

State of Connecticut

PUBLIC DOCUMENT No. 47

STATE GEOLOGICAL AND NATURAL HISTORY SURVEY

EDWARD L. TROXELL, Ph.D., Superintendent

Bulletin No. 67



HARTFORD

Printed by the State Geological and Natural History Survey

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

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EDWARD L. TROXELL, PH.D.
Trinity College, Hartford, Connecticut

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Printed under authority of Section 142,
General Statutes of Connecticut, Revision of 1930,
as amended by Section 45e, Supplement of 1939.

JOHN M. DOWE,
State Comptroller.

Publication approved by the Commissioner of Finance and Control

**Twenty-first Biennial Report of the
Commissioners**

OF THE

State Geological and Natural History Survey

1943-1944

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1944

LETTER OF TRANSMITTAL

Hartford, Connecticut,
December 4, 1944

His Excellency, Raymond E. Baldwin,
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 for the General Assembly, in compliance with past custom, the twenty-first biennial report of the Survey, covering the two years ending December 31, 1944.

Respectfully submitted,

EDWARD L. TROXELL,
Superintendent.

TWENTY-FIRST BIENNIAL REPORT
OF THE
GEOLOGICAL AND NATURAL HISTORY SURVEY
OF CONNECTICUT

EDWARD L. TROXELL, Ph. D., *Superintendent*

PRELIMINARY STATEMENT

Always in war abnormal conditions exist; the Geological and Natural History Survey is not immune to this influence. The nature of our work has had to be modified: certain of our field operations—important as we thought them—are being suspended or are directed along lines consistent with the emergency. In spite of this it will be evident that the Survey workers have been unusually active.

The report of our work will recognize two particular lines of endeavor: the first, the cooperation with other agencies; the second, the field work that has been accomplished by our men. We have continued the studies in forestry, the taking of a tree census, et cetera, begun three years ago and we also have three men who have been diligent in geological work. Lately our workers have been taken away so rapidly, being called to other duties, it has been difficult to carry on our researches with any continuity. Reference will be made to our bulletins and unprinted manuscripts and the need for making the results of our intensive investigations available to our people through publication.

Budget:—The field efforts of the Survey for the last two years have been directed mainly along three lines, a forest study, a search for strategic minerals, and the areal geology and field work in southern Connecticut. With these projects we have found ourselves especially busy the past summer and autumn and never before in the experience of the present superintendent has there been such a large salary list; in fact it will be necessary either to curtail some of these activities or to ask for additional funds from the Assembly next January to carry us on.

Because of the increased work of the Survey along various lines, the Commissioners have given their approval for the requesting of an additional \$1000 for each year of the coming biennium. Our budget in the past has always been based on a modest estimate of our needs; indeed, we have usually kept well within the amount requested from the Assembly and money has been returned to the State. Now we feel that we are justified, as we look to the post-war planning, as we

attempt to profit by the intensive studies in support of the war, and as the Survey continues to take on more lines of investigation—we feel entirely justified in requesting this added sum for our budget, so small in comparison to the expenditures of other State agencies.

The Commissioners, preparing for the future, are asking not only for an increase of \$1000 for each of the two years of the next biennium, but they contemplate presenting a bill to the Legislature for \$950 for use next spring to make up for an accumulating deficit. This emergency arises largely because of the intensified studies we have been making.

New Commissioners:—At this point it gives us pleasure to note and greet the coming of three new commissioners to have part in the direction of the affairs of the Survey. Dr. Victor L. Butterfield as president of Wesleyan University takes over the tasks of Dr. McConaughy whose influence in the State gave strength and prestige to the Survey. Dr. Dorothy Schaffter is the new president of Connecticut College, replacing Dr. Blunt whose kindly suggestions have been of such value to us. Dr. Arthur H. Hughes, acting president of Trinity College, has taken the place of the late Dr. Remsen Brinckerhoff Ogilby. Dean Hughes, who holds office and serves as commissioner until President Elect G. Keith Funston reports for duty, is greatly appreciated because he can and does give skilful and timely advice, being near at hand. We treasure the recollection of Dr. Ogilby's inquiring search of the superintendent's mind! and his wise counsel.

