

# MICHIGAN

**Office of Planning Coordination  
Bureau of Planning and Program Development  
Executive Office of the Governor**

TECHNICAL MEMORANDUM NO. 7

WATER ACCESS AND BOATING DEVELOPMENT PROGRAM

NOVEMBER, 1968

URBAN PLANNING ASSISTANCE PROJECT MICHIGAN P-131 PROJECT NO. RN-3

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STATE OF MICHIGAN  
EXECUTIVE OFFICE

BUREAU OF PLANNING AND  
PROGRAM DEVELOPMENT  
OFFICE OF  
PLANNING COORDINATION  
Lewis Cass Building  
Lansing 48913



Date: Feb. 10, 1969

To: The File  
From: William D. Lontz  
Subject: Water Access and Boating Development Program, Michigan P-131,  
Project RN-3

Background

The water access and boating development program was one part of a three-part study being developed under project RN-3, Water Oriented Recreation Study, Michigan P-131. The two additional studies were a lake inventory, Information Bulletin Number 9; and a stream inventory, Technical Memorandum Number 2.

Objective

The objective of the study was to identify lake and stream areas acceptable to, or for the development of, all types of inland lake and stream boating activities. The study was prompted by a shift in gas tax refunding procedures which expanded and provided more latitude and financing by the Waterways Division, Department of Natural Resources, for inland boating facilities.

Relationship to the Outdoor Recreation Plan and Project Status

The boating portion of the action program of the Michigan Outdoor Recreation Plan is attached as appendix A. Present watercraft registration is 29.8% on the Great Lakes and 70.2% on the inland waters of the state. By 1980 it is expected that there will be 40% of all watercraft on the Great Lakes and 60% of all watercraft on inland waters. There is also a need for the development of sites on rivers, both inland and connecting to the Great Lakes, to meet the increased fishing potential of these waters. There is a need to develop the existing 100 state-owned sites and to provide an additional 100 sites on these waters. This will require one allocation of \$5,493,800 during the ten-year planning program.

Total program cost was estimated at \$84,195,236. With the increase in full tax allocation for boating concerns, a good portion of this program could be undertaken in the next ten years. Although the physical boating needs were ascertained and the fiscal resources were partially available, a plan as to new boating facilities location, to serve people and take advantage of the natural resource base, was needed.

The first step proposed was to review the lake and stream inventory base and ascertain physical areas where sites might be located. It was

originally envisioned that the lake and stream inventory, a part of the project, would be the contributing resource material to begin the planning effort desired. However, these two inventories were delayed by financial, staffing and computer difficulties; thus it was impossible to start this portion of the project.

An example of the type of data that was to be used in this study is attached as appendix B. The material is prepared for Alger County and consists of data on number of lakes by size and class, area of lakes by size and class, and length of shoreline by size and class. The data is categorized by lake type including marsh and bog, marsh, warm water, warm and cold water, cold water, and total for all lake types of the area.

#### Future Considerations

The completion of the lake inventory data, coupled with the stream inventory material, will permit realization of the original objective of this project. Completion will also further application for other considerations than boating and will aid substantially in the development of the Michigan Outdoor Recreation Plan.

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APPENDIX A:

MICHIGAN OUTDOOR RECREATION PLAN,  
ACTION PROGRAM -- WATERWAYS

Subject: ACTION - WATERWAYS

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RECREATIONAL BOATING NEEDS OF 1980

## I. General.

On December 31, 1965, the Secretary of State had approximately 399,000 recreational watercraft registered. Since only boats propelled by motors must be registered, it is obvious that this is not the total boating fleet. In fact, the Waterways Commission estimates that an additional 50,000 craft not subject to registration are owned by Michigan residents.

As part of the Transportation Study of the State of Michigan, financed by a grant from the Federal Government, the Waterways Commission has been studying the anticipated boating picture in 1980. This study is near completion and scheduled for printing by December 1, 1966. It is intended that this report will provide the bulk of the back-up material for this report and will be submitted to the Committee as soon as it is received. Other back-up material is attached in the order referenced.

The Boating Study indicates that a total recreational boating fleet of about 800,000 craft will exist in Michigan by 1980. Of this total, 718,200 will be registered and 81,800 nonregistered craft. We are hereafter concerned only with the registered craft because we believe the non-registered craft do not require use of public facilities.

At present, 35.8% of all registered craft are regularly launched by trailer or transported on tops of cars and do not require moorings. 64.2% of the fleet are not so transported but are kept at moorings supplied at cottages or homes, boat and yacht clubs, or commercial or public marinas.

