Fishery Management Plan

Turtle-Flambeau Flowage, Iron County, Wisconsin

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Prepared by:

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Jeff Roth, Senior Fisheries Biologist
Wisconsin Department of Natural Resources, Mercer

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Dave Neuswanger, Fisheries Team Leader
Wisconsin Department of Natural Resources
Upper Chippewa Basin, Hayward

FOREWORD AND ACKNOWLEDGMENTS

This is a long-term strategic plan that will guide our fishery management efforts on the Turtle-Flambeau Flowage for many years to come. We believe our fishery management plans should be based upon a shared vision that is developed by combining information from statewide angler surveys, onsite creel surveys, and interactive input from local stakeholders. From those sources we determine user preferences in light of ecosystem capability. We believe the goals of a good plan must reflect the shared vision of users and managers; and measurable objectives must be set so we know whether selected strategies are succeeding or failing. We believe in making good tries and learning from failure. Part of that process involves amending strategic plans (like this document) when failure dictates that we either develop more realistic objectives or change our strategies to achieve reasonable objectives. This plan should be updated as needed in the decades that follow.

We call this a "long-term strategic plan" because the goals and objectives are relatively timeless, and because we possess neither the wisdom nor the authority to commit DNR or partner resources to a specific operational schedule of funding and action. Each year will bring its own fiscal constraints and operational priorities, so we must remain flexible in our implementation of proposed actions. Because there are so many complex and inter-related strategies, we have chosen to forego the lengthy process required to secure statewide DNR approval at this time. We will do our best to justify actions we believe necessary to realize our shared vision to DNR leaders and the general public as time and circumstances permit. We promise to consult this plan annually as we allocate time and resources to the many important projects before us.

We thank the Turtle-Flambeau Flowage Property Owners Association for hosting our stakeholder visioning session at the Mercer Community Center on July 8, 2005. We especially acknowledge the contributions of the late Arlen Wanta – Past President of the Association. Without Arlen's leadership, friendship, and sincere interest in protecting and improving the fishery of the Turtle-Flambeau Flowage, many accomplishments to date would not have been made.

We acknowledge the expertise and efficiency of Fisheries Technicians Jim Cox and Jim (Hulio) Zarzycki, whose unparalleled knowledge of the Flowage and decades of dedicated effort have provided most of the high-quality data that appear in this document.

We also thank the 54 local stakeholders who donated a Friday evening to help us develop the vision that forms the backbone of this plan. We are very pleased to incorporate their input at this appropriate stage in the planning process; and we look forward to their continued support for actions we believe will be necessary to achieve our shared vision. We can settle for nothing less in an area where the quality of fishing means so much to our livelihoods and our quality of life.

BACKGROUND

Habitat Characteristics and Productivity

The Turtle-Flambeau Flowage (including Trude Lake) inundated 16 named natural lake basins and now covers 13,766 surface acres at normal pool elevation. Maximum depth is 50 feet. There are 229 miles of winding mainland shoreline and 105 miles of shoreline associated with 377 islands. Diverse bottom substrates are comprised primarily of sand and gravel, but significant areas of rubble, boulder and muck exist in some locations. The Flowage is fed by the Manitowish River, Bear River, Turtle River, and seven smaller inlet streams. The outlet is the North Fork of the Flambeau River, which is part of the Chippewa River drainage system.

The water has a light brown color that reduces transparency in a way characteristic of flowages that receive tannin-stained runoff from forested watersheds and wetlands. Average alkalinity (buffering capacity) is relatively low (30 parts per million), and pH averages 7.6. Total phosphorus concentration averages 23 parts per billion (regional average is 31 ppb). But because of reduced light transparency, chlorophyll *a* concentration (a measure of microscopic algae abundance) averages only 3 parts per billion (regional average is 12 ppb). Combined, these parameters indicate that the Flowage is mesotrophic. Its Trophic State Index of 43 reflects a moderate level of biological productivity.

The Flowage stratifies thermally with some variation, depending upon the lake basin. Dissolved oxygen is sufficient for over-winter survival of fish throughout the Flowage with the exception of the Horseshoe area, where partial winterkills have been documented. Areas with aquatic macrophytes (large plants) are scarce, though a variety of submersed plant species are common in the shallow back-bays. The trunks of submersed trees, left uncut during construction of the Turtle Dam, remain a common navigation hazard but provide valuable fish habitat. Large boulders and rock bars are equally commonplace and add an important element of structure for the diverse assemblage of fish species in the Flowage.

Human Development and Public Access

The Flowage was created in 1926 when the Chippewa and Flambeau Improvement Company built a dam on the Flambeau River downstream of its confluence with the Turtle River. The Flowage was built as a storage reservoir with the primary purpose of providing water to the North Fork of the Flambeau River as needed for power generation at several hydroelectric projects downstream. The project also provides flood protection to downstream areas. Full pool elevation of the reservoir is 1,572.0 feet above mean sea level (MSL).

Flowage water levels are manipulated under terms of a Memorandum of Understanding between the Chippewa and Flambeau Improvement Company and the Wisconsin Department of Natural Resources. The MOU calls for summer and winter draw-downs not to exceed four and eight feet, respectively. The 4-foot summer drawdown begins after high spring flows have subsided, usually in mid June, in order to augment downstream flows for power generation. The 8-foot winter drawdown usually begins in late fall, allowing water level to drop throughout the winter until the reservoir reaches its lowest level in March. The Chippewa and Flambeau Improvement Company then must attempt to refill the Flowage by April 20 to a level of 1,571.5 feet MSL in order to inundate a sufficient amount of high-quality fish spawning habitat.

