TAMBLING LAKE
VILAS COUNTY
LAKE PLANNING GRANT
REPORT

LARGE SCALE
PHASE 3
LPL-916-04- Revised

FEBRUARY 2005

BY
TAMBLING LAKE ASSOCIATION
AND
AQUATIC RESOURCES

WRITTEN BY
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Introduction

Tambling Lake, located in southeastern Vilas County, Wisconsin is a 174-acre lake with an outflow to Tamblin Creek. Its maximum depth is ~~14~~ feet with an average depth of ~~7~~ feet. The shallow water shoreline area is primarily sand with the entire deepwater bottom area covered with muck. Tambling Lake has relatively soft water with a very light brown water color. Tamblin Creek flows one-quarter mile to a wetland area of Voyageur Lake in the Eagle River Chain.

The watershed is mainly forested with second growth northern hardwoods but some of the shoreline has shrub-conifer bog areas. The direct drainage area is approximately 330 acres with steep to moderately steep sandy hills dominating the surrounding landscape. There are currently 73 landowners with shoreline property. Dwellings are found on almost every property. Public access is from Rangeline Road, which borders the lake on the southwest corner, where Tamblin Creek exits the lake.

The shallowness and muck bottom areas of the lake have affected the use and management of the lake. Tambling Lake has an abundance of aquatic vegetation. It has had several periodic fish kills in the past.

In ~~the~~ 1995 and 1996, Tambling Lake Association, Inc. with its consultant, Rand Atkinson of Aquatic Resources, completed Phase 1 of the planning grant process. During this phase the resource history and the current conditions of the lake community of Tambling Lake was described. This inventory was used to develop recommendations for a comprehensive lake management plan.

During Phase 2 implementation of the comprehensive restoration plans identified in Phase 1 were ~~began.~~ The water quality problem of low oxygen levels below the ice and periodic winter-kill was evaluated further by assessing the proposed aeration sites as they presently existed. The design and plan for installation of the aeration systems was then completed. One of the proposed aeration systems was then installed in 2001. The outlet area was evaluated and a plan developed for restoration. A property owner's survey gave direction to the lake community on funding of further lake management activities. A shoreline demonstration project was designed and restoration began.

In 2002, a second aeration system was put in place as recommended in the comprehensive plan with help of the Wisconsin Protection Grant Program. These aeration systems will now provide protection of the fisheries and lake resources that were in the past exposed to low winter oxygen and periodic winter kill conditions.

In 2003 Phase 3 application was submitted to the Wisconsin Lake Planning Grant Program to continue further with the comprehensive restoration plans for Tambling Lake described in the Phase 1 comprehensive plan and partially implemented in Phase 2. This included further evaluation of the effectiveness of the installed aeration systems, coordination of the replacement of the outlet culvert, and a current evaluation of the fisheries. A meeting on December 2, 2003 attended by Tambling Lake Board members, their consultant Rand Atkinson of Aquatic Resources, and DNR staff Jennifer Wudi and Steve Gilbert scaled back the scope of the planning grant to a fisheries evaluation. Justification by the DNR staff for this modification and reduction in the grant goals was that the aeration system evaluation was not needed as the effectiveness of the newly installed aeration system would be tested in fact by its the prevention of winter kill of

fishery in the future. Plans were made to have the planning grant funds purchase an oxygen meter for periodic testing of the lake instead. It was also stated that the outlet should not be restored to allow fish passage from Tamblin Creek into Tambling Lake as the existence of exotic species and newly discovered fish pathogens in the Eagle River Chain could possible enter Tambling Lake. This would far outweigh the ecological restoration effects described in the Phase 1 evaluation and comprehensive plan. The grant was then modified to just evaluate the fishery and make recommendations.

INFORMATION AND EDUCATION

The original Phase 3 proposal was presented at the Tambling Lake Association, Inc. at their annual meeting in 2003. A revised planning grant was approved by board members at a meeting on December 2, 2003. A preliminary progress report of the spring 2004 fisheries evaluation and study results were presented at the lake annual meeting on June 12, 2004. The final report and recommendations will be presented at the annual meeting in June 2005. Preliminary data collected in the fisheries survey was forwarded to the DNR fish manager Steve Gilbert and Tambling Lake Board members in October 2004. Tambling Lake Association grant activity news has been distributed through electonic mail by the president and secretary of the association.

WATER RESOURCE RESTORATION AND APPRAISAL

The aeration system's effect on the restoration of Tambling Lake that was originally scheduled as part of this planning grant was not evaluated as part of this planning grant. Periodic oxygen sampling scheduled by Department of Natural Resources personnel and the Lake Association during the winter of 2003-2004 never occurred because of equipment problems, training scheduling difficulties, and personnel health problems. This winter dissolved oxygen sampling was to coincide with the sampling of the condition of the fishery- which according to the Department of Natural Resources will be in the future the "indicator" of the success of the adequacy of the aeration system. The outlet restoration plan to restore the river connection to Voyageur Lake of the Eagle River Chain of Lakes will not be implemented. Department of Natural Resources personnel feel the existence of exotic species and newly discovered fish pathogens in the Eagle River Chain could possible enter Tambling Lake far outweighing the ecological restoration proposed.

Specifically, the water resource restoration process is to:

1.) Evaluate the water quality conditions in the restoration areas as it exists and changes as the restoration projects proceeds.
2.) Develop, design, plan and determine the cost of each restoration project.
3.) Coordinate and implement these rehabilitation projects that will restore the Tambling Lake aquatic ecosystem.

Restoration Process

1.) Compile, review, and interpret existing water resource data in restoration areas.
2.) Develop a comprehensive restoration plan.
3.) Implement the comprehensive restoration plan.
4.) Appraise the effects of the restoration.
5.) Prepare a report on the restoration project.

AERATION SYSTEM PLANNING AND EVALUATION

Periodic fish winter kills are a documented problem in Tambling Lake. The resource inventory in Phase 1 was able to assess the conditions of a current fish kill. It also found data that documented that outstanding fisheries resources existed between these periodic winterkill situations. Water chemistry evaluations and physical studies from Phase 1 identified the detrimental water chemistry effects that low or no oxygen conditions under the ice have on recirculating nutrients into the food chain. All these facts point to a need for an oxygen circulation system for Tambling Lake under the ice.

New technologies in oxygen transfer and delivery as well as a new understanding of lake circulation makes aeration economical. Lake aeration is a valuable lake restoration technique. The importance of dissolved oxygen to the aquatic community of fish, plankton, and plants and animals living in and on the bottom is well documented. Aeration is effective

in improving dissolved oxygen levels. In addition, aeration can lead to improved water quality by eliminating chemicals such as ammonia, hydrogen sulfide, manganese, and ferrous iron which currently build up in Tambling Lake. Although aeration has little direct effect on aquatic plants, it can lead to reduction and channeling of phosphorus, a critical plant nutrient, away from aquatic plants to other living organisms. The prevention of periodic winter kill of fish is the first step in channeling nutrients from bottom sediments to other living organisms, which includes fish and the live organisms they feed on.

