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OF THE

**STATE OF MICHIGAN.**



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## REPORT, &c.

OFFICE OF STATE GEOLOGIST, }  
Detroit, Feb. 4, 1839. }

*To the Hon. Senate and House of Representatives of Michigan.*

In conformity with the requisitions of your honorable body, I herewith transmit such information, touching the progress and general results of the works placed under my charge, as would appear to be called for in an annual report; reserving the great mass of matter which has been accumulated, with the view to an elucidation of the condition and resources of our state, for a *final* report.

Immediately upon the reception of an act "relative to the geological survey," approved March 22, 1838, I proceeded, in conformity with the instructions contained in said act, to organize a geological board and to divide the complete work in such a manner as to constitute a geological and mineralogical, a zoological, a botanical, and a topographical department.

At as early a day as circumstances would permit, the heads of each of these departments took the field, and continued their arduous duties until the inclemency of the season compelled a suspension of labor; since which time they have been busily engaged in arranging the great amount of information which has been obtained in such a manner that it may eventually be made available.

My individual labor has been chiefly devoted to an examination of the coast of those portions of our state bordering on lakes Huron and Michigan, together with so much of the interior of the peninsula as circumstances would permit. I have also devoted a portion of the past season to a general examination of some of

the southern and central counties of the state, preparatory to the more minute examination which has been commenced and which it is proposed to renew with the first opening of spring.

The geographical information respecting the northern portion of this peninsula is so imperfectly understood that, were it at this time desirable, it would be impossible to lay before you the minute results of the examinations in that portion of the state, in such a manner as to be intelligible, unless accompanied with complete new maps, which could not be expected to be forwarded in a report, that at most, can only be looked upon as setting forth, in a general manner, the progress of the work placed under my charge.

#### NORTHERN PART OF THE PENINSULA.

##### *Topography and General Character.*

The country under consideration, lying west of Saginaw bay, and extending north from townships 10 and 11 north, to the straits of Mackinac, has been so imperfectly known to the citizens of our state that no estimate of its value could be made. No circumstances have occurred to aid in developing its resources, and from the forbidding character of most of the coast, it has very naturally been considered as a flat country, worthless except for the immense tracts of pine timber which were supposed to exist in it; both of which suppositions are, to a great extent, without foundation. It is true, however, that the northern portions of the peninsula are characterized by a larger proportion of irreclaimable marsh than is to be found in the southern counties, yet notwithstanding this, many portions are not inferior to the other parts of the state.

Several streams of considerable size occur on the northern part of the peninsula; among the most important of which are the Maskego, White, Pere Marquette, Manistee and Platte on the west; Cheboigan on the north, and Thunder Bay, Au Sable, Pere and Tittabawassa rivers on the east.

The Maskego river, which is the largest of the streams enumerated, has its principal source in a group of large inland lakes situated west of the meridian, in about ranges 3 and 4 west, and towns 22 and 23 north. These lakes are almost completely surrounded by nearly impenetrable swamps, covering a large portion of the area of from 7 to 8 townships, the chief portions of which may

safely be said to be utterly irreclaimable. From one of the principal lakes of the group mentioned, the Maskego river runs southwesterly in a line partially parallel with the coast of lake Michigan, receiving numerous tributaries, until it finally discharges its waters into the last mentioned lake, in town 10 north, range 17 west. The stream through its whole course is extremely crooked and its total length, including its windings, may be estimated at about two hundred miles. The waters descend with an extremely rapid, though for the most part uniform current, and their depth is very regular. The stream is capable of being easily made navigable for steamboats nearly, if not quite, to the lake which forms its source. Large portions of the lands situated upon this stream are well adapted to the purposes of agriculture, and although the great majority are timbered lands, there is nevertheless a sufficient amount of prairie to greatly facilitate the settlement of the surrounding country.

The Maskego, like almost all the streams on the western side of Lake Michigan, first discharges its waters into a small lake that is separated only by a very slight distance from the main lake. The Maskego river may be said to furnish one of the best natural "stream" harbors which is found upon Lake Michigan.

The Tittabawassa on the east, which is one of the branches of the Saginaw river, has its source not very far distant from that of the Maskego, and the upper portion of its course is nearly parallel to the latter stream, the Maskego being upon the west side of the summit, while the Tittabawassa is upon the eastern side. The latter stream, gradually curving to the east, discharges its waters through the Saginaw river into Saginaw bay of Lake Huron.

The Tittabawassa is navigable for boats of light draught for a distance of from 40 to 50 miles, above which it is obstructed by numerous rapids that will furnish, if properly applied, an abundance of hydraulic power. The surrounding country is considerably elevated, and the banks of the stream sometimes rise quite abruptly to a height of from 20 to 40 or even 50 feet. Portions of the lands in the vicinity of the river are of good quality and well adapted to agriculture; but other portions occur where the soil is of a light sandy character and will require much labor to ren-

der it productive. Some valuable tracts of white pine exist in the vicinity of the Tittabawassa, but in consequence of the ravages of fire, which has been communicated from Indian camps, pine in quantities is rarely seen upon the immediate banks of the river.

The Au Sable and Thunder Bay rivers are both capable of being made excellent harbors for lake shipping, and they are streams of considerable magnitude. The former may be rendered navigable, but to what distance I am not able to say. The navigation of the latter stream is obstructed near its mouth by a series of rapids, the bed of the stream being composed of limestone *in place*.

The water of most of the other streams enumerated, like those already mentioned, flows with a brisk current and sometimes with great rapidity. The beds of the streams are chiefly composed of a yellow sand, and the depth is remarkably uniform. An abundance of hydraulic power will be furnished, but the sandy character of the soil, more particularly upon the eastern slope, will sometimes render it difficult to secure from accident the dams which may be erected.

The country north of the southern boundary of Arenac county and east of the meridian, so far as examined, is on the whole but ill adapted to the purposes of agriculture, being chiefly composed of sandy ridges with intervening swales, and rising so gradually towards the central portions of the state as to leave the country extremely flat. There are, however, many valuable tracts of white pine, which will serve to render this portion of the state of some importance. Yellow pine, well adapted for light spars, also abounds.

A large portion of the immediate shores of the lake is composed of marsh.

An exception to the flatness of the country exists in an elevated district commencing in high hills a little south of Thunder Bay river and stretching in a southwesterly direction towards the head of Lake Michigan. This range, at its commencement, is usually known as the highlands of the Au Sable. These hills follow the line of bearing of the rock formation, and no doubt extend

diagonally completely across the state, forming a portion of the summit of the more northern part of the peninsula.

The greater portion of the country, after passing the summit west of the meridian, is of a character totally different from that just described. From the site of old Mackinac, at the very extremity of the peninsula, south to the Manistee river, a direct distance of about 140 miles, the immediate shores of the lake are almost invariably considerably elevated, sometimes rising abruptly to a height of from 300 to 400 feet. The country, (more particularly the northern portions,) as we proceeded into the interior, continues to rise, until it attains an altitude probably quite equal, if not superior, to any other portion of the peninsula. This is more particularly the case in the vicinity of, and southeast from Little and Grand Traverse bays. Here the surface is considerably broken by elevated ridges of limerock, which are, without doubt, a continuation, of the line of bearing of the great limestone formation of Wisconsin.

In proceeding south from Grand Traverse bay, the interior of the country would appear to become less elevated, or gradually to fall away to the southeast, while the elevation of the coast is increased: a circumstance which will serve to account for the general direction of the two principal streams, the Maskego and Tittabawassa rivers. The elevated shores of Lake Michigan, which when viewed from a distance have the appearance of sand, are found in reality to be composed, except in the recent sand dunes, of alternating layers of a highly marly clay and sand.

The hilly limestone region to which allusion has been made, is mostly heavily timbered with beech and maple, and although portions of it are rather broken, it is as a whole admirably adapted to the purposes of agriculture.

After leaving the limestone district, in passing south the country becomes more variable, the soil sometimes assuming a sandy character. The face of the country is also generally more level, although some districts are considerably rough.

This northern portion of the peninsula is usually regarded, by the inhabitants of our state as possessing too rigorous a climate to admit of agriculture, but this is an error which deserves to be corrected. The Ottawa Indians residing on Little Traverse bay

and who have somewhat extensive cultivated fields in the elevated limestone district of the interior, more particularly in the vicinity of one of the southwestern forks of the Cheboigan river, inform me that their crops of corn have not failed within their recollection to yield largely, and certainly I never saw finer corn than in some of their fields.

The soil of these lands is strictly a "warm" one, and exposed as it is to the vivifying influences of the southern winds during the summer, it cannot fail to be productive. In this respect the country on the western slope is precisely the opposite of that on the northerly and easterly slopes, for this latter district is constantly subject to the chilling influence of the northerly winds from Lake Superior, an influence which even the most cursory observer could hardly fail to notice. This difference of circumstances, even were the character of the soil similar upon the opposite sides of the peninsula, could not fail materially to affect the value of the lands for the purposes of agriculture, adding to the value of those of one district while it would detract from those of the other.

#### *Rocks.*

The examinations of the past year, in the northern and unsettled portions of the peninsula, have been wholly of a general character, and were made with a view of determining, as far as possible, the precise points to which the minute examinations can, hereafter, be directed with the greatest profit. These examinations cannot be completed in such a manner as to enable us to delineate the geology of that country upon our maps, until the United States' *linear* surveys be completed. These latter surveys, which during the past year have been extended as far north as town twenty-six, have nearly reached a portion of the peninsula, which, in a geological point of view, is possessed of the highest interest. Several parties of surveyors are now nearly in readiness to commence the work north of the town mentioned, and we confidently hope, that during the ensuing year the chief part of the subdivisions which remain to be done, may be completed.

It is not my intention, at this time, to enter into a minute descrip-

tion of the order of superposition of the rocks, over the large area of country under consideration, nor would it be possible, were it desirable, to present the subject to you in such a shape as to render it intelligible without the aid of diagrams. The accompanying descriptions will, therefore, be almost exclusively confined to those points at which the *out-crop* of rock occurs under such circumstances that it may be made available for practical purposes, together with such suggestions as the circumstances may appear to warrant.

The rocks of this northern portion of the peninsula may be regarded as referable to the great carboniferous group of the state, a position to which their fossil contents is amply sufficient to substantiate their claim. In this respect they coincide with the rocks heretofore described as occupying the southern counties; nevertheless, it must be borne in mind, as there stated, that these rocks occupy a very different position in the series.

The rocks of the district under consideration consist of a succession of limestones, with intervening shales, sandstones and clays; and as we approach the very extremity of the peninsula, the limestone is shattered, in a manner similar to that exhibited by the sandstone in the southern counties of the state.

The line of bearing of the members constituting this group of rocks, not only in the northern but likewise in the southern portion of the peninsula, is regularly northeasterly and southwesterly, a direction which it is believed the rocks upon the opposite side of Lake Michigan will also, at least to a certain extent, be found to pursue. The general characters of the separate portions of the group are preserved, in a remarkably distinct manner, at great distances, and the mineral contents are but little varied.

My examinations would lead me to infer that the coal of the central portions of our state, and that upon the Illinois river, is embraced in a rock which belongs to the same portion of the great basin; a conclusion which, if borne out, will aid much in determining some important points, respecting the relation which the neighboring rocks bear to each other.

I am also led to conclude that that portion of the rock series which, in Illinois and Wisconsin, embraces the ores of lead, is

identical with a portion of the rock formation which occurs in the northern part of our own state; a circumstance which might fairly have been inferred from the general line of bearing of the rock. Whether this extension of the rock also contains that mineral, in sufficient quantities to be of any practical value, remains yet to be determined.

A slight glance at the map of our state will sufficiently explain the relation which Saginaw bay, of Lake Huron, holds to the *line of bearing* already mentioned. This great arm of that lake, stretches in a southwesterly direction, making a deep indentation in the peninsula, and occupying a denuded space in the sandstone, just at that point where the latter comes in contact with the limestone of the north. Thus while the southerly portions of the bay are characterized by the appearance of abrupt, but low cliffs of sandstone, which rock may be traced in a southwesterly direction completely across the peninsula, the opposite, or northerly shore, is not less marked by the occurrence of limerock, which stretches in a like manner, southwesterly to Lake Michigan. This limestone forms several of the headlands and small islands of Saginaw bay and Lake Huron, and also occasionally appears in the beds of the streams, giving rise to rapids near their places of embouchure.

In proceeding northerly from the mouth of Saginaw river, limestone is first noticed, forming the very extremity of Point au Gris. Quarries have been opened here, and a rough building stone obtained. It is of compact structure, tolerably adapted to resist the action of the elements, and being situated, as it is, in such a manner that the stone may be readily quarried and transported, it is a point from which the country in the vicinity of Saginaw river may be more economically supplied, with this character of stone, than from any other. By judicious selection, portions of it may be made use of for the manufacture of lime, but the great mass is of too siliceous a character to admit of use for that purpose.

Limestone still more siliceous in its composition, occurs on the Charity islands, where it may be quarried to a limited extent, and will answer a good purpose for rough walls. The rock of these islands, for the reason already stated, will scarcely admit of being

applied to use for the manufacture of lime. That at Great Charity island contains large quantities of imbedded chert.

Between Charity islands and the southerly cape of Thunder Bay limestone appears at short intervals, but at such low levels (usually forming the bed of the lake,) as to be of no practical value. At this latter point the rock occurs in an abrupt cliff, which rises directly from the water, to a height of from ten to twenty feet, and is continued for the distance of half a mile.

The limerock alternates with layers of a fissile clay slate, the latter of which composes about two-thirds of the whole *out-cropping* rock forming the face of the cliff. The limestone may be easily quarried, and portions of it would answer tolerably well for architectural purposes, but as a whole, in consequence of the irregular shapes into which the rock is liable to separate, it is of inferior quality.

At a distance of something less than two miles, southeast from the cliff just mentioned, a dark colored and highly bituminous shale occurs, forming a small island. This island which, during the past season, in consequence of the high water, has been nearly submerged, is usually denominated Sulphur island.

This bituminous shale, which is seen to extend a considerable distance around, forming the bed of the lake, dips below the limestone just described, and may be regarded as of no great thickness. Small specks and nodules of iron pyrites are imbedded in it, and so completely is the whole mass saturated with bitumen, that when thrown upon "the fire" it blazes freely. From this circumstance it has been mistaken for coal, and considerable quantities of it were actually shipped to Detroit, under this delusive supposition.

Limestone is again seen in the bed of Thunder Bay river, at a distance of about one mile from its mouth. Over the *out-cropping* edge of the rock the waters descend in a series of very brisk rapids; and the stream is capable of furnishing a greater amount of hydraulic power, at this point, than has been noticed at any single place on the peninsula. Were it not that the sandy nature of the banks would render much care necessary in order to make the works secure, it might be very cheaply applied; and occurring, as it does, near the mouth of a large stream, which will furnish a safe harbor for lake vessels, the great value of this immense

power, for application to mechanical purposes, cannot fail to be eventually appreciated.

Limestone was not observed at any point upon Thunder Bay river, sufficiently elevated, to admit of its being quarried.

Lime rock also occurs at the northerly cape of Thunder Bay, the Thunder Bay islands and Middle island, as also at several intermediate places upon the coast; but it chiefly occurs either below the water of the lake, or so little elevated above it as scarcely to be capable of being turned to any considerable practical account.