The State of Wisconsin owns over 35,000 acres within the Turtle-Flambeau Scenic Waters Area boundary, including 95% of the shoreline. Most of these public lands were acquired from Northern States Power Company in 1990 (over 22,000 acres, including 114 miles of mainland shoreline and 195 islands). There are seven developed public boat landings with parking facilities – six owned by the State of Wisconsin and one owned by Iron County. There are 60 campsites managed by DNR on state-owned lands and one campground owned and managed by Iron County. In 1970 there were 24 private resorts on the Flowage, many of which have been subdivided into individual private properties in the past decade. Currently there are only six active private resorts on the Turtle-Flambeau Flowage.

Historical Perspectives on the Fishery

Upon impoundment in 1926 the fish community of the Turtle-Flambeau Flowage consisted of species native to the Flambeau River system, including walleye, northern pike, and muskellunge. Supplemental stocking of these species began in 1937. During the 1940s and 50s water level fluctuated dramatically, dropping so low on three occasions that only the original stream channels and lake basins contained water. Such drastic fluctuations had an adverse effect on native fish populations. To compensate for losses, a variety of other species native to the region were stocked in the following decades.

The first comprehensive survey of the fishery was completed in 1975. That survey, aimed primarily at determining the actual density (number per acre) of adult walleyes, was the first of its type in northern Wisconsin. The survey yielded valuable information about game fish population density, angler origin and preferences, and angler catch and harvest. Walleye was the predominant game fish during the 1970s and early 80s. During the 1980s the smallmouth bass population began to increase, resulting in a high-quality fishery that has received regional and national attention. Comprehensive surveys completed in 1989, 1992, and 1997 furnished data that justified adoption of special harvest regulations for various species. Flowage walleyes were exempted from the statewide minimum size limit of 15 inches in 1990 because of slow growth rate. Trude Lake walleyes were exempted in 1994, also due to slow growth rate. In 1992, a 40-inch minimum length limit was established for muskellunge (including Trude Lake). In 1995, a 15-inch minimum length limit and two-fish daily bag limit were established for smallmouth bass (not including Trude Lake). Additional special regulations for panfish became effective in 1996, reducing the liberal statewide daily bag limit of 50 panfish to 10 panfish daily (all species combined) throughout the Flowage (including Trude Lake), with a 10-inch minimum length limit on black crappie.

The Turtle-Flambeau Flowage lies within the Ceded Territory, and the fishery is shared with Ojibwe tribal harvesters. Both Lac Du Flambeau and Bad River bands of Ojibwe harvested from the Flowage traditionally. The first modern-day tribal spearfishing harvest in Iron County occurred on the Turtle-Flambeau Flowage in 1985. Today, the Flowage supports approximately 25% of total walleye harvest in the Ceded Territory annually. Calculations to determine the total allowable catch are based upon actual walleye population estimates and other formulas that are conservatively designed to prevent overharvest by the combined efforts of tribal spearers and recreational anglers. Tribal harvest averaged 2,876 walleyes annually in the 1980s, 3,004 fish annually in the 1990s, and 1,853 walleyes annually since 2000. Annual tribal harvest has averaged only 3.6% of the estimated adult walleye population in any given year.

Aquatic Community Overview

Walleye are the most important and abundant game fish in the Turtle-Flambeau Flowage and Trude Lake. Walleye density was estimated at 4.8 to 5.8 adults per acre during 1989-1997, far exceeding the average of 3.8 per acre in northern Wisconsin populations sustained by natural reproduction.

Panfish are a very important part of the Turtle-Flambeau Flowage fishery. Due to a desirable level of predation by abundant walleye, panfish are not as numerous as in many other waters. Therefore, size structure of the primary panfish species – black crappie, yellow perch, bluegill and pumpkinseed – is exceptional. Past creel survey data revealed that over 90% of all panfish caught by anglers were kept. In order to prevent overharvest and distribute the harvest equitably, a reduced daily bag limit of 10 panfish (all species combined) became effective in 1996. Additionally, a 10-inch minimum length limit was placed on crappie in order to improve size structure and sustain angling quality.

Muskellunge are an important component of the fishery. In the last decade more than 10% of all Flowage anglers fished specifically for musky. During the 1997 creel survey, an estimated 1,357 musky were caught at a rate of 28 hours per fish (near the statewide average) – an increase over the estimated 1989 angler catch of only 494 musky. The average size of angler-caught muskellunge increased from 40.7 inches in 1989 to 42.0 inches in 1997 – far exceeding the statewide average of 37 inches. The 40-inch minimum length limit has been in effect since 1992, and it may have helped to improve size structure. The largest fish captured in DNR nets in the 1997 survey was 50.5 inches long. Past surveys have shown that natural reproduction and recruitment are insufficient to sustain a quality fishery. Therefore, fingerling muskellunge (10-12 inches long) have been stocked in the fall on numerous occasions, and since 2001 have been stocked every other year in Trude Lake (0.5 per acre) and the main body of the Flowage (2,500 fish unless a surplus in hatchery production allows more to be stocked).

Smallmouth bass became a major component of the fish community during the late 1980s. Flowage smallies are particularly robust in appearance (very heavy for their length). The high quality of these fish and their relatively high vulnerability to angling keeps the sport fishery thriving at times when angler catch rates of walleye decline during the “dog days” of summer. But we suspect bass population density is lower than most anglers realize. Our most recent estimate was that there was approximately one smallmouth bass for every five adult walleyes in the Flowage. This is not readily apparent to anglers because smallmouth bass usually are so much easier to catch than walleye.

