The second report was the result of a practical field experiment based on the facts discovered by the earlier investigations. The conditions of this field experiment were not as trying or severe as might be desired, and although the results were highly gratifying, yet they did not seem as conclusive as we could wish. Accordingly, the past summer, another field experiment, on a somewhat larger scale, was tried in a part of the State where the smut of oats has been very destructive.

The trial was conducted on the farm of Chas. Baker, Noble County.

The last week in April three acres of oats were sown in three plats, the seed being treated respectively 40, 60 and 90 minutes in a solution of one part of commercial formalin to 200 parts of water. The seed was scattered broadcast without drying. Alongside of these areas was sown a field of untreated seeds. All of the seed used was from a previous crop of smutty oats that was very much infested.

No difference was noted in the time of germination of the several lots, but the treated seeds produced plants that were more uniform and better developed than those from the untreated ones.

At the time of cutting the difference between the two fields was very striking. Fully 15 per cent. of the heads of the untreated seeds were smutty, while not one stalk of the plants from the treated seeds showed any signs of smut. The whole experiment was conducted by the owner of the place from directions and material furnished by the department and the results were examined by one of our students. Of the three separate lots of treated seeds the ones soaked for 60 minutes seemed to be the best, and that time is recommended as safe and efficient for treatment. Comment on this experiment is unnecessary, and it is hoped that these facts may increase the use of this fungicide to the improvement of our production of oats.

The Flora of Lake Maxinkuckee.

By J. T. Scovell.

Lake Maxinkuckee is situated in Marshall County, Indiana. It occupies parts of sections 15, 16, 21, 22, 27, 28 and 34 of Township 32 north of Range 1 east of the second principal meridian. The lake is a little more than two and one-half miles long from north to south and about

one and one-half miles wide, having an area of nearly 1,900 acres. The surface of the lake is about 735 feet above tide. It is 150 feet above Lake Michigan, but 130 feet below the summit of the divide between Lake Michigan and the Wabash River. The lake is 15 feet above the Tippecanoe River five miles south, and about 75 feet above English Lake, 20 miles west. These elevations show that the lake is on a slope that descends gently toward the south and west. The lake is near the southwestern angle of the Saginaw moraine. The country about the lake is quite varied. There are hills and valleys, broad undulating plateaus, wet marshes and boggy swamps. The soils are sand, gravel, boulder, clay and swamp muck. There are more hills and clay and boulders on the east, more sand and gravel, more marshes and swamps on the west. On the east the surface rises somewhat abruptly to a general level of 75 or 80 feet above the lake, some hills reaching an elevation of about 140 feet. On the west there is a narrow divide 25 to 30 feet above the lake, then low land and swamp. The confused mingling of sand, gravel, clay and boulders, the irregular hills and the numerous kettle holes indicate that the surface features about the lake are of glacial origin. Just east of the center of the lake there are 15 or 20 acres of water that is from 85 to 90 feet deep. This deepest water is part of some 300 acres of deep water that forms the central portion of the lake. Fully one-half the area of the lake is shallow, the water being ten feet or less in depth.

Wells drilled from 75 to 150 feet through sand, gravel and clay, without reaching bed rock, indicate that the lake bed is wholly composed of morainic materials. In fact it seems to occupy a cluster of kettle holes, one long and deep, surrounded by several of lesser size and depth. The region drained into the lake is quite limited, being scarcely more than three times its area. "The Inlet" enters the lake from the southeast, Aubeenaubee Creek from the east, and Culver Inlet, with one branch from the north and one from the east, enters the northeastern part of the lake. These four streams, each rising within two miles of the lake, each largely fed by springs, are the principal inlets. Several very small streams, the outlets of springs, bogs, flowing wells and little swamps, contribute something to the waters of the lake. "The Outlet" is a sluggish stream which flows from the west side of the lake southerly into the Tippecanoe River. About 80 rods from the lake the outlet expands into a pond or lake, having an area of about 60 acres. This body of

water is shallow, at no place more than 12 feet deep. The greater part of its bed is muddy, and two-thirds of its outline is marshy. The ordinary variation in the level of the lake during the year is less than two feet. Such variation does not materially change the area of the lake or appreciably modify the various forms of life that inhabit its waters.