Outer Thunder Bay island is composed of limestone, covered, in part, by a very thin deposit chiefly of vegetable matter. An inferior coarse building stone may be obtained, in considerable quantities, upon this island, but it is extremely irregular in shape and not of the most durable character.

The southerly portion of outer Thunder Bay island is composed of a shelly or sub-slaty, silicious limestone, considerably charged with bitumen, and almost wholly composed of a congeries of fossils, the animal matter of which has undoubtedly given rise to the bituminous character of the rock. It possesses much interest in a scientific point of view, but is of no value for any practical purposes.

Much of the surface of Middle island is composed of loose masses of a limestone, which is admirably adapted to the manufacture of lime. Occurring, as these masses do, of a convenient size, the labor of quarrying is saved, while the manufactured lime may be safely and conveniently shipped. The manufacture of lime, for the counties bordering on the lower rivers, may be safely and economically carried on at this point. Several kilns have already been burned upon the island.

Between Middle island and Forty Mile point, limerock appears, at intervals, forming the bed of the lake. The rock was not noticed, at any place, to rise above the surface of the water, and although it is of a compact and regular structure, and well adapted for practical use, its submerged situation will effectually prevent its application to any useful purpose.

Limerock again occurs at the straits of Mackinac and in the vicinity. It appears upon the island of Mackinac together with

Bois Blanc, Round and St. Martin's islands, as also upon the northern peninsula, north from Mackinac.

The island of Mackinac, which has a circumference of about nine miles, rises in rocky cliffs, upon its easterly and southeasterly portions, very abruptly, to a height varying from 120 to 150 feet.

The site of the present Fort Mackinac is elevated 150 feet above the water of the lake. Beyond the first elevation, upon which the fort is situated, there is a somewhat level plateau, which, however, rises gradually, until by a final and quite abrupt ascent the island attains its greatest elevation, being 219 feet. This final elevation, which is somewhat conical, has a flat area of limited extent on its very summit, upon which, during the late war, Fort George, afterwards called Fort Holmes, was erected. This beautifully situated spot furnishes one of the finest views of the surrounding coast and islands that could be conceived.

The island of Mackinac is based upon limestone, with a very superficial covering of soil. This soil, in consequence of the large amount of calcareous matter which enters into its composition, possesses a fertility that a superficial examiner would scarcely ascribe to it.

The limestone chiefly consists of an irregular assemblage of angular fragments, united by a tufaceous cement. These fragments usually appear, at first sight, to possess a compact structure; but a more minute examination shows them to contain numerous minute cellules, sufficiently large to admit water, which, by the action of frost, subjects the rock to rapid disintegration. Portions of the rock may, nevertheless, be selected partially free from this difficulty, and which are possessed of sufficient compactness to render them of value as a coarse building stone.

Hornstone, striped jasper, imperfect hog-tooth spar, calcareous spar and fluor spar occur imbedded in the rock, although the latter is of very rare occurrence.

Limestone, of a similar character, constitutes the chief portion of Round island; but here the rock is more compact, and will prove less subject to disintegration than that before mentioned. It will answer a good purpose as a coarse building stone.

A range of somewhat elevated hills, of limerock, occurs upon the main land, northwesterly from Mackinac, commencing a short distance inland. One of these hills, known as the "Sitting Rabbit," presents an abrupt cliff, destitute of vegetation upon its southerly side. This rock is, without doubt, indetical, in geological position, with that upon the islands last mentioned.

The low group known as the St. Martin's islands, are also composed of a similar limestone.

The shattered and deranged condition of the rock upon the island of Mackinaw, and its vicinity, gives the whole mass a peculiarly complicated structure, and has led to what is conceived to be an error respecting it. Thus the rock has been described as a conglomerate, destitute of stratification, a conclusion which would appear to have been drawn without a proper consideration of the facts connected with the subject. That the fragmentary masses, composing the main portions of the rock, have not been transported, is conclusively shown by the fact that the most delicate angles are preserved, a circumstance which could not have taken place had they been subjected to the action of water, before being cemented. A careful examination has shown that portions of the rock still remain, in which the relative position of the original lines of stratification are preserved for an extent of several rods; and on Round island the line of stratification was traced for a distance of nearly half a mile.

The rock in question, no doubt occupies very nearly its original *relative* situation, and its present condition may be ascribed to an uplift of the strata, subsequent to the complete induration of the rock; a cause which is amply sufficient to account for the present appearances. The fragments thus separated have been imperfectly cemented by the gradual infiltration of calcareous matter, thus re-uniting the complete mass.

It is well known that portions of the sandstone, in the southern counties of the state, are shattered in a similar manner; but in this instance the fragments have not been re-united.

The *old red sandstone*, over a large area, in the vicinity of the Porcupine mountains, of Lake Superior, has been similarly disturbed, and the protruded trap rocks, which occur in the immediate vicinity, afford a sufficient explanation of the causes which

have been most active in producing it; facts which should not be lost sight of in explaining the causes of the present condition of the rocks in the vicinity of Mackinac.

From the island of Mackinac to Little Traverse bay, rock does not appear upon the immediate shore of the lake, though hills based upon limestone, stretch at a distance, through the interior. These hills approach very near the head of the bay mentioned, where they attain an elevation of several hundred feet; and as a whole they probably constitute the most elevated and regular chain of hills on the peninsula.

On the easterly side, and near the head of Little Traverse bay the lime rock *crops out*. It continues for a distance of nearly a mile, forming an abrupt cliff elevated from 10 to 20 feet.

This rock varies from a dark blue and compact limestone to that of a greyish color and sub-crystalline structure. The rock may be easily quarried, and portions of it will answer a tolerable purpose as a building stone. But much of it is of an inferior quality; for the dark blue limestone is subject to break into irregular fragments, while much of the grey rock is either too *flaggy*, or contains so large a proportion of argilliceous matter in its composition as to render it unfit for use.

At a distance of from two to three miles westerly from the place of *out-crop* just mentioned, the rock again appears, in a continuous cliff, elevated from 15 to 20 feet.

The inclination of the rock is here northwesterly. It continues for a distance of about three-fourths of a mile when it dips beneath the water of the lake. This series of rocks no doubt overlies that last described.

The separate strata of this cliff, at its highest point, are represented, in a descending series, as follows: the rock being overlaid by about one foot of soil:

1. Siliceous limestone almost partaking of the character of sandstone—9 feet.
2. A confused mass of broken fossils, chiefly encrinites and cyathophyllae, imbedded in clay—2 inches.
3. Vesiculated chert, colored with iron—4 to 8 inches.
4. Flaggy limestone, mostly separable into layers varying from

one-fourth of an inch to one inch in thickness; the lamina usually forming a small segment of a large circle—8 feet.

5. Bluish clay (having the odor and appearance of silt,) divided by septae into irregular masses. It contains imbedded semi-crystalline grains of iron pyrites, which has the appearance of coarse golden yellow colored sand. About four feet of this stratum appears above the surface of the lake and it was estimated to extend 4 feet below, making its total thickness 8 feet.

This clay is underlayed by limestone.

The rock appearing in the cliff is, as a whole, of an inferior quality for economical purposes, yet portions may be selected which would answer a very tolerable purpose as a building stone.

Limestone was noticed, at intervals, forming the bed of the lake, as far south as the northerly cape of Grand Traverse bay. At this latter place it was last seen to rise above the surface of the water, attaining an altitude of from 4 to 8 feet.

This rock contains large quantities of imbedded hornstone arranged in irregular layers, varying from 2 to 12 inches in thickness. The siliceous matter having been deposited in thin successive layers gives the whole mass of hornstone a beautifully zoned appearance.

Portions of the limestone rock will furnish a tolerably good material for use as a coarse building stone, but as a whole it is of inferior quality.

About four miles southeasterly from the lime rock last described, and just within Grand Traverse bay, a dark colored bituminous slate, containing nodules of iron pyrites *crops out*, and continues at intervals for a distance of a mile. It closely resembles that before described as occurring at Sulphur island, near Thunder Bay, except that it is not so highly charged with bituminous matter. The rock is of no practical importance.

South from Grand Traverse bay to the southerly boundary of the state, rock was not seen, *in place*, upon the immediate shores of the lake, but it occurs at many points a little in the interior, one of which may be noticed as being immediately connected with the rock strata under consideration.

This limerock comes to the surface in a hilly region, lying between Pere Monquette and White rivers, (town 15 north,) at a

distance of from 10 to 12 miles from the shore of Lake Michigan. The surrounding country, embracing between one and two townships, is composed of broken, conical hills, rising abruptly to a height varying from one to two hundred feet. From the bases and sides of these hills numerous beautiful springs of water are discharged.

The rock is mostly covered with soil, and its character is not well determined, but situated as it is, at a distance from the coast, and not near any navigable stream, it is at the present time of no practical value.

In connection with the subject under consideration, I would call your attention to the immense quantities of rolled pebbles of limestone which occur on the shores of Lake Huron, more particularly between Thunder Bay and Forty Mile point. The shores are lined at short intervals, with these small masses, consisting of the harder portions of the rock which have resisted the action of the elements. These masses possessing, as they do, great uniformity of size, are admirably adapted for use in the construction of roads.

The coast is not unfrequently lined, many feet in thickness with these fragments, and so situated that vessels may be readily laden with them. Occurring in the form they do, the expense of pounding will be saved, and no preparation will be required to fit them for immediate use in macadamizing roads.

It is well known that great numbers of vessels annually pass down the lake "in ballast," and it is deserving of serious consideration whether sufficient inducement could not be given, for the transportation of this material, for use upon the roads in the vicinity of Detroit river.

The finer gravels have already been considerably used for gravelling walks, but I am not aware that any use has, as yet, been made of the larger stones which occur in such abundance upon the upper lake coast.

#### *Tertiary Clays.*

A large proportion of the rocks of the peninsula are overlaid by a series of beds of clay, sand and gravel, that sometimes attain a thickness of several hundred feet. These beds compose a group

of deposites, the lower portions of which, so far as I am able to determine, are destitute of fossil remains. Some of the members of the group, would appear to be of a local character, occupying but a limited extent; while others are spread over a large area of country. Of these deposites, perhaps no one occupies a greater extent than the lower clay, which is nearly universal upon the border portions of the peninsula.

The members of this group are most largely developed upon those parts of the peninsula bordering on the coast, and they gradually become thinner as we proceed inland, until they finally wholly disappear; their place being supplied either by rock *in place* or by diluvial deposites.

The great thickness of the exposed portions of these *tertiary* beds, upon the northwestern part of the peninsula, afford ample opportunities for examining this interesting series of deposites. But since the consideration of the subject, *as a whole*, will be left to the future, a few allusions only will be made to some of the clays embraced in the series.

The lower clay, which is usually of a blue or bluish gray color, is almost universally more or less filled with imbedded pebbles, chiefly of *primary* rocks, which sometimes, though rarely, attain to several hundred pounds weight. These water-worn masses usually completely ruin the clay for all practical purposes, but in a few instances the clay has been found sufficiently free from them to admit of use, for the manufacture of bricks. The thickness of this clay is known only at a few points: and as the deposit was made unconformably upon an unequal surface, its thickness must be subject to very great variation. In the vicinity of Detroit it has been sunk completely through and found to have a thickness of 118 feet.

This lower deposit of clay, in the southeastern part of the state, is usually overlaid by a stratum, varying from 1 to 5 feet in thickness, of an exceedingly fine marly clay. This clay, when sufficiently free from lime, is well adapted to the manufacture of bricks and earthen ware.

On the northwestern side, bordering on Lake Michigan, the upper clays are much more largely developed than upon the more southeasterly portions of the peninsula. These deposites of clay

alternate with beds of sand and gravel, the whole sometimes attaining a thickness of from 100 to 400 feet. The separate beds vary considerably in character; the upper usually containing a much larger proportion of lime than the lower ones, yet they usually agree in possessing an extreme fineness of texture. Many portions of these clays, appearing in the abrupt shores of Lake Michigan, are well adapted to the manufacture of bricks and earthen ware, but they usually contain so large a proportion of lime as to render them unfit for use for those purposes. Some portions of these clays, in which lime enters largely as an ingredient, rather deserve the name of marls, and they are admirably adapted for use upon the sandy lands of the northern part of the peninsula.

#### *Shell Marl.*

Several beds of shell marl were noticed upon the northwesterly side of the peninsula; and upon the eventual settlement of the country they will prove of great value to the agriculturist, as well as for the manufacture of lime. In consequence of the unsurveyed condition of the country, it is impossible, at this time, to designate the localities.

White river of Lake Michigan takes its name from the occurrence of a bed of shell marl, of a very white color, directly at its mouth. The marl composing this bed would appear to have been deposited in an old channel of the river, which had been shut up by the action of the winds and waves upon the sand at its mouth, and afterwards to have been buried many feet in depth by drifting sands. In process of time the river returned to its former place of embouchure, thus laying bare the marl in question. It will prove a valuable material for the manufacture of lime, as well as for application to the light sandy lands in the immediate vicinity. The bed is not extensive.

#### *Gypsum.*

Gypsum occurs associated with the northern limestone, but for the most part under circumstances that will effectually prevent its being obtained in any considerable quantities.

Gypsum of a beautiful white color occurs in the bed of the lake a little north from Point au Gris river, but to what extent it is

impossible to determine, for it is covered by several feet of water, which will effectually prevent the working of the bed.

On the St. Martin's group of islands, near Mackinac, gypsum also occurs, chiefly in loose pieces, scattered over the islands. A bed of gypsum is said to be associated with the limerock in the immediate vicinity of these islands, and in such a situation that during the low stages of water, it appears above the surface; but at the time of my examination it was covered by several feet of water. I am informed that some years ago several ship loads of gypsum, collected in loose masses upon the St. Martin's islands, were transported to the lower lakes. Nearly all which appeared upon the surface has been removed, and the low level of the islands will effectually prevent any considerable explorations for more.

Gypsum also occurs on the *northern peninsula*, between Green Bay and Mackinac, but to what extent has not yet been determined. Small quantities have also been collected and shipped from this part of the coast.

#### *Change of Elevation in the Waters of the Great Lakes.*

Intimately connected with the geological changes which are taking place, from the deposits of detrital matter at the mouths of streams, and in the deeper portions of the lakes, together with the degradation of the lake and river coasts, are the changes in the relative level of the waters of the lakes; a subject to which the attention of our citizens has been more particularly called within the past two years.

The great interest which this subject possesses in connection with our lake harbors, as well as with those agricultural interests situated upon the flat lands bordering the lakes and rivers, may be a sufficient apology for the introduction, in this report, of the accompanying facts and reflections upon the subject. An accurate and satisfactory determination of the total rise and fall of the waters of the lakes, is a subject, the importance of which, in connection with some of our works of internal improvement and harbors, can, at this time, scarcely be appreciated.

Much confusion is conceived to have arisen, in the minds of a portion of our citizens, in consequence of a confounding of the re-

gular *annual* rise and fall to which the waters of the lakes are subject, with that apparently irregular elevation and subsidence, which only appears to be completed in a series of years; changes that are conceived to depend upon causes so widely different that while the one can be calculated with almost the same certainty as the return of the seasons, the other can no by means be calculated with any degree of certainty.

It is well known to those who have been accustomed to notice the relative height of the water of the lakes, that during the winter season, while the flow of water from the small streams is either partially or wholly checked by ice, and while the springs fail to discharge their accustomed quantity, the water of the lakes is invariably low.

