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TURTLE LAKES 5 YEAR WATERSHED EDUCATION AND BEST MANAGEMENT PRACTICES LAKE PROTECTION PROJECT

2010-15 END OF PROJECT SUMMARY REPORT
LOWER AND UPPER TURTLE LAKES
Barron County, Wisconsin

WDNR Project #: LPT-359-10

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October 2015

LOWER TURTLE LAKE MANAGEMENT DISTRICT,
UPPER TURTLE LAKE ASSOCIATION,
LOWER TURTLE LAKEASSOCIATION

ALMENA & TURTLE LAKE, WI 54889

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PREPARED FOR THE LOWER TURTLE LAKE MANAGEMENT DISTRICT, UPPER TURTLE LAKE ASSOCIATION AND OTHER PROJECT PARTNERS

INTRODUCTION

The Turtle Lakes Watershed is located in west central Barron County, Wisconsin along State Hwy 8 between the Villages of Turtle Lake and Almena and includes both Lower and Upper Turtle Lakes. It is part of the larger Red Cedar River Watershed. Upper Turtle Lake is north of Hwy 8 and Lower Turtle Lake is south. The combined watersheds of these two lakes cover more than 5000 acres. Lower Turtle Lake has a smaller surface area than Upper Turtle Lake, but a larger individual watershed. More than 3000 acres of the total watershed are incorporated into agricultural practices each year. Approximately 60% of that is planted in row crops.

Three free flowing and/or intermittent streams carry sediment and the associated nutrients into Upper Turtle Lake. Turtle Creek, which flows continuously between the two lakes, carries nutrients from Upper to Lower Turtle Lake. Three additional free flowing and/or intermittent streams carry more sediment and nutrients into Lower Turtle Lake. Both lakes experience excessive plant growth early in the year until nutrient enrichment in the summer months limits water clarity and sunlight penetration reducing overall plant growth. Lower Turtle Lake, at the lower end of the watershed, is considerably worse than Upper Turtle Lake, but both are impacted when sediment and the associated nutrients are washed into the lakes throughout the season.

Curly-leaf pondweed (CLP), a non-native invasive aquatic plant species, exists in both lakes contributing to the problems experienced.

In 1994, watershed modeling indicated that approximately 232 tons of sediment enter Lower Turtle Lake per year carrying with it over 1100 lbs. of phosphorous. This modeling was revisited in a 2005 lake study and upped the total phosphorous coming into Lower Turtle Lake to at least 1500 lbs. per year. A 2003 study on Upper estimated phosphorous loading to be 400 lbs. per year. In 1994, it was estimated that agriculture accounted for about 60% of the total phosphorous load. Modeling in 2009, based on 2008 farming data suggested agriculture accounted for about 68% of the total phosphorous load.

There are many farming best management practices (BMP's) that can significantly reduce phosphorous loading to area lakes and streams. The most beneficial BMP in the Turtle Lakes Watershed is the transition from common field preparation and planting practices of plowing to turn over the soil, disking, and cultivation to "no-till" field preparation and planting. Increased involvement in "no till" crop management could potentially reduce agricultural phosphorous loading by 40% or more. In 1994 modeling on Lower Turtle Lake, it was shown that if all row cropping occurring in the watershed was converted to "no till" phosphorous could be reduced from 1128 lbs. per year to 678 lbs. per year. In 2005, conservation tillage, but not necessarily "no till" was used on about 27% of all the row crops in the area of the Turtle Lakes Watershed according to the Barron County Soil and Water Conservation Department. Other agricultural best management practices including field buffer strips, cover crops, and grassed water ways could reduce phosphorus further.

The remaining 32% of the identified phosphorous loading was coming from a number of different sources including the near shore area around the two lakes, internal release and re-suspension of sediments,

plant decay (specifically CLP), groundwater, and atmospheric deposition. Little can be done to reduce phosphorous loading from groundwater and atmospheric deposition as these are mostly natural sources. Internal loading could potentially be addressed but before doing so, other sources of phosphorus needed to be addressed. Early season senescence of CLP adds phosphorous but estimates of how much vary with biomass, density, lake characteristics, and other variables. Management of curly-leaf pondweed in both lakes could help reduce this source of phosphorous loading. At the time this project was started, Eurasian water milfoil (EWM) was not known to be in either lake. At the end of this project, this is still the case.

Like with the agricultural community, there are many shoreland BMP's that riparian owners can implement to reduce phosphorous loading coming off the near shore area including restoration, buffer strips, septic system maintenance, rain gardens, rain barrels, driveway and path diversions, infiltration areas, and no use or use of phosphorous-free fertilizers.

LAKE PROTECTION PROJECT FUNDING

In March of 2009, a request was made of the Wisconsin Department of Natural Resources (WDNR) to approve a combined and revised version the Lower Turtle Lakes Lake Management Plan and the recommendations therein. Furthermore, a request was made of the WDNR to determine which of the management recommendations made in the Revised Plan were eligible for implementation funding via the Wisconsin Lake Protection Grant Program. Notice from the WDNR was received on April 16th, 2009 designating those management recommendations eligible for lake protection funding, and giving the Lower Turtle Lake Management District (LTLMD) approval for the submittal of a Lake Protection Grant to request funding for the implementation of the approved recommendations in the revised Management Plan.

A 5-yr Lake Protection Project (LPP) was developed in late 2009 seeking to educate farmers and riparian owners in the combined watershed of the two lakes about BMP's that would benefit both lakes in the long run. It also sought to provide incentives and cost-sharing to help implement these BMP's. The project sought to provide funding and support for completing aquatic plant surveying and developing Aquatic Plant Management Plans for both lakes. Lake user and riparian owner education was included through the establishment of watercraft inspection and in-lake aquatic invasive species monitoring programs. Extensive water quality testing was included in the two lakes and associated tributaries to document changes that were expected from the successful implementation of this project. Lake education fairs and several larger agriculturally focused education and demonstration events were planned over the course of five years. This grant application was approved in early 2010, with implementation immediately following and continuing through 2015.

The following is a description of the actions that were completed as a result of the lake protection funding provided by the WDNR. All management actions were supported by grant funds, other local funding, and volunteer time and donated services provided by the Lower Turtle Lake Management District (LTLMD), Upper Turtle Lake Association (UTLA), Lower Turtle Lake Association (LTLA), Town of Almena, Barron County Soil and Water Conservation Department (SWCD), and the consultant hired to oversee this implementation of the project.

BEST MANAGEMENT PRACTICES STAKEHOLDERS BOARD

Due to the immense scope of this project, a Project Administration and Oversight Board (Stakeholders Board) made up of representatives from the various stakeholders was considered necessary. It was the responsibility of this board to oversee the LPP and provide input guiding the implementation of all project actions and development of project materials.

In support of this project, a nine member Stakeholders Board was set up. It included two representatives from the LTLMD, two representatives from the UTLA, two representatives from the local farming community in the watershed, a Barron County SWCD representative, an at-large representative who could come from the local township or another organization like the LTLA, and the project consultant. All board decisions would be based on a majority vote, with the consultant casting the tie breaker vote if necessary. Board members, other than the project consultant, were not compensated, however, all time donated by board members was eligible as match for the larger Project. Each stakeholder provided their own representatives. It was not required that a representative be on the board for the entire duration of this project, but most were. Table 1 identifies the people who made up the nine member board from 2010 to 2015. A WDNR liaison was always invited to attend the meetings when the Agendas were sent out.

Table 1 – 2010-2015 Turtle Lakes Protection Project Stakeholders Board Members

Stakeholders	Board Members	2010	2011	2012	2013	2014	2015
Lower Turtle Lake Management District	Ken Bonner - Chair	x	x	x	x	x	x
	Corry Walbridge - Treasurer	x	x	x	x	x	x
Upper Turtle Lake Association	Mark Koegel - Secretary	x	x	x	x	x	x
	Kathy Zalusky	x	x				
	Ken Bjork			x	x		
	Diane Taxdahl					x	
At-large (Lower Turtle Lake Association)	Susan Rheingans	x	x	x	x	x	x
Barron County SWCD	Tyler Gruetzmacher	x	x	x	x	x	x
Farming Community	Harland Becker	x	x	x	x	x	x
	Dale Scheps	x	x	x	x	x	x
Consultant (SEH and LEAPS)	Dave Blumer	x	x	x	x	x	x
WDNR Liaisons	Pamela Toshner	x	x				
	Alex Smith			x	x	x	x

The first meeting of for the project was held in December 2009. During this meeting assignments were given to known stakeholders board members. The first meeting of the official Stakeholders Board occurred in January 2010. Meetings were held essentially every two months after that. A total of 38 meetings were held. All meetings were scheduled on the third Thursday of the month from 4:00 to 6:00pm at the Almena Town Hall unless arrangements were made for a different date, time, and place (Table 2). The meetings were run following Robert's Rules of Order; were chaired by Ken Bonner; and minutes were kept, distributed, and approved at the beginning of each new meeting. Agendas were created by the Project Consultant with input from Stakeholders Board members and sent out at least one to two weeks ahead of the meeting date. The Almena Town Clerk, WDNR, and several other local units of government and/or members of the community were copied on the agendas as needed. The meetings were considered open meetings and were frequently attended by other interested parties. All agendas and minutes from these meetings are included on the accompanying Data CD.

Table 2 – Stakeholders Meeting Schedule

Turtle Lakes Stakeholders Meetings - 2010-2015						
Month	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Jan	x	x	x	x		
Feb						
Mar	x	x	x	x	x	x
Apr			x		x	x
May	x	x	x	x	x	
June				x		x
July	x	x	x	x	x	
Aug						x
Sept	x	x	x	x	x	
Oct						x
Nov	x	x	x	x	x	
Dec						x

PROJECT PARTNERS

Another purpose of the Stakeholders Board was to bring the partners of this project together on a regular basis to assess whether or not each individual partner was completing that which was expected of them. Since the Barron County Soil and Water Conservation District, the Upper Turtle Lake Association, and the Lower Turtle Lake Association were such important partners, formal, but not binding agreements were drafted and signed that laid out partner expectations for volunteer time and actions to be completed in support of this project. These documents are included in the Data CD that accompanies this document. Table 3 lays out what the partner expectations going into this project were. All partners contributed volunteer time and donated services, although none were at the value that was initially expected. Some were way over and some were under initial expectations, however the required match for this project was actually met in the fourth year of this project, making years five and six gratis for the project.

Other partners included the UW-Extension Agriculture Agent, Towns of Almena and Turtle Lake, Dragonfly Gardens, and "The Green Frog" Consulting.

Table 3 – Project Partner Volunteer and Donated Services

Turtle Lakes - Lake Protection Project Volunteer and Donated Services - 2010-2015			
Partner	Initial Expectations (Time-hrs)	Value ($)	Initial Expectations (Value)
Lower Turtle Lake Management District	2060	$12.00	$24,720.00
Lower Turtle Lake Association (contract)	1580	$12.00	$18,960.00
Upper Turtle Lake Association (contract)	1782	$12.00	$21,384.00
Barron County Soil and Water (contract)	540	$40.00	$21,600.00
SEH/LEAPS	108	$75.00	$8,100.00
Others	NA	NA	NA
			$94,764.00

FARMER EDUCATION

It was a goal in this project to provide local farmers with information and education opportunities to learn more about no till and other best management practices to prevent soil loss from fields and protect water quality. Efforts were made throughout this project to provide them with access to experts in the conservation farming field, farmers already incorporating no till and/or other best management practices, and equipment manufacturers specializing in the equipment necessary to change farming operations. Several on-site field trips and visits were set up and promoted to show farmers in the watershed how small changes could mean positive changes to their bottom dollar and protect the lakes at the same time. Offers were made to cover conference registration fees and the cost of accommodations for any farmer in the watershed who was interested in attending any of the agriculture and/or lake conferences that were held from 2010 to 2015. This included the Red Cedar River Watershed Conference in Menomonie (2012-2015); the annual Wisconsin Lakes Conference in Green Bay (2010-2015); the NW Lakes Conference (2010-2015); and Farm Technology Days in 2013.

Table 3 highlights the agricultural outreach and education events that were directly sponsored by this project. By 2013, the majority of farmers in the watershed had heard about the lake protection project and had been contacted repeatedly by the Project Consultant and other members of the Stakeholders Board to encourage their involvement in the actions sponsored as a part of this project. Many, but not all of the farmers did participate. Those that did not made it clear that they were not interested in participating no matter what was offered. Beginning in 2013, the focus of the actions implemented shifted from agricultural projects to riparian projects. Both had been promoted from the beginning, but greater effort that was extended toward agriculture early in the project, shifted to promoting shoreland improvement BMP's. Project updates and mailings were sent to all farmers working in the watershed through 2014.

Table 4 – Agricultural Education and Outreach Efforts

Agricultural Outreach and Education Events - 2010-2015						
Event	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
No Till Introduction Open Discussion	x					
Glen Wohlk Field Day	x					
No Till Conference/Dinner		x				
No Till Planter Demonstration Day			x			
Best Management Practices Challenge			x			
Side by Side No Till/Conventional Till Comparison			x	x	x	
Scheps Field Day/Picnic			x			
Red Cedar Watershed Conference			x	x	x	x
Farm Technology Days				x		
Project Mailings	x	x	x	x	x	

NO TILL INTRODUCTION AND FARMER MEETNGS

During the January 2010 meeting of the Stakeholders Board, area farmers and property owners who rent their property to local farmers were invited to attend to discuss how they felt the lake protection money that was granted would best be put to use by them. Several prominent land owners in the watershed were in attendance. A presentation was given to lay out what was included in the 5-year project. Two local farmers were chosen at this time to be a part of the official Stakeholders Board guiding this project. Another meeting

with farmers was held in October 2010. All farmers were invited to attend, four showed up. As a result of this meeting the watershed boundaries used to define the Turtle Lakes watershed was modified to include a couple more properties.

GLEN WOHLK NO TILL FIELD DAY

Following a pancake and sausage breakfast sponsored by the Stakeholders Board, a tour was set up at a local farmer who uses no till cropping practices and has done so for many years. About a dozen breakfast participants met with Glen Wohlk and viewed his equipment, toured several of his fields, and asked questions.

NO TILL CONFERENCE/DINNER

The Lower Turtle Lake Management District in cooperation with the Turtle Lakes Lake Protection Project Stakeholders Board made up of local farmers, Upper and Lower Turtle Lake representatives, Barron County, DNR and local township liaisons, and SEH scientists sponsored an Agricultural Producer's Dinner held at the Renegades Supper Club on Hwy 8 between Upper and Lower Turtle Lake. The goal of the dinner was to provide local farmers with a social event away from the farm to learn about and provide input related to the use of no till farming practices and other agricultural best management practices in the watershed. All farmers in the watershed and their spouses were invited to a free dinner presentation on June 23, 2011 at 7:00pm. Stake holder Board Members and their spouses were also invited. Several no till and agricultural BMP experts and their spouses were invited to be panelists, answering questions related to the different programs the Turtle Lake Project offers, and their own involvement in best management practices including not till. DNR and Township Liaisons and their spouses were also invited.

