Dickinson Lake
Oakland County
Flint River Watershed

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Environment

Dickinson Lake is located in Seven Lakes State Park approximately 2 miles northwest of the Village of Holly in Oakland County (Figure 1). Dickinson Lake lies within the Swartz Creek sub-watershed of the Flint River watershed. Its principal outlet (unnamed) exits Dickinson Lake on the north shore flowing to Big Seven Lake which discharges into the West Branch Swartz Creek. Small seepage inlets enter Dickinson Lake from Spring and Mud lakes to the west and another small unnamed inlet enters from the south shore.

The Holly area lies within the Ionia district of the Southern Lower Michigan Regional Landscape Ecosystem and is characterized by features identified in the Lansing sub-district (Albert 1995). The Lansing sub-district is described as gently sloping ground moraine broken by outwash channels and numerous end-moraine ridges. Undulating topography formed alternating well drained rises and poorly drained depressions of variable soils with numerous kettle lakes. Soils on raised moraines generally consist of medium texture sand and loam while depressions along end moraine ridges are typically fine texture and high in organic content. Outwash channels developed by glacial retreat generally form the river and stream drainage pattern of the watershed. The Swartz Creek drainage associated with Dickinson Lake and northwest Oakland County is typified with a cluster of kettle lakes interconnected by slow meandering tributaries and low lying swamp lands.

Dickinson Lake lies in a depression of land within Seven Lakes State Park. Vegetation on the uplands is characterized as oak-hickory forest. The immediate shoreline of Dickinson Lake is characterized as marsh with a succession of bulrush and tamarack growth toward the upland. This marsh fringe has been documented to provide important habitat for the eastern massasauga rattlesnake and northern water snake in addition to other reptiles, amphibians, and aquatic shore birds. The entire shoreline is undeveloped with the exception of the Michigan Department of Natural Resources (MDNR) boat access site. The access site is paved and is a barrier-free design. A floating fishing pier is also located adjacent to the launch site.

The shape of Dickinson Lake is semi-circular with the exception of two narrow coves extending to the south (Figure 2). It is a 44 acre marl/clay type lake with calcium deposits on the aquatic vegetation and wood structure. Contour changes are abrupt and show signs of dredging. Historically, marl was a component of Portland cement and anecdotal reports have suggested Dickinson Lake was once a source of this material. The lake reaches maximum depths of 63-68 feet at 3 locations (Figure 2). An estimated 25% of the lake acreage is 10 feet or less in depth.

Inland lakes can be classified in different ways but common classification considers trophic state and thermal conditions. In terms of trophic state, Dickinson Lake does not fit the typical oligotrophic-mesotrophic-eutrophic classification system. It is a marl type lake which functions uniquely within the trophic classification system. Marl lakes are typically a product of lime rich soils which have high

calcium content. Marl lakes generally have high alkalinity and high pH. As groundwater percolates through the soils, it reacts with bacteria, resulting in higher carbonic acidity which in turn dissolves lime. When this groundwater enters the lake it typically results in the precipitation of calcium carbonate also known as marl. Calcium carbonate is known to bind phosphorus (an algae promoting nutrient) resulting in less algae and lower lake productivity. Historical records indicate Dickinson Lake's alkalinity is in the range of 188-210 mg/l and has an epilimnion pH range of 8.0 to 8.3.

Dickinson Lake thermal characteristics were measured August 8, 2010 (Table 1). A temperature profile in the deep basin found thermocline development between the 15-30 ft. water depths. Epilimnion thermal characteristics were consistent with warmwater classification with temperatures between 75-79F. Fish supporting oxygen levels (>3mg/l) were found to the 40 ft. water depth.

The bottom substrate of Dickinson Lake is dominated with clay and marl but some areas of sand are present. The calcium carbonate precipitate coats all aquatic vegetation and structure submerged within the lake. Aquatic vegetation is generally sparse throughout the lake. Cursory observations made in August, 2010 indicated a low presence of clasping pondweed, american pondweed, chara, water shield, and water lily. Emergent bulrush is common along the marsh fringe of the lake. Wood structure and other forms of fish cover are sparse throughout the lake. For the most part, the limited aquatic vegetation and the cliffs of the submerged clay substrate are the prevalent form of fish cover. Of anecdotal value, a 14 ft. wood boat can be found in 5 ft. of water on the west shore. This boat belonged to a previous riparian landowner and is said to have capsized during a storm in the late 1950's while docked along the shore.

