Mac
~~Mc~~GREGOR

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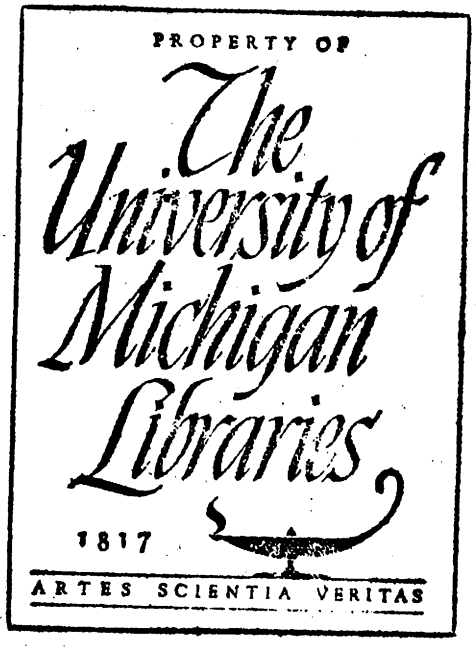
MANAGEMENT PLANS FOR THE DEVELOPMENT OF THE HURON RIVER WILDLIFE SANCTUARY

(Presented as partial fulfillment of the requirements of a M.S.F. degree at the University of Michigan).



Charles E. Mac Gregor

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In preparing this report an attempt was made to treat all of the major aspects involved in a complete land use program. That is; agricultural practices, recreational planning and landscape improvement, in addition to matters pertaining directly to wildlife.

The area is to be administered under the Michigan Wild Life Sanctuary Law, Act 184 of the Public Acts of 1929.

General Description of the Area

This area, stretching along the Huron river between Ann Arbor and Ypsilanti, consists of approximately 2370 acres, 460 acres of which are covered by water. The river occupies a narrow gorge-like valley, ranging from 100 to 250 feet below the adjacent upland plain; the slopes are steep, and the short tributary streams have cut sharp ravines.

The soils are prevailingly sandy loam of medium productivity, but clays and spots of wet soils around seepage springs are included. Much of the area remains unproductive, and conditions are unfavorable for its complete and profitable agricultural use. The fact that of the total land area of approximately 1905 acres, only 250 acres ar 12.8 per cent were cropped indicates in a practical way the undesirability of large portions of the area for agriculture. The soils differ widely in texture, structure, chemical composition, productivity, and moisture-holding capacity--natural factors which bear a relation to plant growth and consequently to agriculture and natural cover. They also exhibit a lack of uniformity, such as extreme local variations in texture.

The surface soils range from nearly pure sand to heavy silt loam. Most of the soils are sandy loams and loams. It is estimated that 25 per cent of the soil is poor in

organic matter in the plow layer, containing less than 2 per cent by weight (Veatch, "). The humous layer in virgin, well drained soils doew not exceed 3 inches in thickness, and consequently, in the cultivated soil very little coloring from organic matter occurs below a depth of 6 or 7 inches. The soils are deeply penetrable, however, as the parent soil material is unconsolidated glacial drift to a depth of several feet.

The greater part of the area is well drained, as the water table is not high and the slope is sufficient to provide free run-off. Gulley erosion is occurring along certain portions of the river, but in most places check dams or other steps have been taken to decrease this waste of soil.

Early Description and Development of Washtenaw County *

In order to obtain a better understanding of the development of the area and the ecological changes which have taken place, it might be well to include a brief summary of the early history and development of Washtenaw County, with emphasis on the area lying along the Huron river between Ann Arbor and Ypsilanti.

It has only been about one hundred and fifteen years since the first white settlement was made in Washtenaw County on or near the present site of Ypsilanti,but the march of events has been so rapid that the county has all the appearence of an old long settled country. The actual pioneer life in Washtenaw was of short duration for the county was quickly settled and the soil readily responded to cultivation.

The settlers of the county never clashed with the Indians, since the redskins had removed from the area before the first permanent settlement was made, in 1823, and what little intercourse there was between the Indians and the settlers, was of a friendly character.

At the time of its settlement it was not a "trackless wilderness," its forests were interspersed with openings, denuded of trees and shrubs. It was ready to respond quickly to cultivation, and this probably accounts, in some

* Beakes, S. W. 1906 Past and Present of Washtenaw County. (all quotations taken from this source).

measure, for the rapidity of its settlement, after such settlement began.

Robert Cavalier de La Salle, with four Frenchmen were the first white men to trod the soil of Washtenaw County in April, 1680. Detroit was the first permanent settlement in this vicinity, being established as a French trading post in 1701.

In the early eighteenth century, Cadallac spoke of the vast prairies, of the natural orchards which "soften and bend their branches under the weight and quantity of their fruit towards the mother earth which has produced them," while "the ambitious vine, which has never wept under the pruning knife, builds a thick roof with its large leaves and heavy clusters, weighing down the top of the tree which receives it, and often stifling it with its embrace." He also writes of "soaring" eagles, numerous swans in the rivers and of the abundance of deer and elk.

A letter writen from Ann Arbor by a traveler from Upper Canada, who visited Washtenaw in 1829, describes the appearance of the country six years after its first settlement, and accounts for its open appearance as follows:

"The singular and interesting appearance of the country, in its alternating groves and fields, orchards and timber lands, is a subject of inquiry with the speculative mind. To me it has the appearance of a highly improved district from which every vestage of art has been annihilated. It

is supposed by many to have been produced by the labor and enterprise of the natives for the culture of Indian corn. This is very improbable. The character and habits of no tribe of Indians of which we have any knowledge in North America would justify such an opinion. So far as my observations and inquiries have extended they go to support the hypothesis that the fire annually communicated by the Indians for the purpose of hunting has produced the present prairies, plains and openings that diversify the whole face of the country. This will be the more readily admitted when the fact is known that the soil of the land on these openings or plains is universally sandy, or a mixture of sand and marl in such proportions as to render it porous. Consequently the rain or moisture of the surface is readily absorbed. Vegetation soon becomes dry and the fire, in its usual destruction of the undergrowth, makes gradual inroads upon the timber until not a shrub is left to the extent of this dry soil. The contrary of this is the effect upon the clay or moist land. Here the water is retained upon the surface, the leaves are kept constantly moist, so that the fire makes little or no impression. Consequently, the heavily timbered land is generally more or less clay, and is better adapted to the culture of wheat and grass than the plains, which excell in the articles of corn, potatoes and all kinds of vines."

The boundaries of Washtenaw County were defined in 1822, at a time when there was not a single white person living within its boundaries. The limits of the county

thus organized differed materially from the present limits, as the new county contained forty towns instead of twenty as at present. It was not until 1826, or three years after its first settlement, that there were thought to be sufficient number of inhabitants to organize the county, and in 1826, the legislative council passed an act to organize the county. Washtenaw was the seventh county laid out in Michigan, being preceded by Wayne, Mackinac, Monroe, Macomb, and St. Clair.

Railroad Development

In 1831 the Detroit and St. Joseph, or Michigan Central Railroad, as it afterward came to be called, was chartered to run directly through Washtenaw County, and through the villages of Ypsilanti, Ann Arbor and Dexter. However, the road was not completed from Detroit to Ypsilanti until 1838 and another year elapsed before the road was completed to Ann Arbor. The railroad did not reach Dexter until July 1841.

Early Power Development of the Huron River

A history of the development of power on the Huron river is a history of the industrial development of Washtenaw County. The Huron was first utilized for water-power by sawmills. Almost at the same time small grist-mills were erected on the banks of the river. Following the grist-mills came the flouring mills, wollen mills, carding mills, all small in size and giving employment to but few people. Upon the development of the great wheat

fields of the Dakotas, the place of the flour mills was taken to some extent by paper mills and pulp factories, but the quantity of material for wood pulp was limited, and today there is no pulp mill in existence on the Huron river.

Were it not for the development of electricity the value of the water power of the Huron river would have been only slightly utilized. For the development of electrical power plants it became necessary to raise the headwaters of of the river and the location of numerous large dams at convenient distances along the river, making large reservoirs of water, to be utilized by one company for the production of power.

Climatic Conditions

The climate of Washtenaw County of which Ann Arbor and Superior Townships are a part is characterized by fairly cold winters and mild summers. The mean annual precipitation is 31.31 inches, including melted snow, and the average annual snowfall is about 37 inches. Wind movement and evaporation are low, humidity is moderately high, and the county receives about 50 percent of the possible sunshine.

The mean annual temperature is 47.7 degrees Farenheit. The average length of the frost-free season is 164 days, from May 2 to October 13, inclusive, and is ample, at this latitude, to mature the staple crops grown. Although frosts have occurred as late as May 24 and as early as September 22, crops are seldom seriously damaged, except in the lower or wetter areas.

The precipitation is fairly evenly distributed throughout the year and is sufficient for high crop production. Although there is a rather wide annual and seasonal variation and marked differences exist in the moisture-holding capacity of the soils receiving the same amount of precipitation, crop failures seldom result from a deficiency or excess of water. Snowfall may be depended on every winter to furnish some protection to fall-sown grain, but a continuous cover may not remain on the ground, and occasional

damage from freezes is to be expected. Hailstorms sometimes occur during the summer, but they seldom cause much damage to crops.

The prevailing winds are westerly. They rarely attain high velocity and, therefore, are rarely destructive to crops and cultivated soils, except on very dry muck soils and the loose incoherent sands in the more exposed situations.

The climate does not present any very marked differences within the county, as no great differences within the county, as no great differences in altitude exist and no very large bodies of water are nearby. Local differences in susceptibility of crops to damage from frost are observed, and there may be some slight differences in relation to fruit growing, depending on the situation and the direction of the slope of the land.

Normal monthly, seasonal, and annual temperature and precipitation at Ann Arbor, Washtenaw County, Michigan*

(Elevation, 930 feet)

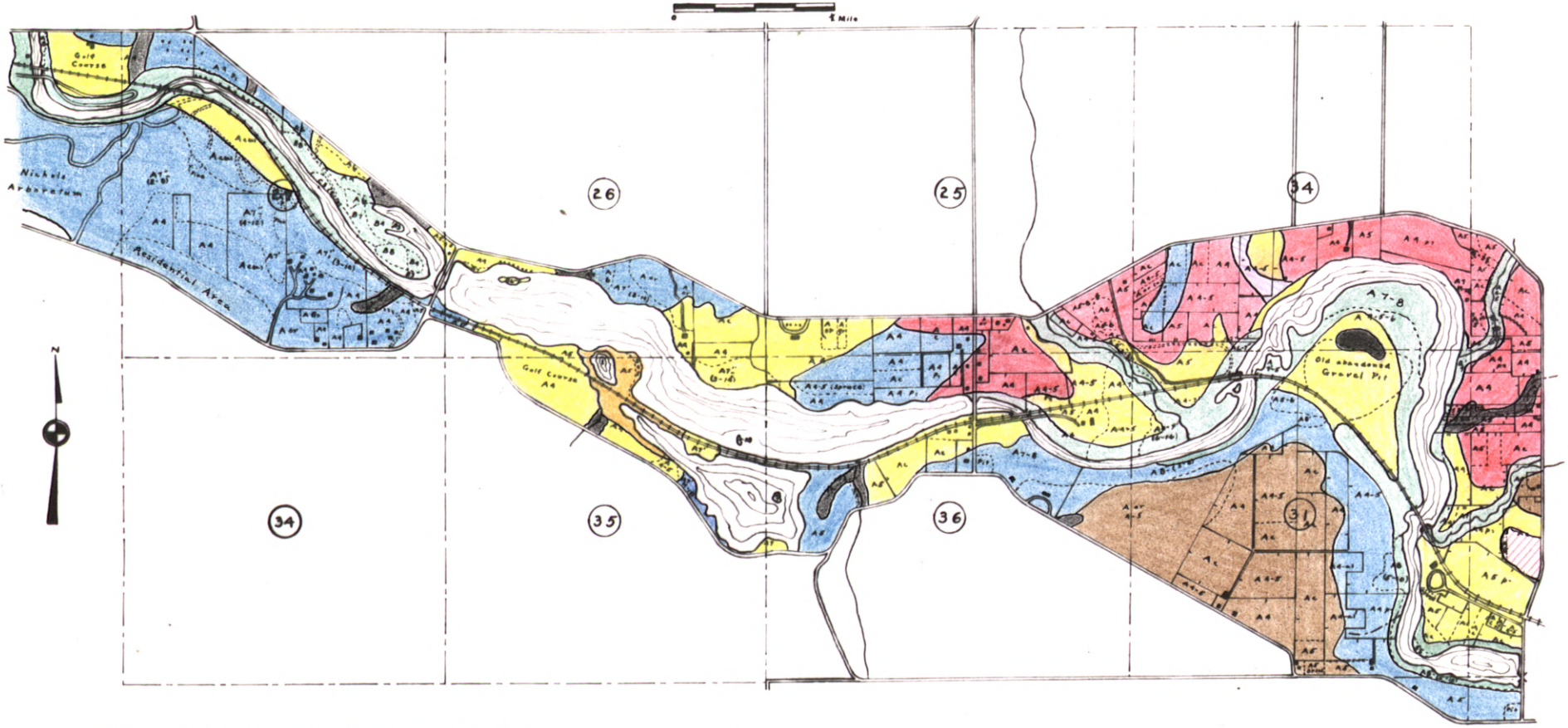
Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year - (1930)	Total amount for the wettest year - (1880)	Snow average depth
	F.	F.	F.	In.	In.	In.	In.
December	27.0	62	-16	2.07	0.80	0.54	9.1
January	22.6	63	-19	1.89	3.08	3.20	9.4
February	23.2	66	-21	1.81	1.14	1.25	9.0
Winter	24.3	66	-21	5.77	5.02	4.99	27.5
March	33.0	83	- 5	2.21	1.10	2.30	5.6
April	45.8	88	9	2.63	2.85	6.87	0.8
May	57.5	95	20	3.52	2.44	4.72	0.2
Spring	45.4	95	- 5	8.36	6.39	13.89	6.6
June	67.0	100	35	3.44	3.03	5.92	0
July	71.7	102	41	2.94	1.42	7.20	0
August	69.2	104	39	2.72	0.17	4.21	0
Summer	69.3	104	35	9.10	4.62	17.42	0
September	62.8	99	27	2.95	3.66	2.29	0
October	50.6	91	19	2.64	1.09	3.58	0.1
November	37.8	73	4	2.49	1.20	2.08	3.0
Fall	50.4	99	4	8.08	5.95	7.95	3.1
Year	47.4	104	-21	31.31	21.98	44.25	37.2

* Veatch, J. O. Soil Survey of Washtenaw County, Michigan, p. 4

SOIL MAP

HURON RIVER WILD-LIFE SANCTUARY UNIT

SCALE



- Bellefontaine sandy loam
- Fox sandy loam
- Miami silt loam
- Griffin loam
- Miami loam
- Genesee loam
- Washtenaw loam
- Carlisle muck
- Gilford loam

Description of Soils

------- Bellefontaine sandy loam

Virgin Bellefontaine sandy loam soil contains only a small quantity of organic matter but sufficient to impart a light-brown tint to the cultivated soil. The surface soil is loose and pervious, but the subsurface soil contains sufficient clay and the structure is sufficiently tight to check the free downward movement of water. The surface soil generally exhibits medium acidity, but below a depth of 2 or 3 feet the reaction is less acid. This type of soil occurs in areas which are characterized by knobs, hills, and gentle to steep slopes. According to local standards, the soil is of medium fertility. Good yields of all of the common general-farm crops can be obtained on the smoother land and it is also fair orchard land.

