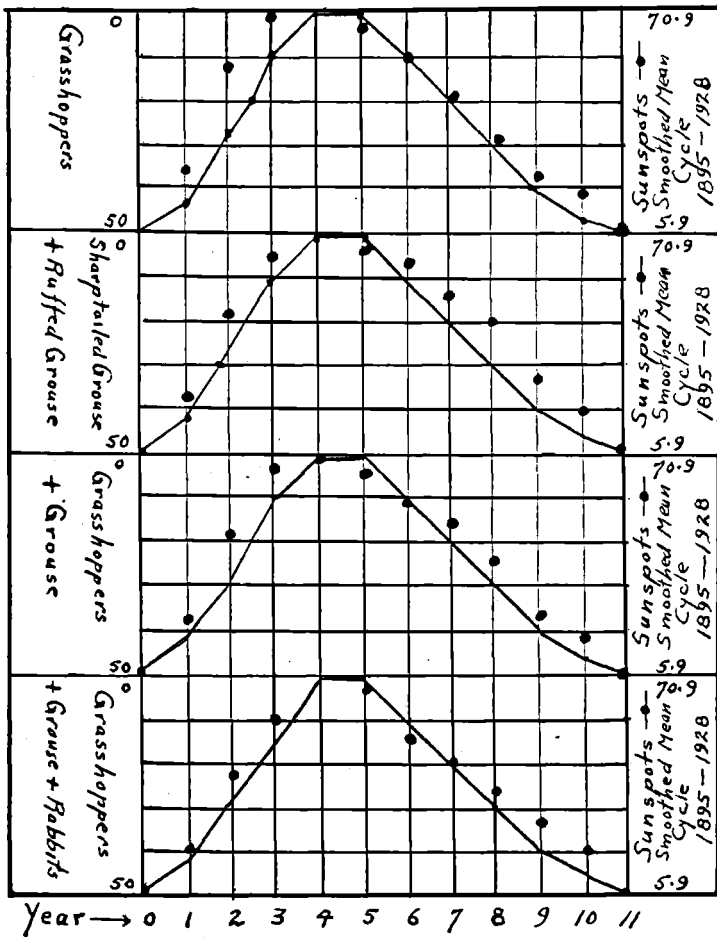


FIGURE 1

Chart prepared by Dr. R. E. DeLury, Dominion Observatory, Ottawa, showing relationship between sunspots and the Criddle statistics on fluctuations in Grouse, Grasshoppers and Rabbits. Faunal variations were recorded by Norman Criddle at Aweme, Manitoba, 1896-1929 and published in *The Canadian Field-Naturalist*, Vol. XLIV, No. 4, April 1930.

For Dr. DeLury's comment *vide* C. F. N. XLIV, No. 5, May 1930.

out-of-doors about wild life and its conservation. The effect of all the publicity work done in the United States has had an appreciable influence on Canadian thought in this connection. I am reminded of how closely we are bound together these days in publicity about conservation when I remember sitting by my own fireside and hearing Thornton W. Burgess speaking from Springfield, Massachusetts, and telling about how tame the deer were in the town of Banff, which is located in one of the western National Parks of Canada.

From time to time we have been face to face with plausible fallacies which interfered with conservation work, and every effort has been made to remove these fallacies. One example will suffice. It was generally believed a short time ago that if the ducks which breed in the southern part of the Provinces of Manitoba, Saskatchewan, and Alberta should be very largely replaced by the invasion of agriculture in that area, they would merely retreat to some mysterious northern fastness to breed. The study of the breeding-ranges for all of the ducks of Canada in the records of our National Museum showed that most of the northern parts of Canada were beyond the breeding-range of those species in which the hunter was interested. There were no northern fastnesses to which most of the prairie-nesting ducks could be expected to retreat, but the areas which are most suited for agriculture on the prairies of Canada are also the areas which are most suited for duck-production. Prairie-bred ducks may not be of great significance to the naturalists and hunters of New England, but they are of interest to almost every one else in the United States except in the extreme northeast, and to almost everyone in Canada, except those in the Maritime Provinces.

