

1907

BIENNIAL REPORT

Erwin H. Barbour
Nebraska Geological Survey

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NEBRASKA GEOLOGICAL SURVEY

ERWIN HINCKLEY BARBOUR, STATE GEOLOGIST

VOLUME II

PART 8

BIENNIAL REPORT

BY

ERWIN HINCKLEY BARBOUR



WILBER, NEB.
WESTERN PUBLISHING CO.
1907

LETTER OF TRANSMITTAL.

*To His Excellency George L. Sheldon,
Governor of the State of Nebraska:*

Sir:—I have the honor to transmit herewith a report on the work of the Nebraska Geological Survey for the past biennium, including certain statements respecting the preceding biennium.

ERWIN HINCKLEY BARBOUR,
State Geologist

The University of Nebraska,
Department of Geology,
Lincoln, January, 1907.

BIENNIAL REPORT

BY ERWIN HINCKLEY BARBOUR

WORK OF THE STATE GEOLOGICAL SURVEY IN BRIEF.

The Nebraska Geological Survey as now constituted has been in operation since 1891, but it has enjoyed state aid during the past four years only. Considering the size of the commonwealth and the limited appropriations for geological work, unusual progress has been made. Since no report covering the work of the first biennium was prepared it will be included incidentally in this paper. Briefly stated the Nebraska Geological Survey during the past biennium has devoted especial attention to the industrial resources of the state, prepared ten or twelve reports in manuscript form, published eight reports completing volumes I and II, made extensive collections of industrial material, fitted an office with furniture and fixtures, finished certain maps, many drawings, photographs, and plates for succeeding reports, and has prepared an invoice and catalogue of all survey material.

LIST OF PUBLISHED PAPERS.

VOLUME I, (out of print.)

Report of the State Geologist, pages 1 to 258, 166 figures, 13 plates, 4 colored maps.

By Erwin Hinckley Barbour.

The above report includes a ten-page paper on Jefferson county by F. A. Carmony.

VOLUME II, (not ready for distribution.)

Part 1, The Coal Measure Bryozoa of Nebraska, pages 1 to 168, 1 figure, 21 plates.

By George Evert Condra.

Part 2, The Geology of Cass County, pages 169 to 302, 33 figures, 20 plates, 1 colored map.

By Elmer Grant Woodruff.

Part 3, Notice of a New Fossil Mammal from Sioux county, Nebraska. (The fossil four-horned antelope, *Syndyoceras cooki*) pages 303 to 311, 1 plate.

By Erwin Hinckley Barbour.

Part 4, Notice of a New Fossil Rhinoceros from Sioux County, pages 311 to 318, 4 figures.

By Erwin Hinckley Barbour.

Part 5, Preliminary Report on the Primitive Man of Ne-

braska, pages 319 to 328, 4 figures.

By Erwin H. Barbour and Henry B. Ward.

Part 6, Evidence of Loess Man in Nebraska, pages 329 to 349, 16 figures.

By Erwin Hinckley Barbour.

Part 7, The Honey Creek Coal Mine, pages 350 to 365, 7 figures.

By Erwin Hinckley Barbour.

Part 8, Biennial Report (the present paper), which concludes Vol. II.

MANUSCRIPT REPORTS.

There are at hand a number of manuscript reports of which the three following are to be published as soon as funds are again available:

1. A paper by Dr. Charles Newton Gould, treating of the clay, sand, and other resources of the Dakota Cretaceous of Nebraska, which will consist of about two hundred pages with numerous illustrations.

2. A paper on cement and its uses and its possible manufacture in Nebraska, by Erwin Hinckley Barbour. The cement industry in the United States is of such rising importance and there is such opportunity for its development in Nebraska that a special paper of two hundred to three hundred pages treating of the subject has been prepared and will be published as soon as the new legislative appropriation is available.

3. A paper on the sand and gravel resources of Nebraska, by Dr. George Evart Condra. Along with the cement industry

comes an increasing demand for Nebraska sand and gravel. The production of these has already attained great proportions and a two hundred page report fully illustrated is now ready and awaiting funds for publication. The foregoing reports were to have been published during the present biennium, and the contract has been let, but owing to the lack of funds, as already explained, they must be held over for a new appropriation.

EQUIPMENT.

Hereafter the legislative appropriation for the Nebraska Geological Survey will go farther for the reason that many of the first expenses of the survey have been met, such as filing cabinets and other necessary office furniture, type-writing machine, maps, drawings, photographs, and engravings. All furniture and equipments are of a plain, substantial, standard sort and will be serviceable for years to come. The regents of the State University have just finished a portion of the first wing of a new fire-proof museum, on the second floor of which will be located the office of the Nebraska Geological Survey.