------- Fox sandy loam

A distinguishing characteristic of Fox sandy loam is the reddish-brown clayey layer, in which the proportion of clay may be small but is sufficient to bind the coarser material into a coherent mass and render it less pervious and more retentive than the material above or below it. The amount of organic matter in the cultivated soil is not high. This soil is utilized principally for general farming and where it is liberally manured, produces good yields. Orchards and and small fruits do well.

------- Miami silt loam

The organic matter content of Miami silt loam is not high, but the supply is fairly durable. The soil can be

maintained in a good state of tilth if it is managed under proper moisture conditions, but otherwise it may become hard and excessively cloddy. The average content of moisture is comparatively high, as both the subsurface layer and substratum are rather impervious and highly retentive of moisture. The productivity of this soil is considered medium to high, according to local standards. In general, the surface soil of the virgin soil is slightly acid or neutral, the acidity increasing in the second layer. The land conditions are favorable for the family farm of medium size, producing a variety of products.

------- Griffin loam

Griffin loam is poorly drained bottom land soil, or the alluvium deposited by streams during flood stages. The surface soil is for the most part brown sandy loam containing a comparatively large proportion of organic matter. Poor subsurface drainage and consequent poor aeration and oxidation occurs just below the surface soil. The soil ranges in reaction from slightly acid to alkaline, and it is high in natural fertility. The land does not have high agricultural value because of poor drainage and the narrowness of the areas.

------- Miami loam

The surface layer of Miami loam in a dry condition consists of grayish-brown granular loam. Below this is a pale yellowish-brown or grayish-brown leached material which is more gritty or less loamy than that of the surface layer. The cultivated layer contains a medium supply of organic matter. The average content of moisture is comparatively high, and the productivity is considered medium or high, according to local standards. The subsoil, although moderately compact does not prevent root penetration.

Most of this soil exhibits from slight to strong acidity in the cultivated soil to a depth ranging from 2 to 3 feet. Miami loam is a fairly productive and durable soil, and the land is well adapted to general farming.

------- Genesee loam

Genesee loam includes the drier or naturally better drained recent-alluvial soils. The material varies considerably in texture in the surface soil and in the lower layers, but most of it is brown mellow loam or loosely coherent sandy loam, underlain by heavier or more coherent sandy loam or sandy clay. The soil is of high fertility.

------- Washtenaw loam

Washtenaw loam occurs in depressions where the soil has been washed in from adjacent slopes. The soil so accumulated, for the most part, represents the finer materials - clay, silt, and very fine sand - and contains a high percentage of organic matter. The thickness of the accumulated soil ranges from a foot to 10 feet, beneath which are old or fossil soils. Although the soil is of high fertility, it is inadequately drained for cultivated crops, and small grain frequently lodges.

------- Carlisle muck

Carlisle muck is characterized by dark-brown or black surface material, a coarse-granular structure, and a loamy texture. In the typical soil the organic matter becomes finer in texture at a depth of a few inches, is pasty when wet, and is hard and horny, breaking with an angular or conchoidal fracture when dry. Carlisle muck is characteristically nearly neutral or alkaline in reaction. Analyses in various parts

of the State indicate that it is comparatively rich in lime and phosphorus, but poor in potash. Carlisle muck was originally forested, and a considerable part is still covered by trees, of which elm, ash, and soft maple are the domimant or characteristic species, in addition to some tamarack, aspen, and willow. Cultivation is only possible where the soil is properly drained, cultivated, and fertilized.

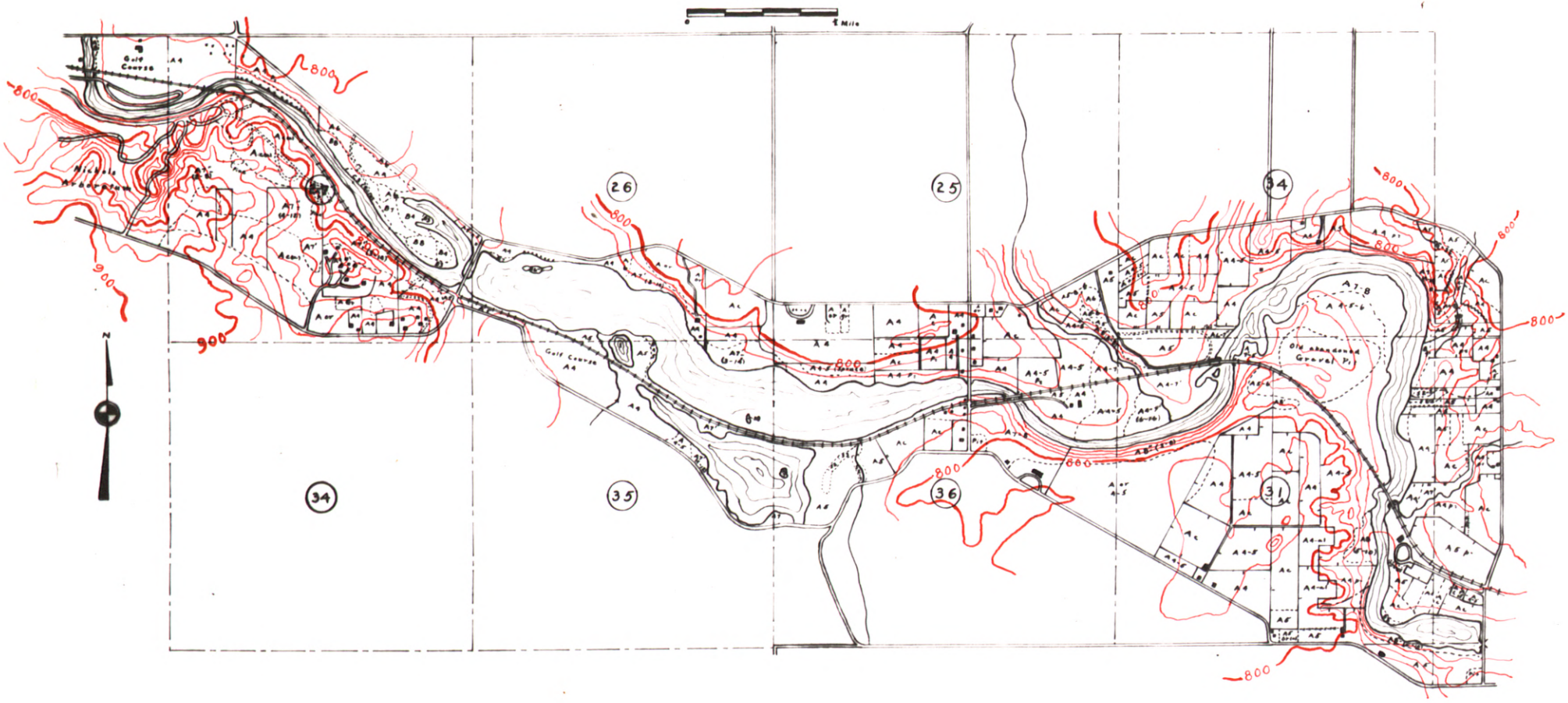
------- Gilford loam

Gilford loam has a medium-heavy dark-colored surface soil high in organic matter, underlain by sand and gravel or by friable sandy clay. The land is level, and the soil is of medium or high fertility. It is suitable for growing corn, alfalfa, and small grains, or for truck crops. Poor natural drainage is the depreciating factor, and tiling is the first essential in the use of this soil for agriculture.

TOPOGRAPHICAL MAP

HURON RIVER WILD-LIFE SANCTUARY UNIT

SCALE



GEOLOGICAL MAP

HURON RIVER WILD-LIFE SANCTUARY UNIT

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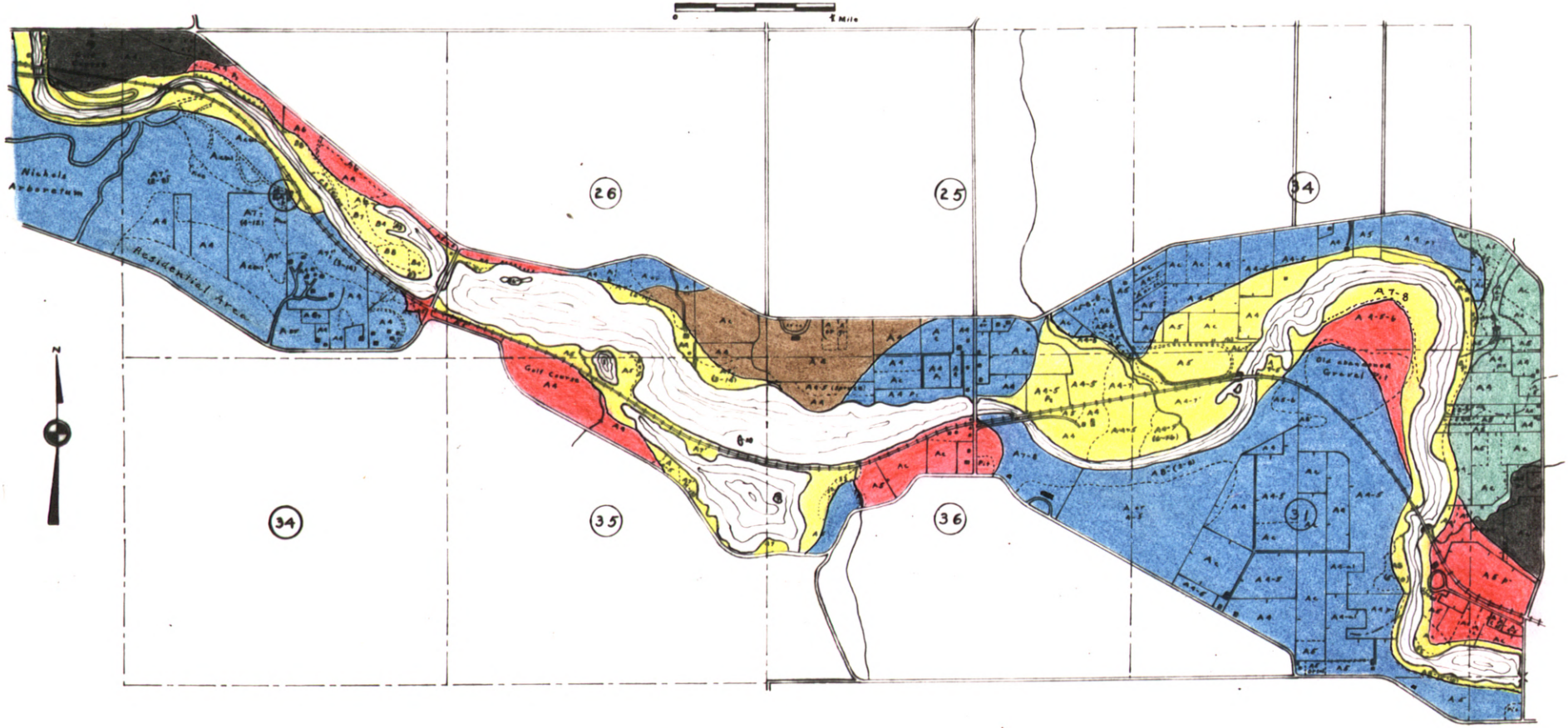
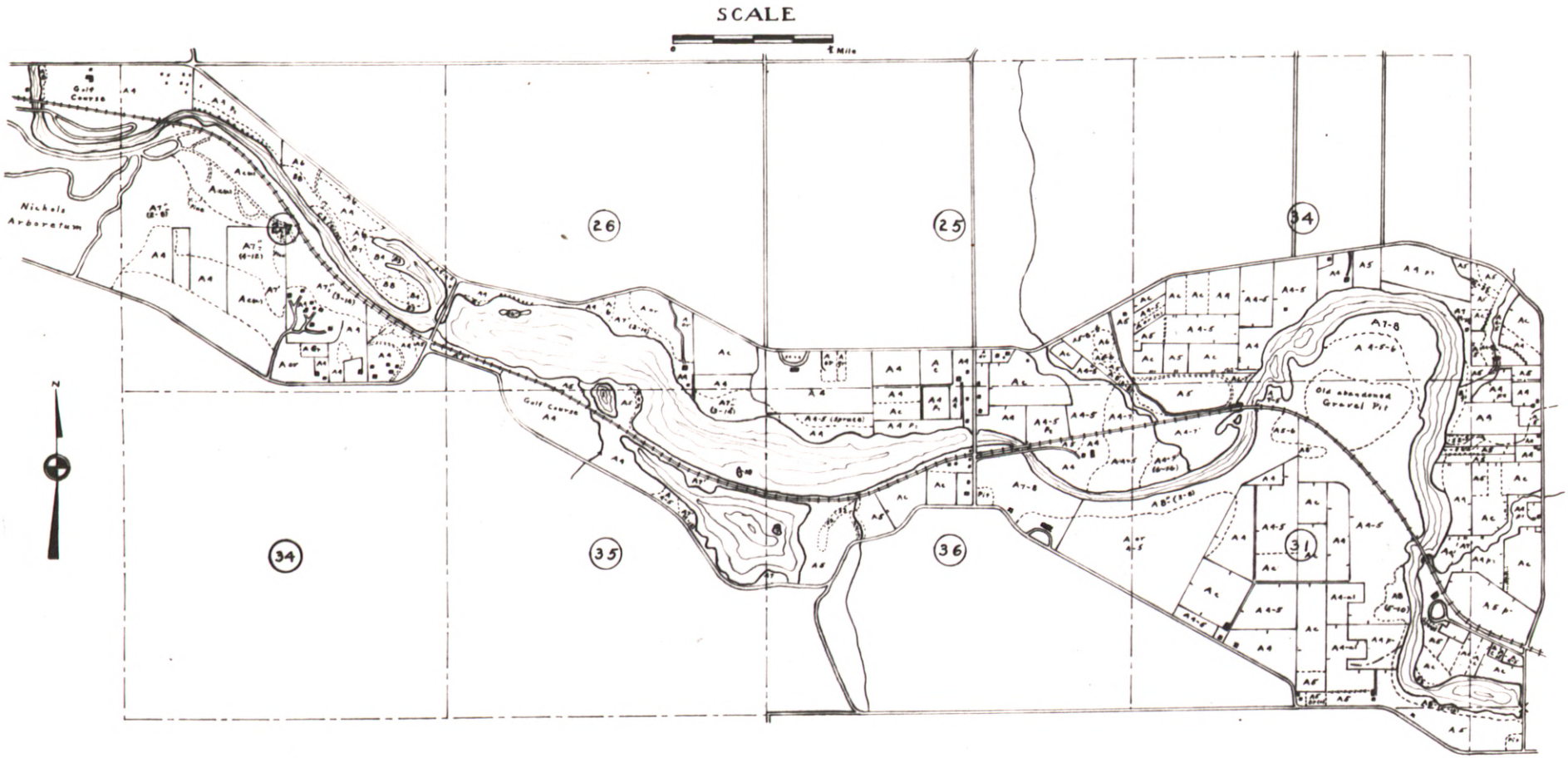


- Terminal moraines
- Alluvium
- Ground moraine
- Glacial outwash
- Delta sand and gravel
- Early river-terrace gravels

COVER MAP

HURON RIVER WILD-LIFE SANCTUARY UNIT



Legend on page 21

Classification of Types Based on Origin and Succession

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Origin From Land

Upland Type A

4 Grasses
5 Herbaceous plants
6 Shrubs
7 Oak-hickory
8 Oak-hickory-maple
9 Beech-maple

Sand Dunes W

1 Drifted sand
2 Grasses
3 Herbaceous mixed
4 Shrubs
5 Forest

Origin From Open Water

Lakes B

1 Submerged vegetation
2 Floating vegetation
3 Emergent vegetation
4 Reed marsh
5 Sedge marsh
6 Sedge-grass
7 Mixed herbaceous
8 Herbaceous shrub-sedge

Stream Flood Plain E

1 Mixed herbaceous
2 Shrubs
3 Willow-poplar
4 Elm-maple-ash
5 Beech-maple

Bog Phase D

1 Floating vegetation
2 Bog (Spagnum-sedge bog)
3 Emergent vegetation (on submerged mat)
4 Reed bog
5 Shrub bog (leather-leaf bog)
6 Tamarack-poison sumac
7 Swamp evergreens-spruce-tamarack
8 Shrubs
9 Aspen
10 Elm-yellow birch-tamarack
11 Beech-maple
12 Grass (cleared and drained)

Seepage Areas S

1 Sedges
2 Mixed herbaceous
3 Shrub
4 Tamarack
5 Elm-maple-ash
6 Beech-maple

Kettle Holes K

0 Open water
1 Grasses
2 Herbaceous
3 Shrubs

Swamp Phase C

1 Shrub
2 Willow-aspen or tamarack
3 Elm-maple-ash
4 Beech-maple

Fence Rows

Clear or light	I
Medium	II
Heavy	III

Miscellaneous

Abandoned	a
Cropped	c
Evergreen plantings	e
Deciduous plantings	d
Orchard	or
Pastured	p
Individual trees	x
Open water	o

Cropped Lands

Alfalfa	al
Beans	b
Barley	br
Buckwheat	bw
Beets	be
Corn	cr
Clover	cl
Garden	gr
Oats	o
Potatoes	pot
Sweet clover	sw
Timothy	t
Wheat	w

(Crop symbols to be indicated on field map but not to be traced)

- -

Timber Size

4" to 6" (Diameter Breast High)
7" to 10"
9" to 14"
Etc.