The geological features identified in the Phase 1 inventory and the presence of spring seepage that flow towards the outlet suggests that aeration can be effective management tool in Tambling Lake. A sediment profile conducted in the phase 1 inventory located two hard bottom seepage areas below the flocculent muck where the aeration system might best be placed. One of these gravel areas is in the northeast bay of the lake and the second is in the southeast corner. These are major seepage areas beneath the lake and introduction of oxygen should circulate the effects of the added oxygen to beyond the immediate area.

During Phase 2 of the planning process present dissolved oxygen conditions under the ice at the proposed aeration sites were further evaluate during the winters of 1999-2000 and 2000-2001. Very low oxygen levels were documented in the winter of 2000-2001 and winter kill was narrowly avoided. Reports from these evaluations were provided to the Lake Association board and passed on to residents through the lake newsletter.

In the winter of 2001-2002 the aeration system installed in the northeast corner was evaluated with additional sampling in the deepest area of the lake, at the second proposed aeration site, and at the outlet. The aeration system was started after ice up. In January the size of the aeration hole was estimated. At the deepest spot in the lake dissolved oxygen dropped to less than 1 mg/l but oxygen in the proximity of the aeration system appeared to remain near 3.5 mg/l. Outlet oxygen at the last winter reading was at 5.2 mg/l. Reports from this evaluation were then compared to past oxygen profiles. These comparison reports were presented to the association board and 2002 results overview article appeared in the newsletter.

During the winter of 2002-2003 dissolved oxygen conditions under the ice were monitored at both aeration system locations, in the deepest areas of the lake, and at the outlet. Clear ice provided light conditions for plant species to live and provide oxygen through most of this winter. Dissolved oxygen was at least 5 mg/l beneath the ice at all tested sites including at the aeration sites. Again, a report describing past oxygen monitoring readings, freeze up and ice out dates, and snow and ice conditions, was created. This report was presented to the lake board and an overview was described to the lake residents at the annual meeting.

Volunteer secchi disc monitoring was increased to twice monthly in 2002 and 2003 to appraise the possible summer effects of diffused aeration under the ice.

The effects of diffused aeration on the oxygen conditions under ice during the winter of 2003-2004 and 2004-2005 needed to be appraised. It was probable that severe winter kill conditions could occur during these periods. These two winters as well as the next two or three winters are more likely to provide heavy snow cover that corresponds to the "wet" years of the eleven-year wet-drought cycle in Wisconsin.

Outlet Evaluation and Culvert Replacement

The existing culvert has a plunge pool on the downstream side that prevents migration of fish into Tambling Lake. The culvert is also in need of repair. The Phase 1 comprehensive plan recognized the need for culvert replacement and Phase 2 planning developed and designed a plan to restore the outlet. Tambling Lake Association will be working with the Town of Washington, consultants, and state officials for the proper placement of the culvert. If necessary the Tambling Lake Association may solicit funds for the restoration through the lake protection program.

The replacement of this culvert would be a direct benefit to the fisheries by removing the present barrier to fish migration. It would allow the movement of both game and forage fish in and out of Tambling Lake. In combination with the aeration system restoration project, this management practice would increase the population density of minnows and other aquatic organisms that game and panfish feed on. With an unobstructed properly placed culvert the excellent fisheries that existed in the 1975 could return again.

The justification for culvert replacement was identified in Phase 1 comprehensive planning. A design for culvert replacement was created and presented to the Tambling Lake Association at the annual meeting during the Phase 2 planning process. Lake residents expressed concern at that time that the new design may lower the lake water level. The Tambling Lake Association has kept water level and rainfall data for the past several years to establish a norm and range for water levels prior to restoration.

FISHERY APPRAISAL AND EVALUATION

Introduction

Little is known about the current fisheries of Tambling Lake. The last survey of the lake was completed nearly 20 years ago in 1975-76. Walleye fingerlings were stocked for three years after this survey and no further stocking has been done until after the 1995-96 winter fish kill. Panfish and a few largemouth bass were transferred from a nearby lake in the spring of 1996. The fishkill during the winter of 1995-96 disrupted the fisheries that had developed since the last documented fish kill in 1986. The physical, chemical, and biological conditions that created this fish kill situation were documented in the Phase 1 planning grant study.

Tambling Lake in the past has supported a diverse fishery in between periodic winter fish kills. Winter fish kills were documented in 1948, 1965, 1986, and 1996. A probable fish kill occurred during the winter of 1933-34 followed by the earliest recorded fish stocking in 1934. This stocking was a fish transfer of several species including northern, walleye, yellow perch, bluegills, white sucker, and minnows. Fish stocking to include sac fry and fingerling walleye, largemouth, muskellunge, and muskellunge/northern hybrid occurred from 1934 until 1976.

Fish assessments were made by netting or electroshocking in 1958, 1965, 1967, 1975-76, and in 1986. The 1965 and 1986 electroshocker surveys were winterkill assessments. The first survey in 1958 and comprehensive survey in 1975-76 indicated a healthy and diversified fishery.

At one time game fish, pan fish and minnows moved freely from Voyageur Lake of the Eagle River chain into Tambling Lake via Tamblin Creek. Phase 1 planning grant observations, during winter oxygen depletion in 1995-96, found that fish were drawn to the outlet area but were kept from exiting the lake by several disturbances in that area. These disturbances included: 1.) shoreline fills that adversely effected shallow water lakeshore hydraulics and filled in the channel, 2.) periodic ice pushup mounds from easterly winds during spring ice out that also blocked the outlet, and 3.) a poorly placed, undersized culvert under the town road that collected sediment on the lake(upstream) side and prevented fish and forage fish from entering the lake on the downstream side. Historical records document that at one time walleye used the outlet area of Tambling Lake for spawning as a migration run from the Eagle River chain to this outlet area occurred every spring.

Tamblin Creek, the outlet to Voyageur Lake, had become shallow from widening caused by the woody debris that fell from the second growth hardwood over story that it passes through. Tambling Lake Association members have been successful in maintaining a deeper central channel by removal of this fallen debris every fall since 1996. Again, fish passage to this barrier culvert is now possible.

