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State of Connecticut

NINTH BIENNIAL REPORT OF THE
COMMISSIONERS

OF THE

State Geological and Natural
History Survey

1919-1920

Bulletin No. 32

State of Connecticut
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State Geological and Natural
History Survey

HERBERT E. GREGORY, SUPERINTENDENT

BULLETIN NO. 32



HARTFORD
Printed for the State Geological and Natural History Survey
1920

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State Geological and Natural History Survey

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HERBERT E. GREGORY

Publication Approved by the Board of Control

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**NINTH BIENNIAL REPORT OF THE
COMMISSIONERS**

OF THE

**State Geological and Natural History
Survey of Connecticut**

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LETTER OF TRANSMITTAL

NEW HAVEN, CONN., December 30, 1920.
HIS EXCELLENCY, MARCUS H. HOLCOMB,
Governor of Connecticut,
Hartford, Connecticut.

Sir:—I have the honor to transmit to you herewith, in behalf of the Commissioners of the State Geological and Natural History Survey, the report of the Superintendent of the work, covering the two years ending December 31, 1920.

Very respectfully,

HERBERT E. GREGORY,
Acting Secretary of the Commission.

**NINTH BIENNIAL REPORT OF THE GEOLOGICAL
AND NATURAL HISTORY SURVEY
OF CONNECTICUT**

SCOPE AND PLAN OF THE STATE SURVEY.

The act of 1903 establishing the Survey proposed two subjects for investigation, viz, the geology of the State, and the natural history, or botany and zoology, of the State. It has been presumed to be the intent of the law that the appropriation should be divided with some approach to equality between geology and biology. The law further specifies three aims with reference to which the work should be prosecuted: first, the purely scientific aim of advancing our knowledge of the geology and natural history of the State; second, the economic aim of leading to the most effective conservation and utilization of the resources of the State; third, the educational aim of promoting the work of the schools of the State by the publication of the results of investigation in a form adapted for the use of teachers.

The plan of organization which was outlined in the first report has been retained. Only one salaried officer has been appointed by the Commissioners, viz, the Superintendent. Other scientific men have been engaged to investigate particular subjects and prepare reports or bulletins thereon.

The contracts made with these scientific men provide for an allotment for actual and necessary field expenses and for a small monthly salary during the time the investigator is at work in the field. For manuscript reports prepared without expense to the State, a small honorarium is paid to their authors. In making new contracts it is the policy of the Superintendent to include an agreement as to the date at which the completed report is to be submitted and to discontinue allotments for projects on which no work has been done for several years.

Each report is published as a separate bulletin, the bulletins being numbered consecutively, generally in the order in which they are received. Each bulletin bears the name of the author or the names of the authors, and each author is responsible for his own work. The bulletins are issued in paper covers, but a part of the edition is reserved for binding. Bulletins 1 to 5 have been bound as Volume I, Bulletins 6 to 12 as Volume II, Bulletins 13 to 15 as Volume III, Bulletins 16 to 21 as Volume IV, and Bulletin 22 as Volume V. The bound volumes are especially desirable for public libraries and similar institutions, in which complete sets of our publications are to be preserved. The pamphlet form, in

which each bulletin is complete in itself, is convenient for the large number of students, teachers, and others who have use for some particular bulletin. The publications of the Survey are distributed by the State Librarian. They are given liberally to colleges, public libraries, geological surveys, and other scientific institutions, and to scientific men of repute in the branches of science with which the respective bulletins are concerned. In many cases, books and papers of great value are received in exchange for the publications of the Survey. All books and papers thus received are deposited in the State Library. The publications of the Survey are also distributed liberally to citizens of our own State, particularly to teachers who can make use of them in their work. In the case of persons who are not known as scientific men, and who appear to have no special claim for the donation of the publications of the Survey, the bulletins are sold at prices sufficient to cover the cost of printing and transportation.

BULLETINS PUBLISHED.

