

Evaluation of Present and Historical Water Quality of the Turtle Flambeau Flowage and
Trude Lake near Mercer, Iron County, Wisconsin

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Final Report

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Owner's Association

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Project Area

The Turtle Flambeau Flowage (TFF) and Trude Lake have been described as one of the “crown jewels” of Wisconsin. Together, the two waterbodies and their adjacent shorelands make up the Turtle Flambeau Scenic Waters Area, a designated State Scenic Waters Area located in Iron County between the communities of Mercer, Park Falls, and Butternut. With 95% of its shores owned by the state, this Scenic Waters Area attracts visitors from throughout the Midwest and beyond. The TFF was created in 1926 when the Chippewa and Flambeau Improvement Company built a dam on the Flambeau River downstream from its confluence with the Turtle River. The dam flooded 16 natural lakes and forms an impoundment of 13,545 acres. The state acquired the Flowage in 1990, including shorelands along Trude Lake. Trude Lake is connected to the TFF and is managed as part of the Scenic Waters Area. State ownership now comprises over 36,000 acres including 114 miles of shoreline and 195 islands. The total surface area of the TFF and Trude Lake (TFFTL) is 14,229 acres.

There are 60 remote campsites on the Flowage including four group campsites. The state management plan for the Scenic Waters Area has a goal to “implement management practices which will perpetuate the natural character of the Flowage’s shoreline”.

The Iron County Land Use Plan states that Iron County is 60% forest cover. The County is within two major watersheds, Lake Superior and Upper Chippewa. The TFFTL lies within the Flambeau Flowage Watershed (247 sq. mi.) in the Upper Chippewa Basin. 660 square miles of land drains to the TFFTL when you include the tributary Bear and Manitowish River watersheds. Tributaries to the Flowage begin in Vilas and Iron Counties.

The Turtle Flambeau Flowage and Trude Lake Property Owners’ Association (TFF-TL POA) was formed in 1996 and currently has 131 landowner members, and 18 non-voting “friends”. The mission of the association is to “maintain, protect and enhance the quality of the flowage and its surroundings for the collective interest of members and the general public”.

Project Goals

While the TFFTL is a renowned tourist destination in the region, the ecological condition and health of its waters have not been fully documented. Like many northern lakes, establishing baseline data and developing preventative management goals are the keys to future water body health. WDNR Upper Chippewa Basin staff cites potential changes in water levels for reservoirs as an increasing regional problem, particularly considering climate change predictions for more variable precipitation in the future (T. Aartila, WDNR, Personal Communication, 2008). Climate change predictions for this region suggest that large surface area, shallow lakes like the TFFTL may experience significant impacts on water

quality/quantity and fisheries as average annual temperatures and precipitation levels fluctuate (J. Magnuson, University of Wisconsin, Personal Communication, 2008). Likely impacts of future climate change on lakes include: increased duration of summer lake stratification, increased release of nutrients and contaminants from bottom sediments as waters warm, increased level of summer algae blooms, and potential decline in cool water species such as walleye and increase in warm water species such as smallmouth bass and bluegill (Union for Concerned Scientists, 2008). This suggests that management goals should consider a changing climate as a factor in long term lake health.

The TFFTL remains Wisconsin's only large flowage in public ownership that is not heavily infested with invasive species. Travel corridors and public access suggests that without specific education and prevention programs, it is only a matter of time before invasives are introduced (J. Vander Zanden, University of Wisconsin, Written Communication, 2008).

The project goals were to:

- Determine the current water quality and trophic status of the TFFTL and provide information describing its condition in comparison to historical and existing self-help data.
- Systematically evaluate the water-quality data being collected as part the WDNR Citizen Monitoring Program.
- Provide information on initial results and further study recommendations to Association members, TFFTL user groups, and the general public.
- Develop an assessment/appraisal report.

Objectives included:

- Collect data on water quality during 2009
- Analyze existing data for trends and identify further study needs
- Conduct a watershed land-use assessment
- Characterize aquatic plant and habitat conditions
- Compile results of above data and recommendations
- Produce press releases and newsletter articles on project goals and outcomes
- Provide on-line information through WDNR property website and/or association website
- Draft and submit an assessment/appraisal report which may justify the need for a future diagnostic feasibility study and future management plan

Results

Current Water Quality and Trophic Status

In 1998, the TFF-TL POA began monitoring water clarity with a secchi disc at one Flowage location, TFF-Deep Hole, in the Baraboo basin near Springstead landing. Between 1999 and 2005 two more TFF locations were added for monitoring water clarity, in the Townline and Bastine basins of the Flowage. In 2000, samples for chlorophyll a and total phosphorus were added at the TFF-Deep Hole location. Between 2005 and this study (2009), sampling was cut back to a single site at TFF Deep Hole, but included secchi depth, total phosphorus and

chlorophyll a . In 2008, the Association applied for funding to conduct a more thorough evaluation of water quality due to concerns such as phosphorus loading in tributaries, impacts of water clarity on loon populations, and future impacts of a changing climate. While the study would not be comprehensive enough to fully answer these questions, it was hoped to identify red flags and establish more in-depth baseline data. The Association continued its sampling at the Baraboo Deep Hole. The U.S. Geological Survey (USGS) conducted additional sampling at four sites on the Flowage (including Baraboo Deep Hole) and one site on Trude Lake. See Figure 1.

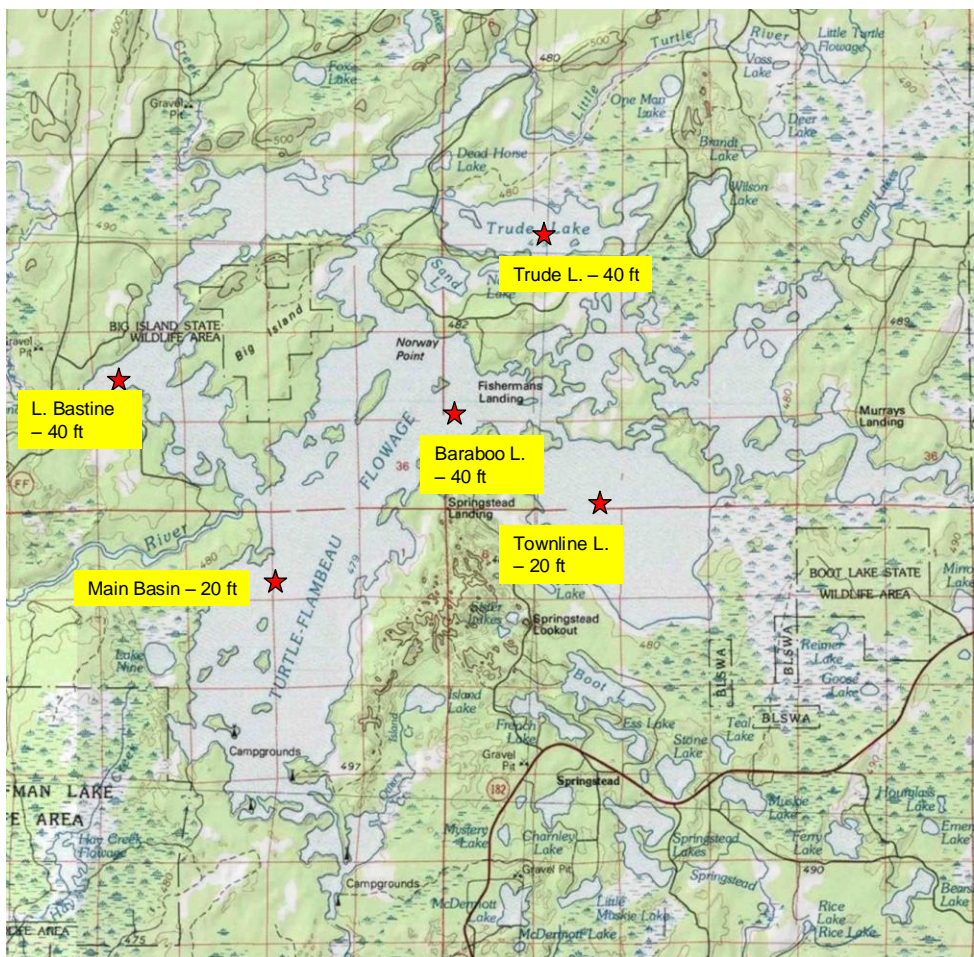


Figure 1. Monitoring sites on the Turtle-Flambeau Flowage.

Dr. Dale Robertson and Paul Reneau, from the USGS, led this effort. During 2009 they took secchi depth, total phosphorus, chlorophyll a, dissolved oxygen (DO), and temperature at the five locations, once per month, in April, June, July/Aug, Aug/Sept, and March.

Dissolved oxygen and temperature are charted for all locations in Figures 2-4.