Information was provided related to the Lake Protection funding this project has available and the current plans on how to use it. Participants were asked their opinions of the plans and asked if they have other or better ideas for using the funding that they would be more receptive of. The information gathered during this dinner/presentation/panel discussion will be used to develop future actions and more efficient planning for activities included in the Lake Protection Project. More than 35 people attended this event, including Kathy Bartilson and Sheri Snowbank of the WDNR.

The following Panelists attended the Event:

Tim Jergenson – Barron County/UW-Extension Agricultural Agent
Glen Wohlk – Barron County Agricultural Producer
Gary Nielsen – Barron County Agricultural Producer
Brad Johnson – Polk County Agricultural Producer
Karl Hakanson – Red Cedar River Watershed TMDL Manager
Dan Hedrington – SEH Agricultural Consultant

Figure 1 - Turtle Lakes No Till and BMPs Conference Panelists and Participants, June 2011

NO TILL PLANTER DEMONSTRATION DAY

Dale Scheps purchased a new, technologically advanced twelve row corn planter for use in 2012 and beyond. On April 21, 2012 farmers and lake people both were invited to come to Tri County Implement Dealer in Turtle Lake to learn about the planter. Ten people showed up on a cold morning to see the demonstration. The piece of equipment was amazing. Dave Lundgren (Tri County Representative) led the discussion and demonstration.

Figure 2 – No Till Planter Demonstration, April 2012

BEST MANAGEMENT PRACTICES CHALLENGE

Best Management Practices (BMPs) are designed to save farmers money while maintaining optimal yields. The BMP CHALLENGE programs use local university BMP recommendations along with local crop advisors to ensure that the BMP CHALLENGE programs meet the needs of the farmer. With BMP and below BMP rates, any one year can result in less than maximum yields, though net savings can be positive.

The BMP CHALLENGE programs work to give farmers an opportunity to test reduced nutrient and tillage rates on their fields, without worrying about loss to their income. BMP CHALLENGE can work directly with farmers, through watershed/conservation districts or through other organizations, to reduce nutrient and sediment outputs to local waterways and to educate farmers on BMPs. Currently, these programs can be implemented in 19 states: California, Delaware, Idaho, Iowa, Illinois, Indiana, Maryland, Michigan, Minnesota, Missouri, Nebraska, New York, North Carolina, Ohio, Pennsylvania, South Dakota, Vermont, Virginia and Wisconsin (www.bmpchallenge.org, last accessed 10-15-2015).

Two local farmers (Dale Scheps and Vern Nelson) agreed to participate in the BMP Challenge in 2012. One farmer was paid $20.00 for losses incurred from incorporating no till planting, and the other farmer was required to pay in $100.00 because he actually saved a few dollars over his normal expenses from incorporating no till planting. Neither farmer participated in the BMP Challenge program in 2013 or subsequent years.

The BMP Challenge program was not a part of the original Turtle Lakes Project, but did support the goals of it.

SIDE BY SIDE COMPARISON

Based on the BMP Challenge program, a conventional till vs no till side by side comparison was set up on property owned by Dale Scheps. Tim Jergenson, Barron County Agricultural Agent was secured to provide crop advisement and tracking of yield on the comparison. This side by side was officially set up in 2012 and repeated for three years. A large sign was produced and installed along Hwy 8 at the site informing people

about the project. The site was visited in June 2012, and a tour set up as a part of the July 21, 2012 Scheps Farm Event, including cutting of corn in the area to provide access for those taking the tour.

Figure 3 – No Till Side by Side Signage along Hwy 8

In May 2014, Tim Jergenson reported on 2012 and 2013 results from the no till side by side. Since Dale Scheps does such a good job in preparing his fields, Tim reported that there were basically no significant differences in yields between till and no-till. There was less tractor and equipment use for field preparation for no till which saved money. It is possible that other first time no-tillers may not have such favorable outcomes as quickly as Dale did.

DALE SCHEPS/SAN-DAL DAIRY FIELD DAY-PICNIC

On Saturday July 21, 2012 the Lake Protection Project and SanDal Dairy sponsored a 4 hour farm tour event at the farm owned by Dale Scheps and his family. The purpose of the tour was to connect lake property owners and other community members with the agricultural community in an effort to raise awareness about large farming operations and what can and is being done to minimize their impact on the natural resources in the area. Dale offered up the farm and many of his family members and employees to guide many different tours relating to the daily operation of the farm. In addition, the agronomist and farm nutritionists that Dale works with through Countryside Cooperative presented on the operations and requirements of the farm. The following tours were a part of the event:

- Heffer shed
- Calving
- Free stall barn
- Manure handling
- Milking parlor
- Feed storage
- No till/conventional till side by side comparison
- Equipment

The tour began with a short introduction by Ken Bonner, Chair of the Lake Protection Project, and then an introduction to the farm by Dale and his family. Participants were divided into small groups to complete the various tours. Lunch (burgers, brats, beans, chips, white and chocolate milk, pop, and all the fixings) was served on site. The event was open to the general public and advertised in the local paper. Nearly 90 people attended. There were many positive comments related to the event. An agenda and the flyer advertising the event are included in the Data CD.

Figure 4 – SanDal Dairy Field Day/Picnic (Dale Scheps, part of the group, a tour, food preparation)

RED CEDAR RIVER WATERSHED CONFERENCE

The Red Cedar River Watershed in Northwest, WI that extends from Big Chetac Lake near Birchwood, WI in Sawyer County to the Chippewa River in Dunn County (Figure 5) includes several bodies of water including Lakes Tainter and Menomin and the Chetek Chain of Lakes that suffer each year from massive blue-green algae blooms. Other lakes in the watershed including both Turtle Lakes experience their own algae blooms. And while not as bad as those blooms in Tainter and Menomin and the Chetek Chain, they are bad enough to cause hardship and concern. There are many reasons why the waters in this watershed are struggling, but most of it is due to nutrient loading coming off the land. A group of citizens, concerned over the poor quality of their waters, came together in 2012 to search for a sustainable solution to the problem that would work for everyone in the watershed - farmers, city dwellers, commercial interests, waterfront property owners, and recreational water users. The Red Cedar Watershed Conference, which started in 2012, is an attempt to bring the various stakeholders together to spend a day speaking, learning, and discussing how to restore the Red Cedar River Watershed to the beautiful system it should be.

The focus of the conference was much the same as what was already being done in the smaller Turtle Lakes Watershed. As such, the Turtle Lakes project was presented in the first Conference held in March 2012. A presentation (Figure 6) was prepared high-lighting the Turtle Lakes Project ups and downs through

2012. Members of the Stakeholders Board were also present to answer questions. In every year of the Conference, the Lake Protection Project let farmers know that the conference was happening and offered to pay the registration fee. Unfortunately, not a lot of farmers took us up on that offer. One of the speakers in the 2015 conference was outstanding regarding the use of planting practices and the benefits gained by no till.

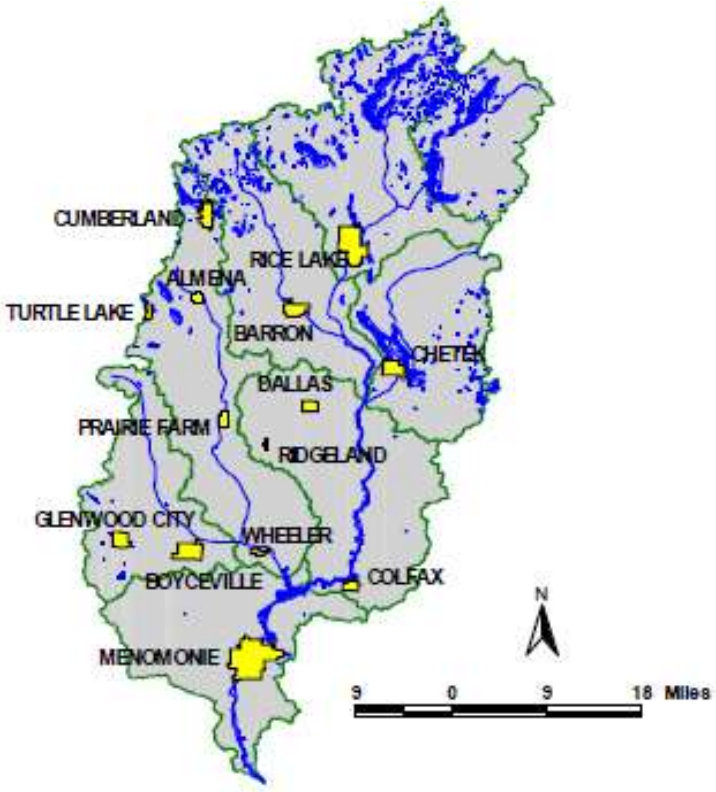


Figure 5 – Red Cedar River Watershed

Figure 6 – Opening Slide for 2012 Presentation at the Red Cedar River Watershed Conference

FARM TECHNOLOGIES DAYS

The Wisconsin Farm Technology Days is the largest agricultural show in Wisconsin and one of the largest in the nation. The three-day outdoor event showcases the latest improvements in production agriculture, including many practical applications of recent research findings and technological developments. Each year, it is held in a different Wisconsin county - on a different host family farm. In 2013, the event was held on a farm near Dallas, WI in Barron County, only a few miles east of the Turtle Lakes.

Wisconsin Farm Technology Days provides visitors the opportunity to see and talk with more than 600 commercial and educational exhibitors in Tent City who are eager to visit with them about their machinery, equipment, facilities, products, and service needs. A wide variety of agricultural products and services used in today's dairy, livestock, and crop production systems in Wisconsin will be on display. In addition, specialists and county extension agents from the University of Wisconsin and state and federal agencies are on hand to answer questions. Educational exhibits, special interest displays, and field machinery demonstrations provide something of interest for everyone.

Like with the Red Cedar River Watershed Conference, the Turtle Lakes Project offered to pay the entry fee for any farmer or riparian owner in the Turtle Lakes watershed wishing to attend. Several riparian owners did attend the event as did most of the local farmers.

PROJECT PROGRAM MAILINGS

In each year of this project, local farmers in the watershed were sent a mailing informing them of the programs the Lake Protection Project was funding. Farmers were encouraged to participate in the programs and the letter provided more detail into why the programs were offered. In 2011, twelve farmers were included in the contact list. By 2014, 21 farmers and those who rent the land to the farmers were included. An Annual Program Sheet was included, as was a watershed map, a map of target project areas, and sample contracts so folks knew what they were getting involved in.

RIPARIAN EDUCATION

Another important part of this five year project was property owner or riparian education related to best management practices that they could employ to help make improvements in the lakes. Although the largest contributor to the nutrient load coming into the two lakes is agriculture, the implementation of shoreline improvement projects is extremely important. Although the contributions to the overall nutrient load attributed to the riparian zone (where people live around the lakes) is much smaller than that of agriculture, many easy and inexpensive best management practices can be implemented. In addition, those practices generally do not impact the value of the property or the income earned off the land like in agriculture.

As a property owner on one of the lakes, it is easy to assume that what is done on that property has little impact good or bad, particularly in the face of what is coming in from agricultural practices. However, when all developed properties on the two lakes are considered the nutrient loading from this source is considerable, and if based on load per acre of land, way higher than that of agriculture. Beyond that, nearly every farmer working with this project stated that they would work with the project willingly, but only if riparian owners show that they are willing to be part of the solution to the problem as well.

This project made many attempts to make the riparian owners on both lakes aware that what they do on their property matters. While the individual contribution is small, the impact on the over attitude about making changes is huge. Table 5 shows the events sponsored by this project that are directly related to riparian education.

Table 5 – Riparian Owner Education and Outreach Efforts

Riparian Owner Outreach and Education Events - 2010-2015						
Event	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Lake and Tributary Monitoring Training	x					
Project Kickoff Breakfast	x					
Glen Wohlk Field Day	x					
Aquatic Invasive Species Workshops	x		x			x
Lake Fair	x					
Tree, Plant, Rain Barrel, and Gift Certificate Give-aways		x	x	x	x	
Property Owner Interest Survey		x				
Red Cedar Watershed Conference			x	x	x	x
Scheps Field Day/Picnic			x			
Farm Technology Days				x		
Shoreland Improvement Workshops			x	x	x	
Shoreland Improvement Brochure						x
Project Newsletters	x	x	x	x	x	x
Final Project Presentations						x

LAKE AND TRIBUTARY MONITORING TRAINING

Volunteers from Upper and Lower Turtle Lakes attended training on Clean Boats, Clean Water (CBCW) Saturday, April 24, in Spooner. Dave Blumer headed an on-lake lake and tributary monitoring training session on Saturday, May 8, 2010. Five volunteers attended the training on Lower Turtle Lake in the morning and three volunteers attended the training on Upper Turtle Lake in the afternoon. Four Upper Turtle Lake

volunteers attended a workshop on lake and tributary monitoring sponsored by the WDNR on Saturday, May 15 at 10am, in Spooner.

PROJECT KICKOFF BREAKFAST

A Pancake Breakfast was held on Saturday, May 22, 2010 from 8am – 1pm at Corry Walbridge's place on Lower Turtle Lake. The event was held to introduce the lake protection project to the general lake constituency and solicit volunteer help in a number of areas. The event was publicized in newsletters from both lakes. Personal invitations were sent to the local farmers. Pancakes were prepared at the event along with sausage and all the necessary breakfast fixings. A presentation was given introducing the project and informing participants where their volunteer services would be most useful. A field trip to a local farmer who already implements no till was planned. Several displays were set up as well. A sign-up sheet was provided for participants to indicate what volunteer activity they were willing to help out with.

Thirty-three people participated in the breakfast (Figure 7).

Figure 7 – May 2010 Project Kickoff Breakfast

GLEN WOHLK FIELD DAY

Following a pancake and sausage breakfast sponsored by the Stakeholders Board, a tour was set up at a local farmer who uses no till cropping practices and has done so for many years. About a dozen breakfast participants met with Glen Wohlk and viewed his equipment, toured several of his fields, and asked questions.

AQUATIC INVASIVE SPECIES WORKSHOPS

The first aquatic invasive species monitoring training was help on June 27, 2010 at neighboring White Ash Lake. Two volunteers from each lake were present for the training. In August 2012, another aquatic invasive species and native aquatic plant identification session was held at the Upper Turtle Lake public boat landing off Hwy 8. Nine people, some from each lake, showed up at the ID session. A hands-on presentation was given to help participants identify both native and non-native aquatic plant species. Following the hands-on portion of the workshop, it was planned that participants would take trips out on the water on both lakes and put what they learned to practice. It was very windy on the lake that day, so the pontoon portion of the workshop was cancelled. Instead participants went down to the boat landing on Upper Turtle Lake where a strong northwest wind had blown many different plant species into the shallows around the landing. Nearly a dozen aquatic plant species were identified, none of them invasive.

