

BLUE BOOK

OF THE

STATE OF ILLINOIS

1927-1928



PUBLISHED BY
LOUIS L. EMMERSON
SECRETARY OF STATE

[Printed by authority of the State of Illinois.]

THE NATURAL HISTORY SURVEY OF ILLINOIS.

By H. C. OESTERLING, *Editor and Publicist.*

THE POSITION which Illinois has enjoyed for more than half a century as the leader of all the states in respect to scientific investigations of plant and animal life, especially on problems of great economic importance, has been due largely to the life-long work of Dr. Stephen A. Forbes and his associates in the State Natural History Survey.* Pioneer work of permanent value has been accomplished along many lines, with results which materially benefit almost every resident of the State; and the new problems arising out of changing conditions in agriculture, forestry, and stream utilization are being systematically solved. Without attempting so much as to recount all the investigations conducted during the last sixty years, we must be content here with a brief outline of the most important pieces of work now in hand and a bare enumeration of those already finished.†

Besides the work in general biology, which has been prosecuted all the time with more or less regularity, the activities of the Natural History Survey are divided into five sections, concerned respectively with Aquatic Life, Botany, Entomology, Forestry, and Ornithology. Of these five sections all but one—on Ornithology—are now in operation; and each will be treated separately in following paragraphs. Since the publication of the descriptive catalogue of the birds of Illinois and several papers on the numbers and local distribution of land birds in the different seasons of the year, very little work has been done on this subject because of lack of funds. The law contemplates the preparation of a series of final reports on all forms of plant and animal life in the State, and most of the efforts of the field workers in all the sections are directed toward the accumulation of information to that end.

AQUATIC LIFE.

Detailed knowledge of the various forms of aquatic life and their inter-relations is the foundation of the new science of *aquiculture*, which aims to increase the usefulness and value of streams and lakes. A vast fund of such knowledge has been gathered by the Natural History Survey through almost continuous investigations during the last fifty years, with the result that Illinois is the outstanding pioneer State in this enterprise.

These investigations cover all the important waters of the State and extend into the bordering rivers and Lake Michigan. Early work was mostly on the lakes and smaller bodies of water, but by far the largest amount of work has been done on the Illinois River, which is consequently the most thoroughly studied stream in America. For many years a station was maintained at Havana, and later at Peoria; and very extensive collections of aquatic life were accumulated and studied and described in a great variety of papers, which constitute a vital history of the river through the vicissitudes of droughts and floods and pollution. Since 1923, except for occasional observations of the conditions in the Illinois River, operations have been transferred to the Rock River, where the normal life of the stream has not been so much disturbed by pollution. The material collected at all seasons of the year throughout the length of the river is systematically analyzed in the laboratories at Urbana, and reports are issued from time to time on various new facts thus learned.

* The Natural History Survey was organized in its present form, as a division of the State Department of Registration and Education, in 1917, under the Civil Administrative Code, by the union of the State Laboratory of Natural History and the State Entomologist's Office; and Dr. Forbes, who had been directing both of the former bureaus, was made Chief of the Survey.

† A complete list of publications, from the beginning in 1876 down to the present, will be sent upon request. Address the Chief, State Natural History Survey, Urbana, Illinois.

Thousands of kinds of bottom-dwelling animals (worms, snails, insect larvae, leeches, mussels, crayfishes, etc.) have been collected at hundreds of places over the State and have been studied with regard to their numbers and distribution, their foods, habits, diseases, and conditions of life, their inter-relations, and their economic importance. Besides forming the food of most of the larger fishes, some of these bottom fauna have great value; the mussels, for example, being useful in the manufacture of buttons and in the production of pearls, constitute one of the important resources of the larger streams, as will be shown in a forthcoming report.

Beginning in 1876 and still continuing, numerous intensive studies have been made on the food of fishes, their growth and development, their habits and peculiar traits, the conditions under which they live, their parasites and diseases, etc. Much information on these phases of fish life was included in a voluminous report, with many colored plates and other illustrations, published in 1908 and reprinted in 1929, under the title of "Fishes of Illinois," a volume which should be in every public library in the State and in every public school, as well as in the hands of sportsmen who are interested in ichthyology.