Figure 2. Southwest Dissolved Oxygen and Temperature

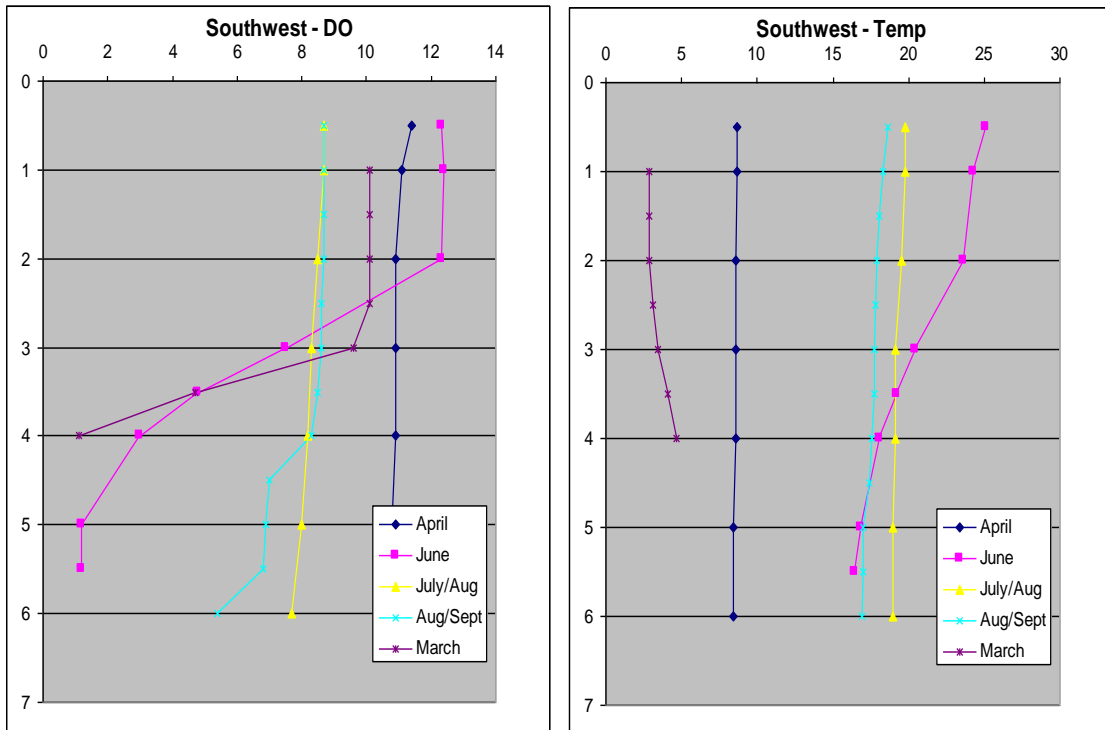


Figure 3. Turtle Flambeau- Dissolved Oxygen and Temperature, Trude Lake and Bastine

Turtle Flambeau – Dissolved Oxygen and Temperature

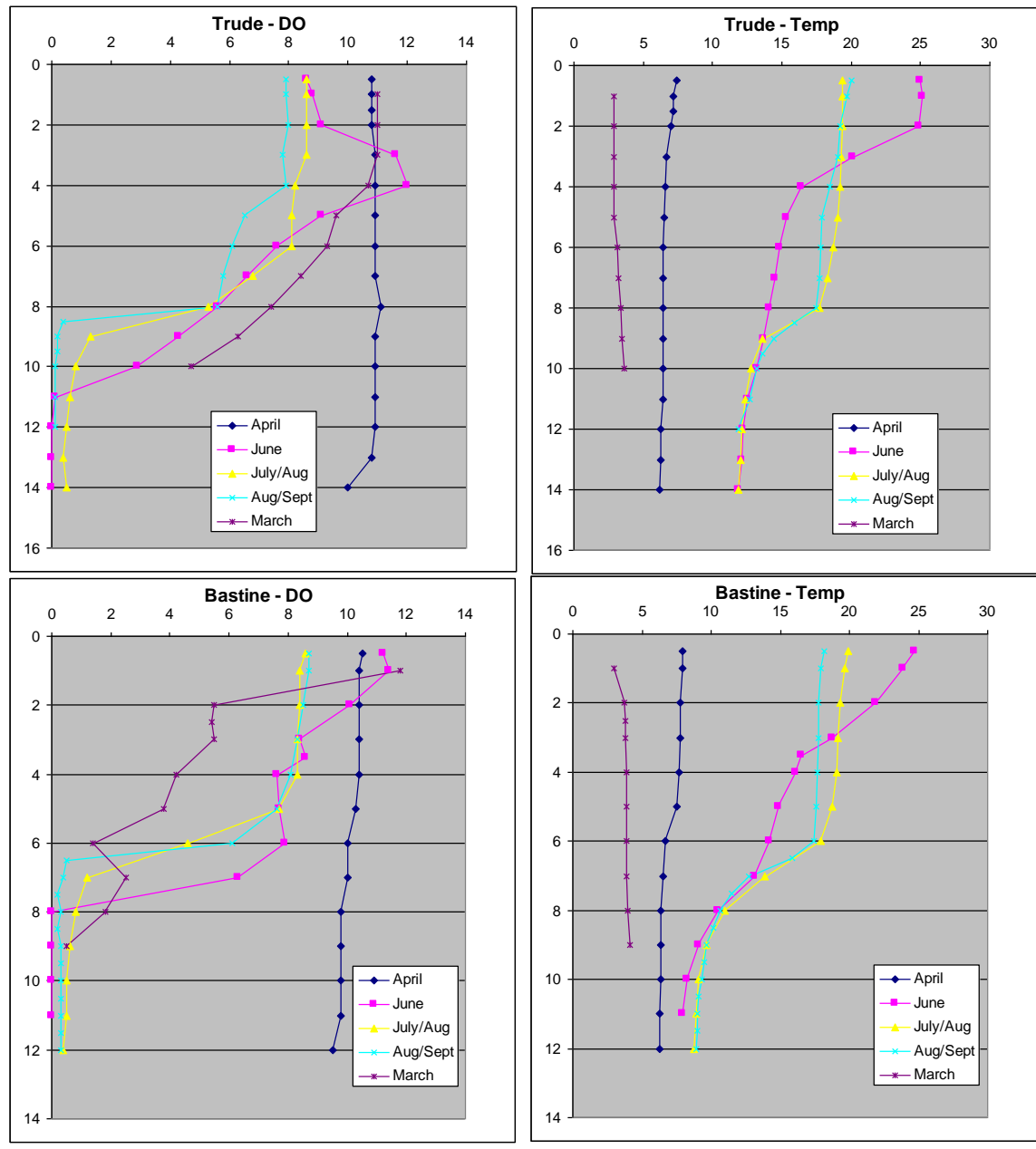
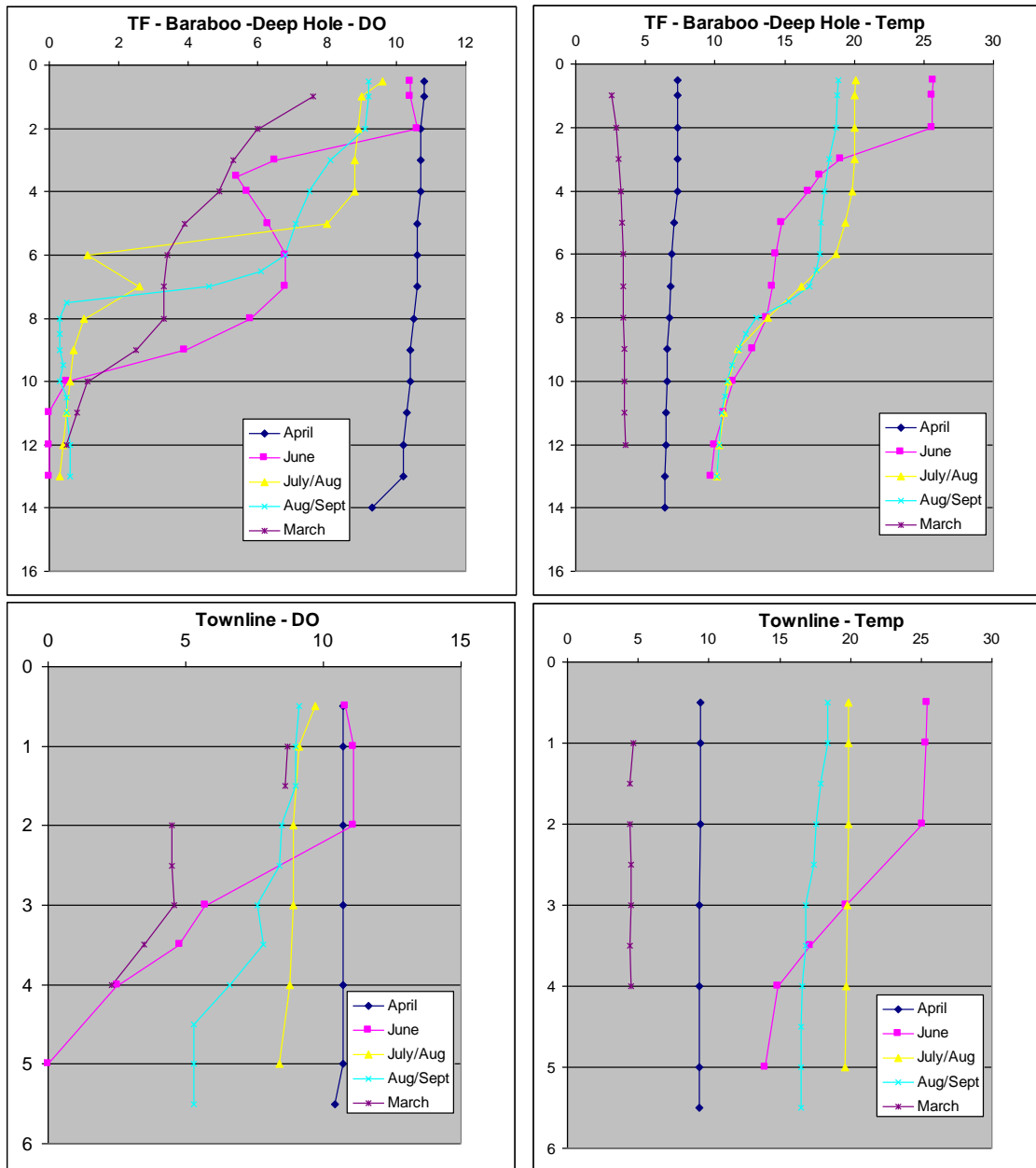


Figure 4. Turtle Flambeau - Dissolved Oxygen and Temperature, Baraboo /Townline

Turtle Flambeau – Dissolved Oxygen and Temperature



Overall, deeper Flowage areas and Trude Lake experience stronger thermal stratification. Townline is the shallowest and experienced more mixing during summer months. Dissolved

oxygen during the winter sampling indicated adequate concentrations to support fish populations.

