STATE OF CONNECTICUT

# TWENTY-NINTH AND THIRTIETH BIENNIAL REPORTS OF THE COMMISSIONERS OF THE STATE GEOLOGICAL AND NATURAL HISTORY SURVEY

1959-1962

STATE GEOLOGICAL AND NATURAL HISTORY SURVEY
OF CONNECTICUT
A DIVISION OF THE DEPARTMENT OF AGRICULTURE AND
NATURAL RESOURCES

1963

BULLETIN 95

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## A DIVISION OF THE DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES



## LETTER OF TRANSMITTAL

Hartford, Connecticut
January 1, 1963

His Excellency, John N. Dempsey
Governor of Connecticut
Hartford, Connecticut

Sir:

I have the honor to transmit to you, herewith, on behalf of the Commissioners of the State Geological and Natural History Survey, in compliance with past custom, the Twenty-ninth and Thirtieth Biennial Reports of the Survey, covering the four years ending December 31, 1962.

This report prepared by Dr. Joe Webb Peoples for the Commissioners is the first such report since the Survey was made part of the Department of Agriculture and Natural Resources under Public Act No. 637 in 1959. It is clear that the four years covered by the report have been fruitful ones in both the geological and natural history aspects of its program as shown by progress in field investigations and in publication.

Respectfully submitted,

JOSEPH N. GILL
*Commissioner of Agriculture and Natural Resources*

# TWENTY-NINTH AND THIRTIETH BIENNIAL REPORTS OF THE COMMISSIONERS OF THE STATE GEOLOGICAL AND NATURAL HISTORY SURVEY

## 1959-1962

### ORGANIZATION AND HISTORY

The State Geological and Natural History Survey was created by the 1903 statutes of the General Assembly (Chapter 133, Public Acts of 1903) as amended in 1915 (Chapter 185) and 1945 (H.B. No. 1145, P.A. No. 301, Sect. 2227). These statutes set up a board of Commissioners to be in general charge of the Survey. This Commission includes the Governor of the State, and five active scientists, appointed by the presidents of Connecticut College, Trinity College, University of Connecticut, Wesleyan University, and Yale University. (Currently the scientific members of the Commission include three geologists, a biologist, and a botanist.) Each Commissioner serves "without further appointment until his removal from the state, death, or resignation, unless sooner removed for cause." The Commissioners choose as Director of the Survey one of the appointed members of the Commission.

Public Act No. 637 of the January 1959 Assembly placed the Geological and Natural History Survey in the newly organized Department of Agriculture and Natural Resources.

#### *Personnel changes*

Early in 1960 Dr. John B. Lucke, then Director of the Connecticut Geological and Natural History Survey, asked to be relieved of his duties as Director in order to devote more of his time to scientific work and writing. The present Director was elected by the Commissioners and began his duties as of 1 June 1960; however, the office of the Survey was not moved to Middletown until July of that year. Mrs. Norma Van Bibber who had served very efficiently and faithfully for six years as secretary of the Survey also resigned when the office was moved. Mrs. Louise Henney succeeded her as secretary on a part-time basis.

The tenure of the various Superintendents or Directors of the Survey is summarized below.

| *Superintendent or Director* | *Location of Survey Office* | *Dates* |
|---|---|---|
| William North Rice | Wesleyan University | 1903-16 |
| Herbert Ernest Gregory | Yale University | 1916-21 |
| Henry Hollister Robinson | Yale University | 1921-25 |
| Wilton Everett Britton | Connecticut Agricultural Experiment Station | 1925-39 |
| Edward Leffinwell Troxell | Trinity College | 1939-54 |
| John Becker Lucke | University of Connecticut | 1954-60 |
| Joe Webb Peoples | Wesleyan University | 1960- |

The six-year tenure of Dr. Lucke was an outstanding period for the organization. During these years all of the accumulated manuscripts were published, and a dynamic new geologic mapping program on a quadrangle basis was organized. Beginning in 1949 some quadrangle mapping had been undertaken and by 1954 four quadrangle reports published, but it had become obvious that at this rate the state would not be completely mapped for many years. Dr. Lucke and the Commissioners continued the existing program of mapping by geologists temporarily employed by the State. In addition they initiated a cooperative program with the U.S. Geological Survey. By this agreement the State and Federal Surveys contribute equal amounts of money, and the mapping is done by the staff of the U.S. Geological Survey. Both of these programs continue to be in operation and are described later in this report.

### *Operating program*

The Survey has no full-time personnel; its activities are administered and such routine matters as answering inquiries from the public are carried on by the Director, Dr. Peoples, and the Secretary, Mrs. Henney, who both work on a part-time basis. Dr. Remington of Yale University plans and edits the series of entomological publications, and Dr. Lou Williams Page serving as general editor works as required to process the manuscripts received.

The scientific work is carried on by university professors and graduate students. The Survey has been fortunate in interesting able people, some with world-wide reputations, who have undertaken projects at very modest stipends. The number of workers has varied widely with the availability of funds and personnel.