The Survey has already published the following bulletins:

1. First Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1903-1904, 18 pp., 1904.
2. A Preliminary Report on the Protozoa of the Fresh Waters of Connecticut, by H. W. Conn, 69 pp., 34 pls., 1905.
3. A Preliminary Report on the Hymeniales of Connecticut, by E. A. White, 81 pp., 40 pls., 1905.
4. The Clays and Clay Industries of Connecticut, by G. F. Loughlin, 121 pp., 13 pls., 1 fig., 1905.
5. The Ustilagineæ, or Smuts, of Connecticut, by G. P. Clinton, 45 pp., 7 pls., 1905.
6. Manual of the Geology of Connecticut, by W. N. Rice and H. E. Gregory, 273 pp., 31 pls., 22 figs., 1906.
7. Preliminary Geological Map of Connecticut, by H. E. Gregory and H. H. Robinson, 39 pp., 1 map, 1 fig., 1907.
8. Bibliography of Connecticut Geology, by H. E. Gregory, 123 pp., 1907.
9. Second Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1905-1906, 23 pp., 1906.
10. A Preliminary Report on the Algæ of the Fresh Waters of Connecticut, by H. W. Conn and L. W. (Hazen) Webster, 78 pp., 44 pls., 1908.
11. The Bryophytes of Connecticut, by A. W. Evans and G. E. Nichols, 203 pp., 1908.
12. Third Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1907-1908, 30 pp., 1908.
13. The Lithology of Connecticut, by Joseph Barrell and G. F. Loughlin, 207 pp., 6 tables, 1910.
14. Catalogue of the Flowering Plants and Ferns of Connecticut growing without cultivation, by a Committee of the Connecticut Botanical Society, 569 pp., 1910.
15. Second Report on the Hymeniales of Connecticut, by E. A. White, 70 pp., 28 pls., 1910.

16. Guide to the Insects of Connecticut, prepared under the direction of W. E. Britton. Part I. General Introduction, by W. E. Britton. Part II, The Euplexoptera and Orthoptera of Connecticut, by B. H. Walden, 169 pp., 11 pls., 66 figs., 1911.
17. Fourth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1909-1910, 31 pp., 1910.
18. Triassic Fishes of Connecticut, by C. R. Eastman, 77 pp., 11 pls., 8 figs., 1911.
19. Echinoderms of Connecticut, by W. R. Coe, 152 pp., 32 pls., 29 figs., 1912.
20. The Birds of Connecticut, by J. H. Sage and L. B. Bishop, assisted by W. P. Bliss, 320 pp., 1913.
21. Fifth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1911-1912, 27 pp., 1912.
22. Guide to the Insects of Connecticut, prepared under the direction of W. E. Britton. Part III, The Hymenoptera, or Wasp-like Insects of Connecticut, by Henry Lorenz Viereck, in collaboration with A. D. MacGillivray, C. T. Brues, W. M. Wheeler, and S. A. Rohwer, 824 pp., 10 pls., 15 figs., 1916.
23. Central Connecticut in the Geologic Past, by Joseph Barrell, 44 pp., 9 figs., 1915.
24. Triassic Life of the Connecticut Valley, by R. S. Lull, 285 pp., 12 pls., 3 maps, 126 figs., 1 section, 1915.
25. Sixth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1913-1914, 24 pp., 1915.
26. The Arthrostraca of Connecticut, by Beverly Waugh Kunkel, 261 pp., 84 figs., 1918.
27. Seventh Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1915-1916, 17 pp., 1917.
28. Eighth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1917-1918, 21 pp., 1919.
29. The Quarternary Geology of the New Haven Region, Connecticut, by Freeman Ward, 80 pp., 9 pls., 17 figs., 1920.
30. Drainage Modifications and Glaciation in the Danbury Region, Connecticut, by Ruth Sawyer Harvey, 59 pp., 5 pls., 10 figs., 1920.
31. Check-List of the Insects of Connecticut, by Wilton Everett Britton, 397 pp., 1920.