A new line of research has been suggested by the unfortunate coincidence that ducks prefer the prairies as a breeding-ground. Dr. Harrison F. Lewis, of the Department, is engaged in investigating the actual and potential value as a duck-producing area of the Pre-Cambrian shield which forms the geological backbone of North America and is largely within the confines of Canada. Large areas of the Pre-Cambrian, although relatively wild and unsettled and although provided with abundance of water, produce very few waterfowl, because of the lack of suitable foods. This lack is in part due to extreme erosion resulting from the last, or Labradorian, glaciation, which removed residual soils and is so recent that many suitable duck-foods, such as various potamogetons, *Lemna*, and *Vallisneria* have hardly had sufficient time since its close to immigrate into the glaciated

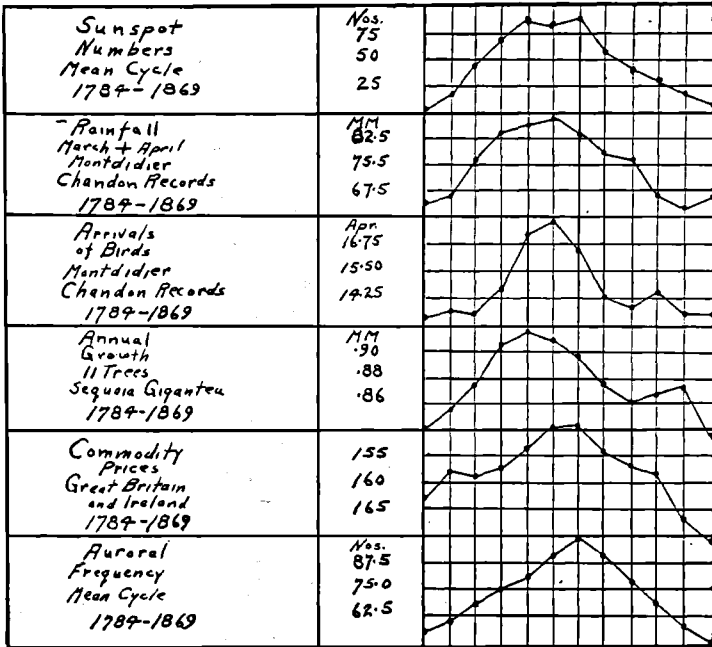


FIGURE 2

Chart of the 11 year Sun spot cycle—1784-1869, with charts for the same period of Montdidier (France) rainfall, Montdidier dates of arrival of birds, tree-growths (sequoias, California), commodity prices in Great Britain and Ireland, and Aurora Borealis. Sun spots and the weather—*Journal Royal Astronomical Society of Canada*, Vol. XIX, pp. 293-298, 1925, Courtesy Dominion Observatory, Ottawa.

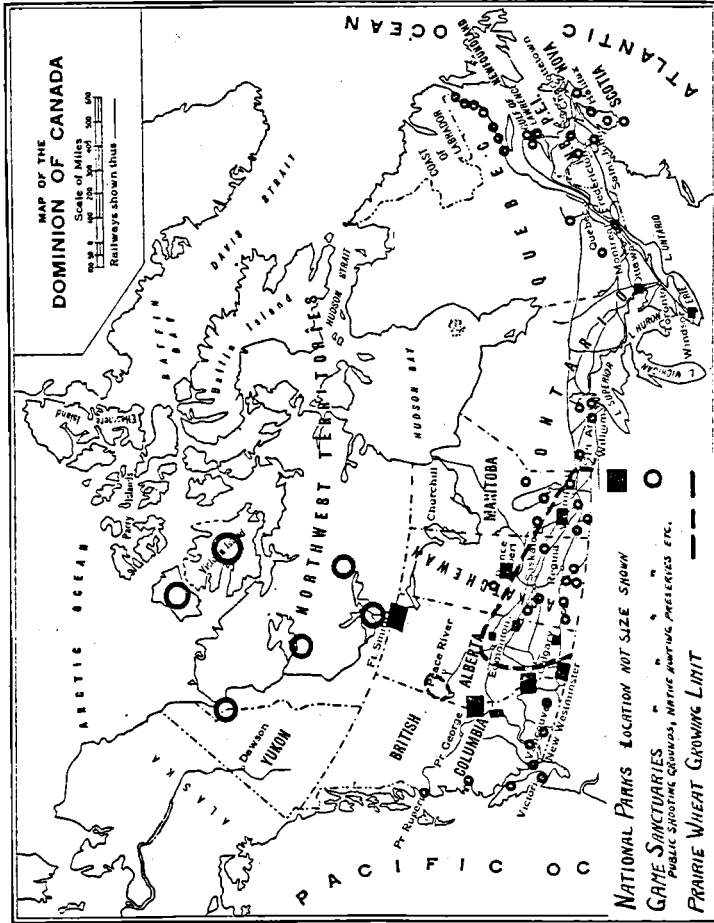
country. It is also due in part to the acidic nature of much of the granite, diorite, gneiss, and other plutonic rocks which make up the country rock over large parts of the region and whose influence, when not counteracted by other factors, causes acidic soils and waters inimical to many of the best duck-foods, which are calciphiles. Nevertheless, there are large areas of the Pre-Cambrian which produce a good many ducks, and, by proper introduction of duck-foods, may be made to produce more. They consist of:

(1) Areas covered with varved clays, more or less calciferous, laid down as lacustrine deposits or marine deposits, either on the bottoms of great glacial lakes, such as Lake Agassiz and Lake Barlow, or in arms of the sea, such as the Champlain Sea and Gilbert Gulf, during periods of post-glacial submergence.