Northern pike may be the second most abundant game fish in the Flowage. Our 1997 survey produced a population estimate of 2 adult pike per acre – possibly enough to adversely affect natural recruitment of young muskellunge via predation. Only 3% of the 2,925 pike captured in 1997 were longer than 23.0 inches. Poor size structure may be attributable to slower-than-average growth rate and high natural mortality by age six. The reason for this is not well understood. Fish that live longer than six years exhibit average growth rate, and they can achieve desirable sizes. The largest pike captured in 1997 was 36 inches long.

Since 2002 a total of 315 log fish shelters have been placed in the pelagic or open-water regions of the Flowage in order to replace submersed woody habitat that has deteriorated over time. This long-term project is expected to continue as a cooperative venture between the Department of Natural Resources and the Turtle-Flambeau Flowage Property Owners Association.

Developing a Vision for the Turtle-Flambeau Flowage Fishery

On July 8, 2005, DNR representatives Jeff Roth and Dave Neuswanger met with 54 stakeholders who were willing to volunteer their time to help develop a long-term vision for the fishery of the Turtle-Flambeau Flowage. Of the 37 participants who signed up to receive a copy of the final plan, 20 were local, 13 were non-local Wisconsin residents, and 4 were non-residents who fished the Flowage frequently. Objectives of the meeting were to prioritize species of interest, and then to identify for those species the relative importance of numbers versus size and catch versus harvest. Attention was then focused on identifying the desired conditions (goals and objectives) that appear in this plan. At this meeting, specific goals and objectives were developed for walleye, black crappie, muskellunge, and smallmouth bass by consensus of voting stakeholders in consultation with Jeff Roth, who served as technical advisor to the group on what was possible. However, no attention was given to methods for achieving goals and objectives (management strategies such as harvest regulations, fish stockings, and habitat preservation or enhancement). It was understood and agreed that professional fishery managers would select the most appropriate strategies once goals and objectives had been developed with input from stakeholders in light of what is known about statewide angler preference and the capacity of the Turtle-Flambeau Flowage to produce what is desired.

Detailed results of the visioning session appear in the Appendix (Tables A1 and A2). In summary, local stakeholders in the Turtle-Flambeau Flowage fishery ranked walleyes first among species of interest, and they were determined to maintain what most participants considered to be a very good walleye fishery. This emphasis on walleye is consistent with statewide angler priorities and ecosystem capabilities, so efforts to sustain good walleye fishing will continue to assume a prominent role in future management. It is interesting to note that several fishing guides characterized the walleye fishery as being as good as it has ever been, while some individual anglers were struggling to catch walleyes in ways and places where they had always caught them in the past. A potential explanation for this discrepancy may be that walleyes have become less oriented to classic structure like rock bars and points, and more oriented to weeds and near-shore woody cover. Not all anglers have adapted their fishing methods to these guide-perceived changes in walleye location over the past few years.

There was great enthusiasm for maintaining good fishing for panfish – particularly for yellow perch and black crappie, but also for bluegill. Approximately a third of all voting stakeholders exhibited a bias for size over numbers of panfish, and almost nobody felt that maximum sustainable harvest should be promoted at the expense of panfish size structure (Table A2). The current conservative regulation protecting panfish from overharvest (10 daily bag for all panfish and a 10-inch minimum length limit on crappie) seems consistent with angler desires for moderate numbers of larger-than-average panfish. DNR needs to refine methods for assessing panfish populations in order to determine if angler expectations are being met.

Musky fishing at the Flowage was of medium to high importance to three-quarters of participating stakeholders (Table A1). Participants exhibited a clear preference for size over numbers and had a strong catch-and-release tendency that suggests the Turtle-Flambeau Flowage should be managed as a trophy musky fishery. Because the Flowage musky fishery is totally dependent upon stocking, and stocked fish have demonstrated the capacity to grow to very large sizes, it should be possible to achieve trophy musky fishery objectives without compromising our ability to achieve objectives for other more important species.

Smallmouth bass generated a mixed reaction from participating stakeholders, though 71% characterized their interest in the smallmouth bass fishery as moderate or high (Table A1). Some participants who did not care for smallmouth bass initially feared that smallmouths ate or competed for food with walleyes to the detriment of the walleye population. Some of those fears were allayed after discussion about known interactions between these species. Subsequent goals and objectives were developed based upon a majority view that smallmouth bass probably have not adversely affected the walleye fishery in the Turtle-Flambeau Flowage (or many other places for that matter). A bias for size over number of smallmouths is reflected in the objectives, and management strategies should acknowledge the relatively strong tendency among a majority of Flowage stakeholders to catch and release smallmouth bass.

Northern pike were generally of low importance to the stakeholders who attended our visioning session (Table A1). Other species, such as bullhead and rock bass, generated little or no interest among participants.

THE PLAN

The following goals and objectives were developed with significant input from stakeholders in the fishery. We agree they are desirable and achievable. Stakeholders were not consulted about management strategies. Recommended strategies represent a local consensus agreement between Plan authors regarding actions necessary to achieve the goals and objectives.

GOAL 1: **WALLEYE:** A population of moderate to high density with a moderate proportion of quality-size fish

Objective 1.1: 4 to 8 adult walleye per acre in spring population estimates (Adult walleye are defined by DNR as all fish over 15 inches long and all smaller fish for which gender can be determined.)