Today, 29.8% of all registered watercraft are utilized principally on the Great Lakes, and 70.2% on the inland waters of this State. By 1980, however, this situation is expected to change to the point that the ratio will be 40% and 60% for Great Lakes and inland waters, respectively. The following will be the situation in 1980:

<u>WATERS</u>	<u>PERCENTAGE</u>	<u>TOTAL</u>
Great Lakes	40%	287,280
Inland Waters	<u>60%</u>	<u>430,920</u>
Totals	100%	718,200

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## II. Launching and Car-top Facilities.

Of the total boating fleet, and assuming a constant percentage continues, a total of 257,116 craft will be utilized in this fashion. These craft will be used on:

<u>WATERS</u>	<u>PERCENTAGE</u>	<u>TOTAL</u>
Great Lakes	40%	102,846
Inland Waters	<u>60%</u>	<u>154,270</u>
Totals	100%	257,116

To determine the launching facilities required, a typical design of such a facility was established and indicated that an average of 50 cars and trailers can be parked and an adequate launching ramp provided per acre. To meet 100% of the Great Lakes launching demand would require 2,057 acres while to meet the total inland waters demand would require 3,085 acres.

Because it is known that a small portion of this total demand is being met by non-public facilities, we are assuming that we will only have to meet 80% of the 1980 demand. In addition it is assumed that there will be a 20% double use factor at each site. This results in a total inland waters launching acreage of 1,974 acres. Table 1 shows the manner in which it is proposed to acquire this property. Total cost of acquisition is estimated at \$5,763,750 over the 13-year period and at \$4,433,654 for the 10-year program.

To develop these sites to the standards outlined in Table 2 will cost \$26,182,309 over the 13-year period and \$20,140,240 for the 10-year planning period.

To meet the Great Lakes demand, it is estimated that 100% of the facilities will have to be provided by public units of government. At present, there are an estimated 771 acres available for this use, leaving 1,286 acres to be acquired. At an average cost of \$10,000 per acre, total acquisition costs during the 10-year planning period will be \$9,892,310. The development costs for this same period is estimated at \$11,703,980.

Because Federal funds are available to communities for land acquisition, it is proposed to make this a local responsibility. However, Federal funds are not presently available for development of these facilities and it is therefore proposed to continue the present State program of matching equally local expenditures for this purpose.

There is also a need for development of sites on rivers, both inland and connecting to the Great Lakes, to meet the increased fishing potential of these waters. To develop the existing 100 State-owned sites and to provide an additional 100 sites on these waters will require an allocation of \$5,493,000 during the 10-year planning period.

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## III. Seasonal Berthing Facilities.

The study shows that 64.2% of all registered boats in Michigan are currently not transported but are maintained at a single location. Except for an extremely small percentage which is considered negligible, these craft are either moored or anchored in the water.

Since there are 399,000 registered craft today in Michigan, and since we know that 64.2% of these craft are not launched or transported, it means that a total of 256,158 boat owners are seeking berths or moorings. This total is divided by waters as follows:

<u>WATERS</u>	<u>PERCENTAGE</u>	<u>TOTAL</u>
Great Lakes	29.8%	76,335
Inland Waters	<u>70.2%</u>	<u>179,823</u>
Totals	100 %	256,158

According to the study, the demand for berths was met in the following manner:

<u>WATERS</u>	<u>SATISFIED DEMAND</u>		<u>UNSATISFIED DEMAND</u>		<u>TOTALS</u>	
Great Lakes	71,303	93.4%	5,032	6.6%	76,335	100%
Inland Waters	<u>177,122</u>	98.4%	<u>2,701</u>	1.6%	<u>179,823</u>	100%
Totals	248,425		7,733		256,158	

The Michigan State Waterways Commission's 1965 Inventory of berthing facilities on the Great Lakes Appendix A showed that 20,547 berths were available on a seasonal basis from commercial marinas, boat and yacht clubs, and from public marinas. This information, combined with the known unsatisfied demand, indicates the following as to the Great Lakes berthing situation:

Private Berths (cottages, homes, etc.)	50,756	66.5%
Marinas and Clubs	20,547	26.9%
Unsatisfied	<u>5,032</u>	<u>6.6%</u>
Totals	76,335	100 %

From the inventory data, the total marina supply consisted of the following:

Public Facilities	2,257	10.98%
Marinas, Clubs	<u>18,290</u>	<u>89.02%</u>
Totals	20,547	100 %

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The present ratio of inland water use vs. Great Lakes waters use is expected to shift about 10% by 1980 as noted above. With this factor included, it is possible to extrapolate the current berthing demand data to 1980. In 1980, the total registered boating fleet will be 718,200 craft. Of this total, 64.2% or 461,084 will be looking for berths.