## GEOLOGICAL MAPPING PROGRAM

The major effort in recent years has been toward the completion of mapping each of the more than 100 quadrangles in the State. For most quadrangles two maps are prepared, one delineating the bedrock geology and the other the surficial geology. In some cases both bedrock and surficial geology can be shown on one map. The progress of this mapping has been accelerated by the cooperative program with the



U.S. Geological Survey initiated in 1955. The matching funds provided by the State and by the Federal Survey are shown in the report of the cooperative program given below. The Geological and Natural History Survey has continued its own mapping program with university personnel working during the summer. In addition, Federal geologists working under a cooperative agreement with the State Water Resources Commission have also done some quadrangle mapping in areas of particular interest to its program. The spirit of cooperation between the groups has been excellent. Moreover, university geologists, operating with funds from sources other than the Federal and State Surveys, have mapped quadrangles and have offered them to the State for publication. For three years the agencies concerned have joined for an annual conference to review the past performance and to plan the future programs. The geologists who have been doing the quadrangle mapping meet with guests from Connecticut and neighboring states in Middletown to discuss geological problems of common interest, to resolve problems of correlation across quadrangle boundaries, and to discuss future plans. These meetings have been stimulating and useful. Fifty-two people attended the most recent conference which took place 22-23 August 1962.

With a few minor changes, the report of progress submitted by the U.S. Geological Survey at the August 1962 meeting is as follows.

### U.S. GEOLOGICAL SURVEY REPORT ON PROGRESS OF GEOLOGIC MAPPING IN CONNECTICUT AS OF AUGUST 15, 1962, AND STATUS OF THE COOPERATIVE GEOLOGIC PROGRAM

*Over-all progress.* This is the eighth year of the cooperative geologic mapping program between the Connecticut Geological and Natural History Survey and the U. S. Geological Survey. At the present date, about half of the quadrangles necessary for State-wide geologic coverage are mapped or are being mapped. Over-all progress to date is as follows. (Those quadrangles for which bedrock and surficial geology are combined on one map are credited once in each category.)

| | *Bedrock* | *Surficial* |
|---|---|---|
| Number of quadrangles covering state | 117 | 117 |
| Number of quadrangles mapped or being mapped by State and U.S.G.S. | 69 (59%) | 40 (34%) |
| Number of quadrangles published to date by State and U.S.G.S. | 13 (11%) | 12 (10%) |

*Funds.* Funds that have been, and are, available to the Cooperative are as follows:

| *Fiscal year* | *State* | *U.S.G.S.* | *Total* |
|---|---|---|---|
| 1956 | $20,000 | $20,000 | $ 40,000 |
| 1957 | 20,000 | 20,000 | 40,000 |
| 1958 | 40,000 | 40,000 | 80,000 |

| | | | |
|---|---|---|---|
| 1959 | 40,000 | 40,000 | 80,000 |
| 1960 | 40,000 | 40,000 | 80,000 |
| 1961 | 40,000 | 40,000 | 80,000 |
| 1962 | 40,000 | 40,000 | 80,000 |
| | Total spent to date | | $480,000 |
| Authorized for 1963 | 40,000 | 40,000 | $ 80,000 |

*Products of the Cooperative.* In May 1961, the U. S. Geological Survey started publishing Geologic Quadrangle maps without texts or with texts limited to 3,000 words. This is expected to speed up publication of quadrangle maps following completion of field work. It is too early as yet to determine the results of this policy. Several of the texts previously prepared for the old GQ format are being revised for Bulletin format. It is expected that GQ maps with or without brief texts will be published in advance of any extended text treatment on one or more quadrangles prepared for bulletin publication. The GQ maps will be reissued as plates in such a bulletin or a smaller scale map covering the geology of several quadrangles will be prepared for the bulletin. No GQ maps have as yet gone through the entire processing mill from submission to Branch to publication strictly as maps without or with only brief texts. The New London surficial map is the first to be published without text, but a text prepared for the old style GQ format had previously been through part of the processing mill.

Mapping to date by the U. S. Geological Survey is summarized as follows. (Five quadrangles mapped by the Water Resources Division are included.)

| | *Bedrock* | *Surficial* |
|---|---|---|
| Quadrangles assigned to U.S. Survey to date | 37 | 31 |
| Quadrangles published | 3 (8%) | 10 (33%) |
| Quadrangles at present at Division level or higher | 2 | 1 |
| Quadrangles at present in Branch review | 6 (22%) 73% | 3 (13%) 62% |
| Quadrangle mapping completed only | 16 (43%) | 5 (16%) |
| Quadrangles currently being mapped | 10 (3 recessed) | 11 (5 recessed) |
| Ratio of quads-in-mill to quads mapped—completed only | 8/16 (.5) | 4/5 (.8) |

The above figures indicate a backlog of bedrock maps available for processing. Below are more detailed lists of the status of maps and reports. Reference is also made to the maps and chart accompanying this report.