Procedure

A limited early fyke net survey was conducted for four consecutive days from April 28 through May 1, 2004 targeting early spawning northern pike and yellow perch. A later panfish fyke netting survey was conducted for four consecutive days from June 2 through June 5, 2004 For both fyke net surveys one fyke net had a mesh size of 1/8", two fyke nets had mesh sizes ¾', with the fourth net having a 1" mesh. Leads for fyke nets ranged from 25 to 50 feet to match contours of shoreline for placement of fyke net funnels in deepest water possible without total fyke net submergence. A shoreline seining survey was performed on July 13 to identify minnow species present and young of the year recruitment. A 50-foot by 6-foot bag seine with 1/8" mesh was used for 100 foot seine hauls in four areas of the lake in a maximum depth of 3'. Maps of netting locations for each survey were made.

All fish captured were recorded by net location on a panfish netting data recording or a gamefish length frequency sheet. Panfish and gamefish total lengths were measured to the nearest 1/10 of and inch and ½", respectively. All fish had their top caudal (CT) fin clipped during the early and late fyke net surveys. Marked fish were released away from the nets and from the outlet. All fish were examined during each day of the fyke net surveys and during seining for recapture of CT marked fish. Any recaptured fish were recorded on the daily record sheets for each net location. Scales were taken from all gamefish and at least from 25 of each specie of panfish from each net over the netting period as capture allowed. Ten scales were taken from each ½ inch panfish group encountered as capture allowed. Scales were placed in scale enveloped labeled with species, total length of fish, and date of capture. Length measurements and scale data were used to develop an age/ growth assessment of the current fishery

Results

Fyke Net Survey April 28- May 1, 2004

This fyke net survey targeted northern pike and yellow perch and was conducted during clear days where the winds were mild and switching from southwest to northwest. An early spring rain storm occurred during the night of April 28th. Water temperatures rose from 49oF to 54oF through the 3-day sampling period. Location of fyke net sets are described in **Figure 1**.

Five northern pike were captured ranging in length from 17 to 21 inches. One 17.25"" largemouth bass was captured during the netting. Twenty-five bluegills were caught ranging from 4.3 to 7.8". Twenty bluegill x pumpkinseed hybrids were netted ranging from 4.5 to 7.0". Four pumpkinseeds from 5.0 to 6.6" were also captured. Four black crappie ranging from 5.3 to 9.7" were also netted. There was no recapture of any fish. Though no yellow perch were captured, small and short egg scanes were observed on the bottom sands of the southeast shore at the time of netting. Modal sizes are described in the Summary Fishing Record on **Appendix 1**.

Fyke Net Survey June 2-6, 2004

This fyke net survey targeted panfish and was conducted during clear days with winds from the northwest. Water temperature ranged from 65 to 67oF through the netting period. Location of fyke net sets are described in **Figure 1**.

Seven northern pike were captured ranging in length from 21 to 27 inches. Six largemouth bass were captured ranging from 14 to 17.4'. One hundred twenty-five bluegills were caught ranging from 4.2 to 8.0". Ninety-four bluegill x pumpkinseed hybrids were netted ranging from 4.0 to 7.7". Thirty-two pumpkinseeds from 4.1 to 7.5" were also captured. Thirty-one black crappie ranging from 5.3 to 9.7" were also netted. Sixteen rock bass were caught ranging from 4.3 to 10". Two 7" golden shiner minnows were also captured in the fyke nets. Modal sizes are described in the Summary Fishing Record on **Appendix 2**.

Shoreline Seining Survey July 13, 2004

A shoreline seining survey on June 13, 2004 was conducted to sample young-of-the-year recruitment into the game and panfish fishery and to identify the minnow species that might be present in the shoreline areas of Tambling Lake. Seinable shorelines are limited in Tambling Lake. Shoreline seining locations are described in **Figure 1**. Weather was clear and sunny and water temperature was 74 oF in the deep water of the lake. .

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How deep?

Five hundred fifteen bluegills were caught ranging from 2.8 to 7.2". Four hundred fifty-three bluegill x pumpkinseed hybrids were netted ranging from 3.5 to 6.7". Eighty- five pumpkinseeds from 4.0 to 6.0" were also captured. No black crappie, rock bass, or minnow species were captured during the seining. Modal sizes are described in the Summary Fishing Record on **Appendix 3**.

Discussion

Tambling Lake's fishery appears to be in good health. Growth of both gamefish and panfish captured in this study exceeded that of other Vilas County lakes or the averages of other northern lakes. Black spot or black grub (Neascus spp) was noted on a small percentage of the fish, but was particularly found on the bluegill, the dominant panfish specie present in the lake.

Twelve northern pike were captured during the early and late fyke net surveys. Seven of these captured fish were Age 4 or young-of-the-year in 2000. Their lengths ranged from 20.7 to 22.5". The remaining five northern pike were from the 1999 and 1998 year classes and ranged in length from 24.6 to 27". See **Table 1** and **Figure 2**. The Age 4 fish were 4.6 to 13.7 % longer in length than the northern Wisconsin average growth for northern pike. The single Age 5 northern was 11.4% longer than the average. The three Age 6 northern were 3.4 to 12.1% longer than this average. See **Figure 2**. All appeared to be robust and healthy.

Seven largemouth bass were captured during the fyke netting. The one Age 4 (2000 year class) bass was 15.2 " which is 10% larger than the northern Wisconsin average. The three Age 5 largemouth bass ranged from 14.1 to 16.25". The three Age 6 bass ranged from 16.0 to 17.5" See **Table 1**. Age 4, 5, and 6 largemouth bass exceeded the northern Wisconsin largemouth bass length by 10%, 6.9 to 23.3%, and 15 to 26.1%, respectively. See **Figure 2.**

Bluegills dominate the pan fishery with 659 captured during the netting period. Two fish were recaptured. The Age 4 (2000 year class) dominated the catch with 319 fish ranging from 4.2 to 5.6". The 2002 Age 2 and 2003 Age 1-year classes were nearly equal in capture numbers. See **Table 2**. The 2002, 2003, and 2004 year classes of bluegill mean lengths were similar to those found in Muskellunge Lake (Vilas County). For older bluegill the mean length exceeded growth data from Muskellunge Lake (**Figure 3**.)

The bluegill x pumpkinseed hybrid were second in total capture of panfish with 566 individuals. Age 2 (2003 year class) was the dominant year class with 357 fish netted ranging in length from 3.5 to 4.0". The 2001- Age 3 hybrids, ranging from 4.2 to 4.8", were second in numbers captured. See **Table 2.**

A total of 121 pumpkinseed sunfish were captured during this study. Age 3 (2001-year class) was the dominant year class of pumpkinseed sunfish with 77 or 64% of the pumpkinseed captured (**Table 2.**). All year classes of pumpkinseed exceeded published growth data for Flora Lake in Vilas County (**Figure 3**).

Twenty-eight black crappie were captured during the study ranging from 5.2 to 9.7". Growth of this species exceeded the published average growth of northwest Wisconsin black crappies. The first year growth of black crappie was phenomenal which probably corresponds to it's quick dietary switch to being piscivorous(fish eating) and its preference for open water habitat of the shallows of Tambling Lake. Sixteen rock bass were captured ranging from 4.3 to 10.0". Growth of this fish was exceptional when compared to published data from Muskellunge Lake (Vilas County). See **Table 2.** .

