CANADA

DEPARTMENT OF MINES AND RESOURCES

MINES, FORESTS AND SCIENTIFIC SERVICES BRANCH

GEOLOGICAL SURVEY OF CANADA

PAPER 49-6

PLEISTOCENE DEPOSITS OF O'LEARY MAP-AREA, PRINCE COUNTY, PRINCE EDWARD ISLAND

(Report and Map)

By

E. B. Owen

OTTAWA

1949

This document was produced by scanning the original publication.

Ce document est le produit d'une numérisation par balayage de la publication originale.

CANADA

DEPARTMENT OF MINES AND RESOURCES

MINES, FORESTS AND SCIENTIFIC SERVICES BRANCH

GEOLOGICAL SURVEY OF CANADA

Paper 49-6

PLEISTOCENE DEPOSITS OF O'LEARY MAP-AREA, PRINCE COUNTY, PRINCE EDWARD ISLAND

(Summary Account)

By
E.B. Owen

OTTAWA
1949

CONTENTS

Introduction..... 1

Physical features..... 1

Geology..... 2

Bedrock formations..... 2

Unconsolidated deposits..... 2

Evidences of glaciation..... 6

Soils..... 7

Economic possibilities..... 8

Illustration

Preliminary map - O'Leary, Prince County, Prince Edward Island
----- In envelope.

PLEISTOCENE DEPOSITS OF O'LEARY MAP-AREA, P.E.I.

Introduction

This report is part of a broad scheme to provide a series of Pleistocene and ground-water reports of all of Prince Edward Island, accompanied by maps on the scale of 1 inch to 1 mile.

Up to the present, the only published information on the Pleistocene geology of the Island is by Chalmers.[1]

---

[1] Chalmers, R.: Report on the Surface Geology of Eastern New Brunswick, North-Western Nova Scotia and a portion of Prince Edward Island; Geol. Surv., Canada, Ann. Rept., vol. VII, 1894, pt. M (1895).

The present report is based on field work done during the months of September and October 1948. The writer was ably assisted in the field by W. T. Hatfield. He is indebted for many courtesies to Messrs. C. Milligan and P. W. Pate of Tyne Valley and O'Leary respectively, to G. B. Whiteside of the Department of Agriculture, and to various members of the Provincial Department of Public Works and Highways, Charlottetown.

Physical Features

O'Leary map-area is in the northwest part of the province of Prince Edward Island, and has an area of about 200 square miles. The village of O'Leary, the largest of several small communities within the area, lies about 72 miles northwest of the city of Charlottetown.

The surface of O'Leary map-area is relatively flat, though low, rounded hills interspersed with broad, flat velleys produce a gently undulating aspect in many localities. Surface elevations range from sea-level to more than 175 feet in the northwest corner.

A prominent topographic feature is a series of discontinuous ridges or bluffs that roughly parallel the present shoreline and can be traced intermittently throughout the entire map-area. These

bluffs probably represent emerged marine shorelines. In general they follow the 25-, 50-, and 75-foot contour lines.

The area is well drained by Pierre Jacque and Mill Rivers as well as by numerous small creeks. The Pierre Jacque flows southerly across the west part of the area, whereas Mill River flows easterly across the north part. Most of the streams are permanent, but do not carry much water. The source of much of the water is in wooded and swampy areas underlain by relatively impervious clay till. Some streams have been dammed, and are utilized to operate small saw or grist mills. However, as more land is cleared and swamps drained, many of the permanent streams will become intermittent, and it will become increasingly difficult to operate such industries.

Geology

Bedrock Formations. The entire map-area is underlain by Upper Carboniferous, or possibly Permian formations. The term 'Permo-Carboniferous' has been chosen as best meeting the nomenclature of these[1]

[1] Ells, R. W.: Report on the Geology of Prince Edward Island with Reference to Proposed Borings for Coal; Geol. Surv., Canada, Ann. Rept. (new series), vol. XV, report A, 1902, p. 369A (1903).

rocks. They consist of dark red sandstone; soft, red shale; hard, pebble-conglomerates; and irregular beds of impure limestone containing pebbles of bright red shale. The latter are described locally as limy conglomerates. Bedrock is exposed only in road cuts, drainage ditches, and gravel pits, and along the present shoreline.