Total phosphorus, chlorophyll a and secchi depth are shown on Figure 5.

Trude Lake had the best water quality with the lowest phosphorus, chlorophyll a, and highest secchi depths. Townline showed the poorest water quality with the highest phosphorus, chlorophyll a and shallowest secchi depth.

When these figures are combined with the long term association database the results are relatively consistent for Baraboo Deep Hole. The addition of four more basins shows the higher variability within the TFFTL system. See Figure 6.

Figure 5. Turtle Flambeau - Water Quality 2009

Turtle Flambeau – Water Quality 2009

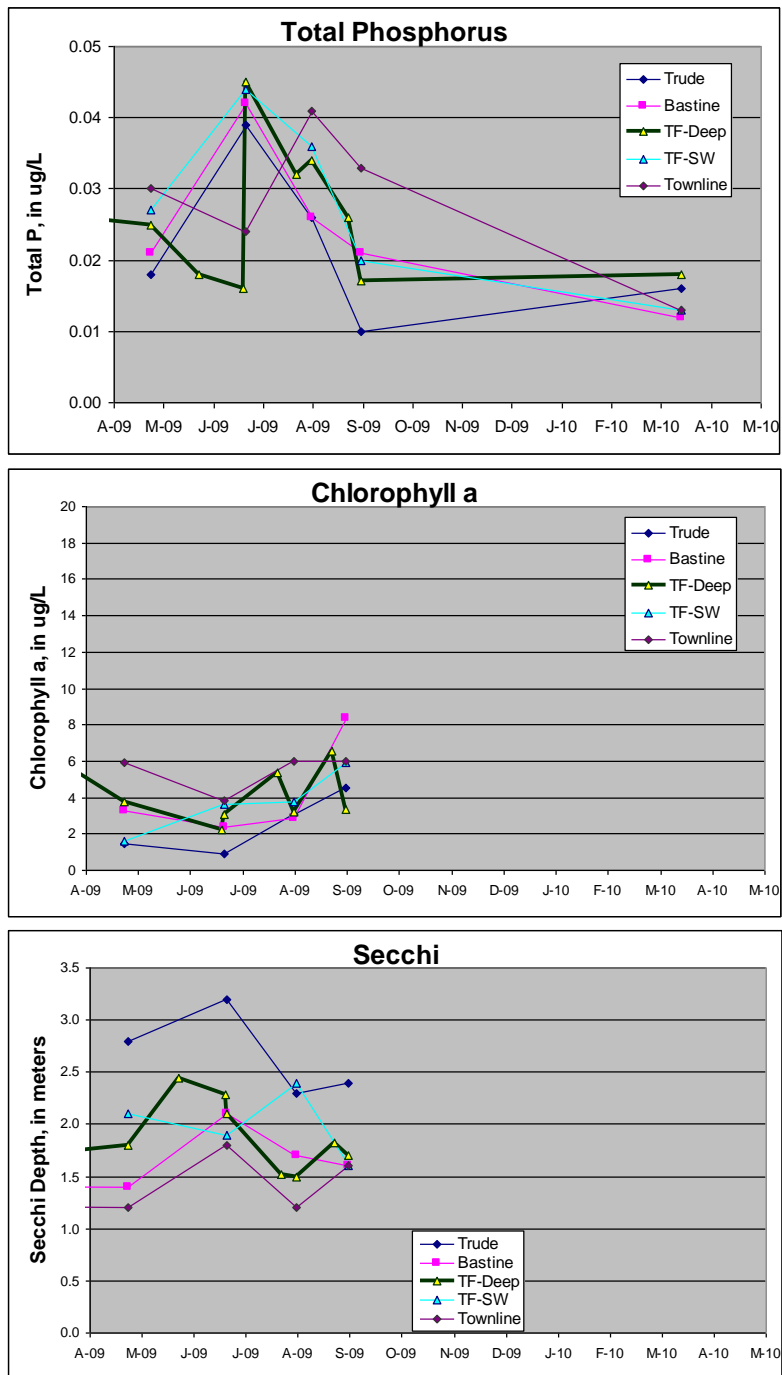
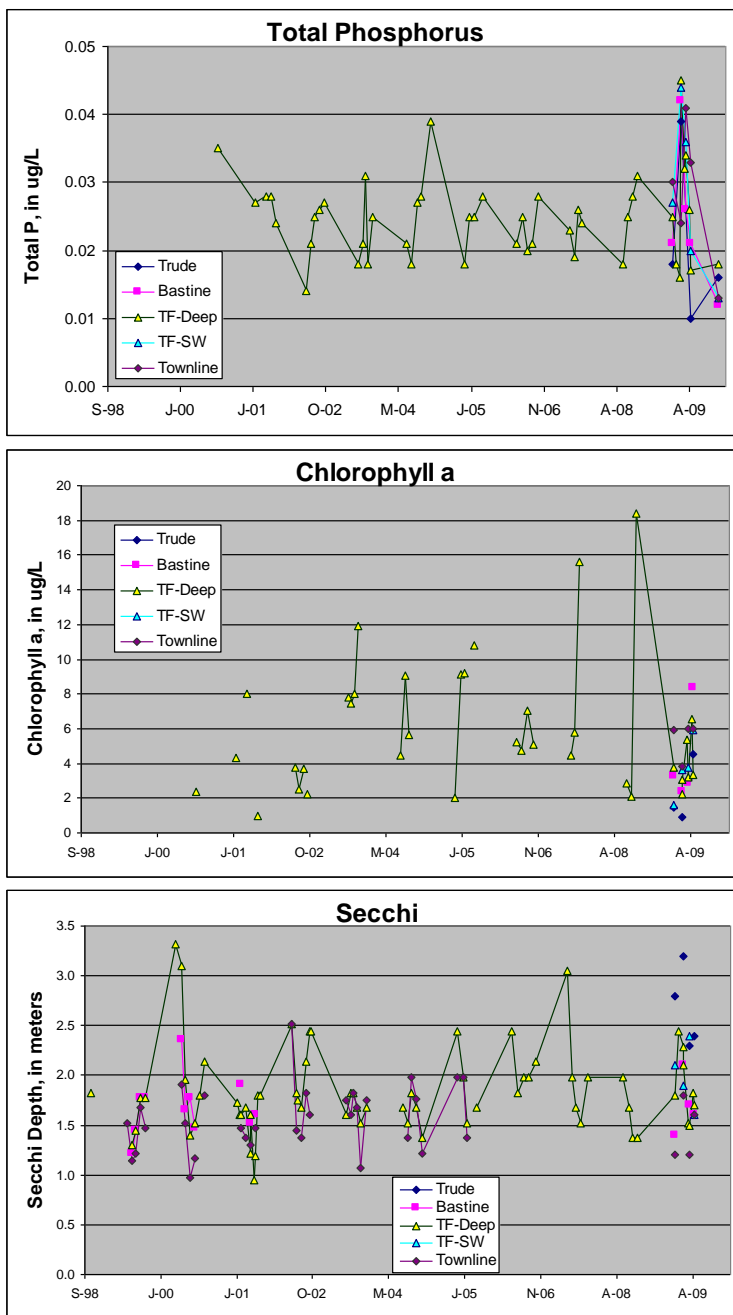