<u>WATERS</u>	<u>PERCENTAGE</u>	<u>TOTAL</u>
Great Lakes	40.0%	184,434
Inland Waters	<u>60.0%</u>	<u>276,650</u>
Totals	100 %	461,084

The 1980 demand will be met in the following manner:

<u>WATERS</u>	<u>SATISFIED DEMAND</u>		<u>UNSATISFIED DEMAND</u>		<u>TOTALS</u>	
Great Lakes	172,261	93.4%	12,173	6.6%	184,434	100%
Inland Waters	<u>272,224</u>	98.4%	<u>4,426</u>	1.6%	<u>276,650</u>	100%
Totals	444,485		16,599		461,084	

Assuming a constant ability on the part of each interest to provide berths in 1980 on the same basis as in 1965, the Great Lakes demand will be met by:

Private (cottages, homes, etc.)	122,648	66.5%
Marinas and Clubs	49,613	26.9%
Unsatisfied	<u>12,173</u>	<u>6.6%</u>
Totals	184,434	100 %

The marina and club facilities will be financed as follows:

Public Facilities	5,448	10.98%
Commercial and Club Facilities	<u>44,165</u>	<u>89.02%</u>
Totals	49,613	100 %

To determine the total facilities which must be provided by the public sector to meet the unsatisfied demand and to continue to supply that percentage of the total boat wells it now provides, the unsatisfied demand figure and the public facilities figure are added (12,173 + 5,448) to obtain the total, 17,621.

This total must be supplied by 1980. The annual requirement thus becomes 1,355 berths and the 10-year program requirement 13,550 berths.

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The Waterways Commission has found that the greatest area of need that is not being met by commercial and club facilities and that, in its opinion, will continue not to be met by these organizations, is in providing berths for the smaller craft between 20 and 30 feet in length. This size boat provides the least income to a commercial marina and yet requires virtually identical expenditures for facilities as is required for larger craft that return a much greater income and profit to the marina owner. Larger craft consume much greater amounts of fuel because they are generally equipped with dual engines; larger craft are the source of greater equipment sales; larger craft are usually almost entirely marina-maintained rather than owner-maintained which provides additional income. These factors are not expected to change.

Accordingly, it is the proposal of the Waterways Commission to provide seasonal mooring facilities only for the smaller craft and permit the larger craft to continue to be serviced by commercial marinas. To meet the 1980 demand will require a total expenditure of \$35,242,000 and a 10-year program expenditure of \$30,629,231. The Waterways Commission proposes to meet this obligation by participating equally with local interests and/or the Federal Government in the development costs but to require local interests to finance property acquisition costs. Local interests can secure aid in acquiring property from the Federal Government while the State cannot, and it is contemplated that the vast majority of these facilities will be owned and operated by local units of government.

#### IV. Great Lakes Refuge Harbors and Transient Facilities.

To provide for the increased boating traffic between harbors on the Great Lakes which will develop by 1980, to provide areas for the location of seasonal marinas and public launching ramps, and to expand existing harbors and facilities will require a total expenditure of \$25,114,615.

This total is to be divided between State, Federal, and local units of government and the program will continue on its present basis whereby the local community is the owner of the completed facility and responsible for its operation and maintenance. Land acquisition costs will be the responsibility of the participating local unit of government.

#### V. Other.

It is proposed that two additional programs be undertaken, the first being the provision of boating island parks in the metropolitan Detroit area. Because the owners of smallcraft operated on Lake St. Clair, the Detroit River, and Lake Erie, have at present virtually no area where their craft can be reasonably utilized, it is proposed to provide two boating parks, one on Lake St. Clair and one on Lake Erie. The purpose of these parks would be to provide protected docking accommodations and developed and maintained swimming areas for the boat owners, their families and guests.

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The development cost of these facilities is estimated at \$6,000,000. However, revenues received from the operation of the first facility will, in part, be used to finance construction of the second, resulting in a total requirement of only \$4,000,000.

All of these programs will also require appropriations for operating and maintenance costs. It is expected that these costs will total \$12,630,000 over the 10-year period. In addition to these costs, it is proposed to assume ownership and operating responsibility over dams creating major impoundments in Michigan where the owners of the dams propose to abandon them. These structures will principally consist of abandoned power dams and it is estimated that this total program will cost \$2,000,000 over the 10-year planning period.

Table 3 summarizes all program costs involved in these programs and indicates that a total State appropriation of \$84,195,236 is required for the 10-year program.