A similar workshop was repeated at the same place in July 2015. Again about 8-10 people were present, and this time a pontoon ride was completed and participants given the opportunity to use a plant rake to rake out plants from Upper Turtle Lake. They then used the tools and materials from the workshop to identify the

plant species they found. Both workshops were very well-received, and publicized through special post-cards sent to lake residents, on the lake organization web pages, and through an email blitz.

LAKE FAIR

A Lake Fair (Figure 8) focused on various components of the lake protection project was held on October 16, 2010 from 1-4 pm at the Renegades Supper Club of Almena located on Hwy 8 between the two lakes. Displays were set up showcasing water quality monitoring and equipment; aquatic plant and aquatic invasive species identification; Clean Boats, Clean Waters; AIS monitoring; shoreland restoration, agricultural best management practices, surface water runoff model, and Loonwatch and Emerald Ash Borer. Two speakers gave presentations: Tim Jergenson, Barron County Agricultural Extension Agent; and Brian Bertalson, United Agricultural Cooperative. Tim discussed the impacts of agricultural BMPs, and Brian discussed the content of Dale Schep's Nutrient Management Plan.

Several field trips were set up in association with the Lake Fair. Water quality monitoring on Upper Turtle Lake; stream monitoring on the Upper Turtle Lake outlet of Turtle Creek, and visits to several fields where BMPs had been implemented were planned.

All the residents of the Towns of Almena and Turtle Lake, lake residents, local farmers, and folks from other area lake associations were invited. Several dozen people attended the event, which was very well received.

Figure 8 – October 2010 Lake Fair

RAIN BARRELS, TREES, GIFT CERTIFICATE, AND NATIVE PLANT GIVE-A-WAYS

In an attempt to increase participation in shoreland improvement activities planned in this project, several give-a-ways were used as incentives. Table 6 shows in what year give-a-ways were conducted and what was given away. In 2010 three rain barrels were purchased by the Stakeholders Board to reward lake volunteers who recorded the most Clean Boats Clean Waters hours in 2010. Another rain barrel was given away during the first Shoreland Improvement Workshop held in May 2012 (Figure 9).

As assortment of trees and shrubs including red and white pine, two types of dogwood shrubs, and serviceberry bushes were given away to workshop participants in 2012, 2013, and 2014. Along with the trees, was a planting guide created by The Green Frog consulting agency specific to these varieties of trees and the Turtle Lakes.

Three $33.00 gift certificates from Dragonfly Gardens were given away after the 2013 Shoreland Improvement Workshop. The gift certificates were only good toward the purchase of native plants to be used in shoreland improvement projects. As an additional incentive for participants in the 2014 Shoreland Improvement Workshop to sign an actual agreement stating they would implement an improvement project in 2014, signees were given a $25.00 gift certificate from Dragonfly Gardens.

During the 2013 Shoreland Improvement Workshop, Dragonfly Gardens was actually present with native plants on display. At the end of the workshop, several flats of native plants were given away to participants.

Table 6 – Turtle Lake Protection Project Incentive Give-a-ways

Incentive Give-a-Way Projects to Support Property Owner Participation in Lake Protection Projects						
Give-a-Way	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Rain barrels	x		x			
Trees and Shrubs			x	x	x	
Gift Certificates				x	x	
Native Plants				x	x	

Figure 9 – Rain barrel Give-a-way at 2012 Shoreland Improvement Workshop

PROPERTY OWNER INTEREST SURVEY

Riparian owner property evaluations and site plans were started in 2010, and continued through 2014. However, many of the earlier projects were implemented and there was a desire to find out why and to encourage people who had already had evaluations and those who had not too move forward with shoreland improvement projects. In an attempt to re-contact all 2010 and 2011 property owners who had participated in site evaluations and walk-throughs, two paper surveys were developed and distributed to riparian owners on the two lakes. Both surveys were run through the WDNR survey specialist for approval, and then distributed in October/November 2011.

The first survey was a Shoreland Restoration Property Owner Survey of Interest sent to all property owners on both lakes. The purpose of this survey was to gather some basic residency information, and then determine property owner knowledge of landscaping for water quality practices that could help to protect and improve the lakes. It also sought to determine how much interest property owners on both lakes have in making improvements to their individual properties and what it would take to get them to do it.

The second was a follow-up survey sent to each property owner that had already had a property evaluation completed by the lake protection project. The purpose of this second survey was to determine how many of the existing evaluations had been acted on. If the project had not been acted on, the survey attempted to find out what level of interest the property owner had in getting a project done. It further went on to seek information about how the participant felt about the shoreland evaluation program and if it needed improvement.

Results in the Property Owners Interest Survey indicated that folks were really looking for education, free plants, and assistance with planning and design of a shoreland improvement project. As a result, a Shoreland Improvement Workshop and Tree/shrub give-a-way was planned for the spring of 2012.

RED CEDAR WATERSHED CONFERENCE

The Red Cedar River Watershed in Northwest, WI that extends from Big Chetac Lake near Birchwood, WI in Sawyer County to the Chippewa River in Dunn County (Figure 5) includes several bodies of water including Lakes Tainter and Menomin and the Chetek Chain of Lakes that suffer each year from massive blue-green algae blooms. Other lakes in the watershed including both Turtle Lakes experience their own algae blooms. And while not as bad as those blooms in Tainter and Menomin and the Chetek Chain, they are bad enough to cause hardship and concern. There are many reasons why the waters in this watershed are struggling, but most of it is due to nutrient loading coming off the land. A group of citizens, concerned over the poor quality of their waters, came together in 2012 to search for a sustainable solution to the problem that would work for everyone in the watershed - farmers, city dwellers, commercial interests, waterfront property owners, and recreational water users. The Red Cedar Watershed Conference, which started in 2012, is an attempt to bring the various stakeholders together to spend a day speaking, learning, and discussing how to restore the Red Cedar River Watershed to the beautiful system it should be.

The focus of the conference was much the same as what was already being done in the smaller Turtle Lakes Watershed. As such, the Turtle Lakes project was presented in the first Conference held in March 2012. A presentation (Figure 6) was prepared high-lighting the Turtle Lakes Project ups and downs through 2012. Members of the Stakeholders Board were also present to answer questions. In every year of the Conference, the Lake Protection Project let riparian owners know that the conference was happening and offered to pay the registration fee. Unfortunately, not a lot of people took us up on that offer.

SCHEPS FIELD DAY/PICNIC

On Saturday July 21, 2012 the Lake Protection Project and SanDal Dairy sponsored a 4 hour farm tour event at the farm owned by Dale Scheps and his family. The purpose of the tour was to connect lake property owners and other community members with the agricultural community in an effort to raise awareness about large farming operations and what can and is being done to minimize their impact on the natural resources in the area. Dale offered up the farm and many of his family members and employees to guide many different tours relating to the daily operation of the farm. In addition, the agronomist and farm nutritionists that Dale works with through Countryside Cooperative presented on the operations and requirements of the farm. The following tours were a part of the event:

- Heffer shed
- Calving
- Free stall barn
- Manure handling
- Milking parlor
- Feed storage
- No till/conventional till side by side comparison
- Equipment

The tour began with a short introduction by Ken Bonner, Chair of the Lake Protection Project, and then an introduction to the farm by Dale and his family. Participants were divided into small groups to complete the various tours. Lunch (burgers, brats, beans, chips, white and chocolate milk, pop, and all the fixings) was served on site. The event was open to the general public and advertised in the local paper. Nearly 90 people attended. There were many positive comments related to the event.

FARM TECHNOLOGY DAYS

The Wisconsin Farm Technology Days is the largest agricultural show in Wisconsin and one of the largest in the nation. The three-day outdoor event showcases the latest improvements in production agriculture, including many practical applications of recent research findings and technological developments. Each year, it is held in a different Wisconsin county - on a different host family farm. In 2013, the event was held on a farm near Dallas, WI in Barron County, only a few miles east of the Turtle Lakes.

Wisconsin Farm Technology Days provides visitors the opportunity to see and talk with more than 600 commercial and educational exhibitors in Tent City who are eager to visit with them about their machinery, equipment, facilities, products, and service needs. A wide variety of agricultural products and services used in today's dairy, livestock, and crop production systems in Wisconsin will be on display. In addition, specialists and county extension agents from the University of Wisconsin and state and federal agencies are on hand to answer questions. Educational exhibits, special interest displays, and field machinery demonstrations provide something of interest for everyone.

Like with the Red Cedar River Watershed Conference, the Turtle Lakes Project offered to pay the entry fee for any farmer or riparian owner in the Turtle Lakes watershed wishing to attend. Several riparian owners did attend the event as did most of the local farmers.

SHORELAND IMPROVEMENT WORKSHOPS

Shoreland improvement workshops were started in 2012 as a response to a property owner's interest survey that had been sent out in the fall of 2011. Throughout 2010 and 2011, several shoreland improvement plans were developed for property owners, but none of the projects had been implemented. Part of the problem was the fact that if restoration projects were to be funded under the grant, the project would have to be deeded in perpetuity on the property. What this meant is that the property owner or any subsequent purchaser of the property would have to maintain the restoration project essentially "forever" or risk fine or repayment to the WDNR. No one was willing to do that.

It was in 2012, that the Town of Almena donated $2000.00 to the Lake Protection Project, and promised to do this in each of the remaining years of the project (through 2014). As a result, smaller improvement projects could be implemented, and funding made available to assist in their implementation.

The 2012 Workshop was held on April 28, 2012 from 9-Noon (Figure 10). Invitations were sent to all property owners on both lakes. An ambitious agenda was created with Amanda Kostner from Green Frog Consulting and Dave Blumer from SEH presenting. More than 50 people attended the 3-hr Restoration Workshop including riparian owners, several of the local farmers, and Stakeholders Board Members. The attendance was evenly split between Upper and Lower Turtle Lake property owners. Refreshments were provided by the Lake Protection Project and included coffee, rolls, fruit, and pop. SEH provided information related to the Turtle Lakes Protection Project, requirements for restoration projects, and information to determine properties represented at the workshop that would be eligible for full site evaluations. Amanda Kostner provided the bulk of the information talking about simple things any land owner can do to reduce runoff from their property, buffers, rain gardens, full site restorations, and the use of native plants. Two guest presenters from Shell Lake discussed the restoration project that they went through in 2010.

Figure 10 – 2012 Shoreland Improvement Workshop

On May 18, 2013, the Stakeholders Board again sponsored a Tree-Giveaway to promote landowner improvements to their shoreline. Not really a Shoreland Improvement Workshop, but approximately 250 trees and shrubs (spruce, white pine, dogwoods, and service berries) were obtained from Barron County and given away at the event. Several Stakeholders Board members were present and a representative from Dragonfly Gardens was there to help answer questions and selling plants. Four $33.00 gift certificates to Dragonfly Gardens to be used for the purchase of native shoreland plants and raingarden plants were given away. Turnout to the event was approximately 35 people. This event brought in several property owners that had not been active before and initiated a few more walk-throughs.

On May 31, 2014 an official Shoreland Improvement Workshop was again sponsored by the Stakeholders Board. The purpose of this workshop was to invite all property owners on both lakes who in the three years prior to 2014 had been recipients of some sort of shoreland improvement planning. Some properties received whole improvement plans; others just received property walk-throughs followed by a list of ideas to make improvements. Project ideas included shoreland restoration sites, installation of rain gardens, water diversion actions, native plantings, installation of rain barrels, and other projects to stabilize the property, channel runoff to more appropriate locations, or ways to handle roof runoff. Some of these projects had been implemented, most had not.

Twenty-four property owners were personally invited to this workshop. About twenty of them showed up, which was a fantastic turnout. A quick review of why these property assessments were done, how they fit into the Lake Protection Project, and what options were available to get more of them implemented was done. Then each property owner met with Amanda Kostner (The Green Frog Consulting) and Dave Blumer (LEAPS) to review their individual projects, obtain a commitment from the property owner to implement all or some of what was included their original projects, set up a schedule whereby Amanda could provide assistance if needed, and put an estimated dollar figure on the cost. Once all the individual discussions were had, the Stakeholders Board decided how much of the total cost of these projects they could cover. Based on the number of projects, the Stakeholders Board decided to cover 70% of the cost for planning and materials. If a property owner wanted to hire someone else to actual install the project, that cost was the responsibility of the individual property owner. If a commitment was signed, the property owner was sent a $25.00 gift certificate from Dragonfly Gardens to help with installation.

SHORELAND IMPROVEMENT BROCHURE

All of these workshops led to 20 different shoreland improvement projects being implemented on the Turtle Lakes. In an attempt to provide incentive for future shoreland improvement projects, a Shoreland Improvement Brochure high-lighting many of the completed projects was developed in 2015 (Figure 11). Several hundred copies of the color brochure were made and distributed to all lake property owners in September 2015.

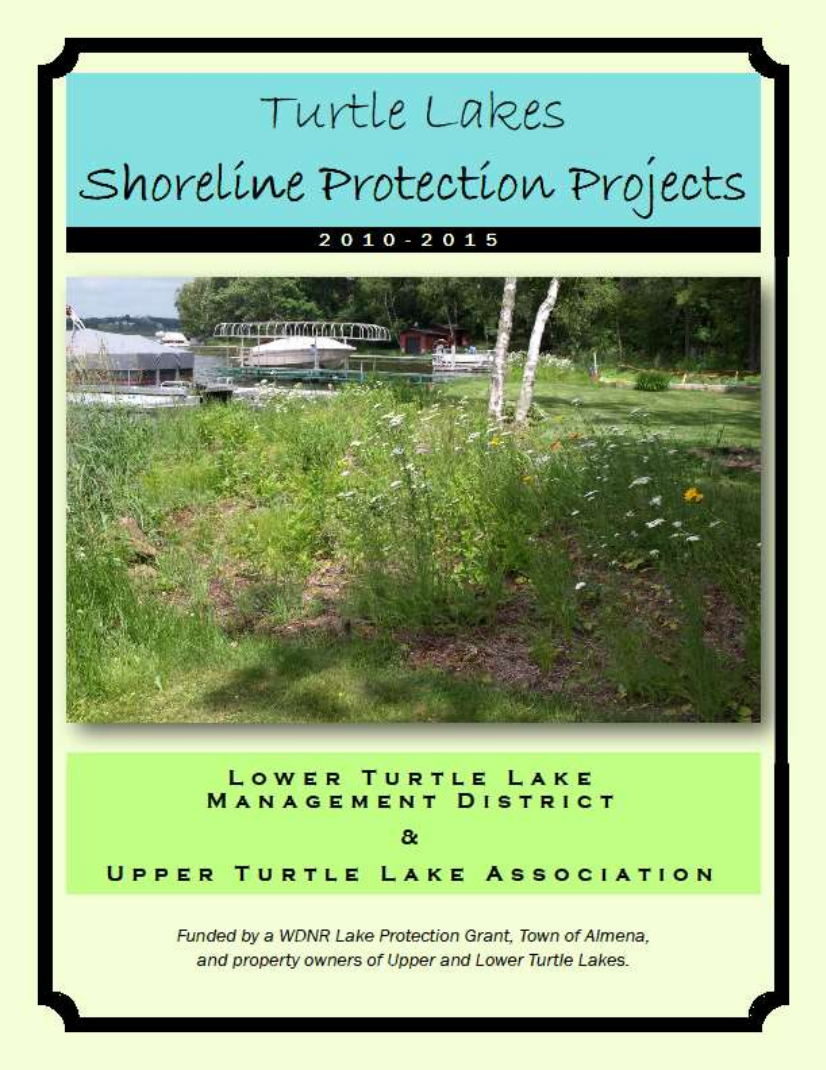


Figure 11 – Cover page of the Shoreland Improvement Brochure

PROJECT NEWSLETTERS

Both the Lower Turtle Lake Management District and the Upper Turtle Lake Association provided continuous project updates and information about the Turtle Lakes Protection Project in their regular newsletters. Each lake sent at least one newsletter out each year with information about this project. All available newsletters are in the Data CD accompanying this report.