The following maps and reports have been published:

1. Simpson, H. E., 1959, Surficial geology of the New Britain quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-119.
2. Gates, Robert, 1959, Bedrock geology of the Roxbury quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-121.
3. Schnabel, R. W., 1960, Bedrock geology of the Avon quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-134.
4. Colton, Roger B., 1960, Surficial geology of the Windsor Locks quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-137.
5. Goldsmith, Richard, 1960, Surficial geology of the Uncasville quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-138.
6. Snyder, G. L., 1961, Bedrock geology of the Norwich quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-144.
7. Simpson, H. E., 1961, Surficial geology of the Bristol quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-145.
8. LaSala, A. M., 1961, Surficial geology of the Southington quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-146. (In cooperation with Connecticut Water Resources Commission.)
9. Schnabel, R. W., 1962, Surficial geology of the Avon quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-147.
10. Goldsmith, R., 1962, Surficial geology of the Montville quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-148.
11. Hanshaw, P. M., 1962, Surficial geology of the Meriden quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-150.
12. Hanshaw, P. M., 1962, Surficial geology of the Norwich quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-165.
13. Goldsmith, R., 1962, Surficial geology of the New London quadrangle, Connecticut: U. S. Geol. Survey Geol. Quad. Map GQ-176.

In addition, the following outside reports concerning observations made in the course of the mapping of Connecticut geology that are of general interest have been published:

1. Lundgren, L., Goldsmith, R., and Snyder, G. L., 1958, Major thrust fault in southeastern Connecticut (abs.): Geol. Soc. America Bull., v. 69, no. 12, pt. 2, p. 1606.
2. Goldsmith, R., 1960, A post-Harbor Hill-Charlestown moraine in southeastern Connecticut: Am. Jour. Sci., v. 258, p. 740-743.
3. Hanshaw, P. M., and Barnett, P. R., 1960, Possible use of boron, chromium, and nickel content in correlating Triassic igneous rocks in Connecticut: U. S. Geol. Survey Prof. Paper 400-B, p. 170-172.
4. Goldsmith, R., 1961, Axial plane folding in southeastern Connecticut: U. S. Geol. Survey Prof. Paper 424-C, p. C-54.

5. Goldsmith, R., Snyder, G. L., and Conklin, N., 1961, Sphene in granitic gneisses of southeastern Connecticut: U. S. Geol. Survey Prof. Paper 424-D, p. 310.

6. Fritts, C. E., 1962, The barite mines of Cheshire: The 19th century mining and milling industries of Cheshire and New Haven, Connecticut: The Cheshire Historical Society, Cheshire, Conn.

7. Fritts, C. E., 1962, Age and sequence of metasedimentary formations northwest of New Haven, Connecticut: U. S. Geol. Survey Prof. Paper 450-D, p. 32-36.

8. Dixon, H. R., Lundgren, Lawrence, Jr., Snyder, G. L., Eaton, Gordon, 1962, Colchester nappe of eastern Connecticut (abs.): Geol. Soc. America Program 1962 Annual Meetings.

The following report is in press:

1. Fritts, C. E., Late Newark fault versus pre-Newark peneplain in Connecticut.

A number of quadrangle maps and reports have been submitted from authors and are in various stages of processing:

Mt. Carmel bedrock
Southington bedrock
Hartford North surficial and bedrock (Water Resources)
Broad Brook surficial and bedrock
Fitchville bedrock
Manchester surficial and bedrock
New Britain bedrock
Scotland bedrock
Tariffville surficial (Water Resources)
Willimantic bedrock
Windsor Locks bedrock

In the forthcoming year it is expected that the following 19 quadrangle maps will be submitted by the authors:

Ansonia bedrock
Ashaway and Watch Hill bedrock
Ashaway and Watch Hill surficial
Ashley Falls surficial
Bashbish Falls surficial
Bristol bedrock
Columbia bedrock
Danielson bedrock
Durham surficial
Hampton bedrock
Marlborough bedrock
Milford bedrock
Montville bedrock



New London bedrock
Plainfield bedrock
Springfield South bedrock and surficial
Tariffville bedrock
Uncasville bedrock
Willimantic bedrock

In summary, the number of publications to date by members of the Federal Survey and expected future number of publications are shown below:

| | |
|---|---|
| Geol. Quad. published 1959 | 1 |
| Geol. Quad. published 1960 | 3 |
| Geol. Quad. published 1961 | 2 |
| Geol. Quad. published 1962 | 5 |
| Geol. Quad. expected to be published 1963 | 3 |
| Geol. Quad. possibly published 1964 | 9 |