There is limited suitable spawning substrate for the nest building fish (centrachids) in Tambling Lake. Observations along the west northwest shallow sandy shoreline during seining found a large diameter spawning depression, probably of a bass, surrounded by smaller spawning depressions of panfish. These old spawning nest were clustered together in less than 2 feet of water.

Shallow water cover for fish is also limited in Tambling Lake. Shallow shoreline areas of sand give way to muck bottoms before the 3 to 5' contours around most of the lake. In general, floating and emergent vegetation and woody debris is sparse in the littoral (shallow water) areas. There is also very little submergent vegetation along the sandy shorelines of Tambling Lake. Yet the deeper water area of Tambling Lake has dense beds of submerged vegetation for fish cover. .

These deeper water areas of muck bottom substrate support a wide variety of dense, submerged vegetation. With a maximum depth of 14' and an abundance of vegetation over most of the lake water clarity throughout most of the year extends to the bottom. Phytoplankton (free-floating microscopic plants) and zooplankton (microscopic animals that feed on the phytoplankton) abundance and availability for consumption by postlarval fry of any fish specie appears to be periodically limited in Tambling Lake. It appears that the abundant submerged aquatic vegetation in deeper waters out competes the phytoplankton for the available dissolved nutrients in the lake. Survival of young of the year centrachids in Tambling Lake is probably limited by the low densities of zooplankton as food for the postlarval stages of growth, lack of shallow water cover, and predation by older fish throughout the first year.

The presence of hybridization usually occurs when spawning fish of several species are crowded, or where there is few of one specie and an abundance of another and the sparse specie has difficulty in finding the mate of the same specie. Looking at the year class strengths of bluegill, pumpkinseed, and their hybrids in Tambling Lake, strong year classes in a particular year are not shared by any individual species. For example using panfish capture numbers, the bluegill - pumpkinseed hybrid had a dominate year class in 2002, the pumpkinseed in 2001, and the bluegill in 2000. Though their capture numbers were small, the rock bass strong year class of 1999 was different from other panfish and the black crappie shared it's strong year class year with the hybrid in 2002. See **Table 2**

In a comparison of the growth of the three main panfish found in Tambling Lake several patterns are evident. Pumpkinseed appears to be the fastest grower through age 6 and were found in the lowest numbers. Bluegill is the slowest growers and had the largest population. Hybrid growth and population fell in between until Age 5 where bluegill growth exceeded it. See **Figure 4.**

Pumpkinseeds prefer lakes that have abundant aquatic vegetation and clear water. As adults they stay close to this vegetation and can feed on a variety of sizes of food items found from top to bottom in the water column. As young they are preyed upon by yellow perch, crappies, smallmouth and largemouth bass, walleye, northern pike, muskellunge, and other sunfish. They actively feed throughout the day with peak feeding during the afternoon.

Bluegills prefer shallow warm lakes but avoid direct sunlight so seek shelter in aquatic vegetation and submerged brush. Bluegills primarily feed at dawn and dusk but do feed throughout the day on a variety sizes of prey items when they are seasonally available. Bluegills seem to follow a daily migration pattern that brings them close to shore at night and into deeper water during the day. As young they are prey to the same species as the pumpkinseed.

The hybrid between bluegill and pumpkinseed usually occurs under crowded conditions or when there is lack of numbers in the population of one of the species. The abundance of hybrids in Tambling Lake can be an indicator of competition between species for limited spawning areas and competition for food niches may be occurring. The entrance of a hybrid in the mix of a population increases competition to both non- hybrid species for food. Fish populations are dynamic and growth and population shifts can change based on competition with the same species, with different species, as well as the presence and number of predator species.

The black crappie can be found in clear, quiet warm water of small lakes and always associated with abundant growth of aquatic vegetation. Black crappies are known for their irregular growth and year class strengths and this appears to be true in Tambling Lake. The black crappie is one of the few members of the centrachid family that continues to feed through the winter, so this may contribute to irregular growth patterns. Black crappie can spawn on sand, fine gravel or mud in up to 6 feet of water and prefers to spawn near Chara or other vegetation. These spawning conditions are found in various areas of Tambling Lake.

Recommendations

Growth of all fish species sampled in this survey appears to equal or exceed growth rates for northern Wisconsin fisheries described in several publications. A winterkill of the Tambling Lake fishery occurred in the winter of 1995-96. This fishery is probably still evolving into a dynamic diverse fishery that it contained in the past. A comprehensive survey between winter fish kills in the 1970's and 80's indicated a diverse population which included the species that are now present, yellow perch (the dominate panfish at the time) and a healthy walleye population. The present aeration system should allow Tambling Lake to continue to produce a good fishery that could include perch and walleye.

The plunge pool below a poorly placed culvert on Tamblin Creek at the outlet of the lake has created a barrier for fish entering the lake. Historically, walleyes were known to spawn at the outlet of lake when a culvert was properly placed. It is very probable at one time many wetland and stream-spawning minnow species also entered Tambling Lake through this access. Tamblin Creek disperses into fairly large marsh area before entering Voyageur Lake. Before the barrier, the stream itself and this marsh area was probably a nursery area not only for minnow species but for northern pike and other species. Without this culvert replacement and restoration of this recruitment route, stocking in an attempt to create the excellent fishery of the past seems to be the only choice.

. In light of the nutrients available associated with: 1.) a muck substrate covering nearly all areas below the 4 foot contour, 2.) a dense submergent aquatic plant population, and 3.) aquatic invertebrate food source that goes along with this habitat; the fishery should be managed for the full utilization of these nutrients.

Habitat Restoration

Dense aquatic plant beds have been associated with stunted fish when predator fish numbers have been found to be low. Stocking of northern pike has not been successful in controlling panfish populations and has often adversely effected the growth of naturally reproducing populations. Northern pike need shallow flooded areas of emergent vegetation of grasses, sedges, or rushes for egg deposition. This habitat is limited mainly to areas in the northeast bay of Tambling Lake.

Northern pike and largemouth bass are daytime feeders that often dart from cover of submerged weeds and woody debris to capture wandering prey. Tambling Lake's weed line of submerged vegetation where the sand gives way to muck at the 4-5' contour provides this habitat but there is little woody cover of downed logs and trees in the littoral shoreline areas.

Much of Tambling Lake's shoreline has been developed but there are a few areas where downed shoreline trees and snags are found. **Random property owners should secure snags and logs perpendicular to their shore to create improved woody shelter habitat for the populations of northern pike, black crappies, and largemouth bass in Tambling Lake.**

There are a few areas in Tambling Lake that have firm enough bottom or enough depth for the placement of brush shelters or the standard fish crib. **Brush shelters of reduce size could be placed in clusters in these few areas of the lake to increase woody debris and give habitat diversity in areas where submerged vegetation is dominate.** Weighted down with the proper bouncy these structures could meet navigational clearance requirements.