History

Dickinson Lake, and the lands associated with Seven Lakes State Park, came into State ownership in 1969. At that time, records indicate 9 cottages on Dickinson Lake. In subsequent years, the cottages were removed and MDNR, Parks and Recreation Division developed a boat access site.

Early fish community records indicate Dickinson Lake supported a variety of warmwater species including bluegill, largemouth bass, carp, black crappie, northern pike, and yellow perch. In 1973, a partial eradication of competing species was conducted using the fish toxicant antimycin to allow trout only fish management. From 1973 to 1985, Dickinson Lake was managed as a special trout lake and was stocked annually with rainbow trout. In a 1983 fisheries assessment, trout survival was deemed poor and the fish community had reverted back to pre-antimycin status with small slow growing bluegill being the most prominent species. Trout stocking was discontinued after 1985 due to poor survival. A 1992 fisheries assessment found a similar warmwater fish community but bluegill size structure had improved with a strong presence of 7 inch fish. From 1995-1997, 5-6,000 two inch redear sunfish were stocked into Dickinson Lake in an effort to provide a more diverse fishery. A 1998 fisheries assessment found marginal redear sunfish survival and stocking was discontinued. Other fish found in the 1998 assessment appeared in similar composition and abundance as found in previous years. The one notable trend was what appeared to be a declining bluegill size structure. All of the fisheries assessments of Dickinson Lake indicate an unproductive marl environment. Populations of several fish species exist (Table 2) but in relatively low numbers with bluegill and largemouth bass being the most prevalent sportfish.

Current Status

In May, 2010, Fisheries Division conducted a fisheries survey on Dickinson Lake using trap nets, small mesh fyke nets, gill nets, and daytime eletrofishing. Multiple gear types were used to reduce bias and to better represent species and size composition of the fish community. Trap nets were used to capture larger (>3 inches) fish species that inhabit the littoral zone or that move inshore at night. Small mesh fyke nets were used to sample small fish (<3 inches) in the near shore zone. Gill nets sampled fishes in the offshore waters. Electrofishing was used to sample the littoral zone.

During the 2010 survey, a total of 1,107 fish representing 14 species were collected (Table 3). Trap nets accounted for 70% of the total catch while electrofishing and small mesh fyke nets, accounted for 21% and 9%, respectively. Only two fish (<1% of catch) were captured with gill nets. Bluegill were the most abundant species collected comprising 78% of the total catch. Redear sunfish and largemouth bass were also collected in appreciable numbers comprising 8% and 4% of the catch, respectively.

A total of 863 bluegill averaging 5.5 inches were collected in the 2010 assessment (Table 3). Trap nets accounted for 76% of the bluegill catch while eletrofishing and small mesh fyke nets accounted for 18% and 6%, respectively. Average size of bluegill collected with trap nets was 6.0 inches compared to 3.7 inches with electrofishing gear and 5.0 inches with small mesh fyke nets. Thirty-four percent of the total bluegill catch met or exceeded the acceptable harvest size of 6 inches. Age and growth analysis indicated bluegill were growing below State average having a mean growth index of -1.1 (Table 4). Age distribution found multiple year classes with strongest representation of age 5 fish. Bluegill longevity peaked at age 5.

A total of 93 redear sunfish averaging 6.0 inches were collected in the 2010 assessment (Table 3). Trap nets accounted for 53% of the total redear sunfish catch while small mesh fyke nets and electrofishing accounted for 32% and 15%, respectively. Average size of redear sunfish collected with trap nets was 6.5 inches compared to 5.8 inches with small mesh fyke nets and 4.7 inches with electrofishing gear. Forty-six percent of the total redear sunfish catch met or exceeded the acceptable harvest size of 6 inches. Age and growth analysis indicated redear sunfish were growing below State average having a mean growth index of -2.4 inches (Table 4). Age distribution found multiple year classes with strongest representation of fish aged 2-4 years. Redear sunfish longevity peaked at age 6.