Timber Stocking

Scattered	I
Medium	II
Heavy	III

Underbrush Density

Scattered	-
Medium	=
Heavy	≡

ACREAGE MAP

HURON RIVER WILD-LIFE SANCTUARY UNIT

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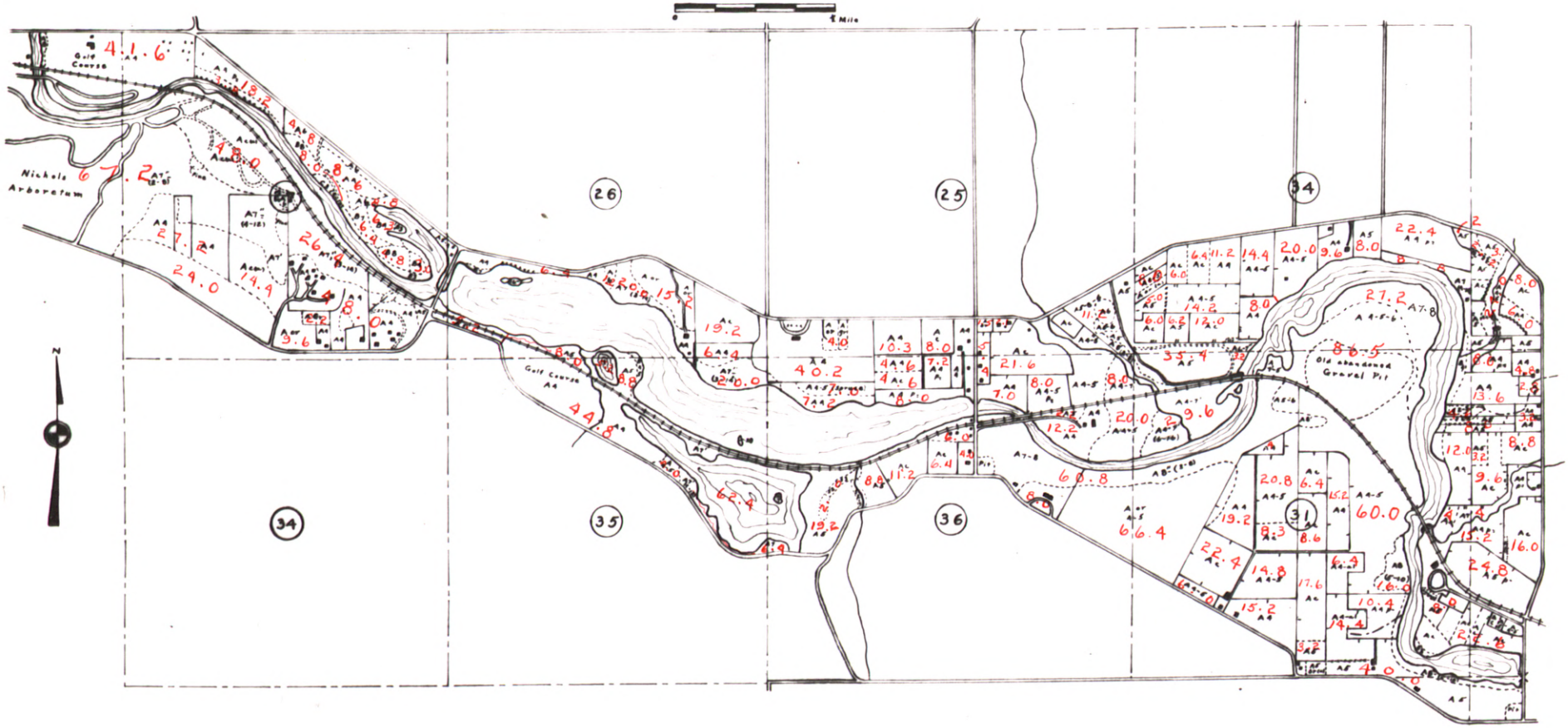

PLANIMETER SHEET

Upland Types		Marshland Types		Seepage Areas	
A(c)	250.6	B(4)	9.3	S(2)	2.0
A(4)	569.8	B(6)	5.8	S(3)	2.2
A(5)	192.6	B(7)	14.9	S(2-3)	4.6
A(6)	35.2	B(8)	13.0		8.8
A(4-5-6)	86.5		43.0		
A(7)	82.4				
A(8)	26.3				
A(7-8)	181.6				
A(or)	98.9				
A(4-5)	305.4				
	1829.3				

Railroad grade	22.7
Open water	462.1
Upland type	1829.3
Marshland type	43.0
Seepage areas	8.8
Total area	2365.9

CROP MAP

HURON RIVER WILD-LIFE SANCTUARY UNIT

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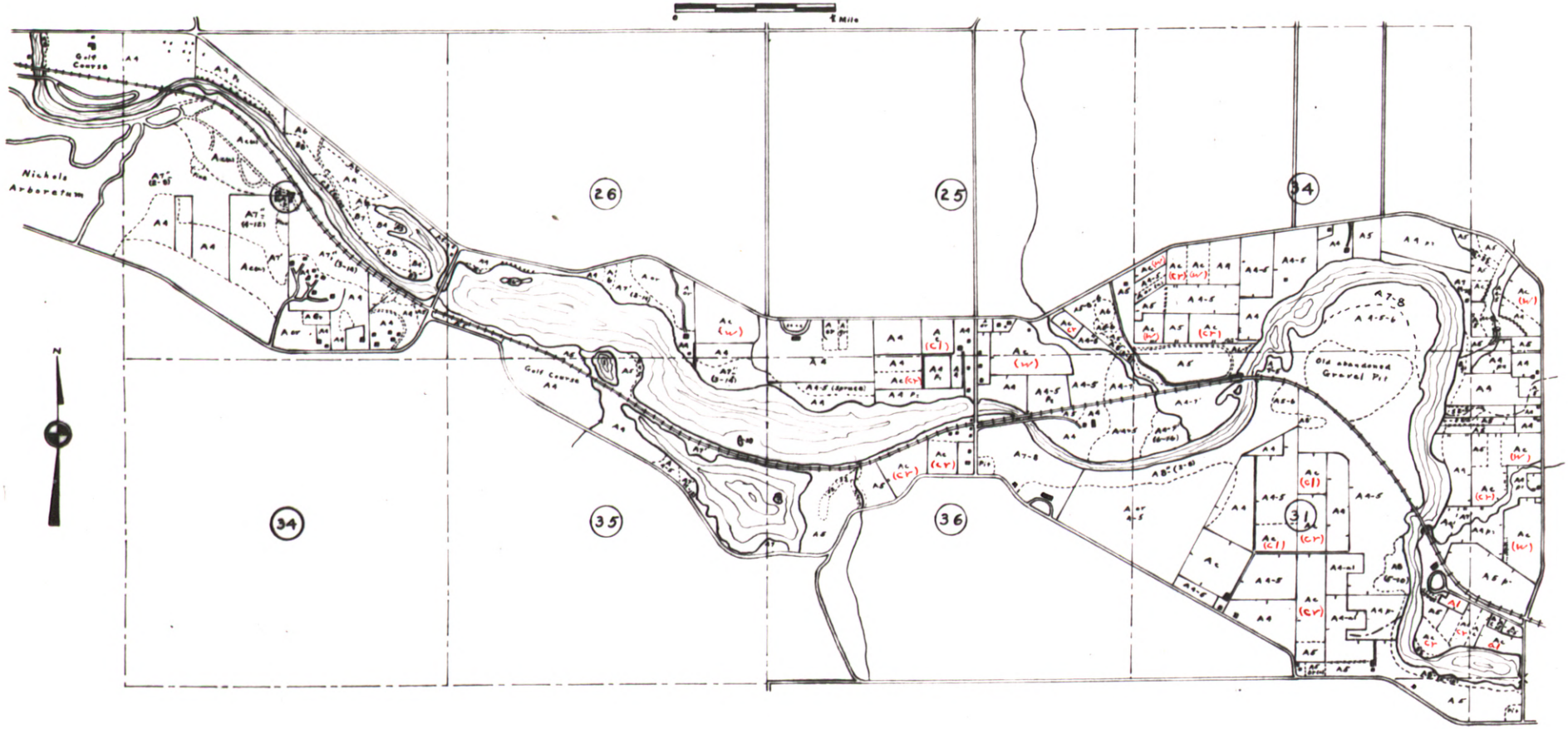

GRAZING MAP

HURON RIVER WILD-LIFE SANCTUARY UNIT

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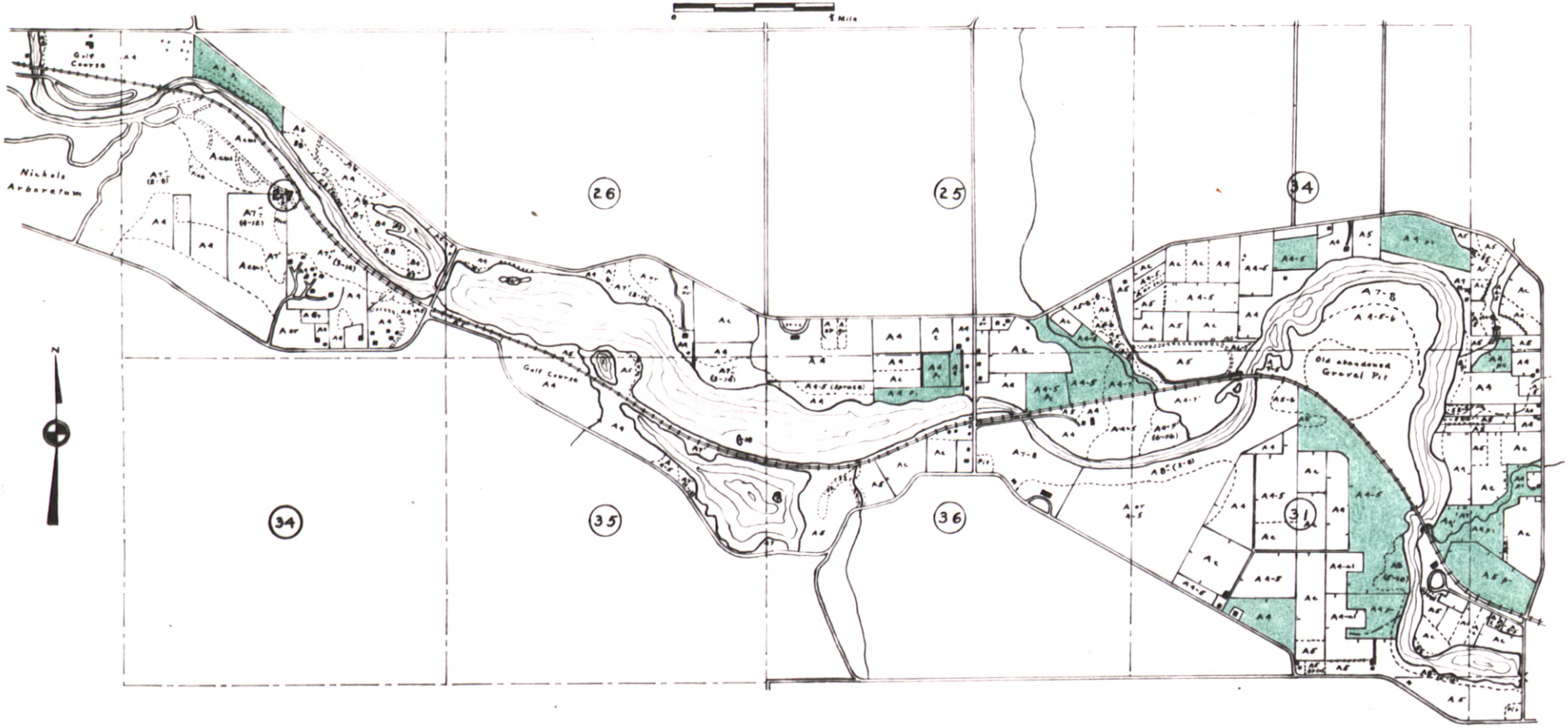

INTERSPERSION MAP

HURON RIVER WILD-LIFE SANCTUARY UNIT

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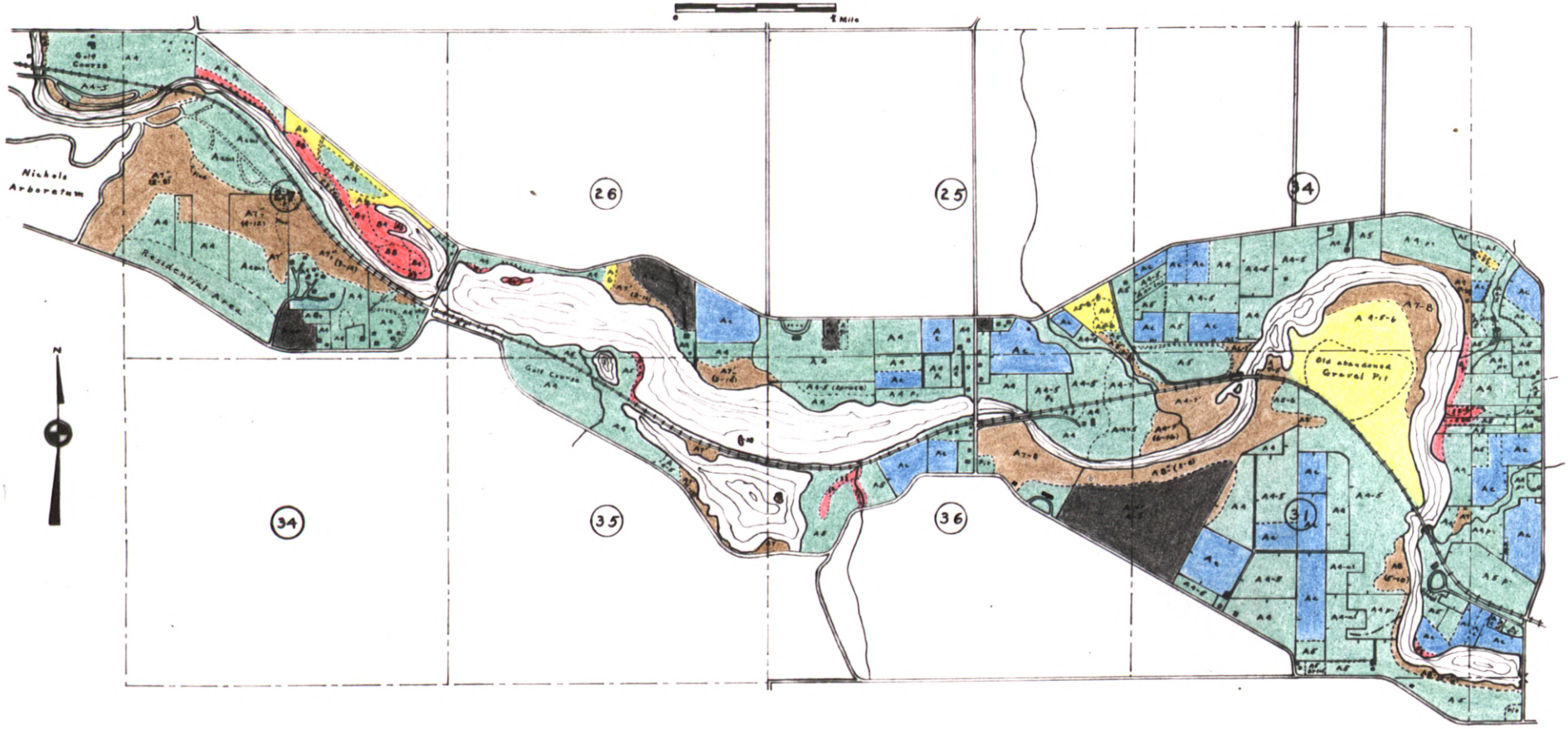

