DANE COUNTY FINAL REPORT ON THE YAHARA WINS - ADAPTIVE MANAGEMENT PILOT PROJECT

07/05/2016

Final report on Dane County Land and Water Resources Department efforts in assisting Yahara WINs with pilot testing the adaptive management compliance option within the Six Mile Creek Watershed.

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EXECUTIVE SUMMARY

Executive Summary

Since 2012, Dane County has been assisting the Madison Metropolitan Sewage District (MMSD) and the Yahara Watershed Improvement Network (Yahara WINs) in pilot testing adaptive management as a regulatory and TMDL compliance option. This option takes a holistic approach in trying to reduce all sources of phosphorus pollution (point and non-point) within a watershed in order to improve water quality. The Dane County Land and Water Resources Department (Dane County) has had an active role for decades in assisting the rural community with voluntary implementation of conservation practices to address non-point sources of pollution; and as such, is advantageously positioned to provide assistance.

Dane County received funding from Yahara WINs in 2013 for services related to pilot testing the adaptive management option within the Six Mile Creek watershed, which is located on the northern side of Lake Mendota and the City of Madison. Services provided included: assistance with practice implementation, management of cost-share agreements, quantification and tracking of phosphorus reductions, verifying practice installation and maintenance, and developing reports. The primary goal of the pilot project was to test the adaptive management option and evaluate whether phosphorus reductions, through voluntarily implemented conservation practices, were possible using viable quantification procedures. Information and lessons learned from the project will be used to develop a plan for transition to a "full scale" adaptive management project in the Yahara River watershed.

The pilot project saw success in the application of conservation practices. From 2012 – 2015 implemented conservation practices reduced a total of 5,167 pounds of phosphorus within the Six Mile Creek pilot project area. Knowledge gained was used in the development of innovative conservation practices, programs, and a strategic implementation plan for a full scale adaptive management project. In addition, insight was gained regarding the ability to leverage and use multiple sources of cost-share funding across various government and partner organizations. The following report provides more detailed information regarding the pilot project and additional efforts in transitioning to a full scale adaptive management project.

Project Highlights

BACKGROUND

Photo of Six Mile Creek and Lake Mendota

Adaptive management is a regulatory approach designed to achieve a water body's phosphorus water quality criteria in an efficient and cost effective manner. It is a compliance option that is available only to eligible permitted point sources and is intended to improve overall water quality by fostering a collaborative approach in which point and non-point sources work together to reduce phosphorus pollution within a watershed.

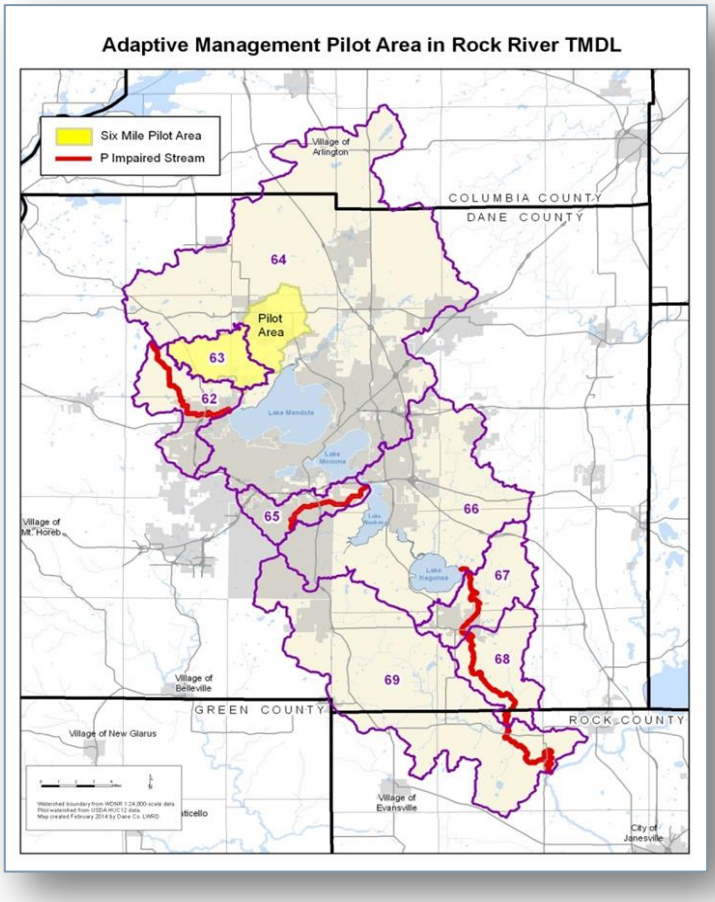
The Madison Metropolitan Sewage District (MMSD), on behalf of Yahara WINs, approached the Dane County Land and Water Resources Department (Dane County) to discuss the potential for a pilot project that would explore the adaptive management compliance option in 2012. Dane County has a long and proven history assisting agricultural landowners and producers with implementing conservation practices that address non-point sources of pollution. In addition, Dane County is able to provide a number of services including: expert technical service in the design and implementation of conservation practices; quality assurance verifying that all practices meet design standards and specifications; advanced modeling and quantification procedures to calculate phosphorus reductions; and funding for cost-share assistance.