The total program costs (\$84,195,236) contrasted with current revenue projections (\$17,563,000) indicate a shortage of \$66,632,236. It is proposed to make up the bulk of this shortage through a total allocation of 3% of all fuel taxes collected on the sale of fuel consumed in internal combustion engines in Michigan. This will provide additional revenues of \$64,065,000 and will leave a shortage of \$2,567,236 in the 10-year planning period. This is considered acceptable in view of the scope of this program.

Justification for the marine fuel tax increase is found in Appendix B.

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Table 1

INLAND WATERS LAUNCHING SITE LAND ACQUISITION PROGRAM

REGION I	No. of Lakes	% To Have Sites	No. To Have Sites	No. Of Sites Lake	Planned No. of Sites	Pre-sent Sites	No. Of New Sites	Acres P/New Site	Total New Acres	Total Pres. Acres	Total Acres	Total Cost
11-25	992	5	50	1	50	10	40	.50	20.00	5.00	25.00	\$ 60,000
26-50	432	10	43	1	43	7	36	.75	27.00	5.25	32.25	81,000
51-100	285	33	94	1	94	17	77	1.00	77.00	17.00	94.00	231,000
101-200	158	50	79	1	79	18	61	1.25	76.25	22.50	98.75	228,750
201-500	83	65	54	1	54	12	42	1.50	63.00	18.00	81.00	189,000
501-1000	31	75	23	1	23	10	13	2.50	32.50	25.00	57.50	97,500
1001-5000	21	100	21	2	42	6	36	2.50	90.00	15.00	105.00	270,000
5001-10000	2	100	2	2	4	2	2	2.50	5.00	5.00	10.00	15,000
10,001 +	2	100	2	3	6	2	4	2.50	10.00	5.00	15.00	30,000
	2,006		368		395	84	311		400.75	117.75	518.50	\$1,202,250*
* at \$3,000 per acre												
REGION II	No. of Lakes	% To Have Sites	No. To Have Sites	No. Of Sites Lake	Planned No. of Sites	Pre-sent Sites	No. Of New Sites	Acres P/New Site	Total New Acres	Total Pres. Acres	Total Acres	Total Cost
11-25	746	5	37	1	37	14	23	.50	11.50	7.00	18.50	\$ 51,750
26-50	386	10	39	1	39	21	18	.75	13.50	15.75	29.25	60,750
51-100	210	50	105	1	105	26	79	1.00	79.00	26.00	105.00	355,500
101-200	144	65	94	1	94	38	56	1.25	70.00	47.50	117.50	315,000
201-500	88	75	66	1	66	40	26	1.50	39.00	60.00	99.00	175,500
501-1000	35	90	32	1.5	48	16	32	2.50	80.00	40.00	120.00	360,000
1001-5000	37	100	37	2.0	74	16	58	2.50	145.00	40.00	185.00	652,500
5001-10000	7	100	7	4.0	28	6	22	2.50	55.00	15.00	70.00	247,500
10,001 +	6	100	6	4.0	24	6	18	2.50	45.00	15.00	60.00	202,500
	1,659		423		512	183	332		538.00	266.25	804.25	\$2,421,000*
* at \$4,500 per acre												
REGION III	No. of Lakes	% To Have Sites	No. To Have Sites	No. Of Sites Lake	Planned No. of Sites	Pre-sent Sites	No. Of New Sites	Acres P/New Site	Total New Acres	Total Pres. Acres	Total Acres	Total Cost
11-25	935	5	47	1	47	10	37	.50	18.50	5.00	23.50	\$ 111,000
26-50	447	15	67	1	67	25	42	.75	31.50	18.75	50.25	189,000
51-100	289	50	145	1	145	35	110	1.00	110.00	35.00	145.00	660,000
101-200	176	65	114	1	114	47	67	1.25	83.75	58.75	142.50	502,500
201-500	107	80	86	1	86	49	37	1.50	55.50	73.50	129.00	333,000
501-1000	24	90	22	1.5	33	22	11	2.50	27.50	55.00	82.50	165,000
1001-5000	9	100	9	2.0	18	6	12	2.50	30.00	15.00	45.00	180,000
	1,987		490		510	194	316		356.75	261.00	617.75	\$2,140,500*
* at \$6,000 per acre												
TOTALS	5,652		1,281		1,420	461	959		1,295.50	645.00	1,940.50	\$5,763,750*
* Average Cost Per Site \$18,239.71. Average Cost Per Acre \$4,449.												