- Cropped land
- Woodland
- Marsh
- Orchard
- Brush
- Grassland or mixed herbaceous

PROPERTY MAP

HURON RIVER WILD-LIFE SANCTUARY UNIT

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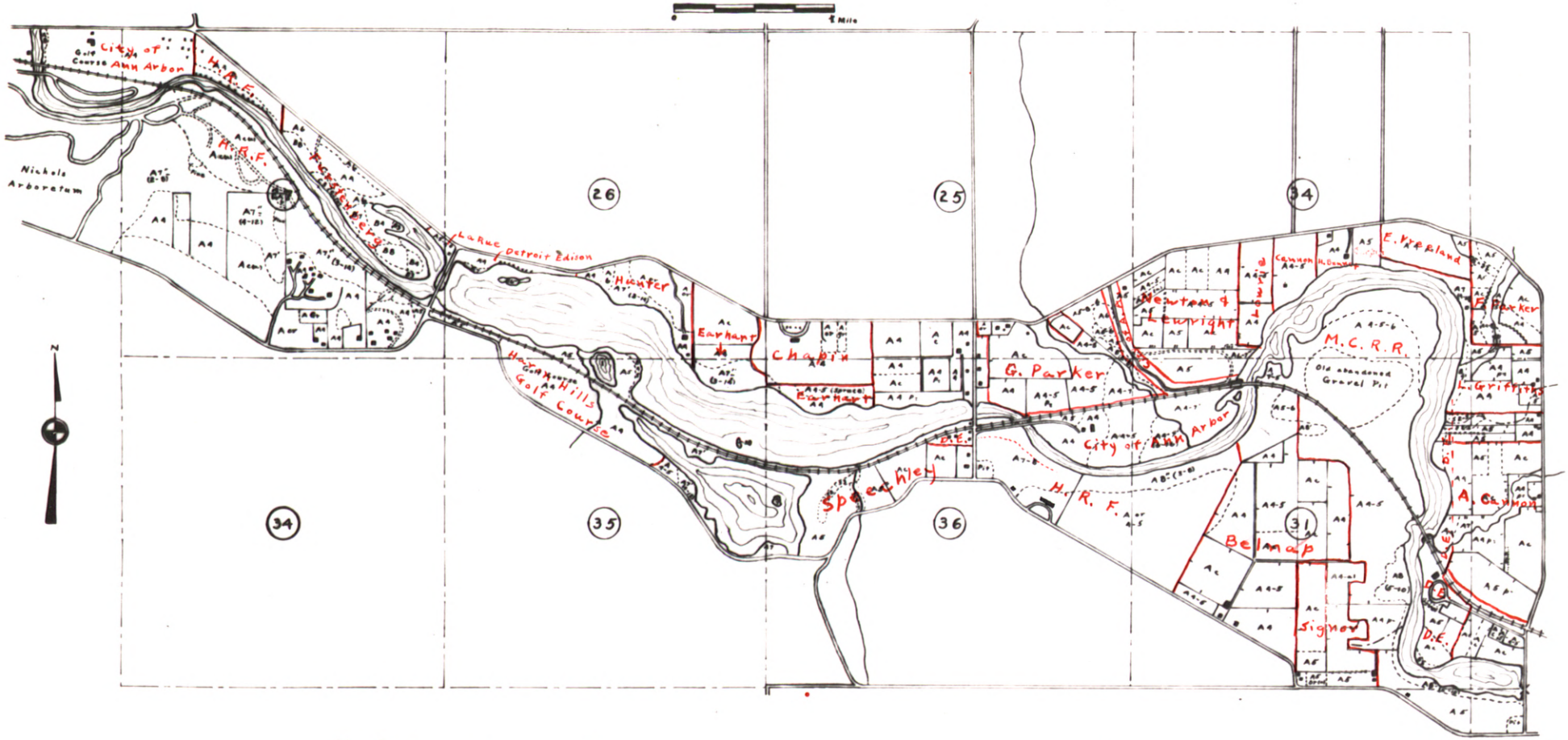

H.R.F. – Huron River Farms (Property of Detroit Edison Co.)

D.E. – Detroit Edison Co.

HURON RIVER WILD-LIFE SANCTUARY UNIT

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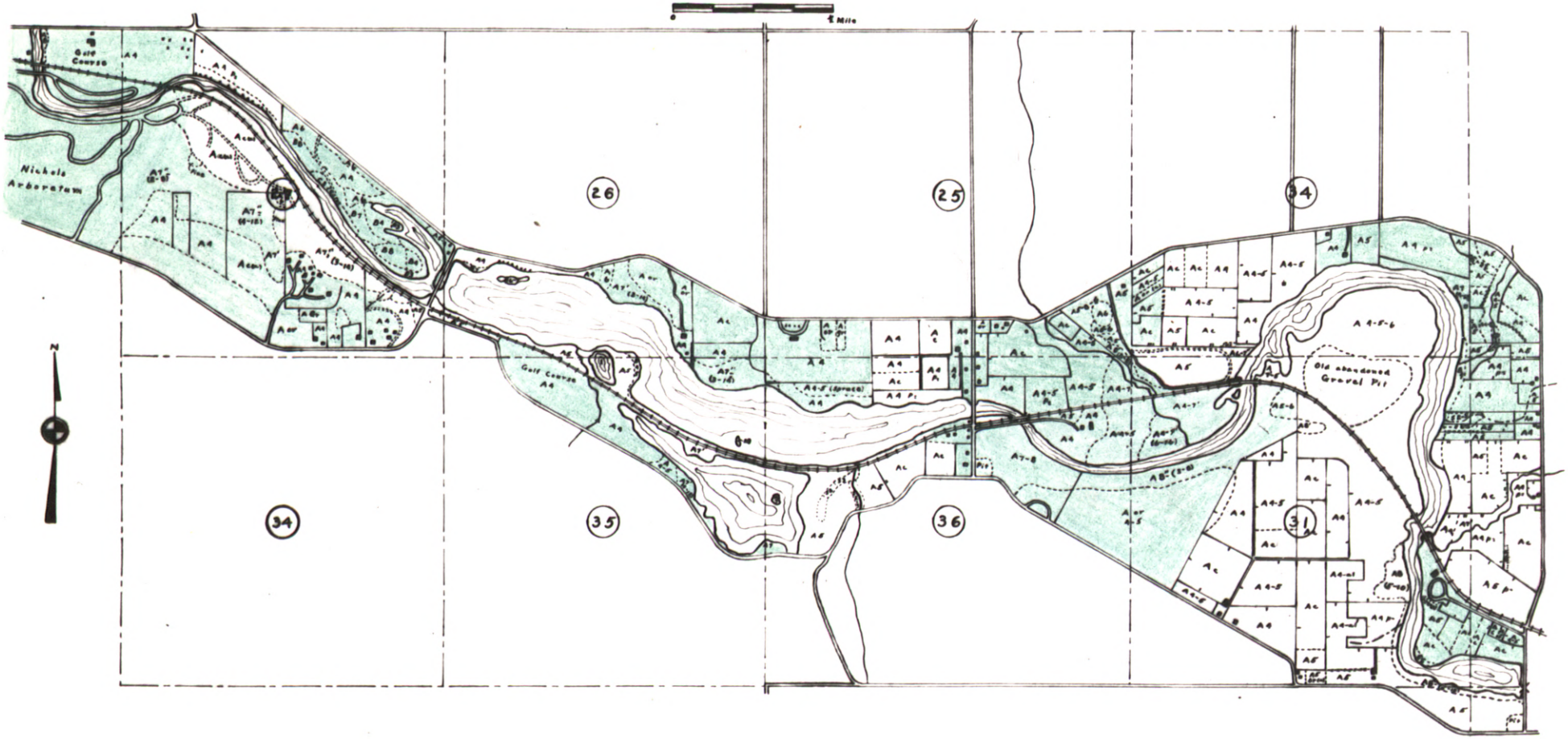
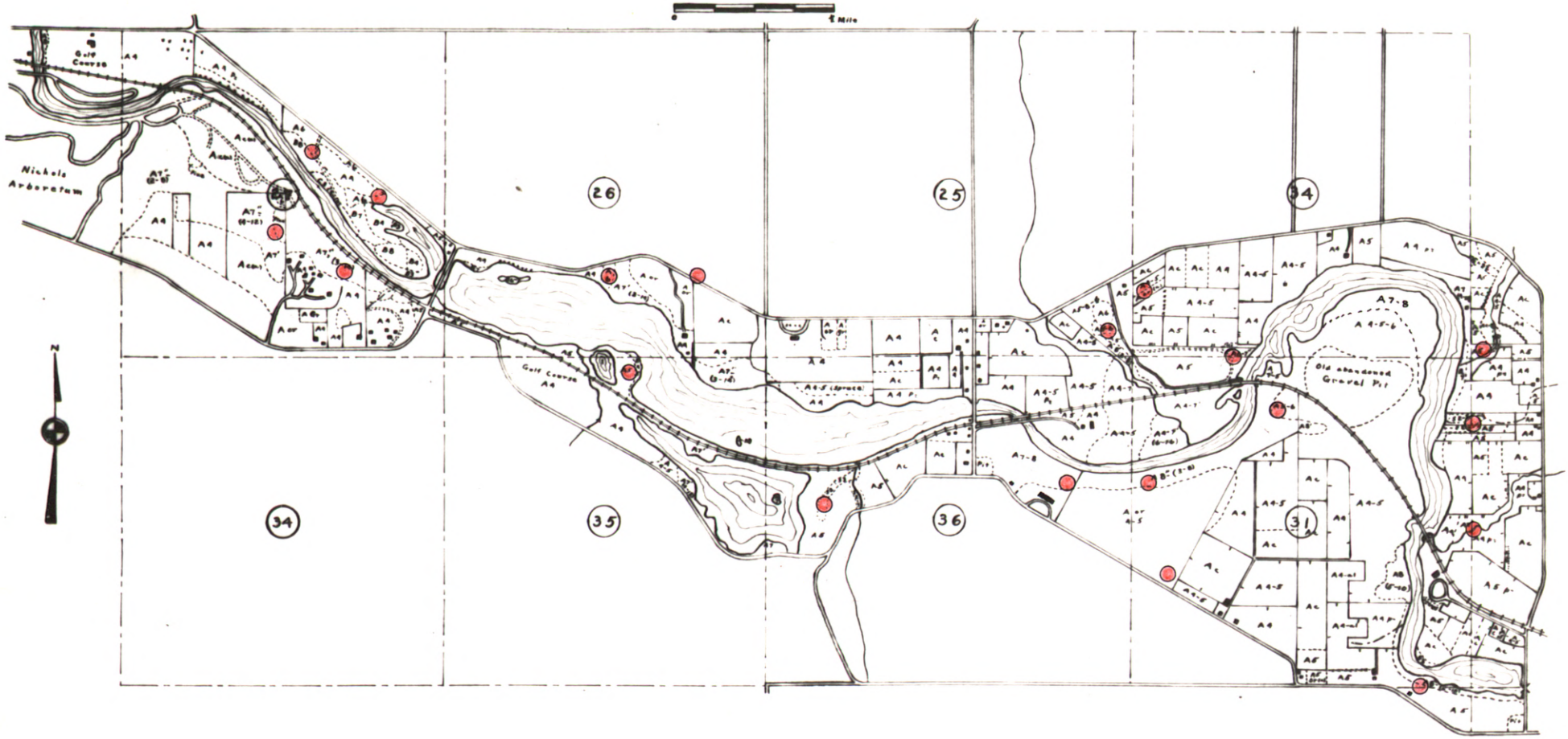


Areas closed to hunters

Pheasant
Crowing areas

HURON RIVER WILD-LIFE SANCTUARY
UNIT

SCALE



Birds Observed on the Area*

1. Pied-billed grebe
2. Great blue heron
3. Green heron
4. Black crown night heron
5. American bittern
6. Least bittern
7. Canada goose
8. Whistling swan
9. Mallard
10. Black duck
11. Bald pate
12. Pin tail
13. Green wing teal
14. Blue wing teal
15. Shoveller
16. Wood duck
17. Red head
18. Ring-neck
19. Canvass back
20. Greater Scaup
21. Lesser Scaup
22. American golden-eye
23. Buffle head
24. Ruddy duck
25. Hooded merganser
26. American merganser
27. Red-brested merganser
28. Turkey vulcher
29. Sharp-shinned hawk
30. Cooper hawk
31. Red tail hawk
32. Red shoulder hawk
33. Broad wing hawk
34. Ruffed leg hawk
35. Marsh hawk
36. Pigeon hawk
37. Sparrow hawk
38. Osprey
39. Bobwhite
40. Pheasant
41. Hungarian partridge
42. Sora rail
43. Virginia rail
44. Florida gallenule
45. Coot
46. Killdeer
47. Wood cock
48. Wilson snipe
49. Spotted sandpiper
50. Upland plover

* Bird observations made on the area by Donald Duncan, student of Ornithology at the University of Michigan, between the years 1935 and 1938.