Given the collaborative and holistic approach in addressing both point and non-point sources of pollution within a watershed, Dane County agreed to support and participate in a four-year adaptive management pilot project located in the Six Mile Creek sub-watershed (Figure 1). This pilot project was referred to as the Yahara WINs pilot project.

PROJECT HIGHLIGHTS

Dane County was responsible for inventorying and identifying priority areas, assisting landowners and producers with implementation of conservation practices, prioritizing conservation practice implementation, quantifying and verifying phosphorus reductions, administering cost-share agreements, and reporting progress.

FIGURE 1. MAP OF THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED WITHIN DANE COUNTY AND THE ROCK RIVER TMDL.



Six Mile Creek (Figure 1) was chosen for the pilot project because this watershed was identified as contributing some of the highest loadings of non-point source phosphorus in the Rock River Total Maximum Daily Load (TMDL) as well as the Montgomery and Associates Soil and Water Assessment (SWAT) analysis of the Yahara River watershed. This watershed is located within the Mississippi River Basin making it eligible for USDA's- Natural Resources Conservation Service (NRCS) - Mississippi River Basin Initiative (MRBI) funding administered through the Environmental Quality Incentive Program (EQIP). Dane County submitted a proposal and was awarded funding through the NRCS-MRBI-EQIP program in 2013. This allowed additional Federal cost-share funding to be leveraged with funding provided by Yahara WINS participants and Dane County.

PROJECT HIGHLIGHTS

ACCOMPLISHMENTS

Over the course of the four year pilot project, numerous accomplishments were made as well as lessons learned on how a full scale adaptive management project might be implemented. Many of the initial implementation approaches and goals were modified once knowledge was gained from testing and applying different strategies. This kept true to the intent of adaptive management in that as new information becomes available changes should be made in order to improve the likelihood of project success.

Overall, the project was successful in achieving the main goal of reducing phosphorus from reaching nearby surface waters through the voluntary implementation of conservation practices. In total, 5,167 pounds of phosphorus was reduced (Figure 2). Total phosphorus reductions are the sum of "new" and "carryover" pounds of phosphorus. New pounds are calculated phosphorus reductions resulting from conservation practices implemented during the reporting year. Carryover pounds are those calculated pounds of phosphorus resulting from previously verified and implemented conservation practices.

Phosphorus reductions were also quantified from those conservation practices implemented within the watershed between 2008 and 2012. The intent of quantifying reductions for this time period was to capture improvements from practices implemented that were not captured when setting the baseline TMDL condition and targeted phosphorus reductions. This total reduction in phosphorus was the result of various conservation practices being implemented by landowners and producers including nutrient management plans, grassed waterways, harvestable buffers, etc. (Table 1). Additional project accomplishments are also listed below. Without the voluntary willingness of landowners and producers within the watershed, many of these accomplishments would not have been possible.

PROJECT HIGHLIGHTS

FIGURE 2. YEARLY PHOSPHORUS REDUCTIONS WITHIN THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED.