Unconsolidated Deposits. The superficial deposits of O'Leary map-area are largely of Pleistocene age; they include material of glacial, marine, and glacio-fluvial origin.

Ground moraine constitutes almost all the glacial deposits. The material is a till varying from a reddish brown, compact, unstratified clay till, in the north and central parts of the map-area, to a reddish brown,

loose, unstratified, sandy till, in the west and south. The upper sections of the clay till contain a variable number and assortment of erratics, consisting chiefly of boulders and fragments of crystalline rocks foreign to Prince Edward Island. These are commonly rounded, and have been scratched and polished by the ice. Dawson and Harrington,[1] and Chalmers[2] have identified many of these rocks as having been derived

---

[1] Dawson, J. W.; Harrington B. J.: Report on the Geological Structure and Mineral Resources of Prince Edward Island; Montreal, Canada, p. 22, 1871.

[2] Chalmers, R.: Report on the Surface Geology of Eastern New Brunswick, North-western Nova Scotia and a Portion of Prince Edward Island, Geol. Surv., Canada, Ann. Rept., vol. VII, 1894 pt. M, pp. 52, 91, (1895).

---

from regions in New Brunswick. The quantity of locally derived boulders in the clay till increases with depth, and in most places such boulders, predominantly sandstone, are very numerous in the till lying directly above bedrock. Where bedrock is sandstone, the till lying directly above is comparable to sandy till. The number of boulders, both foreign and local, contained in the clay till varies from almost nil in the north-central part of the area to localities in the central part where they constitute as much as 50 per cent of the material. The emerged marine shorelines are developed strongest in the clay till areas. This is particularly noticeable near St. Chrysostom in the south part of the map-area. Good sections of clay till are not exposed. One section occurs in a drainage ditch on the west side of the road about $\frac{1}{4}$ mile north of Mount Pleasant Air Station. Another, disclosing several large striated erratics, occurs in an excavation for road fill on the road about $1\frac{1}{2}$ miles west of Milo.

Sandy till contains a large percentage of sandstone boulders derived from local bedrock. Such deposits are relatively thin, and generally occur where sandstone bedrock is near the surface. An excellent exposure of sandy till can be seen in a ditch along the road about $\frac{1}{4}$ mile west of Springhill.

Gravelly, sandy till is not extensive. It occurs only in the immediate vicinity of conglomerate bedrock and contains numerous small, hard, rounded pebbles of quartz and quartzite derived from the conglomerate. This material is an excellent indication of nearby conglomerate bedrock, and all such deposits should be investigated thoroughly when prospecting for this type of bedrock. An illustration is afforded in the area immediately surrounding Sillikers' gravel pit about 1 mile south of Mount Royal.

The highest Pleistocene shoreline in the map-area is at an elevation of about 75 feet above sea-level, and except for two small localities ½ mile and 1 mile south of Harmony, no deposits of stratified clay, silt, or sand occur above this elevation. Several small deposits of marine clay are exposed along the banks of Trout River about a mile east of Carleton. The clay is from 3 to 4 feet thick and is reported to be underlain by thin beds of sand and clay. The known thickness of the marine deposits in the map-area varies from 6 inches to 20 feet. They are thinnest in the region about Foxley Bay, and reach their maximum thickness in areas below the strong bluffs in the vicinity of West Point and Victoria West. They are generally found to be resting on bedrock or clay till.

The material constituting the emerged beaches consists mainly of a fine- to medium-grained sand. Gravel is not common, and where present is superficial and not more than 2 to 3 feet deep. In most occurrences, the pebbles contained in the gravel consist of red sandstone. However, in a few instances, notably in the gravel pit by the highway about ¼ mile northwest of Portage, many of the pebbles were derived from conglomerate bedrock. This particular beach deposit can be traced northeast for 1¼ miles; it is possible that the pebbles were derived from a southeast extension of the conglomerate beds outcropping in the pit at Goffs bridge 2½ miles to the northwest.