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Table 2 LAUNCHING RAMP IMPROVEMENTS BY REGION

I T E M	R E G I O N S		
	I	II	III
1. Clearing and Grubbing	All	All	All
2. Grading	All	All	All
3. Concrete Ramp	All	All	All
4. Catwalk	5%	15%	60%
5. Gravel Drives & Parking	All	All	All
6. Paved Drives & Parking	5%	15%	60%
7. Landscaping	All	All	All
8. Fence	5%	15%	60%
9. Toilets	5%	15%	60%

(Assumes 1 1/2 acre lot, 45' ramp)

The above assumes that, on an average, the percentages cited for the particular item will occur in the respective Region. This is done for cost purposes primarily and does not necessarily mean that only the percentages cited for a particular Region will be used in considering the necessity for the item at an individual site.

REGION I SITE AND ACCESS ROAD COSTS

New Site and Road, Average Cost: \$19,781 x 311 Sites = \$6,179,881  
 Existing Sites, Average Cost: 5,710\* x 84 Sites = 479,640  
 \$ 6,659,521

REGION II SITE AND ACCESS ROAD COSTS

New Site and Road, Average Cost: \$21,653 x 332 Sites = \$7,188,796  
 Existing Sites, Average Cost: 6,252\* x 183 Sites = 1,144,116  
 \$ 8,332,912

REGION III SITE AND ACCESS ROAD COSTS

New Site and Road, Average Cost: \$30,076 x 316 Sites = \$9,504,016  
 Existing Sites, Average Cost: 8,690\* x 194 Sites = 1,685,860  
 \$11,189,876

Total Program Costs, 13 Year Period \$26,182,309

10 Year Program Cost (\$26,182,309 ÷ 13 x 10) = \$20,140,240

\*Cost of improvements to existing sites estimated as follows:

For site development, 50% of the cost of a new site;  
 For access road, 10% of the cost of a new road.

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Table 3

PROGRAM COST SUMMARY

PROGRAM	TOTAL	MSWC	FEDERAL	LOCAL
Great Lakes Refuge Harbors	\$ 14,637,692 <sup>1</sup>	\$ 6,406,994	\$ 8,230,698 <sup>1</sup>	\$ 0
Transient Berths	9,276,923	8,353,846	0 <sup>1</sup>	923,077
Land Acquisition Costs	<u>1,200,000</u>	<u>0</u>	<u>0</u>	<u>1,200,000</u>
TOTAL	\$ 25,114,615	\$14,760,840	\$ 8,230,698 <sup>1</sup>	\$ 2,123,077
Seasonal Marinas, Dev.	\$ 27,109,231	\$13,554,616	\$ 6,777,307 <sup>2</sup>	\$ 6,777,308
Land Acquisition Costs	<u>3,520,000</u>	<u>0</u>	<u>0</u>	<u>3,520,000</u>
TOTAL	\$ 30,629,231	\$13,554,616	\$ 6,777,307 <sup>2</sup>	\$10,297,308
Inland Ramps Land Acq.	\$ 5,763,750	\$ 5,763,750	\$ 0	\$ 0
Inland Ramps Development	<u>20,140,240</u>	<u>20,140,240</u>	<u>0</u>	<u>0</u>
TOTAL	\$ 25,903,990	\$25,903,990	\$ 0	\$ 0
Great Lakes Ramps, Dev.	\$ 11,703,980	\$ 5,851,990	\$ 0	\$ 5,851,990
Great Lakes Ramps, Land	<u>9,892,310</u>	<u>0</u>	<u>0</u>	<u>8,892,310</u>
TOTAL	\$ 21,596,290	\$ 5,851,990	\$ 0	\$15,744,300
River Site Land Acq.	\$ 500,000	\$ 500,000	\$ 0	\$ 0
River Site Development	<u>4,993,800</u>	<u>4,993,800</u>	<u>0</u>	<u>0</u>
TOTAL	\$ 5,493,800	\$ 5,493,800	\$ 0	\$ 0
Boat Island Parks	\$ 4,000,000	\$ 4,000,000	\$ 0	\$ 0
Operation & Maintenance	12,630,000	12,630,000	0	0
Dam Operation & Maint.	<u>2,000,000</u>	<u>2,000,000</u>	<u>0</u>	<u>0</u>
TOTAL	\$ 18,630,000	\$18,630,000	\$ 0	\$ 0
PROGRAM TOTALS	\$127,367,926	\$84,195,236	\$15,008,005	\$28,164,685

1 = Regular River &amp; Harbor Appropriations

2 = Economic Development Administration Grants

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APPENDIX B:

MICHIGAN LAKE INVENTORY --  
TEST DATA

MICHIGAN LAKE INVENTORY

1965 SURVEY

LAKES BY SIZE AND BY TYPE

AREA COVERED : ALGER

PAGE 1

TYPE -- MARSH: & BOG -- BROWN WATER

SIZE CLASS		NUMBERS OF LAKES							AREA OF LAKES					LENGTH OF SHORE						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
NO.	ACRES	NO OF LAKES	% OF COL OF ALL LAKES		CUM TOT	CUM TOT %	INTER LAKES INCLD	TOTAL ACRES ASGND & NOT ASD	ACRES ASGND THIS AREA	% OF COL	% OF ALL LAKES	CUM TOTAL	CUM TOT %	MILES	% OF COL TOT	% OF ALL LAKES	CUM TOTAL	CUM TOT %		
1	5 -	9	1	0	0	2	40	0	6	6	0	0	31	29	0.0	0	0	0.0	0	1
2	10 -	15	0	0	0	1	20	0	0	0	0	0	25	24	0.0	0	0	0.0	0	2
3	16 -	24	0	0	0	1	20	0	0	0	0	0	25	24	0.0	0	0	0.0	0	3
4	25 -	39	1	0	0	1	20	0	25	25	0	0	25	24	0.0	0	0	0.0	0	4
5	40 -	59	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	5
6	60 -	99	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	6
7	100 -	159	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	7
8	160 -	249	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	8
9	250 -	399	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	9
10	400 -	599	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	10
11	600 -	999	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	11
12	1000 -	1599	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	12
13	1600 -	2499	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	13
14	2500 -	3999	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	14
15	4000 -	5999	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	15
16	6000 -	9999	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	16
17	10000 -	15999	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	17
18	16000 -	+	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	18
TOTAL			0	**	0	5	**	0	0	0	**	0	106	**	0.0	**	0	0.0	**	

MICHIGAN LAKE INVENTORY

1965 SURVEY

LAKES BY SIZE AND BY TYPE

AREA COVERED : ALGER

PAGE 2

TYPE -- MARSH LAKE -- GRASSY, CLEAR WATER

SIZE CLASS		NUMBERS OF LAKES								AREA OF LAKES						LENGTH OF SHORE				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
NO.	ACRES	NO OF LAKES	% OF COL LAKES	% OF ALL LAKES	CUM TOT	CUM TOT %	INTER AREA LAKES INCLD	TOTAL ACRES ASGND & NOT ASD	ACRES ASGND THIS AREA	% OF COL LAKES	% OF ALL LAKES	CUM TOTAL	CUM TOT %	MILES	% OF COL LAKES	% OF ALL LAKES	CUM TOTAL	CUM TOT %		
1	5 -	9	0	0	0	5	9	0	0	0	0	1349	6	0.0	0	0	17.0	17	1	
2	10 -	15	0	0	0	5	9	0	0	0	0	1349	6	0.0	0	0	17.0	17	2	
3	16 -	24	1	0	0	5	9	0	23	23	0	1349	6	0.0	0	0	17.0	17	3	
4	25 -	39	1	0	0	4	7	0	34	34	0	1326	6	1.0	0	0	17.0	17	4	
5	40 -	59	0	0	0	3	6	0	0	0	0	1292	6	0.0	0	0	16.0	16	5	
6	60 -	99	0	0	0	3	6	0	0	0	0	1292	6	0.0	0	0	16.0	16	6	
7	100 -	159	1	0	0	3	6	0	123	123	0	1292	6	3.0	0	0	16.0	16	7	
8	160 -	249	0	0	0	2	4	0	0	0	0	1169	5	0.0	0	0	13.0	13	8	
9	250 -	399	1	0	0	2	4	0	269	269	0	1169	5	2.0	0	0	13.0	13	9	
10	400 -	599	0	0	0	1	2	0	0	0	0	900	4	0.0	0	0	11.0	11	10	
11	600 -	999	1	0	0	1	2	0	900	900	0	900	4	11.0	0	0	11.0	11	11	
12	1000 -	1599	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	12	
13	1600 -	2499	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	13	
14	2500 -	3999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	14	
15	4000 -	5999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	15	
16	6000 -	9999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	16	
17	10000 -	15999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	17	
18	16000 -	+	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	18	
TOTAL			0	**	0	54	**	0	0	0	**	0	22267	**	0.0	**	0	6824.0	**	