Stocking

Stocking of Tambling Lake should try to duplicate the fishery that existed in the mid 1970's that was documented in a comprehensive survey report in 1975. Minnow species populations, because of their ability to feed on vegetable matter and provide forage for both game and large panfish, should be enhanced by stocking.

Two large golden shiners were captured in this fishery survey. Golden shiners spawn on submerged vegetation, in old bass nests, on bare sand, and in old aquatic vegetation throughout the summer. This habitat is found in parts of Tambling Lake. These shiners are very diverse feeders and feed on many of the same organisms that panfish and juvenile game fish feed on.

Northern redbelly dace should be stocked into Tambling Lake to provide a fish that feeds mainly at the plant trophic level. This fish spawns from May to August and likes the quiet, clear, waters of small lakes. It is mostly associated with substrates of finely divided detritus or silt – the dominant bottom material in Tambling Lake. The food of this minnow consists mainly of algae such as diatoms and filamentous algae, but also included zooplankton and aquatic insects. In return they would provide food for all predatory fish and larger panfish of Tambling Lake. These minnows are available for stocking in the spring of the year. **Stocking several hundred pounds of northern redbelly dace should establish a reproducing population if predation is shared and limited by a broader forage base.**

Stocking of yellow perch to enhance the remnant population that presently exist would increase the forage base for predator fish and large panfish. Because if it's cylindrical body size It is often the preferred food for larger predator fish. The presence of small egg scanes southeastern shoreline during the early fyke survey is an indicator that they do exist and the population probably is limited to fairly small fish at this time. **The goal would be to create a perch fishery that is represented by at least 5-year classes and be self- sustaining. Stocking of several thousand yellow perch over a two year period or in the spring and fall of a single year would be recommended begin establishing this population.**

Maintaining a diverse predator population is important in preventing the stunting of the panfish population. Following the stocking of the redbelly dace and yellow perch, that will increase the present forage base, walleyes should be stocked. The goal of stocking would be to eventually create a fishable population that would have a minimum of five-year classes. **A thousand large fingerling walleyes should be stocked for 3 years consecutive years and allowed to reproduce.** A survey in another ten years should be conducted to analyze the success of these stockings.

FIGURE 1. TAMBLING LAKE 2004 FYKE NET AND SEINING LOCATIONS

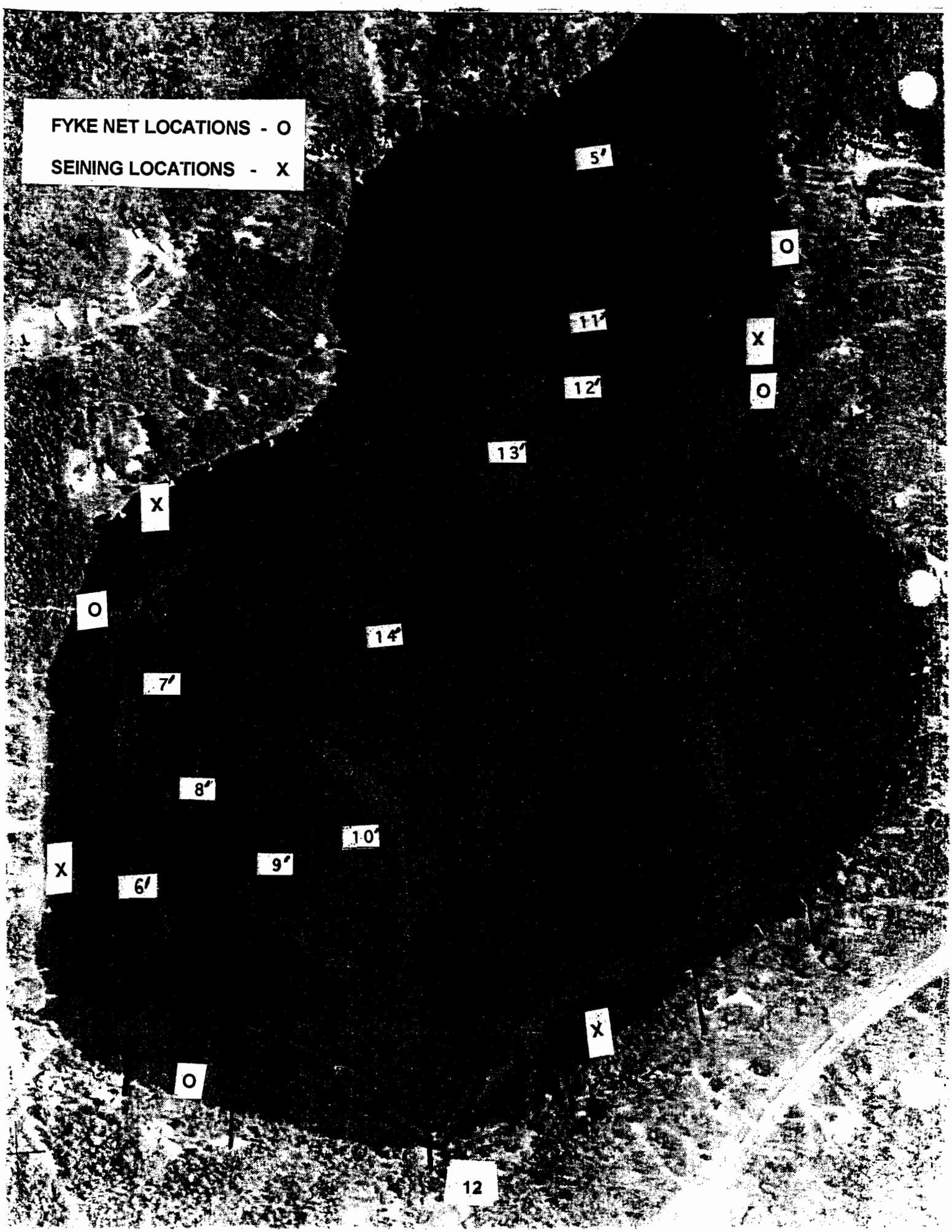


TABLE 1.TAMBLING LAKE
2004 FISH SURVEY
GAMEFISH MINNOW
DATA

LARGEMOUTH BASS

YOY	AGE	Length inches	Length mm	N. Lakes mm
2000	4	15.2	386	297
1999	5	14.1	358	335
1999	**5**	**16.2**	**412**	**335**
1999	**5**	**16.25**	**413**	**335**
1998	6	16	406	353
1998	6	17.2	437	353
1998	6	17.5	445	353

