MICHIGAN DEPARTMENT OF CONSERVATION
Game Division

A Preliminary Study of Waterfowl Flooding Projects in Region II. Summer 1951

(An extract of Game Division Report #1150 of the same title)

This is the only copy of Report #1150 at the present time. It is an extract of #1150, pending typing of the final report. Other copies of this extract are available in the P-R file (see W. E. Laycock)

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4-8-52

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FOREWARD

This is an extract of Game Division report #1150, of the same title. It is that portion of the report that deals with flooding projects financed in part by Federal Aid in Wildlife Restoration funds. Parts II and III of report #1150 are described in the "Introduction" following. Since they do not involve P-R projects and are primarily tabular and of reference value only, they are not included herewith. Maps and floral and faunal lists included in the appendices of that report are not included since they too are primarily of reference value.

It is hoped that this preliminary study will be continued during the summer of 1952. In the meantime this will provide some record of the condition of several of our flooding projects in the summer of 1951.

INTRODUCTION

In 1948 the Game Division of the Department of Conservation began a program of habitat improvement for waterfowl in Michigan by constructing a series of dams in likely sites. Region II has had its share of these flooding projects. To date eight of these have been completed in the region and are now operating, and several more are in various stages of completion. Although no restrictions in size have been set up, they have been from 20 to 800 acres in extent. Federal Aid in Wildlife Restoration funds financed these projects.

Michigan's capacity for inland waterfowl production is well known. Flooding projects are not new in Michigan, and their value as producers of waterfowl is virtually unquestioned. But on the other hand we know very little about the ecological succession in such ponds. Moreover, there has been a strong suspicion that certain stages of succession yield a flora which is not the most desirable for ducks or fish. In short, we know these ponds are worthwhile, but beyond that we know very little about how to maintain them at their maximum efficiency. Since a considerable investment is involved, it behooves us to make some study of how to maintain this maximum efficiency.

There are three things we need to know: (1) What is the ecological succession on these backwaters we are creating? (2) Which of these ecological stages is the most productive of waterfowl? (3) How can we maintain the most efficient ecological stage on the projects we are now constructing?

This is a complicated problem and will take years of study to solve. Type of soil, type of water, type of surrounding forest cover, and many other variables undoubtedly strongly affect succession. For an accurate management plan the effects of each must be determined.

The groundwork for such a study of ponds in Region II was begun in the summer of 1951 at the Roughton Lake Wildlife Experiment Station. Stephen DiAngelo, a graduate student of the University of Michigan, was hired as a Conservation Aide

during the summer of 1951 to make a preliminary survey. This is a report on the work he did. His study consists of four parts as outlined below:

1--Bear Creek Flooding Project. This is one of the newly created flooding projects. It was picked as a dam more or less typical of such projects in Region II, and is located only five miles from the Experiment Station in southwest Rockwall County. As a basis for a continuing study of ecological succession the flooding was cover mapped in considerable detail. Although it had been flooded one year a cover map was re-constructed, showing cover types before flooding. Superimposed on this map are cover conditions as they existed one year after flooding. A detailed aquatic plant census of the old stream course was made. A waterfowl census of the area was made and waterfowl production estimated. Permanent camera points for recording future changes were set up, and a series of camera point pictures taken.

2--Mud Lake Flooding Project. Mud Lake, located about 10 miles east of the Station, northeast of Prudenville, is an impoundment constructed by the CCC and the Department of Conservation in the middle 1930's. It is now about fifteen years old. Mud Lake was selected as a pond which might represent what Bear Creek would look like fifteen years from now. Aquatic vegetation at Mud Lake may be very nearly climaxed. Local opinion suggests that Mud Lake may have been more productive of ducks and fish in the past than it is now. Time did not permit making a cover map of Mud Lake but an aquatic plant census was made, from which we obtained a detailed estimate of the extent of various cover types on the flooded area as of 1951.

3--Evaluation of Various Herbicidial Techniques. In 1950 before Bear Creek was flooded, H. J. Miller, the department's waterfowl specialist, set up a series of experimental plots to determine the effectiveness of various methods for killing out sedge sod so that desirable aquatic species could take over faster. Miller tried several herbicides and various mechanical methods of destroying the sod. A plant census was made on these plots, and preliminary evaluation of the various methods was made.

b. Casual Surveys of Completed Flooding Projects. Biangels visited five other newly completed flooding projects, making hurried plant and waterfowl censuses, setting up some camera points and taking a series of pictures. This was done as a preliminary to setting up more detailed studies similar to the Bear Creek study, on other flooding projects in 1952. While these surveys were only sketchy, they will serve as a record of value for any future work we can manage to do on them.

For convenience, common names are used for plants throughout the text, except for a few instances when common names do not exist or are not specific. The common names used are those given by Fassett (1940).

This report is preliminary. It is intended solely as background for future work. It has been prepared as a record of the status of certain flooding projects in 1951. Therefore no final management recommendations are intended from this report.

We intend to continue this project during the summer of 1952.

R. A. MACMILLAN

PART I. BEAR CREEK FLOODING PROJECT

Location and Description:

The Bear Creek dam is located in Roscommon County, Michigan; T22N, R4W, NW¼ NW¼ Section 7, approximately five miles southwest of Houghton Lake. Above the dam, the creek drains an area of approximately 12 square miles. This drainage area is an elongated basin extending northeast from the dam. Running along the longitudinal axis of the basin is the meandering creek. Typical cover types, ranging from the creek bed to upland are grass, sedge, swamp birch, bog alder, willow, coniferous swamp, hardwood swamp, poplar, oak, and jack pine.