MICHIGAN LAKE INVENTORY

1965 SURVEY

LAKES BY SIZE AND BY TYPE

AREA COVERED : ALGER

PAGE 3

TYPE -- WARM WATER --STRATIFIED, SHALLOW

SIZE CLASS		NUMBERS OF LAKES								AREA OF LAKES						LENGTH OF SHORE				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
NO.	ACRES	NO OF LAKES	% OF COL TOT	% OF ALL LAKES	CUM TOT	CUM TOT %	INTER LAKES INCLD	TOTAL ACRES NOT ASD	ACRES ASGND THIS AREA	% OF COL TOT	% OF ALL LAKES	CUM TOTAL	CUM TOT %	MILES	% OF COL TOT	% OF ALL LAKES	CUM TOTAL	CUM TOT %		
1	5 -	9	1	0	0	16	14	0	7	7	0	0	11544	7	0.0	0	0	66.0	66	1
2	10 -	15	0	0	0	15	13	0	0	0	0	0	11537	7	0.0	0	0	66.0	66	2
3	16 -	24	1	0	0	15	13	0	24	24	0	0	11537	7	0.0	0	0	66.0	66	3
4	25 -	39	4	0	0	14	12	0	115	115	0	0	11513	7	1.0	0	0	66.0	66	4
5	40 -	59	1	1	0	10	9	1	41	41	0	0	11398	7	2.0	0	0	65.0	65	5
6	60 -	99	0	0	0	9	8	0	0	0	0	0	11357	7	0.0	0	0	63.0	63	6
7	100 -	159	1	0	0	9	8	0	100	100	0	0	11357	7	2.0	0	0	63.0	63	7
8	160 -	249	2	0	0	8	7	0	353	353	0	0	11257	7	5.0	0	0	61.0	61	8
9	250 -	399	2	1	0	6	5	1	652	652	0	0	10904	7	5.0	0	0	56.0	56	9
10	400 -	599	0	0	0	4	3	0	0	0	0	0	10252	6	0.0	0	0	51.0	51	10
11	600 -	999	1	0	0	4	3	0	665	665	0	0	10252	6	5.0	0	0	51.0	51	11
12	1000 -	1599	2	1	0	3	3	1	2817	2817	0	0	9587	6	26.0	0	0	46.0	46	12
13	1600 -	2499	0	0	0	1	1	0	0	0	0	0	6770	4	0.0	0	0	20.0	20	13
14	2500 -	3999	0	0	0	1	1	0	0	0	0	0	6770	4	0.0	0	0	20.0	20	14
15	4000 -	5999	0	0	0	1	1	0	0	0	0	0	6770	4	0.0	0	0	20.0	20	15
16	6000 -	9999	1	1	0	1	1	1	6770	6770	0	0	6770	4	20.0	0	0	20.0	20	16
17	10000 -	15999	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	17
18	16000 -	+	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	18
TOTAL			0	**	0	117	**	0	0	0	**	0	159575	**	0.0	**	0	800.0	**	

MICHIGAN LAKE INVENTORY

1965 SURVEY

LAKES BY SIZE AND BY TYPE

AREA COVERED : ALGER

PAGE 4

TYPE -- WARM & COLD WATER -- 2 STORY -- WW & TROUT SPECIES

SIZE CLASS		NUMBERS OF LAKES								AREA OF LAKES					LENGTH OF SHORE				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NO.	ACRES	NO OF LAKES	% OF COL	% OF ALL	CUM TOT	CUM TOT %	INTER AREA LAKES INCLD	TOTAL ACRES ASGND & NOT ASD	ACRES ASGND THIS AREA	% OF COL TOT	% OF ALL LAKES	CUM TOTAL	CUM TOT %	MILES	% OF COL TOT	% OF ALL LAKES	CUM TOTAL	CUM TOT %	
1	5 -	9	0	0	0	1	17	0	0	0	0	98	17	0.0	0	0	2.0	2	1
2	10 -	15	0	0	0	1	17	0	0	0	0	98	17	0.0	0	0	2.0	2	2
3	16 -	24	0	0	0	1	17	0	0	0	0	98	17	0.0	0	0	2.0	2	3
4	25 -	39	0	0	0	1	17	0	0	0	0	98	17	0.0	0	0	2.0	2	4
5	40 -	59	0	0	0	1	17	0	0	0	0	98	17	0.0	0	0	2.0	2	5
6	60 -	99	1	0	0	1	17	0	98	98	0	98	17	2.0	0	0	2.0	2	6
7	100 -	159	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	7
8	160 -	249	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	8
9	250 -	399	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	9
10	400 -	599	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	10
11	600 -	999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	11
12	1000 -	1599	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	12
13	1600 -	2499	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	13
14	2500 -	3999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	14
15	4000 -	5999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	15
16	6000 -	9999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	16
17	10000 -	15999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	17
18	16000 -	+	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	18
TOTAL			0	**	0	6	**	0	0	0	**	0	588	**	0	**	12.0	**	