Perhaps the most striking fact that has come to light, in the course of the aquatic work, is that all young fishes and most of the bottom fauna are entirely dependent for their food on the microscopic plants and animals which swarm in the water, and which are commonly referred to as "plankton."* If a stream or lake does not have an abundance of plankton, it can not be expected to support a flourishing fish life. Disregard of this simple fact has been the cause of many disappointments in attempts to "stock" small streams, ponds, and artificial lakes with game fishes.

The work outlined above, together with related investigations of the effects of stream pollution upon all forms of life in the waters of the State, points the way to proper value as sources of food and water supply and as places for recreation and scientific study.

BOTANY.

The present activities of the botanical section of the Natural History Survey are concerned almost entirely with crop diseases, which are estimated to cost the farmers of Illinois in excess of \$44,000,000 a year. The particular services rendered are:

- (1) Protection of growers, by systematic crop surveys, against losses arising from unsuspected invasions by new and dangerous diseases.
- (2) Investigation of the variations in destructiveness manifested by important crop diseases and of the causes which underly these variations.
- (3) The popular dissemination of practical information respecting means for avoiding destructive disease attacks.

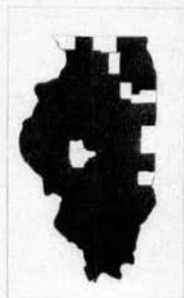
In the six years during which the present botanical work has been under way, there have been numerous instances in which the yearly systematic survey has been distinctly valuable. Noteworthy instances of its usefulness include distinctly helpful services rendered in connection with the flag smut of wheat, in determining the limits of its occurrence; forewarning growers undertaking the raising of cotton of the diseases to be encountered; the discovery and destruction of the only instance of alfalfa infestation with the stem nematode; and an extensive survey in connection with a possible invasion of the central peach orchards by the destructive peach yellows.

Throughout each growing season many important crops have been subjected to continuous examination, and the variations in severity of their

* The most extensive plankton studies ever made in America were those of Kofoid on the *Plankton of the Illinois River* published by the Illinois State Laboratory of Natural History, in the form of four voluminous reports (1896-1904), which have become classics in the scientific world. Recent studies have been on the Illinois, Mississippi, and Rock Rivers and on Lake Michigan. An article on the *Plankton of Lake Michigan* appears in the current volume of the State Natural History Survey Bulletin, and a series of articles on the *Plankton of the Rock River* is in preparation.

APPLE SCAB

IN ILLINOIS

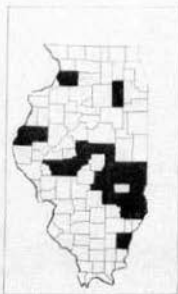


DISTRIBUTION

ANNUAL LOSS = 342,000 BU.

SOYBEAN BLIGHT

IN ILLINOIS



DISTRIBUTION

several diseases have been observed and recorded. This information, preserved and analyzed according to approved statistical methods, furnishes a basis for comparing the prevalence and destructiveness of individual crop diseases, year with year, locality with locality, and under diverse conditions of temperature and rainfall. From such comparisons the laws governing the occurrence of disease epidemics are being derived; and they in turn are expected to suggest the formulation of practical rules, based upon the natural law, the observation of which by the growers of crops will constitute a most effective protection against the destructive attacks now so commonly experienced.

In the meantime, the data collected and the personal opinions formulated by the botanists as they work among the various crops enables them to see what recommendations can be made for handling emergency outbreaks. This results in the wide dissemination of information on disease control at a time when the growers interest, aroused by his personal need, is keyed to receive it with benefit. For example, the steady increase of stinking smut in the Illinois wheat crop has been under observation for six years, and although annual warnings were issued, it was only in 1927 that the disease reached distressing proportions. The warning issued in that season was accepted eagerly; and the saving to the farmers of the State likely to accrue from the emergency circular prepared for the occasion will more than outweigh the entire cost to the State of the botanical survey throughout its six years of operation.

ENTOMOLOGY.

Practically all the research work on insect control in Illinois is carried on by the State Natural History Survey. The entomologists are experimenting constantly to discover the secrets of insect life and to develop new and better methods for controlling or eradicating insect pests. The results of this work, which has been going on for almost two-thirds of a century, are so numerous and so far-reaching as to benefit every resident of the State.