51. Herrin gull
52. Ring-billed gull
53. Black tern
54. Morning dove
55. Yellow-billed cuckoo
56. Black-billed cuckoo
57. Screech owl
58. Barred owl
59. Long eared owl
60. Night hawk
61. Chimney swift
62. Ruby throated humming bird
63. Belted Kingfisher
64. Flicker
65. Red-headed woodpecker
66. Hairy woodpecker
67. Downy woodpecker
68. Yellow bellied sapsucker
69. King bird
70. Crested fly catcher
71. Phoebe
72. Acadian fly catcher
73. Alder fly catcher
74. Least fly catcher
75. Wood pewee
76. Horned lark
77. Tree swallow
78. Bank swallow
79. Rough-winged swallow
80. Barn swallow
81. Cliff swallow
82. Purple marten
83. Blue jay
84. Crow
85. Black-capped chickadee
86. Tufted titmouse
87. White brested nuthatch
88. Red brested nuthatch
89. Brown creeper
90. House wren
91. Winter wren
92. Long-billed marsh wren
93. Short-billed marsh wren
94. Catbird
95. Brown thrasher
96. Robin
97. Wood thrush
98. Hermit thrush
99. Olive backed thrush
100. Gray-cheeked thrush
101. Veery
102 Black bird
103. Golden crowned kinglet
104. Ruby crowned kinglet

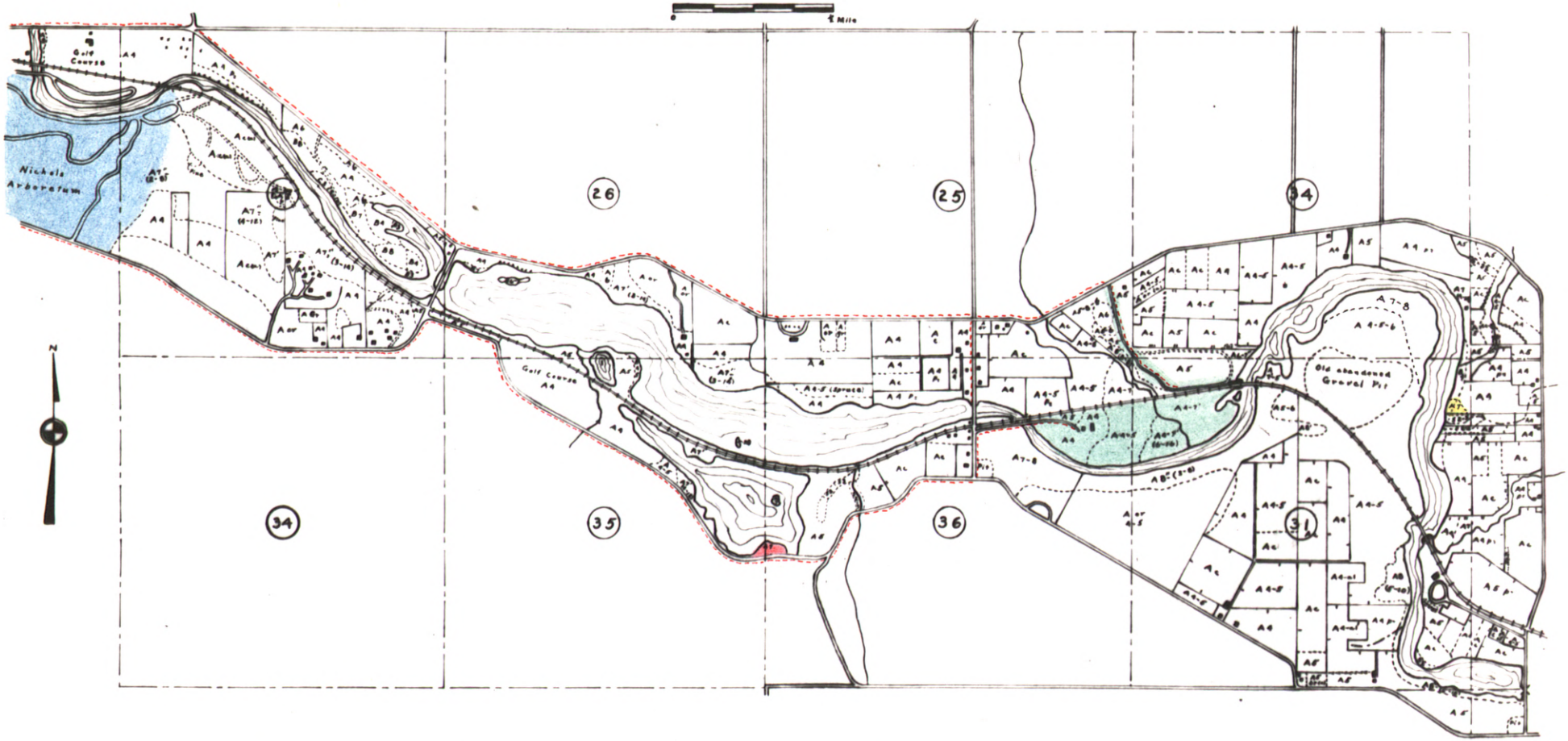
105. Cedar wax wing
106. Starling
107. Blue-headed vireo
108. Red-eyed vireo
109. Warbling vireo
110. Black and white warbler
111. Tennessee warbler
112. Nashville warbler
113. Parula warbler
114. Yellow warbler
115. Magnolia warbler
116. Black-throated blue warbler
117. Myrtle warbler
118. Black-throated green warbler
119. Black burnian warbler
120. Palm warbler
121. Oven bird
122. N. Yellow throated warbler
123. American redstart
124. English sparrow
125. Bobolink
126. Meadow lark
127. Red-wing black bird
128. Baltimore Oreole
129. Rusty black bird
130. Bronz grackle
131. Cow bird

132. Cardinal
133. Rose-breasted grosbeak
134. Indigo bunting
135. Evening grosbeak
136. Purple finch
137. Pine siskin
138. Gold finch
139. Red eyed towhee
140. Savanna sparrow
141. Vesper sparrow
142. Slate-colored junco
143. Tree sparrow
144. Chipping sparrow
145. Field sparrow
146. White-crowned sparrow
147. White -throated sparrow
148. Fox sparrow
149. Swamp sparrow
150. Song sparrow
151. Lapland Longspur
152. Snow bunting

RECREATIONAL MAP

HURON RIVER WILD-LIFE SANCTUARY UNIT

SCALE

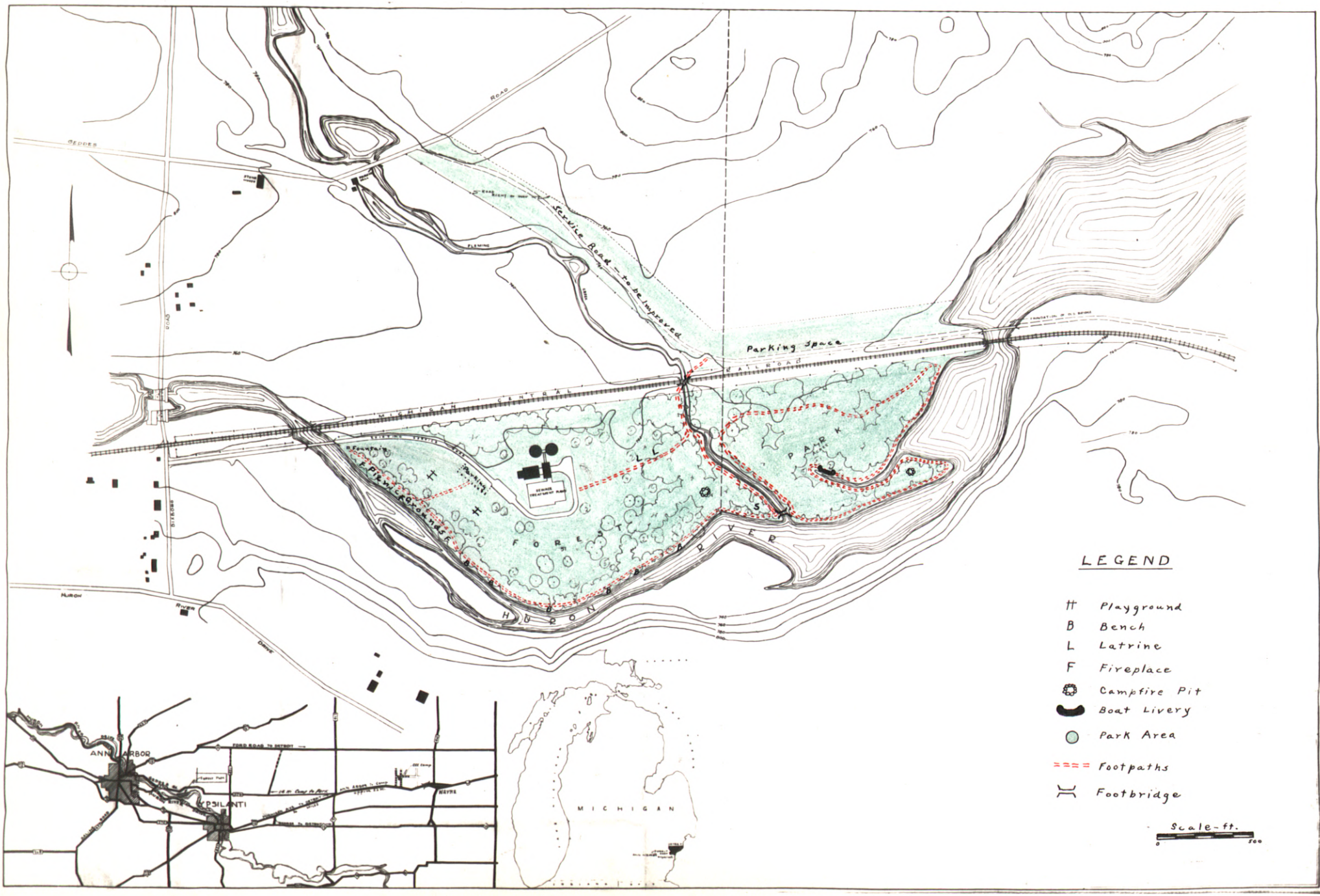


Nichols Arboretum

Forest Park Picnic Grounds

Picnic Area for Hikers and Cyclists

Picnic Grounds for Canoeists



Map by Courtesy of Ann Arbor Park Department

Recreational Development of the Area

Recreation shall be treated by this thesis as of secondary importance, since this particular area is considered to be more valuable as a wildlife sanctuary than as a recreational area. However, perhaps it is a mistake to make a distinction between the two terms for to the nature lover, a wildlife refuge is an ideal area for recreation. To the sportsmen these two termes are also very closely related for without wildlife sanctuaries his favorite shooting grounds would soon become very unsatisfactory recreational areas. Thus we see that recreation is closely correlated with wildlife refuges and should occupy an important part in the management and supervision of such areas.

Fig. 1.--A picturesque expanse of the Huron River near the mouth of Flemming Creek.

This particular tract is ideally situated as a recreational area. It lies along the scenic Huron River (Fig.1).

extending between the two cities of Ann Arbor and Ypsilanti. The area is easily accessible from both cities by motor car, bicycle, or on foot for the entire area is bounded by fine roads.

In the past little has been done to develop the recreational possibilities, mainly because of the water polution of the Huron River.which has been a "catch-all" for the sewage of the cities and villages along its course. This condition is rapidly changing, however, with Ann Arbor leading the way by installing a fine sewage disposal plant (Fig. 2).

Fig.2.--City of Ann Arbor's sewage disposal plant, located along the Huron River east of Dixboro.

Henry S. Curtis, executive secretary of the Huron-Clinton Parkway committee, is taking the lead in an active movement to beautify the Huron River Valley. In a broadcast over the University of Michigan's radio station on the 25th of January, 1938, he listed seven aspects of the Huron Valley situation which should be improved. The first

was the possibility that the Michigan Central would shift its major traffic elsewhere or that smokeless engines may be provided. His other six suggestions were to provide a parkway along the ridges beside the valley; beautify the bluffs and construct winding trails; reforestation of certain areas and the erection of beautifying structures. Banks of the river should be cleared of dumps and offensive structures. Pollution of the water should stop and erosion into the river should be halted if possible. The stream itself should be beautified by cleaning up the bed and planting lagoons and marshy borders with water flowers.

This is, in deed, an excellent program and should meet with remarkable success, provided the committee, which Mr. Curtis represents, receives the cooperation of such agencies as the national government, the state, the six counties concerned, the thirteen cities affected, the large private companies which have important holdings and, lastly, the general public.

Driving, canoeing, picnicking, fishing, bicycling, hiking, and such winter sports as skating, skiing, and tobogganing are a few of the recreational activities which may be developed on the area without conflicting greatly with the wildlife sanctuary program. Each of these recreational possibilities will be treated briefly by the following paragraphs.

A delightful, leisurely drive after a hard days work may be had by motoring over Geddes Road and the Huron River

Drive, which bound the area on the north and south respectively. Both roads follow the river closely over most of the distance, adding greatly to the beauty of thedrive. They are connected at three points by cross-roads which facilitate three possible round trips of varying length. If only a very short outing is desired the motorist need only travel east as far as Geddes Bridge. A second possibility is to continue eastward to the intersection with the Dixboro Road which affords a crossing of the river. Still others may desire to circle the entire area or perhaps drive into Ypsilanti, which is only a little over a mile from the south-east corner of the area. In the above cases it has been assumed that the motorist would start from Ann Arbor, however, this drive is just as accessible to the residents of Ypsilanti and vicinity.

The motorist will also find the drive through Nichols Arboretum very scenic and enjoyable. Here he may part his car at several advantageous spots where the rolling, wooded hills and the winding Huron River may be viewed from the car or, if he so desires, he may stroll along the many wooded paths from which he may view practically every species of tree and shrub which will grow in this region. Then too, the arboretum abounds in song birds and many of our smaller mammals.

This section of the Huron River provides an ideal water course for canoeing. For the most part the current is not swift and nowhere is it treacherous even for the inexperienced

canoeist. The water course at present is scenic but will be greatly enhanced after the banks are planted with trees, shrubs and vines, and flowering waterplants are established in the lagoons and along the marshy borders of the river as a part of the wildlife sanctuary program.

Fig. 3--View of the high, heavily wooded bank opposite the picnic grounds.

The construction of a pathway around Geddes Dam will facilitate an easy portage enablying the ambitious canoeist to make a round trip between the two cities of Ann Arbor and Ypsilanti. For those who may not care to spend as much time on the river, there are several attractive spots where a boat can be beached and a restful afternoon or evening spent around a small-cheerful campfire.

There are no public picnic grounds on the tract at the present time, however, Ann Arbor recognizes the need for such an area and is ready to develop a recreational grounds

adjacent to the sewage disposal plant. This location in relation to the whole area is shown on the recreational map on page 35, while a more detailed map of the area is shown on page 36. Thirty acres of the proposed picnic area are well wooded, in a natural state and ungrazed; in addition there are approximately twenty acres of grassland with scattered trees, constituting the grounds of the sewage disposal plant.

Fig. 4.--Flemming Creek just before it flows into the Huron River.

Flemming Creek (Fig. 4) flows through the center of the area, adding greatly to the beauty and recreational possibilities of the area. An impression of the beauty of the area may be gathered from Figures ., 4, and 5.

A vigorous attempt is to be made to preserve the natural wildness of the wooded portions of the area by providing well kept footpaths with the hope that with

but few exceptions, most of the visitors will be content to follow the trails instead of trampling the reproduction and ground cover. All of the structures, including tables, benches, shelter and bridge are to be of rustic design to fit in with the general surroundings.

Fig. 5.--Natures enchanting beauty along the Huron River in the spring.

Fig. 6.--For those who thirst, here is satisfaction.

A fountain (Fig. 6) near the river at the west end of the area provides a steady source of excellent drinking

water for all visitors.

A suspension bridge is to be built underneath the railroad bridge over Flemming Creek to facilitate a safe enterance to the area to those driving in on the north service road. As an added safty measure, a high fence is to be constructed along the railroad track so that there will be little danger of small children getting onto the railroad right of way.

The improvements are to be constructed by P. W. A. labor, under the direction of E. A. Gallop, superintendent of the Ann Arbor Park Department. It is deemed advisable to carry on the development over a short period of years rather than hurry it through during a single season.

# # #

A second picnic grounds is to be developed on the south side of the river between Gedded Bridge and Geddes Dam (Recreational Map, page 35). This small area is to be limited for the use of cyclists and hikers, where they may stop to rest and perhaps have a roast around a campfire. Stone lined pits and fireplaces are the only important improvements needed.