As the spring season advances, the snow that had fallen during the winter is changed to water, the springs receive their accustomed supply, and the small streams are again opened, their banks being full in proportion to the amount of snow which may have fallen during the winter, added to the rapidity with which it has been melted.

The water of the lakes, in consequence of this suddenly increased quantity received from the immense number of tributaries, commences rising with the first opening of spring, and usually attains its greatest elevation, (at least in the upper lakes,) some time in the month of June or July. As the seasons advance, or during the summer and a large portion of the autumnal months, evaporation is increased, and the amount of water discharged by the streams lessened, in consequence of which the water of the lakes falls very gradually until winter again sets in, when a still greater depression takes place from the renewed operation of the causes already mentioned.

The *extreme variation* in the height of water from winter to summer is subject to considerable change, according as the winters may vary from cold and dry to warm and wet; but during the past eight years, it may be estimated at two feet.

This annual rise and fall of the water of the lakes, dependent as it manifestly is, upon causes which are somewhat uniform in their operation, must not be confounded with that elevation and depression to which the waters are subject, independent of causes

connected with the seasons of the year. These latter changes which take place more gradually, sometimes undergoing but little variation for a series of years, are least liable to be noticed, unless they be very considerable; but with respect to consequences they are of vastly more importance, since they are subject to a larger and more permanent range.

That the waters of the lakes, from the earliest settlement of the country, have been subject to considerable variation in relative height, is well known. At one time the belief was very general that these changes take place at regular intervals, rising for a space of seven years, and subsiding for a similar length of time; a belief which would appear to be in consonance with that of the Indians upon the peninsula, and with whom it no doubt originated. It is not wonderful that a subject, the causes of which are so little comprehended by our natives, should be invested with an air of mystery, or that an error once propagated (in consequence of the long series of years required to bring about any considerable change,) could scarcely be eradicated.

While the idea of the septennial rise and fall must be regarded as founded in error, it is nevertheless true that from the earliest records, the height of the lakes has been subject to a considerable variation, usually rising very gradually and irregularly for a series of years, and after this falling in a like manner.

Our old inhabitants agree in stating that the waters were high from 1800 to 1802; in proof of which it is stated that the roads which had before been in use upon the banks of the Detroit river, were so completely inundated as to be rendered impassable. A similar circumstance is related to have occurred in the vicinity of Chicago, a broad sandy beach forming the immediate shore of the lake near that place having been wholly overflowed.

I have been unable to obtain authentic information respecting the changes which took place between the years just mentioned and 1814, but from the latter year to the present time, we have a more connected series of facts relating to the subject.

"It is now a matter of record, that in 1814 and 1815 the Detroit and St. Clair rivers were unusually high; that the foundations of the houses, and much land that had long been under dry cultivation, were submerged. These buildings had been erected

many years before, and of course under the belief that they were aloof from all but extraordinary and temporary inundations. No observations appear to have been made upon the progress of the elevation, whether it were gradual or abrupt, or whether there were any preceding seasons of a character to produce it."

"In 1820, or about that time, the rivers had resumed their usual level. Several wharves were built at Detroit, between that year and 1828, at a height, as was supposed, sufficiently above the general level for all purposes of convenience and safety. At the latter date the rivers had again attained the elevation of 1815, and remained so until 1830, with only such occasional depressions as might be caused by strong winds, being nearly upon a level with the wharves."\*

From 1830, when my attention was first drawn to this subject, to the present year, I have been enabled to make a somewhat connected series of observations, under circumstances peculiarly favorably, having during that time followed the complete line of coast, from the foot of Lake Huron to the head of Lake Superior by canoe, and having traversed portions of the coast several times, thus being enabled to renew observations at points where they had been previously made. During the time of these examinations, I have been enabled to fix, with a considerable degree of certainty, upon the height at which the waters of the lakes stood in 1819 and '20, when they were at their lowest level; a step which was conceived to be one of the first, necessary in determining the complete range between high and low water.

For the last two years my attention has been more particularly called to the coast of lakes Huron and Michigan, and I feel confident in asserting that the water of these lakes has, during the last year, (1838,) attained a greater elevation than has before occurred in a very great number of years; a fact which is conclusively shown by the renewed degradation of banks covered with debris, that had long remained undisturbed, as well as by the great number of forest trees, sometimes covering many acres of ground, that have been destroyed in consequence of inundation.

\*The above extracts are from the pen of Col. Henry Whiting, U. S. Army, and their value is much enhanced from the fact that they embrace only such portions of the subject as were the result of his personal observation.

Many of these forest trees may be estimated to have attained an age of from one to two centuries.

In order to arrive as nearly as possible at correct conclusions as to the variation in the height of the water of the lakes from 1820 to 1838, I have carefully compared my own observations with those contained in an invaluable register, kept in this city by Col. Henry Whiting, U. S. Army, as also with the valuable data contained in the report of the State Topographer, hereto appended. It should be noted that the height of the water in the Detroit river is much more subject to fluctuation from slight causes, such as the effects of the winds and ice, than that in the open lakes; causes for the operation of which, it is sometimes difficult, if not impossible, to make the proper allowance. In fact, slight causes are productive of such changes as to render it absolutely impossible to arrive at accurate conclusions, except by simultaneous observations, made at points widely separated.

Assuming June 1819 and 20 as zero, or the point of low water, the following table will not vary very far from an accurate statement of the relative height for several of the subsequent years.

	Ft. In.
June 1819 and 20,	0.00
“ 1828, rise,	2.10
“ 1830, same level,	2.10
“ 1836, rise,	10—3.08
“ 1837, “	5—4.01
“ 1838, “	7—4.08 Total.

In examining this table of relative heights, it should be borne in mind that this estimate does not include the regular yearly variation to which the waters of the lakes are subject. The estimates, it will be seen, are made from June of each year, or that month in which the waters are invariably high; but it is conceived the result would not be varied were the calculations made from any other month in the year, provided the same month were selected for the observations of the succeeding years. Were the difference in height computed from February, 1820 to June, 1838, the total amount would be found to be increased to about six feet eight inches, a method of estimating which would lead to conclusions wholly unwarranted; nevertheless the assumption of these defec-

tive premises may serve to account for the exaggerated statements which have so often been made, of the increased height of these waters.

This rise of water has by no means been confined to the great lakes, for the waters of the small lakes through the whole interior portions of the state have, unless their waters are discharged through broad and shallow outlets, been increased in a like manner. Small streams the width of which, at their points of intersecting the section lines, were recorded by the United States' surveyors, in those surveys made from 1820 to 26, have been found, in many instances, during the past year, to have nearly double the width assigned them; and mills have actually been erected upon streams which, according to the field notes taken in the years mentioned, must at that time have been nearly dry. It is also well known that within the last few years, (preceding 1838,) portions of the elevated country which were previously dry, have been inundated with water; springs have burst out where they had been previously unknown, and that marshes, which before contained but little water, have been transformed into small ponds or lakes.

These changes have not been peculiar to Michigan, for they have been noticed, more or less, over the whole western part of the United States, and perhaps it may not be too much to add, over most of the northern part of the continent; and they are changes which, from the immense extent effected, must depend upon causes which have operated in a very general manner.

It is well known that the water of all streams, during the occurrence of a wet and cold season, when the fall of rain is increased and evaporation diminished, is augmented, and that the augmentation or diminution will be in proportion as these causes are in more or less active operation. Our great chain of inland lakes, so far as these causes may be supposed to operate, may be regarded as a stream of great width, and must necessarily be liable to be affected by similar causes; although when the great extent occupied by these bodies of water is taken into consideration, it can be readily understood why these causes when once brought into operation would produce their results more slowly,

as well as why the results once produced would be of a more permanent character.

That the changes in the relative height of the waters of the lakes may be dependent upon the operation of a similar series of general causes, operating for a succession of years, I have many reasons for inferring. The succession of cold and wet seasons immediately preceding 1838, have been proverbial over the whole western country; and the unfavorable influence which these wet seasons have produced, more particularly upon those farming interests situated on low and flat lands, has been severely felt by that portion of our agricultural community. While these facts may be apparent to all, it is nevertheless desirable to refer to the subject in a more definite manner; a task which is rendered somewhat difficult, for the reason that, until the last few years, continuous tables, indicating the amount of rain which has fallen, have only been kept at a very limited number of places in the U. States.

The total amount of rain which fell at Philadelphia (as shown by a register, chiefly kept at the Pennsylvania Hospital) from 1810 to 1814 inclusive, or during the five years immediately preceding the high water of 1814 and '15, was 185.68 inches; and the amount which fell at the same place from 1815 to 1819, the five years immediately preceding the low water of 1819 and '20, was 151.14 inches; showing an excess of 34.53 inches, or a fraction over 2 feet and  $10\frac{1}{2}$  inches for the years immediately preceding the stage of high water.

The amount of rain which fell at Philadelphia, as deduced from the same table, from 1816 to 1826 inclusive,\* was 364.43 inches, and from 1827 to 1837 inclusive,† 451.05 inches, being an increase, in the last eleven years, of 86.62 inches, or a fraction over 7 feet  $2\frac{1}{2}$  inches.

The amount of rain which fell at Marietta, Ohio, (as deduced from the tables of Dr. Hildreth,) from 1819 to 1823 inclusive,‡ was 202.83 inches, and from 1828 to 1832 inclusive,|| was 228.17,

\* Eleven years, embracing the complete time from which the waters had perceptibly commenced falling, until they had again nearly attained the same altitude.

† Eleven years, during most of which time the waters have been steadily increasing in height.

‡ Five years, embracing the time of low water.

|| Five years, during most of which time the water was increasing in height.

showing an increase during the last five years estimated, of 25.34 inches or a fraction over 2 feet  $1\frac{1}{2}$  inches.

That there has been a corresponding increase in the amount of rain that has fallen within the area of the great lake basin, I am not able to show by actual data, but the known increased size of the numerous tributaries, together with the other facts mentioned, will go far to substantiate the opinion that the fall of rain over that area has been greatly increased during that time.

According to the estimate of the State Topographer, it appears that the basin of the great northwestern lakes has a superficial area, nearly four times larger than that of the lakes themselves. Now if we may be allowed to assume that the increase of the amount of rain which has fallen into this basin, during the last eleven, of the fourteen years estimated, be equal to the increase at Philadelphia, during that time, it would follow that, had all sources of discharge been cut off, this cause alone would have been sufficient to elevate the waters of the lakes about 29 feet;\* an elevation more than six times greater than that which is estimated to have taken place.

When we take into consideration, in connexion with the causes already enumerated, the fact that during the wet years, evaporation must have been less than during the dry ones, it may fairly be presumed that sufficient *apparent* causes have existed, to produce all the results which have been noticed; and we may add, should a succession of dry and warm seasons follow, we may look with certainty for a return of the water of the lakes to its former low level.

#### SOUTHERN PART OF THE PENINSULA.

A small portion of the season was devoted to general examinations, chiefly in the counties of Calhoun, Branch, Hillsdale and Jackson, but as it is proposed to commence the minute examination of these counties with the first opening of spring, it will not be desirable to lay the mass of facts collected, before you at this time.

The *county of Calhoun*, which in an agricultural point of view

\* It is not, of course, supposed, that had the sources of discharge been cut off, this would have been the *actual* result, for the estimate is made without any reference to the increased evaporation and other causes, which would have been brought into action in consequence of the extended area.

cannot be looked upon as second to any county in our state, is abundantly supplied with many of those materials which, if properly appreciated, may be made to add much to the eventual prosperity and wealth of the people. But while the agriculturist reaps a rich reward for his labor, in abundant crops, he should not fail to bear in mind, that the soil which is now yielding so abundantly, will, unless the most watchful care be used, sooner or later be rendered comparatively sterile. With a lavish distribution of all that will be required to retain the original fertility of the soils of this county, it is to be hoped that those most deeply interested will not neglect to turn the materials around them to the best account.

The whole northern part, *at least*, of *Calhoun county*, is based upon the sandstone series of the great carboniferous group of rocks. The outcropping edge of this rock furnishes an abundance of a material well adapted to the purposes of building. Quarries have been opened, at short intervals, through nearly the whole of that portion of the county traversed by the Kalamazoo river, as well as upon several of the tributaries of that stream, and with a little care in selection, it is admirably adapted to the purposes to which that rock is usually applied.

*Shell marl* occurs at numerous points in the county, occasionally in beds of considerable extent, and it may be profitably applied to use, either as a manure or for the manufacture of lime, an article, of which, under other circumstances, the county would be nearly destitute.

*Fibrous peat* also occurs in considerable quantities, and when properly prepared, in the compost heap, will prove of great value to the farmer in enriching his lands.

The articles of marl and peat, occurring as they do, at very short intervals through most of the county, will eventually be of a value, in sustaining the agricultural interests, that at the present time can scarcely be appreciated. It is true that most of the gravelly soils, which predominate through Calhoun county, contain at this time, sufficient calcareous matter to favor the growth of the small grains, more particularly wheat and rye, which are well known to require a comparatively large proportion of that ingredient in the soil, to insure productive crops; but the time will

come when this will cease to be the case, and when the marl beds must be called upon to supply the deficiency.

The county of Calhoun, together with the adjoining portions of Jackson and Hillsdale, abounds in large springs, which having their sources deep in the sandstone, are little liable to be affected by the droughts of summer. The waters of these springs are, for the most part "hard," in consequence of the contained salts of lime, but they are usually of great transparency and coldness. Several springs were noticed, the waters of which were so highly charged with carbonate of lime, as to have given rise to somewhat extensive beds of tufaceous marl.

No rock, *in place*, was noticed in the southwestern part of Calhoun, but a little south, and just within the line of Branch county, a deposit occurs, which may probably be referred to one portion of the carboniferous group, though this connection has not absolutely been shown to exist.

The deposit consists of a tough semi-indurated and stratified clay, having at first sight much the appearance of a very fine sandrock. It contains imbedded clay iron stone, composed as usual, of thin concentric layers of the carbonate and hydrate of iron, surrounding nodular masses of septaria.

The iron ore in question is of the same character as that from which much of the iron of our neighboring state, Ohio, is manufactured, and should future examinations show the deposit to contain the ore in sufficient quantity to admit of working, it cannot fail to prove of immense importance to the surrounding country. Occurring as the ore in Branch county does, upon the borders of a township, nearly the whole of which is heavily timbered, very great facilities exist for procuring the materials necessary for its reduction.

The "kidney ore" is usually reduced with great facility, and in the large way, in the furnaces of Ohio, yields from 30 to 37 per cent of cast iron.

Portions of the clay embraced in the deposit under consideration, if care be used to select such only as is free from iron, will prove of great value for the manufacture of stone ware, fire bricks, &c. The presence of lime, it is well known, renders clay unfit for the manufacture of the articles mentioned; for the rea-

son that the clay, by this admixture, is rendered fusible at a comparatively low temperature. The great mass of the clay alluded to, contains only a minute proportion of lime; and being so situated that it may be obtained with facility, it may be very advantageously applied to the purposes mentioned.

The deposit under consideration was first noticed on the Cold-water river, a short distance above the junction of that stream with the St. Joseph, where it appears in the bed of the stream, and also forms the banks, attaining an elevation of from 10 to 12 feet. The outcropping edge was traced for a distance of from one to two miles, and it was also found, but slightly covered with soil, extending over an area of from 800 to 1000 acres. It is not supposed, however, that the complete extent of its near approach to the surface has been examined, for there can be little doubt that the range will be found to be quite extensive.