Almost all the insects which attack orchards, fields, and gardens, shade trees and shrubs, domestic animals and man, and which infest houses and barns, graneries and elevators, flour and feed mills, greenhouses and other buildings, have been the subjects of special investigations; and a list of the titles of the reports published on these subjects would fill several pages of this book. In addition, the work of the entomologists has included important studies of fundamental principles of insect activities; for example: studies of insect life as a part of the larger life of river systems, especially with reference to the food supply for fishes; studies of insects as food for birds, to determine the actual value and desirability of various kinds of birds in any region, and ecological studies of rivers, lakes, marshes, sand areas, prairies, and forests, as places in which insects breed and feed in certain periods of the year, and from which they sally forth on destructive raids, to return again at other seasons and begin the next cycle of their lives.

Very comprehensive studies have been made on insects injurious to corn; and intensive and long-continued experimental investigations have been conducted into the effects of weather and climate on the rates of development of other insects having great economic importance—the Hessian fly, the codling moth (apple worm), the chinch bug, etc.—with a view to more accurate prediction of their appearance in any season and more effective measures of preventing their depredations.

Experiments with the European corn borer, which were begun in 1920—anticipating the appearance of the borer in Illinois by seven years—are being continued on a large scale through a special appropriation by the last General Assembly. Similar work is being undertaken with the Mexican bean beetle and the Japanese beetle, both of which are practically certain to invade this State within a few years.

Related to this work are many biological studies of the food, the habits, the local occurrence, and the parasites of insects found in Illinois, notably the June beetles, the grasshoppers, the termites, the stone flies, the mosquitoes, the moths, and many others.

Numerous monographic papers, furthering our knowledge of the classifications of large groups of insects, both in their mature forms and in their immature forms, have been published by the survey. These and other works have been made possible only by the systematic collecting of hundreds of thousands of "specimens" over a period of sixty years.

The insect collections of the Natural History Survey, which is the most complete collection of Illinois insects ever made, and one of the best general collections in the United States, also enables the entomologists to identify certainly and promptly most insects which are sent in by the Survey's field workers, by the county farm advisors, and by others desiring such information.

The aim is to accumulate a complete "stock" of all species occurring in Illinois, so as to furnish material for a series of final and authoritative reports on the insects of the State. In order to make the present collection still more valuable to other investigators, a list of the "types" (original specimens used by specialists in describing new species) has been published by the Natural History Survey.

Field demonstrations on the control of insect pests are carried on by the Survey in cooperation with the Agricultural Experiment Station of the University of Illinois. Much of this work is done at the Urbana headquarters and at the regular field stations which are permanently located at Des Plaines, Jacksonville, and Carbondale; but demonstrations have been made also at many hundreds of places throughout the State.

Farmers and fruit-growers are notified several times each season regarding the best times to apply sprays for controlling field and orchard pests. A State-wide study of wheat-field insects is conducted each year, so that information may be given as to the best time for saving the grain to escape damage by the Hessian fly.

The work on the malarial mosquito and other disease-carrying insects, which was begun in 1917 by Dr. Forbes, is being carried on in co-operation with the State Department of Public Health.

Anyone wishing to have an insect identified and to find out if it is of any importance, on what it feeds, and the best methods of controlling it, should send specimens and write to the Chief Entomologist, Natural History Survey, Urbana.

FORESTRY.

The beginning and early progress of the forestry movement in Illinois have been described in reports of the State Natural History Survey in the Blue Book for 1921-1922 (p. 313), for 1923-1924 (p. 385), and for 1925-1926 (p. 468). These reports show that the movement began in 1909, when the Illinois State Laboratory of Natural History, co-operating with the United States Forest Service, investigated the forest conditions in those regions of the State where forests were believed to be the most extensive. Much information collected at that time was published in the bulletin of the Laboratory (Volume IX, Article IV). After an interval of ten years, in which public interest was not yet sufficiently aroused to support further work in forestry, the Natural History Survey undertook to make a comprehensive inventory of forest resources in Illinois and to compile accurate data on the extent to which wood in all its forms is used in the State. Trained foresters, employed for this purpose, were engaged for several years (1920-1924) in surveying and mapping the wooded areas of five acres or more in all parts of the State except in a few prairie counties where forests are relatively unimportant. Detailed and accurate information was thus collected on the location, extent and condition of forest tracts; and special studies were made of the rates of growth of the most common species of trees on different types of soil and in different situations.

