Van Auken Lake

Van Buren County, T2S; R16W; S33
Paw Paw River Watershed, Surveyed March 2004

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Environment

Van Auken Lake covers a surface area of 249 acres in the west-central part of Van Buren County. Maximum depth of the lake is 47 feet with 136 acres (54.6% of lake depth) greater than 20 feet (Figure 1). Maximum length is 1.0 mi with a maximum width of 0.5 mi. Bottom substrate consists of sand except for a small portion in the northwest corner that is soft organic material. The lake has been sparsely built up with rural development located along the north and west sides of the lake. There is a State of Michigan owned public access site in the northeast corner of the lake. Van Auken Lake is immediately surrounded by forest and forested wetland with an emergent wetland located along the southeasterly side. The lake drains to the Paw Paw River through an outlet located in the south-west corner. A single small spring creek inlet enters on the south side. Watercolor of the lake is a reddish-brown.

Van Auken Lake is located in the Mud Lake Drain sub-watershed of the Paw Paw River. This sub-watershed covers 15.7 square miles of land in Van Buren County. Capac-Riddle-Selfridge (91%) soil types dominate the land surface of the sub-watershed with small amounts of Coloma-Spinks-Oshtemo (4%) and Riddles-Spinks-Oshtemo (5%) soil types. These soil types provide opportunity for land management to be dominated by agriculture because of the suitability of these soils for field crops and good drainage. Approximately 6,204.8 acres (9.7 sq.mi) or 61.7 percent of the total land area of the sub-watershed are used for agricultural land. Forest Land (19%), water (5%), and wetlands (5%) have been greatly reduced in the area. Of the existing wetlands, forested wetland is the most abundant covering 1.34 square miles (47%) with some emergent (16%) and scrub-shrub (8%) habitat covering 256 and 128 acres, respectively, and limited to areas adjacent to lake and stream corridors.

History

Michigan Department of Conservation (MDOC) and the Institute for Fisheries Research provided an early summary of lake conditions during the 1940's. The report indicated that the lake provided excellent fishing for black crappie, mediocre catches of bluegill, a considerable number of northern pike, but relatively few largemouth bass. Creel census surveys conducted during various years from 1953 to 1964 indicate that anglers harvested primarily bluegill and black crappie with limited catches of largemouth bass, yellow perch, pumpkinseed, and northern pike.

Michigan Department of Natural Resources (MDNR) fish surveys were conducted from 1972 through 1992. All surveys indicated good warmwater fish populations with no apparent changes in fish community assemblage during this time. MDNR-Fisheries Division management and stocking efforts for Van Auken Lake have been principally on a single species, the northern pike. Started in 1982, a northern pike stocking effort involved planting pike at various life stages to augment the year class strength of the fishery (Table 1). A 1989 survey targeted at capturing northern pike showed good survival and growth, with fish between 16-35 inches taken in gill nets. There appeared to be some

natural reproduction as well as good survival of stocked fish and stocking was continued to ensure good fishing. Again in 1992 a survey was conducted that used four trap nets, two fyke nets, four gill nets, and electro-fishing to characterize the fish community and growth rates of sport fish. This survey indicated that black crappies had good growth, bluegills and yellow perch were slow growing, and pike and bass had good growth rates. This survey also indicated natural reproduction of pike with two of 17 pike collected from non-stocked years.

Current Status

An equal amount of sampling effort according to lake size was applied to this lake and nearby Rush Lake in 2004. Six trap nets were used for a total effort of 18 net lifts. Northern pike were the targeted species but other fish species were captured that included black crappie, bluegill, alewife, pumpkinseed, largemouth bass, gizzard shad, white sucker, warmouth, yellow bullhead, bowfin, brown bullhead, spotted gar, lake chubsucker, common carp, yellow perch, grass pickerel, and golden shiner. Only minimum and maximum lengths were recorded during each net lift for the non-targeted species. A total of 249 northern pike were captured in 18 net lifts for a catch per effort of 13.8 fish/net lift. Catch rates during the three-day sampling effort were higher (range = 12.5 to 15 fish/net/day) than catch rates observed in Rush Lake (range = 6.0 to 7.75 fish/net/day), suggesting that a higher density of northern pike might exist in Van Auken Lake. Trap net catch rates did not show a decreasing trend from the beginning of sampling until netting was completed (Figure 2). Therefore, the sampling effort was not long enough to adequately describe the population status of northern pike in Van Auken Lake.