Allusion has already been made to the numerous springs which occur in Calhoun county; but in no portion of the state has such an abundance of large springs been noticed as in the southwestern parts of Jackson county. Springs were here observed, frequently at very short intervals, discharging almost incredible quantities of water, and in some instances giving rise to streams of considerable size, at once. The waters of the larger of these springs are invariably found to proceed from the sandrock. They are little liable to be affected by drought, and, as I am informed, never freeze. The waters of those springs examined had, during the month of October, a temperature ranging from 47° to 49° Fah.

The counties of Branch, Hillsdale and Jackson, like that of Calhoun, abound in beds of shell and tufaceous marl, which is usually well fitted for the manufacture of lime, or for use for agricultural purposes. Ligneous peat also frequently occurs, and it may, with proper preparation, be rendered of much value as a manure.

#### *Coal.*

We have been enabled, during the past year, considerably to extend the small amount of information before transmitted to you, respecting the coal beds of our state; and although, from the limited extent of the minute examinations in the coal district, I am still

unable to place the subject before you in such a manner as could be wished; its great importance would, nevertheless, seem to call for an allusion, at least, to such additional information as has been obtained.

By reference to the report of C. C. Douglass, Assistant Geologist, hereto appended, on the subject of the minute surveys of Ingham and Eaton counties, it will be seen that the main bed of coal, which traverses the central counties of the state, has been traced northerly to within a few miles of the south line of Shiawassee county; and that the bed has been found of sufficient thickness to admit of being profitably worked.

Much labor will be required in order to determine the north-easterly limit of the coal range; but so many facts respecting the line of its *outcrop*, have been collected, that the labor will be considerably lessened during the continuance of the examinations. The unbroken character of the country, together with the readiness with which the rock embracing the coal, disintegrates, thus covering the outcropping edges with debris, throw obstacles in the way of a connected series of examinations, which are severely felt; but thus far, we have been enabled to combat these difficulties with greater success than could have been anticipated.

The line of coal has also been traced southwesterly into Jackson county, where the bed is of sufficient thickness to admit of being worked, and the coal is of a quality well fitted for all the purposes to which that substance is usually applied.

Two miles, in a southeasterly direction, from the village of Barry, (Jackson county,) some explorations have been made, and an amount, estimated at about 1500 bushels of coal, raised. This coal has been applied to use in the blacksmiths' shops of the vicinity, and is mostly of good quality, although it is occasionally somewhat injured by the presence of iron pyrites. For the reason that the outcrop of this bed is nearly on a level with the water of Sandstone creek, the persons engaged in the work were unable to sink completely through the coal; it was, however, penetrated at one point, to a depth of about three feet. The immediate banks of the stream rise, by a gentle acclivity, to a height of from ten to fifteen feet, and by renewing the examinations upon that side of the stream opposite to the dip of the strata, they may

be conducted free from the difficulties before mentioned. This bed of coal is associated with a series of shales and sandstones, in a manner similar to that of the other beds in the state. The coal is highly bituminous, a character in common with all that has been seen in the state, and it may safely be said that none other need be looked for on the peninsula.

From facts now before me, I am led to hope, that coal will be found in the elevated hills of the northern part of the peninsula, easterly from Little Traverse bay; a circumstance which, should it prove to be the case, will add much to the value of that portion of the state.

#### SALT SPRINGS AND STATE SALT LANDS.

The subject of salt springs, which was laid before you, somewhat at length, in the first annual report from this department, has been partially re-examined during the past year, and the observations considerably extended. These renewed examinations have served to add confidence to the hope then expressed, that a portion of these springs will eventually prove of value to the state. Many springs, before unknown, have been observed, and would be more particularly noticed had not the facts, involving the *main question*, been before submitted.

The progress which had been made in the improvements directed to be commenced "at one or more of the state salt springs," has been duly submitted to you in a separate report. Since the reception of your instructions to continue the improvements, which had previously been partially suspended, the work has been renewed with a vigor commensurate with its importance. Should the examinations in progress lead to favorable results, as we trust they will, this important addition to the products of the state, cannot fail to add to its prosperity; while, should we fail in our anticipations, the income which may be derived from the lands, will create a sinking fund, that may soon be made to reimburse to the state, the amount which may be expended for that purpose.

Of the salt springs granted to our state by the general government, five yet remain to be located; which, with their contiguous lands, will amount to thirty sections. The location of these lands has been thus far delayed, in consequence of the unfinished

condition of the United States' surveys, they not having been sufficiently completed to allow those selections to be made which were most desirable. Nor have we, as yet, been enabled to obtain from the general land office "plats" of the sections of country, in which it is proposed to complete those locations. Since, according to the terms of the grant, the returns of these lands are required to be made during the current year, it becomes a matter of no small moment to complete the selections at the earliest day possible; in view of which, so soon as the necessary information can be obtained from the general land office, steps will be taken to complete the locations.

#### ZOOLOGICAL AND BOTANICAL DEPARTMENTS.

These departments of the geological survey, which, during the year 1837, were united under the direct charge of Dr. Abm. Sager, have, in conformity to the provisions of the revised act, been separated into two distinct departments, that of zoology having been left in charge of Dr. Sager, while that of botany was placed under charge of Dr. John Wright.

The success which has attended the labors of the heads of these departments, is of the most flattering kind, and affords ample proof that the high character which those gentlemen have sustained as men of science and industry, has not been misplaced, and that we may anticipate from their labors the most interesting and useful results.

The subjects falling within the scope of these departments, being of a more abstruse character, do not so readily admit of being treated in a disjointed manner, as the other subjects of the geological survey; for which reason the heads of these departments, in most of the states where these surveys are in progress, have not been called upon for annual reports, it being intended to embody the whole at once, in a final and connected report. As our own state is somewhat differently circumstanced, having been less explored, it was deemed advisable to throw together such catalogues as would furnish those persons who have devoted attention to the subjects in our state, a skeleton of the progress that has been made, hoping thereby to elicit such additional information as

may be at hand. The reports of the zoologist and botanist, numbered 1 and 2, are hereto appended.

The fact that there is, in reality, but one science in nature, and that all the subdivisions of that science are to a great extent, arbitrary, is frequently lost sight of in our utilitarian age; a circumstance to which, no doubt, may in part be ascribed the general disposition to scan results closely, while the steps necessary to bring about those results are scarcely considered. We are thus too often disposed to consider as of little value or importance, those very subjects, the laborious investigation of which are daily adding to our comfort and enjoyment.

The man who should richly endow an institution would be looked upon as a benefactor; while the man of science who should engage in a patient investigation of the habits of the Hessian fly, and thereby be able to suggest some successful expedient for avoiding the ravages committed upon our wheat fields, would, no doubt, be looked upon as one engaged in a work of no value to his fellow men; yet, if we look at results, the latter would be much more eminently entitled to the name of benefactor.

One of the fathers of natural history, after carefully studying the habits of a small worm that had proved destructive to the timber in the navy yards of his country, suggested a simple yet perfect remedy, thereby saving annually more than a million of dollars to his government; yet, during these investigations, he was stigmatized as one engaged in a work which was wholly unworthy his attention, and which could not possibly prove of any practical value.

The subjects of geology may be regarded as so intimately connected with the other departments of natural history, as to be absolutely inseparable. "All the branches of natural history, and most of the other sciences, cluster around geology, and lend to it and each other a mutual support. No man can make great advances in all the branches of geology; the proper course to be pursued, is for each individual to become acquainted with the outlines of the subject, and then devote his attention to some particular branch of enquiry. It is by such a division of labor, that geology has advanced so rapidly within a few years. The geologist must have

the results of such labors before he can draw definite conclusions on some points of geology."\*

When the work in the departments under consideration shall have been completed, it is proposed to embody in a final report, in a condensed yet intelligible manner, all that has been elicited during the progress of the examinations, as well as what is now embodied in abstract works upon those subjects. While an attempt will be made to render this of value to the man of science, the subjects of practical utility will, nevertheless, be kept constantly in view.

The medical properties and various uses to which the indigenous plants of our state may be applied, are at this time scarcely known, and less appreciated, by our citizens; and while we are looking abroad for many articles necessary to our health and comfort, the very same articles, or those which will answer the purpose equally well, are growing in abundance around us.

#### COLLECTIONS FOR THE STATE UNIVERSITY.

That portion of the duties assigned the geological board, involving the collection of specimens of natural history for the university, has received as large a share of attention as a faithful performance of the other duties assigned would permit. The present time, no doubt, offers a more favorable opportunity to supply the parent university and its branches with specimens of natural history, than any that will again soon occur. In view of the limited facilities which are afforded for the study of these subjects in the colleges of our country, as also of the character which the addition of such facilities would give to our state institution, the board of regents have manifested a deep anxiety to furnish every facility in their power to aid in making these collections as perfect as possible.

The collections already made in the several departments of mineralogy, geology, zoology, and botany are in such condition that they may be readily transferred to the university, at Ann Arbor, whenever the proper arrangements shall have been made by the regents for that purpose.

\* Governor Marcy's report to the Legislature of the state of New York, on the subject of the geological survey of that state.

The board of regents have already furnished ample rooms, in this city, as a temporary place of deposit for the collections now being made.

TOPOGRAPHICAL DEPARTMENT, MAPS, &c.

This department of the geological survey, which was duly organized under the provisions of the act of 1838, has been placed under the immediate charge of S. W. Higgins, Esq. whose report, No. 3, is hereto appended.

The arduous duties connected with this department have been performed with a degree of energy and devotion which deserve the highest encomiums; and we trust it may result in furnishing for our state an amount of accurately delineated geographical and topographical information, which will not be exceeded by any state in our union.

The present time is an exceedingly favorable one for carrying forward this portion of the work; for at this time, while the state engineers are engaged upon our works of internal improvement, and while the United States' surveyors are engaged in subdividing the northern part of the peninsula, we are enabled, with a comparatively small amount of labor and expense, to collect a vast amount of the most accurate geographical and topographical information, which unless recorded at once would soon be lost.

The necessity for the construction of accurate geographical maps, for the delineation of the geology and topography of the state, can be easily understood; and without the former, the projection of the latter would be a dead letter. The inaccuracy of our present maps, together with their reduced scale, is well known; and the necessity for the construction of those of a larger and more perfect character, has been deeply felt by every person whose attention has been called minutely to the subject. In order to avoid the embarrassment which this defective character of geographical information is daily producing, it is very desirable that the remedy should be provided, with as little delay as may be compatible with the magnitude of the work.

Maps of the separate counties of the state, have been commenced, upon a scale of two miles to the inch;\* a size which will

\* This scale is a fraction larger than that adopted by the surveyor general of the state of New York, for the maps of that state, which were constructed under his direction.

enable us to place upon them most of that information which will be required for the use of town and county officers; such as the length of fractional section lines, variations in the surveys, width of streams at the crossings of the section lines, principal roads, &c. &c. Upon these maps, when completed, will also be introduced the complete geology and topography of the country.

In order that the materials upon which to base these maps may always be at hand, the complete original United States surveys, so far as returns have been made to the land offices of the state, have been copied: and steps have been taken to procure from the general land office those new surveys in progress, immediately upon the transmission of the returns by the deputy surveyors. These "plats," however, only designate the small streams and marshes at the crossings of the section lines, leaving the whole interior of the sections to be filled up. In order to accomplish the immense work of filling up the deficiencies in the township maps, each of the assistants engaged in the survey, is instructed to take into the field perfect copies of the original surveys of the district in which he may be engaged, and to return the same with the streams carried out, across the interior of the sections, together with an accurate delineation of the marshes, small lakes, ranges of hills, the area of different kinds of soils, timbered lands, openings, prairies, the courses of the township roads, &c. &c., as also with the geology, and so much of the topography, as the work may warrant.

The difficulties connected with the construction of accurate maps, of the older counties of the state, are much increased in consequence of the inaccuracy of the original United States' surveys. In fact, so great is the discrepancy, in many instances, as to lead to the inference that some of the subdivisions were made, or platted, without going upon the ground. And where the lines, in many parts of these counties, were "run," the variation between the actual and proposed course is so great, as to render it nearly impossible to make the "work close." Many streams, of considerable magnitude, are wholly omitted upon these "plats"; lakes and swamps are placed where none exist; and small lakes, in a few instances, have been found to be upon sections widely separated from those upon which they are represented, facts which are

known to have given rise to mistakes of a most serious character. Instances can be cited where lands have been purchased at the land office, by reference to the "plats" on file, and these lands afterwards found to be completely covered by the waters of a lake; others, where in consequence of erroneous marks at the corners of sections, lands have been "entered" several miles distant from those intended; circumstances which have given rise to much individual distress.

In connection with this subject, I would respectfully call your attention to the importance of dividing the northern portion of the peninsula into counties, and assigning to each a definite limit, with as little delay as the progress of United States' surveys will permit. The most natural divisions may as readily be determined from information which will be elicited during the continuance of the work in progress, as at any future time. By adopting this course before private interest comes to clash upon the subject, much legislation may be avoided; at the same time that it will throw those portions of our state into such a form that they may be more satisfactorily projected upon the maps now in progress. No possible objection, it is conceived, can be urged against this course, while it may fairly be supposed it will result in great good.

#### REPORTS OF GEOLOGICAL ASSISTANTS.

The reports of Messrs. C. C. Douglass and Bela Hubbard, assistants in the geological department proper, of the survey, numbered 4 and 5, are hereto appended. The great mass of geographical and topographical information which they have been industriously engaged in collecting, could not be laid before you, except in connection with complete maps of the counties in which they have been engaged. The duties which were assigned these assistants, notwithstanding the numerous difficulties by which they have been surrounded, have been accomplished in a manner highly creditable; and we have now on file nearly all the matter requisite for the complete elucidation of the condition and resources, as well as for the construction of maps of the counties, in the survey of which they have been engaged.

The consideration of that portion of the work which relates more particularly to agriculture, it has been deemed advisable,

thus far, to defer, for the very good reason that sufficient time has not yet elapsed for the complete analysis of the soils, a labor which must be performed before minute practical conclusions can be drawn. The extent of certain characters of soils, in the counties examined, together with their adaptation to the purposes of agriculture, and the remedies necessary to supply any defects in their composition, are subjects, to the consideration of which much time has already been, and will hereafter be devoted.

Upon the first opening of spring, it is proposed to renew the minute surveys in the southern counties of the state, and to complete the work, in each of those counties, as rapidly as circumstances will permit.

The difficulties by which we were surrounded in perfecting the survey, under the original act, have been removed by the present plan of organization, and moving on as a whole, the assistance and support given each other, by the separate departments, is such, that a much larger amount of labor is accomplished than, under other circumstances, could possibly be done, while the work is, at the same time, rendered uniform and complete.

In conclusion, I would respectfully tender through you my grateful acknowledgements as well for the uniform kindness with which I have been received, as for the valuable information and assistance which has been rendered to the work in progress, by the citizens of our state.

DOUGLASS HOUGHTON,  
*State Geologist.*

## DOCUMENTS.

(No. 1.)

### REPORT

Of Doct. ABM. SAGER, Zoologist of Geological Survey.

*Detroit, January 12, 1839.*

TO DOUGLASS HOUGHTON, STATE GEOLOGIST.

SIR—In conformity to the provisions of an act approved March 22, 1838, providing for a geological survey of the state, the undersigned respectfully submits the following report of the progress made in the zoological department.