Interest in these publications and their usefulness to the people of Connecticut is indicated to some degree by the number of requests for copies. The following summary is furnished by the State Librarian:

Bulletin	Date issued	Number of copies printed	Number of copies now on hand
1	1904	3,000	17
2	1905	3,500	Out of print
3	1905	3,500	180
4	1905	3,500	275
5	1905	3,500	450
6	1906	4,000	Out of print
7	1907	3,500	50
8	1907	3,500	500
9	1906	3,000	575
10	1908	3,500	580
11	1908	3,000	520

Bulletin	Date issued	Number of copies printed	Number of copies now on hand
12	1908	3,000	19
13	1910	3,500	875
14	1910	4,000	1,550
15	1910	3,500	950
16	1911	3,500	375
17	1910	3,000	610
18	1911	3,500	960
19	1912	3,500	2,020
20	1913	4,500	1,250
21	1912	3,000	650
22	1916	3,500	1,150
23	1915	4,000	1,250
24	1915	4,000	1,134
25	1915	2,900	275
26	1918	3,000	1,002
27	1917	2,900	1,010
28	1919	2,500	200
29	1920	2,500	Not yet distributed
30	1920	2,500	" " "
31	1920	3,000	" " "

Vol. I	} 600 copies of each bulletin as listed above used for binding	} 262	
" II			202
" III			278
" IV			312
" V			402

The editions of Bulletins 2 and 6 are exhausted for distribution purposes, as is also the Geological Map mounted for use on walls, accompanying Bulletin 7. The State Librarian remarks that on account of the constant demand for these three Bulletins, 2, 6 and 7, they might with profit be re-published.

Copies of all bulletins may still be obtained in bound volumes.

The publications made in cooperation with the United States Geological Survey are given on pages 12-14.

That the publications of the Survey are serving their purpose is indicated by laudatory reviews and by many letters of commendation. The following is an illustration:

"We consider that this [Bulletin 22] is one of the most valuable memoirs on the Hymenoptera that has been published on this continent, and systematic workers are finding it most useful."—Canadian Department of Agriculture.

Since the last Biennial Report, Bulletins 29 and 30 have been published. Bulletin 31 is now in press. Bulletin 29, the Quarterly Geology of the New Haven Region, Connecticut, by Freeman Ward, consists of a discussion of the preglacial, glacial, and post-glacial conditions of the New Haven region, together with a description of soils and of natural scenery.

Bulletin 30, Drainage Modifications and Glaciation in the Danbury Region, Connecticut, by Miss Ruth Sawyer Harvey, is a discussion of the streams in the Central Housatonic Basin.

A general description of the region centering at Danbury is given from a geological standpoint.

Bulletin 31, Check-List of the Insects of Connecticut, by Wilton Everett Britton, will be of value to institutions as well as to individuals in the identification of insects in the State. As Mr. Britton has been assisted in his work of records and identification of species by collectors and specialists in entomology in and near Connecticut, the list, though necessarily incomplete, is believed to be accurate. To quote from the preface of Bulletin 31:

"The purpose of this list is to stimulate an interest in the collection and study of insects in the State, as has been done in New Jersey, and to serve as a check-catalogue of the species in the collections of the institutions and amateur collectors. A work entitled "Guide to the Insects of Connecticut," containing keys to orders, families, genera, and species, and including much information about life-histories, habits, distribution, etc., is already in progress; two papers, the Euplexoptera and Orthoptera, by B. H. Walden, and the Hymenoptera, by Henry L. Viereck, having already been published as Bulletins 16 and 22 of this Survey. It will be many years at least before the Guide can be finished so as to include all orders of insects, and the usefulness of a check-list for service during this time seemed to warrant its preparation and publication."

UNPUBLISHED MANUSCRIPTS.

A paper on the Geology of the Stonington-Westerly region, Connecticut and Rhode Island, has been prepared by Miss Laura Hatch, and accepted for publication. Its aim is to give a complete geologic and physiographic description of a region which contains type physiographic and petrographic features.

A paper has been prepared on the Geology of the Guilford (Connecticut) Quadrangle by Wilbur G. Foye. This report represents a study of igneous and metamorphic rocks of this area as bearing on the geologic history of the State.

It is expected that the manuscripts of the following bulletins will be received during the coming year:

Hemiptera of Connecticut. Fifteen zoologists, under the direction of W. E. Britton, have contributed to the preparation of this bulletin which will have over 800 printed pages. Except for slight revision, this work is complete.

The Decapods of Connecticut, by A. E. Verrill. The introduction and the systematic portion have been completed, making over 200 printed pages, and 111 illustrations have been prepared. A bibliography is to accompany the report, which otherwise is practically complete.