A deposit of glacio-fluvial origin consisting of well-stratified silts, sands, and gravels lies about ½ mile north of St. Anthony

along the south bank of Mill River. The general strike of the deposit is east-west and the dip of the crossbedding, which is prominent, is to the east. Pebbles and boulders in it are of sandstone and limy conglomerate with a few, scattered, small, rounded pebbles of quartz and quartzite derived from local pebble-conglomerate bedrock. In places, the material in the bottom of the gravel pit excavated in the deposit has been firmly cemented into a hard conglomerate. This is due to the deposition of lime carbonate, which was probably dissolved from limy boulders in the deposit and redeposited at depth by water percolating downward through the porous material. The sands and gravels appear to be considerably finer at the east end of the deposit. A smaller deposit, striking almost at right angles to the other, crosses the road about $\frac{1}{4}$ mile west of St. Anthony. Somewhat similar deposits in Nova Scotia have been described by Chalmers[1] and Wickenden[2].

---

[1] Chalmers, R.: Report on the Surface Geology of Eastern New Brunswick, North-western Nova Scotia and a Portion of Prince Edward Island; Geol. Surv., Canada, Ann. Rept., vol. VII, 1894, pt. M, pp. 84-87 (1895).

[2] Wickenden, R. T. D.: Glacial Deposits of Part of Northern Nova Scotia; Roy. Soc., Canada, vol. XXXV, 1941, pp. 146-147.

Beach sand and gravel are not widely developed along the present shoreline. The largest deposits of sand are adjacent to areas overlain by sandy till or marine sands. Accordingly, large quantities are found along the coast extending north and east from West Point Very little beach sand occurs where the present shoreline consists of bedrock or clay till. Minor amounts of beach gravel occur about $\frac{1}{4}$ mile southeast along the coast from the wharf at Brae Harbour.

Large deposits of wind-blown sand occur at West Point and along the coast about 2 miles east of West Point wharf and smaller deposits are found near Rock Point on the east side of Egmont Bay. The dunes are of the linear type, parallel with the coast. The sources of the sand are the low, sloping beaches along which the dunes are forming. Inland, commencing about 200 feet from the water, the dune sand is held together by coarse grass

and small spruce, but near the water, where the vegetation is sparse, the dunes are constantly shifting. It is reported that the width of the dune sand deposits at West Point has increased by about 400 feet during the past 25 years.

Numerous deposits of peat, consisting of partly decomposed organic material, occur in the area. The largest and most important of these is at Black Banks, in the northwest part. Other small deposits occur at a point on the highway about 1 mile northwest of Portage, on the coast about $1\frac{1}{4}$ miles east of West Point warf, and near Baptiste Point. In each place the peat deposits occur at elevations of less than 25 feet and are close to the sea. The material exposed in their vicinity is composed of marine silts and sands underlain by relatively impervious clay till. These peat deposits have been well described by Leverin[1] and Swinnerton[2].

---

[1] Leverin, H. A.: Moss Deposits in Canada; Bur. Mines, Canada, pub. 817, 1946.

[2] Swinnerton, A. A.: Peat Survey, Prince Edward Island; Bur. Mines, Canada, F. R. L. Rept. No. 109, Dec. 1948.

Alluvial or flood-plain deposits are not common. The material usually consists of greyish silt and sand mixed with partly decomposed organic material, and extends for only a few feet from the sides of the streams.

Evidences of Glaciation

The last ice movement in O'Leary map-area was from west to east. Large erratic boulders, mainly of granite and diorite from the mainland of New Brunswick[3], occur both on the surface and mixed with the

---

[3] Chalmers, R.: Report on the Surface Geology of Eastern New Brunswick, North-Western Nova Scotia and a Portion of Prince Edward Island, Geol. Surv., Canada, Ann. Rept., vol. VII, 1894, pt. M, p. 52, (1895).