Rifle peat and Lupton muck predominate the lowland area, while Sungatuck and Rubicon sands are found in the uplands. Sand roads which follow the natural ridges surround the area. Changes in topography are in general gradual. The entire area is state-owned.

Temperatures taken in Bear Creek on August 25th, 1951, near the dam showed the surface water in the channel to be 70°F. while two miles away at the upper part of the stream in the northeast corner of Section 32 the temperature was 64°F., a difference of 6°.

The color of the water at the upper end of the stream is less stained than at the dam. Light readings were taken with an ordinary photo-electric cell light meter from light reflected from a 12" square metal plate painted white on the top and black on the bottom. This plate was suspended 10" under water, the white side facing up, and tied to a diving mask which rested on the water surface. The light meter was held next to the glass of the diving mask, thus eliminating reflection from the water surface. Readings taken 10" below the water surface showed 40% less light penetration at the dam than at the upper end in Section 32.

History of the Area:

Old beaver-cut stumps and flooded dead timber are found scattered throughout the area, indicating that beaver have occupied Bear Creek for many

years in the past. Weathered "deadheads" are testimony that the creek was used by Michigan's early lumbermen to float logs. Bear Creek may have been flooded to facilitate logging, but no evidence of former dams could be found.

Apparently none of the former beaver floodings were as extensive as the present one, for the waters now reach into living timber stands which show no signs of former flooding.

Before flooding, the elevation recorded at the dam site on September 17, 1951, was 89.62 feet (based on an assumed datum). Theoretically, the water was to be raised to the 94 foot contour, creating a head of approximately 4 feet of water.

The proposed flooded area, as determined by the engineers, was to be 273 acres. Maintenance of this 94 foot water level is dependent on 5 splash boards.

Work was completed on the dam in the fall of 1950, and 4 splash boards were put in. A fault on an earth fill developed, however, and the 5th (and last) splash board was not put in, so that the water level would remain low until the fill could be repaired. During the summer of 1951 beaver moved in and constructed a dam on the concrete dam (see Fig. 1), raising the water approximately to the final level recommended by engineers. Since this threatened the weakened dike, the beaver dam was cleaned out on June 10, 1951, and again on August 1, 1951. A marked effect of this high water stage upon stream-border plants is seen in Figure 2. Since the beaver still persisted, after August 1st, five beaver were live-trapped and released elsewhere. In September the earth fill was repaired, and the last splash board was placed, raising the water level to the 94 foot contour.

Thus during the summer, water levels fluctuated approximately between the 93 and 94 foot levels; in September water level was permanently established at the 94 foot level.

Figure 1
Beaver dam built on top of concrete dam ...
much to the chagrin of our engineers

Figure 2
Effect of the beaver dam. This photo was taken two miles above the dam. Note the well-defined water line created by killing foliage of sweet gale.

Information on waterfowl productivity and hunter use of the area prior to flooding is scanty. On the basis of opinion and impersonal interview, we can estimate that perhaps one or two broods per year were raised, and only an occasional hunter used the area.

Preliminary Findings on Aquatic Plant Succession Following Flooding: A detailed cover map of the entire Bear Creek flooding project was made with the help of aerial photos. This map was constructed showing cover as it existed before flooding. Following this, another map of cover as it existed in the summer of 1951 was made. This allows a limited "before and after" comparison, indicating changes in plant succession. These are discussed below.

Trees recently flooded (silver and red maple, cedar, elm, black ash, poplar and birch) are outwardly unchanged (see fig. 16 and 17). Wooded regions previously flooded by beaver show that silver maple and black ash have withstood high water successfully. Although there was some incidental bladderwort among the newly flooded timber there was no definite evidence of any aquatic plant invasion in the flooded timber type. Duckweeds have shown their presence among the flooded trees but not in any great abundance. Since duckweeds are free-floating aquatic plants they are likely to accumulate in stagnant waters, and not in any particular cover type.

During this first year, flooding has affected tag alder and swamp birch little, if at all. Previous floodings have made it difficult to determine at this time the effects of the present flooding. Neither the alder nor the willow is growing luxuriously.

In flooded marshes of sedge and bluejoint, the bladderworts have been the submergent plant invaders. In areas where sedge and grass have been prostrated or killed by flooding, the newly created openings rapidly became invaded by the surface-growing water smartweed. The presence of duckweed is only incidental.

Areas of living grass and sedge still persist after flooding and offer some competition to the desirable smartweeds, but at the same time provide excellent cover for waterfowl.

In the flooded grass flats lying along and between the meanders of the stream, the invading plants are the same as in the marshy grass-sedge areas, i.e., bladderworts are the dominant submerged plants and smartweed the major surfacing aquatic plants (Figs. 22 and 23). Flooding has killed a good portion of the grass but there is still enough living grass to give these areas the appearance of grassy meadows (Figs. 15 and 26). Smartweed on the edge of these grassy meadows is spreading rapidly along the edge of, and into, the stream.

The flooded sweet gale along the edge of the stream appears to be in poor condition (see Fig. 20). In general sweet gale can grow in flooded waters, but the foliage which is water-covered dies rapidly (see Fig. 2).