The Vegetation of Connecticut, by George E. Nichols. The field work on which this bulletin is based has been completed and some progress made with the preparation of the manuscript. The scope of this work, authorized by the Commissioners in December, 1917, is indicated in Bulletin 28, page 18, 1919.

COOPERATION WITH THE UNITED STATES GEOLOGICAL SURVEY.

During the years 1911 to 1917 the State Geological and Natural History Survey cooperated with the United States Geological Survey in a study of the water resources of Connecticut. During this time, 69 towns, which comprise 35 per cent of the area of the State and include 50 per cent of its population, were surveyed. The list of towns covered by this investigation is given in Bulletin 27, page 13, of the State Survey. Further work was discontinued on June 30, 1917, for the duration of the war. In 1919, cooperative work was again undertaken and a study made by Mr. John S. Brown of the underground water resources of the region bordering Long Island Sound.

By the terms of the contract, the United States Geological Survey assumed responsibility for the prosecution of the work, and Herbert E. Gregory, Geologist of the Federal Survey, was appointed to direct the investigations. The purpose of the series of studies is to determine the position, amount, and quality of the waters—particularly underground waters—of the State of Connecticut and to discuss their economic utilization. The value of such studies depends upon their usefulness, not only to communities using a common supply, but to individual landholders, and the preparation of reports has, therefore, involved detailed mapping and local descriptions. The position of ground water with reference to the land surface has been determined; areas of open field, forest, rock, and types of glacial soil have been outlined; water from springs, wells, and brooks has been analyzed; and studies of the most economical and sanitary supplies for farms and villages have been made. By description and discussion in the text, by tabulation of statistics and representation of data on maps and sections, the conclusions of the authors regarding amount, quality, and availability of water supply of each town are given.

By agreement, the results of these investigations of the water resources of Connecticut are to be published as water-supply papers of the United States Geological Survey, and the expense of publication is to be met by the Federal Treasury. Each water-supply paper will bear the title: "Prepared in Cooperation with the Connecticut Geological and Natural History Survey," and the contract reserves the right of the State of Connecticut to publish or republish all or parts of the reports.

The following publications have appeared:

Ground Water in the Hartford, Stamford, Salisbury, Willimantic, and Saybrook Areas, Connecticut, by H. E. Gregory and A. J. Ellis. Water-Supply Paper 374, 1916. 150 pp., 13 pls., 10 figs.

Ground Water in the Waterbury Area, Connecticut, by A. J. Ellis. Water-Supply Paper 397, 1916. 73 pp., 4 pls., 10 figs.

Water-Supply Paper 374 represents the first systematic attempt to investigate the ground water in the State. The area described covers 715 square miles and includes the towns of Hartford, West Hartford, Newington, Wethersfield, East Hartford, Manchester, Windsor, East Windsor, South Windsor, Bloomfield, Stamford, Greenwich, Salisbury, Canaan, North Canaan, Windham, Franklin, Saybrook, Essex, Westbrook, and Old Lyme. The aim of the paper is to show how much water is stored underground, how the supply fluctuates, what its quality is, how it can be procured, and how much can be secured from streams.

Water-Supply Paper 397 covers work on an area of about 171 square miles, and includes the towns of Ansonia, Seymour, Oxford, Beacon Falls, Naugatuck, Middlebury, Waterbury, Watertown, Thomaston. This region is rich in good water-power sites and well provided with water for municipal supplies, but the conflicting demands of water users have given rise to local problems of conservation. This report records facts and recommendations on which regulations for the use of water may be based.

These publications, and also Water-Supply Paper 232, by H. E. Gregory, Underground Water Resources of Connecticut, which deals with the State as a whole, may be obtained free of charge from the Director, United States Geological Survey, Washington, D. C.

The call for these studies of water resources of the State is somewhat greater than for many similar public documents. The first edition of Water-Supply Paper 232, issued in 1909, was exhausted and of the second printing, 228 copies were in stock on December 1, 1920. One hundred and forty copies of Water-Supply Paper 374, issued in 1916, and 316 copies of Water-Supply Paper 397, issued in 1916, were on hand December 1, 1920.