## GEOLOGIC MAPPING PROGRAM BY THE STATE

The progress which the State has made is as follows:

| *Quadrangle* | *Mapping started* | *Mapping completed* | *Comments* |
|---|---|---|---|
| Litchfield (Br) | 1949 | 1949 | Published 1951, QR 1 |
| New Milford (Br) | 1949 | 1952 | Ms. due Winter, 1963 |
| New Preston (Br) | 1950 | 1951 | Published 1952, QR 2 |
| Glastonbury (Br) | 1950 | 1951 | Published 1955, QR 5 |
| Rockville (Br) | 1951 | 1952 | Published 1955, QR 6 |
| Woodbury (Br) | 1952 | 1952 | Published 1954, QR 3 |
| Ellington (Br) | 1952 | 1953 | Published 1954, QR 4 |
| Kent (Br) | 1952 | | Ms. due Winter, 1963 |
| Middletown (Sur) | 1953 | 1954 | Ms. due Dec. 1962 |
| Danbury (Br) | 1953 | 1954 | Published 1958, QR 7 |
| Roxbury (Br) | 1953? | 1955 | Published 1959, GQ 121 |
| Hartford South (Sur) | 1954 | 1955 | Ms. due Dec. 1962 |
| Bethel (Br) | 1955 | 1957? | Ms. being revised |
| Deep River (Br) | 1955 | 1956 | To press Nov. 1962, QR 13 |
| Middletown (Br) | 1955 | 1956 | Published 1959, QR 8 |
| Brewster (Br) | 1955 | 1955 | To be published by |
| Peach Lake (Br) | 1955 | 1955 | New York Geol. Survey |
| Glastonbury (Sur) | 1956 | 1962 | Ms. due Dec. 1963 |

| | | | |
|---|---|---|---|
| Middle Haddam (Sur) | 1956 | 1962 | Ms. due Dec. 1963 |
| Essex (Br) | 1956 | 1956 | Ms. due Dec. 1962 |
| Cornwall (Br) | 1956 | 1960 | Published 1962, QR 11 |
| Branford (Br) | 1957 | 1958 | Ms. due Dec. 1962 |
| Hamburg (Br) | 1957 | 1959 | Ms. due Summer, 1963 |
| Naugatuck (Br) | 1957 | 1958 | Published 1960, QR 9 |
| Thomaston, (Br) | 1957 | 1962 | Ms. due 1963? |
| Branford (Sur) | 1958 | 1961 | Ms. received Oct. 1962 |
| Mount Carmel (Sur) | 1958 | 1960 | Published 1962, QR 12 |
| New Haven (Sur) | 1958 | 1963? | |
| South Coventry (Sur) | 1958 | 1963? | |
| Wallingford (Sur) | 1958 | 1958 | Published 1960, QR 10 |
| West Torrington (Br) | 1958 | 1962 | Ms. due Sept. 1963 |
| Lyme (Br) | 1959 | | Ms. due Summer, 1964 |
| Moodus (Br) | 1959 | 1960 | Recessed |
| Collinsville (Br) | 1959 | 1961 | Ms. due Fall, 1962 |
| Essex (Sur) | 1960 | | Recessed |
| Spring Hill (Sur) | 1960 | 1963? | |
| Hartford South (Br) | 1960 | 1963? | |
| Middle Haddam (Br) | 1961 | 1963? | |
| New Haven (Br) | 1961 | 1963? | |
| Ellsworth (Br) | 1962 | ? | |
| South Canaan (Br) | 1962 | ? | |

By June 30, 1963, the State will have published 14 quadrangles. The Branford surficial geology map and report will be edited by that date and ready to send to the printer.

In addition, the manuscripts of the following quadrangle reports are expected to be completed within this fiscal year:

1. Essex (bedrock)
2. Collinsville (bedrock)
3. Hartford South (surficial)
4. Branford (bedrock)
5. Wallingford (bedrock)
6. Middletown (surficial)
7. Bethel (bedrock)
8. Guilford (bedrock)



Within the next two years the following should be received:

9. Kent (bedrock)
10. New Milford (bedrock)
11. Hamburg (bedrock)
12. West Torrington (bedrock)
13. Thomaston (bedrock)
14. Glastonbury (surficial)
15. Middle Haddam (surficial)
16. Moodus (bedrock)
17. Lyme (bedrock)

Other quadrangles which may be completed by July 1965:

18. Hartford South (bedrock)
19. Middle Haddam (bedrock)
20. South Coventry (surficial)
21. New Haven (surficial)
22. New Haven (bedrock)

Past experience has shown that authors do not always deliver manuscripts on time, and, doubtless some of these maps and reports may not be available for publication in the next biennium. However, it is hoped that from twelve to fifteen of these will be published during this period.

## OTHER GEOLOGIC STUDIES

The Survey has supported the geologic study of beaches and sedimentation near the shore. Report of Investigations No. 1, "Geological and Economic Aspects of Beach Erosion Along the Connecticut Coast," by John E. Sanders and Charles W. Ellis, summarizes some significant conclusions concerning erosion of natural and artificial beaches. "Marine Sedimentary Environments in the Vicinity of the Norwalk Islands, Connecticut," by Charles W. Ellis, was published as Bulletin 94 in December 1962. The major conclusions to be drawn from these two studies is that plans for any engineering work on beaches should be based on a knowledge of their natural regimen and that more detailed geologic studies of the beaches of Connecticut are required.

In June 1960 the Survey supported the beginning of a study of the coastal geomorphology of Connecticut by Arthur Bloom of Yale University. After July 1 of that year Dr. Bloom was able to obtain funds from the Office of Naval Research for the continuation of this work. An abstract of his paper, an investigation of sedimentation using carbon-14 dating, was published in 1962, "Evidence of Submergence from Connecticut Tidal Marshes" (Geol. Soc. America Special Paper 68, p. 138). It showed that submergence along our coast has been in progress for at least 6,800 years or at a rate of 3½ inches per century for the past

1,200 years. Dr. Bloom hopes to continue studies along the coast if he can get continued financial support from the Navy. In late 1962 he expects to submit a manuscript for publication by the Survey on the investigation already completed.