(2) Areas covered with Pre-Cambrian or Palæozoic calciferous series, of either sedimentary or volcanic origin, or with glacial drift originating from such areas. Pre-Cambrian series involved include Beltian, Huronian, Timiskaming, Keewatin, and other strata, which, although they form a relatively small proportion of the superficies of the shield, are sufficiently large and widely scattered to be actually of great importance.

Introduction of calcicolous duck-foods on such areas and of oxyphytic duck-foods on the acidic areas, with possible transplantation of duck species if thought advisable, may be found practicable on a large scale and so cause a marked recuperation of the North American supply of wild ducks. Since, however, the huge area involved has never before been studied from this point of view, and the work is entirely new, involving the coördination of several sciences, namely Ornithology, Botany, Geology, and Chemistry, great rapidity of development must not be looked for.

Variation in water-supply in the shallow prairie lakes was found to be a very important factor in the production of ducks. The officers of the Department concerned with wild life and those of the Department in the Dominion Observatory have been coöperating to study these variations and some truly remarkable relationships have been found connecting variations in the sun with variations in living things. Perhaps the most striking of these are based upon natural-history observations of Mr. Norman Criddle, who has kept definite wild-life records at Aweme, Manitoba, for about forty years. These are shown in a chart. Variations in the sun are also found to cause variations in rainfall, and cycles of moist and dry years result. Thus, while it may not be possible to control



the moisture-supply for these important shallow lakes, it may at least prove possible to foretell the probable duck-supply from year to year, and plan for its conservation with more foresight than is possible at present. One of the most valuable methods of reaching the particular phase of the cycle of moist and dry years for any locality is afforded by a study of tree-sections for that locality, and the Dominion Observatory is now analyzing tree-sections from many parts of Canada with this end in view.

There are many people that are not convinced that wild life is of sufficient economic importance to be worth bothering about. To meet this frame of mind we have prepared very definite statistics, showing that the wild birds, wild mammals, and sporting fish of Canada have an annual value of approximately \$50,000,000. A business of this size is one the capital of which is worth \$1,000,000,000. The details are being published and will be available shortly¹. The value of birds as insect-destroyers is not included.

In more purely ornithological lines some advances in scientific research have been made, and there is an increasing interest in the need for scientific answers to puzzling problems. It was Mr. J. A. Munro, Chief Western Officer under the Migratory Bird Treaty, who pointed out some years ago that the cause of duck sickness in Western lakes was probably bacterial in origin, and this seems to be confirmed by the latest findings of the Biological Survey that this mysterious and fatal malady was botulism.

Important studies of the Double-crested Cormorant have been made in Canada by Messrs. Munro and Lewis, and the latter found that, apparently, this species, which is often accused of eating salmon and trout, had an abhorrence for such food.

Those of you who attended the A. O. U. meeting at Salem will remember that Dr. Lewis presented statistical information to show that the Bird Sanctuaries established for the protection of sea-birds on the north shore of the Gulf of St. Lawrence in Quebec really were functioning in the way that it was expected they should. Mr. Munro has been providing new and interesting material on the relation of birds to fisheries. The evidence gathered in these various particulars is especially

¹The Cash Value of the Wild Life of Canada. By Harrison F. Lewis. Proceedings 24th Convention International Association of Game, Fish and Conservation Commission, 1930. Secretary-Treasurer, R. P. Holland, 578 Madison Avenue, New York.

useful, because birds have often been accused of causing damage for which they were not really responsible, or the bird damage has been limited and they have been blamed for far more than they have caused. If all birds which were found doing any damage whatever to man's interest were destroyed, it is feared that we should soon have eliminated much of the fascinating avifauna of North America. Along this line one of the most interesting attacks on birds developed recently. Geese and Brant were accused of damaging commercial eel-grass beds. Careful investigation showed, however, that the damage to these beds was caused by too frequent cutting by man, and not by the birds. Although the birds were charged with the damage, the investigation of this problem proved to be more botanical than ornithological.

The idea of bird sanctuaries in Canada is a very old one. It was in 1887 that the first sanctuary was formally set aside by the Department of the Interior at Last Mountain Lake in the Province of Saskatchewan. A glance at the map will show that the idea has spread, and it has certainly proved to be one of the finest means of saving some of the original inhabitants of North America for posterity. Although a very considerable number of these Western sanctuaries were transferred to the respective Provinces during the past year by what really amounted to an amendment of the constitution of Canada, the transfer agreement contains the following clause:

"The Provinces will further continue and preserve as such the bird sanctuaries and public shooting grounds which have been already established and will set aside such additional bird sanctuaries and public shooting grounds as may hereafter be established by agreement between the Minister of the Interior and the Provincial Secretary or such other Minister of the Province as may be specified under the laws thereof."