There were 41 largemouth bass averaging 8.8 inches collected in the 2010 assessment (Table 3). Electrofishing accounted for 76% of the total catch while trap and small mesh fyke nets accounted for 22% of the total catch. Average size of the largemouth collected electrofishing was 8.9 inches compared to 7.8 inches collected with trap and fyke nets. Seven percent of the total largemouth bass catch met or exceeded the minimum harvest size of 14 inches. Age and growth analysis indicated largemouth bass were growing below State average having a mean growth index of -1.6 (Table 4). Age distribution found multiple year classes with strongest representation of fish aged 2-4 years. Largemouth bass longevity appears to last beyond 7 years of age.

Other fish species were caught in relatively low abundance and do not allow for detailed analysis (Table 3). Twenty-three pumpkinseed averaging 5.2 inches where collected. Age and growth analysis of the 5 inch pumpkinseed indicated growth below the State average (Table 4). Pumpkinseed longevity appears to peak at age 5. Twelve black crappie averaging 10.1 inches were collected. Three

walleye averaging 20.8 inches were collected. A moderate level of sunfish hybridization was observed. Non-sportfish collected in low numbers included bowfin, brown and yellow bullhead, central mudminnow, carp, grass pickerel, green sunfish, and white sucker.

Analysis and Discussion

Bluegill have consistently been the most abundant fish species in Dickinson Lake (Table 5). In southern Michigan warmwater lakes, bluegill are typically the most abundant fish species present and play a key role in community structure and overall sport fishing quality (Schneider 1981). Schneider (1990) suggests indices of bluegill characteristics which can be used to classify the status of populations. The "Schneider Index" uses size scores of length frequency and relates them to a subjective ranking system ranging from "very poor" to "superior". Using the Schneider Index for classifying bluegill populations, Dickinson Lake scored 3.75 for an "acceptable-satisfactory" ranking (Table 6). The Schneider Index indicates bluegill size structure has remained similar to that found in 1998. Although not overly abundant, and most likely difficult to catch due to the lack of cover in Dickinson Lake, bluegill appear to provide satisfactory angling opportunities. The low proportion of bluegill greater than 8 inches is likely the result of slow growth or natural and angling mortality. Few bluegill appear to live long enough to achieve larger size.

Past assessments have questioned the stocking survival of redear sunfish in Dickinson Lake based upon low catch rates (Table 5). Redear sunfish were represented in low occurrence in the 2010 assessment indicating a low level of survival and the redear captured appeared to be the result of natural reproduction. The redear sunfish size structure was dominated by fish in the 5-7 inch size range and is considerably less than expected for the species suggesting habitat and food requirements are not ideal. Redear sunfish do not appear to be living beyond age 6 which also contributes to the less than ideal size structure and lack of harvestable size fish.

Largemouth bass represent the dominant predator fish species in Dickinson Lake and is a favored sportfish by many anglers. As found in previous assessments, the 2010 assessment found an acceptable largemouth bass fishery with fish ranging from 3-15 inches. Large fish are not overly abundant and the lack of structural cover makes angling difficult, but reasonable numbers of fish are present.

Relatively small populations of pumpkinseed and black crappie provide additional recreational opportunities in Dickinson Lake. Pumpkinseed size structure was relatively poor with little opportunity to harvest acceptable sized fish. Although only a few black crappie were collected in 2010, those found were of good size and provide some recreational value.

The capture of 3 adult walleye represents the first documentation of the species in Dickinson Lake. Walleye have not been stocked in Dickinson Lake by MDNR, Fisheries and their presence is a mystery. These walleye may have found their way into Dickinson Lake from the connecting waters of Big Seven Lake where stocking occurs.