Northern pike captured during the survey ranged from 19.0 to 34.8 inches. The age structure was considered good with ages 2 to 10 present in the sample. Age-1 and age-2 northern pike comprised the majority of fish captured (29.6 % and 34.6 % respectively, Table 2). Capture rates of age 5-7 fish averaged 8.9% with fish older than age 8 representing a combined 3.9% of the catch. The estimate of annual survival (catch curve regression) of pike ages 3 to 7 was 63% with an annual mortality of 37%. A sub-sample of fish were aged per inch group, therefore a weighted mean length at age was calculated. Length at age data indicated that northern pike reach a legal harvest size of 24 inches after age 3. There was a sufficient size structure of legal northern pike present with growth up to 34.8 inches in length.

Northern pike growth was calculated using the von Bertalanffy growth model with 99% confidence limits. There were insufficient samples for individual age classes of females, so samples were combined to describe the pike population. Mean ultimate lengths at age with 99% confidence limits has been suggested to be a good estimate of growth potential for northern pike and muskellunge (Casselman 2005, personal communication). Minimum ultimate size was determined from the lower 99% confidence limit at age 9, which was 26 inches for Van Auken Lakes population (Figure 3).

Northern pike have been stocked in Van Auken Lake since 1982 (Table 1). Year classes captured in the survey ranged from 1994 to 2002, with only a single northern pike from the 1994-year class representing fish that could have been from previous stocking efforts. Based on the age structure of northern pike collected during this survey, there is evidence for natural reproduction occurring in the lake.

Analysis and Discussion

Recent introductions of nonindigenous fishes to the natural environment of Van Auken Lake were present during the latest survey that were not apparently present during previous surveys. These fish include alewife and gizzard shad and although their impact to the environment of the lake is unknown at this time, they do provide forage for northern pike.

Density dependent growth has been shown to be an important factor in determining the size structure of northern pike populations (Margenau et al. 1998, and Pierce et al. 2003). Maintaining a stocking strategy for this lake could therefore increase the density of pike and could cause a reduction in growth and size structure. The suitability of a lake's habitat to support northern pike (as influenced by the morphometry of lake basins) has strong effects on their density, which in turn has important effects on growth rates, production, and size structure. Habitat variables such as extensive littoral area and turbidity have also been identified as variables that may limit pike growth and size structure. Protection of the lakes habitat and basin characteristics is important to maintain sustainability of northern pike populations.

Northern pike ecological role to structure fish communities has been studied extensively throughout their range. Diet studies of northern pike indicate opportunistic feeding strategies with some preference towards prey like yellow perch (Margenau et al. 1998) and soft-rayed fish like white suckers. Relative abundance of largemouth bass has been positively related to size structures of yellow perch and bluegills when northern pike are absent, but when populations of northern pike and largemouth bass co-exist these relationships are less evident and there is not a noticeable affect above what is exerted by bass. Northern pike stocking as a top-down predator technique to control the abundance of small bluegills is therefore also not needed in Van Auken Lake.

Management Direction

The remaining riparian wetlands adjacent to Van Auken Lake are critically important to the health of the lakes fish community. Unwise riparian development and wetland loss will result in deterioration of the water quality and fisheries habitat. Northern pike rely on riparian wetlands for spawning and rearing purposes. For these reasons, all remaining riparian wetlands adjacent to the lake should be protected from dredging and filling activities. Threats that would result in alterations to the fish community include inadequate vegetation control practices, clearing and development that exceeds 25% of the riparian shoreline, activities that result in hard armoring of the shoreline, and changes in land use that would degrade the water quality of the lake.