One picnic ground is to be provided for the exclusive use of boating enthusiasts. The proposed site is located near the east end of the area (Recreational Map, page 35). This spot is some distance from the road and cannot be

reached except by water without trespassing on private property, and even then it is reached only with difficulty. This high, oak-covered knowl affords an excellent view of the river and surrounding landscape. The only necessary improvements are a dock to facilitate an easy landing and a campfire pit.

Probably one of the most appreciated benefits derived from the construction of the Ann Arbor sewage disposal plant is the greatly improved condition for fishing along the Huron River. Now that waste materials are no longer dumped directly into the river it is possible to successfully stock the river with desirable species which previously were not found in these waters.

Plantings of such waterfowl food and cover plants as bushy pondweed, redhead grass, coontail, pickerel plant, sago pond plant, water lilies, water shield and wild celery along the marshy stretches of the river will be equally beneficial for fish.

If the numbers of cyclists continue to increase as rapidly as it has in the past few years, a condition will soon be reached where governmental agencies will be forcibly faced with the problem of providing bicycle trails over which the cyclist may travel without endangering his own life or that of the passing motorists. This need already exists in the vicinity of Ann Arbor, where this particular

form of recreation is especially popular, partly due to the fine type of exercise which this sport provides and partly to the fact that bicycling is the only means of transportation open to the average university student due to the strict enforcement of the auto ban. On the recreational map (page 35) are laid out several possible routes providing a variety of scenery and travel distances. The scenic beauty afforded from these trails will be greatly enhanced by the plantings of evergreens, hardwoods, and shrubs which are to be established freely over the area.

The proposed bicycle trails will also serve as foot-paths to hikers. The hiker is by no means limited to the limits of the sanctuary, for the adjacent areas also contain numerous spots of interest. The already well established trails winding through Nichols Arboretum are not shown on the map, but nevertheless, this area of approximately ninety acres is an extremely important recreational area. Not only is the Arboretum rich in natural beauty, but it is also an ideal out-door laboratory for the study of nature.

With the improvement of environmental conditions for wildlife, students of natural history and ornithology will find this and excellent area for field study. Over one hundred and fifty species of birds (listed on page 31) have been observed on the area. Some of the mammals found on the area include:- rabbit, squirrel, mink, weasel, muskrat, moles, shrews, and mice.

The Huron River with its high bordering ridges furnishes an ideal setting for winter sports. During normal winters the river is frozen over for at least a month, providing excellent ice for skating. The section of the river between Geddes Bridge and Geddes Dam is best suited for this sport for here the river is usually fairly free of snow. A simple shelter built on the north side of the river near Geddes Bridge is needed to accomodate skaters.

The steep hills and ridges along this area are excellent for skiing and tobogganing. The hills of the Arboretum and the eastern portion of the municiple golf course are at present most popular for these two sports. An improved means of ascent are needed to better facilitate these two areas for sliding.

The finances for the developing the recreational possibilities of the area will have to come chiefly from some source other than the state conservation department. Although the plantings made under the direction of this state department will be made primarily for the improvement of the environment for wildlife, they will, nevertheless, greatly enhance the area from the aesthetic standpoint. Finances for the other improvements will have to be raised or appropriated through the effort of such a group of individuals as the Huron-Clinton Parkway Committee.

Suggestions for Farmstead Landscaping

On first thought, farmstead landscaping may seem to be out of place in a management plan for a wildlife sanctuary, but let us pause for a moment and consider. It is only through the interest and cooperation of the landowner that a program such as this can possibly be successful. Improvement of food and cover conditions through the establishment of food patches, fence row improvement and control of grazing, can be brought about only through the willingness of the landowner to cooperate. What better way can we choose to show our appreciation than to help him beautify the surroundings for he and his family.

The first step to be taken in farmstead landscaping is to make a detailed map or diagram of the present lay-out of the farmstead carefully drawn to scale. This encourages a careful study of existing conditions, calls attention to undesirable features, and helps determine where to make improvements. The map should be revised from time to time as new improvements are made. This enables one to keep clearly in mind the relative position of various objects and features by giving a "bird's-eye view" of the whole arrangement.

The next step is to start a diagram of the landscape plan which is to be undertaken on a sheet, similar to the one of the present farmstead lay-out. Tracing paper placed over the map of the present farmstead is probably the easiest

way of preparing such a sheet. Block in the most important features first and develop this plan gradually as new ideas are acquired. The sketch on page 50, illustrates how the improvements may be shown diagramatically. Changes may be made from time to time which are considered desirable, but all future plantings and arrangements should conform to the revised plan.

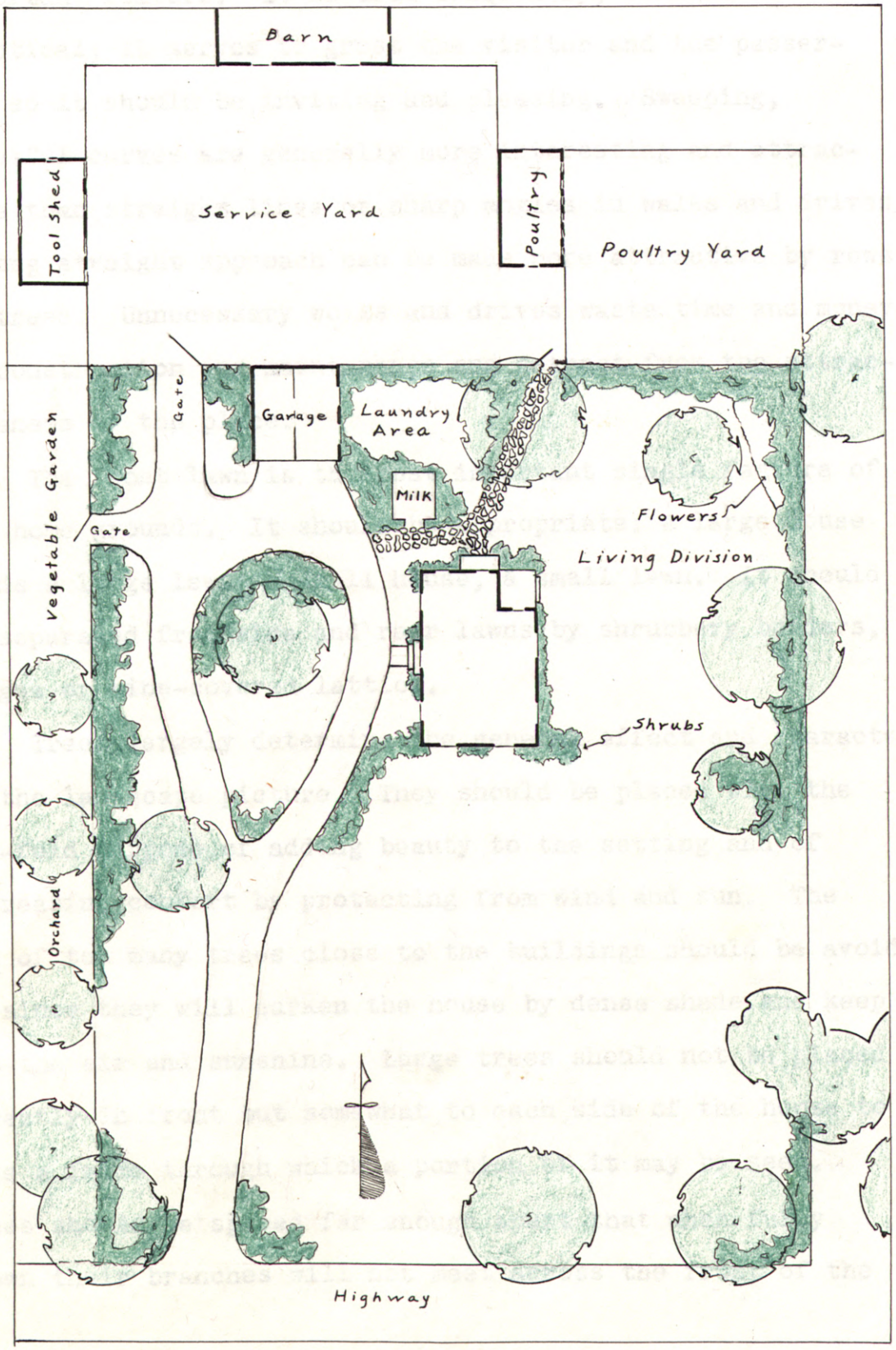
An attempt should not be made to change the whole picture at once but let each step lead toward the ultimate goal as revealed in the completed plan--an attractive, convenient and comfortable home.

Farm home grounds should have a roomy and spacious effect. A cramped or crowded appearance about the home is not in keeping with the broad fields lying about it. Even a small yard may be so arranged so as to give it an appearance of spaceousness. Large grounds require much time and labor to keep up and should be planned only by those of means.

An informal design and arrangement will usually prove most satisfactory for the average farmstead. Plants should be placed and arranged to bring out a natural effect. Formal arrangements appear too artificial and do not blend in well with the surrounding landscape.

The arrangement of the walks and drives for a particular farmstead depends largely upon the lay of the land, the grouping of the buildings and their location with reference

Farmstead Landscape Sketch



Reproduced from Cover of Vocational Educational Bulletin 189—

to the main highway. The entrance driveway is always an important feature. It is used frequently, so must be practical; it serves to greet the visitor and the passer-by, so it should be inviting and pleasing. Sweeping, graceful curves are generally more interesting and attractive than straight lines or sharp angles in walks and drives. A long straight approach can be made more attractive by rows of trees. Unnecessary wolks and drives waste time and money in construction and maintenance and detract from the attractiveness of the place.

The front lawn is the most important single feature of the home grounds. It should be appropriate: A large house needs a large lawn; a small house, a small lawn. It should be separated from side and rear lawns by shrubbery borders, hedges or wine-covered lattice.

Trees largely determine the general effect and character of the landscape picture. They should be placed with the two-fold purpose of adding beauty to the setting and of increasing comfort by protecting from wind and sun. The use of too many trees close to the buildings should be avoided since they will darken the house by dense shade and keep out the air and sunshine. Large trees should not be placed directly in front but somewhat to each side of the house to make a frame through which a portion of it may be seen. Trees should be spaced far enough apart that when fully grown their branches will not meet across the front of the

house and thus hide it from view. Large trees located near the rear corners will extent their branches above the house and make a background against which the house will show to advantage. This background softens the harsh straight roof and corner lines of the house and gives a pleasing effect.

Shrubs and vines are necessary to fill the edges of the landscape picture, to soften and relieve straight formal lines, and to screen and to blend together all the important features of the landscape. To do this effectively care must be used in selecting and massing shrubs of the proper height of growth. Success in using shrubs is attained when all buildings and plantings fit together naturally and appear to belong to the place and landscape. Groups or masses of shrubs produce a pleasant effect. Isolated individual plantings scattered over the lawn give a "cluttered up" effect and detract from the picture. Tall shrubs placed in the background and maintained at their natural height give a more natural and more beautiful effect than shrubs which require severe top pruning to keep them at the proper height.

Flowers, both annuals and perennials, add color and variety to the picture and should be used about every farm home. A definite portion of the grounds should be laid out in flower gardens. Border plantings and attractive groupings of flowers at appropriate points about the shrubbery and house are pleasing. Bright flowered annuals and perennials along walks, fences, and walls and around the vegetable

garden will increase the beauty of the place. Masses of color blending into one another are more desirable than unrelated clusters of color.

In so far as practicable native trees, shrubs, vines, and wild flowers should be used for plantings about the farm home to give the effect of simplicity and naturalness-- two important aims in beautifying the farm home grounds.

SHADE AND ORNAMENTAL TREES SUITABLE FOR FARM HOME GROUNDS

I. Large Trees Used Chiefly for Shade, Wind Protection, Screening, or Background Effects

A. Deciduous

- Ailanthus (Tree of Heaven)
- Ash--
  - Black
  - Blue
  - Green
  - White
- Basswood
- Beech
- Birch
- Chestnut
- Elm-- American
- Hackberry
- Hickory
- Locust
  - Black
  - Honey
- Maple--
  - Norway
  - Red
  - Sugar
- Mulberry
- Oak--
  - Pin
  - Red
  - White
- Poplar--
  - Lombardy
  - Norway
  - Silver
- Sour gum
- Sycamore
- Walnut
- Willow

B. Evergreens

- Arborvitae
- Cedar
- Fir
- Hemlock
- Holly
- Magnolia
- Pine--
  - Austrian
  - Norway
- Pine--
  - Scotch
  - Western Yellow
  - White
- Spruce--
  - Colorado Blue
  - Norway
  - White

II. Small Trees or Large Shrubs Having Distinctive Shape, Folliage, or Flowers Used Chiefly for Ornamental Purposes

A. Deciduous

- Cherry--
  - Black
  - Choke
  - Japanese Flowering
  - Pin
- Crab, Flowering
  - Bechtel
  - Parkman
- Crabapple, Wild
- Dogwood

Hawthorne
Japanese Lilac
Mountain Ash--
American
Eupopean
Nannyberry
Ninebark
Redbud
Siberian Pea Tree
Wafer Ash
Wahoo
Weeping Willow
White Birch

B. Evergreens

Arborvitae
Holly
Juniper
Magnolia
Spruce

Roadside Improvement

Roadside plantings serve a double purpose, they furnish both food and cover to wildlife and at the same time greatly enhance the beauty of the country side not only to the passing morotist but also to the farm population.

A large proportion of the traffic along this area consists of pleasure vehicles, and much of it is of such a character that it will appreciate improved roadsides. Appropriate planting often adds the needed touch and always goes far toward making a road attractive.

Many rural residents who desire to have their children remain on the farm are realizing that if young people are to be satisfied with farm life the surroundings must be attractive. One way to attain this objective is to plant good trees and shrubs along the country roads, at least comparable with those on the streets of modern town and villages.

Before going ahead with the planting, care should be taken to select the species and type of planting that will give the most pleasing effect. For the flat straight stretches of road the best arrangement is one of formal character with trees planted in rows at regular distances; while along the rolling stretches informal plantings in which trees singly or in groups are planted at irregular distances apart and from the road are more appropriate.

Plantings near bicycle trails and footpaths along the highways should be of such a height and so arranged that their users are not hidden from the view of the motorist. Such a condition would result in increased hazard and would, therefore, defeat the purpose of the trail. For this reason, plants not over 2 or 3 feet high should be used between the road and the path.

The open spaces between shrubbery groups may be covered with grasses or dwarf herbaceous growths with more or less possibility of showy flowers. Other herbaceous flowering plants can be added here or in the borders of the shrubbery groups.

Where the trees are set out formally, more care must be used in the selection and arrangement of supplementary plantings. Small trees can be placed between the larger ones such as flowering dogwoods and service berry between American elms, or any other shrub of appropriate habit and height; while on another stretch of road a different shrub may be used.

The shrubs may be placed less formally, but the beds in which they are planted should be for the most part parallel with the tree rows or at least rather formally or symmetrically arranged. However, the size and character of the plants in these beds may be as irregular and unsymmetrically as they were used in informal plantings.

Extreme care should be exercised at all times in the choice of plants to maintain harmony and yet not create a uniformness which is likely to become monotinous to the eye.