FINAL PROJECT PRESENTATIONS

Final Project Summary Presentations were given to both the Lower Turtle Lake Management District and the Upper Turtle Lake Association. It was interesting in that the Summary Presentation given to the Upper Turtle Lake Association on Saturday September 12, 2015 was exactly 6 years to the day after the initial Project Presentation was given.

AGRICULTURAL BEST MANAGEMENT PRACTICES

There are many farming best management practices (BMP's) that have been shown to significantly reduce phosphorous loading to local lakes and streams. The most beneficial BMP in the Turtle Lakes Watershed is the transition from common field preparation and planting practices to "no-till" field preparation and planting. It was estimated in the initial project description that increased involvement in "no till" crop management could potentially reduce agricultural phosphorous loading by 40% or more. In 1994 modeling on Lower Turtle Lake, it was shown that if all row cropping occurring in the watershed was converted to "no till" phosphorous could be reduced from 1128 lbs. per year to 678 lbs. per year. There are many other beneficial agricultural BMP's including installing grassed waterways or buffer strips near waterways, feed lot adjustments, manure management, barnyard runoff diversions, etc. that a farmer might be willing to implement if cost-sharing was provided to do so. A major component of this five year project was the promotion of these agricultural best management practices. Table 7 provides a snapshot of the best management practices that were included in this project. In the following sections of this report, more detail about the implementation of these BMPs will be provided.

Table 7 – Agricultural Best Management Practices (BMPs) implemented as a part of this five year project

Agricultural Best Management Practices 2010-2015						
Best Management Practice	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
No Till Incentive	x	x	x	x	x	
Contracted No Till Planting		x	x	x	x	
Cover Crop Incentive		x				
Barnyard Improvement Projects		x				x
BMP Challenge/Side by Side			x	x	x	

NO TILL INCENTIVE

In the development of this project, discussion with the Barron County Soil and Water Conservation Department suggested that farmers may not be interested in signing more than a one-year contract to become involved in no till planting. No till incentive contracts for a longer period of time were desired by the Project developers. As such, several different contracts were created for local farmers to consider. One year contracts had a lower incentive payment. Longer contracts had higher payments. It was also known that the when farmers switch to no till practices they may experience reduced harvests that might discourage no till participation after only one year. It often takes two or three years to experience the increased crop yields and cost savings that are promoted by no till enthusiasts. One of the main reasons to have a three year contract is to provide enough time to show farmers they can save money and not experience reduced crop yields.

Any farmer actively row-cropping farmland within the Turtle Lakes Watershed could have participated in this incentives program. The list of crops considered row cropping are corn, soybeans, snap beans, and grain. Pasture or hay crops were generally not eligible, unless being planted for the first time on top of the residue of a previous crop that was planted using no till. It was expected that in any given year the maximum amount of farm land devoted to row cropping in the Turtle Lakes Watershed would be 1250 acres. No Till contracts for 1-year and 3-years (or more) were developed by this project and signed by participants. If a project was signed up for more than one year, the participant was paid $17.50/acre, and only $15.00/acre if signing only a one year contract.

There was little to no crop land in the watershed that was incorporating no till planting practices prior to 2010. Farmers who owned land in the watershed, farmers who rented land in the watershed, and the

property owners who owned the rented land were included in mailings each year. Table 8 shows the number of farmers participating in the No Till Incentive Program, the number of acres in the program each year, and the value of the incentive paid to the participating farmers. Figure 12 provides a visual of the increase in no till acres each year of this project. Based on the 1994 modeling that was done and an estimate of 1250 acres in crop land, in the last year of the project the amount of phosphorus prevented from entering the system was approximately 342 lbs., or 30% of the total phosphorus load from cropland in that year. Over the five year period of this project, the total phosphorus load to the lakes from crop land was likely reduced by 17.3% or nearly 1000 lbs. of phosphorus.

Table 8 – Results of the Turtle Lakes No Till Incentive Program

Turtle Lakes No Till Incentive Project - Total Acres and Value										
	D. Scheps	H. Becker	D. West	V. Nelson	D. Wohlk	T. Becker	L.Lentz	L. Hansen	Total	Value
2010	41	80	NA	NA	NA	NA	NA	NA	121	$2,117.50
2011	28	122	NA	NA	NA	NA	NA	NA	150	$2,625.00
2012	88	120	28	168	18	17	NA	NA	439	$7,682.50
2013	48	132	78	169	18	10	NA	NA	455	$7,962.50
2014	73	249	124	50	0	0	110	24	630	$10,690.00
Total	278	703	230	387	36	27	110	24	1795	$31,077.50
Value	$4,865.00	$12,302.50	$4,025.00	$6,772.50	$630.00	$472.50	$1,650.00	$360.00		

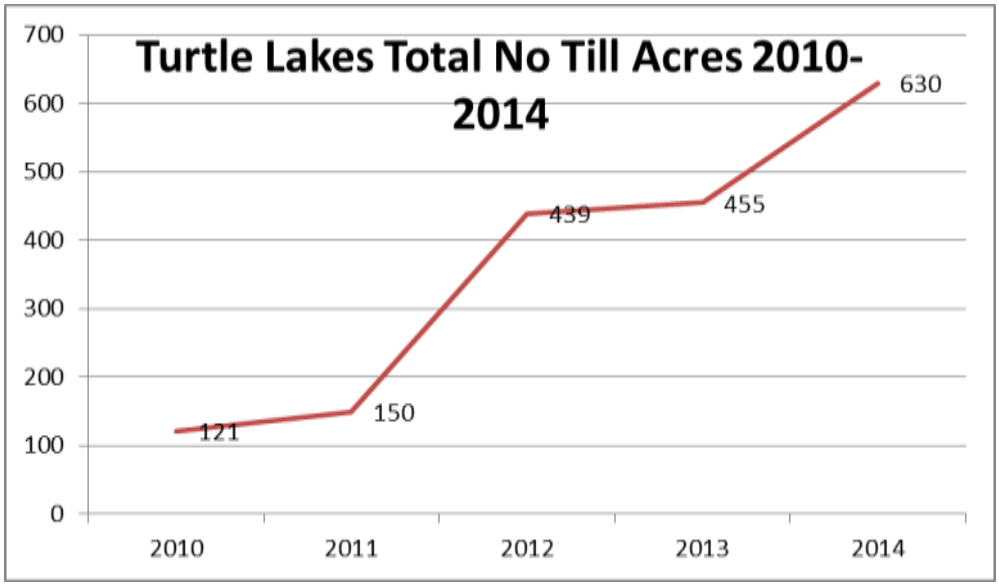


Figure 12 – Increase in total acres of crop land enrolled in the No Till Incentive Project

The number of farmers participating in the program also increased during this project, reaching its peak in 2012 and 2013 with six farmers (Figure 13). A little more than $31,000.00 was paid out in no till incentives over the five year period. The most active farmer was Harland Becker who was paid just over $12,300.00 for 703 acres of no till during that time span.

The biggest question left unanswered in this project, is how many farmers will continue to employ no till without the incentives from the Lake Protection Project. The short and most likely answer to that question is likely nearly all of them. Certainly those farmers who purchased the equipment will continue to use no till. Smaller farmers may not, but will if they believe that their yields will be comparable over time, but their cost

to plant (fuel and time) will go down. The second question is what about the crop land that was not enrolled in the lake protection project .

One of the largest farmland renters and two of the biggest farmland owners in the watershed were not interested in participating in any of the Cost-sharing or Incentive Programs being offered through the lake protection project despite being contacted every year. The renter farmed around 200 acres in the watershed, and stayed out of the program until 2014. One property owner farms a large piece of cropland just south of Hwy 8 and stayed out of the program until 2013 when he sold the property to an investor. The investor did not participate in the lake protection project either, but it is interesting to note, that the new farmer who is renting the property now, does incorporate no till, grassed waterways, and field borders. Another prominent farmer in the watershed, who also declined to be a part of the programs supported by the lake protection project, is likely going to sell or rent his land in the next few years to a neighboring farmer who does use no till. So it is highly likely, that in the next couple of years almost all crop farming done in the watershed will be completed using no till.

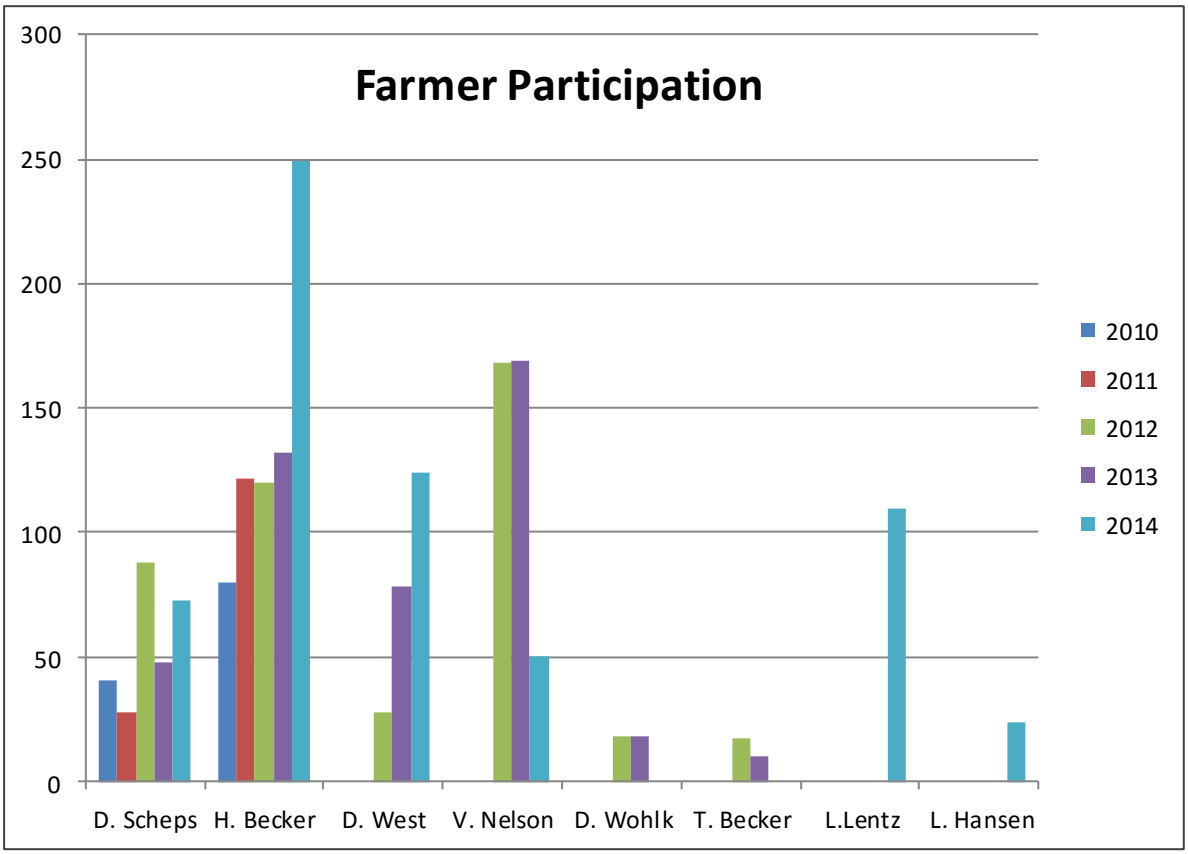


Figure 13 –Farmer participation by year and the amount of acres included in the Incentive Program

CONTRACTED NO TILL PLANTING

Planting crops using no till requires a little different set up in the equipment used to plant. The planter needs to be able to penetrate through a layer of residue on the surface of the field that could be a couple of inches or more deep. Dale Scheps, Harland Becker, Vern Nelson, and Larry Lentz either had the ability to implement no till or purchased no till planters during this project. Dean West, Darrel Wohlk, Thomas Becker, and Larry Hansen did not have the appropriate equipment but were willing to incorporate no till if someone else could do the planting. Once Dale Scheps purchased his large no till corn planter, arrangements were made for him to do contract no till planting for those who did not own the equipment themselves. Harland

Becker had the appropriate equipment to incorporate no till planting of soybeans and alfalfa. Both farmers were approached by this project, and arrangements made for them to do contract planting that would be paid for by this project. All property planted in no till by Dean West, Darrel Wohlk, Thomas Becker, and Larry Hanson was planted as a part of the contract services paid for by this project. Over the course of five years, 317 acres of no till was planted by contract at a cost of $5,070.58.

COVER CROP INCENTIVE

In 2011, the lake protection project included an incentive payment for the use of cover crops in the watershed. Farmers were given an $18.50/acre incentive payment if they were to incorporate a cover crop going into the fall and winter season that would be left on the field; and $12.95/acre if harvest of the cover crop was expected. Two farmers participated in the program: Harland Becker and Dale Scheps. Harland incorporated 36 acres in cover crops, utilizing white radishes on one field where no till corn was planted the following season. He was paid $666.00. Dale Scheps had 21.75 acres in cover crop utilizing rye which was harvested in the spring. He was paid $281.66. Cover crop payments were not continued past 2011 because it was feared at the time, that the project would run out of money in the grant to cover contracts prematurely.

BARNYARD IMPROVEMENT PROJECTS

Although many potential projects were discussed in this project including wetland restorations, feed lot improvements, grassed waterways, and field borders, only two projects were actually completed during this project.

Two small wetland restoration projects were discussed early in the project, but put off due to a focus being placed on other projects. One of the wetland projects was revisited in late 2014, but at that time, there was not enough money left in the lake protection project to cover the estimated expenses.

Cost-sharing for the installation of field borders was pushed throughout this project, but also required the farmer to sign an agreement that the border would be maintained for a minimum of 10 years with a payment of only $100/acre. Early in this project, corn prices far exceeded what little incentive was being offered for installation of a field border, and only one farmer was interested, and he preferred to sign a five-year agreement, which was not supported by the Barron County Soil and Water Conservation Department or the Stakeholders Board. In the end, no field border projects were installed.