Management Direction

The relatively low abundance of all species of fish in Dickinson Lake is directly related to the unproductive environment presented by its marl characteristics. The low productivity of Dickinson Lake greatly limits fisheries management. Management for trout species has proven ineffective. The stocking of redear sunfish has met with limited success. The low abundance of northern pike found in previous assessments and the capture of adult walleye in the 2010 assessment show potential for survival, and supplemental stocking may enhance these fisheries. The marsh fringe of Dickinson Lake appears well suited for northern pike spawning and a more abundant self-sustaining population might be achieved with stocking. However, at this time, northern pike are not being stocked in Michigan due to rearing concerns associated with viral hemorrhagic septicemia. Despite the unavailability of northern pike, supplemental stocking should be considered for future management.

Fisheries Division has a supply of walleye fingerlings available for Statewide stocking. Given the potential for survival, management recommendations are to experimentally stock walleye fingerlings into Dickinson Lake to provide a more diversified and highly sought after species. Natural reproduction of walleye is unlikely and the fishery would be contingent upon stocking. Recommendations are to stock 2,200 spring fingerling walleye (50/acre) on an alternate year schedule for a 6 year period. An evaluation of walleye stocking should be scheduled within the same time period.

References

Albert, D. A. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: a working map and classification, fourth edition. Michigan Natural Features Inventory, Lansing.

Schneider, J. C. 1981. Fish communities in warmwater lakes. Michigan Department of Natural Resources, Fisheries Research Report 1890, Ann Arbor.

Schneider, J.C., 1990. Classifying bluegill populations from lake survey data. Michigan Department of Natural Resources, Fisheries Technical Report No. 90-10. Ann Arbor, Michigan.

Figure 1. Location of Dickinson Lake within Seven Lakes State Park, Oakland County.