Objective 1.2: Of all walleye 10 inches and longer captured by fyke netting in early spring, 30-50% should be 15 inches or longer (PSD = 30-50%).

Walleye Status and Management Strategies (Local DNR Recommendations):

Comprehensive surveys that allow us to estimate walleye population density, angler effort, and angler harvest were completed in 1989, 1992 and 1997. Walleye density in those years was consistently above average and within the range of Objective 1.1 at 4.8 to 5.8 adult fish per acre (Table 1). Angler effort was consistently 13-14 hours per acre. Angler harvest rate was 4-5 hours per fish, except in 1992 when walleye anglers fished 7.2 hours, on average, to harvest a walleye. (Walleye vulnerability to angling fluctuates with the availability of natural prey.) Walleye bag limits have varied from five fish in 1989 to two or three fish during the 1990s. The daily bag limit has been three since 2001. Estimated total exploitation rate has been highly variable but quite sustainable (9-26% annually); and the tribal harvest component of total exploitation rate has been relatively low (3-4%; Table 1).

Table 1. Estimated population density, angler effort and harvest during the open-water season, and total exploitation rate of walleye on the Turtle-Flambeau Flowage and Trude Lake (13,766 acres combined) during years when DNR conducted comprehensive surveys.

Survey Year	Adult Walleye Density (Number/Acre)	Walleye Angler Effort (Hours/Acre)	Walleye Angler Harvest Rate (Hours/Fish)	Total Exploitation Rate (% of Adult Walleyes Harvested by Anglers and Spearers Annually)
1989	5.8	13.4	4.8	16.0
1992	4.8	14.3	7.2	9.2*
1997	4.9	14.1	4.3	26.3*

* The tribal spearing component of exploitation rate was 3.5% in 1992 and 4.0% in 1997.

Despite the absence of a minimum length limit in this harvest-oriented fishery, walleye population size structure has been acceptable for many years. The proportion of all fish over 11 inches long in 1989, 1992, and 1997 that also were over 15 inches long was close to the desired 30-50% for Proportional Stock Density (#≥15” ÷ #≥10”) in Objective 1.2 (Table 2). The denominators of these proportions differ by one inch; but they are close enough to suggest that for many years walleye size structure has been within a range now identified as acceptable to Flowage anglers.

Comprehensive survey data from 1989, 1992, and 1997 raised concerns that the proportion of large walleye in the population may have been declining in the late 1990s. In 1997, the estimated density of walleye over 15 inches long (1.5/acre) and their proportion of the adult population (31%) were considerably lower than in 1989 or 1992 (Table 2). This was at least partially attributable to the recruitment of many young fish to the 11- to 13-inch range in 1997, which depressed the overall proportion of larger fish in the population; but the actual estimated number of fish over 15 inches was down also. Nevertheless, guides tell us currently that walleye fishing is better than ever, so we can only speculate on the current status of walleye size structure until we are able to perform a spring fyke-netting survey.

Table 2. Estimated numbers and within-year proportions (in parentheses) of various size groups of adult walleye in the Turtle-Flambeau Flowage and Trude Lake (13,766 acres combined) during years when DNR conducted mark-recapture population estimates.

Parameter	1989	1992	1997
No. 11.0 – 12.9"	16,462 (21%)	12,015 (18%)	28,133 (42%)
No. 13.0 – 14.9"	24,053 (30%)	20,579 (31%)	17,957 (27%)
No. 15.0 – 16.9"	24,293 (30%)	19,277 (29%)	11,107 (17%)
No. 17.0 – 18.9"	12,066 (15%)	8,648 (13%)	6,584 (10%)
No. ≥ 19.0"	3,037 (4%)	5,347 (8%)	3,059 (5%)
Total No. ≥ 11"	**79,911**	**65,866**	**66,840**
No./Acre ≥ 11"	**5.8**	**4.8**	**4.9**
No./Acre ≥ 15"	**2.9**	**2.4**	**1.5**
# ≥ 15" ÷ # ≥ 11"	**49%**	**51%**	**31%**

Walleye populations can change dramatically over time due primarily to variations in recruitment and harvest. Increased frequency of monitoring is necessary in order to determine whether our walleye population objectives are being met. Because of the size and importance of the Turtle-Flambeau Flowage, we propose to begin gathering catch-rate and size-structure data by early spring fyke-netting in alternate (odd) years in order to closely track the walleye population. With our assistance, WDNR's Treaty Assessment unit plans to conduct a comprehensive survey (actual mark-recapture walleye population estimate) in spring of 2009.

We experimented with the recommended new approach to monitoring the walleye population in spring of 2006 in the Baraboo and Lake-of-the-Falls regions of the Flowage. In those surveys, walleye PSD was 36 percent – well within the desirable range identified in Objective 1.2. If future monitoring should reveal that Objective 1.2 cannot be met on a consistent basis because of excessive size-selective harvest or other factors, we will consider more restrictive harvest regulations. However, we are aware that very few Flowage stakeholders are interested in trophy walleye fishing. Instead, they prefer a balance between size and number, and they have a distinct bias toward number (Appendix Table A2).

Because natural recruitment has been consistently high, walleye stocking should not be necessary. And we will maintain a "no length limit" approach toward managing walleye as long as Management Plan objectives are met during most survey years.

GOAL 2: **YELLOW PERCH:** A population of low to moderate density with a moderate to high proportion of preferred-size fish.

Objective 2.1: Fishery biologists currently lack a well-accepted method for assessing yellow perch abundance, but as time permits we will compare the utility of early spring fyke netting versus late spring fyke netting on the Turtle-Flambeau Flowage. We will update this objective with appropriate parameter values if and when we develop confidence in a particular method of assessment.