Two barnyard improvement projects were completed as a part of this project.

HOYT AND PAMELA ROSE HORSE FARM PROJECT

In 2011, a barnyard and runoff reduction project was completed on a horse farm owned by Hoyt Rose. The Rose's raise and board horses for their own use and for others. They have several very large indoor facilities with lots of rooftop. The horses are pastured and fed as well contributing to pollution in surface water runoff from the property. There is a large gravel driveway and several access roads that put additional pollutants into runoff from the property. All of this goes into Lower Turtle Lake on the east side of the lake (Figure 14).

The project included the installation of a roof runoff control system, grassed waterways, crowning of access roads, livestock fencing, and nutrient management planning. The project was completed in 2012 except for nutrient management planning. Instead of creating his own nutrient management plan, Hoyt Rose decided to rent his land to Dale Scheps to be included in his nutrient management plan. A total of $11,224.15 was paid out by the lake protection project in support of this barnyard improvement project.

At one point there was discussion about adding a feed lot component to the Rose Farm project. There was also discussion related to supporting a combination mulching/water heating project with the manure and other debris from the horse stalls. These additions were ultimately not included in this project due to cost and questionable outcomes, particularly with the mulching/water heating project.

Figure 14 – Rose Horse Farm Improvement Cost-sharing Project

DEAN WEST BARNYARD IMPROVEMENT PROJECT

In 2011, discussion began relating to a barnyard improvement, feedlot, and grassed waterway project on the home farm of Dean West. The original project included redesign of a heavy use area, grassed waterways, a water diversion, re-vegetation of a treatment area, and livestock fencing, and was estimated to cost more than $27,000.00 with the lake protection project covering 70% or nearly $19,000.00 (Figure 15). In 2012, Dean informed us that he was selling his dairy herd and would no longer be using his pasture and feed lot, or the barnyard in support of the dairy operation. As a result, the project was reduced in scope considerably.

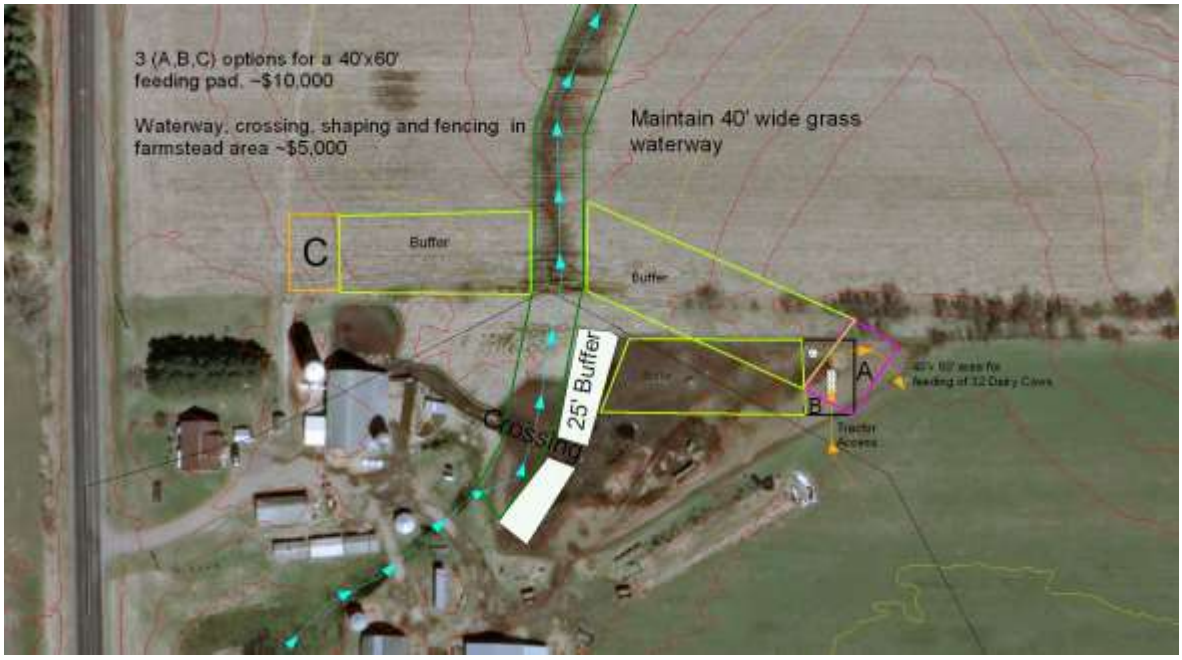


Figure 15 – Dean West Original Barnyard Project, 2011

Completing a project on the West Farm was still considered a priority as any significant rainfall event and spring snowmelt moved through the area between the barn and the pasture carrying with it much sediment and debris which was loaded with phosphorus and other pollutants. A revised project was proposed in 2013 which only included excavation in the immediate area between the barn and the existing pasture to create a grassed waterway in place of the mud hole that was already present. The new project only had an estimated value of $4,642.00 of which 70% ($3,249.40) would be paid for by the lake protection project. This project was completed in 2015 (Figure 16).

Figure 16 – Dean West Grassed Waterway Project (before and after)

BMP CHALLENGE/SIDE BY SIDE

In 2012, the Stakeholders Board became aware of a program supported in Wisconsin called the BMP Challenge. The BMP CHALLENGE programs work to give farmers an opportunity to test reduced nutrient and tillage rates on their fields, without worrying about loss to their income.

Two local farmers (Dale Scheps and Vern Nelson) agreed to participate in the BMP Challenge in 2012. Side by side comparisons of no till planted corn and conventionally planted corn were set up on each of their properties (Figure 17). Photos taken from both sites in July 2012 clearly show the differences between the no till portions and the conventional till portions of the project (Figure 18). After all yields were calculated by the Barron County Agriculture Extension Agent, and estimated costs for field preparation were considered, One farmer (Nelson) was paid $20.00 for losses incurred from incorporating no till planting, and the other farmer (Scheps) was required to pay in $100.00 because he actually saved a few dollars over his normal expenses from incorporating no till planting. Neither farmer participated in the BMP Challenge program in 2013 or subsequent years. However, the BMP Challenge led to the three year side by side comparison on Dale Scheps's property.

The BMP Challenge program was not a part of the original Turtle Lakes Project, but did support the goals of it.

Figure 17 – Vern Nelson (left) and Dale Scheps (right) 2012 BMP Challenge Side by Side Comparisons

Figure 18 – Nelson Side by Side (left) and Scheps Side by Side (right) in July 2012 after a rain event

In the process of agreeing to participate in the BMP Challenge, Dale Scheps was also asked to set up a three year side by side comparison (Figure 19) to be used to show whether or not incorporating no till really does decrease yield. It was agreed that Dale Scheps would receive a payment in each of three years above and beyond the no till incentive to maintain the side by side for three years. Tim Jergenson agreed to continue evaluating the yield off of the field where the side by side was implemented.

In his report (included on the Data CD), Tim reported no measureable different between the two treatment areas in corn harvested for grain. In the final year of this demonstration, the corn was harvested as silage and the no-till treatment had a slight advantage over the conventional treatment. There were no differences observed in the timing of corn seedling emergence, post-emergent plant population, or weed pressure. It was calculated in all three years, the cost savings per acre for implementation of no till was $24.10.

The Side by Side project cost the lake protection project $798.75 over the three years it was implemented.

Figure 19 – Road Sign installed along Hwy 8 adjacent to the Side by Side Project

TOTAL COST OF AGRICULTURAL BEST MANAGEMENT PRACTICES PROGRAMS

Table 9 shows the breakdown of the costs for implementing agricultural BMPs in support of this project. It is difficult to quantify how much phosphorus reduction has likely occurred as a result of these projects, but it is a safe bet, that some have been realized.

Table 9 – Total cost of Agricultural BMPs implemented as a part of this project

Five Year Cost of Agricutural BMPS		
No Till	$31,077.50	2010-2014
Contracted Planting	$5,070.58	2011-2014
Cover Crops	$947.66	2011
Barnyard Improvements	$14,473.55	2011, 2015
Side by Side	$798.75	2012-2014
	$52,368.04	

RIPARIAN BEST MANAGEMENT PRACTICES

The focus of the Turtle Lakes Protection Project was two-fold. The first part of the project was to work with agricultural producers in the watershed to educate, inform, and encourage them to participate in best management practices that would not only reduce the amount of sediment and phosphorus entering the lake, but potentially improve, or at least not harm, their bottom line.

The second part of this project was to do basically the same thing with the riparian or lakeshore property owners on both lakes. The goal was to educate, inform, and encourage riparian owners to participate in best management practices that would also help reduce the sediment and phosphorus load going into both lakes. Working with agricultural interests addresses the larger watershed, and working with property owners addresses the nearshore area. Both are significant contributors to what causes water quality degradation in the lakes. Furthermore, both farmers and riparian owners were not willing to participate unless the other did too.

Best management practices or BMPs in the nearshore area include projects to reduce runoff from buildings, driveways, sidewalks, and mowed lawns; projects to divert runoff away from the lake; and projects to slow water that does runoff the nearshore area down and allow it to be filtered by vegetation and/or infiltrated into the ground before it gets to the lake.

RIPARIAN OWNER PROJECTS

A shoreland improvement consultant was brought into this project in 2010 to help guide property owners through BMP planning and implementation projects. It was thought that all that was needed was to give people a little information and they would readily participate in shoreland improvement projects. This did not prove to be the case in the first couple years of this project. Getting property owners to commit to planning projects was difficult, but at least easier, much easier than getting them to actually implement a shoreland improvement project after it was planned.

One significant issue was that there were certain requirements that had to be met if a project was going to be funded under the grant. There were requirements for how large and complete a project had to be. The entire exposed shoreline had to be restored for a minimum of 35-50 ft. from the water's edge to the end of the project. Runoff diversion projects, rain barrels, small rain gardens, native plantings, and partial restorations were not eligible by themselves for funding support from the grant. Smaller projects had to be included along with a full restoration plan to be considered. Even if a project met the requirements for full restoration, the land owner then had to add an agreement to maintain the shoreland improvement project in perpetuity to the property deed. No one was willing to do this.

In an effort to increase the number of participants in shoreland improvement planning, 100 % of the planning costs were paid for by the lake protection project. It was hoped that if there was no planning costs, property owners might be more willing to implement projects with their own money. By the end of 2011, only 8 properties (four from each lake) had been evaluated with full site evaluation plans being written, but none had begun implementation. It was at this time, that a property owner interest survey was developed and sent out to all property owners on both lakes to find out why there was not more participation. At the same time, a survey was sent to those folks who had already received planning services to find out what they thought of the program, why they had not begun implementation, and what could be done to further encourage implementation.

Responses from the two surveys led to the first Shoreland Improvement Workshop held in April 2012. The workshop was a great success with over 40 people attending. More than a dozen new property owners signed up for property Walk-Arounds. Walk-Arounds were not designed to be full site evaluations, but rather a quick glance at a property with an eye on identifying small or large projects that could be implemented to

make improvements. These were much less time consuming and less expensive than the full site evaluations from 2010 and 2011. A form was developed that was used on every walk-around so that they were consistent from one property owner to another. If it was determined that a property would benefit from a full site plan, and the property owner was willing to implement a larger project, a request could be made to complete a full plan. In addition, the Town of Almena donated $2,000.00 in 2012 to be used for implementing smaller projects without all the previously required hoops to jump through.

Through 2012 and 2013, seventeen property Walk-Arounds where completed. Walk-Arounds included recommendations for the installation of rain barrels or in some cases rain gutters; recommendations for restoration of native plants; construction of rain gardens; erosion control/repair projects; no mow areas; runoff diversion projects; and many other things. However, by the end of 2013, still only a couple of projects had been implemented. This led to another Shoreland Improvement Workshop held in May 2014. This workshop was different than the others in that only property owners where either full site plans or walk-arounds had been completed were invited. The purpose of the workshop was to review what had been done and why, and then a face to face discussion was had with each property owner about what it would take to get their projects implemented. After the discussion, the property owner was asked to sign an informal commitment letter that stated their intention to implement whatever project was on the table by the end of 2014. Cost estimates were made, additional planning requirements identified, and dates set for actual project implementation.

The meeting was a big hit, with nearly all of the properties receiving planning services in attendance. By the end of 2014, most of the projects that had been discussed were implemented. Table 10 shows what was done and when. Actual site evaluations and walk-around documents are included on the Data CD. Table 11 shows what documents were created to support the riparian BMPs project.

Table 10 – Riparian Best Management Practices Planning Projects

Turlte Lakes Protection Project Riparian Best Management Practices - Shoreland Improvement Projects - 2010-2015								
Best Management Practice	**Participant**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Implemented**
Full Site Plans	Meyer	x						Yes
	Cran	x						Yes
	Zalusky	x						Yes
	Solberg	x						?
	Stoffel		x					?
	Swanson		x					?
	Koegel		x					Yes
	Dietzman		x					Yes
Walk-Arounds	Chiodi			x				?
	Hofmeister			x				?
	Hoppe			x				Yes
	Shultz			x				?
	Spring			x				?
	Bonner			x				Yes
	DRheingans			x				Yes
	Kalis			x				Yes
	Mullin			x				?
	RRheingans			x				Yes
	Walbridge			x				Yes
	Licht				x			Yes
	Steuber				x			Yes
	Taxdahl				x			Yes
	Johnson				x			Yes
	Halvorson				x			?
	Post				x			Yes
Boat Landings	Upper (1)		x	x	x	x		No
	Lower (2)		x	x				No
Riparian Implementation					x	x	x	NA

Table 11 – Shoreland Improvement and Riparian Education Documents

Shoreland Improvement Documents Used in the Turtle Lakes Protection Project	
Developed	**Borrowed**
Buffer Care and Maintenance	Self-Evaluation Checklist
Rain Barrels	Rain Gardens a How-To Manual
Tree Planting Guide	Be LakeSmart
Re-establishing Native Plants	
Barron County Native Plant List	
Contacts for Waterfront Questions	
Local Contractors for Implementation	
Walk-Around Evaluation Form	
Property Interst Survey	
Participant Follow-Up Survey	

BOAT LANDING PROJECTS

When this project was started, it was also felt that improvement projects could be completed at the three public access sites on the lakes. The two Lower Turtle Lake accesses were looked at first and it was determined that there was little that could be done on the east landing without major engineering and reconstruction; and not much that was needed at the west side landing, as it was not frequently used. There was some discussion about closing the east side landing and directing all launching to the west side landing. Had this been the case, then more could have been done on the west side of the lake. However, local people, the Town, County, and WDNR were not in favor of this idea, so it was not pursued.