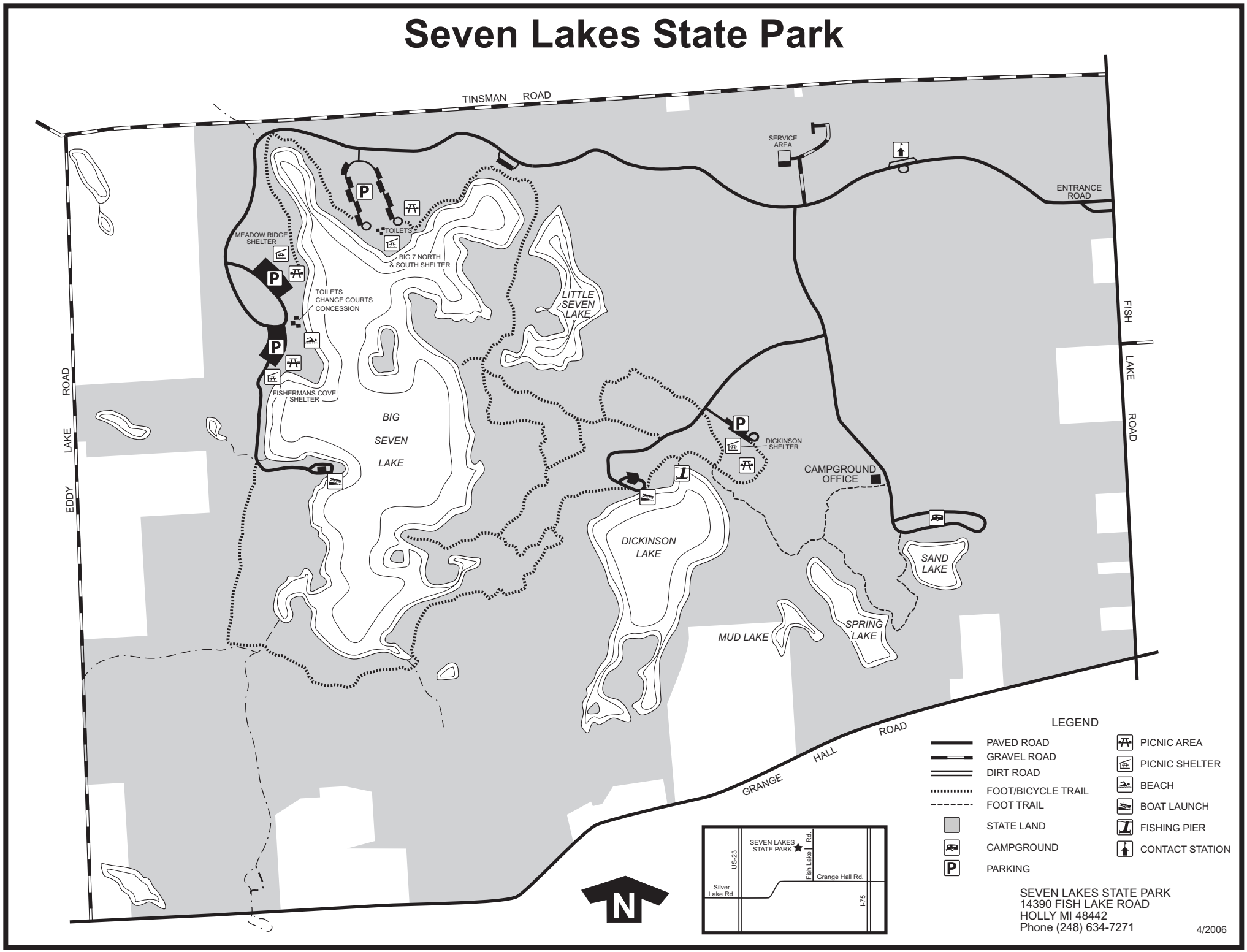
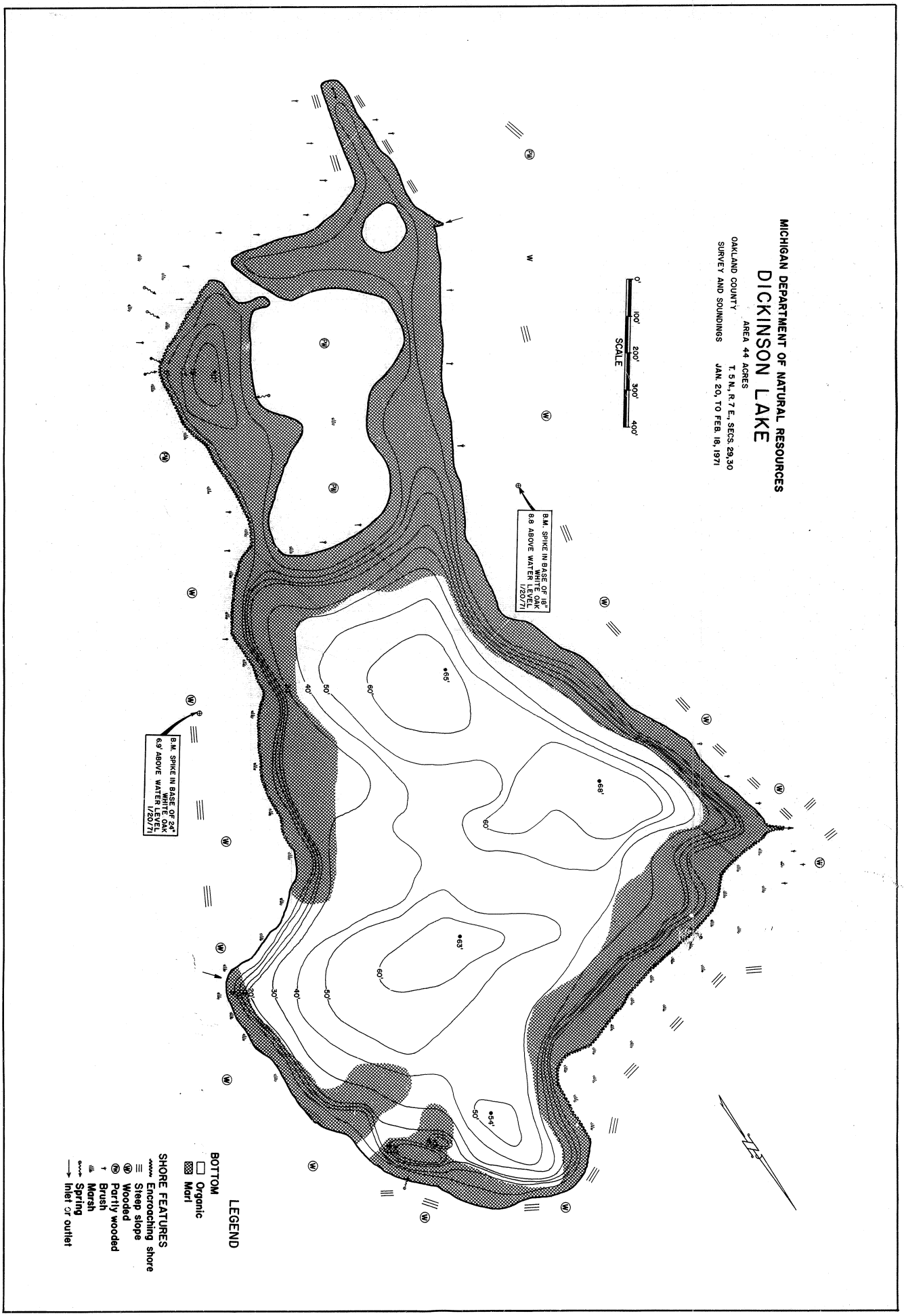