Objective 2.2: Of all yellow perch 5 inches and longer captured in early or late spring fyke nets, 15-25% should be 10 inches or longer (RSD-10 = 15-25%).

Yellow Perch Status and Management Strategies (Local DNR Recommendations):

We lack confidence in the rare existing data on yellow perch in the Turtle-Flambeau Flowage. A survey was conducted by using large fyke nets (86 net-nights) in mid June of 1995 in order to assess capture rate and size structure of panfish populations prior to implementation of the ten-daily bag limit in 1997. At that time, capture rate of yellow perch ≥ 5 inches was very low – only 0.6 per net-night. Of those perch, the proportion ≥ 10 inches (RSD-10) was 16% – well within the desirable range identified in Objective 2.2. In late spring of 2006, we sought to evaluate the impact of special panfish harvest regulations that went into effect in 1997. In 75 net-nights of effort, perch RSD-10 was again 16%, and fyke-net capture rate was 1.5 fish per net-night – somewhat higher than in 1995. But we cannot conclude anything about yellow perch population status or changes until we develop more experience and confidence in our methods of assessment. Therefore, we propose to continue capturing and processing yellow perch in late spring fyke nets in alternate (even) years, comparing those results with early spring fyknet results in alternate (odd) years if and when we have enough time to collect such data, until we learn which method will allow us to confidently assess yellow perch abundance and size structure in the Turtle-Flambeau Flowage.

Because yellow perch are the most preferred prey of walleye, our ability to sustain a "low to moderate density" of perch, as desired by local stakeholders, may be somewhat limited by the higher-priority interest in maintaining a moderate- to high-density walleye population. But other strategies, such as reducing the number of northern pike and retaining conservative panfish harvest regulations, could help to increase adult perch density over time.

GOAL 3: **BLACK CRAPPIE:** A population of moderate density with a moderate to high proportion of preferred-size fish and a low to moderate proportion of memorable-size fish.

Objective 3.1: Fishery biologists currently lack a well-accepted method for assessing black crappie abundance in northern lakes, but we will examine the utility of late spring fyke netting on the Turtle-Flambeau Flowage. We will update this objective with appropriate parameter values if and when we develop confidence in that method of assessment.

Objective 3.2: Of all black crappie 5 inches and longer captured by fyke netting in late spring, 40-60% should be 10 inches or longer (RSD-10 = 40-60%) and 10-20% should be 12 inches or longer (RSD-12 = 10-20%).

Black Crappie Status and Management Strategies (Local DNR Recommendations):

We lack confidence in the rare existing data on black crappie in the Turtle-Flambeau Flowage. A survey was conducted by using large fyke nets (86 net-nights) in mid June of 1995 (after the crappie spawning season) in order to assess capture rate and size structure of panfish populations prior to implementation of the ten-daily bag limit and the 10-inch minimum length limit for crappie in 1997. Of the 207 black crappie ≥ 5 inches captured during that survey, the proportion ≥ 10 inches (RSD-10) was 46%, and the proportion ≥ 12 inches (RSD-12) was 18% – well within the desirable range identified in Objective 3.2. In late spring of 2006, we sought to evaluate the impact of special panfish harvest regulations that went into effect in 1997. In 75 net-nights of effort, black crappie capture rate and an RSD-10 of 52% were similar to 1995 survey results, but RSD-12 was only 9%. We cannot conclude anything about black crappie population status or changes until we develop more experience and confidence in our method of assessment. Therefore, we propose to capture and process black crappie in late spring fyke nets in alternate (even) years until we learn if this method will allow us to confidently assess crappie abundance and size structure in the Turtle-Flambeau Flowage.

Installation of 315 log fish shelters since 2002 has been done in order to replace submersed woody habitat that has deteriorated over time. This activity has been very popular, partly because project partners enjoy fishing near the shelters, especially for crappie. If shelter construction and placement does not lead to over-harvest of crappie, this long-term project should continue as a cooperative venture between the Department of Natural Resources and the Turtle-Flambeau Flowage Property Owners Association.

GOAL 4: **MUSKELLUNGE:** A population of low to moderate density with a moderate proportion of memorable-size fish

Objective 4.1: 0.1 to 0.2 adult muskellunge per acre in population estimates

Objective 4.2: Of all muskellunge 20 inches and longer captured by fyke netting in early spring, 20-30% should be 42 inches or longer (RSD-42 = 20-30%).

Muskellunge Status and Management Strategies (Local DNR Recommendations):

An attempt to estimate adult muskellunge population density was made during the 1997 comprehensive survey (a monumental task on a body of water this large), but adverse weather prohibited completion. As a result, actual musky population density is unknown. However, the 1997 fyke netting effort provided meaningful data on muskellunge size distribution. In that survey, 296 muskellunge were captured, of which 19% were over 40 inches and 3% were over 42 inches long – far below the 20-30% range identified as desirable in Objective 4.2.

Angler creel survey results suggest that muskellunge population density may have increased between 1989 and 1997. In 1989, an estimated 494 muskies were caught at a rate of 71 hours per fish by anglers fishing specifically for muskellunge. In 1997, an estimated 1,357 muskies were caught at a specific catch rate of 28 hours per fish – close to the Wisconsin statewide average of 25 hours per fish. We are uncertain if this reflects a real increase in musky population growth, or just better fishing conditions in 1997 than in 1989. But it seems likely that numbers actually increased, possibly in response to the increase in minimum length limit from 34 inches to 40 inches beginning in 1992.