POST-WAR PLANNING

Looking to the future we have set up a dozen or more vacancies, conforming to a familiar custom of the Personnel Department at the State Capitol; into these we can put new workers with a minimum of confusion as the need arises. One group of positions will take care of the usual investigators who offer their services from our colleges and universities; another group will serve for the ready employment of foresters who will be able to carry on such tasks as the making of a tree census. A third category makes it possible for us to employ student help for the benefit of the science departments, in our educational institutions, on research problems that are of importance to the State. Hereafter, and with the permission of the Commissioners, we can immediately engage these workers and start their projects without delay.

Lines of Investigation:—The post-war plan calls for a continuation of many of our present studies; but we see also how we can devote our energies profitably to new problems in many parts of Connecticut. While the superintendent's interest and experience lie mostly along geological lines he is committed to the policy of advancing every phase of the natural sciences. He feels certain that this will all have increased importance as the war workers return; it

is urgent that every effort be made to give employment to the students of natural history who have gone to the armed forces or who are assisting otherwise in the war. We will rely on and earnestly solicit the science departments of our colleges and universities for advice in all fields. As an example of future possibilities, it has been recommended that we make a thorough study of the garnet deposit in the West Redding region: with a complete mapping, a study of the trends of the formation, and a noting of any possible change in the character of the material, this may be found to be a mineral deposit of great economic value to us. Another instance: Lewis Babbitt, who has been collecting data for a revision of our bulletin on the reptiles, has been employed by the Government to look into the matter of increased supplies of venom, particularly from the rattlesnake; he has travelled forth and back along the Atlantic seaboard promoting this important work on behalf of our armed forces in the reptile infested regions of the earth. His researches should be continued.

BULLETINS

We now have permission from the State Capitol to present a paper on the mosquitoes for publication immediately. This new manuscript awaits only the revision and final touches by the author before it is ready. It is felt by all of us concerned that a bulletin on the mosquitoes will be most timely, in view of the fact that these insects, disease carriers, are now being inadvertently brought in from foreign lands.

Mosquito Control:—It has been brought to our attention that many thousands of dollars each year are spent by the State on mosquito control and yet, to the present time, no comprehensive statement has been published on the subject. One high authority, in speaking of our need for this bulletin, says that it would have a direct bearing on the health problems now and after the war and hence is of great importance. Commissioner Lowell comments as follows: "It seems to me entirely reasonable that a manuscript on the mosquitoes of Connecticut should be published at this time because of the possible danger of transmission of malaria and other diseases as a result of troops returning from the tropics." Dr. Matheson, the author, has stated that 100,000 female mosquitoes were found hibernating in a cellar 4 by 6 by 7 feet in dimension; and on stagnant pools in salt marshes the water was literally blackened by mosquito larvae.

The Diptera, or True Flies:—There was issued in 1943 Bulletin No. 64 on the flies; it is dated 1942 because the manuscript was submitted at that time and that is the date that obtains in questions of priority. This is an impressive volume of 500 pages and is one of our most scholarly and most valuable productions. We were proud to have a bulletin, with the contents of this one by three distinguished entomologists, go out under the name of the Natural History Survey. The reading of the eight pages of the introduction is a liberal education in itself, and we commend it to everyone; but we would not

recommend the book as a whole to anyone as light literature. Much of it is technical; but in large part it is original and it constitutes a monument to the intensive work of the authors and a body of fact and theory of inestimable value to science.

THE FOREST STUDIES

We have been carrying on cooperative plans which, as models of mutual assistance, have proven to be nearly ideal—one of these is with the Forest and Park Commission; another is in connection with the United States Geological Survey.