NORTHERN PIKE

YOY	AGE	Length inches	Length mm	N. Lakes mm
2000	4	20.7	526	503
2000	4	21	533	503
2000	4	21.2	539	503
2000	4	21.2	539	503
2000	4	21.5	546	503
2000	4	21.6	549	503
2000	4	22.5	572	503
1999	**5**	**24.6**	**625**	**561**
1998	6	24.9	633	612
1998	6	25	635	612
1998	6	27	686	612

GOLDEN SHINER

YOY	AGE	Length inches	Length mm
2000	4	7	178
2000	4	7.6	193

Preliminary Report
10-1-04 Rand Atkinson, Aquatic Resources

Figure 2. Tambling Lake 2004
Gamefish Age-Growth

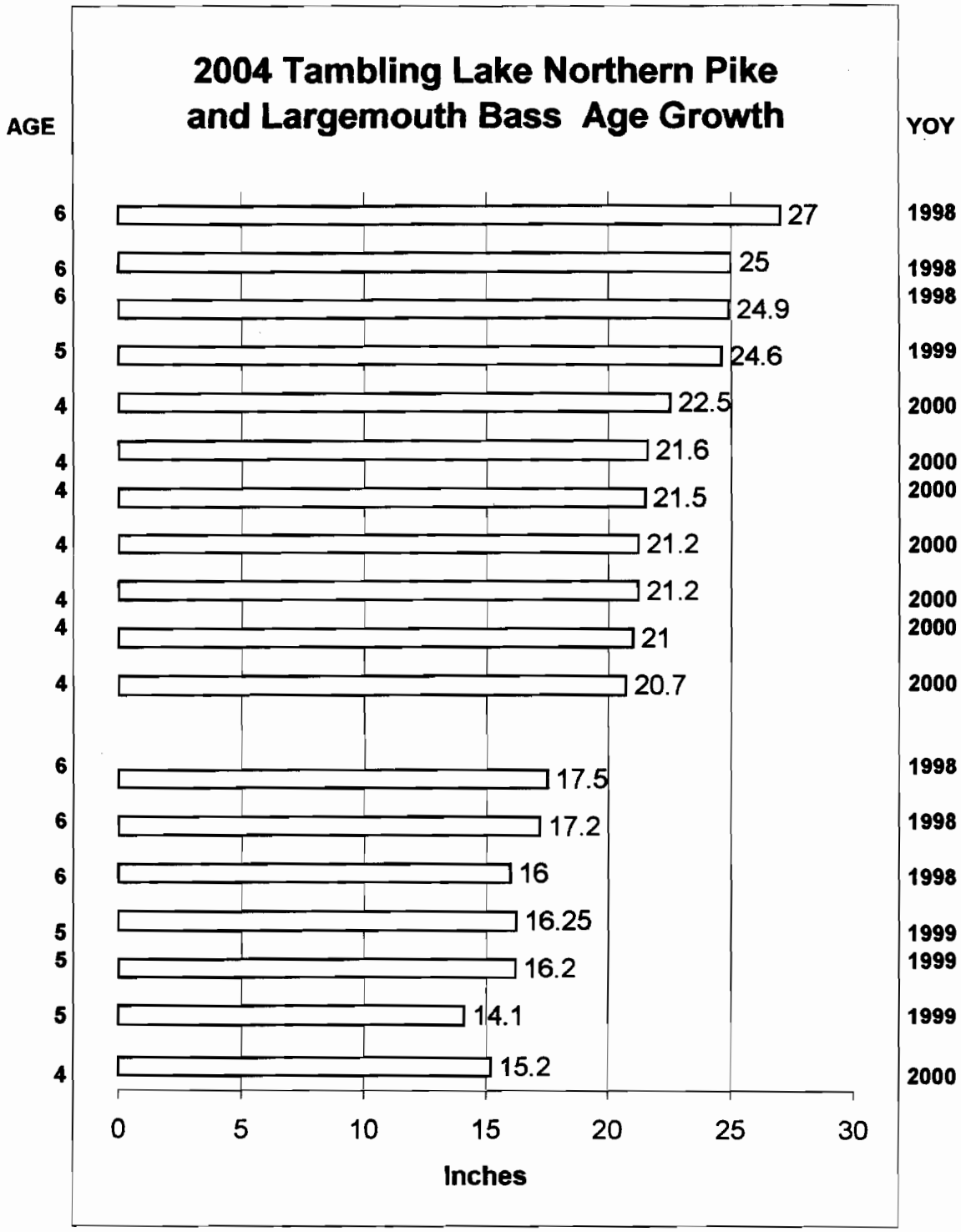
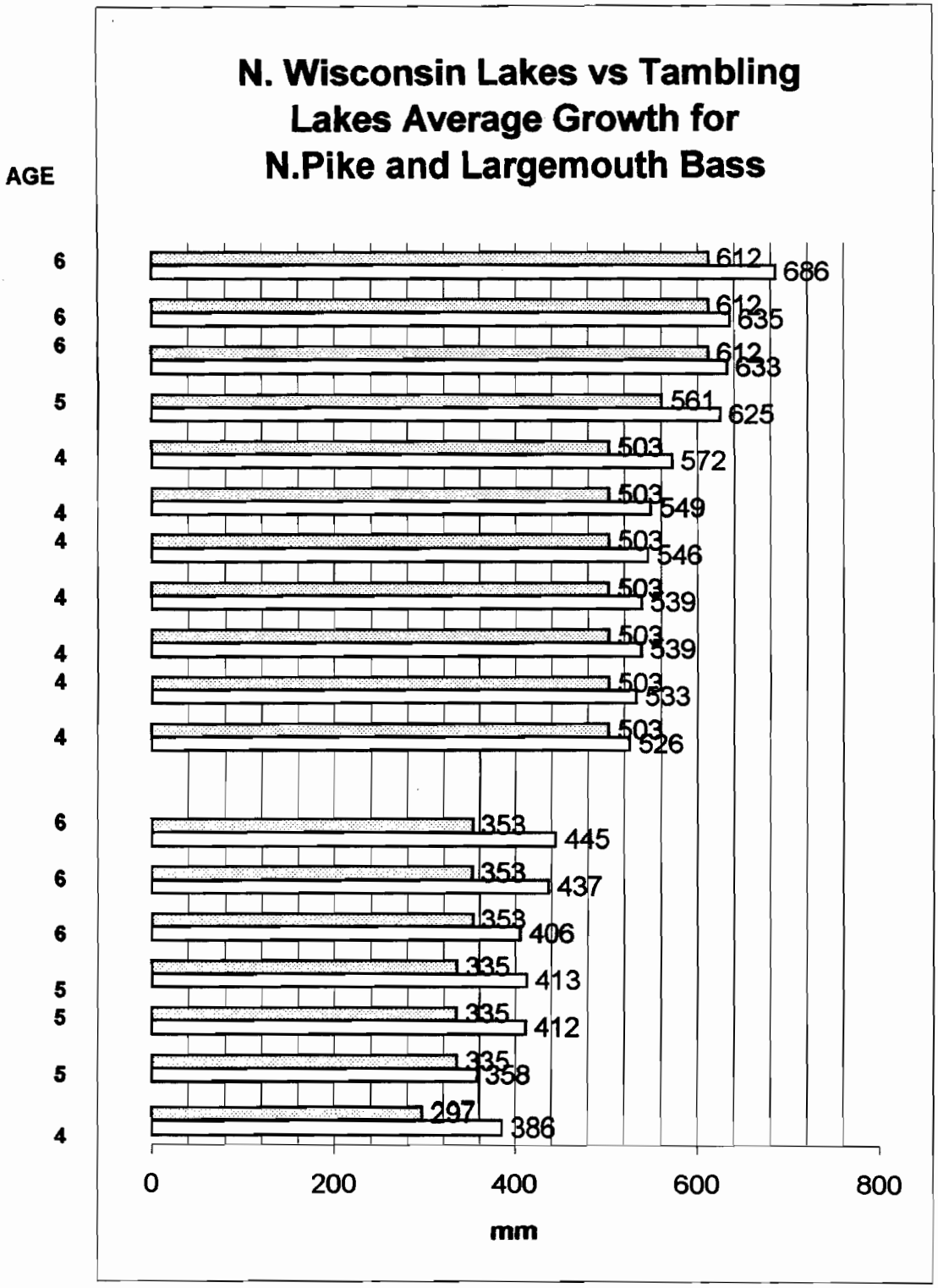