The average size of muskellunge reported caught by anglers increased from 40.7 inches in 1989 to 42.0 inches in 1997. Improvements in angler catch rate and an increase in the average size of muskellunge caught by anglers between 1989 and 1997 suggest that we should continue stocking 10- to 12-inch muskellunge fingerlings in alternate years in the fall at a rate of 0.5 per acre (391 fish) in Trude Lake; and we should continue stocking 2,500 fish (more in times of hatchery surplus) in the Flowage itself in alternate years.

Table A2 indicates a strong preference among local stakeholders for size over number, and for catch-and-release versus harvest with respect to muskellunge. In a lake that clearly is capable of producing trophy-sized fish (50 inches and longer), we believe musky anglers will support our ambitious size structure objective (4.2) and whatever regulation(s) may be necessary to increase the proportion of memorable-size fish (those over 42 inches long) from 3% (1997) to 20-30%. We do not have a recent estimate of muskellunge population size structure; but we know it will require several years for this population to respond to changes in regulations. Therefore, we propose to maintain the 40-inch minimum length limit until the next scheduled comprehensive survey is completed in 2009. At that time, if Objective 4.2 has not been met under the 40-inch minimum length limit, we should seriously consider increasing the minimum length limit to 45 or 50 inches.

GOAL 5: **SMALLMOUTH BASS:** A population of moderate density with a moderate proportion of memorable-size fish.

Objective 5.1: Electrofishing capture rates for 7-inch and longer smallmouth bass of 15-30 per hour during the bass spawning season.

Objective 5.2: Of all smallmouth bass 7 inches and longer captured by electrofishing during the bass spawning season, 10-15% should be 17 inches or longer (RSD-17 = 10-15%).

Smallmouth Bass Status and Management Strategies (Local DNR Recommendations):

Anglers caught (not necessarily kept) an estimated 5,200 smallmouth bass at an average length of 12.0 inches during our 1989 creel survey. In 1995 the minimum length limit on black bass increased from 12 to 15 inches, and the daily bag limit decreased from five to two on the Flowage proper (not including Trude Lake). In 1997 anglers caught an estimated 5,600 bass at an average length of nearly 16.0 inches. The increase in length limit combined with a growing "catch and release" ethic among bass anglers may have helped to improve smallmouth bass size structure in the Turtle-Flambeau Flowage.

Our spring 1997 electrofishing capture rate for stock-size smallmouth bass (fish $\geq$ 7 inches long) was only 6 per hour (15-30 per hour desired); and of the 199 fish captured $\geq$ 7 inches long, only 8% were of memorable size – 17 inches and longer (10-15% desired). These parameters fall far short of Objectives 5.1 and 5.2, but it is important to acknowledge that not all sampling in 1997 was conducted during the bass spawning season; therefore smallmouth bass (particularly mature adults) may have been offshore and invulnerable to capture by electrofishing on some survey dates. We must start sampling bass during a three-week window in time when bass are preparing to spawn, spawning, or in an immediate post-spawn behavioral pattern in shallow water in order to learn the actual status of the purportedly expanding population. Under our new baseline monitoring protocol, we will begin accurate assessments of the smallmouth bass population during late spring electrofishing in 2008 and in alternate (even) years thereafter.

Many visioning session participants came to the meeting believing that smallmouth bass are responsible for repressing walleye production. Fishery researchers have found no significant negative interactions between walleye and smallmouth bass. Walleye occupy a wide variety of habitat types and prefer yellow perch, white suckers and other fish as prey. Smallmouth bass feed heavily upon crayfish that live in the abundant rocky and woody substrates. Discussion seemed to convince most participants that walleye and smallmouth bass can coexist very well.

Moderation in the selection of a goal and objectives for the smallmouth bass fishery reflects the fact that local and statewide anglers alike place walleye at the top of their priority list. Still, if our smallmouth bass goal and objectives are met, we believe the Turtle-Flambeau Flowage will be, if it is not already, one of the finest smallmouth bass fisheries in the country. It is imperative that we conduct a meaningful survey as soon as possible in order to establish a true baseline for the relative abundance and size structure of smallmouth bass in the Flowage. If Objectives 5.1 and 5.2 are met under current conditions and regulations, then we see no reason to change management strategies, other than to include Trude Lake under the 15-inch minimum length limit and two-daily bag limit for the sake of consistency throughout the Flowage. But if recruitment has increased the relative abundance of smallmouth bass beyond the range stated in Objective 5.1, or if size structure has suffered from excessive recruitment of young fish or angler over-harvest of large fish, then we reserve the option to recommend a slot length limit of 14 to 18 inches for smallmouth bass. Such a regulation would completely protect all bass between 14 and 18 inches long, allowing harvest of three fish daily, only one of which could be 18 inches or longer. Meaningful survey data beginning in 2008 should help us to decide the best approach.

GOAL 6: **BLUEGILL:** A population of low to moderate density with a moderate to high proportion of preferred-size fish.

Objective 6.1: Fishery biologists currently lack a well-accepted method for assessing bluegill abundance in northern lakes, but we will compare the utility of electrofishing versus fyke netting in late spring on the Turtle-Flambeau Flowage. We will update this objective with appropriate parameter values if and when we develop confidence in a particular method of assessment.

Objective 6.2: Of all bluegill 3 inches and longer captured by electrofishing or fyke netting in late spring, 10-30% should be 8 inches or longer (RSD-8 = 10-30%).