Previous to submitting the result of the investigation in this department during the past year, permit me, for the satisfaction of those whose liberality and zeal for the interest of our state authorized the survey, to present a condensed view of the objects and anticipated results of the investigation in this department.

To investigate as far as practicable the mode of existence, the relative position, office and influence in the sentient organic world of every animal native to our state, from the insect of ephemeral existence, the worm that wends its way darkling through a brief and simple life, to the quadruped of most varied and complicated structure and functions, more especially their relation to and influence, either direct and obvious, or indirect, upon the interest and happiness of man; operating by the development of our intellectual and moral natures, and ministering to our physical necessities,—to ascertain if possible the means of rendering them directly subservient to our interests and avert the evils arising from an excessive development of the species.—to collect, preserve and systematically arrange, in order to display affinities of structure, specimens of every species, and materials illustrative of their

habits and instincts, the whole with a view to excite and disseminate a taste for the interesting and important study of zoology :— These appear to have been the objects contemplated by the legislature that framed and enacted the bill authorizing the investigation.

It must be obvious to every reflecting mind, that no well directed or availing efforts can be made, either to improve the advantages or avert the evils growing out of our connection with the animal world, without an intimate acquaintance with their structure, capabilities and habits. Destitute of this knowledge, we but strike in the dark, and are more likely to impair than promote our interests.

It will be seen at a glance that the subject is of vast extent ; and surely if the study of the phenomena of the inorganic world, with a view to determine its general laws, of which to avail ourselves to advance our interest, is worthy of encouragement as of last importance, not less so are those manifold and varied manifestations of the Infinite that constitute the phenomena of the organic world, and the proper study of the Botanist and Zoologist. Nor should we anticipate less important results when those studies have been prosecuted to the educing those general principles that rule the organic creation, than we already derive from an acquaintance with those by which the inorganic world is directed and governed. As intellectual pursuits, in moral interest and sublimity, they do not concede the palm of superiority to any other subjects whatever. Surely the mind that can view from the pinnacle of the temple of science, at a glance, the whole organic world outspread beneath him, can comprehend its vast and intricate machinery, and behold it moving by a few simple, uniform and unvarying principles, is favored with a prospect not less sublime than that to whose intellectual vision the whole inorganic world is revealed.

As early in the season as the necessary arrangements and preparations would permit, we commenced our labor, the results of which will, in part, be found in the subjoined catalogue. Of many of the species contained in the catalogue, the requisite number of species have been preserved ; of some other species, a much larger number than was required have been collected, with a view to foreign exchanges, and in consequence of the rarity of others

not a sufficient number have been secured. Besides the species enumerated in the catalogue, a very considerable number belonging to the inferior classes have been obtained, but do not yet admit of arrangement in a catalogue. Although a considerable amount of materials have been collected towards forming a history of the subjects of our investigation, yet much remains to be accomplished before the subject can be said to approach completeness.

ABM. SAGER, *State Zoologist.*

## CATALOGUE.

## CLASS MAMMALIA.

- Order Quadrumana  
 Fam. Vespertilionidae. Gray. Bats  
 Sub-fam. Vespertilioninae. Gray.  
 Vespertilio arcuatus. Say.
- Order Ferae. Linn.  
 Fam. Felidae  
 Lupus occidentalis. Rich. Wolf  
 Vulpes fulvus. L. Red fox  
 Fam. Mustelidae. Sw.  
 Sub-fam. Ursinae. Sw.  
 Procyon lotor. L. Raccoon  
 Sub-fam. Mustelinae. Sw.  
 Putorius lutreola. Cuv. Mink  
 Fam. Soricidae. S.  
 Sorex parvus. Say. Shrew  
 Scalops canadensis. Cuv. Canada mole  
 Condylura macroura. Harl. Star nosed mole
- Order Glires. Linn.  
 Div. 1st. Claviculata  
 Fiber zibeticus. L. Musk rat  
 Arvicola ———  
 Meriones canadensis. Ill. Jumping mouse  
 Spermophilus Hoodii. F. Cuv.  
 Sciurus vulpinus? Gm. Fox squirrel  
 carolinensis. L. Gray squirrel  
 Sciurus hudsonius. L. Chickaree  
 niger. L. Black squirrel  
 Tamia striata. Kl. Ground squirrel  
 Div. Inclaviculata  
 Lepus americanus. Gm. American hare

## CLASS AVES.

- Order Raptores  
 Fam. Falconidae  
 Sub-fam. Aquilinae. Eagles  
 Pandion americanus. Sw. Fish eagle  
 Aquila leucocephalus. Bald eagle  
 Sub-fam. Buteoninae. Buzzards  
 Buteo Sancti Johannis. Gm. Black hawk  
 lagopus. ? Roughed legged hawk  
 lineatus, Aud. Red breasted hawk  
 Circus cyaneus. L. Marsh hawk  
 Sub-fam. Falconinae. Falcons  
 Falco peregrinus. Gm. Wandering falcon  
 sparverius. L. Amer. sparrow hawk  
 columbarius. L. Pigeon hawk  
 Sub-fam. Accipitrinae. Hawks  
 Accipiter pennsylvanicus. Sw.  
 Cooperi. Nutt. Cooper's hawk  
 Astur borealis. Sw. Red tailed hawk  
 Fam. Strigidae Owls  
 Scotophilus acadica. Sw. Little owl  
 Otus. brachyotus. Sw. Short eared owl  
 vulgaris. Sw. Long eared owl  
 Asio virginiana. Sw. Great horned owl  
 Ulula nebulosa. Cuv. Barred owl  
 Nyctea candida. Sw. Snowy owl  
 Surnia funerea. Dum. Hawk owl
- Order Insessores—Perchers  
 Tribe Dentirostres  
 Fam. Laniadae  
 Sub-fam. Lanianae  
 Lanius septentrionalis. Gm. Shrike  
 Sub-fam. Tyranninae  
 Tyrannus intrepidus. Sw. Great crested king bird  
 crinita. Sw. King bird  
 inornata. Nutt  
 Tyrannula fusca. Sw. Phebe

- Tyrannula virens*. Sw. Wood pewee  
*acadica*. Sw. Little pewee  
*Traillii*. Sw. Trail's pewee
- Fam. Merulidae  
 Sub-fam. Merulinae  
*Orpheus polyglottis*. Sw. Mocking bird  
*rufus*. Brown thrush  
*felivox*. Sw. Cat bird  
*migratorius*. Sw. American robin  
*mustelinus*. Sw. Wood thrush.  
*aurocapillus*. Golden crowned thrush  
*aquaticus*. Water thrush
- Fam. Sylviidae  
 Sub-fam. Saxicolinae  
*Sialia Wilsonii*. Sw. Blue bird.  
 Sub-fam. Sylvianae  
*Culicivora coerulea*. Sw.  
 Sub-fam. Parianae  
*Setophaga ruticilla*. Sw. Amer. redstart  
*canadensis*. Sw. Canada flycatcher  
*cucullata*. Sw. Hooded flycatcher  
*Dumecola (?) Wilsonii*. Sw. Wilson's flycatcher  
*Sylvicola americana*. Sw. Blue yellowbacked do  
*discolor*. Sw. Prairie warbler  
*coronata*. Sw. Yellow crowned warbler  
*castanea*. Sw. Baybreasted warbler  
*icterocephala*. Sw. Chesnutsided warbler  
*Blackburnae*. Sw. Blackburnian warbler  
*virens*. Sw. Summer yellowbird  
*Canadensis*. Blackthroated blue warbler  
*Vermivora pinus*. Sw. Pine warbler  
*chrysoptera*. Sw. Goldenwinged warbler  
*rubricapilla*. Sw. Nashville warbler  
*Mniotilta varia* Veill. Black and white creeper  
*Parus palustris*. L. Black cap tit  
*Trichas personatus*. Sw. Maryland yellowthroat
- Fam. Ampelidae  
 Sub-fam. Vireoninae  
*Vireo olivaceus*. Wils. Redeyed greenlet

- Vireo flavifrons*. Veill. Yellowthroated greenlet  
*noveboracensis*. Bon. White eyed greenlet
- Sub-fam. Bombycillinae  
*Bombycilla carolinensis*. Briss. Cedar bird
- Sub-fam. Garrulinae  
*Cyanurus cristatus*. Sw. Blue jay
- Fam. Sturnidae  
 Sub-fam. Scaphidurinae  
*Quiscalis versicolor*. Veill. Crow Black bird  
*Scolecophagus ferrugineus*. Sw. Rustle grackle
- Sub-fam. Icterinae  
*Icterus Baltimore*. Daud. Golden oriole  
*spurius*. Bon. Orchard oriole
- Sub-fam. Aglainae  
*Dolichonyx orizivora* Sw. Rice bunting  
*Agelaius phoeniceus*. Bill. Swamp black bird  
*Molothrus pecoris*. Sw. Cowpen  
*Sturnella collaris*. Bill. Meadow lark
- Fam. Fringillidae  
 Sub-fam. Coccothraustinae  
*Coccyborus ludovicianus*. Sw. Redbreasted grosbeak  
*Carduelis americana*. Sw. Yellow bird
- Sub-fam. Tanagrinae  
*Phoenisoma rubra*. Sw. Summer red bird  
*Pipilo erythrophthalmus*. Veill. Towee bunting
- Sub-fam. Fringillinae  
*Fringilla graminea*. Wils. Ground sparrow  
*juncorum*. Lath. Field sparrow  
*Zonotrichia savannarum*. Sw. Savanna finch  
*leucophrys*. Sw. White crowned sparrow  
*pennsylvanica*. Sw. White throated do.  
*melodia*. Sw. Song sparrow  
*Anmodramus palustris*. Sw. Swamp sparrow  
*Chondestes strigata*. Sw. Lark finch  
*Emberiza canadensis*. Sw. Tree sparrow  
*americana*. Wils. Black throated bunting  
*cyanea*. Sw. Indigo bird  
*Plectrophanes nivalis*. Selb.

- Sub-fam. Alaudinae  
*Alauda cornuta* Wils. Lark
- Sub-fam. Motacillinae  
*Anthus aquaticus*. Bech.
- Tribe 3d, Scansores
- Fam. Picidae  
*Picus villosus*. L. Hairy woodpecker  
*pubescens*. L. Downy woodpecker  
*Dendrocopus varius*. Sw. Yellow bellied woodpecker  
*Dryotomus pileatus*. Sw. Log cock  
*Colaptes auratus*. Sw. Flicker  
*Melanerpes erythrocephalus*. Sw. Red headed wood-  
 pecker  
*Centurus carolinus*. Sw. Carolina woodpecker
- Fam. Certhiidae  
 Sub-fam. Certhianae  
*Certhia familiaris*. L. Creeper
- Sub-fam. Sittinae  
*Sitta carolinensis*. L. White bellied nuthatch
- Sub-fam. Trogloditinae  
*Thryothorus palustris*. Veill. Marsh wren  
*Troglodytes europeus*. Winter wren
- Fam. Cuculidae  
 Sub-fam. Cuculinae  
*Erythrophrys domenicus*. Sw. Black billed cuckoo  
*Coccyzus americanus*. Sw. Yellow billed cuckoo
- Tribe 4th. Tenuirostres
- Fam. Trochilidae  
*Trochilus colubris*. L. Humming bird
- Fam. Halcyonidae  
*Ispida alcyon*. Sw.
- Fam. Caprimulgidae  
*Caprimulgus vociferus*. L. Whippoorwill  
*Chordeiles americana*. Sw. Night jar
- Fam. Hirundinae  
*Cypselus pelagius*. Temm. Chimney swallow  
*Hirundo purpureus*. L. Purple martin  
*rufa*. Gm. Barn swallow

- Fam. Hirundinae  
*Hirundo bicolor*. Veill.
- Order Rasores
- Fam. Tetraonidae  
*Bonasia umbellus*. Bon. Ruffed grouse  
*Tetrao cupido*. L. Prairie hen  
*canadensis*. L. Canada grouse  
*Ortyx virginiana*. Steph. American quail
- Fam. Columbidae  
*Ectopistes carolinensis*. Sw. Turtle dove  
*migratorius*. Sw. Passenger pigeon
- Order Grallatores. Waders
- Fam. Ardeidae  
*Ardea herodias*. L. Blue heron  
*Egretta americana*. Sw. Egret heron  
*Butor americana*. Sw. American bittern  
*exilis*. Sw. Least bittern
- Fam. Rallidae  
*Fulica chloropus*. Gm. Common gallinule  
*atra*. Wils. Common coot  
*Rallus virginianus*. L. Virginian rail  
*noveboracensis*. Bon.
- Fam. Scolopacidae  
*Scolopax minor*. Gm. Woodcock  
*griseus*. Gm. Red breasted snipe  
*Wilsonii*. Bm. Wilson's snipe  
*Limosa fedoa*. Veill. Marbled godwit  
*Tringa pectoralis*. Bon. Pectoral sand-piper  
*minuta*. Leisl. Small sand-piper  
*Wilsonii*. Nutt. Wilson's sand-piper  
*cinerea*. Knot  
*Totanus melanoleucus*. Veill. Tell-tale  
*flavipes*. Veill. Lesser yellow shanks  
*Bartramius*. Temm. Bartram's tatter  
*macularius*. Temm. Spotted sand-piper  
*chloropygius*. Veill. Green rump sand-piper  
*Streptilas interpres*. Ill. Turnstone

## Fam. Charadriadae

- Charadrius vociferus. L. Kildeer plover  
 pluvialis. L. Golden plover  
 Squatarola melanogaster, Bech.

## Order Natatores

## Fam. Anatidae

## Sub-fam. Anserinae

- Cygnus musicus. Bech. Swan  
 Anser canadensis. Veill. Canada goose  
 hyerboreus. Pall. Snow goose

## Sub-fam. Anatinae. River ducks

- Mareca americana. Leach. American widgeon  
 Dendronessa sponsa. Sw. Tree duck  
 Chauliodus strepera. Sw. Gadwall  
 Anas clypeata. Sw. Shoveller  
 Boschas domestica. Sw. Mallard  
     crecca. Sw. Greenwinged teal  
     discors. Sw. Bluewinged teal  
     obscura. Sw. Dusky duck  
 Dafila caudacuta. Leach. Pintail duck

## Sub-fam. Fuligulinae

- Fuligula ferina. Steph. Pochard  
     valisneri. Steph. Canvassback  
     marilla. Steph. Scaup duck  
     rufitorques. Bon. Ringneck  
 Clangula albeola. Rich. Buffelhead  
 Haralda glacialis. Sw. Longtailed duck

## Sub-fam. Merganidae

- Mergus merganser. L. Gooseander  
     serrator. L.  
     cucullatus. L. Crested merganser

## Fam. Colymbidae

- Podiceps rubricollis. Lath. Rednecked grebe  
 cornutus. Lath. Horned grebe  
 Dasyptilus carolinensis. Sw. Pied dobchick

## Fam. Alcedae

## Sub-fam. Laridae

- Sterna Hirundo. L. Swallowtailed tern

- Sub-fam. Larus Bonapartii. Sw. Bonaparte's gull  
     zonorhynchus. Rich.  
     glaucus. Brunn.  
     atricilla. Sw.