In the stream channel smartweed and bladderwort established themselves along the edges. Also along these edges, but with rarer occurrence, were found floating bur-reed (Fig. 17), flat-stemmed pondweed, coontail, and water marigold. It is believed that these plants were present before flooding. The great vigor with which these four plants can spread and dominate an area has been noted at older impoundments; the latter three are submerged types and no photographs are available.

At the dam where construction operations have exposed the bare mineral soil, three major species have become established cattail, bur reed, and flat-stemmed pondweed.

On the experimentally plowed ridges where organic soil has been laid bare, cattail and bur reed have again become rapidly established. It may be of significance that there was relatively more bur reed than cattail on the exposed organic soil, and that on the exposed <u>mineral</u> soil (at the dam) there was

relatively more cattail than bur reed. In Part III the occurrence of these two plants on the plowed strips is taken up in detail.

By way of summary it can be said that the major change in plant succession has been the establishment of smartweed and bladderwort. Where the soil has been turned and kept moist cattail and bur reed have rapidly colonized. Except for bladderwort the value of these plants to wildlife is of great importance. From observations on similar, but older, impoundments there is reason to believe that bladderwort will soon be replaced to a large extent by more desirable plants.

Essential Waterfowl Features Provided by the Flooding of Bear Creek:

1. The area still supports extensive areas of living tag alder and swamp birch. Most of this alder and swamp birch is now flooded and is providing excellent seclusion for ducks at Bear Creek. The number of ducks harbored in this alder could not be estimated because of the difficulty encountered in approaching the ducks. Suffice it to say that, from the activity heard in the alder, the number of ducks present during the summer of 1951 was more than has been recorded.

2. The flooded grass flats provide good feeding areas for teal.

3. The flooded timber provides excellent habitat for the nesting and rearing of wood ducks. Although only two wood duck broods were censused it is quite certain that many more were produced on the area. The increased water height during the summer provided by the beavers' addition to the concrete dam aided this situation by flooding additional timber.

4. The increased shoreline resulting from flooding provided a proportionally greater nesting habitat for waterfowl.

5. Likewise, the total waterfowl food-producing capacity was increased greatly with flooding.

Waterfowl Counts and Productivity:

Seven waterfowl censuses were made during the summer. These are summarized in Table 1./ The greatest number of ducks counted on the entire area in

in report 1150.

one day was 108; undoubtedly there were more ducks on the area, as was pointed out above. Mallards composed the greatest percentage (38%) of this total while black ducks ranked second with 15.7 percent. Blue-winged teal were third in abundance (11.2%). The remaining 35.1 percent included unidentified ducks (11.1%), ring-necked ducks (9.2%), green-winged teal (6.3%), wood ducks (3.7%), grebes (2.8%), and hooded merganesers (1.8%).

Nine different broods were located at Bear Creek; this amounts to approximately one brood per thirty acres. The young of these broods totaled 71 birds.

The methods used in making these counts were : (1) visiting likely spots, such as flooded hardwoods or marshy pockets, and (2) traveling by boat along the stream's course, counting the ducks flushed or seen flying.

Camera Points:

Fourteen camera points were established; their locations are on file in the Houghton Lake Wildlife Experiment Station files. These points are permanent and are marked by 4-inch cedar posts (except where otherwise indicated). From 1 to 4 photographs were taken at each camera point, making a total of 35 photos which are shown in Figures 3 - 25 inclusive.

Figure 3

[illegible] in a flooded grass-sedge marsh in Sec. 6, [illegible] Iowa, in July 1951, was less than one foot.

[illegible] IA

Figure 4

[illegible] marsh showing, from foreground to background, sedge, reed canary grass, box elder, [illegible] and cedar forest fringe.

Figure 5
Experimental plowing in the open marsh as shown in Figures 1 and 4. CF 2A

Figure 6
General view of experimental plowing. CF 3B

Camera Points (cont'd)

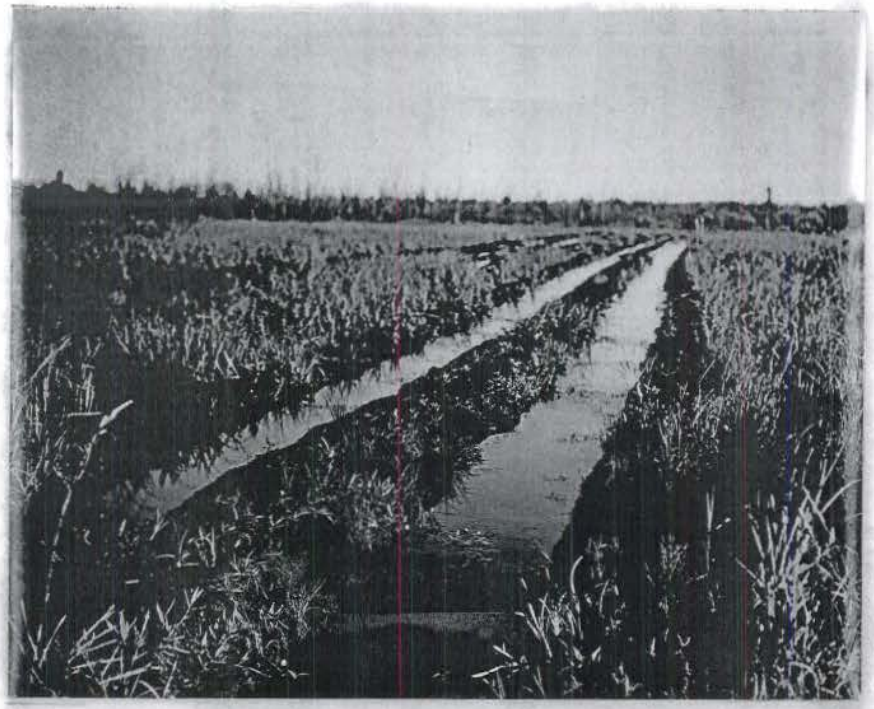

Figure 7
Bur reed and cattail (small shoots on ridges in foreground) establishing itself. Pearlweed is growing on the water's surface. CP 2C