On page 66 is a suggested list of desirable trees for roadside planting. These trees were selected both because of their beauty and because of their production of food for wildlife. Shrubs and grasses should be choosen in view of their value for food and cover. The same species which are used for fence row improvement and for food patches may also be used to advantage for roadside plantings, list on page

The roadside plantings are to be made under the direction and supervision of the State Highway Department and the State Board of Agriculture. The following summary, (Mulford, 5)suggests the scope of the State laws in regard to roadside improvement. "The State Highway Commission and the State Board of Agriculture have joint supervision of planting trees on trunkline and other highways with the consent of property owners; under another act the State Highway Commission may protect growth on State-aid roads and plant any trees they can secure without buying. A tax rebate of 5 cents a tree for 5 years is given for private planting on roads where there has been no State regard. Trees for planting may be obtained from the public-domain commission or the State Agricultural College. No signs are permitted on trees. There are no laws for State roads.

Wild Life Management Plan

General Discussion

A wildlife refuge is defined by Leopold[1] as "an area closed to hunting in order that its excess population may flow out and restock surrounding areas. A refuge is at all times a sanctuary, and the two terms are synonymous."

In case the surrounding area is a hunting range the main objective in establishing a refuge may be to maintain a breeding stock on that shooting ground. In other cases the primary function may be to maintain or to increase the population of a closed species. However, in most cases, including the Huron River Sanctuary, it is equally desirable to increase both game and non-game species of birds and mammals.

To be correctly called a refuge, the area must be surrounded by a range suitable for the species involved, except in the case of migratory birds, when the refuges are often located outside the breeding range, in which event the sole function is to provide a resting place where the birds may feed unmolested. Normally, however, a sanctuary is an integral part of a larger area, functioning as a "reservoir" to that area.

The establishment of a wildlife sanctuary along the Huron River between Ann Arbor and Ypsilanti is justifiable

[1] Leopold, Aldo - 1933 Game Management, p. 195.

and desirable for several reasons. In the first place the area is well adapted to such a land use program. The tract contains a variety of well dispersed cover types which with some improvement is capable of producing food, cover and nesting sites for large numbers of wildlife. Secondly, the shape of the tract also lends itself well toward the accomplishment of the ultimate purpose of a wildlife sanctuary, for being long and rather narrow it will benefit a larger adjacent area than a well blocked tract of the same acreage. Then too, the increased recreational use of the area make it almost imperative to eliminate hunting as a measure of protection to human life. The availability of this area as an out-door laboratory for University classes in ornithology, natural history and conservation is another piont in favor of this program. And finally, the hunters of the vicinity must realize the heavy annual drain placed on the breeding stock in this highly populated section of the State and should be willing to take, or initiate , action in the establishment of a wildlife sanctuary on this area.

Actual Management Plans

By a carefully planned planting program an attempt is to be made to improve the environmental conditions for wildlife, so that within a few years the carrying capacity of the area for the various species of birds and mammals will be reached. Until this goal is realized, the true function of a wildlife refuge cannot be attained. That is to say, the number of head which will flow out to adjacent areas

depends on the intensity of the population pressure within. The distance to which the excess population will flow out varies with the mobility of the species.

The success of a refuge to restock surrounding areas does not lie entirely within the sanctuary itself, but to a large extent on the character of the food and cover conditions of the surrounding range. In this particular case the adjacent area appears to be rather well adapted to absorb and hold the over flow. However, in order to have an ideal unit, a cooperative farm-game improvement program should be carried on simultaneously on the surrounding range.

The environmental improvements which are to be made are shown on the large scale map of the area on page 62. These proposed improvements were made after the area had been thoroughly covered during three seasons of the year--fall, winter and spring. From observations and notes made in the field under these various climatic conditions, a clear picture was obtained of the major food and cover improvements necessary for an increased future population.

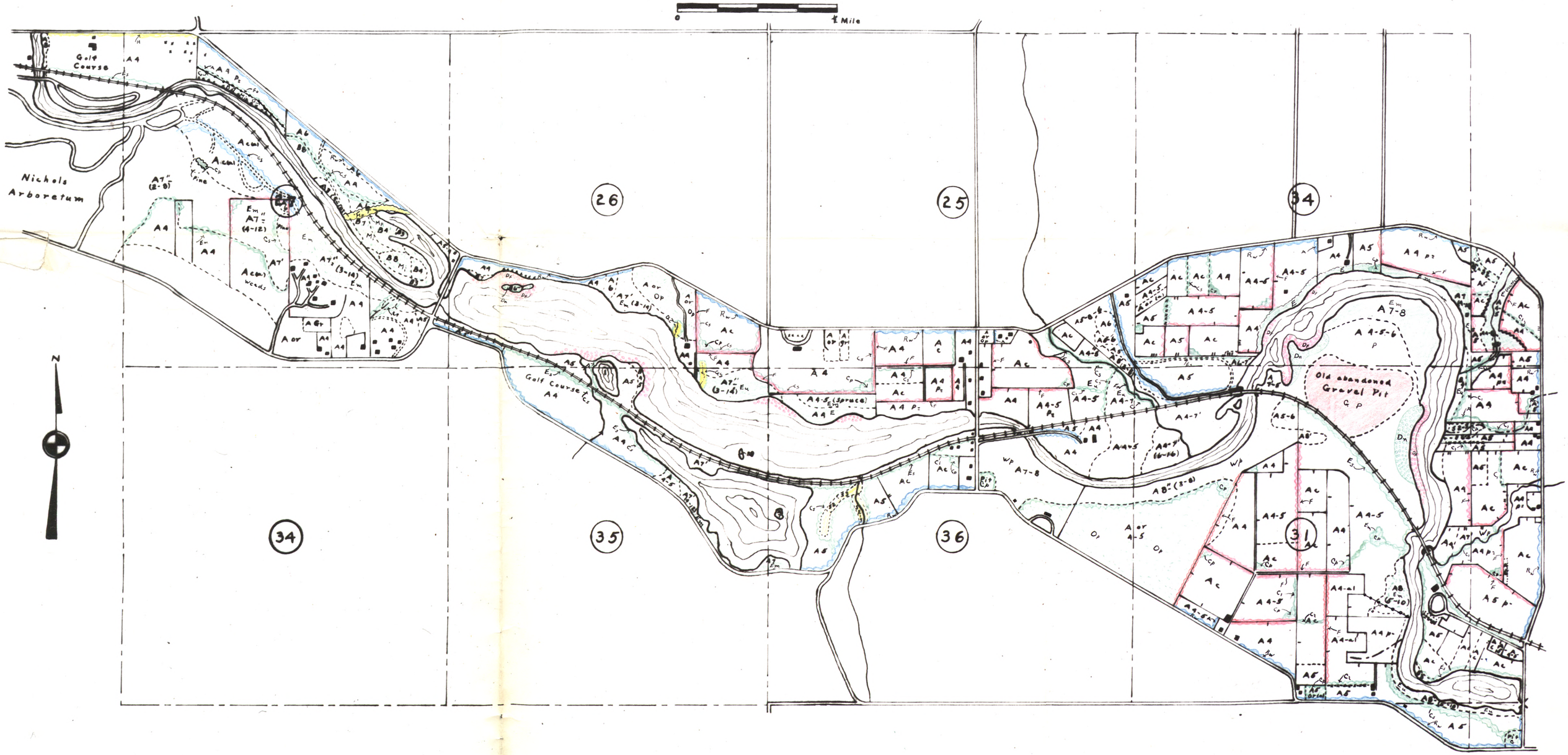
Waterfowl Refuge Program

A special improvement program is to be undertaken to develop Superior Pond, the broad bend of the Huron River in Sections 30 and 31 of Superior Township, as a resting and feeding ground for waterfowl. Many ducks drop down upon

HURON RIVER WILD-LIFE SANCTUARY UNIT

SCALE

0 ½ Mile



A	Wind Break	E	Evergreen Planting	G_c	Erosion Control
C	Cover Improvement	E_m	Evergreen and Mixed Planting	H	Hedge Row
C_l	Cover Lane	E_s	Evergreen Strip	M_i	Marsh Improvement
C_p	Cover and Food Patch	E_u	Evergreen Underplanting	M_p	Marsh Protection
C_s	Cover and Food Strip	F	Fence Row Improvement	O_p	Orchard Improvement
D_f	Waterfowl Food Planting	F_o	Fence Built	R_w	Roadside Improvement
D_n	Waterfowl Cover and Nesting Improvement	G	Gravel Pit Improvement	W_p	Woodland Protection
				P	Protection

this broad expanse of the river, where they are afforded a certain amount of seclusion and protection. Although the majority of the ducks do not nest on the area, there are two known nesting records of black ducks[1] and it is very likely that there have been many unobserved nests annually on the area. Over twenty five species of waterfowl have been observed along the river and about a dozen species of shore birds (refer to bird list on page 31). A rookery of Black Crowned Night Herons is located along this stretch of the river, demonstrating the possibilities which exist for establishing what may be termed a sanctuary within a a sanctuary where a concentrated effort to improve feeding and nesting conditions may bring results far in excess of any expectations of the present.

The suggested program for improving this small unit must necessarily be general in nature since the time allotted to the development of plans for this project limited the scope of the field work so that it was impossible to make a detailed inventory of the existing vegetation and bottom conditions along Superior Pond. Nevertheless, an attempt has been made to make suggestions of a practical nature as to the type of work which should be carried out (map on page 62), including a list of desirable food and cover plants (page 68) and an estimate of the cost of carrying on such a program (page 72).

[1] Recorded by Dr. Hahn of the Zoology Department and Dr. Wight of the Forestry and Conservation School, University of Michigan.

Administration

The area is to be administered under the Michigan Wild Life Sanctuary Law, Act No. 184 of the Public Acts of 1929, provisions founds on pages 77-78. Although the Act stipulates in Section 1 that - "applications shall not be approved for areas less than twenty acres nor for more than fifteen hundred acres ---", it is likely that an exception might be made in this case due to the character of the area or, as alternative, the area east of Geddes Bridge might be considered as a separate sanctuary area.

Due to the limited time available for this problem, it has not been possible to take even the initial steps in placing these plans in operation, however, it is hoped that a group of interested individuals such as the Huron-Clinton River Parkway Commission or the Junior Chamber of Commerce of Ann Arbor, will carry on where this report leaves off and put these plans through to completion.

At the present time the State Legislature at Lansing is considering legislation providing for the appropriation of funds to be used in financing improvements along the Huron and Clinton River Valleys. The Federal Ammunitions Tax presents an other possible source of funds for this project. The following discussion is written on the assumption that funds shall be appropriated to carry out this plan.

The first step is to contact the landowners on the area (property map on page 28) and, assuming that they are interested in the proposal, have them fill out blanks of application for didication of Lands under Act 184, P. A. 1929 as a State Wild Life Sanctuary. These in turn shall be presented to the Conservation Commission at Lansing. Upon their approval the actual field work may be begun under the direct supervision of a trained Game Technician. Although it is desirable to extend the planting program over a period of several years, it is very likely that due to the source and nature of the appropriations, the improvements will need be completed within a single year.

Lists of Planting Stock

Trees for Roadside or Mixed Planting

Acer negundo	Box Elder
Acer saccharinum	Soft Maple
Acer saccharum	Sugar Maple
Aesculus Hippocastanum	Horsechestnut
Fraxinus nigra	Black Ash
Juglans nigra	Black Walnut
Picea excelsa	Norway spruce
Pinus ponderosa	Western Yellow Pine
Pinus sylvestris	Scotch Pine
Quercus alba	White Oak
Quercus velutina	Black Oak
Robinia pseudoacacia	Black Locust
Salix spp.	Willow
Tsuga canadensis	Eastern Hemlock
Ulmus americana	American Elm

Trees for Special Purposes (some are shrub-like)

Amelanchier canadensis	June Berry
Crataegus spp.	Hawthorne
Cornus florida	Flowering Dogwood
Corylus Americana	Witch Hazel
Juniperus communis	Ground Juniper
Juniperus virginiana	Red Cedar
Malus florabunda	Wild Crab Apple
Malus pumila	Wild Apple
Morus rubra	Red Mulberry
Prunus serotina	Wild Black Cherry
Prunus pennsylvanica	Fire Cherry

For Hedges

Bridal Wreath
Evergreen
Honeysuckle
Japanese Barberry
Japanese Quince
Privet
Rosa multiflora

Shrubs for Fence Row Improvement, Underplanting and Border Planting.

Ampelopsis quenquefolia	Virginia Creeper
Caragana	Siberian Pea Tree
Berberis Thunbergii	Common Barberry
Sambucus racemosa	Red Elderberry
Solanum Dulcamara	Nightshade
Spiraea lobata	Spriaea
Symphoricarpos racemosus	Snowberry
Symphoricarpos vulgaris	Coral Berry
Viburnum opulus	High Bush Cranberry
Vitis vinefera	Wild Grape

Shrubs for Gulley Control or for Steep Slopes

Coral Berry
Drooping Forsythia
Himalaya Blackberry
Japanese Barberry
Regal Privet
Rhus glabra
Snowberry
Wild Blackberry
Wild Plum
Wild Roses

Food Patch Mixtures (12 pounds per acre)

Buckwheat
Corn
Cow peas
Flax
Rye
Sudan grass
Sunflower
Sweet clover
Vetch

(to be planted in various mixtures)

Waterfowl Food Plants

	Planting Depth
Sago Pondweed (Potamogeton pectinatus)	2-10 ft.
Wild Celery (Vallisneria spiralis)	2-10
Widgeon Grass (Ruppia maritima)	1-10
Wild Rice (Ziaania aquatica & palustrus)	½-3
Eel Grass (Zostera marina)	1-6
Pondweed (Naias flexilis)	1-10
Red head Grass (Potamogeton perfoliatus)	2-8
Duck Potato (Sagitaria latifolia)	up to 1½
White Water Lily (Castalia tuberosa)	1-4
Yellow Water Lily (Nymphozanthus variagatus)	1-4

Ornamental Waterfowl Food Plants

Water Lilies (Nymphaeciae)	1-4
Marsh Marigold (Caltha palustris)	Waters edge
Cat-Tail (Typha latifolia)	1
Bur Reed (Sparganium spp.)	1
Wild Rice (Zizania aquatica & palustris)	½-4
Pickerel Plant (Pontederia cordata)	1-3
Thalia (Thalia spp.)	up to 1½
Water Arum (Sagettaria latifolia)	up to 1½

Lotus

Food Plants for Muskrat

Sweet Flag	up to 1 ft.
Cat-Tail	up to 1
Muskrat Potato	up to 1
Bur Reed	up to 1
Wild Rice	½ - 3
Water Lilies	2 - 5
Great Bulrushes	2-- 5
Muskgrass	2 - 5

Improvement Expenses

The cost of planting stock is given in two columns - the first is the average cost of the stock if purchased from a private nursery[1]; the second is an estimated cost of producing the planting stock by the State. The purpose of so doing is to show the financial benefits derived from a state nursery program for the production of planting stock for wildlife improvement activities.

The Pennsylvania Game Commission has developed such a policy and has succeeded in producing planting at an average cost of less the three and a half dollars per thousand. In the following calculations this average figure is used as the estimated cost of producing the stock in a State operated nursery. The cost of waterfowl planting stock is taken from Terrell's Aquatic Nurseries price list[2].

[1] The price lists of the Naperville Nurseries of Naperville, Illinois were used in this case.

[2] Terrell's Aquatic Nurseries, Oshkosh, Wisconsin.