## CLASS REPTILIA.

## Order Chelonia

- Cistudo clausa. Say. Box tortoise  
 Emys picta. Schw.  
     geographica. Say.  
     guttata. Schw.  
     pennsylvanica. Harl.  
 Chelydra serpentina. Schw. Snapping turtle

## Order Ophidia

- Coluber obsoletus. Say.  
     constrictor. L. Black snake  
     sipedon. L. Brown water snake  
     saurita. L. Ribbon snake  
     sirtalis. L. Garter snake  
     proximus. (?) Say.  
     punctatus. L.  
     septemvittatus. Say.  
     heterodon. Daud. Hognosed snake  
     eximius. DeKay. Chicken snake  
     vernalis. DeKay. Green snake  
 Crotalus tergeminus. Say. Rattle snake

## CLASS AMPHIBIA.

## Order Batrachia

- Bufo musicus, Cuv. Toad  
 Hyla versicolor. LeConte. Tree toad  
 Rana clamitans. Daud.  
     halecina. Daud. Shad frog  
     palustris. LeConte. Tiger frog  
     sylvatica. LeConte. Wood frog  
     gryllus. LeConte. Savannah cricket  
 Salamandra symmetrica. Harl.

*Salamandra cinerea*. (?) Gr.  
undetermined  
*Menobranchis lateralis*. Harl.

## CLASS PISCES.

## Order Acanthopterygii

## Fam. Percoides

*Perca flavescens*? Cuv. and Val. Perch  
Labrax—undetermined  
*Lucioperca Americana*. Cuv. Pickerel  
*Pomotis auritus*? Cuv.  
*Centrarchus aeneus*. Cuv.

## Order Malacopterygii Abdominales

## Fam. Cyprinidae

*Labeo Cyprinus*. Cuv.  
*Catostomus macrolepidotus*. Les. Sucker  
*nigricans*. Les.  
3 species undetermined

## Fam. Esoces

*Esox reticulatus*. Les. Pike  
*estor*. Les. Musklonge

## Fam. Siluridae

*Pimelodus catus*. Lac. Catfish

## Fam. Salmonidae

*Salmo amethystes*. Mitch. Trout  
*Corregonus albus*. Les. Whitefish  
Artedi. Les.

## Fam. Clupeae

*Hyodon tergisus*. Les. Herring  
*Lepisosteus*. Lac.

## Order Malacopterygii Subbrachiata

## Fam. Gadoides

*Lota maculata*. Cuv. Dogfish

## Order Chondropterygii

## Fam. Sturiones

*Sturio maculosus*? Cuv. Sturgeon

## Fam. Cyclostomes

*Petromyzon nigricans*? Les. Lamprey

DIV. MOLUSCA.  
CLASS CHONCHIFERA.

## Sect. Lamellipoda

*Cyclas similis*. Say.  
*dubiosa*. Say.

## Naiadae. Fresh water bivalves

*Unio plicatus*. Say.

*alatus*. Say.  
*purpureus*. Say.  
*fasciolaris*. Raf.  
*undulatus*. Barnes.  
*multiradiatus*. Lea.  
*circulus*. Lea.  
*penitus*. Con.  
*lapillus*. Say.  
*compressus*. Lea.  
*triangularis*. Barnes.  
*cariosus*. Say.  
*fragilis*. Raf.  
*subrotundus*. Lea.  
*coelatus*. Con.  
*iris*. Lea.  
*Hildrethianus*. Lea.  
*siliquoideus*. Barnes.  
*nasutus*. Say.  
*rectus*. Lam.  
*dilatatus*. Raf.  
*tuberculatus*. Raf.  
*bullatus*. Raf.  
*olivarius*. Raf.  
*rubiginosus*. Lea.  
*gibbosus*. Raf.  
*ventricosus*. Bar.

*Anodonta Ferrussaciana*. Lea.  
*cataracta*. Say.

*Alasmodonta marginata*. Say.  
*undulata*. Say.  
*edentula*. Say.

## CLASS MOLUSCA.

## Order Gasteropoda

Phyllidiana

Patella

## Order Trachelipoda

Colimacea

*Helix solitaria*. Say.*albolabris*. Say.*zaleta*. Say.*multilineata*. Say.*clausa*. Say.*materna*. Say.*fallax*. Say.*hirsuta*. Say.*perspectiva*. Say.*palliata*. Say.*inflecta*. Say.*thyroidus*. Say.*fraterna*. Say.*ligera*. Say.*fuliginosa*. Say.*concava*. Say.*profunda*. Say.*alternata*. Say.*tridentata*. Say.*inornata*. Say.*elevata*. Say.*arboreus*. Say.

Pupa ovata. Say.

*Succinea ovalis*. Say.*campestris*. Say.

Lymneana

*Planorbis trivolvis*. Say.*exacuus*. Say.*campanulatus*. Say.*bicarinatus*. Say.*Physa heterostropha*. Say.*Physa elongata*. Say.*Lymneus columellus*. Say.*elodes*. Say.*desidiosus*. Say.*stagnalis*.

Melaniana

*Melania virginica*. Say.*depygis*. Say.

Peristomiana

*Valvata tricarinata*. Say.*sincera*. Say.*Paludina decisa*. Say.*ponderosa*. Say.

(No. 2.)

**REPORT****Of Doct. JOHN WRIGHT, Botanist of the Geological Survey.***Detroit, January 1st, 1839.*

TO DOUGLASS HOUGHTON, STATE GEOLOGIST.

SIR: In compliance with the act passed by the state legislature, March, 1838, providing for a geological survey of the state the undersigned respectfully submits the following

**REPORT :**

The examinations in the botanical department of the survey, during the past season, have been made in the two most southern ranges of counties of the state, from the Detroit river to Lake Michigan, excepting the county of Monroe; and in St. Clair county

The extensive requisitions of the bill, making it obligatory on those engaged in investigating the natural history of the state, to collect and preserve, as far as practicable, seventeen specimens of each kind of its products, has been the principal inducement for confining the sphere of action to the above mentioned portions of the state. The bulky apparatus necessary to be conveyed from place to place, during the excursions, for the preservation of the plants in such extensive collections, and the requisite conveniences for drying and protecting them, render it impracticable to examine a very great extent of country, and particularly such portions of it as are unsettled, during a single season, or until the principal mass is collected.

The plan adopted during the past season, was to make the collections in the more inhabited portions, or in such situations of the country as are the most favorable for the preservation of the plants, and get together, as far as possible, the required number of those species which are found in them.

The parts which we have examined, undoubtedly, contain the majority of the whole number of species which grow in the state ; and as they are sufficiently settled to possess the requisite facilities for acquiring such extensive collections, we have been enabled to accumulate a large number of specimens, which could not have been collected under any other circumstances ; and, at the same time, to include in them the majority of the individual plants of the state ; thereby preventing the embarrassing necessity of securing this extensive mass while investigating larger and less inhabited tracts, where these facilities are not offered.

With the able assistance of Mr. George H. Bull, assistant botanist, I have been enabled to examine between eight and nine hundred native or naturalized species of phenogamous or flowering plants ; and to collect specimens of each, illustrative of their character, amounting, in all, to about nine thousand, which are now in an excellent state of preservation. More than this number of species were observed growing in the counties examined, but they were not in a proper condition for the selection of specimens for preservation at the time of observation.

A considerable number of cryptogamous or flowerless plants were also noticed and secured.

It has been our object, while making these collections, to select those specimens which will exhibit all the characters of the individuals ; and for this purpose, all parts of the plant have been taken, as far as time and opportunity would admit of

The herbaceous plants, when not too large, have been kept entire, including their roots, stems, leaves, and flowers ; and when too large, suitable portions of each have been taken to illustrate them : of the woody ones, small branches with their leaves, and when practicable, flowers and fruit have been selected for the purpose ; and it is intended to make the suit more perfect by procuring sections of their trunks, which want of time prevented us from doing, during the botanizing season. The size of the paper sheet used for holding them is 12 by 17 inches ; thus allowing of the preservation of ample sized ones, which have accordingly been chosen. It has also been considered necessary to a complete herbarium, that the ripe seeds should be added, and those of

a considerable number of species have been obtained for this object.

Observations relating to the individual plants have been made, with reference to their economical and medicinal uses ; and to their correct analysis and individual characters. It is not my intention, in this report, to give a detailed account of such observations ; for this would obviously be improper, as the investigations are not finished, and, in consequence, not sufficiently complete to allow of their being made at the present time ; or, if made, would cause unnecessary repetition in the final report.

For these reasons, I have thought it advisable to confine the notice of the plants, at present, to a catalogue of their names, reserving a detailed account of them for a final report : and endeavor, in the mean time, to collect such facts in regard to the mass opportunity shall offer, as will be of use both in a practical and scientific point of view.

It is my intention to examine, hereafter, those portions of the state which have not been explored, and render the collections as complete as possible.

The accompanying catalogue embraces the phenogamous and filicoid plants which have been collected.

JOHN WRIGHT, *Botanist.*

## C A T A L O G U E.

## A.

- Acalypha virginica*, Linn.\* Three-seed mercury  
*Acer eriocarpum*, Mx. Silver maple  
     *nigrum*, Mx. Black maple  
     *saccharinum*, Linn. Hard maple. Sugar maple  
*Achillea millefolium*, Linn. Yarrow. Milfoil  
*Acnida cannabina*, Linn. Water hemp. Indian hemp  
*Acorus calamus*, Linn. Sweet flag  
*Actaea alba*, Bw. White cohosh  
     *racemosa*, Linn. Cohosh. Black snake-root  
     *rubra*, Bw. Baneberry  
*Actinomeris squarrosa*, Nutt.  
*Adiantum pedatum*, Linn. Maiden-hair  
*Aesculus glabra*, Ww. Small buck-eye  
*Agrimonia Eupatoria*, Linn. Agrimony  
*Agropyron caninum*, R and S.  
*Agrostemma Githago*, Linn. Cockle  
*Agrostis alba*, Linn. White-top  
     *clandestina?* Sprengel  
     *lateriflora*, Mx.  
     *tenuiflora*, Ww.  
     *vulgaris*, Smith. Red-top  
*Aira cespitosa*, Linn.  
*Aletris farinosa*, Linn. False aloe  
*Alisma Plantago*, Linn. Water plantain  
*Allium canadense*, Linn. Meadow garlic  
     *cernuum*, Roth.  
     *tricoccum*, Aiton. Three-seed leek  
*Alnus serulata*, Ww. Alder  
*Alopecurus geniculatus*, Linn. Fox-tail  
*Amaranthus hybridus*, Linn.  
*Ambrosia elatior*, Linn. Hog-weed  
     *trifida*, Linn.  
*Amelanchier Botryapium*, Lind. Shad-bush. June-berry

\*For abbreviations of authors' names, see the end of the catalogue.

*Amelanchier ovalis*, Lind. Medlar-bush  
*sanguinea*, D. C.  
*Amorpha canescens*, Nutt. Lead-plant  
*Amphicarpa monoica*, Elliott.  
*Andromeda calyculata*, Linn. Leather-leaf  
*polifolia*, Linn. Wild rosemary  
*Anemone aconitifolia*, Mx.  
*nemorosa*, Linn. Wood anemone  
*virginiana*, Linn. Wind-flower  
*Andropogon furcatus*, Muhl. Fork-spike  
*nutans*, Linn. Beard-grass  
*scoparius*, Mx. Broom-grass  
*virginicus*, Linn.  
*Angelica atropurpurea*, Linn. High angelica  
*triquinata*, Mx.  
*Anethum foeniculum*, Fennel  
*Anthemis cotula*, Linn. May-weed  
*Apios tuberosa*, Moenchhausen. Ground-nut  
*Apocynum androsaemifolium*, Linn. Dog-bane  
*hypericifolium*, Aiton. Indian hemp.  
*Arabis canadensis*, Linn. Sickle-pod  
*laevigata*, D. C.  
*lyrata*, Linn.  
*sagittata*, Torrey.  
*Aralia nudicaulis*, Linn. Wild sarsaparilla  
*racemosa*, Linn. Spikenard  
*Arbutus Uva-ursi*, Linn. Bearberry  
*Archemora ambigua*, D. C.  
*Arctium lappa*, Linn. Burdock  
*Arethusa bulbosa*, Linn. Arethusa  
*Arenaria stricta*, Mx.  
*lateriflora*, Linn.  
*Aristida stricta*, Mx.  
*Arum triphyllum*, Linn. Wild turnip. Wake robin  
*Artemisia canadensis*, Mx. Wild worm-wood  
*Arundo canadensis*, Mx. Reed-grass  
*coarctata*, Torrey  
*Asarum canadense*, Linn. Wild ginger  
*Asclepias incarnata*, Linn.

*Asclepias lanceolata*, Ives.  
*phytolaccoides*, Lyon.  
*purpurascens*, Linn.  
*syriaca*, Linn. Milk-weed  
*tuberosa*, Linn. Pleurisy-root. White-root  
*verticillata*, Linn.  
*Aspidium acrostichoides*, Ww.  
*asplenoides*, Linn.  
*bulbiferum*, Ww.  
*felix-femina*, Ww.  
*intermedium*, Muhl.  
*noveboracensis*, Ww.  
*Thelypteris*, Ww.  
*Asplenium angustifolium*, Mx.  
*thelypteroides*, Mx. Silvery spleenwort  
*Aster acuminatus*, (?) Mx.  
*corymbosus*, Aiton.  
*diversifolius*, Mx. (?)  
*laxus*, Ww.  
*paniculatus*, Aiton.  
*salicifolius*, (?) Pursh.  
*sericeus*, Nutt.  
*Tradescanti*, Ww.  
*Astragalus canadensis*, Linn. Milk vetch  
*Atheropogon apludoides*, Muhl. Beard-grass

## B

*Baptisia alba*, Ww.  
*tinctoria*, Brown. Wild indigo  
*Batschia canescens*, Mx. Puccoon. False bugloss  
*Betula excelsa*, Aiton. Yellow birch  
*glandulosa*, Mx. Scrub birch  
*papyracea*, Ww. Paper birch. Canoe birch  
*Bidens Beckii*, Torrey. Water marygold  
*Bidens cernua*, Linn.  
*frondosa*, Linn. Burr marygold. Cuckold  
*petiolata*, Nutt.  
*Blephilia ciliata*, Rafinesque.

- Blephilia hirsuta*, Rafinesque.  
*Blitum virgatum*, Linn. Slender blite  
*Botrychium fumaroides*, Ww. Grape-fern  
     *virginicum*, Swartz. Rattlesnake-fern  
*Brachyelytrum aristatum*, P. de B. False drop-grass  
*Bromus ciliatus*, Linn.  
     *pubescens*, Linn.  
     *purgans*, Linn.  
     *secalinus*, Linn. Chess  
*Buchnera americana*, Linn. Blue hearts  
     C.  
*Cacalia atriplicifolia*, Linn.  
     *tuberosa*, Nutt.  
*Cakile americana*, Nutt. Sea rocket  
*Calla palustris*, Linn. Water arum  
*Calopogon pulchellus*, Brown. Grass pink  
*Caltha palustris*, Linn. American cowslip  
*Campanula americana*, Linn.  
     *erinoides*, Muhl. Prickly bell-flower  
     *rotundifolia*, Linn. Flax bell-flower  
*Cannabis sativa*, Linn. Hemp  
*Capsella bursa-pastoris*, Moenchhausen. Shepherd's purse  
*Cardamine hirsuta*, Linn.  
     *pratensis*, Linn.  
     *rhomboidea*, D. C.  
*Carex acuta*, Linn.  
     *alba* v. *setifolia*, Dewey.  
     *ampullacea*, Gmelin.  
     *anceps*, Schkuhr.  
     *aquatilis*, Wahlenberg.  
     *aurea*, Nutt.  
     *bromoides*, Schkuhr.  
     *bullata*, Schkuhr.  
     *cephalophora*, Ww.  
     *cespitosa*, Linn.  
     *collecta*? Dewey.  
     *conoidea*, Schkuhr.