Figure 8
Flooded sedge. Water depth here was 3 to 4 feet. CP 3A

Seneca Points (cont'd)

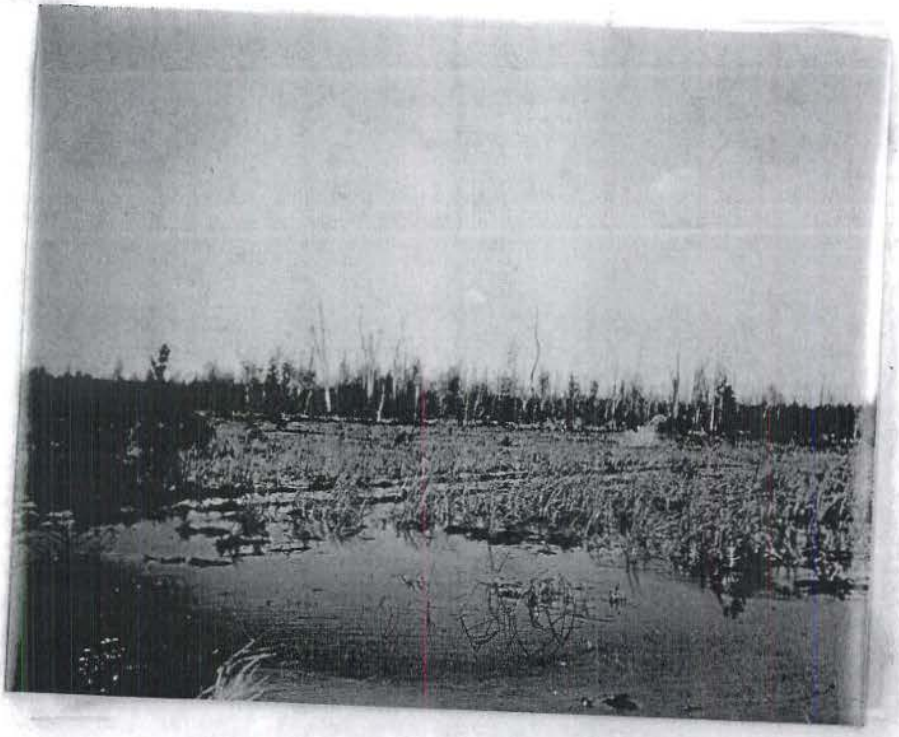

Figure 9
Flooded sedge; plowed strips are seen across middle of photo. GP 38

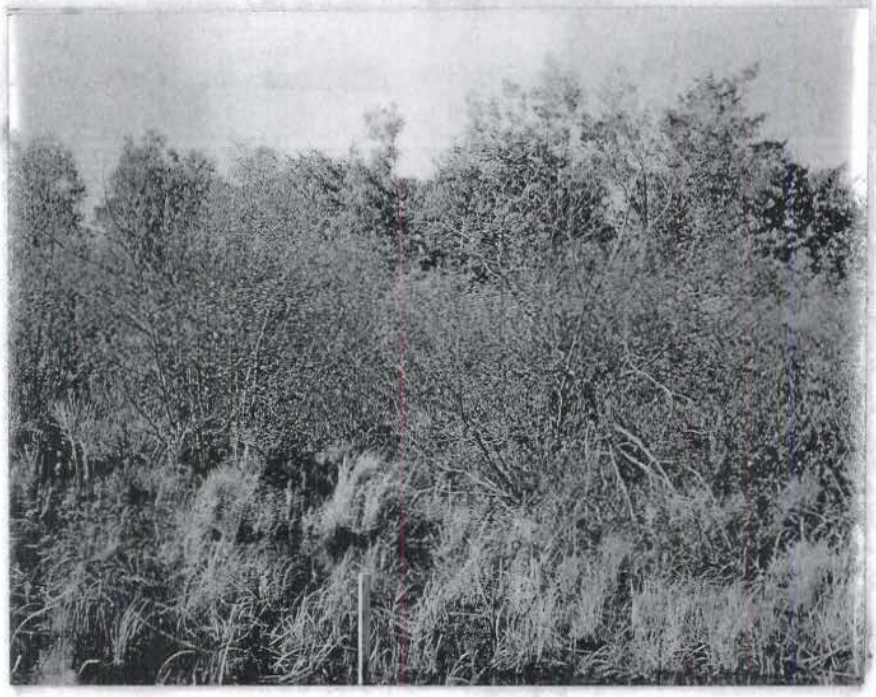

Figure 10
Flooded tag alder. Sedge in foreground and poplar in background. The stake marks one of the herbicidal plots. GP 30

Figure 11
Successful elimination of sedge by plowing. Ducks have used these ridges for loafing and preening. Note smartweed on water and on ridges. Stakes mark herbicidal plots. GF 3D