The northern pike population has been sustaining itself without supplemental stocking since 1994. To maintain a healthy well-balanced fish community in the lake and to avoid affecting the fitness and long-term adaptability of the wild population, I recommend discontinuing stocking northern pike. To protect the ultimate growth potential of the northern pike population from Van Auken Lake, minimum

size limits should be adjusted to reflect regulations from similar populations in the state. Currently the state is summarizing results from "Status and Trends" sampling and this information could better direct regulations for northern pike populations. Minimum size limits based on growth biology can help sustain the size of fish while producing quality fisheries. Van Auken Lake could be listed under classifications for a trophy potential fishery.

Management direction should continue to maintain and protect the warmwater fish community and implement a volunteer creel survey to monitor the exploitation rate of pike if needed.

References

Margenau, T. L., P.W. Rasmussen, and J. M. Kampa. 1998. Factors affecting growth of northern pike in small northern Wisconsin lakes. North American Journal of Fisheries Management 18: 625-639.

Pierce, R.B., C. M. Tomcko, and T. L. Margenau. 2003. Density dependence in growth and size structure of northern pike populations. North American Journal of Fisheries Management 23: 331-339.

INSTITUTE FOR FISHERIES RESEARCH

DIVISION OF FISHERIES — MICHIGAN CONSERVATION DEPT.