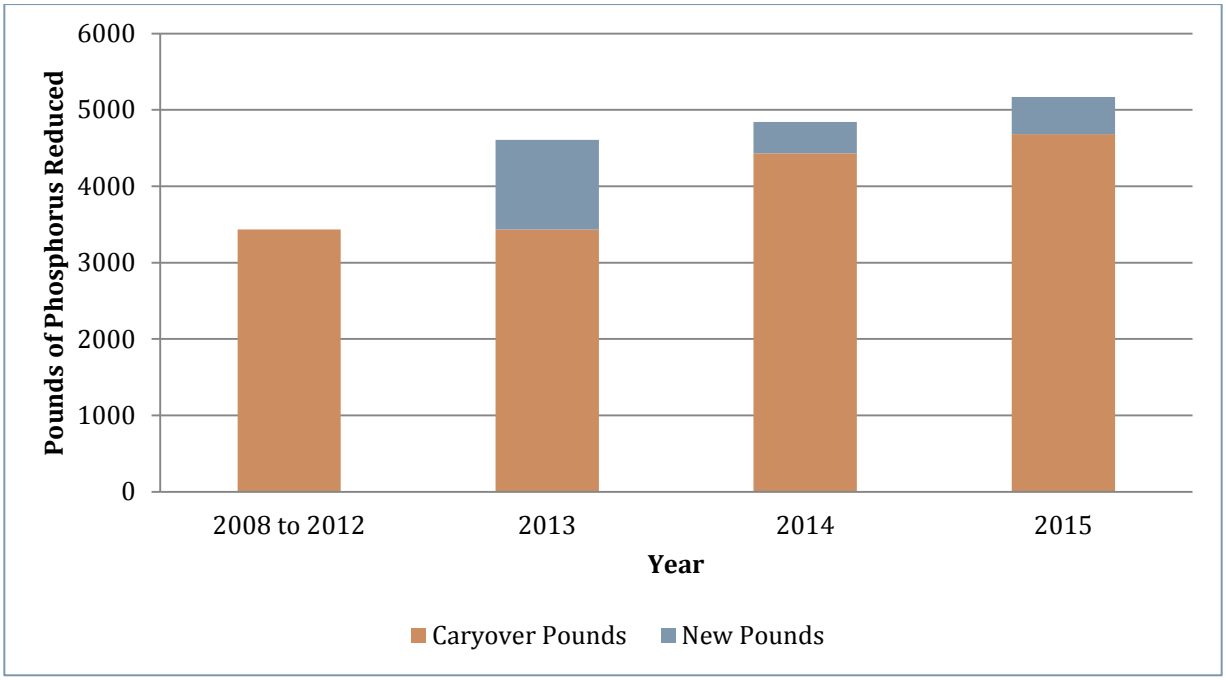


TABLE 1. PRACTICES IMPLEMENTED IN THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED BETWEEN 2008 AND 2015.

Practice	Unit	2008 to 2012	2013	2014	2015	Total Amount
Grade Stabilization Structure	No	1	0	0	0	1
Grassed Waterway	Ac	5	0	0	0	5
Roof Runoff Structure	No	3	1	0	0	4
Heavy Use Area Protection	No	3	0	0	0	3
Streambank and Shoreline	Ft	850	0	0	0	850
Nutrient Management	Ac	4,753	573	1,576	4,786	11,688
Water and Sediment Control	No	1	0	1	1	3
Dane County Perpetual Easement (Lot Abandonment)	No	1	0	0	0	1
Wetland Restoration	Ac	0	15	0	0	15
Lot Relocation	No	0	1	0	0	1

PROJECT HIGHLIGHTS

Practice	Unit	2008 to 2012	2013	2014	2015	Total Amount
Cover Crops	Ac	0	26	0	0	26
Waste Storage	No	0	0	1	0	1
Waste Storage Closure	No	0	0	2	0	2
Harvestable Buffer	Ac	0	0	9.3	0	9.3

Project Achievements

- Collection and evaluation of inventory information on approximately 80% of cropland acres within the Six Mile Creek Watershed.
- Evaluation of existing nutrient management plans for phosphorus loss and soil test phosphorus levels for establishment of a baseline condition.
- Evaluation of farmstead and concentrated flow areas to determine phosphorus losses.
- Implementation of conservation practices.
- Establishment of procedures for the quantification and reporting of phosphorus reductions.
- Calculation of total phosphorus reductions from the implementation of conservation practices from 2008 to 2015 within the Six Mile Creek watershed of 5,167 pounds.
- Assessment of innovative conservation practices and cost-share mechanisms.
- Development of innovative funding mechanisms for new conservation practices.

Knowledge Gained

As important as the accomplishments achieved during the pilot project was, the many lessons learned and knowledge gained. These lessons ranged from how to quantify and track conservation practices and associated phosphorus reductions to communication between landowners, producers, and other participants in the Yahara WINs effort. A brief summary of the lessons learned and knowledge gained is as follows:

- Conservation fatigue may have existed in parts of the Six Mile Creek watershed. It was found that the agricultural landowners and producers in this watershed have already implemented many conservation practices. The results from the inventory information indicate that the average Phosphorus Index (PI) for cropland located

within the pilot area was 3.3. This was considerably lower than the NR 151, Wisconsin Administrative Code, performance standard of 6. This means that in order to reduce phosphorus even further, landowners and producers will need to be willing to go above and beyond what is currently required by state code.