SALARIES AND ASSISTANTS.

It should be understood that no salaries are paid by the State Geological Survey, the director receiving no compensation of any sort directly or indirectly, and his assistants also contributing their services. The only reward for services thus rendered is the publication of papers prepared by members of the staff giving the results of their labor. Some of these reports have required of the contributors several years of work and even personal outlay. The appropriations are spent in the printing of reports and in the preparation of photographs, drawings, engravings, and other expenses incident to the work of publication. Heretofore the railroads have furnished the members of the geological staff with free transportation while engaged in the investigation of the resources of the state, thus making extensive travel possible. From this time on traveling expenses must of necessity increase.

DEVELOPMENT OF RESOURCES.

During the biennium all industries have flourished, the only lack reported to this office being an insufficient number of laborers. The demand for stone, brick, sand, gravel, lime etc., has exceeded the output. New quarries, sand pits, and clay pits have been opened everywhere.

COAL.

Four miles south of Peru a workable bed of coal, fully 32 inches in thickness, has been opened and is being operated. This mine, known as the Honey Creek Mine, though local, is important and seems destined to rob Nebraska of its old distinction "the state without a mine." A special report with maps, photographs, and coal analyses is ready for publication, and a preliminary report has been made in Vol. II, part 7.

TEST WELLS.

During the year a number of test wells have been drilled in various parts of the state, notably at Beatrice, Lincoln, and Falls City, the object being to determine in each locality whether coal, gas, oil, or artesian water is to be had. Samples and well records are being kept. Such investigations could most commendably and legitimately be made by the state. By right, state appropriation should be granted for this express purpose. At present hundreds of private parties are spending large sums of money each investigating for himself, and no one in particular is getting the benefit. The state could so order and systematize this deep well inquiry that the money of the people would be saved and information for the public obtained.

CEMENT BLOCK.

Great progress is to be reported in the manufacture of cement blocks, posts, paving blocks, etc. Even small towns have

plants for the manufacture of such articles for the local market. Such a plant is almost a necessity in every town, often being run in connection with lumber yards. This industry has been greatly stimulated and developed during the biennium.

SAND-LIME BRICK.

The manufacture of sand-lime brick has begun and one large plant at Hastings is producing and shipping many carloads.

PEAT.

Respecting peat, the demand for information is rapidly increasing, showing a tendency towards the development of this neglected resource. Several peat beds have been located and as soon as titles can be secured these are to be developed. Condensed peat makes a fuel of fine quality, almost as desirable as anthracite itself. It is also an important source of illuminating gas. Samples of such excellent quality have recently been received at the office of the State Survey that belief in the development of this industry is fully warranted. The progress of its development is retarded owing to the reluctance of people in giving information about peat beds. Firms in neighboring states stand ready to come to Nebraska to manufacture peat fuel, and our own citizens are ready to engage in the enterprise. Before the close of another biennium the State Survey will be able to report the development of this industry.

NATURAL PUMICE.

The production of volcanic ash or dust, as it should be called, has been greatly increased, although, for supposed prudential reasons, facts respecting the amount marketed are difficult to obtain. Large amounts are used in various cities for polishing wood, metal, and marble, but more especially in the manufacture of soap and scouring powders. Several carloads have been shipped.

to Chicago, as many to the stove works of Detroit, Michigan, to Syracuse, N. Y. to Cincinnati, Ohio, to Denver, Colorado, and in smaller amounts to many other places. Large shipments are being made to South Omaha where scouring soaps of excellent quality are produced.

FLINT.

The flint industry has been well developed and large amounts of flint ballast have been marketed during the past five years. The Atwood company alone has furnished the Burlington railway with 60,000 to 80,000 tons of flint ballast annually for the past four or five years and 50,000 tons for the Rock Island railway between April 20 and December 20, 1906.

CEMENT POSSIBILITIES.