The Upper Turtle Lake public access got a lot more attention. When evaluations started it was quickly discovered that projects would have to go through the County, Town, and the State since the state DOT owned the wayside immediately adjacent to the public access. Most of the improvements projects included some overlap onto the state-owned wayside property. Planning and evaluation was started in 2011, and not really completed until 2013. It included planning and design work for both a rain garden and a stream buffer area. A plant list was even established. At that point, we were informed that the Town/County had plans to make improvement to the landing themselves, and as a result we were advised to hold off on any improvements that may have been planned for the landing. As a result, these plans were not implemented.

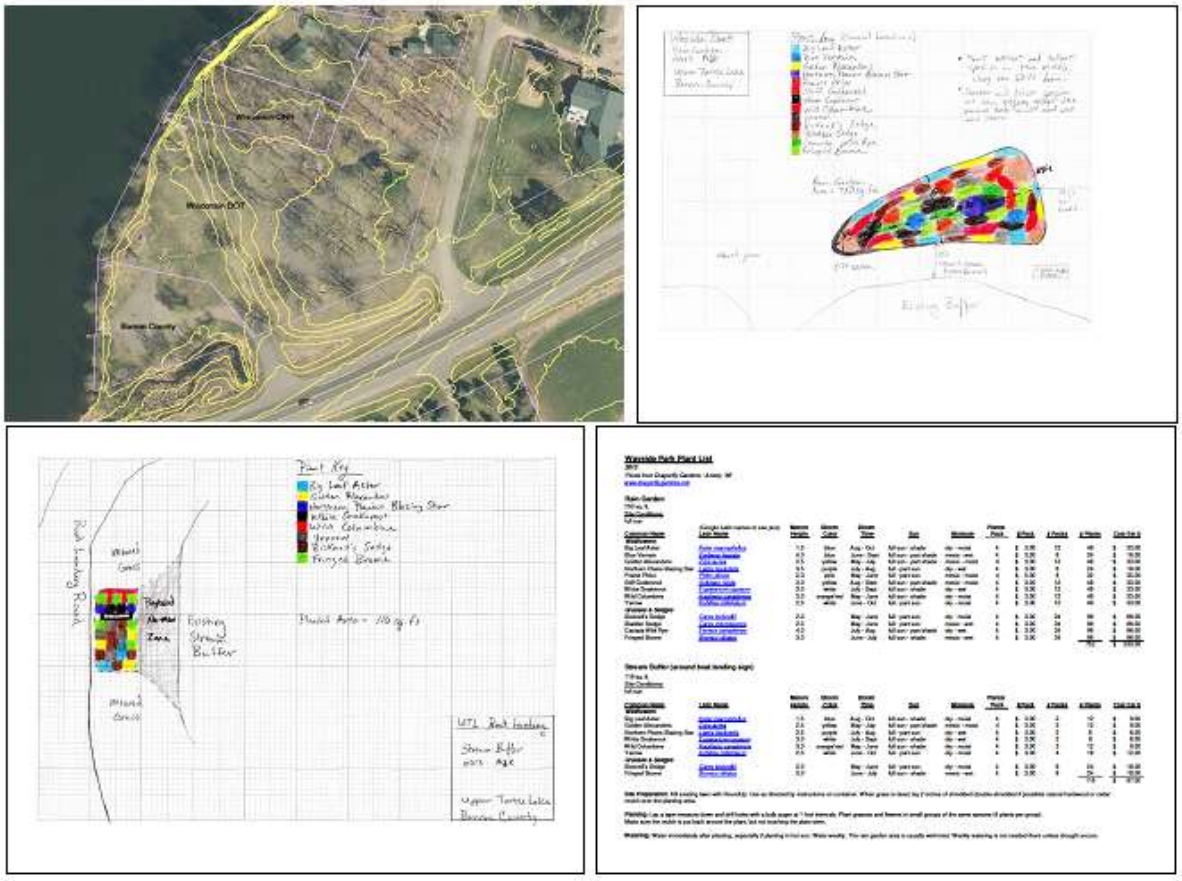


Figure 20 – Upper Turtle Lake Landing Improvement Plan

POINT-INTERCEPT AQUATIC PLANT MANAGEMENT PLANS AND SURVEYS

Aquatic plants are an important part of any lake ecosystem. However, native plant growth that causes navigational impairments and/or creates significant nuisance growth conditions that can be documented may need to be addressed. The introduction of non-native aquatic invasive species like curly-leaf pondweed (CLP) and Eurasian water milfoil (EWM) to a lake may cause serious negative impacts. At the beginning of this project neither lake was known to have EWM. Both lakes were known to have CLP. In order for aquatic plant management to be efficient and effective, the total number of plants in a system both native and non-native, the locations of these plants, and how dense they grow must be known. Critical habitat and sensitive areas need to be designated, protected, and enhanced. When this project started, neither lake has a state approved Aquatic Plant Management Plan (APMP).

As a part of this project whole-lake, point-intercept, aquatic plant surveys were completed on both lakes following WDNR protocol. A similar survey was completed on Lower Turtle Lake in 2008. WDNR protocol recommends redoing plant surveys every 5 years, so another plant survey was completed in 2014. Upper Turtle Lake had never had an appropriate plant survey completed. As a part of this project, one was completed in 2010. APMPs were written for both lakes including EWM Response Plans in the event that EWM is discovered in either lake. The Lower Turtle Lake APMP was based on plant survey results from 2008 and completed in the fall of 2010. The Upper Turtle Lake APMP was based on plant survey results from the 2010 survey and completed in the spring of 2011.

The Lower Turtle Lake APMP primarily focused on management of CLP and this project provided funding for the preparation of an Aquatic Invasive Species (AIS) Established Infestation Control grant to support implementation of that APMP. The grant was prepared and submitted in August 2011, but it was not awarded. In late 2014, based on results from the new data in the 2014 aquatic plant survey, a request was made to add a Native Plant Management Addendum to the APMP written in 2010. The request was approved and the Addendum has been completed and submitted to the WDNR for approval.

AQUATIC PLANT MANAGEMENT IN LOWER TURTLE LAKE

After the AIS grant was not awarded in 2012, the Lower Turtle Lake Management District decided not to pursue another grant until after the lake protection project was complete. The resources needed (time, money, and people) to move forward with CLP management were not readily available to support the grant. Actual management of CLP was not implemented until the 2014 season when approximately 6 acres were chemically treated. The plans are for CLP management to continue for at least the next two years, and to be funded by the Lake District.

Upper Turtle Lake has completed no aquatic plant management except for physical removal by individual property owners.

WATER QUALITY-LAKE AND TRIBUTARY MONITORING

This entire lake protection project was focused on efforts to improve water quality in both lakes, specifically by reducing phosphorous loading from the watershed and nearshore area.

To assess the impacts of this 5-yr lake protection project on the water quality in both lakes increased lake and tributary monitoring was planned. Complete nutrient testing (phosphorus and nitrogen), chlorophyll *a*, and turbidity sampling was planned on three sites in Upper Turtle Lake and on two sites in Lower Turtle Lake. Sampling was to be completed a minimum of 5 times during the open water season. Additionally, temperature and dissolved oxygen profiles were planned to be taken from all lake sites at least every two weeks. A Hach Company HQ40d multi-probe digital dissolved oxygen/pH meter was purchased as a part of this grant to support water quality monitoring efforts on both lakes. Initially conductivity and pH were to be recorded, but due to equipment failure and the expense to repair the malfunctioning pH probe, pH and conductivity were dropped from the plan.

Tributary monitoring for similar water quality parameters as well as suspended solids, flow, and volume was planned on four tributaries to Lower Turtle Lake and on two tributaries to Upper Turtle Lake (Figure 21) a minimum of five times during the season including spring runoff. In many cases, scheduled sampling was unable to be completed because the tributaries to be sampled were dry. Initially it was thought that samples that could not be collected at a scheduled time would be collected following a rain event that caused the tributary to flow. Unfortunately samples not collected due to dry tributaries, soon began to pile up faster than the rain came down.

For the purposes of this Summary Report, only the Total Phosphorus values will be reported on, as reducing the total phosphorus load into the lakes was the main focus of this five year project. All sampling data that was collected as a part of this project is included in the Data CD that accompanies this report.

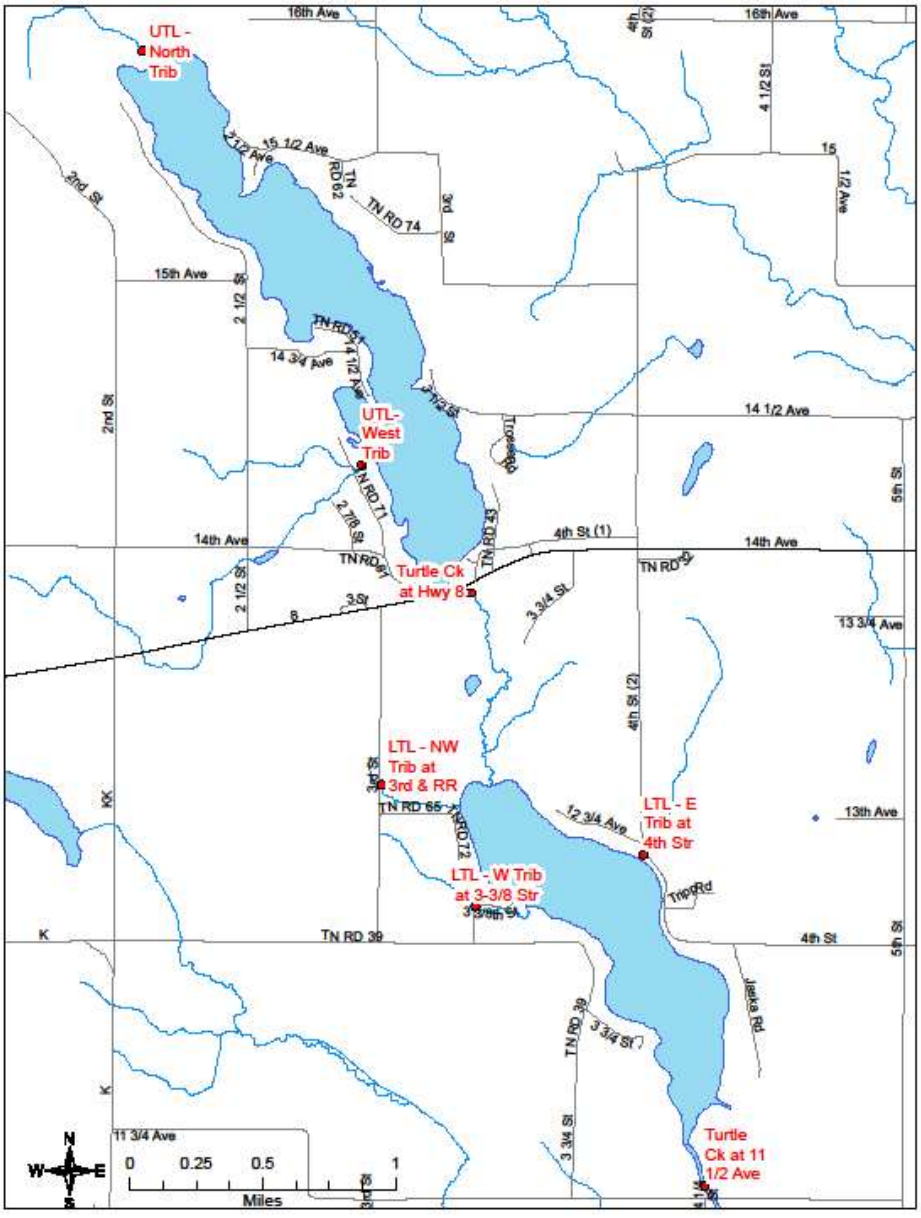


Figure 21 – Turtle Lakes Protection Project Tributary Monitoring Locations

TRIBUTARY SAMPLING

At the beginning of this project (2010), a staff gage was installed in the Upper Turtle Lake Outlet at the Hwy 8 Bridge. Using data collected by the participating consultant and Turtle Lake Protection Project volunteers, a stream flow rating curve was created for the Upper Turtle Lake Outlet (Figure 22). It was anticipated that this rating curve, future staff gage measurements from the Upper Turtle Lake Outlet, and results from water sampling would be used to track the amount of phosphorus leaving Upper Turtle Lake and entering Lower. Staff gages were initially installed at other tributaries as well, but unlike the Upper Turtle Lake Outlet, a lack of water flow or extremely limited flow in most of these tributaries soon made them

obsolete. No rating curves were created for the other tributary sites. Additionally, in the beginning of this project, the outlet on Lower Turtle Lake was not included in the tributary sampling plan.

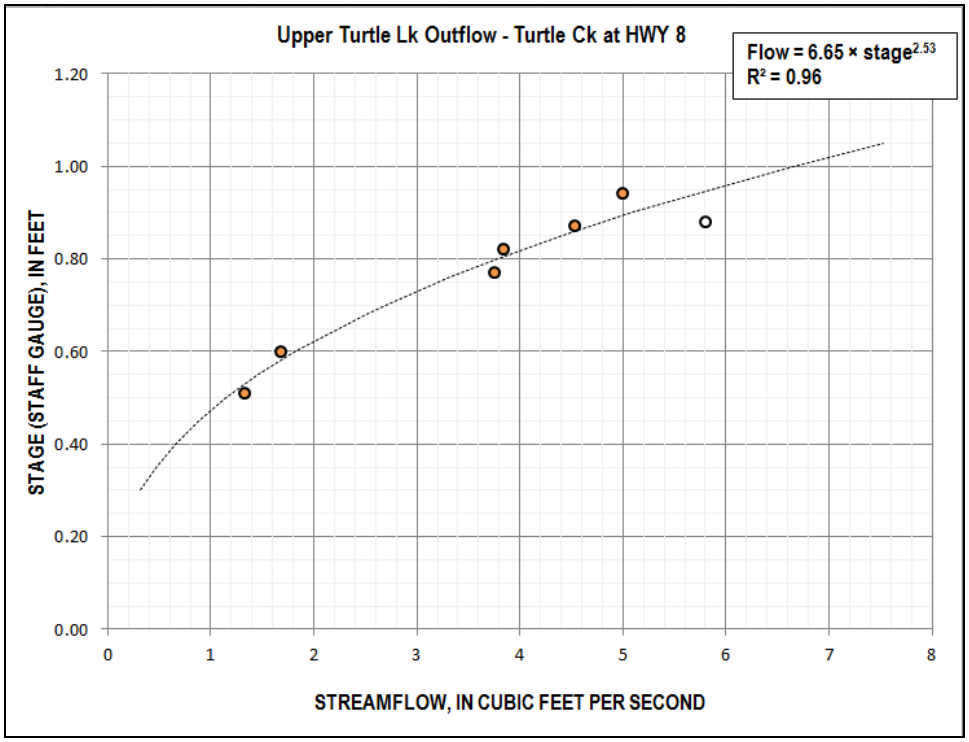


Figure 22 – 2010 Upper Turtle Lake Outlet Rating Curve (Macholl, 2010)

As the project progressed, it was determined that the amount of tributary sampling that was planned was not adequate to pick up changes to water quality that may be due to the BMPs implemented. As a result, additional tributary sampling was added in 2014. Utilizing a consultant who specialized in the collection of water quality data, and had the capability to install continuous data loggers in the tributaries, a much more intensive tributary monitoring project was completed in 2014 on one tributary to Upper Turtle Lake, the Upper Turtle Lake Outlet, and two tributaries on Lower Turtle Lake. Steve Schieffer with Ecological Integrity Services, LLC completed the 2014 tributary sampling program. His report is included in the Data CD that accompanies this report.