---

glacial till.

Many erratics lie at the bases of emerged marine bluffs. These may have been washed from the glacial till or ice-rafted into their

present positions during the last submergence. Most of them are more rounded than erratic boulders occurring at elevations greater than that of the highest emerged shoreline. A distinct topographic feature is a series of low, elongated hills crossing the road extending south from West Devon. A similar group occurs about a mile west of Coleman. In general the long axes of these hills have an east-west strike. They have been called rock drumlins, formed in part by differential erosion of bedrock by the overriding ice-sheet. They are covered with 2 to 6 feet of sandy or gravelly till, which rests on bedrock. Conglomerate beds, which would undoubtedly offer more resistance to ice erosion than any other bedrock on the Island, occur in at least two rock drumlins. One of these lies a mile south of West Devon and the other about half a mile north of Woodstock. In many places in the map-area the movement of material by ice is relatively slight. Gravelly, sandy till is commonly found resting on, or a few feet to the east of, conglomerate beds that were the source of much of the material. Due to the absence of natural rock outcrops, no glacial striae were observed.

Soils

Almost all the soil of the map-area has been derived from superficial deposits of Pleistocene and Recent ages. The accompanying map shows the distribution according to mode of origin and physical character of the materials upon which the soils are developed. The descriptive geological names are based upon field identification. Boundaries are approximate.

Glacial till deposits provide the material upon which most of the soils in O'Leary map-area are developed. These deposits have been subdivided into three general groups: (1) sandy till, (2) clay till, and (3) gravelly, sandy till. These terms are based upon textural identification in the field, and because of its origin, the texture of a till will vary across any one till area. For example, the material in areas mapped as clay till may vary from a heavy clay till to a lighter

sandy-clay till. Also in areas where clay till is relatively thin, small patches or streaks of sandy-clay till may occur. This variation in composition across a till area could lead to the development of several types of soils. The topography in glacial till areas is generally undulating to gently rolling, and the drainage varies from poor, in areas of clay till, to good, in those covered by sandy till.

The material contained in marine deposits, which in many localities are sharply divided from the glacial deposits by easily recognized, emerged sea cliffs, is more homogeneous, and textural differences are more gradational. The normal sequence is sand to silt to clay as the material becomes progressively finer away from the emerged shorelines. Because of the predominance of soft sandstone bedrock in the map-area, fine- to medium-grained sand constitutes much of the material laid down by the former seas. Soils formed in these areas are very sandy; the topography is flat; and the drainage, except in areas where the underlying clay till comes close to surface, is good.

The recent deposits of alluvium, dune sand, and beach sand and gravel occur in minor amounts, and have no agricultural value. The peat and swamp deposits occur in widely separated, flat, poorly drained areas. They have no present agricultural value.

Economic Possibilities

There are four types of gravel deposits in the map-area: (1) gravelly, sandy till; (2) marine beach gravel; (3) glacio-fluvial gravel; and (4) recent, beach gravel.

A large deposit of gravelly, sandy till occurs in the vicinity of Sillikers' pit 1 mile south of Mount Royal. This material was derived from conglomerate bedrock by ice action, and deposited without being moved any great distance. Large boulders of conglomerate in the bottom of the pit would indicate that conglomerate bedrock occurs not far below. It was reported that a drill-hole in the bottom of the Whetlock-Cameron pit, $\frac{1}{4}$ mile east of Sillikers' pit, passed through 22 feet of

conglomerate. The material was extremely hard and drilling difficult. The underlying conglomerate beds that provided the pebbles for this till are extensive. Traces of the till occur in the road about 3½ miles northwest of the pit and on the north side of a small knoll about 7 miles to the southeast.