Figure 2. Hydrographic map of Dickinson Lake, Oakland County.



DICKINSON LAKE, OAKLAND CO., T. 5 N., R. 7 E., SECS, 29,30

Table 1. Temperature profile of Dickinson Lake, Oakland County. Data collected August 8, 2010.

Depth (ft.)	Temperature (F)
1	79
3	79
6	79
9	79
12	79
15	75
18	66
21	57
24	51
27	48
30	45
33	44
36	43
39	42
41	42
45	42
48	42
51	42
54	42
57	42
60	42
61	42

Table 2. Common fish species in Dickinson Lake, Oakland County.

Species	**Scientific name**
Black crappie	*Pomoxis nigromaculatus*
Blackstripe topminnow	*Fundulus notatus*
Bluegill	*Lepomis macrochirus*
Bluntnose minnow	*Pimephales notatus*
Bowfin	*Amia calva*
Bullhead, brown	*Ameiurus nebulosus*
Bullhead, yellow	*Ameiurus natalis*
Carp	*Cyprinus carpio*
Central mudminnow	*Umbra limi*
Common white sucker	*Catostomus commersonii*
Grass pickerel	*Esox americanus*
Green sunfish	*Lepomis cyanellus*
Largemouth bass	*Micropterus salmoides*
Northern pike	*Esox lucius*
Pumpkinseed	*Lepomis gibbosus*
Redear sunfish	*Lepomis microlophus*
Walleye	*Sander vitreus*
Warmouth	*Lepomis gulosus*
Yellow perch	*Perca flavescens*

Table 3. Total catch (all gear) from Dickinson Lake, Oakland County, May, 2010.

Common name	Number	Percent by number	Length range (inches)	Weight (lbs.)	Percent by weight	Percent legal size	Average size (inches)
Black crappie	12	1	5-14	7.9	4	92	10.1
Bluegill	863	78	1-8	114.8	54	34	5.5
Bowfin	1	<1	22	3.8	2		22.5
Bullhead, brown	4	<1	12-13	3.8	2	100	12.8
Bullhead, yellow	10	<1	7-11	4.9	2	100	10.0
Central mudminnow	2	<1	2		<1		2.5
Common carp	4	<1	22-25	25.7	12		24.0
Grass pickerel	3	<1	2-8	0.2	<1		5.5
Green sunfish	9	<1	3-7	1.2	<1	33	5.4
Hybrid sunfish	38	3	2-6	3.7	2	5	5.0
Largemouth bass	41	4	3-15	19.4	9	7	8.8
Pumpkinseed	23	2	2-7	2.8	1	9	5.2
Redear sunfish	93	8	2-8	15.0	7	46	6.0
Walleye	3	<1	18-23	9.1	4	100	20.8
White sucker	1	<1	17	2.1	<1		17.5

Table 4. Age and growth data from 6 species collected in Dickinson Lake, Oakland County, May, 2010.