Figure 3. 2004 Tambling Lake Gamefish Growth Comparisons



Northern Lakes Data Taken from Fishes of Wisconsin By George C. Becker, University of Wisconsin Press

TABLE 2.TAMBLING LAKE
2004 FISH SURVEY
PANFISH
DATA

BLUEGILL

AGE	YOY	T.Capture	Range	Md Lngth		Musk L.
			Inches	inches	mm	mm
Age 2	2002	123	2.8-3.3"	3.1	79	75
Age 3	2001	130	3.5-4.0"	3.75	95	97
Age 4	2000	319	4.2-5.6"	4.8	122	120
Age 5	1999	65	5.5-6.9"	6.3	160	138
Age 6	1998	21	6.9-7.7	7.3	185	148
Age 7	1997	1	8	8	203	162
	Total	659				

PUMPKINSEED

AGE	YOY	T.Capture	Range	Md Lngth		Flora L.
			Inches	inches	mm	mm
Age 2	2002	1	4.1"	4.1	104	79
Age 3	2001	77	4.1-4.7"	4.5	117	106
Age 3	2001	13	5.8-6.6"	6.1	155	106
Age 4	2000	16	4.7-5.6	5.1	130	128
Age 4	2000	13	7.0-7.3	7	178	128
Age 5	1999	1	7.5	7.5	191	151
	TOTAL	121				

BLUEGILL-PUMPKINSEED HYBRID

	YOY	T.Capture	Range	Md Lngth	
			Inches	inches	mm
Age 2	2002	357	3.5-4.0	3.6	91
Age 3	2001	96	4.2-4.8	4.2	107
Age 4	2000	49	4.8-5.9	5.4	137
Age 5	1999	46	5.9-6.9	6.2	158
Age 5	1999	18	7.0-7.7	7.2	183
	TOTAL	566			

BLACK CRAPPIE

	YOY	T.Capture	Lgnth Rng	Md Lngth	Md Lngth	NW Lks
AGE			inches	inches	mm	mm
1	2003	2	5.2-5.4	5.3	135	61
2	2002	17	5.5-6.0	5.8	147	124
3	2001	8	6.2-7.3	6.6	168	163
?		1	9.7	9.7	246	
	TOTAL	28				

ROCK BASS

AGE	YOY	T.Capture	Lgnth Rng	Md Lngth	Md Lngth	Musk L.
			inches	inches	mm	mm
2	2002	1	4.3	4.3	109	63
3	2001	3	5.0-6.7	5.8, 6.8	147,173	83
4	2000	4	6.9-8.6	7.9	201	106
5	1999	8	9.1-10.0	9.3	236	128
	TOTAL	16				