Papers in process of publication are the following:

Ground Water in the Meriden Area, Connecticut, by G. A. Waring, Water-Supply Paper 449. This report covers the towns of Meriden, Berlin, Middlefield, Middletown, Cromwell, and Rocky Hill. It includes chapters on the geography and geology of each town, and discusses the water supplies in detail under the headings: water in till, water in stratified drift, water in bed-rock, springs, wells, quality of water. This report has been approved for printing, but has been delayed on account of difficulty in obtaining paper for illustrations.

Ground Water in the Southington-Granby Area, Connecticut, by H. S. Palmer, Water-Supply Paper 466. This report treats of the geography, surface geology, and water resources of the following towns: Cheshire, Prospect, Southington, Wolcott, New Britain, Plainville, Bristol, Plymouth, Farmington, Avon, Burlington, Harwinton, Simsbury, Canton, New Hartford, Granby, Barkhamsted, and Hartland. This report is in page proof.

Ground Water of the Norwalk, Suffield, and Glastonbury Areas, Connecticut, by H. S. Palmer, Water-Supply Paper 470. The towns covered by this report are Suffield, East Granby, Windsor Locks, Enfield, Glastonbury, Marlborough, Norwalk, Darien, New Canaan, Westport, Weston, Wilton, and Ridgefield, which were surveyed in 1916. This report has received approval for printing and is now with the editors.

Waters of the Pomperaug Valley, Connecticut, by A. J. Ellis. This report is based on field work done in 1913 and a series of stream, well, precipitation, and evaporation measurements carried on continuously from May, 1913, to December, 1916, by Ernest W. Parkin, George A. Parkin, and Ralph V. Wooden, under the direction of A. J. Ellis and H. S. Palmer. The data has been largely compiled. Owing to the death of Mr. Ellis, the report will be prepared by some other geologist of the United States Geological Survey.

Ground Water in the New Haven Area, Connecticut, by J. S. Brown. This report has been completed by the author, and will be published as a Water-Supply Paper.

A study of Coastal Ground Water with Special Reference to Connecticut, by J. S. Brown. This report has been completed by the author and will be published as a Water-Supply Paper.

These reports are for general distribution and when published may be obtained free of charge by addressing: Director, United States Geological Survey, Washington, D. C.

The total expense to the State of Connecticut for the six years' (1911-1917) investigation of water resources under the cooperative agreement is \$6,000. The Federal Government has expended an equal amount in addition to the cost of supervision and administration and the large expense of publication. To meet the cost of the work done during 1919 and 1920, the United States Geological Survey allotted \$1,600 and the State Survey, \$1,940.

It is believed that this work, probably the most exhaustive study of a water-supply problem so far undertaken for a large area, has high value. The publications record basal studies whose results will become more useful as the population increases and problems of water rights and of sanitation become more complicated.

OTHER STATE SURVEY WORK.

Arrangements have been made with Professor William North Rice for the preparation of a bulletin on the geology and natural history of the Middletown region, a guide-book designed for scientists and teachers. It will probably be completed by the fall of 1921.

The Commissioners accepted in January, 1920, the offer of Professor Alexander Petrunkevitch to prepare a bulletin on the

spiders of Connecticut, a report for which many requests have been made. The completion of this report has been postponed by the author for a year because of unusual demands on his time.

A paper on the Odonata of Connecticut is being prepared by Philip Garman, Assistant Entomologist of the Connecticut Agricultural Experiment Station. This will probably be completed by October, 1921. Mr. Garman is also preparing a paper on Mites of Connecticut.

Arrangements have been made with Leonard M. Tarr, Meteorologist of the United States Weather Bureau, for the preparation of a manual on the climate of Connecticut. This report will take up the location of the State relative to the storm tracks and the character of the storms that pass over this section; the topography and its effect on the weather; the variety of forest and fruit trees and the effect of weather upon them; also the variety of crops that can be raised under favorable conditions; in fact, everything that would be affected by weather changes. It is believed that this report will be completed about April 1, 1921.