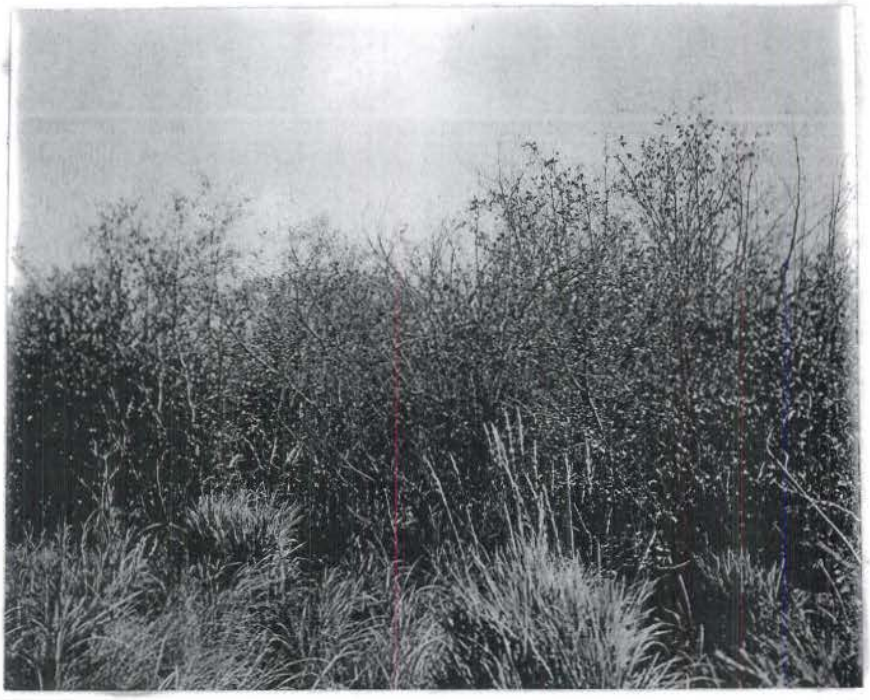

Figure 12
Flooded bog alder partially killed. GF 4A

Figure 13
Cattail patches among sedge in flooded marsh. How will flooding affect this cattail? CP 5A

Figure 14
Edge of flooded sedge marsh showing, from foreground to background, sedge, cattail, bog alder, and black ash. CP 5B

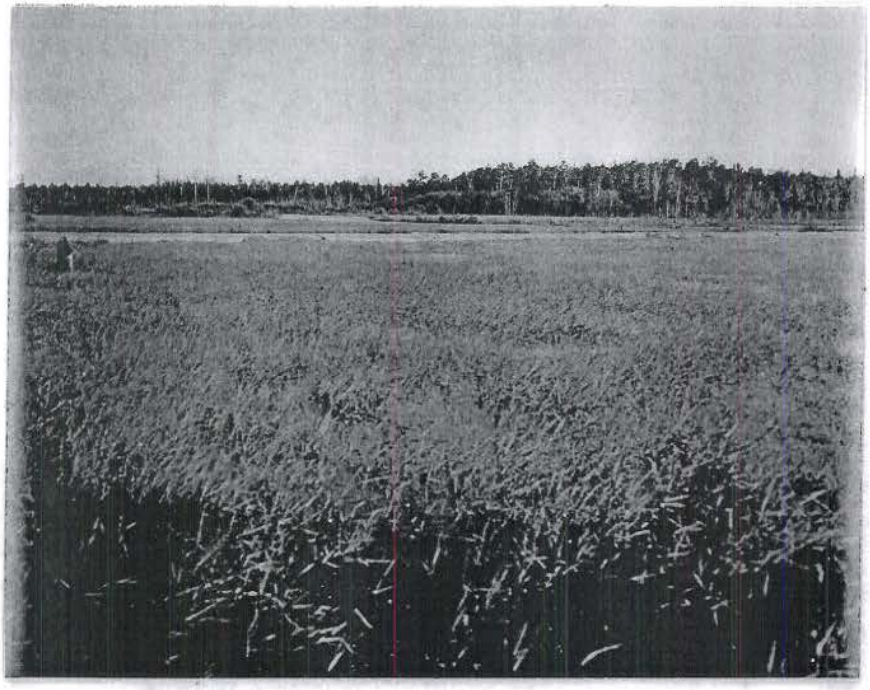

Figure 15
Flooded bluejoint in the stream basin. Note Bear Creek across upper middle. CP 6A