MICHIGAN LAKE INVENTORY

1965 SURVEY

LAKES BY SIZE AND BY TYPE

AREA COVERED : ALGER

PAGE 5

TYPE -- COLD WATER -- TROUT ONLY 000002

SIZE CLASS		NUMBERS OF LAKES							AREA OF LAKES							LENGTH OF SHORE				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
NO.	ACRES	NO OF LAKES	OF COL TOT	OF ALL LAKES	CUM TOT	CUM TOT %	INTER AREA LAKES INCLD*	TOTAL ACRES ASGND & NOT ASD*	ACRES ASGND THIS AREA	% OF COL TOT	% OF ALL LAKES	CUM TOTAL	CUM TOT %	MILES	% OF COL TOT	% OF ALL LAKES	CUM TOTAL	CUM TOT %		
1	5 -	9	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	1	
2	10 -	15	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	2	
3	16 -	24	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	3	
4	25 -	39	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	4	
5	40 -	59	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	5	
6	60 -	99	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	6	
7	100 -	159	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	7	
8	160 -	249	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	8	
9	250 -	399	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	9	
10	400 -	599	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	10	
11	600 -	999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	11	
12	1000 -	1599	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	12	
13	1600 -	2499	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	13	
14	2500 -	3999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	14	
15	4000 -	5999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	15	
16	6000 -	9999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	16	
17	10000 -	15999	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	17	
18	16000 -	+	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	18	
TOTAL			0	**	0	0	**	0	0	**	0	0	**	0.0	**	0	0.0	**		

MICHIGAN LAKE INVENTORY

1965 SURVEY

LAKES BY SIZE AND BY TYPE

AREA COVERED : ALGER

PAGE 6

TYPE -- TOTAL FOR ALL LAKE TYPES OF AREA

SIZE CLASS		NUMBERS OF LAKES							AREA OF LAKES					LENGTH OF SHORE						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
NO.	ACRES	NO OF LAKES	% OF COL	% OF ALL LAKES	CUM TOT	CUM TOT %	INTER AREA LAKES INCLD	TOTAL ACRES ASGND & NOT ASD	ACRES ASGND THIS AREA	% OF COL	% OF ALL LAKES	CUM TOTAL	CUM TOT %	MILES	% OF COL	% OF ALL LAKES	CUM TOTAL	CUM TOT %		
1	5 -	9	2	0	0	26	13	0	15	15	0	0	13042	7	10.0	0	0	185.0	**	1
2	10 -	15	0	0	0	24	12	0	2	2	0	0	13027	7	10.0	0	0	175.0	**	2
3	16 -	24	2	0	0	24	12	0	49	49	0	0	13025	7	10.0	0	0	165.0	**	3
4	25 -	39	6	0	0	22	11	0	176	176	0	0	12976	7	12.0	0	0	155.0	**	4
5	40 -	59	1	1	0	16	8	1	43	43	0	0	12800	7	12.0	0	0	143.0	**	5
6	60 -	99	1	0	0	15	7	0	100	100	0	0	12757	7	12.0	0	0	131.0	**	6
7	100 -	159	2	0	0	14	7	0	225	225	0	0	12657	7	15.0	0	0	119.0	**	7
8	160 -	249	2	0	0	12	6	0	355	355	0	0	12432	7	15.0	0	0	104.0	**	8
9	250 -	399	3	1	0	10	5	1	923	923	0	0	12077	7	17.0	0	0	89.0	89	9
10	400 -	599	2	2	0	7	3	2	2	2	0	0	11154	6	10.0	0	0	72.0	72	10
11	600 -	999	2	0	0	5	2	0	1565	1565	0	0	11152	6	16.0	0	0	62.0	62	11
12	1000 -	1599	2	1	0	3	1	1	2817	2817	0	0	9587	5	26.0	0	0	46.0	46	12
13	1600 -	2499	0	0	0	1	**	0	0	0	0	0	6770	4	0.0	0	0	20.0	20	13
14	2500 -	3999	0	0	0	1	**	0	0	0	0	0	6770	4	0.0	0	0	20.0	20	14
15	4000 -	5999	0	0	0	1	**	0	0	0	0	0	6770	4	0.0	0	0	20.0	20	15
16	6000 -	9999	1	1	0	1	**	1	6770	6770	0	0	6770	4	20.0	0	0	20.0	20	16
17	10000 -	15999	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	17
18	16000 -	+	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0.0	0	18
TOTAL			0	**	0	202	**	0	0	0	**	0	182646	**	0.0	**	0	8186.0	**	