Plan of Cooperation:—In 1941 we devised a program wherein we would cooperate with the Forest and Park Commission; by this plan we were expected to supply workers to carry on in a general way a tree census which could, as we presumed, lead eventually to a research problem and the publication of a bulletin on the silviculture of Connecticut. This idea in broad scope was conceived by Dr. Raymond Kienholz, at that time silviculturist of the State, subsequently made state forester. The work was begun by Harry A. McKusick and continued in 1942 by Donald Tufts, students at the State University. The investigation was conducted largely with bicycle and on foot and made slow progress at first, but the exploration of certain areas was thoroughly done.

Due to the call of these men to other duties the work was suspended for a year and a half. It was in the spring of 1944 that we secured the services of Mr. Charles Nadeau, a man experienced in forestry and one recently employed with the Army Engineers on the Alcan Highway. Instead of working part time as the others had done along with other duties, Nadeau was able to give us his full time and as a result of this has been able to complete, or nearly complete, the study which had been dragging on for so long. At this date parts of one or two counties are still uncompleted but in all probability will be finished early in 1945. On the recommendation of the present state forester, Dr. Kienholz, it was deemed wise to have Mr. Nadeau go back over some of the earlier work, particularly that made in 1930, to check up, revise and correct the data of those earlier years.

We hear with genuine interest that the American Forestry Association, laying plans for an extensive survey of the forest resources of this section, is anxious to see the task, which we started long ago, brought to a completion. It is desirable that the investigations of Mr. Nadeau go on indefinitely.

By the plan of cooperation which we have been following, this Survey employed the field workers and to it will accrue the results of the investigation. The direction of all research will remain in the hands of the state forester, on the whole an ideal of cooperation between two agencies of the State. This is work which Dr. Kienholz is convinced will lead to a bulletin of some 200 pages on the general subject of the forests, their care and productivity.

Scope of Investigation:—With regard to the nature of the work Mr. Nadeau is doing, the value it will have to this Survey and the people of Connecticut, let us make this general statement: The areas of the state, depending on the forest influences are divided into six categories as follows: Forest, Old Field, Urban, Field, Swamp and Open Water.

The trees are classified according to age; they are examined according to the ratio of hard-woods and soft-woods and as to the board feet and cordage. Old Field classification includes farms that have gone back to scrub brush which may in time make good in forest production or may be merely of use to the sportsman. The Urban acreage includes the parks which are kept for the pleasure of the people but will not produce economically. The Fields are those areas generally owned by private individuals. Finally there are the Swamp Lands and Open Water areas, of uncertain amount and of little value except to those interested in fish and game.

Dr. Kienholz summarizes it this way: "We want to know how much water there is; what forest types there are, how much there is of forest, open field and urban areas. All of these have a bearing on forest management, the using of our forest products, and the importance of this information for new industries coming into the state."

Field observations have noted these facts: While the oak is the dominant tree in our forests it is important to know the distribution of all types and species and their habitat; it is found that cedars, for instance,—except the red cedar—are wont to live on the trap rock. Certain species are spoken of as "escapes"—trees that have gone wild or were abandoned, but have succeeded in establishing themselves. Along with other forest resources should be included the value that lies in the pleasure which our trees and wooded hills give the people.

From the economic standpoint we can know the trees that are marketable and those that are merely ornamental; we learn more about the trees that are infested in one way or another. Infestation of our trees by the gypsy moth, which is spreading to include the oaks, has received considerable attention and it is apparent from our studies that the damage from the insect has increased during the period of the war; moreover, we will have definite information on the locations where measures, for eradication of the moth, are most needed, when manpower is available. New data on the chestnut shows that it is generally becoming immunized, that there are more burrs now than were evident a half dozen years ago.

Thus, while this investigation had as its inception the basic idea of making a tree census, it has gone far beyond the mere taking of a count of the number of trees of our forests.

A COOPERATIVE PLAN IN GEOLOGY

For nearly two years graduate students of Yale University have been working on problems based on field geology in the south-central part of the state, the Killingworth region. Last spring it was found advisable for them to give up the areal geology, for the most part, and devote their time to an investigation of our natural resources that aid in the war effort.