In the report from Steve Schieffer, the total amount of phosphorus entering Lower Turtle Lake from the Upper Turtle Lake Outlet and the two other tributaries in 2014 equaled 453.21 kg over a 187 day period (Table 12). The amount of phosphorus leaving Lower Turtle Lake via the outlet was 745.73 kg. The remaining 300 kg of phosphorus is likely coming from the unmonitored portion of the watershed, the nearshore area, internal loading, and decaying plant vegetation (specifically CLP). Removal of CLP before it can reach peak biomass, continued improvements in the nearshore area, and perhaps at some point in the future, the addition of alum to the lake will reduce the phosphorus load further.

Based on the rating curve set up in 2010, and 2010 tributary sampling, 77.38 kg of phosphorus left Upper Turtle Lake in a 186 day period and went into Lower Turtle Lake (Table 12). The other tributaries did not have rating curves, so estimates of the amount of phosphorus entering the system from these locations is unknown. The average phosphorus concentration in each of the tributaries over the five year period of this project is known and is represented in Table 13.

Table 12 – Phosphorus loading data from the Upper Turtle Lake Outlet in 2010 and 2014

Upper Turtle Lake Outlet at Hwy 8 -TP Loading (LEAPS)		
Parameter	**2010**	**2014**
mean daily flow (cuft/sec)	3.729	9.01
total days	186	187
Mean TP (mg/l)	0.0456	0.053
Total TP Outflow (kg)	77.38	218.5
Days with rain	73/186	84/187
Average daily rainfall	0.156	0.149
Total Precipitation (inches)	29.09	27.8
% of Phosphorus load from rains >0.5"	68.07	69.3

Table 13 – Tributary Sampling Results for Total Phosphorus

Turtle Lakes Protection Project 2010-2014 Tributary Sampling Results: Total Phosphorus (mg/l)								
	UTL-NorthTrib	UTL-WestTrib	UTL-Outlet	LTL-NWTrib	LTL-WestTrib	LTL-EastTrib	LTL-Outlet	Notes
2010	0.328	0.3695	0.0393	0.8927	2.573	2.11	NA	121 acres of no till
2011	0.192	0.6067	0.0592	0.3012	0.8055	0.7396	NA	
2012	0.8975	0.6365	0.0548	0.418	5.5	0.4707	NA	
2013	0.1714	0.1742	0.0642	0.1793	0.5203	0.5493	NA	
2014	0.562	0.2053	0.0526	0.4193	0.4448	0.679	0.0661	630 acres of no till

It is interesting to note that the tributaries to the two lakes that are draining the agricultural portions of the watershed (UTL-WestTrib, LTL-NWTrib, LTL-WestTrib, and LTL-EastTrib) show a fairly large reduction in total phosphorus levels from 2010 when only 121 acres of row crops were in no till, to 2014 when 630 acres of row crops were in no till. Additionally, the East Tributary shows a tremendous decline from 2010 to 2014. The Hoyt Rose Horse Farm Runoff Reduction Project was completed in 2011 and was designed to specifically reduce sediment laden runoff from the farmstead and horse pastures that feed the East Tributary. In the water quality report written by Steve Schieffer, in 2014 the East Tributary only contributed 18.12 kg of phosphorus over the 187 day sampling period. More than 215 kg of phosphorus was carried in by the NW Tributary, and nearly 220 kg were brought in from Upper Turtle Lake. According to the Barron County Soil and Water Conservation Department, the Rose Farm had been considered the worst offender in the system. This is not the case any longer.

Only the North Tributary and Outlet on Upper Turtle Lake show increases in the amount of total phosphorus carried in the water samples. There is little agriculture in the area drained by the North Tributary but lots of muck and other organic material that is likely loaded with phosphorus. The phosphorus level found in the Outlet reflects the increased phosphorus levels in Upper Turtle Lake itself, and will be discussed in the next section of this report.

Except for 2014, it is unknown how much phosphorus is removed from Lower Turtle Lake by its Outlet because no data was collected in the first four years of this project. The total tributary testing that was completed in 2014 does not provide much information as to the successful reduction in total phosphorus brought about by this project, but it does provide a great base to reflect back on in future years. The changes made in the larger watershed and in the nearshore area of both lakes during this project should be noticed to a greater degree as time passes. It will be interesting to see what five years of data collected ten years from now would show, and it is recommended that such a monitoring program be implemented.

The other measurement that is directly impacted by changes in the watershed is total suspended solids (TSS). Sediment from the agricultural fields enters the tributaries via runoff. The amount of phosphorus in the water sample often reflects that amount of sediment in the sample. Table 14 shows the annual TSS results from all the tributaries that were monitored as a part of this project. Both the West Tributary on Upper Turtle Lake and the East Tributary on Lower Turtle Lake show a decline in the amount of sediment in the samples from 2010 to 2014. The North Tributary on Upper Turtle and the NW Tributary on Lower Turtle Lake appear unchanged. There is was not enough data from the West Tributary on Lower Turtle Lake to evaluate. TSS from the outlet of Upper Turtle Lake appears unchanged as well. There is not enough data to make any determination on the Outlet of Lower Turtle Lake.

Table 14 – Tributary Sampling Results from Total Suspended Solids

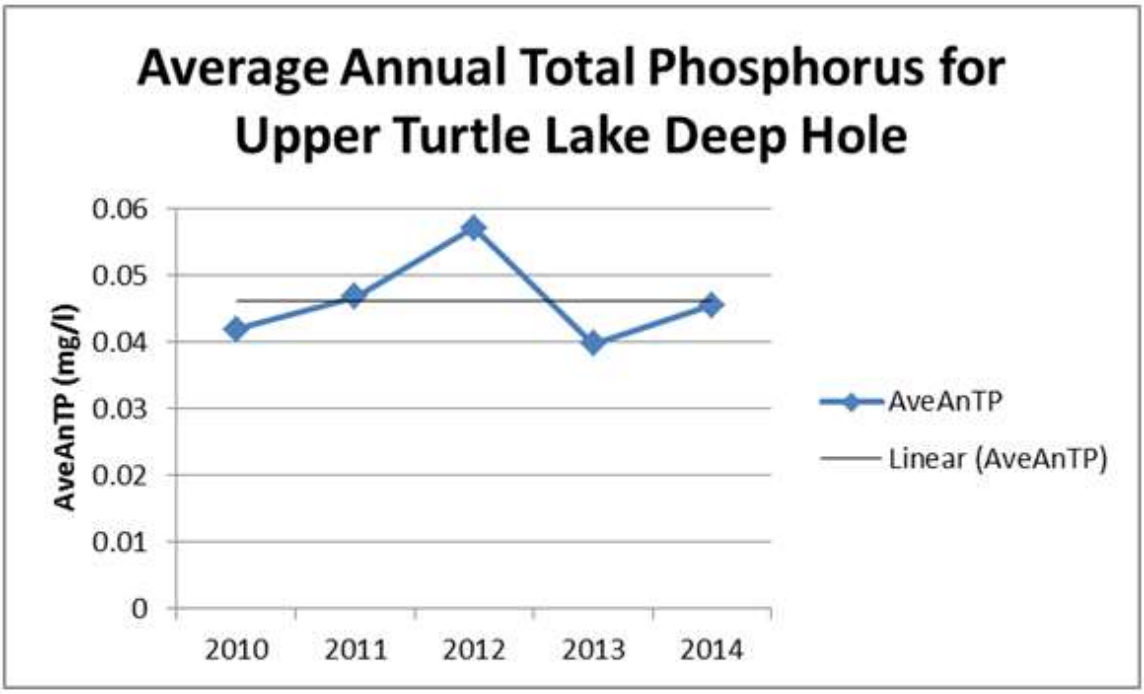
Turtle Lakes Protection Project 2010-2014 Tributary Sampling Results: Total Suspended Solids (mg/l)								
	UTL-NorthTrib	UTL-WestTrib	UTL-Outlet	LTL-NWTrib	LTL-WestTrib	LTL-EastTrib	LTL-Outlet	Notes
2010	182	388	6.5	46	na	168	na	121 acres of no till
2011	197	574	10	276	na	55	na	
2012	318	na	9.5	280	na	295	na	
2013	247	81	17	32	na	80	na	
2014	na	67	6	50	na	48	12	630 acres of no till

LAKE MONITORING

Collection of water samples for suite of nutrient parameters, turbidity, dissolved oxygen (DO) and temperature was completed on three sites in Upper Turtle Lake, and in two sites in Lower Turtle Lake. General analysis of that data suggests that the five years of this project had no discernible impact on the water quality in the lakes. This was not unexpected as it typically takes many years for the effects of reduced sediment and phosphorus loading from the watershed and nearshore area to be seen in a body of water, unless that loading is the source of nearly all of the phosphorus in that body of water. This is not the case in either Lower or Upper Turtle Lake. Other phosphorus sources include internal recycling of phosphorus already in the lakes, stirring up of sediments already in the lakes, contributions by septic systems, natural phosphorus in the ground water, and the phosphorus that is attached to particles blown over the lake or cleansed from the air by rainfall (atmospheric deposition). These other sources have not been wholly evaluated for either lake and were not specifically addressed by this project.

UPPER TURTLE LAKE

Although there is little discernible change in the average phosphorus levels in the lake during the five years of this project (Figure 23), what is discernible is that total phosphorus levels in Upper Turtle Lake are higher during the six year period from 2010-2015 then they were during the six year period from 2000-2005, basically 10 years ago (Figure 23).



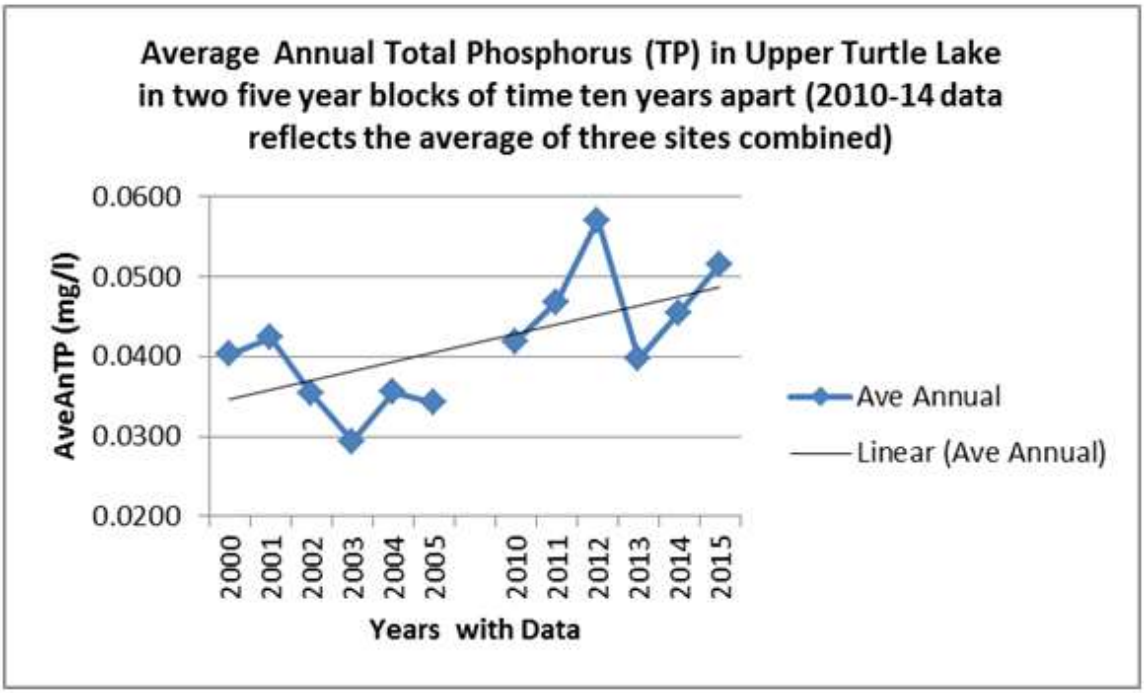


Figure 23 – Total Phosphorus Values for Upper Turtle Lake

An increase in the amount of phosphorus available in the water column generally means an increase in aquatic plant growth in the lake, and in the amount of algae, both planktonic (suspended in the water turning it green) and filamentous (long stringy attached to other substrate). While a certain amount of native aquatic vegetation is good for the lake, too much vegetation can lead to other issues. Too much planktonic algae in the water may actually lead to a lake with very green water and much less aquatic vegetation, speeding up the process of degradation.

Chlorophyll a is a measurement of the amount of green pigment in the algae that is growing in the water and can be used to compare the amount of algae suspended in the water at any given time. The average summer (July and August) chlorophyll readings from 2010-2015 are more than twice as high at 32.32 mg/l, than they were during a six year period from 2000-2005 (15.29 mg/l) ten years ago. This data supports what is reflected in the total phosphorus readings during the same time periods. Average summer (July and August) Secchi readings also reflect this trend (Figure 24).