Figure 6. Turtle Flambeau - Water Quality Long Term

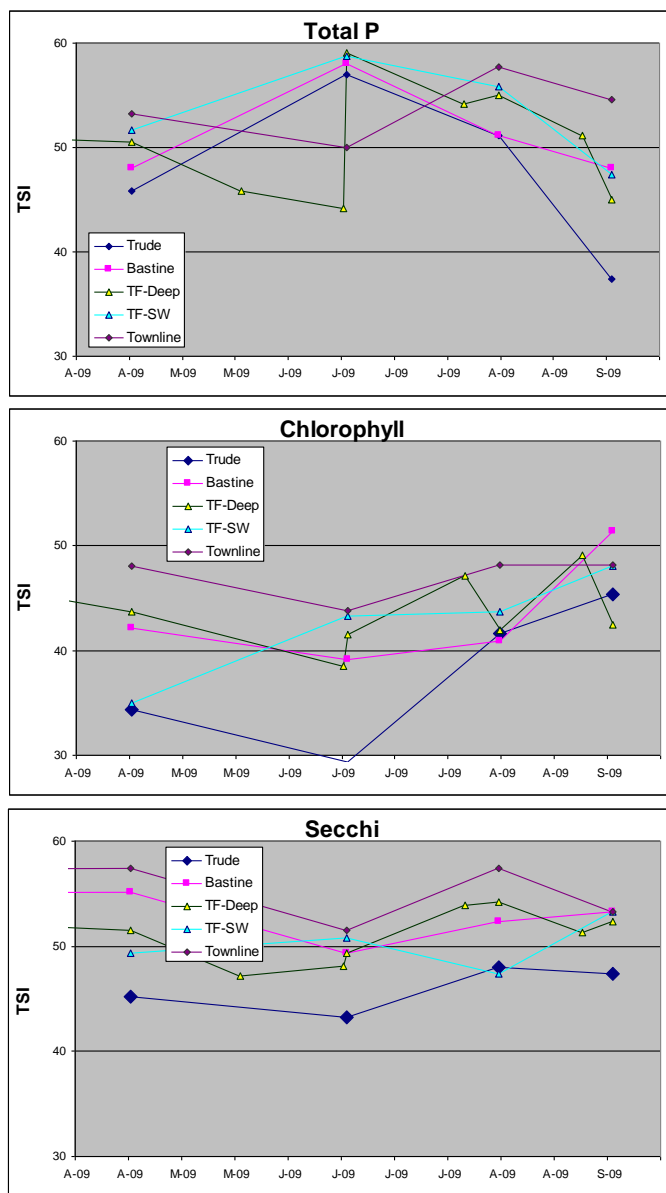
Turtle Flambeau – Water Quality Long Term



The Trophic Status Index (TSI) classifies the Flowage sample sites as eutrophic, or highly productive in terms of nutrients and plants. Trude Lake is mesotrophic, moderately productive with clearer water and fewer nutrients. See Figure 7.

Figure 7. Turtle Flambeau - TSI 2009

Turtle Flambeau – TSI 2009



Trude Lake is mesotrophic with a flow regime separate from than the Flowage, and results in it having slightly different water quality. It was originally a drainage lake with a small stream outflow. When the Flowage was created in 1929, some additional inflow to Trude from the Flowage began to occur during high water. However, this is a modest contribution to the overall Trude Lake system and it maintains its own water quality different from the main Flowage body.

The Flowage, while classed as eutrophic, is a more complex system. The Figures show changes in the water quality throughout the year. Of the four basins, Baraboo has the best water quality and Townline the worst. Townline is the shallowest basin, which can lead to increased turbidity. Phosphorus concentrations in the Flowage are high for a lake; but would be considered low if it were a river. One question still to be answered is how much the Flowage acts like a lake versus a river. This question would require investigation into residency times (the length of time it takes for water to be replaced in the system). It is expected that with its relatively undeveloped shores, most of the phosphorus is entering through tributaries and surrounding wetlands. This, however, has yet to be quantified, along with groundwater contributions.

Chlorophyll a levels (i.e. measurement of the amount of algae) in the Flowage are more in line with a mesotrophic lake. Water clarity is fairly low, in part due to the dark stained water rather than to algae or sediments. Measures of eutrophication do not entirely account for the effects of dark stained waters. So while the Flowage is eutrophic with respect to phosphorus and water clarity, as are most flowages, the water color moderates the chlorophyll a concentrations. It should also be noted that during 2002-2009 the region underwent extreme drought conditions. The Flowage inflows were down and water levels fell to near record lows. Under its operational license, the Flowage should be at full pool by ice-out or shortly thereafter, and water levels slowly decline during July and August. In September, the maximum draw down is 4 ft. In years with adequate precipitation, the water levels may not reach this low. In Oct/November the pool is again re-filled and in winter there is another slow drawdown of typically up to 4 ft (although 8 ft is the maximum winter drawdown). During 2009, spring refill was not achieved, the Flowage experienced reduced inflows and outflows, and the maximum 4 ft summer drawdown was reached early and exceeded. This should be taken into account when considering 2009 data on nutrients, summer temperatures, algae and water clarity.

Evaluation of Current Water Quality Data through Citizen Monitoring Program

The USGS recommended continued monitoring at all five sites and the addition of two sites at the major tributaries (Turtle River and Flambeau River). They also stated that while data on residency times, groundwater and phosphorus sources would be of value, relatively high costs would make funding such a project challenging. In particular, lacking an immediate threat to the system, the TFFTL would not be likely to compete very well for state funding priorities. Both the USGS and WDNR recommend working with upstream neighbors to try to insure low phosphorus inputs.

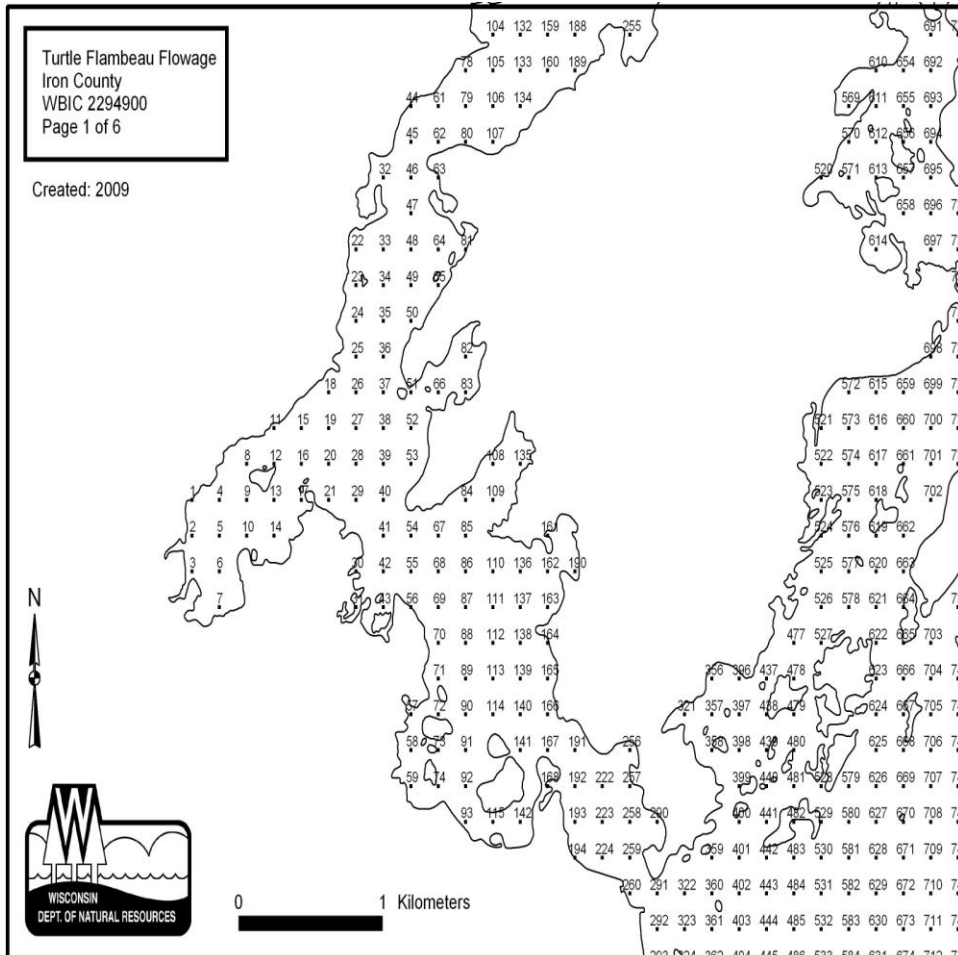
In 2010, the Association did sample the four Flowage sites, but did not sample Trude Lake due to lack of volunteer capacity. WDNR provided additional equipment, funding for samples, and volunteer training. During 2010, phosphorus concentrations in July and August were about the same as 2009, but chlorophyll a concentrations were higher (August Townline chlorophyll was 13.3 compared to 6.0 in 2009). Water clarity also declined in 2010, with secchi depths in Baraboo falling from 6.0 ft in June to 3.0 ft in August. USGS suggested that summer 2010's return to more normal water levels could produce a decline in water quality during the next two years. During times of drought, lakes typically have lower levels of nutrients in the system; with return to "normal" water levels, tributary input of nutrients increase. It should also be noted that the Flowage was hit by a tornado in late July, which may have also contributed to increased sedimentation and subsequent reduced water quality.

Aquatic Plant Survey

The only previous study of aquatic plant communities on the TFF was conducted in 1991 (A. Holzem, unpublished data). Holzem mapped emergent emergent plant communities along the shorelines of the flowage. 192 wetlands were mapped and classified under the Wisconsin Wetland Inventory System. These shoreline wetlands encompass 5,795 ha and 54 wetland types were identified. Holzem found 30 species of wetland plants (not including trees and shrubs).