Perhaps one-eighth of the outline of the lake is low ground, marshy, swampy or boggy. But in general the muck or black mud is shallow, seldom more than two or three feet in depth, and it rests on a bed of hard sand or gravel. From the shore out to a depth of six or eight feet the lake bed is of hard sand or gravel, even along the low ground. At the mouths of the southeast and northeast inlets there are considerable areas of shallow mud over the sand, and at the mouths of the lesser inlets there is always a little soil. But for long distances along the steep banks of clay or gravel there is no fine soil, just sand or gravel. On the north, west and south this bed of sand and gravel supports an abundant growth of Chara, which is generally of small size and thickly crusted with calcic carbonate. This bed is also the home of immense numbers of bivalve mollusks. The chara and shells of dead mollusks yield considerable quantities of calcic carbonate. At first one would expect to find this material making deposits over the bed of this shallow water. But this calcic carbonate and other fine material is swept away and deposited in deeper water, where it helps to form the extensive marl beds of the lake. During the summer there are more winds from the east than from any other quarter, but during the year there are more westerly winds, and in general the westerly winds are stronger. There are also many northerly winds and many southerly winds, so that during the year there are numerous winds from each quarter. These winds pile up the water along the shores toward which they blow. This causes more or less of an undercurrent toward the deep water which carries with it all the fine material of the shallower water. As the westerly winds are more numerous and stronger these undercurrents are stronger on the east, carrying the fine material into deeper water, the marl beds commencing in eight to ten feet of water instead of in six to eight feet of water as on the other sides of the lake. The marl forms a rich soil which shades off into darker material under deeper water. During the winter ice forms to a thickness of from 15 to 25 inches. As the ice expands it crushes against the banks with great force. Where the shores are low the ice often pushes great quantities of sand and other materials up into

ridges, sometimes two or three feet high. These ridges or ice beaches are generally washed away by the high water common in spring, but sometimes they remain, making a distinct and somewhat peculiar plant region. Along the steep banks, the boulders that have fallen to the beach during the summer are crowded against the bank by the ice, making in some places quite extensive stone walls. With such a variety of soils as occur in and about Lake Maxinkuckee, a varied flora may be expected. In the waters of the lake there are great quantities of microscopic life, called *plankton*. Of the microscopic plants, protococcus, rivularia, oscillaria, diatoms, desmids and others are common everywhere in the open lake, but were most abundant among the higher vegetation along the shores. Occasionally rivularia would occur in such quantities as to be conspicuous to the naked eye. Spirogyra, vaucheria, oedogonium, hydrodiction, stigeoclonium, nostoc, cladophera, zygnema, chetophora, and others often occurred in masses in the shallow water. Chara and nitella were very abundant.

Nitella sp? A tall, slender plant, was abundant between 18 and 22 feet, ranging from 12 to 25 feet. In water from 20 to 25 feet deep we seldom found anything beside nitella.

Nitella sp? A small, delicate plant found in shallow water, common in the marshes and in the lake out to a depth of two feet.

Chara sp? A slender, rank-growing plant quite free from lime. Was abundant between 10 and 14 feet, ranging from eight to 24 feet. In some localities this chara was the only plant found between 10 and 14 feet.

Chara sp? A stout plant, seldom more than eight inches high, was thickly coated with lime. It was most abundant at a depth of from eight to 10 feet, often forming a thick mat of vegetation to the exclusion of other plants.

Chara sp? Much smaller than the above mentioned, quite abundant in shallow water, often the only vegetation. It was usually thickly coated with lime.

There are doubtless other species of chara and nitella about the lake, but the ones mentoned are the most abundant.

Potamogeton natans L. This plant was more common in the southwestern portion of the lake, growing in water from four to six feet deep.

P. amplifolius Tuckerm. This plant was abundant in water from five to eight feet deep, but ranged from two to 24 feet. On the Sugar Loaf bar, it was abundant and rank from nine to 24 feet.

P. lonchites Tuckerm. This pond-weed was common everywhere in shallow water. A cluster of rank potamogetons growing in eight to ten feet of water on Weed Patch bar I called lonchitis, but do not feel quite sure that I was correct.

P. heterophyllus Schreb. This plant was quite common out to a depth of four feet.

P. lucens L. This plant, sometimes called perch weed,was widely distributed, growing most commonly in water from six to eight feet deep.

P. praelongus Wulf. Not very common, growing in water from eight to 12 feet deep.

P. perfoliatus L. Not common, but quite abundant in a few localities in the south part of the lake. More common in water from eight to 12 feet deep.

P. zosteraefolius Schum. Quite common. More abundant between 10 and 16 feet, but ranging from two to 26 feet.

P. fricsii Ruprecht. Widely distributed, more abundant between 12 and 16 feet, but ranging from eight to 25 feet.

P. pusillus L. More common in the southeastern portion of the lake in deep water, ranging from 10 to 24 feet.

P. pectinatus L. Forming thick masses, excluding other vegetation in water 10 to 16 feet deep, also in shallow water one to three feet deep. It often stands at the head of a steep slope.

P. robbinsii Oakes. Very common in the shallow waters of the Little Lake, but in the large lake more common in water from 10 to 18 feet deep, ranging from two feet to 24 feet.

Naias flexilis (Willd) Rost and Schmidt. Very abundant, ranging from one to 24 feet. Most common in the northeastern part of the lake.

Naias flexilis robusta Morong. This plant, while not common, was found in several localities

Sagittaria graminea Michx. In the shallow water of the Little Lake.

Philotria canadensis (Michx.) Britton. Very abundant in a few localities in shallow water, as near the head of the outlet. It is widely distributed in deep water, ranging from one to 22 feet.