Peat Deposits of Connecticut. Under the direction of Professor William North Rice, formerly Superintendent of the Connecticut Survey, an investigation of the peat resources of the State was made from July to October, 1907, and continued during 1908, 1909, and 1914. This work was placed in charge of C. A. Davis, the foremost American authority on occurrence and utilization of peat. All the swamps, both fresh and salt water, of the State were studied and the amount and character of the deposits determined by specially devised sounding apparatus. The field work was supplemented by chemical analyses and microscopic studies and by tests of the value of the product as fuel and as fertilizer. It was pioneer work of high grade, and the methods of study developed have been successfully employed elsewhere. At the time of his death in April, 1916, the completed report had been in the hands of Professor Davis for nearly two years awaiting final revision. A thorough but fruitless search for this manuscript has been made. Fortunately, some of the field notebooks and maps remain, but there is little hope that material for publication can be obtained without practically taking up the work anew.

The proposal of Mr. C. C. Osbon of the American Peat Society to prepare a new report on the peat of Connecticut, a report which will give detailed information regarding the location, magnitude, and uses of the deposits of commercial importance in Hartford and Windham Counties, and including the results of studies already made by him in Fairfield county, has been accepted. This report will be completed by June 1, 1921. It is hoped that funds may be obtained to continue the study of peat deposits of Connecticut until all within the State have been investigated. Dr. E. H. Jenkins, Director of the Agricultural Experiment Station, has offered to assist in carrying on these investigations.

The Superintendent has served as the representative of the State and also of the Federal Government in cooperative work for Connecticut. He has assisted industrial concerns in their search for raw materials and has given advice to individuals and corporations outside of Connecticut in regard to suitable locations for manufacturing plants which plan to make large use of gravel, trap rock, feldspar, clay or peat. He has acted as adviser to various boards and commissions in matters relating to sites for buildings and water supply, and at the request of the Committee on Finance made a study of the water problems confronting the State Institutions at Mansfield and at Storrs. At the request of the Governor, he has served as a member of the committee on selecting a site for the proposed new State Prison.

PLANS FOR FUTURE WORK.

I. Geology.

The geology and physical geography of Connecticut possess features of unusual interest. The bulletins already published, the Manual of Geology, the Geological Map, Clays and Clay Industries, Triassic Life, and other reports, have been found useful. It is desirable to continue geologic investigation to include other and more detailed studies of areas and special problems. The State Librarian reports:

"Bulletin 6, Manual of the Geology of Connecticut, should certainly be reprinted, as it has been out of print some time and is a popular bulletin, perhaps the most popular of those issued."

Among the bulletins which should be prepared are the following: Connecticut during the Ice Age. An explanatory description of the surface deposits, lakes, waterfalls, eskers, drumlins, and other topographic features for which the glaciers of Pleistocene time are responsible. Requests for the publication of such a report have come from teachers and other citizens.

Igneous and Metamorphic Rocks of Selected Areas. The structure and composition of the rocks of eastern and of western Connecticut are exceedingly complex, but the solution of the problems which they present is very desirable as a contribution to the geologic history of the United States. The studies already made by Professor W. G. Foye should be continued.

Mineralogy of Connecticut. A descriptive list of the minerals of the State, their occurrence, their geologic relations, and economic value.

Physical Geography. A number of papers of moderate size dealing with the geographic factors concerned with the location of cities, of routes of travel, and the development of industries would find a useful place. The reports should be made of type

localities and eventually combined to form a bulletin on the physical geography of the State. The preparation of papers similar to that now being written by Professor Rice (see p. 14) should be undertaken for other areas.

Feldspars of Connecticut. A bulletin describing the location and extent of feldspar deposits and their availability for commercial purposes.

Road-making Materials. A study of rocks of the State with reference to their suitability for use as crushed stone for road construction and concrete.

II. Botany.

The systematic botany of the flowering plants of southern New England has been comparatively well worked out and a list of flowering plants and ferns of Connecticut has been published by the Survey. Of the flowerless plants, the mosses, liverworts, fungi, fresh-water algæ and bacteria have been treated in Survey reports, which have received high commendation. Work on the ecology of the State, and on the peat deposits, is now in progress. Bulletins on the following subjects would be welcomed by students and investigators:

The Marine Algæ of the Connecticut Shore.
The Lichens of Connecticut.
The Trees of Connecticut.

III. Zoology.

Bulletins on the birds of Connecticut, on the fresh-water Protozoa, on the Echinoderms, on the Amphipods and Isopods, and two parts of a Guide to the Insects of Connecticut have been published. Professor Verrill reports that his paper on the Crustacea is nearing completion. It is desirable that in future years bulletins should appear on mammals, fishes, reptiles, Amphibia, and on selected species of marine fauna. Their publication is desirable from both educational and economic viewpoints.