Cement rocks and shale are widely distributed over Nebraska, so the raw material is at hand. The demand in this state for cement productions is increasing by strides. Shipping facilities are ample, so it only remains to develop this very promising natural resource. Already companies have organized in Superior, Beatrice, Lincoln, and several firms outside of the state have expressed their intention of establishing themselves in Nebraska. Before the next biennial report is due it is fully expected that one or more cement mills will be in operation. It may be shown that good cement and plenty of it can be produced for it has been demonstrated practically by the cement mill once in operation at Beatrice, Gage county, Nebraska. The Beatrice cement is known to have been a good article and it should be stated that the old postoffice building in Lincoln, now undergoing repair and renovation for a city hall, has its basement finished in Beatrice cement. It is to be deeply regretted that the mill was abandoned at a time when the state was young, the knowledge of cement and its uses meagre, and the demand for it small. Had it sur-

vived to the present time it might have become a great industry and the re-establishment of this plant is to be greatly desired. There are three distinct cement areas in this state, viz.: the northeastern border or Niobrara region, the southeastern corner or the Carboniferous region, and the southern border of the state or the Republican region. Ten southern counties, viz.: Richardson, Pawnee, Johnson, Sarpy, Douglas, Otoe, Nemaha, Gage, Cass, and parts of Lancaster have exposures of carboniferous shale and limestone theoretically suited to the manufacture of cement. Perhaps it might be explained here that a good cement rock is an impure limestone. If by nature a limestone lacks the right proportions of impurity it can be supplied by adding the right amount of clay or shale. Clay, shales, and limestone occur interbedded throughout this region and are exposed especially in the vicinity of streams; elsewhere they are blanketed over with a great bed of rich soil and are lost to view. The beds of Gage county have been tested in a practical way. The beds at Humboldt have been analysed and tested theoretically and yield good cement. As much can doubtless be said of the other exposures throughout this region. The Niobrara region seems to be a particularly inviting field for the manufacture of cement. Here the chalk and shale of the Benton Cretaceous are associated one above the other and stand exposed in bold bluffs especially at Niobrara, in Knox county.

The location seems to be superior in every way to the same bed at Yankton, where they are producing a good grade of cement. Besides other shipping facilities Niobrara has the additional advantage of wharfage on the Missouri river. The Missouri is navigable to that point and a number of vessels are loaded there with grain for the river trade, hence it is not a remote possibility that cement may be shipped in like manner and discharged at distributing points along the river. The exposures at Niobrara seem to invite especial consideration. Little, if any, stripping is necessary, everything can be handled by

gravitation methods, and the product can be easily distributed. A glance at the map in Volume I will suffice to show the extent and distribution of cement rock in Nebraska. The Republican region also is characterized by exposures of Cretaceous chalk and shale from which cement can be produced as well as at Yankton, and of as good a grade. Superior, where several railroads meet, would make a good producing and distributing point. Some three years ago a company was organized there for manufacturing cement and it is to be hoped that the company has not been disorganized and the undertaking abandoned. Unless one travels extensively he can form little idea of the immense proportions already assumed by the cement industry in the United States. To the credit of the cement workers of the country be it interposed that the quality of American cement has gone up while the price has gone down, and that too in the face of a demand which would have justified most manufacturers in lowering the quality or advancing the price. Immense business houses and warehouses of costly and elegant design are being made of cement, including walls, partitions, floors, and roofs. Such buildings are dust-proof, mouse and insect proof, and fire proof. Engineers count good cement properly laid as better than the best building stone. It is in fact plastic stone which may be moulded and cast to suit each one's needs and taste, and what is particularly commendatory, the amateur can use it. Houses of every grade from the cottage to palatial residences are made of it, irrigating ditches, great cement bridges, dams, and sea walls. For cellars, cisterns, sidewalks, street crossings there is nothing equally good. Its manifold and varied uses extend to the smaller domestic needs and one can see even poultry houses, stock sheds, dog kennels and fruit cupboards made of it. There is no limit to the usefulness of a plastic stone which can be mixed and worked by everyone. In a deforested country, such as the United States is becoming, the demand for cement as a sub-

stitute for lumber must increase in the future even more than in the past and cement plants cannot but multiply.

The Nebraska Geological Survey expects some day to report important development along this line in our state.

CLAY RESOURCES.

Many new brick plants have been added to the list during the biennium, yet they fail to meet the demands made upon them, and many carloads of brick are imported from neighboring states. On every street one finds brick with Des Moines, Iowa, Galesburg, Illinois, or Coffeyville, Kansas stamped in them. May they burn holes in our shoes until we begin to supply our own market. None of these states have better clay or more of it than our own.

QUARRY RESOURCES.

The old quarries and many new ones recently opened were never in a more prosperous condition and all operators consulted speak of their inability to supply the market. The amount of stone needed for buildings, streets, for the process of manufacturing beet sugar, and for the smelter at Omaha, is greater than can be supplied at home and large shipments are made, especially from Kansas and Colorado.

SAND RESOURCES.