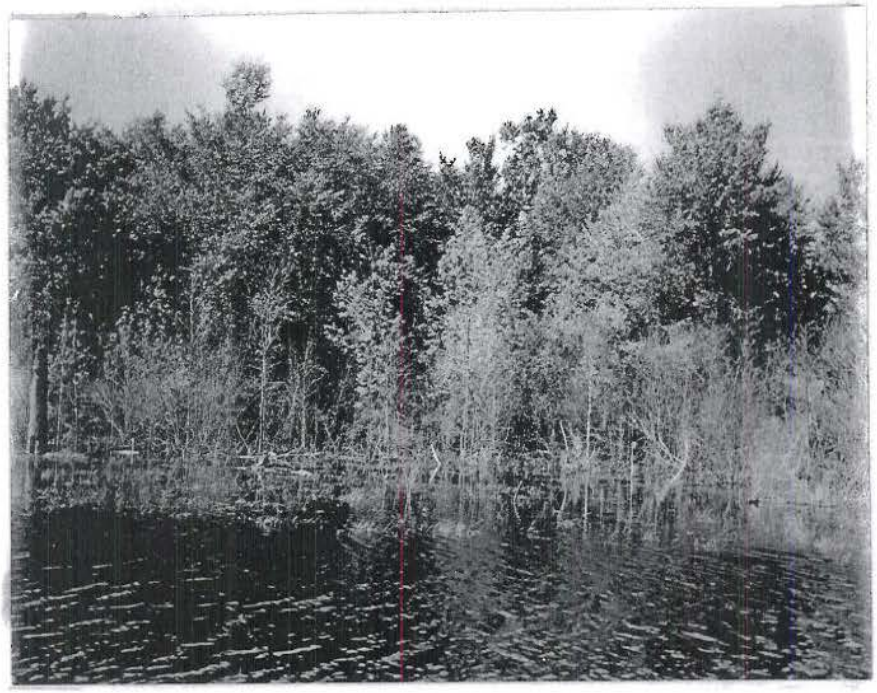

Figure 16
Looking from Bear Creek shoreward. From middle foreground to background are seen bluejoint, black ash (small trees with light foliage), elm, and red maple. CP 6B

Transcription Points (cont'd)

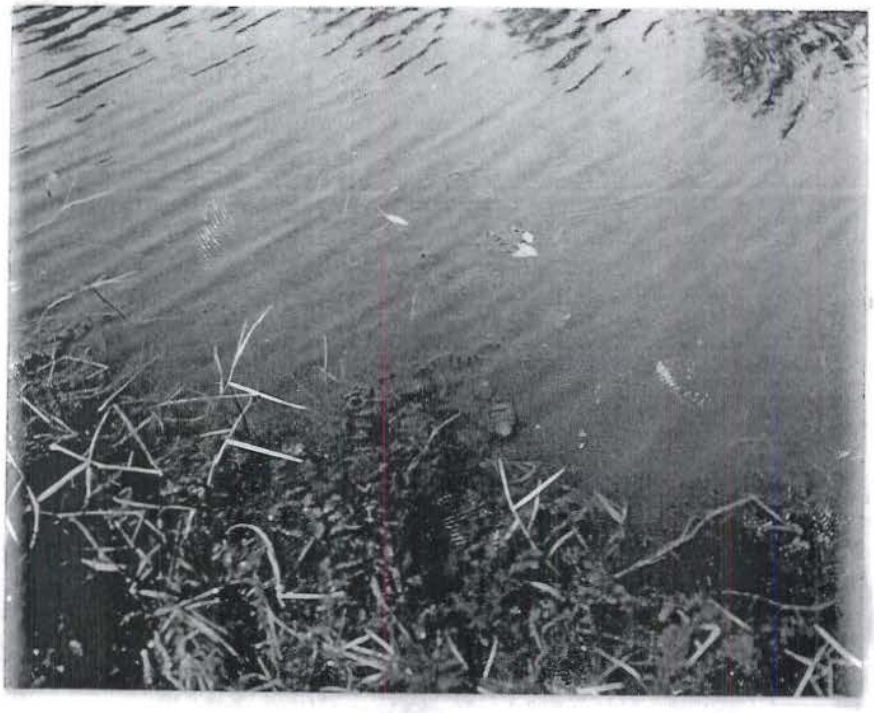

Figure 17
Edge of stream channel, showing bluejoint, floating broadleaf (center of photo) and bladderwort (submerged). Will floating broadleaf take over this site, as it has done on other flooding projects? CF 6D

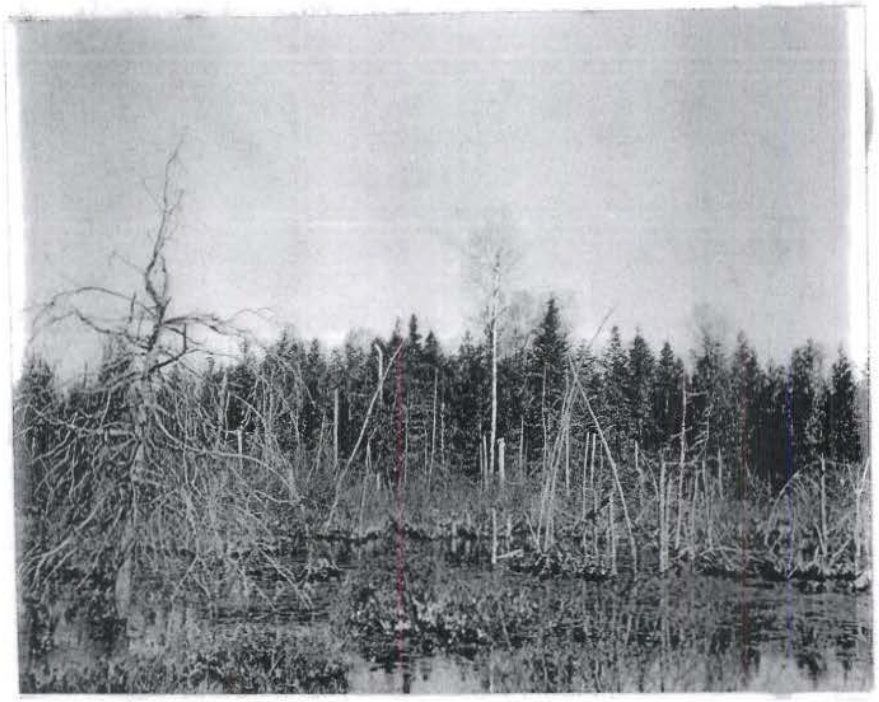

Figure 18
Cedar in background is standing in approximately one foot of water. Snags in foreground give evidence of former floodings. Sweet gale (the low bushy plant in left foreground) is in poor condition. CF 7A