The Personnel:—In 1943 Ralph Digman, a graduate student at Yale—now instructor in geology at Wesleyan University—began field work for the Survey. Accompanying him on many of his trips was Harry Mikami, also a graduate student, who has now practically completed his work for the doctor's degree in the Department of Geology at Yale; Mr. Mikami was added to our staff. These two geologists have continued their interest in the pegmatites of the Killingworth section, but now they are giving most of their attention to the quarries of Central Connecticut from which strategic minerals are being extracted. In the spring of 1944 they were joined by Dr. George Switzer, instructor at Yale, and with their combined services the State Geological Survey entered into a cooperative plan with the United States Government. This undertaking is based upon a scheme worked out by Dr. Eugene N. Cameron; our men are continuing where busy government officials, who had inaugurated the task, were forced to leave off.

Since the beginning of the war the United States Geological Survey had been exploring the possibilities and aiding the production in the state of mica, so important in the war effort because nearly every implement of war uses it as insulation in the spark plugs of internal combustion engines. It was discouraging at first when the Government was taking away so many of our workers; but when Dr. Cameron was called to head the government activities in New England, and later to direct certain phases of geology for the nation, it worked to our ultimate advantage, an advantage that arises from his great interest and loyalty to the Geological Survey of the state. The plan which we formulated uniting our efforts with those of the Government while Dr. Cameron was still in New England, now lies on his desk in Washington where, we feel assured, it will receive the most friendly consideration. It is interesting to note that the higher officials, also, of the United States Geological Survey are, to a large extent, men who have studied in Connecticut or have done much field work here and therefore are well informed of our needs.

A Mutual Assistance Plan:—This plan of cooperation with the United States Geological Survey meant that our men would begin their work on a problem well under way; they could make use of the data collected and the maps and sketches completed by their predecessors; moreover, they always have the benefit of advice and leadership from those who had already accomplished much in the study of these mica quarries. There will be this further advantage to the

State in this arrangement—an arrangement that is a fine example of the mutual assistance agencies can give; all of the information collected at Washington is put at our service and will be of value to us throughout the years. The Government plans soon to publish a bulletin on this phase of our geology; that, too, will be of benefit to us.

On our part, we are prosecuting a work that might have stopped entirely; we will continue the mapping, the study of structures, the tabulation of output of minerals, and the estimating of future supplies. All of this will be made available to the National Government and at the same time will be a part of our accumulating information ready for the time when we, ourselves, may choose to publish minor papers or a bulletin on the subject. We present the details of this plan both because of their interest and because they constitute a model as an agreement reached between two agencies in which there is full confidence, the one in the other:

- “(1) The Connecticut Survey will assign men to carry on studies of the Gillette, Enegren, and Selden Mica Mines.
- (2) The work of the state survey will be designed to continue and to supplement the work done on these deposits by U. S. G. S. parties.
- (3) The U. S. G. S. undertakes to acquaint the state survey with methods of study followed in the past. The purpose is to ensure uniformity of procedure and the gathering of information of the kinds we have found necessary in mica work. The U. S. G. S. will furnish information and active guidance as may be required.
- (4) The U. S. G. S. will furnish the Connecticut Survey with geological data regarding the above deposits. Using these data, the Connecticut Survey will tie its maps to those previously made by the U. S. G. S.
- (5) The Connecticut Survey undertakes to furnish the U. S. G. S. with geological information regarding the above deposits. Data on the nature and persistence of mica concentrations, tonnage of rock moved, etc., are to be included. Copies of maps made by the state survey will be furnished to the U. S. G. S.
- (6) The Connecticut Survey is free to use, for publication or otherwise, geologic data furnished by the U. S. G. S. Credit shall be given to the U. S. G. S. and to the men who have done this work.
- (7) The U. S. G. S. is free to use information furnished by the Connecticut Geological Survey, for publication or otherwise. Proper credit is to be given to the state survey and to the men who do the work.
- (8) The scope of the work to be done by the Connecticut Geological and Natural History Survey is to be modified from time to time, as may be deemed advisable by both organizations.”