Vallesneria spiralis L. Called Eel-grass. Said to be the wild celery of Chesapeake Bay. The plants bearing pistillate flowers grow in shallow water. I saw none deeper than two or three feet. The male plant was most abundant in water from eight to 18 feet deep. We found it as deep as 24 feet. The pistillate flower is carried to the surface of the water by a long thread-like scape. After fertilization the scape forms a spiral of several coils, drawing the ovary several inches under water, where the seeds ripen. The staminate flower has a short peduncle. When the pollen is mature, the flower separates from the plant and rises to the surface. The pollen, escaping from the anther, floats away to the pistillate flowers. The buds or stolons formed in the fall, on the male plant, are highly prized by mud hens and ducks as food. They will dive 10 or 15 feet for it. The shores are often thickly covered with the leaves they break off while getting these dainty bits of food.

Eleocharis interstincta (Vahl.) R. and S. In shallow water in both lakes, often forming large patches.

E. mutata (L.) R. and S. Abundant in shallow water near the mouth of the southeast inlet.

E. palustris (L.) R. and S. Found along the southern shore of Lake Maxinkuckee.

Scirpus americanus Pers. Common in the shallow water of both lakes.

S. lacustris L. Common in the western and southern portions of the lake out to a depth of seven or eight feet. Specimens from 10 feet to 13 feet long often occur.

Spirodela polyrhiza (L.) Schleid. Common in quiet waters about the lake shores.

Lemna trisulca L. Common in the outlet and in the southeastern inlet.

L. minor L. Often found with *Spirodela.*

Wolffia columbiana Karst. In the southeastern inlet and in the outlet.

Eriocaulon septangulare With. In Lake Maxinkuckee, but not common.

Brasenia purpurea (Michx.) Casp. Very abundant in the outlet, only occasionally found in the lake.

Nymphaea advena Soland. Common.

Castalia odorata (Dryand) Woods and Wood. Abundant in the outlet and in the Little Lake. Only occasionally found in the larger lake.

Ceratophyllum demersum L. Common everywhere to a depth of 24 feet.

Abundant in shallow water and quite plentiful between 14 and 20 feet.

Batrachium trichophyllum (Chaix.) Bossch. Abundant in the southeastern part of the Little Lake.

Roripa nasturtium (L.) Rusby. Abundant in the northeastern inlet and in other places.

Myriophyllum spicatum L. Abundant in the Little Lake and in the outlet. In water from two to eight feet deep.

Myriophyllum verticillatum L. Found in both lakes. Not deeper than 14 feet.

Utricularia purpurea Walt. In the outlet.

U. vulgaris L. In the outlet and Little Lake.

U. intermedia Hayne. In the outlet and Little Lake.

U. minor L. In the Little Lake and outlet.

U. gibba L. In the outlet.

U. biflora Lam. In the Little Lake.

Bidens beckii Torr. Found in both lakes. Not very abundant, but ranging from two to 20 feet in depth.

Peltandra virginica (L.) Kunth. Found in shallow water of both lakes, often in the mud along shore.

Pontederia cordata L. Common in shallow water of both lakes, often above water line along shore. Both of these plants, after fertilization, bend over, thrusting the ovary into the water or mud, where the seeds ripen.

On the marshes below the level of high water we found—

Dryopteris thelypteris (L.) A. Gray.

Equisetum fluviatile L.

Typha latifolia L.

Alisma plantago-aquatica L.

Sagittaria latifolia Willd.

Dulichium arundinaceum (L.) Britton.

Eleocharis ovata (Roth) R. and S.

Scirpus smithii A. Gray.

Acorus calamus L.

Xyris flexuosa Muhl.

Juncus effusus L.

Salix discolor Muhl.

Polygonum sagittatum L.

Decodon verticillatus (L.) Ell.

Mimulus ringens L.

Lobelia syphilitica L.

Cephalanthus occidentalis L.

Nyssa sylvatica Marsh.

Polygala cruciata L.

Spiraea tomentosa L. And more than sixty others, largely sedges and grasses.

In addition, along the beach, between low and high water, we found—

Panicum crus-galli L.

Muhlenbergia sylvatica Torr.

Cyperus diandrus Torr.

Polygonium pennsylvanicum L.

Impatiens biflora Walt.

Teucrium canadense L.

Lycopus virginiana L.

Mentha piperita L.

Mentha canadensis L.

Xanthium canadense Mill

Eclipta alba (L.) Hassk.

Bidens connata Muhl. And more than fifty others. In all making over two hundred plants in and about Lake Maxinkuckee growing below high water mark.

I desire to call attention specially to the following facts: First, that the bed of the lake is comparatively barren under water from two feet to six or eight feet deep; second, that there is an abundance of rank vegetation under water from eight feet to 20 feet deep; third, that we found no vegetation below a depth of 26 feet in Lake Maxinkuckee.

Generic Nomenclature of Cedar Apples.

By J. C. Arthur.

In a communication made to this society at a former meeting (December, 1898) the writer gave some account of recent studies in the nomenclature of plant rusts, especially as applied to species occurring in the State of Indiana.* At that

*Arthur, J. C.—Indiana plant rusts, listed in accordance with latest nomenclature. *Proc. Ind. Acad. Sci. for 1898:* 174-186.