- Carex crinita*, La Marck.  
     *cristata*, Schwinitz.  
     *curta*, Gmelin.  
     *Deweyana*, Schwinitz.  
     *disperma*, Dewey.  
     *festucacea*, Schkuhr.  
     *filiformis*, Gmelin.  
     *flava*, Linn.  
     *folliculata*, Linn.  
     *formosa*, Dewey.  
     *gracillima*, Schwinitz.  
     *granularis*, Muhl.  
     *hystericina*, Ww.  
     *lagopodioides*, Schkuhr.  
     *lacustris*, Ww.  
     *laxiflora*, LaMarck.  
     *limosa*, Linn.  
     *lupulina*, Muhl.  
     *marginata*, Muhl.  
     *miliacea*, Muhl.  
     *nigro-marginata*? Schwinitz.  
     *Øderi*, Ehrhart.  
     *paniculata*, Linn.  
     *polytrichoides*, Muhl.  
     *pseudo-cyperus*, Linn.  
     *pubescens*, Muhl.  
     *retrorsa*, Schwinitz.  
     *scabrata*, Schwinitz.  
     *setacea*, Dewey.  
     *squarrosa*, Linn.  
     *stellulata*, Schreber.  
     *stipata*, Muhl.  
     *straminea*, Ww.  
     *sylvatica*  
     *tenera*? Dewey.  
     *tentaculata*, Muhl.  
     *teretiusecula*, Gmelin.  
     *trichocarpa*, Muhl.  
     *trisperma*, Dewey.

- Carex varia?*  
*virescens*, Muhl.  
*xanthophylla*, Wahlenburg.  
 All of the marsh hay made in the state is composed of more or less of the species of the preceding genus.
- Carpinus americana*, Mx. Horn-beam  
*Carya amara*, Nutt. Bitter-nut  
*porcina*, Nutt. Pig-nut  
*Cassia marylandica*, Linn. American senna  
*Ceanothus americanus*, Linn. New Jersey tea  
*Celastrus scandens*, Linn. Climbing staff-tree  
*Celtis crassifolia*, LaMarck. Hoop ash  
*Cenchrus echinatus* v. *tribuloides*, Torrey. Burr-grass  
*Centaurella paniculata*, Mx. Screw-stem  
*Cephalanthus occidentalis*, Linn. Button-bush  
*Cerastium vulgatum*, Linn. Chick-weed  
*Chelone glabra*, Linn. Snake-head  
*Chenopodium album*, Linn. Pig-weed  
*ambrosioides*, Linn. Sweet pig-weed  
*Botrys*, Linn. Oak of Jerusalem  
*hybridum*, Linn.  
*rubrum*, Linn.  
*Chrysosplenium americanum*, Swartz.  
*Cicuta bulbifera*, Linn.  
*maculata*, Linn. Water hemlock  
*Cinna arundinacea*, Ww.  
*Circaea alpina*, Linn.  
*Leutetiana*, Persoon. Enchanter's nightshade  
*Claytonia virginica*, Linn. Spring beauty  
*Clematis virginica*, Linn. Virgins' bower  
*Clintonia borealis*, Rafinesque. Wild lily of the valley  
*Cnicus discolor*, Ww. Thistle  
*glutinosus*, Bw.  
*lanceolatus*, Ww.  
*odoratus*, Muhl.  
*Pitcheri*, Torrey.  
*Collinsia verna*, Nutt.  
*Collinsonia canadensis*, Linn. Horse balm

- Commelina angustifolia*, Mx.  
*Comptonia asplenifolia*, Aiton. Sweet-fern  
*Convallaria multiflora*, Ww. Giant Solomon's seal  
*Convolvulus Sepium*, Linn. Wild morning glory  
*spithameus*, Linn. Dwarf morning glory  
*Coptis trifolia*, Salisbury. Gold thread  
*Corallorhiza multiflora*, Nutt.  
*verna*, Nutt. Coral-root  
*Coreopsis palmata*, Nutt.  
*trichosperma*, Mx.  
*tripteris*, Ww. Tick-seed sunflower  
*Coriandrum sativum*, Linn. Coriander  
*Cornus canadensis*, Linn.  
*Cornus circinata*, Schwinitz.  
*florida*, Linn. Dogwood  
*paniculata*, L'Heritier.  
*sericea*, L'Heritier.  
*Corylus americana*, Walter. Hazle-nut  
*Crataegus coccinea*, Linn. Thorn-bush  
*punctata*, Jacquin. Thorn-tree  
*Cryptotaenia canadensis*, D. C.  
*Cuscuta americana*, Linn. Dodder  
*Cynoglossum amplexicaule*, Mx. Wild comfrey  
*officinale*, Linn. Hound-tongue  
*Cyperus alterniflorus*, Schwinitz.  
*flavescens*, Linn.  
*mariscoides*, Elliott.  
*phymatodes?* Muhl.  
*strigosus*, Linn.  
*Cypripedium acaule*, Aiton. Ladies' slipper  
*pubescens*, Swartz. Mocassin-flower  
*spectabile*, Swartz.

## D.

- Dalibarda fragaroides*, Mx. Dry strawberry  
*Danthonia spicata*, P. deB. Wild oats  
*Datura Tatula*, Linn. Purple thorn-apple  
*Decodon verticillatum*, Elliott. Swamp willow-herb

- Dentaria diphylla*, Mx. Tooth-root. Pepper-root  
*laciniata*, Muhl.  
*Desmodium acuminatum*, D. C.  
*bracteosum*, D. C.  
*canadense*, D. C. Bush trefoil  
*canescens*, D. C. ?  
*ciliare*, D. C.  
*laevigatum*, D. C.  
*marylandicum*, D. C.  
*nudiflorum*, D. C.  
*obtusum*, D. C.  
*paniculatum*, D. C.  
*rotundifolium*, D. C.  
*strictum*, D. C.  
*Diarrhena americana*, P. de B.  
*Diervilla canadensis*. Ww. Bush honeysuckle  
*Digitaria filiformis*, Elliott.  
*sanguinalis*, Scopoli. Finger-grass  
*Dioscorea villosa*, Linn. Yam-root  
*Dracocephalum virginianum*, Ww. Dragon-head  
*Drosera longifolia*, Linn.  
*rotundifolia*, Linn. Sundew  
*Dulichium spathaceum*, Persoon. Galingale

## E.

- Eleusine indica*, LaMarck.  
*Elymuscanadensis*, v. *glaucifolius*, Torrey.  
*Hystrix*, Linn. Hedgehog-grass  
*villosus*, Muhl. Lime-grass  
*virginicus*, Linn. Wild rye  
*Epigaea repens*, Linn. Trailing arbutus  
*Epilobium coloratum*, Muhl.  
*lineare*, Muhl.  
*molle*, Torrey.  
*Epiphegus virginianus*, Barton. Beech-drops  
*Erigeron bellidifolius*, Ww.  
*canadense*, Linn. Flea-bane

- Erigeron heterophyllus*, Muhl.  
*philadelphicus*, Linn.  
*strigosus*, Muhl.  
*Eriocaulon pellucidum*, Mx.  
*Eriophorum angustifolium* ? Bw.  
*polystachyon*, Linn. Cotton-grass  
*Eryngium aquaticum*, Linn. Button snake-root  
*Erythronium americanum*, Smith. Dog-tooth violet  
*Euchroma coccinea*, Nutt. Painted-cup  
*Euonymus americanus*, Linn.  
*obovatus*, Nutt.  
*Eupatorium ageratoides*, Linn.  
*amoenum*, Pursh.  
*perfoliatum*, Linn. Boneset. Thorough-wort  
*sessilifolium*, Linn.  
*Euphorbia corollata*, Linn.  
*maculata*, Linn.  
*polygonifolia*, Linn.  
*Equisetum arvense*, Linn. Horse-tail  
*hyemale* Linn. Scouring rush  
*limosum*, Torrey.

## F.

- Fagus sylvatica*, Linn. Beech  
*Festuca duriuscula*, ? Linn.  
*nutans*, Ww.  
*tenella*, Ww.  
*Fragaria virginiana*, Linn. Strawberry  
*Frasera caroliniensis*, Walter. Columbo  
*Fraxinus acuminata*, LaMarck. White ash  
*pubescens*, Walter. Red ash  
*sambucifolia*, Ww. Black ash  
*Fuirena squarrosa*, Mx.

## G

- Galeopsis Tetrahit*, Linn. Flowering nettle  
*Galium asprellum* ? Mx.  
*boreale*, Pursh.  
*circaezans*, Mx.  
*lanceolatum*, Torrey.

- Galium obtusum* ? Bw.  
*pilosum*, Aiton.  
*tinctorium*, Linn. Wild madder  
*trifidum*, Linn.  
*Gaultheria hispidula*, Muhl.  
*procumbens*, Linn. Wintergreen  
*Gaura biennis*, Linn. Virginian loosestrife  
*Gentiana crinita*, Froelich. Fringed gentian  
*quinqueflora*, Ww.  
*Saponaria*, Linn. Soap gentian  
*Geranium maculatum*, Linn. Crane's-bill  
*Robertianum*, Linn.  
*Gerardia auriculata*, Mx.  
*flava*, Linn. False foxglove  
*glauca*, Eddy.  
*Pedicularia*, Linn.  
*purpurea*, Linn.  
*Geum rivale*, Linn. Purple avens  
*strictum*, Aiton. Upright avens  
*virginianum*, Linn. Avens  
*Gleditschia triacanthos*, Linn. Honey locust  
*Glyceria fluitans*, Brown. Water fescue-grass  
*Gnaphalium plantagineum*, Linn.  
*polycephalum*, Mx. Life everlasting  
*uliginosum*, Linn. Cud-weed  
*Goodyera pubescens*, Brown. Rattle-snake plantain  
*Gyromia virginica*, Nutt. Indian cucumber

## H.

- Habenaria bracteata*, Brown. Vegetable satyr  
*ciliaris*, Brown. Orchis  
*dilatata*, Pursh. Giant orchis  
*fimbriata*, Brown.  
*grandiflora*, Torrey.  
*herbiola*, Brown.  
*huronensis*, Sprengel.  
*orbiculata*, Pursh.  
*psycodes*, Sprengel.  
*tridentata*, Hooker.

- Hamamelis virginica*, Linn. Witch hazel  
*Hedeoma pulegioides*, Persoon. Pennyroyal  
*Helenium autumnale*, Linn.  
*Helianthemum canadense*, Mx. Rock rose  
*Helianthus altissimus*, Linn.  
*divaricatus* ? Linn.  
*frondosus*, Ww.  
*giganteus*, Linn.  
*gracilis*  
*strumosus*, Linn.  
*trachelifolius*, Ww.  
*Heliopsis laevis*, Persoon.  
*Hepatica acutiloba*, D. C.  
*americana*, D. C. Liver-wort  
*Heracleum lanatum*, Mx. Master-wort. Cow parsnip  
*Heuchera americana*, Linn. Alum-root  
*Hibiscus trionum*, Linn.  
*Hieracium Gronovii*, Linn.  
*Kalmii*, Linn.  
*marianum*, Ww.  
*paniculatum*, Linn.  
*Scouleri*, Hedwig.  
*venosum*, Linn. Blood-wort  
*Hippophae canadensis*, Ww. Sea buckthorn,  
*Hippuris vulgaris*, Linn.  
*Houstonia ciliolata*, Torrey.  
*Hydrastis canadensis*, Linn. Golden seal. Yellow-root  
*Hydrocotyle umbellata*, Linn.  
*Hydropeltis purpurea*, Mx. Water shield  
*Hydrophyllum canadense*, Linn. Rough burr-flower  
*virginicum*, Linn. Burr-flower  
*Hypericum ascyroides*, Ww.  
*canadense*, Linn.  
*parviflorum*, Ww.  
*prolificum*, Linn.  
*punctatum*, La Marck.  
*virginicum*, Linn.  
*Hypoxis erecta*, Linn. Star-grass

*Hyssopus nepetoides*, Ww. Giant hyssop  
*scrophularifolius* Ww.

## I.

*Ictodes foetidus*, Bw. Skunk cabbage  
*Impatiens fulva*, Nutt. Speckled jewels  
*pallida*, Nutt. Jewel-weed  
*Inula Helenium*, Linn. Elecampane  
*Iris versicolor*, Linn. Wild flag  
*Isnardia palustris*, Linn. Water purslane

## J.

*Juncus acuminatus*, Mx.  
*Bufo-nius*, Linn.  
*effusus*, Linn. Bulrush  
*nodosus*, Linn.  
*polycephalus*, Mx.  
*setaceus*, Rostk.  
*tenuis*, Ww.

*Juniperus communis*, Linn. Juniper  
*virginianus*, Linn. Red cedar

## K.

*Kalmia glauca*, Aiton. Swamp laurel  
*Krigia amplexicaulis*, Mx;  
*Koeleria nitida*, Nutt.  
*pennsylvanica*, D. C.  
*truncata*, Torrey.

*Kuhnia critonia*, Ww.