Paralleling this, studies were conducted of the values of the woodlands, the economics of forest management and wood production, and the relation of the local supply of forest products, present and prospective, actual and possible, to the demands of Illinois industries. Three reports and four circulars based on the data secured, have been issued by the Natural History Survey: the first report (Article VIII, Vol. XIV) presenting the forest conditions in detail for a limited area of the Ozark region of southern Illinois; the second (Article III, Vol. XV) analyzing the economic of wood production and utilization in Illinois with special reference to the requirements of industries and of the farms, and the relation of the local supply of forest products, present and prospective, to these requirements; and the Third (Article I, Vol. XVI) describing the condition of the forests as to acreage, component species, and estimated yields in the entire State.

The accumulation of this detailed information has permitted the intelligent formulation of a policy both for the State and for the owners of forest property. The first essential of such a policy is a program of forestry extension work among the farmers, who own nine-tenths of the existing forests in Illinois,—extension work aiming at the greatest productivity of the 3,000,000 acres now wooded and the economic reclamation of the 2,000,000 additional acres of waste land. Other essentials are: the teaching of farm forestry at the State University and at other educational centers; the establishment of experimental forest tracts in different parts of the State and on different classes of soil; a definite effort to put an end for all time to forest fires; and the establishment of State forests as places for a demonstration of the most profitable methods of woodland management and as sources of supply to wood-using industries.

Since the care, management, and utilization of forests in Illinois and the promotion of forest culture are essentially agricultural enterprises, calling for a kind of service which the Natural History Survey is not organized or equipped to render, continued progress requires that these essentials of a public policy be carried out by other departments of the State Government. A bill was passed by the Fifty-third General Assembly for the establishment of a forestry division in the Agricultural Experiment Station of the University of Illinois, to be charged with "investigations in forestry and allied subjects for the promotion and development of forestry interests in the State, with special reference to the maintenance and improvement of existing forests and farm woodlots and to the establishment of forest culture on lands better adapted to forestry than to any other use." This law also charged the University with "the instruction of the people of the State, by lecture and bulletin and by the establishment of demonstration forests, in the best methods of planting, care, and utilization of forests and farm woodlots." The operation of this act, however, was conditioned upon the passage of definite appropriations to the University for forestry purposes, and as no such appropriations have yet been made, the law is a dead letter for the time being.

With the expectation that such appropriations would eventually be made, the Natural History Survey, in addition to making complete reports of its own operations, undertook to engage also in publicity and extension work for the instruction and encouragement of the farmers of the State in the proper care and best use of their woodlots and in the utilization of waste land for forest culture. As an aid in such extension work, a Manual of Woodlot Management has been published by the Natural History Survey (Volume XVII, Article II), giving detailed methods of growing and marketing timber in Illinois. Recently a cooperative arrangement, subscribed to by the U. S. Department of Agriculture, the College of Agriculture of the University of Illinois, the Illinois State Department of Conservation and the Illinois State Department of Registration and Education, has been consummated under which the College of Agriculture assumes the supervision of the extension work in forestry as a unit of the regular agriculture extension service. Funds for this work are supplied

by the U. S. Department of Agriculture and the State Natural History Survey.

By an act of the Fifty-fourth General Assembly, the newly created State Department of Conservation was charged, not only with the enforcement of laws and the perpetuation of fish and animal life, but also with the acquisition of land for State forests and the establishment of forest nurseries for the growing of trees to be planted in the State forests and under prescribed conditions on private lands within the State. The Department of Conservation, in co-operation with the United States Department of Agriculture, is now undertaking to provide planting stock for forestry purposes and to establish a fire protection system.

Thus, of the several essentials in the forestry program of Illinois, extension work among the farmers and the establishment of State forests have been provided for, and arrangements have been made for supplying planting stock and for establishing a fire protection system. The essentials yet to be accomplished are the providing of funds in the University budget for financing forestry courses and the operation of experimental areas.