In 2009, a limited random sample survey of aquatic plants was conducted. Due to the large number of grid points in the Flowage and Trude Lake, a sub-set of plots was selected following the methods outlined in "Recommended baseline monitoring of aquatic plants in Wisconsin: Point Intercept Sampling Design, Collection Protocol, Data Analysis and Applications". The full sample grid for the TFF included 1445 sample points Trude Lake totaled 1173 points (See Figure 9 for example point intercept map). From that sample, we conducted surveys at five locations and at each public boat landing. The sub-set included 10 points on a straight line transect at each of the five water quality sample sites used by USGS (see Figure 1) and five plots at each boat landing. If points were deeper than 10 ft, additional plots were added along the transect line until ten points were sampled. Boat landings were sampled in hopes of identifying any invasive species present. 65 plots were examined on the Flowage and 15 on Trude Lake. The survey was conducted in early August 2009, and specimen plants were provided to the University of Wisconsin – Stevens Point for identification and cataloging.

Figure 9. Sample Aquatic Plant Survey Sample Grid



On the Flowage, we found no plants at deeper than 7 ft. However, it should be noted that due to drought the lake level was 3 ft below full pool. This may have influenced areas in which plant growth was possible. Many nearshore wave-scoured gravel areas and sandy beaches were exposed, with herbaceous and woody plants established. Most submersed plants were found in muck substrate. Very few plants were found in sand or gravel. It may be that with return to more “normal” water levels, water clarity and substrate availability may change these distributions somewhat. No plants were found deeper than 6 ft on Trude Lake. However, the sample size was small and with clearer water, light penetration would be expected at greater depths than in the flowage. Additional points should be sampled to ascertain the maximum depth of plant growth for both waterbodies.

A total of 26 species of plants were identified during the surveys. On the TFF, 22 species were found, and on Trude Lake, 12 species were found (see Table 1). This plant survey was not comprehensive and likely does not encompass the full diversity and richness of aquatic plants. It was an initial survey to identify the basic health and potentially invasive species present. While emergent aquatic plants were noted, the focus of the data collection was on submersed plants. It should be noted that no invasive aquatic plants were identified. Surveys

were conducted by lake association volunteers, under supervision of WDNR aquatic plant specialists and Iron County Land Conservation Department Invasive Species staff.

Table 1. Aquatic Plants Found in the Turtle Flambeau Flowage and Trude Lake

Plant Species	Trude Lake	TFF
Elodea Canadensis	X	X
Large leaf pondweed	X	X
Floating leaf bur reed	X	
Nitella	X	X
Arrowhead	X	
Wild celery	X	
Ribbon leaf pondweed	X	X
Small pondweed	X	
Bushy pondweed	X	X
Chara	X	
Variable pondweed	X	
Whorled pondweed	X	
Potomotegan ephidrus		X
Coontail		X
Water marigold		X
Fern leafed pondweed		X
Wild celery		X
Wild rice		X
White pond lily		X
Elodea nitella		X
Bladderwort		X
Floating-leaf pondweed		X
Common burr reed		X
Whorled milfoil		X
Large purple bladderwort		X
Northern water milfoil		X
Leafy pondweed		X
Spiral fruited pondweed		X
Pondweed (unid.)		X

Control Purple Loosestrife

During 2009 and 2010, Association volunteers surveyed the shorelines and wetlands for purple loosestrife and assisted in control operations with the WDNR and Iron County Land Conservation staff. In 2009, low water conditions provided increased shoreline areas for colonization by loosestrife and infestations were rising. A return to near normal water levels in 2010 submerged many of these beds and reduced the number of plants.

Land Use

The landscape within the Turtle Flambeau Flowage watershed is predominately forested. The immediate shorelines are 95% public ownership by the Turtle Flambeau Flowage Scenic Waters Area (WDNR) and a small public ownership by Iron County (Lake of the Falls County Park). Private individuals own 5% of the shoreline in mostly small parcels. Within the greater watershed, public lands include: the Scenic Waters Area, Iron County Forest, Northern Highland American Legion State Forest, and Hay Creek Wildlife Management Area (WDNR). Of the private lands around the flowage, 8.8% are under some form of state oversight with 2.5% enrolled in Forest Crop Law and 6.3% in Managed Forest Law. See Figures 10 and 11 for a map of the watershed and adjacent townships.

Figure 10. Land Use in the TFFTL Watershed

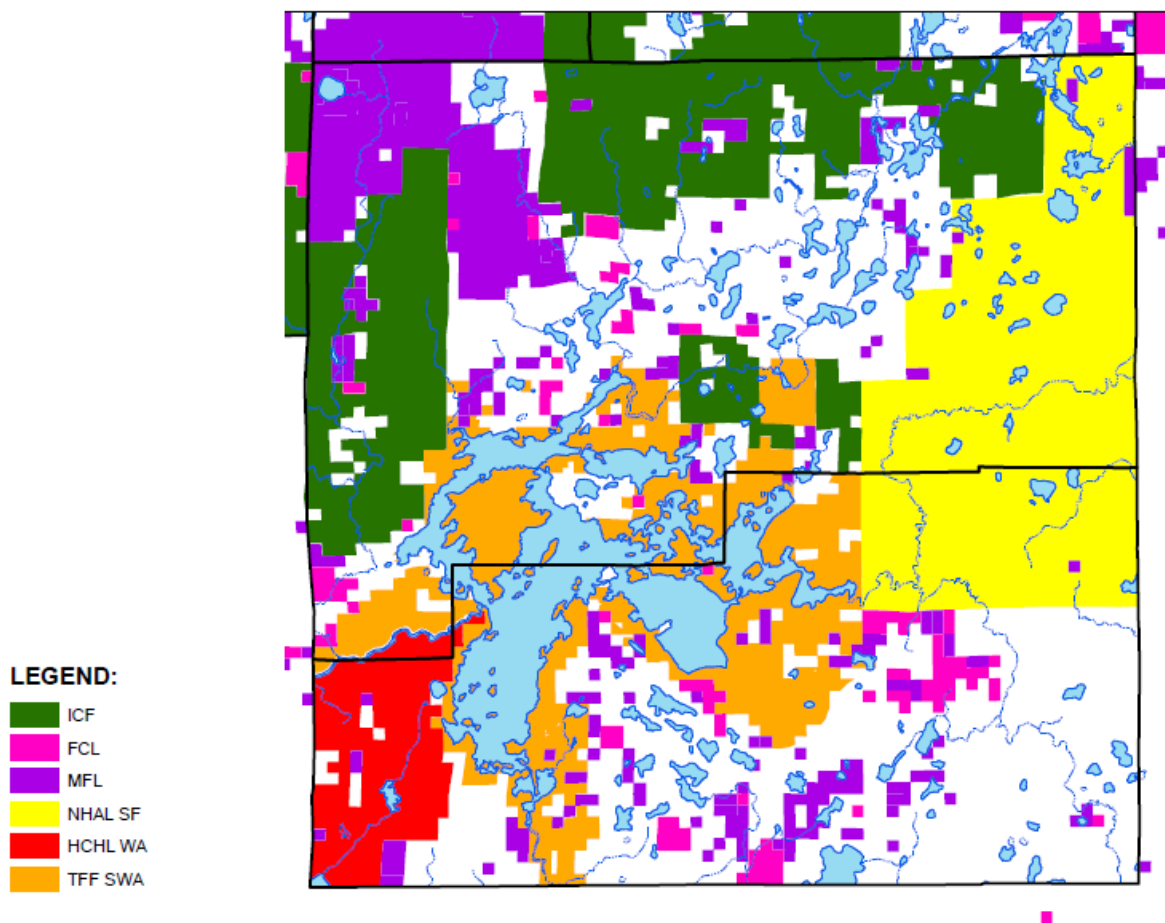
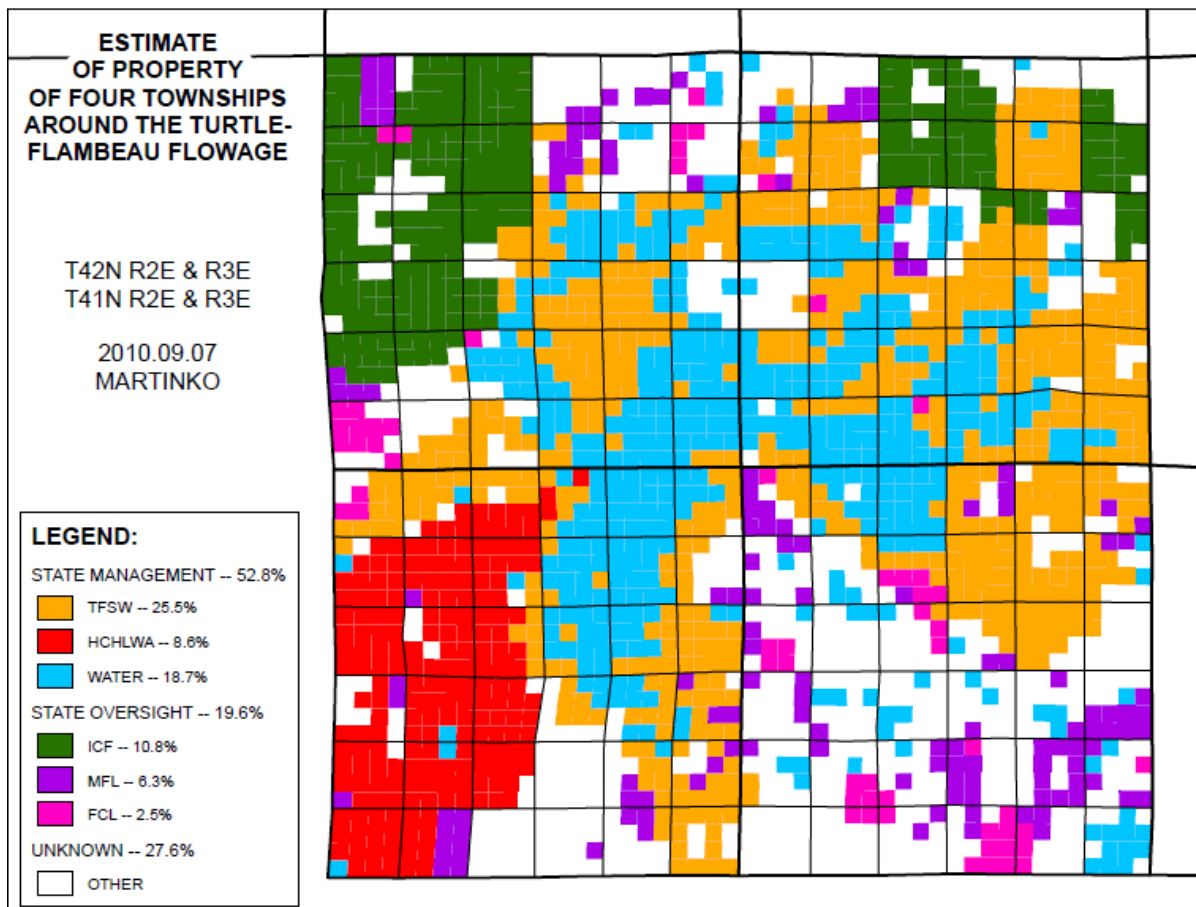