Bluegill Status and Management Strategies (Local DNR Recommendations):

We lack confidence in the rare existing data on bluegill in the Turtle-Flambeau Flowage. A survey was conducted by using large fyke nets (86 net-nights) in mid June of 1995 in order to assess capture rate and size structure of panfish populations prior to implementation of the ten-daily bag limit in 1996. At that time, capture rate of bluegill ≥ 3 inches was very low – only 0.4 per net-night. Of those bluegill, the proportion ≥ 8 inches (RSD-8) was 53% – far exceeding the desirable range identified in Objective 6.2 because of low recruitment and very fast growth rate. Bluegill attained lengths of 8 inches in only six years. Fast growth rate and the appearance of bluegill up to 10.6 inches long revealed the capacity of the Flowage to produce bluegill of preferred and even memorable size.

In late spring of 2006, we sought to evaluate the impact of special panfish harvest regulations that went into effect in 1996. In 75 net-nights of effort, we captured bluegill ≥ 3 inches at a rate of 7.5 per net-night – a 16-fold increase over the trace number captured in 1995. As might be expected with an obvious increase in recruitment, bluegill RSD-8 decreased from 53% in 1995 to 26% in 2006 – outstanding bluegill size structure near the upper limit of the ambitious range of desirability identified in Objective 6.2. Capture of an 11.2-inch bluegill in 2006 continues to demonstrate the ability of Flowage bluegill to achieve exceptionally large size; and the average 8-inch bluegill in 2006 had achieved that length in only five years, as opposed to six years in our 1995 sample. We are uncertain what role a decade of special panfish regulations has played in improving the bluegill population, but we are encouraged by these results to continue the current conservative panfish harvest strategy.

We are uncertain that a bluegill RSD-8 of 10-30% is realistic if bluegill population density continues to trend toward the "moderate" end of the spectrum, but we will maintain that objective unless future data consistently suggest that such outstanding size structure cannot be maintained at anything other than low density. We propose to capture and process bluegill in late spring fyke nets and late spring electrofishing samples in alternate (even) years until we learn which method ultimately will be best in allowing us to confidently track bluegill abundance and size structure.

Pumpkinseed was not identified as a species of particular interest at the 7/8/05 visioning session, but "seeds" frequently are caught and harvested by anglers fishing for bluegill or sunfish in general. Our fyke-netting surveys revealed a 7-fold increase in pumpkinseed capture rate over the past decade. In late spring of 2006 we captured 10.4 pumpkinseed ≥ 3 inches per net-night; and RSD-7 was an impressive 14%.

GOAL 7: **A DIVERSE NATIVE FISH COMMUNITY** that fluctuates in species composition but generally experiences no net loss of native fish species and provides adequate forage for sport fish populations.

Objective 7.1: No net loss of native fish species as documented principally at index stations during alternate (even) year electrofishing surveys in late spring.

Objective 7.2: Adequate forage, as reflected by satisfactory growth rates and condition factors of sport fish populations managed under Goals 1-6.

General Ecosystem Management Strategies (Local DNR Recommendations):

A diverse and stable forage base comprised of suitable-size prey is vital to maintaining sport fish populations of desired density and size structure. In the Turtle-Flambeau Flowage, white suckers are vitally important as prey for game fish. A variety of minnow species are important also. Since 1983, the Flowage has served as a source of sucker eggs used to produce fry for consumption by young walleye and musky reared at the Governor Thompson State Fish Hatchery in Spooner and the Arthur Oehmke State Fish Hatchery inWoodruff. Concerns about the forage base of the Flowage prompted a reduction in sucker egg collection from 1,000 quarts annually (since 1983) to 500 quarts annually beginning in 2004. Also, hatchery personnel have begun to assist in gathering data that will enable us to track whether the annual collection of sucker eggs is having any significant impact on the Flowage sucker population.

Lake sturgeon have been known to inhabit the Turtle-Flambeau Flowage since its creation in 1926. Recently we became concerned about the apparent lack of natural reproduction and recruitment of lake sturgeon. In gill-netting surveys conducted during the early 1990s, we captured only large, old fish. This prompted us to initiate studies to learn more about this unique native fish. Radio telemetry was used to gain insight into spawning locations and annual movement patterns. We discovered that the Manitowish River is an important migration route and spawning site destination for lake sturgeon that reside in the Turtle-Flambeau Flowage most of the year.

After the primary lake sturgeon spawning site was identified on the Manitowish River, we began to study habitat conditions at that site in order to determine what deficiencies might be limiting reproductive success. Data suggest that water velocity and water depth (regulated by the Rest Lake dam upstream) may be unsuitable for spawning sturgeon. Modification to the upstream flow regime is being proposed to provide suitable habitat conditions during the lake sturgeon spawning and nursery period. As an interim measure (until natural reproduction can be re-established), we have been obtaining and fertilizing eggs from adult fish at the Manitowish River spawning site and below the Flambeau Dam in the North Fork of the Flambeau River. Sturgeon eggs have been hatched and fingerlings reared at the Wild Rose State Fish Hatchery. We have been successful in stocking the Flowage on three occasions in the past 15 years. A total of 152,578 fry and 56,946 large fall fingerling lake sturgeon were stocked in 1994, 1998, and 2005. During recent gill netting surveys we have captured many of these fish, indicating some degree of stocking success. We are determined to continue efforts to improve river spawning habitat, rehabilitate the lake sturgeon population, and restore a special lake sturgeon fishery to this ecosystem.