The birds were not forgotten in this very important constitutional change in Canada. In all the work of our Department in wild-life matters we have enjoyed the fullest help from the Biological Survey at Washington; particularly in the gathering of waterfowl statistics and in the securing of information about birds through the banding method has this been in effective operation. This is deeply appreciated, and I assure you that the Department of the Interior, on its part, tries to help in any way possible the administrative branches concerned with

wild-life conservation in the United States¹. Action for the conservation of birds must be based on fact. In learning the truth of birds' travel, the vital statistics of birds, the need for more protection, or even the fact that protection for any species may be relaxed, the bird-bander has an important part to play. He is searching out the truth about birds, and on the knowledge gained by him and by other workers in ornithology a sound structure of conservation may be built. I think all bird-banders become conservationists even if all conservationists do not become bird-banders.

The future of conservation cannot be regarded entirely with equanimity. There is a general expansion of agriculture which is bound ultimately to occupy all the suitable lands of Canada and some which are not now considered suitable. This expansion exerts pressure upon wild life. The new methods of travel, particularly the aeroplane, have hastened the rate of transport in wilderness areas more even than in other places. It is a fair estimate to allow hours instead of weeks for aeroplane travel in northern Canada now. When it is remembered that hunters may be transported by aeroplane, the threat against wild life made by the aeroplane resolves itself into the fact that there is very little wilderness left. The situation is being frankly discussed with the air pilots of Canada, and without doubt this new danger to game can be overcome, at least in part. Transportation again affects game and former wilderness areas in the matter of railways extending their lines northward in Canada. The railway line from The Pas, Manitoba, to Churchill, Manitoba, is nearing completion. The railway line from Cochrane, Ontario, to Moose Factory, Ontario, is at present completed so far north that it is only a

¹Commissioner J. B. Harkin of the Department of National Parks of Canada, kindly compiled for me the number of areas in the Dominion which have been set aside and classified as Public Shooting Grounds, Bird Sanctuaries, National and Provincial Parks, Native Hunting Preserves, Game Refuges, Forest Reserves, etc. These are all in varying degree bird sanctuaries. The data on the areas of Provincial Reservations are not complete, but it seems desirable to sum up in tabular form the number and known area of the tracts, as follows:

<i>Name of Area</i>	<i>Number</i>	<i>Area in Square Miles</i>
Public Shooting Grounds.....	52	703.9
Bird Sanctuaries.....	29	46.
National Parks.....	16	12,059.
Native Hunting Grounds (Northwest Territories).....	5	529,557.
Provincial Game Preserves (26 are also bird sanctuaries).....	61	12,479.
Provincial Game Refuges.....	3	20,615.
Forest Reserves, Provincial Parks and Crown Game Preserves.....	55	31,765.
Totals.....	221	587,112.9

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few miles from the end of steel to tidewater. Churchill is not particularly a duck or waterfowl area so far as known at present, but James Bay is a concentration point for geese, and perhaps for ducks to a more limited extent, and steps are under way to have conservation measures adapted to the new conditions which can be expected shortly.

Lead poisoning seems to be one of the most hopeless of the dangers to waterfowl. The cumulative effect of adding lead year after year to waterfowl marshes is bound to be serious. One of the worst results of lead poisoning, because it seems so unnecessary an accident and such a misfortune although impossible to prevent, was the poisoning in Canada of a considerable number of Trumpeter Swans in this way.

It will probably be found essential to increase restriction of hunting or to stop it entirely for species that are restricted by nature to limited, or very special habitats, whether on their breeding-grounds or on their wintering-areas. Safe breeding-range and safe wintering-range are essentials, and both countries will have to do their utmost in their respective fields to save sufficient areas of these.

One of the most dangerous world conditions affecting many kinds of birds, as you well know, is oil pollution of the sea occasioned by changes in shipping practices in the last few years. Canada has coöperated with the United States and other Maritime Powers ever since the problem became acute, but the final solution still seems to be a long way off.

Whether conservation can keep ahead of the multifarious destructive agencies is problematical. A satisfactory termination of the conservation work of our time depends on a more general awakening of the public, rather than on the interest of a comparatively few people who from one reason or another are intimately concerned. Education which will convince the public as a whole of the need for conservation, and of such a nature that it will get adequate results before the opportunity passes forever is the leading Canadian aim in conservation work.