Figure 19
Flooded swamp birch (foreground). Cedar snags are the results of previous floodings. CP 84

Figure 20
Flooded sweet gale; some willow is intermixed. CP 83

Tamarack Points (cont'd)

Figure 21
Flooded black ash (leaning tree), silver maple (center), and tag alder (extreme left). Dead trees indicate that former floods have killed some trees while others have survived. CP 9A

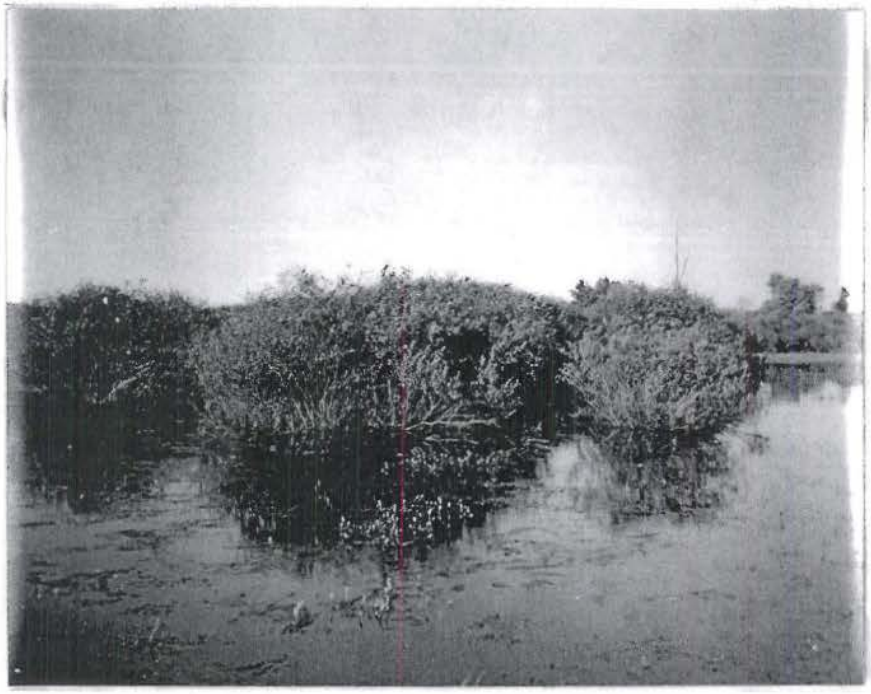

Figure 22
Flooded willows. Note the smartweed on the water surface.
CP 10A

Camera Points (cont'd)