## NATURAL HISTORY

### *Entomology*

Many years ago entomological studies were started by the Survey and this distinguished series of publications is continuing at the present time under the leadership and editorship of Dr. Charles Remington of Yale University. Bulletin 93 of the series of Guides to the Insects of Connecticut is the Eighth Fascicle of Part VI on the Diptera or True Flies of Connecticut. It contains "Scatopsidae," by Edwin F. Cook; "Blepharoceridae" and "Deuterophlebiidae," by Charles P. Alexander; and "Dixidae," by Wesley R. Nowell. This bulletin is expected to appear in the spring of 1963. Another publication on the Diptera or True Flies of Connecticut, the Ninth Fascicle on Black Flies, "Simuliidae," by Alan Stone, is being edited and can be published as soon as funds are available. Other volumes in this comprehensive series are being prepared by a distinguished group of authors. Estimates of funds needed for publication include one bulletin of this series each year.

### *Ecology*

For a number of years ecological studies have been made at the Connecticut College Arboretum. Miscellaneous Series No. 9, "Ecological Studies in the Connecticut Arboretum Natural Area. I. Introduction and a Survey of Vegetation Types," by William A. Niering and Richard H. Goodwin, available in 1962, is a reprint of a paper describing the status of this program which has been in part supported by the Survey. This pioneer study of a natural area has stimulated interest, and the Nature Conservancy, a private agency which is developing a national system of preserves, has set up a number of these in the State. Mr. William H. Whyte, in his report on Connecticut's Natural Resources, urged the need of more such areas and has recommended State effort to supplement the good work which has been done by such private groups as the Nature Conservancy. The Whyte report recommends that the task of designating natural areas be assigned to the Survey.

In the meantime the Survey has already begun an ecological study of the present natural areas. Dr. William Niering of Connecticut College and Dr. Frank Egler of Norfolk have essentially finished the field studies in fifteen natural areas. There are several more areas which must be completed before a report can be written. Information on natural areas is badly needed for educational purposes and as a base on which to judge the continuing effects of man's occupation.

Dr. Wetzel of the University of Connecticut is studying New England mammals at present and hopes to prepare a new bulletin on Mammals of Connecticut to replace Bulletin 53, now out of print and in need of



revision. It is not known whether the new report can be completed in the next biennium.

## WEATHER AND CLIMATE

Twenty-three years ago the Survey published Bulletin 61, "The Weather and Climate of Connecticut," by Joseph M. Kirk, which was a very useful publication. It is now long out of print and also out of date. For at least ten years replacement of this treatise has been hoped for. The State Climatologist Joseph J. Brumbach, is expecting to submit a new report on weather and climate and his target date is March 1963.

## PUBLICATIONS OF THE STATE GEOLOGICAL AND NATURAL HISTORY SURVEY, 1959-1962

The publications listed below have been issued during the period 1959-1962, or are in press. A list of all publications of the Survey up to 1 January 1961 is available from the State Librarian at the State Library in Hartford, who is Distribution Agent for all Survey publications. However, the reprints in the Miscellaneous Series are for distribution on a limited basis only.

| | |
|---|---|
| Bulletin 84 | Explanatory Text for Preliminary Geological Map of Connecticut, by John Rodgers, Robert M. Gates, and John L. Rosenfeld. 64 pp. (Map in pocket), 1959. |
| Bulletin 90 | Twenty-eighth Biennial Report of the Commissioners, 1957-58. 13 pp., 1959. |
| Bulletin 91 | The Flora of Windham County. A Check List, by Alan W. Upham. 87 pp., 1959. |
| Bulletin 92 | Guide to the Insects of Connecticut. Part VI: The Diptera or True Flies of Connecticut; Seventh Fascicle: Psychodidae, by Laurence W. Quate. 54 pp., 1960. |
| Bulletin 93 | Guide to the Insects of Connecticut. Part VI: The Diptera or True Flies of Connecticut; Eighth Fascicle: Scatopsidae, by Edwin F. Cook; Blepharoceridae, Deuterophlebiidae, by Charles P. Alexander; Dixidae, by Wesley R. Nowell. In press. |
| Bulletin 94 | Marine Sedimentary Environments in the Vicinity of the Norwalk Islands, Connecticut, by Charles W. Ellis. In press. |
| Bulletin 95 | Twenty-ninth and Thirtieth Biennial Reports of the Commissioners of the State Geological and Natural History Survey. In press. |
| Quadrangle Report 8 | The Bedrock Geology of the Middletown Quadrangle, with map, by Elroy P. Lehmann. 40 pp., 1959. |
| Quadrangle Report 9 | The Bedrock Geology of the Naugatuck Quadrangle, with map, by Michael H. Carr. 25 pp., 1960. |
| Quadrangle Report 10 | The Surficial Geology of the Wallingford Quadrangle, with map, by Stephen C. Porter. 42 pp., 1960. |