The increased amount of building in this state, especially extensive concrete work, has taxed to the utmost the sand producers of the state. In spite of steam dredges and improved methods of handling large amounts of sand and gravel, the demand has not been met, and every town has engaged in prospecting for local supplies. The output of sand has become so large and of such growing importance that it is to be treated of in a special paper by Dr. George E. Condra in Volume III of the Nebraska Geological Survey.

RELATION OF THE UNIVERSITY TO THE STATE GEOLOGICAL SURVEY.

The helpful co-operation of the University of Nebraska is and always has been extended to the State Geological Survey. The University furnishes offices and store rooms in fire-proof quarters, cases and microscopes, as well as other apparatus, for examining material, and drawers in which to store specimens, and the force of assistants in the department of geology conduct the work without necessitating the employment of special clerks and helpers. In this and in other ways the State University serves the interest of the State Survey, increasing its efficiency and reducing its expenses.

RELATION OF THE MORRILL GEOLOGICAL EXPEDI- TION TO THE STATE GEOLOGICAL SURVEY.

Since 1891 the benefactions of Charles H. Morrill of Lincoln have made it possible to explore every corner of the state, thus greatly increasing the efficiency of the State Geological Survey. In this way was made the collection of quarry products, clay, sand, and agricultural soils of the state, in addition to large collections of the fossils of Nebraska which are now numbered by thousands in Mr. Morrill's cabinets. This work has required years of effort and the expenditure of a very considerable sum of money, both of which have been contributed freely to the state, a fact which seems to be generally known and well appreciated. Occasional scientific contributions, describing material secured and facts obtained, are published from the Morrill geological fund.

RELATION OF THE NATIONAL SURVEY TO THE LOCAL SURVEY.

The United States Geological Survey has undertaken to make exact topographic, hydrographic and geologic maps throughout the United States, more especially in those states where financial co-operation is guaranteed. Such work, though indispensable, entails a cost so great as to be simply prohibitory as far as any state survey is concerned.

A considerable amount of work was done in Nebraska a few years ago by the United States Geological Survey without financial co-operation being demanded of this state.

This was done in consideration of the youthfulness of the state and its lack of means at that time. All base maps, photographs, half tones, and electrotypes of the United States Geological Survey are furnished at cost to the local survey. Likewise in the analysis of soils, coals, water, etc., the local surveys are given the benefit of facts obtained by the National Survey.

PROPOSED GEOLOGICAL SURVEY OF EACH COUNTY.

The United States Geological Survey recognizes no county lines, but lays off the country in definite quadrangles. While it is true that county lines do not constitute a basis of geologic division, they do constitute a geographic division of particular interest to the people. It is the purpose of the State Geological Survey to make a report on each county as rapidly as the work can be done.

Two counties have been surveyed, namely, Jefferson county, by F. A. Carmony, and Cass county, by E. G. Woodruff.

Those counties in which the United States Geological Survey has done topographic work will of necessity be chosen first, because the government maps furnish a base on which to work.

It is the intention of the Nebraska Geological Survey to publish separate reports respecting the resources of each county, including wells, springs, streams and water supply in general, soil, clay, sand, gravel, stone, quarry products and industries, and agricultural and grazing conditions. Each county report is to be accompanied by numerous maps and illustrations.

INVOICE OF THE FURNITURE AND APPARATUS
BELONGING TO STATE GEOLOGICAL SURVEY.

1 Remington Standard Typewriting machine, No. 7, machine No. 156,365, Catalogue No. 11-5-05.....	\$92.25
Large adjustable drawing board, K and E. Cat. No. 15-10-10-05	30.25
1 Surveying rod and target, K. & E. No. 6268, Cat. No. 5-10-10-05	12.75
2 medium drawing boards, K. & E. Cat. Nos. 9-10-10-05..	9.70
1 steel T square, K. & E., Cat. No. 3-10-10-05.....	5.00
1 brass alidade, K. & E., No. 5218, Cat. No. 14-10-10-05..	15.00
1 beam compass, K. & E., Cat. No. 7-10-10-05.....	7.00
1 celluloid triangle and protractor.....	1.80
1 wooden T square, K. & E., Cat. No. 2-10-10-05.....	2.40
1 hand level, K. & E., No. 5700, Cat. No. 13-10-10-05.....	8.00
Extension rod, K. & E., Cat. No. 10-10-10-05.....	5.00
Steel protractor with arm, K. & E., Cat. No. 6-10-10-05..	8.00
12 6-inch brass sieves, 6 to 100 mesh, Cat. No. 5-11-05...	24.00
Small balance, Cat. No. 2-5-11-05.....	3.00
80 glass-stopper show bottles.....	12.90
2 Y. & E. cases for U. S. Geol. Survey Folios, Cat. No. 25-10-05	84.00
Chest of large drawers for drawings and apparatus, K. & E., Cat. No. 10-10-05	35.00
2 Y & E units for blanks and labels, Cat. No. 3-18-1-03..	15.75
4 Y & E units for card catalogue, Cat. No. 4-18-1-03, 7 and 8	61.00
1 Y & E base, Cat. No. 8 and 9-18-1-03.....	5.00