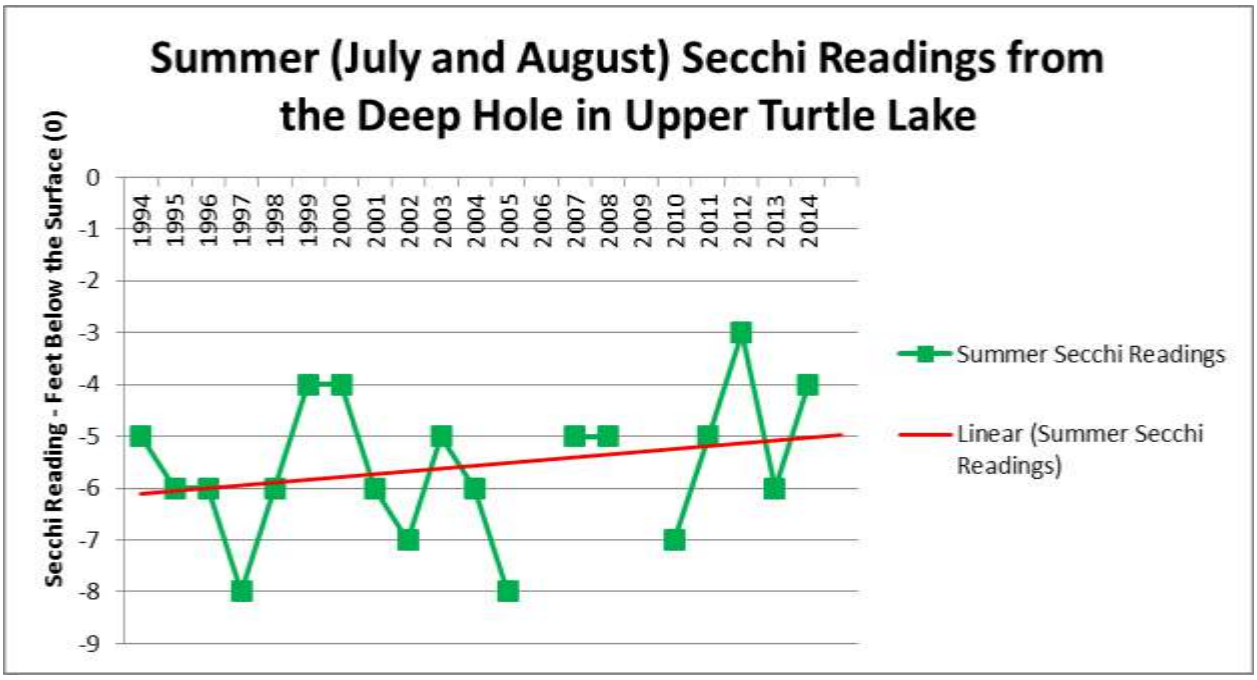


Figure 24 – Average summer (July & August) Secchi readings from Upper Turtle Lake, Deep Hole

LOWER TURTLE LAKE

The average annual total phosphorus in Lower Turtle Lake during this project reflects a slightly increasing trend from 2010 to 2014 (Figure 25). Annual averages were generated by combining data collected at two sites: the north and the south basins. Total phosphorus levels in 2012 were very high, possibly the result of two very dry years (2011 & 2012) where flushing by water passing through the system may have been limited (Figure 26). Although the trend from 2010-2014 is increasing, when the average annual total phosphorus value for the entire five year period between 2010 and 2014 is compared with the average annual readings from two other five year periods (1990-1994 and 2000-2004) it appears that the last five years are better than it was in the last five year period from 2000-2004 (Figure 27). Both are worse than the five year period between 1990 and 1994, but hopefully the trend that seems to be developing will continue.

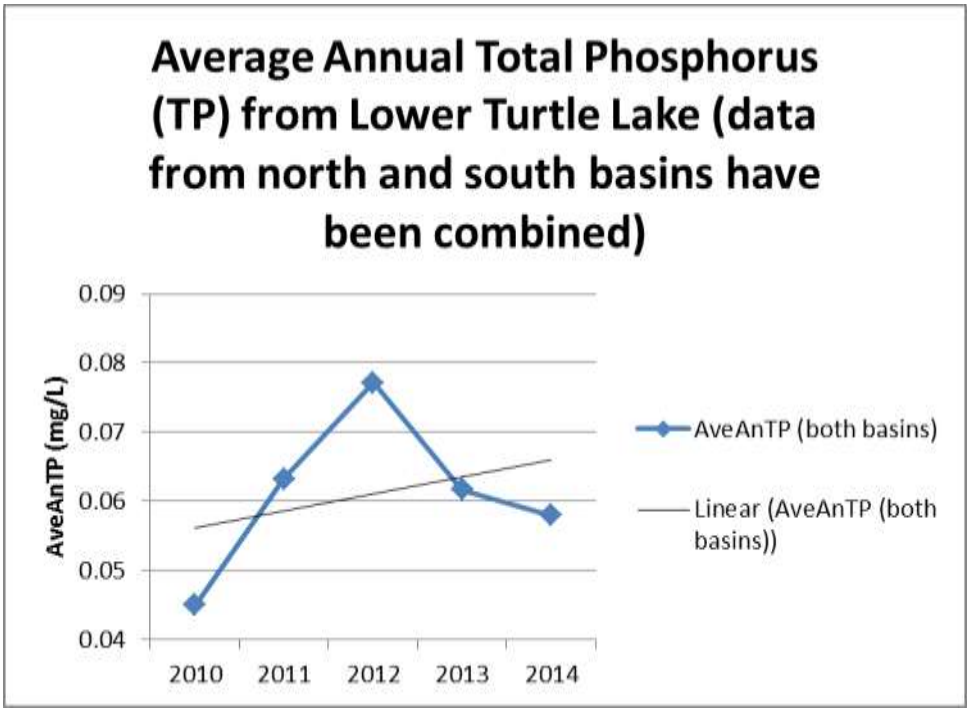


Figure 25 – Total Phosphorus Values for Lower Turtle Lake 2010-2014

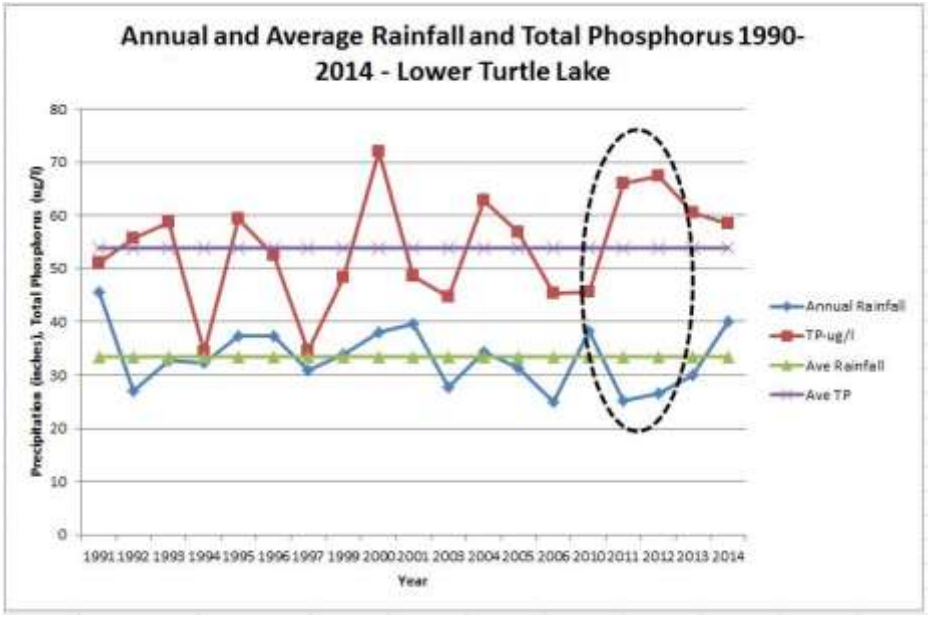


Figure 26 – Annual rainfall, Cumberland, WI (www.weathersource.com) and average annual total phosphorus in Lower Turtle Lake

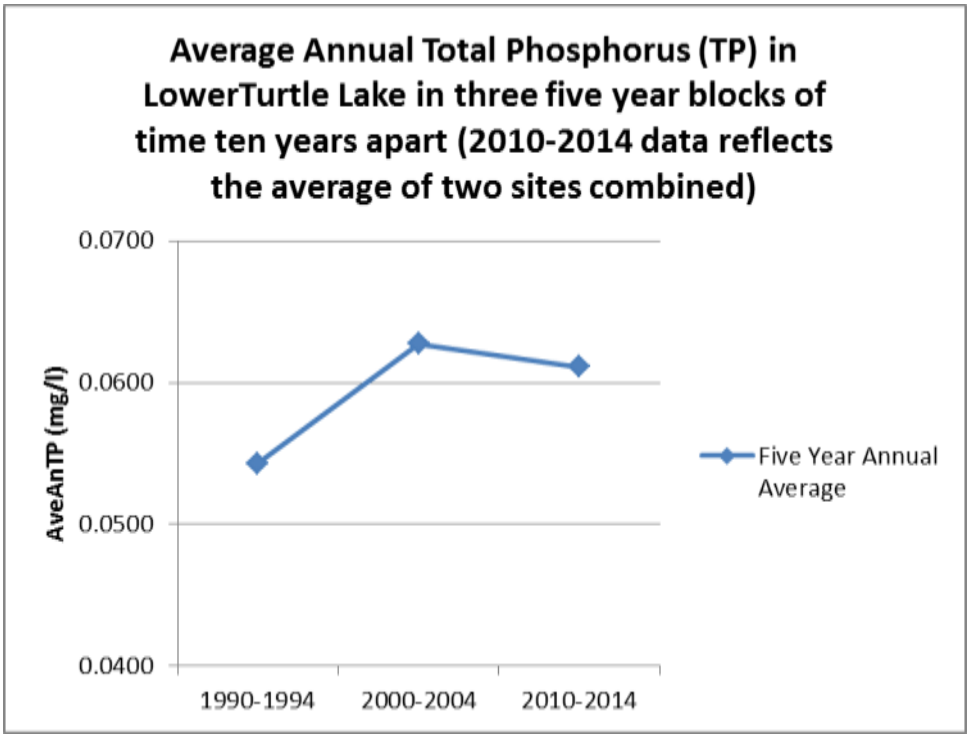


Figure 27 – Five-year Annual Averages for Total Phosphorus in Lower Turtle Lake

There is not enough chlorophyll a data for Lower Turtle Lake in the early 1990s to make comparisons similar to those made with total phosphorus, however, average annual summer chlorophyll readings collected from 2000-2004 are lower than those collected from 2010-2014. Summer Secchi readings of water clarity reflect the same trend as found with total phosphorus. Five year values from 2000-2014 and 2010-2014 are worse than values from 1990-1994, but 2010-2014 values are better than 2000-2004 values (CLMN, 1990-2015).

Clean Boats, Clean Waters and AIS Monitoring

Watercraft inspection following guidelines provided by the Clean Boats, Clean Waters program was included in this project. Three landings were included in the project, two on Lower Turtle and one on Upper Turtle. Both volunteer and paid inspections were completed during this project. Table 15 shows the amount of hours put in at each landing over the five years and the number of people contacted. The data in the table was taken from the WDNR SWIMS database on October 21, 2015.

Table 15 – Watercraft Inspection hours on Lower and Upper Turtle Lake during the lake protection project

Clean Boats Clean Waters 2010-2014			
Lake	**Landing**	**Hours**	**People Contacted**
Lower Turtle Lake	East Landing	348.25	569
	West Landing	342.75	159
Upper Turtle Lake	South Landing	90.75	302
		781.75	1030

Since EWM had not been identified in either lake, AIS monitoring was also part of the lake protection project. AIS monitoring is intended to monitoring both lakes for the presence of several different aquatic invasive species including CLP, EWM, purple loosestrife, rusty crayfish, zebra mussels, Chinese mystery snails, Japanese knotweed, and non-native giant reed grass. Several couples from each lake were trained to look for and possibly identify non-native aquatic invasive species. AIS monitoring was on-going over the course of the five year project, with several refresher sessions completed. None of the above mentioned AIS where discovered along the shores of either lake, but both purple loosestrife and Japanese knotweed have been documented in the watershed.

CLP bed mapping was completed in both lakes as a part of the aquatic plant surveys that were completed in 2010 and 2014 (Figure 28). Additionally, CLP bed mapping was completed in Lower Turtle Lake in 2013, and in 2015 to prepare for the early season chemical treatment that was completed.

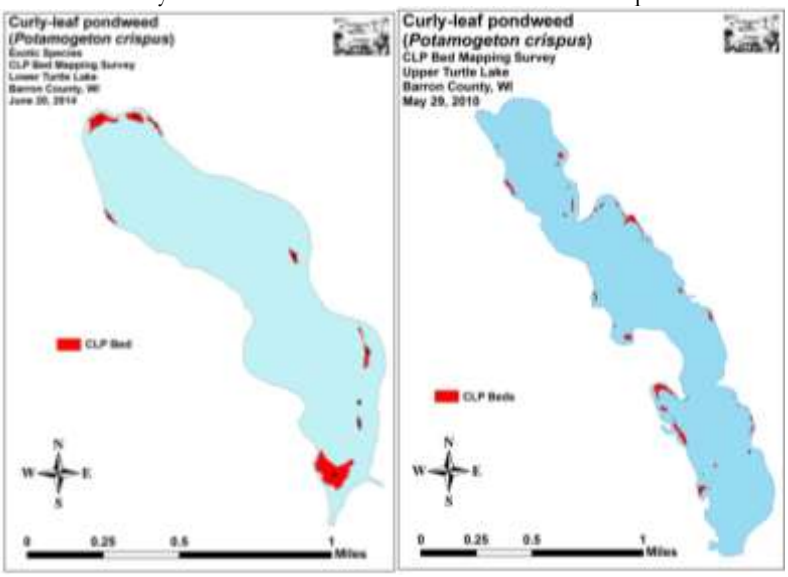


Figure 28 – CLP Bed Mapping in Lower Turtle Lake (2014) and Upper Turtle Lake (2010)

WHAT SHOULD BE DONE NEXT?

The goal of reducing sediment and phosphorus loading from the larger watershed of both lakes through the implementation of agricultural best management practices has been met. The majority of farmers in the watershed are using no till planting practices, and those who are not, will likely be doing so in the near future. Two important barnyard improvement projects have been completed. It is expected that the agricultural community will continue to implement BMPs that will not only improve their bottom line, but also protect the lakes. The Lower Turtle Lake Management District and the Upper Turtle Lake Association should continue to foster a positive relationship between the agricultural interests in the watershed and the interests who own property on the lakes.

Both organizations should continue to encourage property owners on both lakes to make improvements to their nearshore area. Implementation of native plant restorations, rain gardens, no mow areas, runoff diversion projects, and other riparian best management practices should be continued and supported by the lake groups by either providing continued educational opportunities or financial assistance or both.

Management of curly-leaf pondweed began in 2015 on Lower Turtle Lake and is expected to be continued for at least another three years. Reducing the amount of decaying vegetation in the lake will also help in reducing the overall phosphorus load. Although management of CLP in Upper Turtle Lake was not recommended as a part of this five year project, it may be worth considering in the future. Native plants should be protected, but excessive aquatic plant growth in either lake that may negatively impact lake use may be considered for management.

Neither lake had Eurasian Watermilfoil in it when this project started, and neither lake has EWM in it at the end of this project. Aquatic invasive species education and water craft inspection should be continued to reduce the chances of EWM and other invasive species from getting into the lakes. AIS monitoring should be continued in an effort to locate any AIS that may get into the lake before it becomes much more difficult to manage.

Water quality data should continue to be collected from both lakes. At a minimum, both lakes should continue participation in the Citizen Lake Monitoring Network sponsored by the WDNR and UWEX-Lakes. Collection of this data makes it possible to track long-term changes in water quality. In ten years, approximately 2024, another tributary study like what was done in 2014 should be completed to see if continued implementation of agricultural BMPs in the watershed leads to identifiable improvements.

Through this project the lake community and the agricultural community has been made more aware of those things that potentially cause lake degradation. Making sure that the lessons learned are not forgotten is essential to making improvements to both lakes. Most activities designed and implemented as a part of this project were not expected to make noticeable changes in a very short time period. They were however, expected to have a positive impact on long-term water quality and on those concerned with water quality.