LAKE INVENTORY MAP

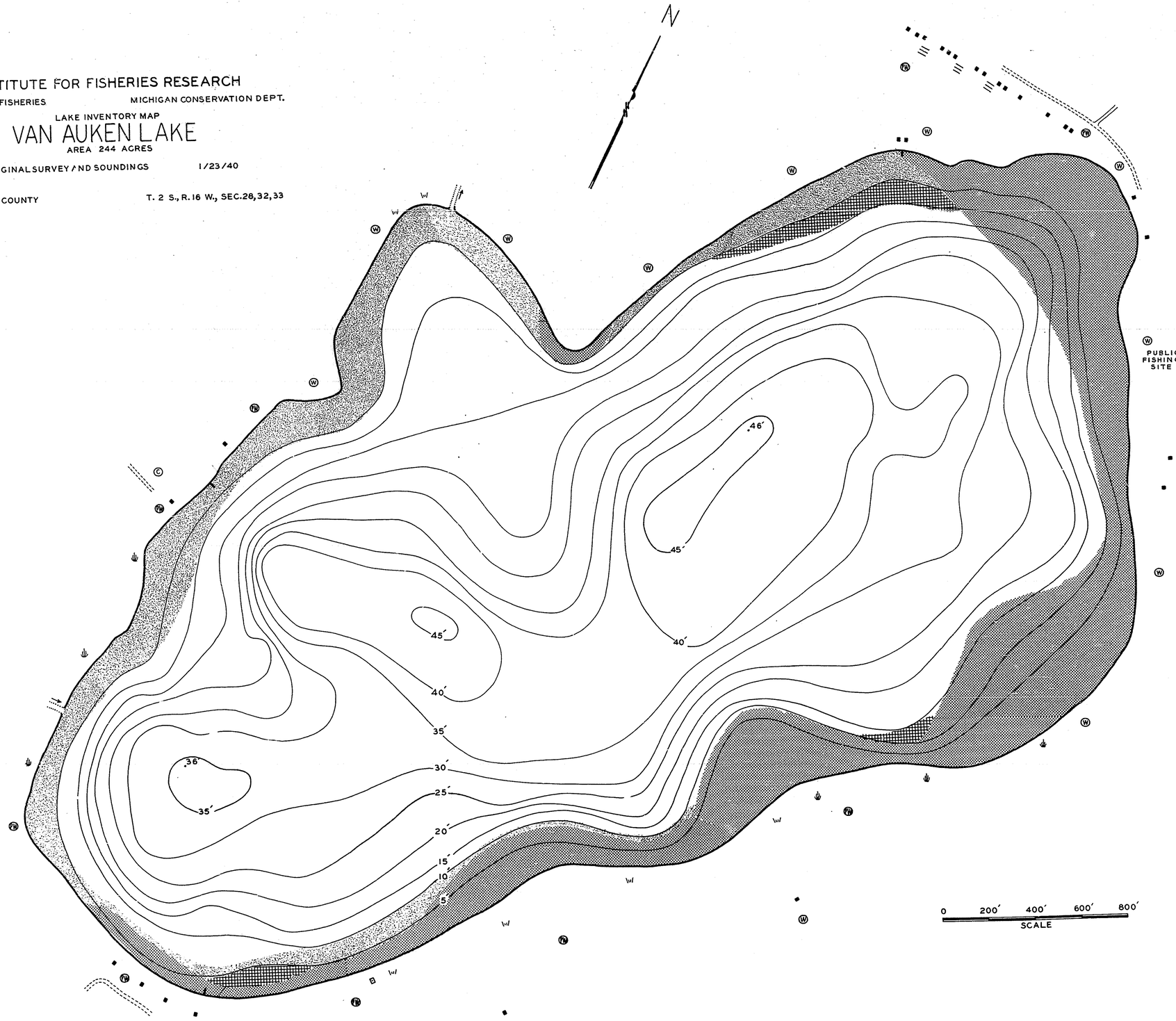
VAN AUKEN LAKE

AREA 244 ACRES

MARGINAL SURVEY AND SOUNDINGS 1/23/40

VAN BUREN COUNTY

T. 2 S., R. 16 W., SEC. 28, 32, 33



LEGEND

BOTTOM
- Sand
- Marl
- Pulpy peat
- Fibrous peat

OUTLINE & CONTOURS
- Shoreline
- 5' Contours

SHORE FEATURES
- Cottage
- Dock
- Unimproved road
- Slope
- Marsh
- Brush
- Boathouse
- W Wooded
- PW Partly wooded
- C Cultivated
- Intermittent stream

VAN AUKEN LAKE Van Buren County T. 2 S., R. 16 W., Sec. 28, 32, 33

Table 1. Northern pike stocking history in Van Auken Lake, Van Buren County.

Year	No. stocked	Avg. Length (cm)
1982	1000	13.5
1984	2500, 1000	9.9, 10.4
1985	4000	9
1988	175000	fry
1989	1000	10.9
1991	5000	5.5
1993	2500	9.9
1994	745	43.4
Total	192,745	

Table 2. Weighted mean length and age composition of northern pike captured in Van Auken Lake (2004).

Species / Age	No. aged	Lengthrange (in.)	State avg.length (in.)	Weightedmean len. (in.)	Weightedage freq.	Meangrowth index*
Northern pike						+1
Age II:	6	20.6-23.5	17.7	22.42	5.21%	1
Age III:	30	19-29.2	20.8	23.09	29.61%	1
Age IV:	37	21.2-32.8	23.4	25.86	34.61%	1
Age V:	9	23-29.8	25.5	25.52	9.34%	0
Age VI:	7	23.2-27.3	27.3	25.42	8.36%	1
Age VII:	13	26.2-30.1	29.3	27.51	8.98%	1
Age VIII:	5	27.4-31.5	31.2	28.95	2.53%	1
Age IX:	2	28.8-29.3		29.03	0.96%	0
Age X:	1	34.8-34.8		34.80	0.40%	0