Gravelly, sandy till, with a depth of from 2 to 3 feet, occurs at Goffs bridge on the south side of Trout River. Below the till are flat-lying lenses of conglomerate interbedded with thin beds of sandstone. The strike of the till deposit is about north 10 degrees west. About 15 feet of conglomerate are exposed on the west side of the pit that has been excavated in this deposit. The material is soft, and can be easily excavated. Considerable conglomerate probably remains in the bottom and along the west side of the pit beneath the road, but due to water seepage from Trout River, and to the position of the road, would be difficult and expensive to obtain. Although the conglomerate beds appear to occur only in the immediate vicinity of the pit, the area to the north of Trout River west of the road to Cascumpeque might be further investigated.

A deposit of gravelly, sandy till lies on the north side of a small knoll about half a mile north of Woodstock. Conglomerate bedrock was encountered in a test pit put down in the floor of the gravel pit excavated in the deposit. This conglomerate occurs about 10 feet below the surface, but doubtfully extends much beyond the limits of the knoll.

Except where it occurs near conglomerate bedrock, gravelly, sandy till is not an important source of gravel. However, it serves as an indicator of the presence of conglomerate at depth, and has led to the discovery of important supplies of gravel for the island.

The emerged marine beach deposits do not constitute a good supply of gravel. In most instances the deposits are shallow, and the pebbles are composed almost entirely of red sandstone, which is not suitable for road metal. Two small gravel pits have been excavated on emerged

beaches at elevations of about 25 feet. One of those is about a mile northeast of West Point wharf, and the other on the highway about half a mile north of Portage. The deposits contain many hard, rounded pebbles of quartz and quartzite derived from conglomerate bedrock, but not in sufficient quantity to form a satisfactory gravel.

A deposit of glacio-fluvial gravel lies along the south shore of Mill River about half a mile north of St. Anthony. The pebbles and boulders consist almost entirely of locally derived sandstones and limy conglomerates, with a few harder pebbles of granite, quartz, and quartzite. Due to the large percentage of soft, friable materials, the gravel is not as satisfactory for road metal as that derived from conglomerate bedrock. The deposit probably extends for some distance to the west of the present pit. The region along Mill River between this gravel pit and Howlan, and as far south as O'Leary, should be thoroughly investigated in an attempt to find a continuation of the deposit.

A gravel deposit of recent origin has accummulated on the beach about a quarter mile east of Brae Harbour wharf. A large proportion of the pebbles are similar to those contained in the conglomerate bedrock. The deposit is small and not important.

Sand is widely distributed throughout the map-area. The marine deposits consist to a large extent of fine- to medium-grained sand derived from local sandstone. Recent beach deposits of medium- to coarse-grained sand are common along the present coast. Due to the presence of large numbers of boulders and pebbles, the areas of sandy till are not good sources of sand.

The quality of the dune sands that occur in the map-area is the same as that of other wind-blown deposits on the island. However, they are not as extensive and, accordingly, it would be less economical to develop them.

The largest deposit of peat in the area is that at Black Banks. It has been fully described in various publications by the Mines

Branch, Department of Mines and Resources, Canada. Two new deposits were observed, one on the coast about 1¼ miles east of West Point wharf and the other near Baptiste Point. These deposits are small, consisting of only a few acres, and are not considered important.

Boulder clay is the most common source of clay in the map-area. In most places it is not suitable for the manufacture of clay products, due to its high sand content and to the presence of many large crystalline and sandstone boulders. Three small marine clay deposits occur on the banks of Trout River. They are shallow, ranging in depth from 3 to 4 feet, and are not considered important as a source of clay. Lenses of massive, red shale interbedded with sandstone and limy conglomerates are common in the bluffs along the west coast. They vary from 1 to 5 feet in thickness, and are usually overlain to a considerable depth by overburden. Most of these shales are unsuitable for the production of clay products, but some beds are of sufficient purity for the manufacture of heavy clay products and even pottery[1].

---

[1] MacPherson, A. R.: Clays and Shales of Prince Edward Island; Bur. Mines, Canada, Memorandum Series No. 91, October 1946.