APPROPRIATION DESIRED.

The work of the Connecticut Geological and Natural History Survey has amply justified its existence; it is highly commended by educational and scientific interests, and by leading business men both within and without the State. By eliminating overhead charges and taking advantage of financial contributions of the Federal Government, an unusual amount of creditable work has been accomplished at an expense far below that which has

been deemed necessary by similar organizations in other states. Although a large sum could be profitably expended on the scientific and educational problems which come within the scope of the Survey, the Commissioners are content to continue this policy of utilizing to the utmost a small but regular biennial appropriation.

They therefore request that the appropriation of \$6,000 for the two years just closing be renewed for the years 1921-22.

CONNECTICUT GEOLOGICAL AND NATURAL HISTORY SURVEY.

The Ninth Biennial Report of the State Geological and Natural History Survey has been published and copies may be obtained from Mr. George S. Godard, State Librarian, Hartford. It describes (1) the organization and aims of the Survey, (2) the work accomplished, (3) work in progress, and (4) plans for future work.

During the past two years a study of the water resources, especially of underground supplies for domestic as well as public use, of the shore towns between the Connecticut and Housatonic Rivers, and of some of the adjacent inland towns, has been completed. A special study was made of the ground water of a more restricted region bordering the Sound for the purpose of determining to what extent salt water affects the quality of domestic supplies. These studies, like the similar ones made elsewhere in the State, were carried out in co-operation with the United States Geological Survey.

At the present time studies have been completed of the water resources of 75 towns, which comprise over one-third the area of the State and contain over one-half the total population. During the past year Water-Supply Paper 470, Ground Water in the Norwalk, Suffield, and Glastonbury areas, by Harold S. Palmer was issued by the United States Geological Survey and may be obtained by writing to The Director, Washington, D. C. The towns included in this report are (1) Darien, New Canaan, Norwalk, Ridgefield, Weston, Westport, Wilton; (2) East Granby, Enfield, Suffield, Windsor Locks; (3) Glastonbury, Marlboro.

The Survey has published three new bulletins; two of these deal with geologic subjects, the third deals with insects.

In Bulletin 29, "The Quaternary Geology of the New Haven Region, Connecticut," by Freeman Ward, Ph. D., will be found an interesting description of the glacial geology, as recorded in the gravels, sands, and clays, of an area comprising most of the region covered by the New Haven sheet of the United States Topographic Atlas. The report is well illustrated and the distribution of the different formations and the depth to the underlying red sandstone, or bedrock, are shown on two large maps.

Bulletin 30, "Drainage Modifications and Glaciation in the Danbury Region, Connecticut," by Ruth S. Harvey, Ph. D., describes the changes brought about in the courses of the Housatonic, Still, and Rocky Rivers as a result of the deposits laid down by the Great Ice Sheet in its final retreat northward. The region studied covers about 150 square miles, extending from the vicinity of New Milford to the headwaters of the Saugatuck and westward to the State Line. It will surprise many people, no doubt, to learn that some of the streams in the Danbury region had their courses notably changed by the glacial deposits; in fact the changes that took place there furnish a clue to many of the anomalies in the courses of streams elsewhere in the State which resulted from the same cause.

Bulletin 31 is "Check-List of the Insects of Connecticut," by Dr. W. E. Britton, State Entomologist. There are listed 6,781 species and varieties all of which are known to occur within the boundaries of the State and are represented by specimens or reliable records. The purpose of this bulletin is to stimulate an interest in the collection and study of the insects of the State and to serve as a check-catalogue of the species in the collections of institutions and amateur collectors.

In addition the Survey has already published a number of interesting and authoritative reports on the geology, botany, and zoology of the State. A complete list of these bulletins, as well as copies of the above described reports, may be obtained by those interested from Mr. George S. Godard, State Librarian, Hartford, who is the Distribution and Exchange Agent of the Survey. Dr. H. H. Robinson, the Superintendent, will also be glad to answer any inquiries in regard to publications or other matters which may be addressed to him at New Haven.