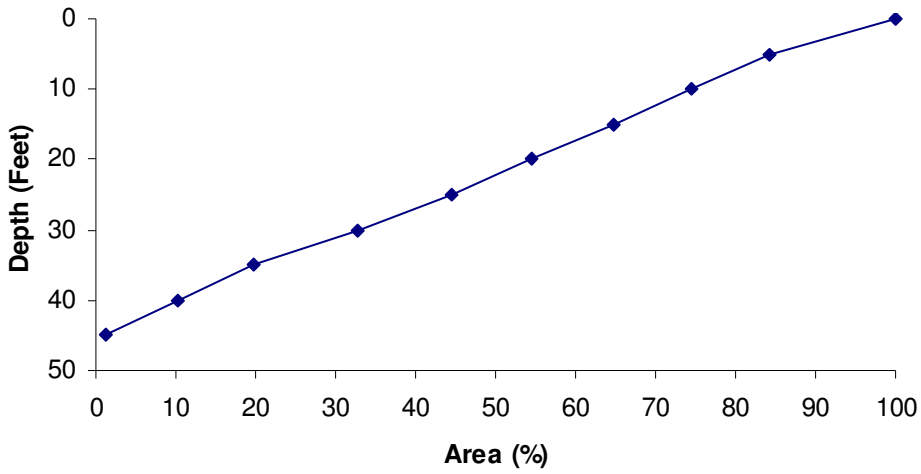


Figure 1. Percent area by depth of Van Auken Lake, Van Buren County. Data taken from MDNR Digital Water Atlas.

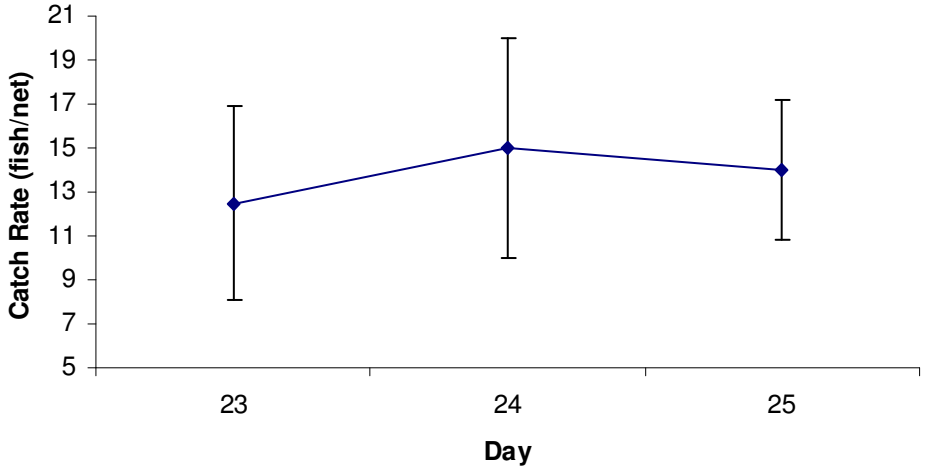


Figure 2. Average daily trap-net catch rates (± SE) for northern pike during 23-25 April, 2004 in Van Auken Lake.

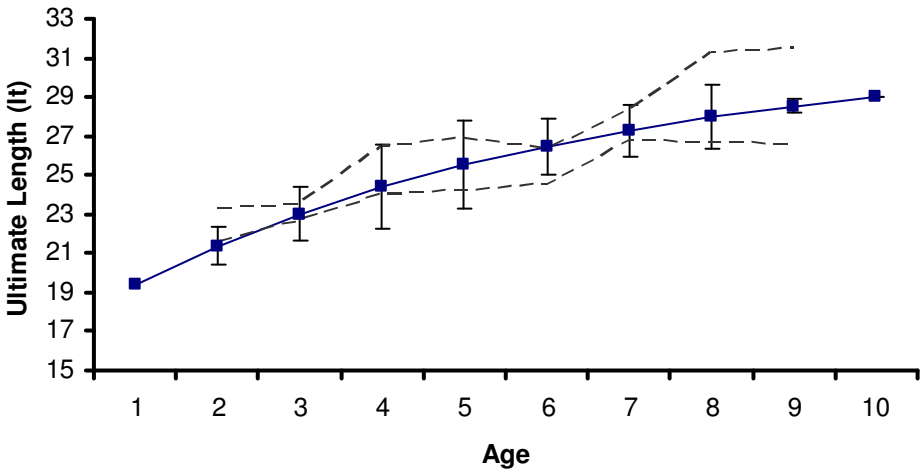


Figure 3. Ultimate length at age for northern pike from Van Auken Lake. Dashed lines are upper and lower 99% confidence limits used to estimate ultimate size for growth potential.