| | |
|---|---|
| Quadrangle Report 11 | The Bedrock Geology of the Cornwall Quadrangle, with map, by Robert M. Gates. 35 pp., 1962. |
| Quadrangle Report 12 | The Surficial Geology of the Mount Carmel Quadrangle, with map, by Richard F. Flint. 25 pp., 1962. |
| Quadrangle Report 13 | The Bedrock Geology of the Deep River Quadrangle, with map, by Lawrence Lundgren, Jr. In press. |
| Misc. Series No. 6 | A Post-Harbor Hill-Charlestown Moraine in Southeastern Connecticut, by Richard Goldsmith. Reprint from Am. Jour. Sci., vol. 258, no. 10, Dec. 1960. |
| Misc. Series No. 7 | Two Tills in Southern Connecticut, by Richard F. Flint. Reprint from Geol. Soc. America Bull., vol. 72, no. 11, Nov. 1961. |
| Misc. Series No. 8 | Deep River Area, Connecticut: Stratigraphy and Structure, by Lawrence Lundgren, Jr. Reprint from Am. Jour. Sci., vol. 260, no. 1, Jan. 1962. |
| Misc. Series No. 9 | Ecological Studies in the Connecticut Arboretum Natural Area. I. Introduction and a Survey of Vegetation Types, by William A. Niering and Richard H. Goodwin. Reprint from Ecology, vol. 43, no. 1, Winter 1962. |
| Misc. Series No. 10 | Structural History of Triassic Rocks of the Connecticut Valley Belt and its Regional Implications, by John E. Sanders. Reprint from N. Y. Acad. Sci. Trans., ser. II, vol. 23, no. 2, Dec. 1960. |
| Report of Investigations No. 1 | Geological and Economic Aspects of Beach Erosion along the Connecticut Coast, by John E. Sanders and Charles W. Ellis, 1961. |

## OTHER ACTIVITIES OF THE CONNECTICUT SURVEY

### *Mineral resources*

Although Connecticut is not generally considered an important mineral-producing state, the value of its mineral production in 1961 reached $16,501,000 compared to $7,100,000 ten years earlier. In 1960 the value of mineral production exceeded that of New Hampshire, Rhode Island, Hawaii, and Maine. If we calculate the value we find that Connecticut's mineral production value is $3,165 per square mile compared to the United States average of $5,012. On a square-mile basis the mineral production exceeded that of more than 20 states in 1960. Some comparisons are given below:

| *State* | *Area in sq. miles* | *Value of mineral production 1960* | *Value per sq. mile of mineral production* |
|---|---|---|---|
| Connecticut | 4,820 | $15,255,000 | $3,165 |
| Massachusetts | 8,039 | $27,588,000 | $3,431 |
| Vermont | 9,124 | $22,879,000 | $2,507 |
| New Hampshire | 9,031 | $5,317,000 | $ 588 |



| | | | |
|---|---|---|---|
| Maine | 29,895 | $13,648,000 | $ 456 |
| Tennessee | 41,687 | $143,089,000 | $3,432 |
| Wisconsin | 55,256 | $77,171,000 | $1,397 |
| Iowa | 55,586 | $95,030,000 | $1,709 |
| Georgia | 58,725 | $91,203,000 | $1,553 |
| Washington | 66,836 | $70,005,000 | $1,048 |
| Missouri | 68,727 | $156,033,000 | $2,270 |
| North Dakota | 70,183 | $72,275,000 | $1,030 |
| Nebraska | 76,808 | $103,687,000 | $1,364 |
| Idaho | 83,354 | $57,441,000 | $ 689 |
| Oregon | 95,607 | $54,419,000 | $ 569 |
| Nevada | 109,821 | $80,285,000 | $ 731 |
| Montana | 146,131 | $178,854,000 | $1,224 |

In recent years some notable new mineral producers in the State include the Keller-Whildin Pottery Company, which is producing clay for making flower pots in Kensington, and the flotation plant of the Feldspar Corporation in Middletown with a capacity of 7,000 tons of pegmatite per month from which is produced feldspar, mica, and silica products.

After examination of a number of raw materials for making light-weight aggregate, the Plasticrete Corporation has decided to use clay from the South Windsor area and has a new plant under construction which is expected to be in production by March 1963. It will have a capacity of 200 tons of clay (dry basis) per day with an expected 300 days per year of operation. The tests are reported to give a product comparable to anything of this kind being made on the North American continent. The aggregate will be used to make light-weight concrete masonry and structural concrete.

Two questions immediately arise. What are the long-range possibilities of mineral production in Connecticut, and in what way can the Geological and Natural History Survey be useful in this field? The increase in production in the last ten years has been largely in construction materials and the most important factor in this increase has been the demand for mineral raw materials created by the expanding State and Federal highway program. With the expected growth of Connecticut's population, the demand for construction materials should remain high. The quadrangle maps of the Survey have already proved to be of great value to the Highway Department geologists and engineers in their appraisal of sand and gravel resources. Private contractors have also been eager to get information of this kind when it is available.