Figure 11. Land Use in Townships Around Turtle Flambeau Flowage



Tributaries to the Flowage include the Turtle River to the north which flows from the northeast to southwest through a series of lakes with modest levels of shoreline development. The Flambeau River enters the Flowage from the east and receives waters from the Bear and Manitowish Rivers. These rivers pass through some developed areas such as Manitowish Waters, the Rest Lake Chain, the community of Lac du Flambeau, and receive effluent from a number of commercial cranberry marshes. While the TFF and Trude Lake's immediate watershed is primarily forested and development is modest, these tributaries have the potential to impact water quality in the future.

Education and Outreach

As part of this project, the TFFTL POA provided education materials and information to its members and the general public. We wrote a series of articles in our bi-annual newsletter and sent out two press releases on the project. We also developed a web site for the association which provided links and pages on the study results and data. This web site is www.TFFTL.org. We have attached copies of our newsletters with the hard copy of this report.

Additional Related Association Accomplishments

In our grant proposal, we listed a number of additional projects which, while not directly funded by our lake planning grant, contribute to the richness of information available to Association members, natural resource managers and the public. These activities are briefly summarized below.

Survey of Property Owners and Land Managers

Issues of Concern to TFFTL Property Owners – Results from a Membership Survey

A membership survey was conducted in the spring of 2009. The survey was initiated by the Association's board of directors, and was designed to augment a previous survey conducted in 2001. The purpose of the 2009 survey was to examine the opinions and concerns of members and to evaluate the impact of low water levels experienced during the past few years. Full results of the survey can be found in Appendix 1. TFF-TL POA 2009 Membership Survey.

Surveys were sent to 148 property owners. Responses were received from 115 members (78%). 64% of respondents had been at their current location for over 11 years and 57% spend more than 4 months on the Flowage each year. When asked members to select "main reasons" they spend time at the Flowage; fishing, peace and tranquility, and scenic/natural environment were most commonly selected. When asked to prioritize "concerns" the following issues ranked highest: water level management, decreased fish population, aquatic invasive species, PWC/jet ski, water quality, excessive boat speeds, and loss of wildlife habitat. This order reflects the order in which members listed their concerns. Those chosen first were rated the highest; in other words, given the most weight. Concerns selected second were given a lesser value or weight, and so on down to the fourth rated concern which was given the lowest value. There was a natural break point after the 7th highest score (10), so only 7 are highlighted as most significant. However, categories with lower scores are no less real and significant, but to a smaller number of members; e.g., problems caused by an inconsiderate neighbor or a localized situation. Expectedly, water level management was the highest rated concern; based on the previous five years of drought which greatly reduced water depths during summer months.

The concern for water levels was also reflected in other question responses. Members cited problems in recreational boating beginning as early as the first 1 foot drop in water level, when 3% of our members begin to have problems getting their boats to open water. From that point on, for every additional 1 ft drop in water level, about 20% more begin to have problems. At 4 ft below "full pool," 71% of members said they experienced major problems taking their boat from the dock to open water; at 5 ft almost 90% of members had problems.

Regarding the Association's newsletter, 96% said it meets or exceeds their expectations. Two thirds of the respondents (67%) said the newsletter keeps them informed; 25% said they want more issues, and a little less than 10% asked for more content. Most members said they

would like to receive their newsletter by U. S. Mail (71%), and 24% said email was their first choice. 5%) preferred getting their newsletter by way of a website.

When asked to rate the Association's performance, 90% said the Association meets or exceeds their expectations. 6% rated the association below expectations. Most of these latter respondents followed up their criticism with a comment.

Sample Universe

Surveys were sent to all 148 Association property owners, with 115 responding. This proportion of responses represent an impressive return rate, resulting in a significant sample of our membership (78%). It is reasonable to conclude, with this response rate, that these results present an accurate reflection of the views and experiences of Association members at large. It is also reasonable to conclude that the results are representative of flowage property owners in general. At the very least, they provide insights into the views and experiences of many who frequent the Turtle Flambeau Flowage.

WDNR Survey Responses

The Turtle Flambeau shoreline is 95% state owned. For this reason it is critical to include the opinions of agency staff in considering management priorities for the waterbody. The 2009 membership survey was distributed to 5 local WDNR field members, asking for their concerns regarding the Flowage. The survey was not scientific, nor does it represent any official view from the WDNR. Most pertinent were their responses to "concerns".

Aquatic invasive species was listed on all 5 responses. Shoreline development was mentioned on 4 responses, and water level management and excessive piers were mentioned in two responses. Others concerns included climate change, septic system pollution, decreased fish population, inconsiderate outside lighting, lawn chemicals and shoreline erosion. Missing on the list, with the exception of inconsiderate outside lighting, were the "user conflicts" that were so well represented on the Association members' list. The concerns seen by the WDNR reflect "resource concerns" as opposed to the broader range of issues listed by members.

Comparison of 2009 and 2001 Member Surveys

A similar survey of association members was conducted in 2001 by Leever Research. At that time the top three issues cited by members were water quality, fish populations and invasive species (in that order). At that time water levels were listed eighth on the list well below the top three issues (above) and below PWC's, shoreline erosion, noise pollution and shoreline development. This shift in concerns is likely due to the length and severity of the drought. 2010 summer precipitation indicates an easing of the drought. It is possible that in future years, with return to more stable water levels, additional survey work should be considered to re-assess member concerns.

Water Level Data Collection and Coordination

The Association continued to track water elevations and outflows on the Flowage during 2009-2010. (see Figures 12 -15). Water levels can have a significant impact on water quality and habitat availability on the TFFTL. The long-term drought experienced over the past 7 years seems to have abated in 2010 with a return to normal water levels. Conservative outflows during the period of this project may have contributed to stable water quality. Association volunteers were closely engaged in work with the WDNR and Xcel Energy to insure water levels were as close to regulatory requirements as possible.