Compiled By: Rand Atkinson, Aquatic Resources, Inc. 2004

Figure 4.
2004 Tambling Lake Panfish Growth

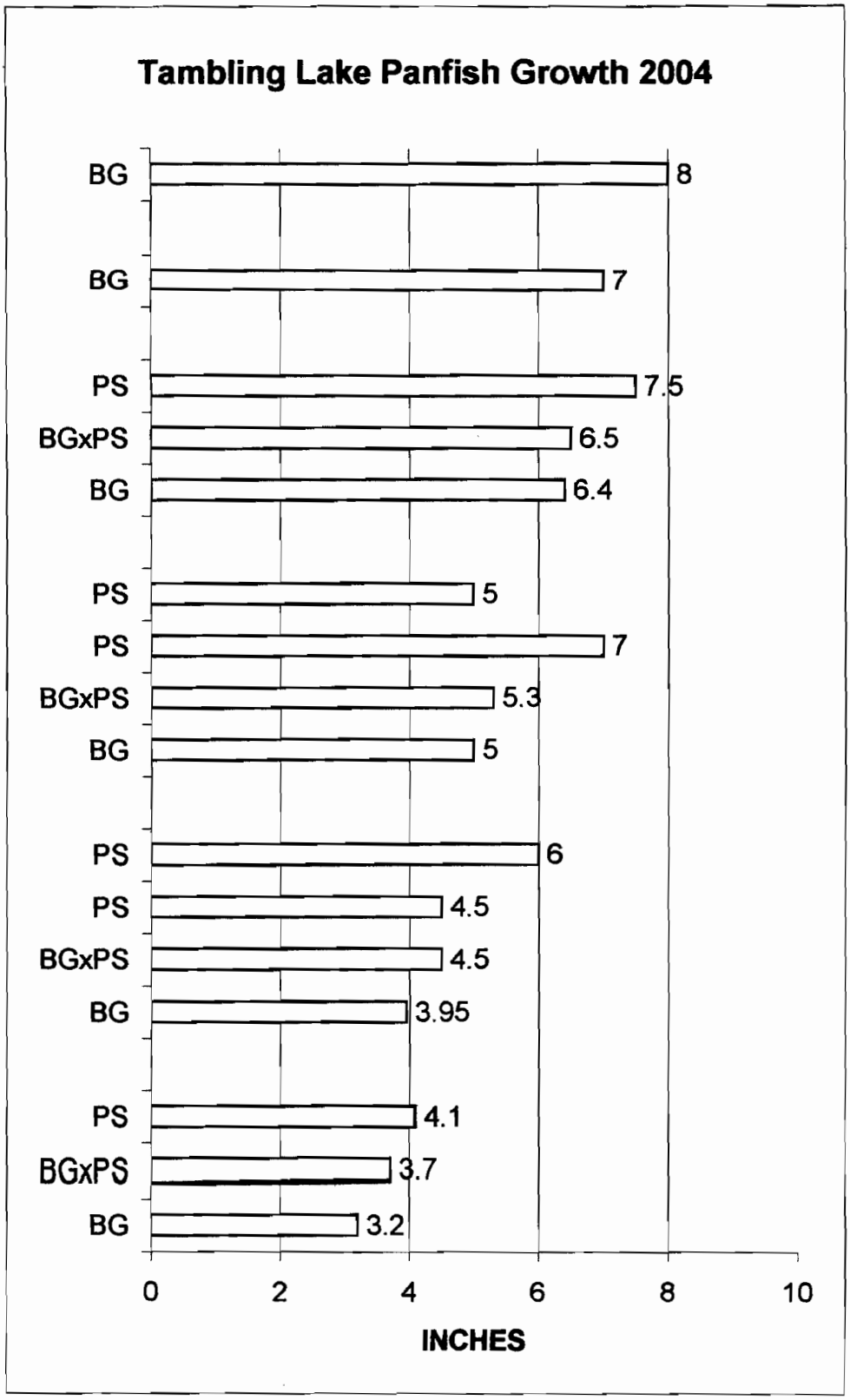
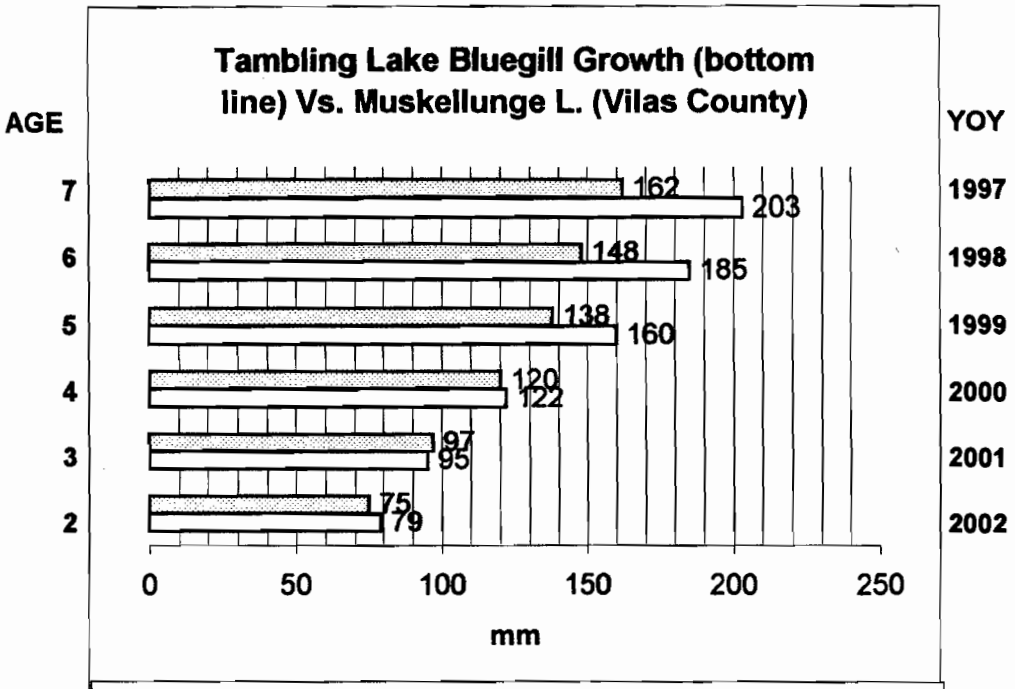
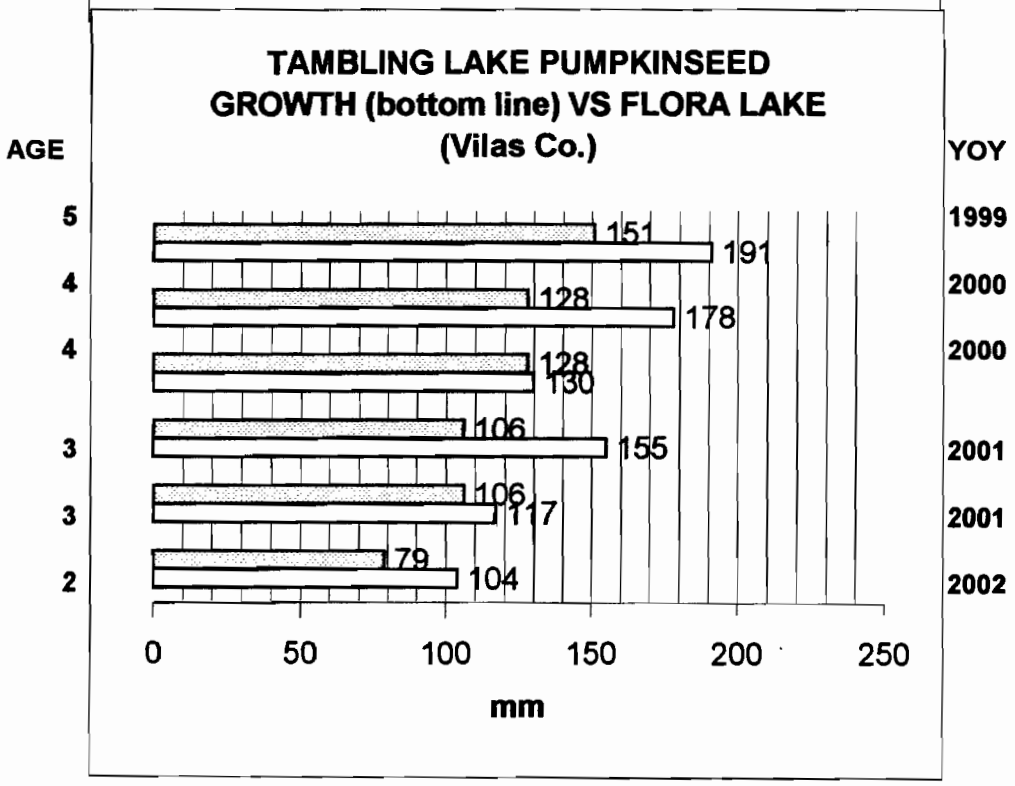


Figure 4.Tambling Lake Panfish Lake Comparison Chart





Data for Muskellunge and Flora Lake Taken from Fishes of Wisconsin by George C. Becker, University of Wisconsin Press