It also seems apparent that the distribution of deposits of such construction materials as sand and gravel should be known in order to guide in the planning and zoning of diverse areas. For instance, many

valuable sand and gravel deposits may not be available because the land has been assigned to conservation purposes or to other priority use.

When the basic geologic mapping is completed, or at least when the most important areas have been mapped, special studies of resources for aggregates, bloatable materials, fill, foundry sand, and the like, should be made.

It is also not unlikely that the geologic mapping now in progress may reveal areas and prospects which should be investigated for other mineral development. Kyanite is a common metamorphic mineral in Connecticut and economic deposits may possibly occur. Limestone and dolomite are important raw materials in the world. When mapping is completed in the Housatonic Valley of western Connecticut favorable places for special investigations of these materials may be suggested. Cement companies have already asked about the occurrence of raw materials for making Portland cement. Our basic information about the distribution and composition of the carbonate rocks is too scanty to give a cement company much encouragement at the present time. Experience has shown that in many states adequate basic information must be available before many companies will spend the necessary money to explore and appraise deposits for economic development. Moreover, in future years there will be a demand for large tonnages of minerals and elements which today are mere curiosities. It is not possible to predict all future developments and needs in advance, but it is possible to obtain a knowledge of the basic geology of our State in advance and thus to have a sound basis from which to plan special searches as the need arises.

### *Cooperation with other agencies*

Close cooperation has been maintained with the Highway Department in the exchange of information. The vast amount of drilling information resulting from highway work is invaluable to the geologist. The new index of exploration data in the State Office of Foundations has already proved to be very helpful. Geologists and engineers of the Highway Department use the published geologic maps, and on occasion have obtained useful unpublished material from the Survey. The Highway Department has also indicated their priority for future mapping in terms of its needs.

The Survey has also maintained close liaison with the cooperative ground water study by the U.S. Geological Survey and the State Water Resources Commission.

The Survey has entered into a cooperative agreement with the U.S. Bureau of Mines. The Bureau of Mines furnishes statistics of production in the State of Connecticut, and the Survey in turn has agreed to aid in gathering statistics and in providing other information on mining activity in the State. This agreement involves no financial obligation; it is simply an agreement to cooperate in the exchange of information.

The suggestion has been made that geologic maps be prepared for some of the State Parks. In each park the geologic map of the area would



be posted in a covered case. Such a map was prepared in a preliminary fashion for Hurd Park but it cannot be completed until the geologist mapping the Middle Haddam quadrangle returns to the field and maps a section recently added to the park. Mr. Peoples has discussed with Mr. Donald C. Mathews, Director of the State Park and Forest Commission, and his staff, the desirability and feasibility of preparing pamphlets or small bulletins describing the geology of some of the parks. It may be possible to get some of these done as by-products of quadrangle mapping. Several state surveys have published attractive guides to their parks; the Canadian Geological Survey has recently published some excellent guides of this type and the plan is to do the same for all of their parks. It would be desirable to have a guide to the natural history as well as to the geology, but this is harder to arrange since it would usually require two authors for each guide.

The Survey has benefited greatly by voluntary, informal cooperation with many colleges. In a notable case graduate students from the University of Wisconsin have come to Connecticut to work with Dr. Robert M. Gates under his general program. In addition to the financial support given by the Survey to Dr. Gates for his quadrangle mapping, the University of Wisconsin has financed his special studies and those of his students to the extent of more than $60,000 in the last few years. With the currently active program of mapping by State and Federal geologists, university people have been increasingly attracted to geologic research problems in the State and have been able to obtain financial support from universities or other sources. The Guilford quadrangle was mapped by a Yale graduate student with no financial support from the State. Students from Massachusetts Institute of Technology, Columbia University, and the University of Massachusetts have projects under way which will add to our basic knowledge of the geology of Connecticut.

## PLANS FOR THE NEXT BIENNIUM

Both the quadrangle mapping program carried on by the State alone and that done in cooperation with the U.S. Geological Survey will be pushed to the utmost in the next two years. Increased funds have been requested for both parts of this program. Increases in Federal salaries and other expenses have seriously cut back the man-years of work which the regular appropriation of the last few years can provide. Moreover, acceleration of surficial mapping is urgently needed to give the groundwater geologists the basic map data they need to meet the schedule of their water inventory program. It would be inefficient to produce basic information so late that it could not be of use in this program. Without additional staff it will not be possible to furnish the maps in time.

Every effort will be made to complete to publication most of the quadrangles which have been started. It is expected that manuscripts and maps of 12 to 18 quadrangles will be ready for publication. Additional editorial and clerical help will be required to prepare these for

publication and to check the proofs. In addition to these, the Federal Survey expects to publish about 12 quadrangles.

In the field of natural history the preparation and publication of papers in the entomology series will be continued. The ecology of natural areas will not only be continued but expanded if the recommendations of the Whyte report are implemented.