In conclusion let us say that in addition to what is being done with the U. S. Geological Survey on the specific projects mentioned our geologists have assisted that organization in their work on other pegmatite occurrences such as at the Collins Hill and the Branchville mica mines. Dr. Switzer has also been consulted on mineralogical matters and Mr. Mikami has made petrographic examinations for the national survey.

In their work on the Connecticut pegmatites, Dr. Switzer says: "We have been impressed by the necessity for a regional study of a number of favorably exposed pegmatites; a synthesis of data derived from such a study, it is believed, will give more insight into the problem of pegmatites than an exclusive study, no matter how intensive, of any single occurrence."

GEOLOGY IN SOUTH CENTRAL CONNECTICUT

This is a summary of reports of progress submitted by Messrs. Harry M. Mikami and Ralph E. Digman. Graduate students at Yale, they are making a survey in an area of some 75 square miles—a triangle running from Lighthouse Point to Hammonasset Beach along the shore and extending inland to North Guilford as an apex.

The present studies will undoubtedly clear up many matters of confusion resulting from earlier work and will furnish information that will solve some of the technical problems heretofore unanswered. The importance of the region warrants this detailed study and the State will be fortunate if we can persuade these men to go on with it after they have completed their graduate work. Even more important will be the coordination of the investigation in this Killingworth area with that which has been and will subsequently be done in other parts of the state; it is the often expressed hope of the Survey that we may, in the not too distant future, publish a geological map to take the place of the old one—out of date and out of print—made in the earlier years in a hurried manner.

Features of the Area:—East River forms a natural boundary within the triangle; the western side is studied specifically by Mikami, while to the east the area is of particular interest to Digman. Due to the fact that these geologists are specialists, one in structural geology and the other in petrography, they cooperate in all their field work, but especially along the borders of their respective zones have they a common interest. There are but few outcropping rocks in this part of the state and therefore the work is all the more difficult; in order to locate the exposures it is sometimes necessary for them to cut their way through the underbrush with a machete; very few outcrops miss their observation.

It hardly seems necessary in this abridged report to go into the technical details of the work being done: the types of granite discovered, the description of the gneisses and schists and the origin of these from pre-existing sandstones and shales. Even to the expert geologist the rocks of this section are exceedingly complex; due to their very great age parts of the original masses have been replaced; bodies of the former rock have been remelted and assimilated and at times it is found that the old masses of rock and mineral have merely their "ghostly outlines" remaining. As complex as they are, an effort is being made to correlate the formations with other parts of this and neighboring states.

The granite, which is a later molten intrusion, often has "inclusions" of the older rock which offer a most interesting field of investigation; these inclusions may throw light on the origin of the granite itself; as remnants of the pre-existing materials they vary in size from several yards in diameter down to small fragments. Some of the inclusions are hardly affected by the granite, others are greatly metamorphosed, smeared out and partly assimilated; the so-called "nebulites" are mere outlines of their former state.

Novel Details:—Out of this complex and difficult investigation Mr. Mikami has developed theories of considerable interest; the nebulites may represent pre-existing gneiss of a composition very close to that of the intruding granites; in places the reverse may be true. The origin of the gneiss is now much disputed; it will be an important contribution if its source and history can be definitely determined.

In the line of new discoveries it is worth mentioning that Mr. Digman has found a new land form, an elevated, water-cut rock, which will doubtless prove of great interest to Professor Flint—now a Major in the Army—who has already done so much work for the Survey in physiography. Digman has more recently reported the finding of an unusual deposit of garnet in a type of rock heretofore reported only from Preston, Connecticut, and from foreign countries. We await the fuller report of the field relations of this unusual formation and the possibility that the garnet, which constitutes 60% of the rock, may be exploited for abrasive use. One of the delights of such field work is that the scientist may at any time come upon unpredictable, unexpected consequences, results not anticipated in the general plan of the investigation.

FINAL STATEMENT

The State Geological and Natural History Survey has important work to do in the years to come. In the immediate future it has in mind the needs of the victory effort; for the later years it has a program that will attend to the development of all our natural resources and the storing of knowledge of them important and useful to the people of the State and to all mankind.