Set forms for casting cement, Cat. No. 25-6-04..... 12.00

The above named pieces of furniture and apparatus are so marked as to be readily identified. The catalogue numbers herein given are either stamped in with steel dies or else are painted or stenciled on the pieces of property and varnished over so as not to be effaced.

EXCHANGES.

In exchange for the papers of the Nebraska Geological Survey several hundred books, pamphlets, maps, charts, and public documents have been received.

These are to be properly stamped, catalogued, and recorded when the department is moved into new quarters, and will constitute the beginning of a reference library for the State Survey. This in time will become a valuable asset.

FINANCIAL STATEMENT

1902.

Feb. 3	A. H. Verrill	\$25.00
Mar. 17	E. H. Barbour, expenses	36.25
Mar. 26	A. H. Verrill	30.00
April 23	A. H. Verrill	40.00
May 15	J. Manz Engraving Co.	96.00
May 15	U. G. Cornell	115.84
May 20	A. H. Verrill	58.00
Sept. 3	A. H. Verrill	55.00
Sept. 14	E. G. Woodruff	24.53
Sept. 14	Lincoln Plate Glass Supply Co.	32.32
Sept. 28	Jacob North & Co., Vol. I	671.35

1903.

June 15	E. L. Thomas	\$23.50
June 15	Norton Ware	9.50
June 15	Helena Redford	42.50
Jan. 22	U. G. Cornell	56.90
Jan. 22	P. J. Harrison	3.75
Jan. 22	G. E. Condra	40.00
July 23	E. H. Barbour, expenses	13.76
July 23	E. L. Webster	50.00
Sept. 14	Helena Redford	15.71
Sept. 28	E. H. Barbour	45.80
Sept. 28	H. I. Redford	18.50
Oct. 20	E. G. Woodruff	12.00
Oct. 20	U. G. Cornell Engraving Co.	9.74
Dec. 8	Helena Redford	18.00
Dec. 8	F. W. Heath	2.50
Dec. 8	E. G. Woodruff	9.50
Dec. 8	E. H. Barbour, expenses	4.48

FINANCIAL STATEMENT.

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1904.

Jan. 16	Helena Redford	28.50
Jan. 16	Albert Jacobson	40.00
Jan. 27	U. G. Cornell	2.92
Jan. 27	U. G. Cornell	9.15
Feb. 17	Harry Porter	140.50
Feb. 26	Helena Redford	20.00
Feb. 26	E. H. Barbour	5.25
Mar. 9	E. L. Webster	5.25
Mar. 9	Helena Redford	11.13
Mar. 9	Lincoln Marble and Granite Works	12.50
Mar. 25	Frank Loomis	3.00
Mar. 25	Linn Huntington	4.05
April 18	Clara Edholm	10.71
April 18	E. G. Woodruff	10.50
April 18	J. B. Davidson	18.00
April 18	Review Press	5.00
April 28	G. E. Condra	6.71
May 6	Hammond Printing Co.	218.68
May 13	Hammond Printing Co.	36.15
June 14	Cornell Engraving Co.	23.56
June 25	J. Thorp & Co.	12.85
Aug. 3	Harry Porter	7.75
Aug. 15	Cornell Engraving Co.	30.97
Sept. 15	Helena Redford	32.40
Oct. 5	A. O. Wiggerjost	6.80
Oct. 22	Albert Jacobson	5.00
Oct. 22	Cornell Engraving Co.	12.32
Oct. 22	Cornell Engraving Co.	5.40
Oct. 22	Helena Redford	7.50
Nov. 14	Kimball Bros.	7.60
Nov. 14	Cornell Engraving Co.	10.91
Dec. 12	Globe Delivery Co.	3.25
Dec. 20	Helena Redford	5.55
Dec. 29	Harry Shedd	13.50

1905.

Jan. 2	Lincoln Photo Supply Co.	3.20
Jan. 22	E. L. Webster	54.30