Improvement Expenses

Improvement	Cost of Labor (at 40¢ per hour)	Cost of Planting Stock: Private Nursery	Cost of Planting Stock: State Nursery
Roadside Improvements:			
Trees: 580 ch. or 900 trees		$16.20	$ 6.30*
Labor - 150 hours	$60.00		
Shrubs: 4000 shrubs		88.00	14.00
Labor - 133 hours	53.20		
Cover and Food Patches:			
9 acres			
Seed - 108 lb.		$16.20	
Labor - at $6 per acre	54.00		
Wind Breaks:			
10 chains			
330 trees		5.00	2.60*
Labor 30 hours	12.00		
Cover Lanes:			
304 chains			
4550 shrubs		91.00	16.00
Labor - 92 hours	36.80		
Evergreen and Mixed Planting:			
50 acres (wide spacing on 35 acres)			
36,000 trees		520.00	126.00
Labor - 300 hours	120.00		
Evergreen Strip:			
300 chains			
22 trees per chain			
6600 trees		99.00	25.10
Labor - 75 hours	30.00		

* Larger stock, therefore, figured at $7.00 per M instead of the usual $3.50.

Improvement	Cost of Labor (at 40¢ per hour)	Cost of Planting Stock	
		Private Nursery	State Nursery
Evergreen Planting:			
35 acres (6x6) spacing 42,350 trees Labor - 353 hours	$141.20	$635.00	$148.00
Evergreen Underplanting:			
28 acres 200 trees per acre 5600 trees Labor - 70 hours	28.00	84.00	19.60
Fence row Improvement:			
535 chains Average 15 plants per chain 8000 plants Labor - 135 hours	54.00	130.00	28.00
Fence Construction:			
37 chains @ $2 per chain	74.00		
Erosion Control:			
3000 plants Labor - 25 hours	10.00	52.50	10.50
Hedge Row:			
35 chains 525 shrubs Labor - 12 hours	4.80	9.00	1.85
Marsh Improvement:			
Muskrat food, cover plants, etc.	$60.00		
Marsh Protection:			
15 chain windbreak 500 trees Labor - 7 hours	2.80	7.50	1.75
Orchard Improvement:			
Labor and materials	25.00		

Improvement	Cost of Labor (at 40¢ per hour)	Cost of Planting Stock
Waterfowl Food Planting:		
20 acres		
200# of seed (wild rice)		$100.00
10,000 tubers (sago pong weed, wild celery, etc.)		140.00
40 bu. of plants or roots (widgeon grass, eel grass, etc.)		300.00
Labor - 100 hours	$40.00	
Cover and Nesting Planting for Waterfowl		
25 acres (not all to be planted to specialized food plants).		
10,000 tubers (Bulrushes, bur reed, cat-tail, etc.)		300.00
250# of seed (Millet, wild rice, wheat, oats, etc.)		90.00
Labor (preparing ground and planting)	$60.00	

Note: Summary and interpretation of cost data on next page.

Summary of Estimated Improvement Expenses

Improvement	Expenses	
	Private Produced Nursery Stock	State Produced Nursery State
Total cost of nursery stock	$1737.20	$399.70
Waterfowl food and cover material*	930.00	930.00
Miscellaneous (food patch mixture and food and cover improvement for muskrat)*	76.20	76.20
Tatal cost of labor*	815.80	815.80
	$3559.20	$2221.70

* Expense same under both set-ups (Prices for waterfowl food and cover plants taken from Terrell's Aquatic Nurseries price list).

Interpretation of Improvement Expenses

The big difference in the cost of nursery stock between that purchased from private nurseries and stock produced in State operated nurseries clearly demonstrates the desirability of establishing State supervised nurseries to produce planting stock for wildlife improvement activities. The difference of $1337.50 between $1737.20 and $399.70 is a saving of 77%. Such an economy should be of interest to the State Conservation Commission.

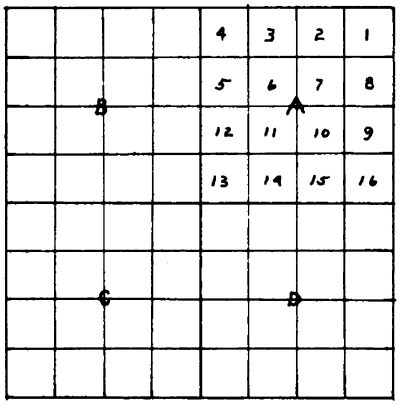
Even though much of the planting stock must be bought from private nurseries at the present time, the evergreen planting stock may be bought from State nurseries at a great saving. It is estimated that by so doing the improvements could be made for at least $800 less than the figure given above for private nursery stock. This would mean that the total expense would be reduced to about $2700.

Census of Hunters

Date	Time of Day	Location of Observation	Number of Hunters	Number of Hunting Dogs	Number of Parked Cars
10/15/38	9:00 - 10:00	27 B 8 [x]	2	1	
		27 A 15			1
		27 D 3	3		
		27 A 12	1		
	10:00 - 11:00	26 C 6			1
		26 C 14	1		1
	11:00 - 12:00	31 A 5	5	1	
		31 D 15	1		
	1:00 - 2:00	31 C 13	2 [o]	2	
	2:00 - 3:00	———	———	———	———
10/16/38	9:00 - 10:00	———	———	———	———
	10:00 - 11:00	27 B 9	2		
		27 B 14			1
10/23/38	9:00 - 10:00	26 C 6	1		
	10:00 - 11:00	———	———	———	———
	11:00 - 12:00	36 B 15	1		1
		35 D 1			1
10/30/38	10:00 - 11:00	S.E. corner of area	2	1	1
	11:00 - 12:00	32 C 10	2		
	1:00 - 2:00	———	———	———	———
	2:00 - 3:00	32 B 13	5		
11/6/38	9:00 - 10:00	27 D 3	2		
Totals			30	5	7

[x] Explanation of symbol on next page.

[o] Hunters had shot 3 black ducks, 3 pheasants and 1 rabbit.



In order to explain the symbols used in indicating the approximate location of the observations, let us take the symbol 27B8 as an example. The 27 indicates the section; B denotes the quarter section; and 8 refers as to which one of the 16 subdivisions of the quarter section within which the observation was made.

As an aid in locating the place of the observation, a 2 inch square, similar to the one above, should be drawn on tracing paper. Its use will save dividing up every section on the base map.

Summary of Hunter Census

Total number of hunter observed	30
Total number of hunting dogs observed	5
Total number of cars parked on area	7
Total hours of observation *.	15
Maximum number of hunters observed on the area during a single day	15
Maximum number of hunters observed on the area in an hour	6

* Observations were made on week ends when it is likely that the greatest number of hunters were out.

Miscellaneous Observations

10/15/38

Location	Observation
27B7-8	13 cows
27A12	5 Black mallards flew up from the river
26C5	4 horses
36A2	2 horses and 7 cows
31D2-7	13 cows
32D5-6	2 horses and 3 cows
31C6	23 sheep

Michigan Wild Life Sanctuary Law

Act No. 184 of the Public Acts of 1929.

An act to provide for the protection and increase of desirable forms of wild life; for the establishment of wild life sanctuaries; for the maintenance and regulation thereof; to provide penalties for the violation of this act and the rules and regulations issued thereunder; and to repeal act number three hundred sixty of the Public Acts of nineteen hundred thirteen.

The People of the State of Michigan enact:

Section 1. The conservation commission is hereby given power to establish state wild life sanctuaries and may by appropriate resolution accept as such, privately owned lands, when the owners and lessees thereof shall file with said commission an application dedicating such lands for such purposes. The commission may accept such dedication only after it shall have determined that the application is made in good faith, that the said lands are suitable for the declared purposes, that the dedication and operation of the proposed wild life sanctuary will tend to increase the supply of desirable wild life in that vicinity and will otherwise be in the public interest. Applications shall not be approved for areas of less than twenty acres nor for more than fifteen hundred acres or for periods of less than five years.

Section 2. Upon application from the agencies officially in control thereof, lands owned by the State of Michigan or by the United States may be dedicated under this act in the same manner as privately owned lands.

Section 3. When an application for the dedication of lands as a state wild life sandtuary shall have been approved by the conservation commission, the director of conservation shall supply suitable signs or posters which the dedicator shall promptly erect and thereafter maintain in such a manner as to clearly define and mark the boundaries of such dedicated lands; and it shall be the duty of the said dedicator to remove all such signs or posters within three months after the expiration or termination of such dedication.

Section 4. When lands have been so dedicated and posted as a state wild life sanctuary, the possession or carrying of firearms thereon, hunting or trapping thereon, or the killing or molestation of wild life on such lands by any

person or by the owners or lessees thereof, or their agents, shall be unlawful during the period of such dedication: Provided, That the director of conservation may issue permits for the taking on any dedicated lands of predatory animals and birds and such other birds and animals as may require control or as may be appropriate in connection with experiments in wild life management of for other purposes not inconsistent with the original intent of the dedication.

Section 5. Dedications under this act may at any time be modified or terminated upon the application of the dedicator and approved by the conservation commission, or may be terminated without the application of the dedicator in case the commission shall determine that a given dedication has become ineffective or otherwise not in the public interest or that the dedicator has failed to erect or maintain the signs and posters provided for in section three.

Section 6. The conservation commission is hereby given authority to issue and enforce such rules and regulations as may be needed in order to administer and accomplish the purposes of this act.

Section 7. It shall be the duty of all conservation officers having the power of arrest and of all sheriffs and other peace officers, to protect the wild life on such dedicated areas from injury or molestation and otherwise to enforce the provisions of this act.

Section 8. Any person who shall violate any of the previsions of this act or any of the rules and regulations issued thereunder, shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be subject to a fine of not less than twenty-five dollars and not more than one hundred dollars, or to imprisenment in the county jail for not more than thirty days, or to both such fine and imprisonment in the discretion of the court.

Section 9. All game refuges established under the terms of act number three hundred sixty, Public Acts of nineteen hundred thirteen, shall continue until the expiration of the periods for which such dedications were officially accepted, but the owners of such game refuges may, if they make application therefor and if the conservation commission shall approve, cancel the original dedication and reinstate such lands under the terms of the present act.

Section 10. Act number three hundred sixty of the Public Acts of nineteen hundred thirteen is hereby repealed, except that all of its provisions shall remain in full force and effect as to those refuges now established and which continue as such, as provided by section nine of this act.

STATE OF MICHIGAN

DEPARTMENT OF CONSERVATION

LANSING

P. J. HOFFMASTER, DIRECTOR

Dear Sir:

We are enclosing a copy of the wildlife sanctuary law and application form. In filling out this application please be sure to provide the correct legal description of the property as requested under paragraph four. Upon return of the application to the Department, the property will in due time be examined as to cover, food, water, and other conditions determining the suitability of the area for sanctuary purposes. Applications will then be presented to the Conservation Commission for final approval. Because several months may be required to secure final approval, application should be made well ahead of the hunting season.

The law, in brief, is intended to provide protection to wildlife by an agreement between the landowner and the Conservation Department in which the owner agrees to give up his hunting rights on the dedicated property for not less than five years, and the Department agrees to provide official posters which the owner erects. The dedication is in no sense a deed or lease, no fee is offered for the use of the lands, and the lands are in no way exempted from taxes. Fishing rights are in no way affected by the dedication.

Conservation officers are expected to give reasonable cooperation in protecting the area dedicated. The law provides a penalty for hunting violations only and conservation officers cannot be expected to provide protection against ordinary trespass or property damage as such violations come under civil trespass laws enforced by local civil authorities and are not within the jurisdiction of the Conservation Department.

Yours very truly,

H. D. Ruhl
In Charge, Game Division

By_____
Martin R. Webb

MRW*LG

*Township*_____ *North.* *Range*_____

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

APPLICATION FOR DEDICATION OF LANDS UNDER ACT 184, P. A. 1929
as a
STATE WILD LIFE SANCTUARY

To the CONSERVATION COMMISSION
Lansing, Michigan.

1. I (we), the undersigned, in accordance with the provisions of Act 184, P. A. 1929, do hereby and in good faith apply to set aside and dedicate the lands hereinafter described for the general purposes prescribed by the law, and in particular for the following purposes_____

_____

For a period of_____years; subject to all limitations and conditions contained in the law itself and to all rules and regulations in connection therewith as issued by the Conservation Commission.

2. Name_____Address_____
(City or town)

_____ _____
(Street and Number) (R. F. D.)

3. Location of property: County_____Twp._____

Town_____Range_____Acres_____.

4. Legal description (sections, forties, lots, etc.) Show on accompanying plat also.

_____

_____

_____

_____

5. Do you own_____(yes or no) or lease_____(yes or no) the property? If leased, from whom?_____
(Owner's name and address)

When does your lease expire?_____

6. For what purpose is this property now used?_____

_____

7. To what use do you intend to put this property in the future?_____

8. For what reason do you wish to dedicate this property as a Wild Life Sanctuary_____

_____

Please fill out the following:

GAME COVER AND FEED:

1. How many acres in:

Thick, unpastured woods?_____Open and pastured woods?_____Brush?_____Swales?_____
Marshes?_____Water?_____Cropland?_____
Cropland?_____Pastureland?_____Idle Clearings?_____

2. Kinds of crops usually grown_____

3. Number of streams_____Size_____Number of lakes_____

Size_____

WILDLIFE SPECIES:

4. Mark in spaces provided whether Many (M), Some(S), Few (F), None (N).

Deer_____	Beaver_____	Fox_____	Woodchuck_____
Bear_____	Muskrat_____	Coyote_____	Porcupine_____
Rabbit_____	Skunk_____	Bobcat_____	Cat_____
Mink_____	Weasel_____	Dog_____	Fox Squirrel_____
Squirrel___ (Black-gray)	Raccoon_____	Badger_____	Red Squirrel_____
Pheasants___	Waterfowl___	Hawks_____	Hung. Partridge___
Quail_____	Shorebirds___	Owls_____	Pr. Chicken_____
Songbirds___	Marshbirds___	R. Grouse(Partridge)_____	
Spruce Hen_____			

COOPERATION:

5. Do you live ON or near the land so that you can and will give it your personal attention?_____If not, do you have a local agent or permanent caretaker on the property? _____If so, give name and address. _____

_____

6. Are you in a position to and are you willing to:

Provide feed during unfavorable seasons?_____

Hatch and release pheasants or ducks if it is found that eggs can be supplied by the Conservation Department?_____

Allow the Department to liberate game animals or birds on this property?_____

Keep a record of activities on the sanctuary and to provide a yearly report?_____

SIGNS:

7. How many signs will you need, if posted 14 rods apart?

_____

8. To what address should these signs be sent?_____

_____

Date_____ Signature_____

(Use other side for additional explanation or comment)

References Cited

1. Conklin, W. G. 1932 Pennsylvania's State Game Refuges and Public Hunting Grounds. Bulletin No. 14.

2. Conklin, W. G. and Morton, J. N. 1936 More Food for Upland Game. Conservation Bulletin No. 11

3. Leopold, Aldo 1933 Game Management.

4. Mc Atee, W. L. 1936 Groups of Plants Valuable for Wildlife Utilization and Erosion Control. U.S.D.A. Circular No. 412.

5. Mulford, F. L. 1938 Planting the Roadside. U.S.D.A. Farmers Bulletin No. 1481.

6. Pittman 1937 Wildlife and the Land. From the Special Committee on Conservation of Wildlife Resources, 75 Congress 1st Session.

7. Ross, W. A. and Scranton, L. L. Landscaping the Farmstead. U.S. Dept. of Interior Vocational Bull. No. 189, Agriculture Series No. 51.

8. Russell, I. C. and Leverett, F. 1915 Geologic Atlas of the United States; Ann Arbor Folio, Michigan.

9. Stevens, R. O. 1937 Wildlife Conservation Through Erosion Control in the Piedmont. U.S.D.A. Farmers' Bull. No. 1788.

10. Terrell, Clyde B. Terrell's Aquatic Nurseries Price List.

11. Veatch, J. O. 1934 Soil Survey of Washtenaw County, Michigan. Bureau of Chemistry and Soils.

12. 1936 Small Refuges for Waterfowl. More Game Birds in America Foundation.