Requests for information are increasing daily—these requests come from other State agencies, companies interested in developing mineral resources, contractors with rock problems, companies which wish to know about the possibilities of gas storage; from teachers who are starting earth science courses, from school children, from citizens interested in mineral and fossil hunting. As more of the State is studied it is reasonable to suppose that requests for information will increase even more and, of course, more information will be available to give to the public. Connecticut science teachers are asking for a simplified geologic map of the State such as New Jersey and Illinois make available to their citizens; they are also asking for guides to outstanding localities and for other material to use in their teaching.

For the last two biennia the Commissioners of the Geological and Natural History Survey have asked for a full-time geologist to work under the Director to aid in the dissemination of information by letter, by mimeographed memoranda, and by preparation of special reports and maps to be printed by offset and distributed as part of the new Report of Investigations series. This geologist would also maintain liaison with the Highway Department engineers and geologists, the Water Commission personnel, and would keep in contact with economic development in the State. In addition, he could also prepare special reports for the Development Commission and other State agencies when they are needed.

Progress on the mapping of the state has been sufficient to start the compilation of state maps, one of the bedrock and one of the surficial geology, at a scale of 1:125,000. A new base map at this scale is urgently needed. In August two engineers from the U.S. Geological Survey were asked to talk to representatives of a number of interested State agencies about the possibility of producing such a map. This kind of map is needed by the Development Commission for planning purposes, by the Water Commission, by the Geological and Natural History Survey, and by many other State agencies. It is hoped that a cooperative project for this purpose can be worked out with the U.S. Geological Survey. Since it will require 18 months to complete, it should be started no later than July 1963.

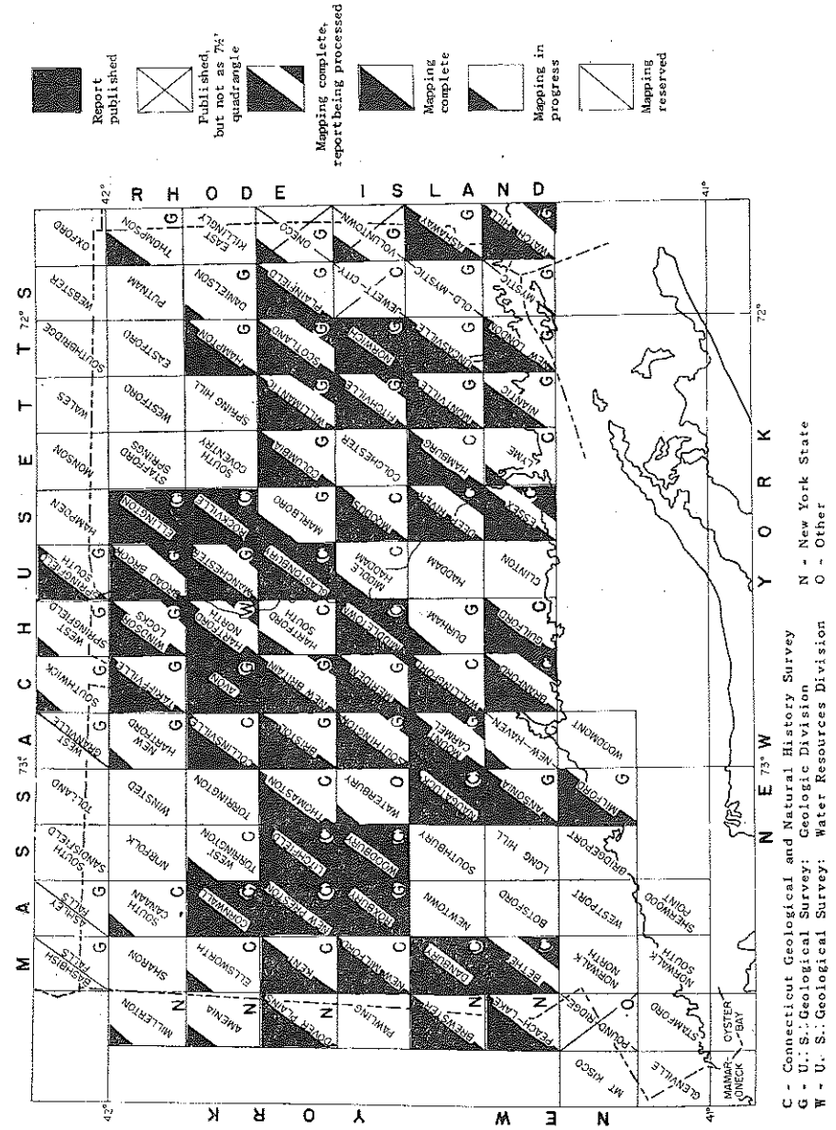
During the next biennium longer range plans should be made, especially for the program in natural history which has not been supported as broadly as the geological program. A proposal has been made to map the vegetation and to publish maps similar to the geologic maps. The need for this project and its feasibility will be studied during the next two years in addition to other suggested programs.



State of Connecticut

Status of Geologic Mapping as of August 1, 1962

BEDROCK GEOLOGY



State of Connecticut

Status of Geologic Mapping as of August 1, 1962

SURFICIAL GEOLOGY