Figure 12 . TFF Trend of Flowage Elevation - 2009

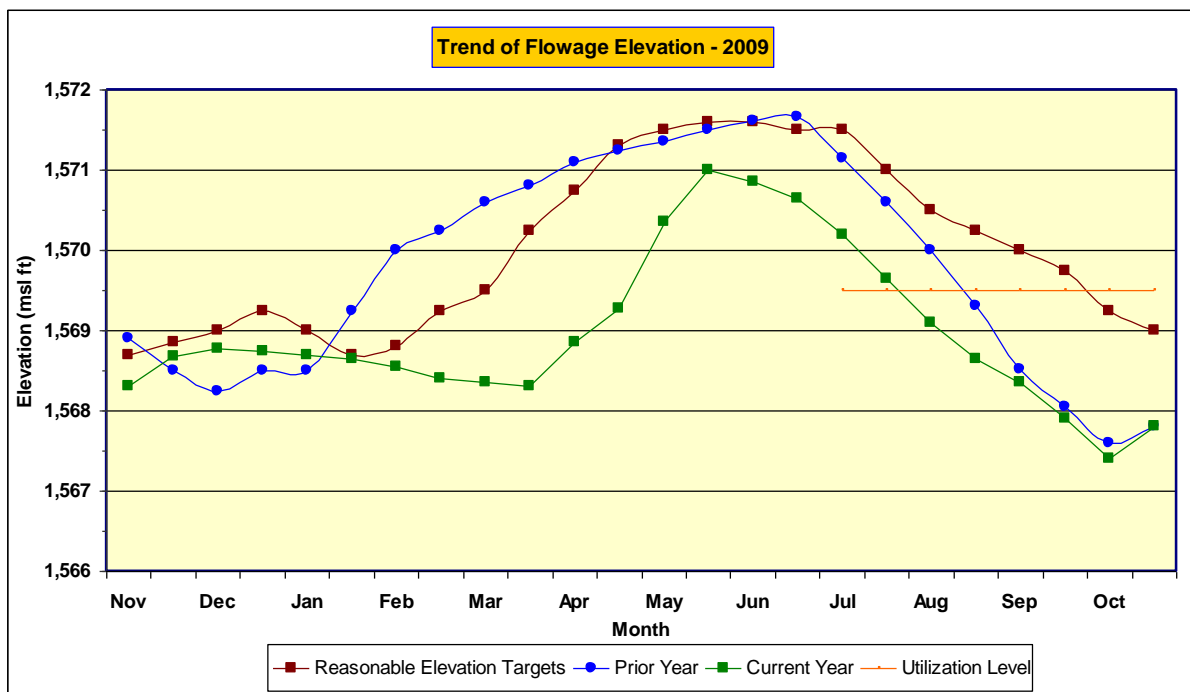


Figure 13. Flowage Discharge (Outflow) Rate - 2009

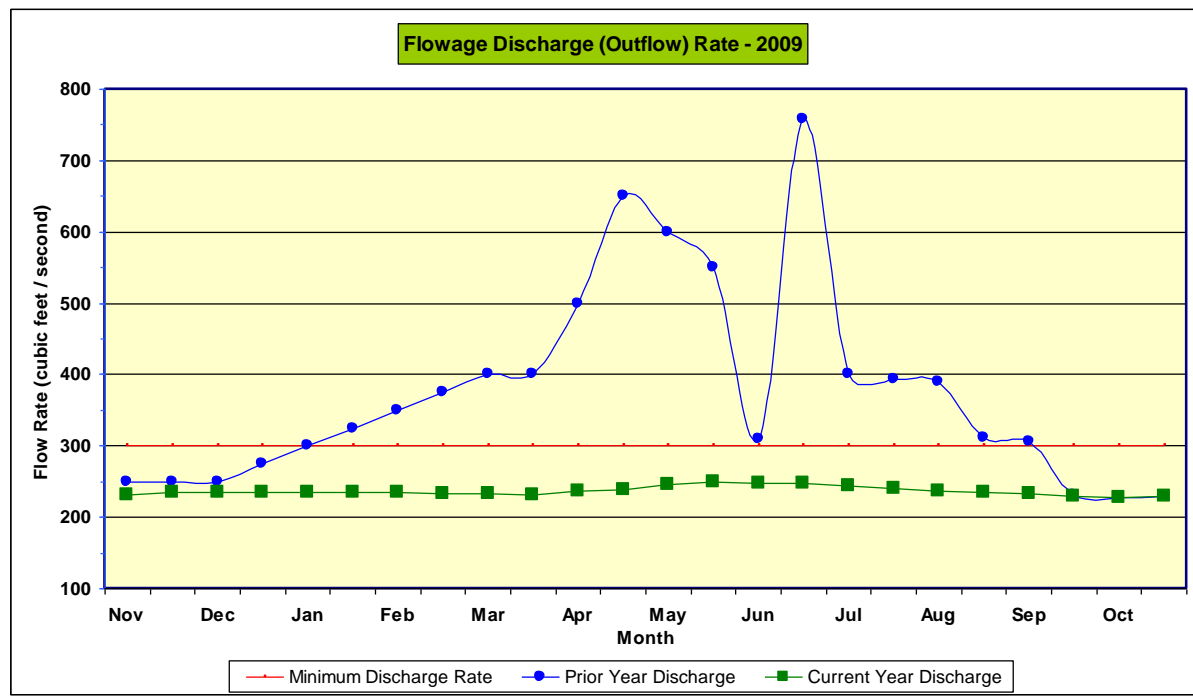


Figure 14. 2010 Trend of Flowage Elevation

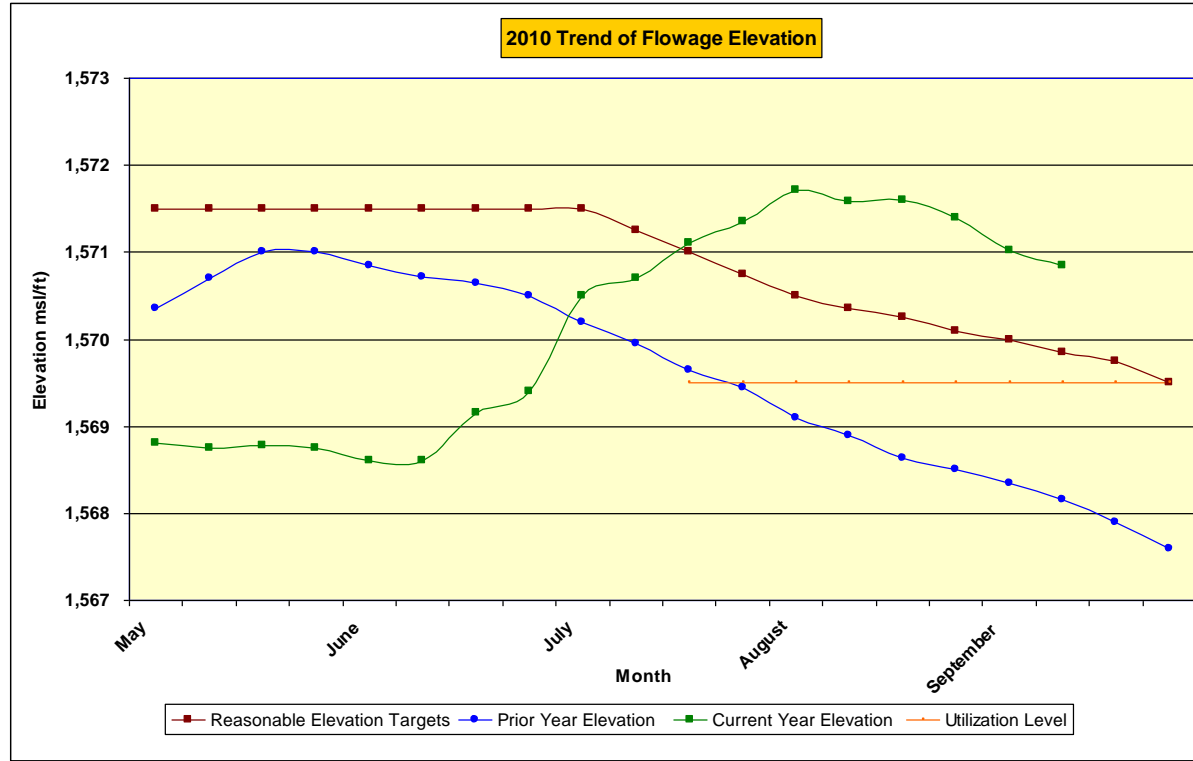
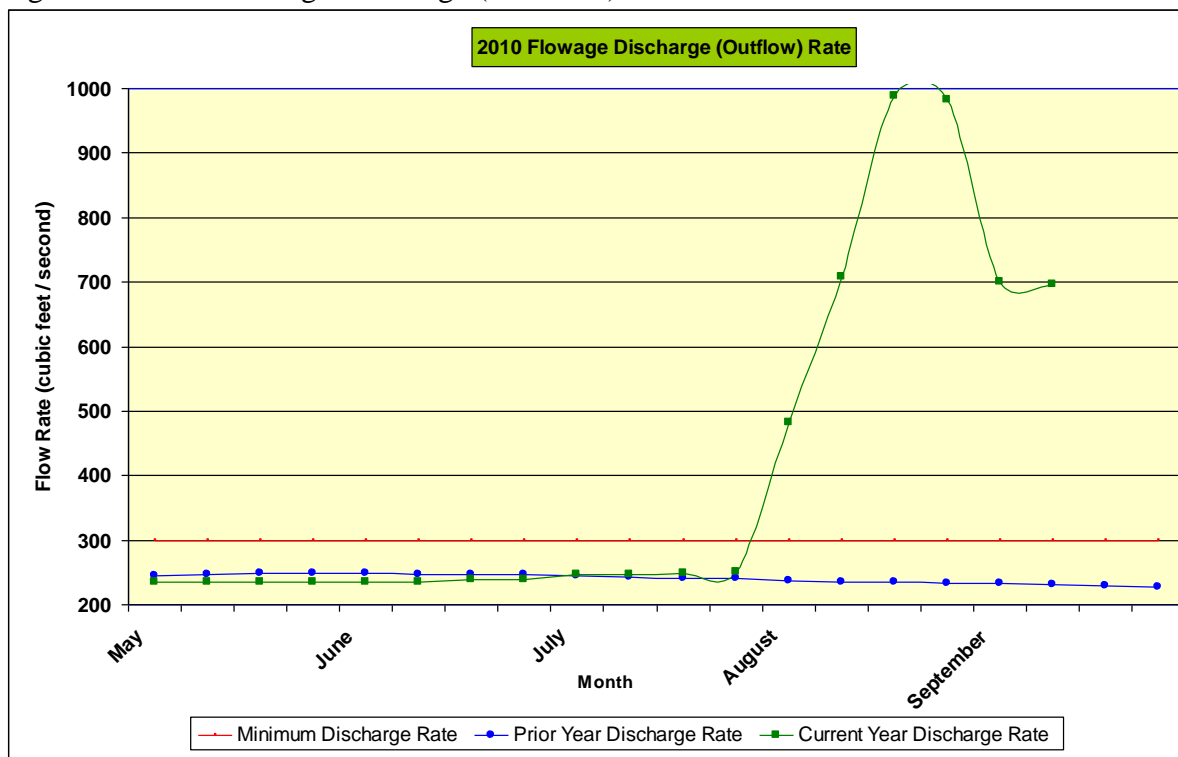