Introduction of invasive exotic species should be discouraged by the Lake Association via their newsletter and appropriate signing at resorts and public access areas. Support for good shoreland management would help to control nutrient levels and prevent excessive growth of aquatic plants. Diligence in maintaining wild shorelines and wide buffer strips between managed lawns and the lake will be rewarded with the quality fishery envisioned in this plan. The less phosphorus and nitrogen that reaches the lake, the more favorable conditions will be for maintenance of a fish community dominated by walleye. Wild shorelines can exist on well-managed private properties as well as public lands. But the more undeveloped land that can be purchased and placed into public ownership, the greater the likelihood that the Turtle-Flambeau Flowage will remain a special place for our children's children.

Summary of Local DNR Recommendations and Action Items

- We propose to begin gathering catch-rate and size-structure data by early spring fyke-netting in alternate (odd) years in order to closely track the **walleye** population. With our assistance, WDNR's Treaty Assessment unit plans to conduct a comprehensive survey (actual mark-recapture walleye population estimate) in spring of 2009. Because natural recruitment has been consistently high, walleye stocking should not be necessary. And we will maintain a "no length limit" approach toward managing walleye as long as Management Plan objectives are met during most survey years.

- We propose to continue capturing and processing **yellow perch** in late spring fyke nets in alternate (even) years, comparing those results with early spring fyknet results in alternate (odd) years if and when we have enough time to collect such data, until we learn which method will allow us to confidently assess yellow perch abundance and size structure.

- We propose to capture and process **black crappie** in late spring fyke nets in alternate (even) years until we learn if this method will allow us to confidently assess crappie abundance and size structure in the Turtle-Flambeau Flowage. If log fish shelter construction and placement does not lead to over-harvest of crappie, this long-term project should continue as a cooperative venture between the DNR and the Flowage Property Owners Association.

- We propose to continue stocking 10- to 12-inch **muskellunge** fingerlings in alternate years in the fall at a rate of 0.5 per acre (391 fish) in Trude Lake; and we propose to continue stocking 2,500 fish (more in times of hatchery surplus) in the Flowage itself in alternate years. We also propose to maintain the 40-inch minimum length limit until the next comprehensive survey is completed in 2009. If Objective 4.2 has not been met under the 40-inch minimum length limit, we should consider increasing the minimum length limit to 45 or 50 inches.

- Under our new baseline monitoring protocol, we will begin accurate assessments of the **smallmouth bass** population during late spring electrofishing in 2008 and in alternate (even) years thereafter. If Objectives 5.1 and 5.2 are met under current conditions and regulations, then we see no reason to change management strategies, other than to include Trude Lake under the 15-inch minimum length limit and two-daily bag limit for the sake of consistency throughout the Flowage. But if recruitment has increased the relative abundance of smallmouth bass beyond the range stated in Objective 5.1, or if size structure has suffered from excessive recruitment of young fish or angler over-harvest of large fish, then we reserve the option to recommend a slot length limit of 14 to 18 inches for smallmouth bass.

- We propose to capture and process **bluegill** in late spring fyke nets and late spring electrofishing samples in alternate (even) years until we learn which method ultimately will be best in allowing us to confidently track bluegill abundance and size structure.

- We are uncertain what role a decade of special **panfish** regulations has played in improving the bluegill population and maintaining decent perch and crappie populations, but we are encouraged by initial results to continue the current conservative panfish harvest strategy.

- We propose to continue harvesting no more than 500 quarts of **white sucker** eggs annually for purposes of feeding walleye and muskellunge fingerlings at DNR hatcheries.

- We propose to continue efforts to improve river spawning habitat, rehabilitate the lake sturgeon population, and restore a special **lake sturgeon** fishery to this ecosystem.

APPENDIX

Results of Visioning Session for Stakeholders in the Fishery of the Turtle-Flambeau Flowage in Iron County, Wisconsin

Date: July 8, 2005
Time: 6:00 p.m. to 10:00 p.m.
Place: Community Center in Mercer, Wisconsin
Facilitator: Dave Neuswanger, Fisheries Supervisor, Upper Chippewa Basin, WDNR
Technical Advisor: Jeff Roth, Senior Fisheries Biologist, Iron/Ashland counties, WDNR
Profile of 54 Participants:

Lakeside Landowners – 37
Area Anglers – 15
Fishing Guides – 6
Business Owners – 2
Others – 1 Conservation Congress board member

Table A1. Levels of sport fishing interest among visioning session participants in Turtle-Flambeau Flowage fish species nominated for consideration.

Fish Species Nominated	Level of Participant Fishing Interest			
	High	Medium	Low	None
Walleye	51	3	0	0
Yellow Perch	34	10	3	0
Black Crappie	32	18	4	0
Muskellunge	20	17	13	0
Smallmouth Bass	15	22	11	4
Bluegill	15	18	15	0
Northern Pike	3	8	30	9

Table A2. Preferences for numbers versus size and catch versus harvest among visioning session participants for fish species perceived to be most important at Turtle-Flambeau Flowage.

Important Fish Species	Preference for Numbers versus Size			Preference for Catch-and-Release versus Harvest		
	Emphasis on Number over Size	Prefer Balance	Emphasis on Size over Number	Emphasis on Catch and Release	Prefer Balance	Emphasis on Maximum Sustainable Harvest
Walleye	20	21	2	1	40	2
Yellow Perch	3	28	12	1	41	0
Black Crappie	1	25	13	1	35	0
Muskellunge	0	8	23	29	6	1
Smallmouth Bass	2	21	11	20	11	4
Bluegill	1	21	11	5	29	1
Northern Pike	0	4	29	5	20	5