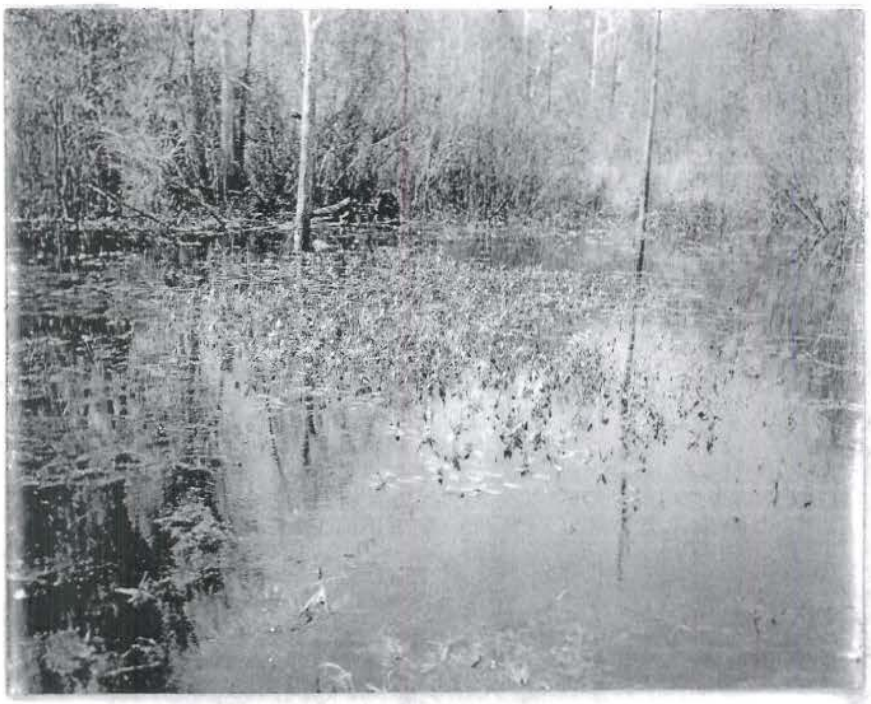

Figure 23
A dense smartweed patch that has appeared since flooding.
CP 11A

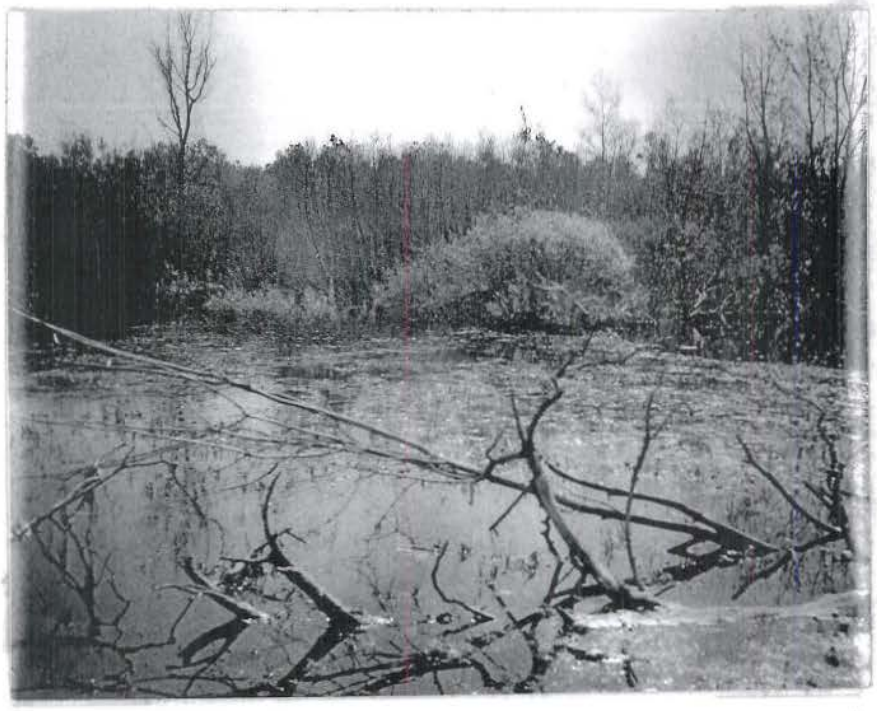

Figure 24
In the center of the figure is a clump of living willow followed by a dense stand of dead tag alder killed by a previous flooding. CP 11B

Western points (cont'd)

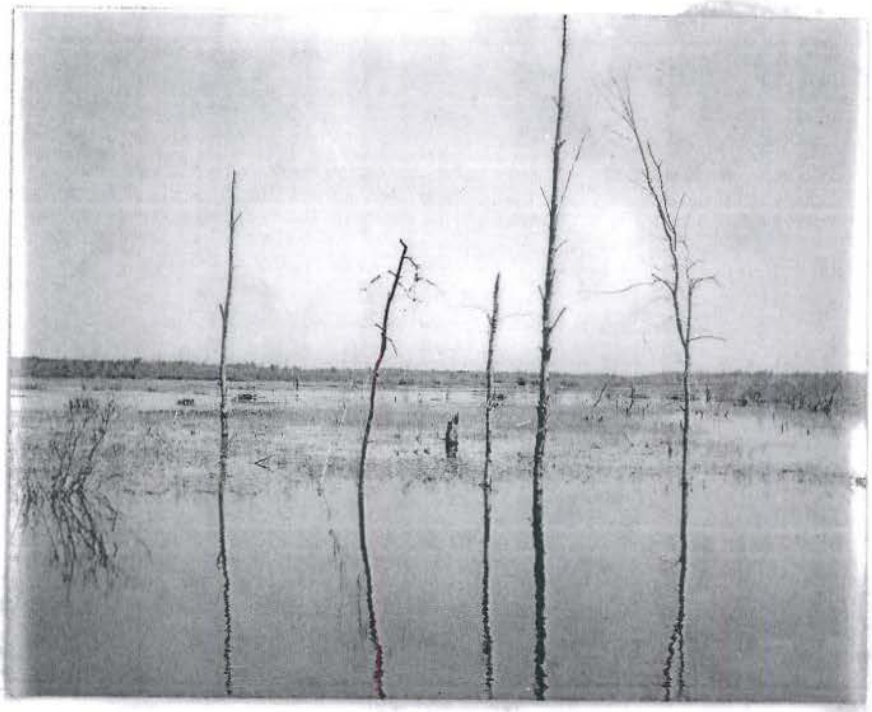

Figure 25
Looking southeast from near the dam. Dead trees mark the edge of the stream channel. CP 11C

Figure 26
The most extensive region of flooded bluejoint on the area.
CP 12A

Figure 27
Planted hardwoods at the dam; includes poplar, white birch, elm, silver maple, and red maple. The concrete dam is at the far end of the sand dike. CP 13A

Figure 28
Hardwoods below the sand dike. CP 13A

Part II. MUD LAKE FLOODING PROJECT

Part III. EVALUATION OF VARIOUS TECHNIQUES FOR DESTROYING BROOM AND GRASS SOD

(These two parts are not included.
See Forward and Introduction.)

PART IV. CASUAL SURVEYS OF COMPLETED FLOODING PROJECTS

In addition to Bear Creek there are seven other completed flooding projects in Region II. All of these were casually inspected at one time or another during the summer. A few pictures were taken, ducks seen were recorded and some sketchy plant censuses were made.

But little time was spent on each of these surveys. Nevertheless, they will provide some record for later studies. It is hoped that in our efforts to learn more about plant succession we may have this record to which we may refer back.

Manpower being available, we hope to make more-detailed surveys of several of these during the summer of 1952.

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8-8-52