Figure 15. 2010 Flowage Discharge (Outflow) Rate



Coordinate TFFTL Loon Research with Climate Change Research

The Association continued to monitor its common loon populations throughout this project. Dr. Mike Meyer of the WDNR Bureau of Integrated Science Services has a population monitoring project tracking common loon presence and chick production as a long term indicator of climate change and habitat quality. Of particular interest are the impacts of climate change on water clarity. Loons are a visual feeder and typically do not nest on lakes with secchi disc readings less than 3 foot. Lake color however, can complicate loon use on lakes with low water clarity. The TFF typically supports 25-30 pair of common loons, and Trude Lake between 3-5 pair. In 2009, of the 25-30 territorial pair, 13 pair on the TFF produced 21 chicks, and 2 pair on Trude Lake produced 4 chicks. In 2010, the TFF loon population included 24 territorial pair, with 15 nesting, and 7 pair producing 9 chicks. On Trude Lake only two pair nested with 1 chick produced.

During 2010, a separate WDNR comprehensive wildlife survey of the TFF was conducted. It is repeated on a 5-year basis. During this one-day survey in late June, 96 loons were observed. This number reflects only birds on the water, not flying. When compared to past comprehensive wildlife surveys this appears to be average year for loons. Productivity (based on TFF Survey) was higher in 1983 thru 1990, but total loons was higher in 2010 (Bruce Bacon, Personal Communication) This reflects an ongoing regional trend of slightly expanding adult loon populations with increasing numbers of non-breeding birds attempting to take over territories.

In 2010, the USGS (Kevin Kenow) fitted 6 male common loons on the TFF and 1 on Trude with satellite telemetry transmitters. These transmitters will track loon migration, survival and a variety of other behavioral measures. Association volunteers assisted in capture and monitoring of these birds. All data from this work have been provided to the WDNR, US Geological Survey and the LoonWatch program at Sigurd Olson Environmental Institute.

During summer 2010, precipitation levels increased, Flowage water levels rose to near full pool and held at this level for the season. Surrounding wetlands were saturated and tributaries were running high. The July 27 tornado event increased erosion and turbidity. Secchi disc readings taken in Baraboo and Horseshoe on July 21 were 5.5 and 3.0 foot respectively. On August 25, secchi disc readings for both basins were 3.0 foot. It is of interest to note that on August 30-31 a partial survey of loon presence on the Flowage found an extremely low number of loons present. At this time of year, most loon chicks are near fledging and potentially able to move to other water bodies should conditions on the Flowage not be optimal. The eastern 1/5 of the Flowage was surveyed on Aug 30, from Fisherman's Landing, through Horseshoe, and to Murrays Landing. No loons were observed in an area with typically 10 territorial pair. On the 31st, the area from Springstead to the south end of the Big Water was surveyed with only 4 adult birds seen. The area would normally have held 11 pair. While no firm conclusions can be drawn from this survey, it is possible that poor visibility shifted loons to more favorable feeding areas during a time of extremely poor water clarity on the Flowage. There are no previous records of this scale of early territorial abandonment on the Flowage.

Planning Document Goals Relating to the TFF and Trude Lake

As part of this project, the lake association developed planning document goals and objectives as they related to the waterbodies. The Turtle Flambeau Flowage Scenic Waters Area functions under a Master Plan. In addition there is a Fisheries Plan for the Flowage. Iron County, the Town of Mercer, and the Town of Sherman also include flowage related statements in their planning materials. These planning goals are summarized in Appendix 3.

Future Plans

The TFFTL POA is not planning to apply for a Lake Protection Grant for further water quality work at this time. The recommendations of the USGS and DNR are to continue the expanded monitoring, and work to add additional sample sites at tributaries. The Association hopes to add these data points as volunteer capacity is developed and funding allows. The Association will continue to work with Iron County Land Conservation Department to develop projects to prevent aquatic invasive species and further document existing aquatic plant communities. An application for an Invasive Species Grant is currently being drafted by Iron County in partnership with the Association.

Thanks

Special thanks are extended to our USGS partners, Dale Robertson and Paul Reneau. WDNR staff Jim Kreitlow, Mike Meyer, Sandy Wickman and Jennifer Hauxwell were also

invaluable as well as the Iron County Land Conservation Department staff Heather Palmquist and Maryjo Gingras. Iron County Forestry Department assisted in GIS land use analysis. We would also like to acknowledge the special efforts of the following TFFTL Association members: Jim Leever, Diane O’Krongly, Tom Mowbray, and Nick Jongbloed for their many volunteer hours conducting field work, tracking data, and assisting with grant administration. And finally, thanks are extended to all the Association volunteers who assisted in plant surveys, water quality monitoring, invasive species control and other aspects of this project.

Appendix 1. Results of 2009 TFF-TL POA Membership Survey (see attached PDF)

Appendix 2. Planning Goals Relating to the Turtle Flambeau and Trude Lake

Iron County Comprehensive Plan 2025 Goals and Objectives

Natural Resources

Goal: Protect, conserve, and encourage the efficient and responsible management of the unique forest, water, land, and other natural resources of Iron County

Objective 1: Identify and work to preserve unique natural resource areas such as lakes, rivers, streams, waterfalls, wetlands, floodplains, wildlife areas and habitat corridors throughout the county.

Action: Provide public education regarding the benefits and methods of protecting, conserving, and managing the county's natural resources.

Action: Review existing zoning and natural resource policies and regulations to ensure that they are consistent with the recommendations of this plan.

Action: Prevent keyholing on county flowages, lakes, rivers, and streams.

Objective 2: Promote and encourage shoreland restoration and management efforts throughout the county.

Action: Offer shoreland restoration incentives to property owners who properly manage and/or restore native shoreline buffers.

Action: Provide leadership and technical support to property owners to improve shorelands.

Objective 3: Reduce threats to groundwater by providing property owner education regarding the identification and management of abandoned wells, underground storage tanks, and septic systems.

Action: Develop an informational pamphlet, website, and hold public information meetings to inform public about these threats to Iron County groundwater.

Objective 4: Ensure water quality is maintained on county lakes.

Action: Encourage the development of support programs and the acquisition of support staff to help maintain and improve existing water quality.

Action: Provide leadership and technical support to property owners to improve water quality on Iron County lakes.

Action: Lakes and rivers that are environmentally sensitive and in pristine or near pristine undeveloped condition should receive the highest level of protection.

Action: Work with Iron County Lakes Alliance on common goals for water protection.

Cultural Resources

Goal: Understand, preserve, and enhance important cultural and historic resources.

Objective 1: Encourage continued identification and promoting of historical sites.

Objective 2: Educate the public about the importance and benefits of the county's

history and culture to the development of the region by working with local historical and heritage groups.

Mercer Town Plan

Overall Goal: An orderly planned development pattern that promotes a safe, healthy, and pleasant living environment and makes efficient use of land, public services, and public financial resources.

Sub Goal 1: Guide land use in recognition of resource limitations and town goals and objectives.

Objective/Action 2: Emphasize wise land use choices rather than structural measures as a means of limiting disruption of the environment and reducing the cost of future maintenance and enforcement.

Sub Goal 3: Conserve the county's distinctive rural, northwoods atmosphere.

Objective/Action 2: Maximize the quality of life by providing regional open space, trails, parks, and recreational opportunities and facilities managed in such a fashion as to afford the maximum benefit to the community.

Sherman Town Plan

Goal: Minimize land use conflicts within the town by working to maintain/improve the visual aesthetics and rural/northwoods character of the town, by providing a variety of recreational opportunities to residents and visitors, and by promoting an effective and continued public-input based planning process.

Turtle Flambeau Scenic Waters Area master Plan and Environmental Assessment, 1995

Goal

To preserve the scenic qualities of the Turtle Flambeau Scenic Waters Area (TFSWA); protect the plant and wildlife communities, especially endangered and threatened species; provide interpretive and educational information; and accommodate compatible recreational opportunities for the general public.

Objectives

- Protect, maintain and enhance the generally “wild” and undeveloped scenic beauty of the 327 miles of flowage shoreline
- - Protect, maintain and enhance the wildlife populations, with particular emphasis on rare, endangered and threatened species found in the TFSWA
- Inventory, conserve and maintain those areas containing unique biotic communities
- Maintain a quality fishery and fishing opportunities for the many anglers who visit the flowage annually

- Maintain or enhance facilities for the diversity of outdoor recreational opportunities which are available on the flowage, including boating, canoeing, camping, hunting, trapping, nature observation, and snowmobiling
- Provide recreational access for the elderly and people with disabilities

Turtle Flambeau Flowage Fisheries Management Plan Goals, 2007

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

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

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.

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

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

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

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.

Appendix 3. Press Coverage