## L.

*Lactuca elongata*, Muhl. Wild lettuce  
*sanguinea*, Bw. Wood lettuce  
*Lathyrus ochroleucus*, Hooker.  
*myrtifolius*, Muhl.  
*palustris*, Linn. Marsh pea  
*venosus*, Muhl.  
*Laurus Benzion*, Linn. Spice-bush. Fever bush  
*Sassafras*, Linn. Sassafras-tree  
*Lechea major*, Mx. Pin-weed  
*Leersia oryzoides*, Swartz. Cut-grass  
*virginica*, Ww. White-grass. Rice-grass  
*Lemna minor*, Linn. Green duck-meat  
*polyrrhiza*, Linn. Water flax-seed

*Lemna trisulca*, Linn. Duck-meat  
*Leontice thalictroides*, Linn. Poppoose-root. False cohosh  
*Leontodon Taraxacum*, Linn. Dandelion.  
*Leonurus cardiaca*, Linn. Motherwort  
*Lepidium virginicum*, Linn. Wild pepper-grass  
*Leptandra virginica*, Linn. Culver's physic  
*Lespedeza angustifolia*, Elliott.  
*capitata*, Mx.  
*polystachia*, Mx.  
*prostrata?* Pursh.  
*reticulata*, Persoon.  
*violacea*, Persoon.  
*Liatris cylindrica*, Mx.  
*scariosa*, Ww.  
*spicata*, Ww. Gay feather  
*squarrosa?* Ww.  
*Lilium canadense*, Linn. Nodding lily  
*philadelphicum*, Linn. Red lily  
*Lindernia attenuata*, Muhl. False hedge hyssop  
*dilatata*, Muhl. Pimpernel  
*Linnaea borealis*, Gronovius. Twin-flower  
*Linum usitatissimum*, Linn. Flax  
*virginianum*, Linn. Wild flax  
*Liriodendron tulipifera*, Linn. White-wood, Tulip-tree  
*Lithospermum officinale*, Linn. Gromwell  
*Lobelia cardinalis*, Linn. Cardinal-flower  
*Claytoniana*, Mx.  
*Kalmii*, Linn.  
*siphilitica*, Linn.  
*Lolium temulentum*, Linn.  
*Lonicera parviflora*, LaMarck.  
*Ludwigia alternifolia*, Ww. Seed box  
*Lupinus perennis*, Linn. Wild lupine  
*Luzula campestris*, D. C.  
*pilosa*, Ww.  
*Lycopus europeus*, Linn. Water horehound  
*virginicus*, Linn. Bugle-weed  
 [H. R. No. 23.] 5

- Lysimachia capitata*, Pursh.  
*ciliata*, Linn. Money-wort  
*hybrida*, Mx.  
*quadrifolia*, Linn.  
*revoluta*, Nutt.  
*stricta*, Aiton. Loosestrife  
*Lythrum Salicaria*, Pursh. Milk willow-herb  
*Lycopodium complanatum*, Linn. Ground pine  
*lucidulum*, Mx. Moon-fruit pine

## M.

- Malaxis liliifolia*, Ww. Twayblade  
*Malva rotundifolia*, Linn. Low mallows  
*Marrubium vulgare*, Linn. Horehound  
*Melanthium glaucum*, Nutt.  
*Menispermum canadense*, Linn. Moon-seed  
*Mentha borealis*, Mx. Horse-mint  
*piperita*, Smith. Peppermint  
*Menyanthes trifoliata*, Linn. Buck-bean  
*Microstylis ophioglossoides*, Nutt.  
*Milium effusum*, Linn. Millet.  
*pungens*, Torrey. Dwarf millet-grass  
*Mimulus alatus*, Linn.  
*ringens*, Linn. Monkey-flower  
*Mitchella repens*, Linn. Checker-berry. Partridge-berry  
*Mitella cordifolia*, LaMarck.  
*diphylla*, Linn. Current-leaf  
*Momordica echinata*, Muhl.  
*Monarda allophylla*, Mx.  
*punctata*, Linn.  
*Mollugo verticillata*, Linn. Carpet-weed  
*Monotropa uniflora*, Linn. Indian pipe-Birds' nest  
*Muhlenbergia diffusa*, Schreber. Dropseed-grass  
*Myriophyllum verticillatum*, Linn. Water milfoil

## N.

- Nasturtium amphibium*, Brown. Water radish  
*natans*, D. C.  
*palustre*, D. C.

- Nemopanthes canadensis*, D. C. Wild holly. Mountain holly.  
*Nemophila paniculata*, Sprengel  
*Nepeta cataria*, Linn. Catnip  
*Nicandra physaloides*, Persoon  
*Nuphar advena*, Aiton  
*Kalmiana*, Aiton  
*Nymphaea odorata*, Aiton. White pond lily  
*Nyssa multiflora*, Walter. Pepperidge

## O

- Oenothera biennis*, Linn. Scabish  
*fruticosa*, Linn. Sundrops  
*muricata*, Linn.  
*pumila*, Linn.  
*Onoclea sensibilis*, Linn. Sensitive-fern  
*Onosmodium hispidum*, Mx. False gromwell  
*Orobanche americana*, Linn.  
*uniflora*, Linn. Squaw-root. Cancer-root  
*Oryzopsis asperifolia*, Mx. Mountain rice  
*Osmorhiza brevistylis*, D. C.  
*longistylis*, D. C. Sweet cicily  
*Osmunda cinnamomea*, Linn. Flowering fern  
*interrupta*, Mx.  
*regalis*, Mx.  
*Ostrya virginica*, Ww. Hop hornbeam. Iron wood  
*Oxalis stricta*, Linn. Yellow wood sorrel. Sheep sorrel  
*Oxycoccus macrocarpus*, Pursh. Cranberry

## P

- Panax quinquefolia*, Linn. Ginseng  
*trifolia*, Linn. Dwarf ground-nut  
*Panicum capillare*, Linn.  
*crus-galli*, Linn. Barn-grass  
*dichotomum* ? Linn.  
*nervosum*, Muhl.  
*nitidum*, LaMarck, and varieties. Panic-grass  
*pubescens*, LaMarck.

*Panicum virgatum*, Linn.  
*Parnassia americana*, Muhl. Flowering plantain  
*Pastinaca sativa*, Linn. Parsnip  
*Pedicularis canadensis*, Linn. Louse-wort  
*pallida*, Pursh  
*Penthorum sedoides*, Linn. Virginian orpine  
*Pentstemon pubescens*, Aiton. Beard-tongue  
*Phalaris americana*, Elliott. Wild canary-grass  
*Phaseolus diversifolius*, Persoon.  
*Phleum pratense*, Linn. Timothy-grass  
*Phlox aristata*, Mx.  
*Phragmites communis*, Trinius. Common reed  
*Phryma leptostachya*, Linn. Lopseed  
*Physalis obscura*, Mx. Ground cherry  
*Phytolacca decandra*, Linn. Poke-berry  
*Pinus pendula*, Aiton. Tamarack. Hackmatack  
*resinosa*, Aiton. Yellow pine. Norway pine. Red pine  
*strobus*, Linn. White pine  
*Piptatherum nigrum*, Torrey. Clustered millet-grass  
*Pisum maritimum*, Linn.  
*Plantago cordata*, LaMarck.  
*lanceolata*, Linn. Snake plantain  
*major*, Linn. Plantain  
*Platanus occidentalis*, Linn. Button-wood. Sycamore  
*Poa annua*, Linn.  
*aquatica v. americana*, Torrey  
*capillaris*, Linn.  
*compressa*, Linn. Blue-grass  
*eragrostis*, Linn.  
*hirsuta*, Mx.  
*nemoralis*, Linn.  
*nervata*, Ww.  
*pratensis*, Linn. English-grass. Meadow-grass  
*reptans*, Mx.  
*serotina*, Ehrhart  
*trivialis*, Linn. Pasture-grass  
*Podophyllum peltatum*, Linn. Mandrake. May apple

*Pogonia ophioglossoides*, Brown. Snake-mouth arethusa  
*Polanisia graveolens*, Rafinesque  
*Polygala cruciata*, Nutt.  
*paucifolia*, Ww. Flowering wintergreen  
*paucifolia v. alba*, Eights.  
*purpurea*, Nutt.  
*Senega*, Linn. Seneca snake-root  
*verticillata*, Linn. Dwarf snake-root  
*Polygonum amphibium*, Linn. Mud knot-weed  
*arifolium*, Linn.  
*aviculare*, Linn. Knot-grass  
*Convolvulus*, Linn. Bind knot-weed  
*Fagopyrum*, Linn. Buckwheat  
*lapathifolium*, Linn.  
*mite*, Persoon. Tasteless knot-weed  
*pennsylvanicum*, Linn.  
*Persicaria*, Linn. Heart's ease. Lady's thumb  
*punctatum*, Elliott. Water pepper  
*sagittatum*, Linn.  
*scandens*, Linn.  
*tenue*, Mx.  
*virginianum*, Linn.  
*Polymnia canadensis*, Linn. White leaf-cup  
*Uvedalia*, Linn. Yellow leaf-cup  
*Polypogon racemosus*, Nutt.  
*Pontederia cordata*, Linn. Pickerel-weed  
*Populus canadensis*, Mx.  
*candicans*, Aiton. Balsam poplar  
*grandidentata*, Mx. Tree poplar  
*tremuloides*, Mx. White poplar. American aspen  
*Porcelia triloba*, Persoon. Pawpaw. Custard apple  
*Portulacca oleracea*, Linn. Purslane  
*Potamogeton heterophyllum*, Schreber.  
*natans*, Linn. Pond-weed  
*lucens*, Linn.  
*pectinatum*, Linn.  
*perfoliatum*, Linn.  
*zosterifolium*, Trinius

- Potentilla Anserina*, Linn. Tansey cinquefoil, Silver-leaf  
*arguta*, Pursh.  
*canadensis*, Linn. Five-finger  
*Comarum*, D.C. Marsh five-finger  
*fruticosa*, Linn. Shrubby cinquefoil  
*norvegica*, Linn. Cinquefoil  
*Prenanthes racemosa*, Mx.  
*Serpentaria*, Pursh.  
*Prinos verticillatus*, Linn. Winterberry. False alder  
*Prunella vulgaris*, Linn. Heal all. Self heal  
*Prunus americana*, Marshall. Meadow plum  
*depressa*, Pursh. Sand cherry  
*obovata*, Beck.  
*pennsylvanica*, Aiton.  
*Ptelea trifoliata*, Linn.  
*Pteris aquilina*, Linn. Common brake  
*Pycnanthemum virginicum*, Persoon. Virginian thyme  
*Pyrola elliptica*, Nutt. White wintergreen  
*rotundifolia*, Linn. Shin-leaf  
*secunda*, Linn. One-sided shin-leaf  
*umbellata*, Linn. Prince's pine  
*Pyrus coronaria*, Linn. Crab apple  
*melanocarpa*, Ww.
- Q.
- Quercus alba*, Linn. White oak  
*bicolor*, Ww. Swamp white oak  
*imbricaria*, Mx. Shingle oak. Laurel oak  
*macrocarpa*, Linn. Over-cup oak. Burr oak.  
*rubra*, Linn. Red oak  
*Queria canadensis*, Linn. Forked chickweed
- R.
- Ranunculus abortivus*, Linn.  
*acris*, Linn. Crowfoot. Butter-cup  
*aquatilis*, Linn. Water crowfoot  
*fascicularis*, Muhl.  
*lacustris*, Beck and Tracy. Lake crowfoot  
*pennsylvanicus*, Linn.  
*recurvatus*, Poiret  
*repens*, Linn.

- Ranunculus sceleratus*, Linn. Celery crowfoot  
*Rensselaeria virginica*, Beck. Water arum  
*Rhamnus franguloideus*, Mx. Dwarf alder  
*Rhus copallina*, Linn. Mountain sumach  
*glabra*, Linn. Sleek sumach  
*radicans*, Linn. Poison ivy  
*toxicodendron*, Linn. Poison ash  
*typhina*, Linn. Sumach  
*venenata*, D. C. Poison elder. Poison sumach  
*Rhynchospora alba*, Vahl.  
*glomerata*, Vahl. False bog rush  
*Ribes floridum*, L'Heritier. Wild black currant  
*gracile*, Mx.  
*triflorum*, Ww. Wild gooseberry  
*Rochelia lappula*, R. and S.  
*virginiana*, R. and S.  
*Rosa carolina*, Linn. Swamp rose  
*parviflora*, Ehrhart. Wild rose  
*Rubus frondosus*, Bw. Leafy raspberry  
*occidentalis*, Linn. Thimbleberry. Black raspberry  
*saxatilis*, Mx.  
*trivialis*, Mx. Creeping blackberry. Dewberry  
*villosus*, Aiton. High blackberry  
*Rudbeckia hirta*, Linn.  
*laciniata*, Linn. Cone-flower  
*pinnata*, Mx.  
*purpurea*, Linn.  
*Ruellia strepens*, Linn. Ruel  
*Rumex acetosellus*, Linn. Field sorrel  
*acutus*, Linn.  
*britannicus*, Linn.  
*crispus*, Linn. Yellow dock
- S.
- Sabbatia angularis*, Pursh. American centaury  
*Sagittaria sagittifolia*, Linn. Arrow-head  
*Salix Muhlenbergia*, Ww. Speckled willow  
*recurvata*, Pursh. Shrub willow  
*rosmarinifolia*, Linn. Rosemary willow

*Sanguinaria canadensis*, Linn. Blood-root  
*Sambucus canadensis*, Linn. Black-berried elder  
     *pubescens*, Persoon. Red-berried elder  
*Sanguisorba canadensis*, Linn. Burnet saxifrage  
*Sanicula marylandica*, Linn. Sanicle  
*Saponaria officinalis*, Linn. Soap-wort. Bouncing Bet  
     *vaccaria*, Linn. Field soap-wort  
*Sarracenia purpurea*, Linn. Side-saddle  
*Saururus cernuus*, Linn. Lizard's tail  
*Saxifraga pennsylvanica*, Linn. Water saxifrage  
*Scheuchzeria palustris*, Linn. Less flowering rush  
*Schoenus mariscoides*, Muhl. Water bog rush  
*Schollera graminea*, Barton. Yellow-eyed water-grass  
*Scirpus acicularis*, Linn.  
     *acutus*, Muhl.  
     *americanus*, Persoon.  
     *autumnalis*, Linn.  
     *brunneus*, Muhl.  
     *capillaris*, Linn.  
     *capitatus*, Linn.  
     *Erisphoruo*, Mx.  
     *equisetoides*, Elliott.  
     *lacustris*, Linn.  
     *lineatus*, Mx.  
     *macrostachyos*, Muhl.  
     *palustris*, Linn. Marsh club rush  
     *spadiceus*, Linn.  
     *sub-squarrosus*, Muhl.  
     *sub-terminalis*, Torrey.  
     *tenuis*, Ww. Club rush  
*Scleria triglomerata*, Mx. Whip-grass  
*Scrophularia lanceolata*, Pursh  
     *marylandica*, Linn. Fig-wort  
*Scutellaria ambigua*, Nutt.  
     *cordifolia*, Muhl.  
     *galericulata*, Linn. Scull-cap  
     *lateriflora*, Linn. Mad-dog scull-cap  
*Senecio Balsamitae*, Muhl. Balsam groundsel  
     *hieracifolius*, Linn. Fire-weed

*Senecio vulgaris*, Linn. Groundsel  
*Setaria glauca*, P. de. B. Fox-tail. Panic-grass  
*Sida Abutilon*, Linn. Indian mallows  
*Silene antirrhina*, Linn. Sleepy catch-fly  
     *stellata*, Aiton.  
*Silphium gummiferum*, Elliott. Rosin-plant  
     *perfoliatum*, Linn. Ragged-cup  
     *terebinthinaceum*, Linn. Prairie dock  
*Sinapis nigra*, Linn. Black mustard  
*Sisymbrium officinale*, Scopoli. Hedge mustard  
*Sisyrinchium anceps*, Cavanilles. Blue-eyed-grass  
*Sium latifolium*, Linn. Water parsnip  
*Smilacina bifolia*, Des Fontaines. Dwarf Solomon's seal  
     *racemosa*, Des Fontaines. Spiked Solomon's seal  
     *stellata*, Des Fontaines.  
*Smilax herbacea*, Linn. Bohea tea  
     *peduncularis*, Muhl. Jacob's ladder  
     *rotundifolia*, Linn. Horse brier. Green brier  
*Solanum nigrum*, Linn. Deadly nightshade  
*Solidago axillaris*, Pursh.  
     *canadensis*, Linn. Canadian golden rod  
     *juncea*, Aiton.  
     *flexicaulis*, Linn.  
     *lanceolata*, Aiton.  
     *nemoralis*, Aiton  
     *rigida*, Linn.  
     *serotina*, Aiton. Smooth golden rod  
*Sonchus oleraceus* v. *aspera*, Linn. Sow thistle  
*Sparganium americanum*, Nutt. Lake burr reed  
     *ramosum*, Smith. Burr reed  
*Spartina cynosuroides*, Ww. Spiked salt-grass  
*Spergula arvensis*, Linn.  
*Spiraea lobata*, Jacquin.  
     *opulifolia*, Linn. Nine bark, Hard hack. Snow ball  
     *salicifolia*, Linn. Willow hard hack  
     *tomentosa*, Linn. Steeple-bush  
*Spiranthes cernua*, Richard. Nodding ladies' tresses  
     *gracilis*, Beck.