Species/Age	No. aged	Length range (in.)	State avg. length (in.)	Weighted mean length (in.)	Weighted age frequency (%)	Mean growth index*
Black crappie						+2.1
Age II	1	5.7-5.7	6.0	5.7	8	
Age III	4	7.7-9.1	7.5	8.5	25	
Age IV	6	10.2-11.5	8.6	10.7	58	
Age V	1	14.0-14.0	9.4	14.0	8	
Bluegill						-1.1
Age II	4	2.2-2.6	3.8	2.4	2	
Age III	16	2.7-3.9	5.0	2.2	12	
Age IV	7	4.5-5.3	5.9	5.0	15	
Age V	32	4.6-8.0	6.7	6.1	69	
Age VI	1	7.3-7.3	7.3	7.3	2	
Largemouth bass						-1.6
Age I	1	3.2-3.2	4.2	3.2	2	
Age II	9	5.0-7.4	7.1	5.7	22	
Age III	10	5.1-8.7	9.4	7.1	27	
Age IV	11	8.7-13.6	11.6	10.4	29	
Age V	4	10.7-12.0	13.2	11.5	10	
Age VI	2	14.6-15.1	14.7	14.9	5	
Age VII	1	12.1-12.1	16.3	12.1	2	
Age X	1	15.8-15.8	19.3	15.8	2	
Pumpkinseed						-0.9
Age III	1	3.9-3.9	4.9	3.9	5	
Age IV	3	4.4-4.9	5.6	4.6	14	
Age V	21	4.4-6.1	6.2	5.3	82	
Redear sunfish						-2.4
Age II	2	2.8-2.8	4.4	2.8	2	
Age III	5	3.7-4.7	6.2	4.0	5	
Age IV	6	4.2-7.6	7.6	5.8	8	
Age V	15	5.2-7.6	8.7	6.0	56	
Age VI	10	5.8-8.9	9.6	6.7	23	
Age VII	3	6.3-7.7	10.3	7.0	6	
Walleye						-
Age V	1	18.4-18.4	17.6	18.4	50	
Age VIII	1	20.4-20.4	21.6	20.4	50	

*****Mean growth index is the average deviation from the state average length at age.

Table 5. Comparison of catch (percent) for recent fish surveys of Dickinson Lake, Oakland County.

	Year			
Species	**1983**	**1992**	**1998**	**2010**
Black crappie	2	<1	<1	1
Black stripe topminnow			<1	
Bluegill	95	59	68	78
Bluntnose minnow			1	
Bowfin		2	2	<1
Bullhead sp.	<1			
Bullhead, brown		7	3	<1
Bullhead, yellow		<1	1	<1
Central mudminnow		<1	<1	<1
Common carp			1	<1
Grass pickerel		<1		<1
Green sunfish	<1	5	5	<1
Hybrid sunfish		3	<1	3
Lake chubsucker				
Largemouth bass	<1	5	3	4
Northern pike	<1	<1	<1	
Pumpkinseed	<1	12	5	2
Warmouth		<1		
Redear sunfish			<1	8
Rainbow trout	<1			
Walleye				<1
White sucker				<1
Yellow perch	<1	1	7	
Total catch (#)	661	726	403	1,107

Table 6. Dickinson Lake bluegill size structure ranking using trap net data and the Schneider Index (Schneider 1990). Index score is in parenthesis.

Sample date	9/20/83	9/21/92	5/22/98	5/17/10
Sample size	631	292	165	656
Average length (inches)	5.2 (2)	5.5 (3)	5.7 (3)	6.0 (4)
% $\geq$ 6 inches	16 (2)	65 (4)	30 (3)	44 (3)
% $\geq$ 7 inches	0.2 (1)	41 (5)	13 (4)	19 (4)
% $\geq$ 8 inches	0 (2)	3 (5)	3 (5)	0.2 (4)
Schneider Index	1.75	4.25	3.75	3.75
Rank[1]	V. Poor/Poor	Satisfactory	Acceptable/ Statisfactory	Acceptable/ Statisfactory

[1]Rank: 1 = Very poor, 2 = Poor, 3 = Acceptable, 4=Satisfactory, 5 = Good, 6 = Excellent, 7 = Superior