- Quantifying the amount of phosphorus coming from non-point sources was challenging. Non-point phosphorus losses are typically quantified using models or similar tools. The challenge with these tools is that different calculations and assumptions are used while reporting the same quantifiable measurement. Consequently, pounds of phosphorus from one tool may not necessarily be comparable to pounds of phosphorus from a different tool.
- Gathering the inventory information needed for establishing a baseline condition regarding non-point phosphorus losses was extremely data intensive and time consuming. As a result, Dane County explored alternative approaches that would provide a meaningful and accurate baseline condition without requiring the time-intensive inventory process used within the Six Mile Creek pilot project. This approach used the Soil and Water Assessment Tool (SWAT) in conjunction with datasets and information available within the Dane County Land and Water Resources Department.
- It took a considerable amount of time (6 months – 2 years) to plan and implement various conservation practices. This time was needed to build trust with landowners and producers as well as confidence that the practice would fit within their operations and be maintained.
- The workload versus available Dane County staff was a challenge. It takes a notable amount of time to plan, design, secure cost share assistance, implement, and verify phosphorus reductions. Practices can take days, months or even years to implement. For every hour that it takes to construct/implement a conservation practice, a minimum of ten additional hours of staff time was likely spent planning, designing, consulting with the landowner and/or producer, administering cost share assistance, and providing related administrative support (e.g. recordkeeping). To put this in perspective, assume that it takes four hours to construct a grass waterway. That means it takes an entire week of staff time to complete the project from start to finish. Dane County continues to develop a staffing plan to address this specific issue.

PROJECT HIGHLIGHTS

- Balancing the need to maintain confidentiality of certain information with the need to provide information required for adaptive management was challenging. Much of the information gathered in the inventories was tied to Federal programs either through the Farm Service Agency (FSA) or NRCS and subject to the Freedom of Information Act (FOIA). Any information related to either of these agencies cannot be shared without proper authorization and must remain unidentifiable. Dane County has entered into an agreement with these agencies to keep this information confidential unless given written permission from the landowner.
- Consistent communication was challenging with so many partners. There are a number of new initiatives under way in Dane County causing some confusion on the part of the landowner, producer, and others regarding how these programs relate to each other. Improved communication, coordination, and messaging among these initiatives will lead to more effective engagement with landowners and farm producers.
- One final lesson learned was the complexity associated with combining various cost share programs. Each program requires a different process and different amounts of paperwork depending on whether it was Federal, State, County, or partner funded. For years, Dane County has been implementing the various programs along with adapting to the many changes within the programs that occur on an annual basis. However, only recently has staff tested new ways in which to maximize and leverage all funding sources. In doing so, staff are learning how to best meet the requirements of each program while not encouraging or discouraging participation in any particular one. This includes using certain sources of funding to promote specific practices as well as combining funding sources to provide a higher cost-share incentive.

Summaries of Annual Progress

YEAR 2012

Dane County's assistance with pilot testing adaptive management began in 2012. This first year consisted of working with MMSD and Yahara WINs in establishing the role that Dane County would take as a technical services and financial assistance provider including development of an implementation strategy. In an effort to provide additional cost-share funding for practice implementation, Dane County applied for and was awarded $1.3 million over 4 years as part of MRBI to be spent within the Six Mile Creek pilot project area. All MRBI funding was administered through NRCS -EQIP. Notable outcomes for 2012 include;

- Nine NRCS-MRBI-EQIP agreements for nutrient management and cover crop practices,
- Developed inventory and phosphorus reduction calculation techniques,
- Established current phosphorus losses on inventoried areas,
- Identified and prioritized high phosphorus contributing areas,
- Implemented conservation practices designed to reduce phosphorus loss,
- Verified the effectiveness of phosphorus reducing practice,
- Initiated the development of a data management system.

Implementation Strategy

Dane County first developed an implementation strategy for the adaptive management pilot project that consisted of six primary actions: (1) development of a comprehensive inventory of nonpoint sources of phosphorus in the pilot watershed area, (2) establishment of a baseline condition with respect to phosphorus loss, (3) identification and prioritization of high phosphorus contributing areas, (4) implementation of conservation practices designed to reduce phosphorus loss, (5) calculation of phosphorus reductions, and (6) verification of the effectiveness of phosphorus control practices and that installed practices are being effectively maintained.

SUMMARIES OF ANNUAL PROGRESS

YEAR 2013

In 2013, Dane County quantified the phosphorus reductions from practices implemented from 2008 to 2012, in addition to assisting with installing additional practices for 2013 (Table 2). The intent of quantifying reductions from 2008 to 2012 was to capture improvements from practice implementation that were not captured when setting the baseline TMDL condition and targeted phosphorus reductions. Dane County also completed the following:

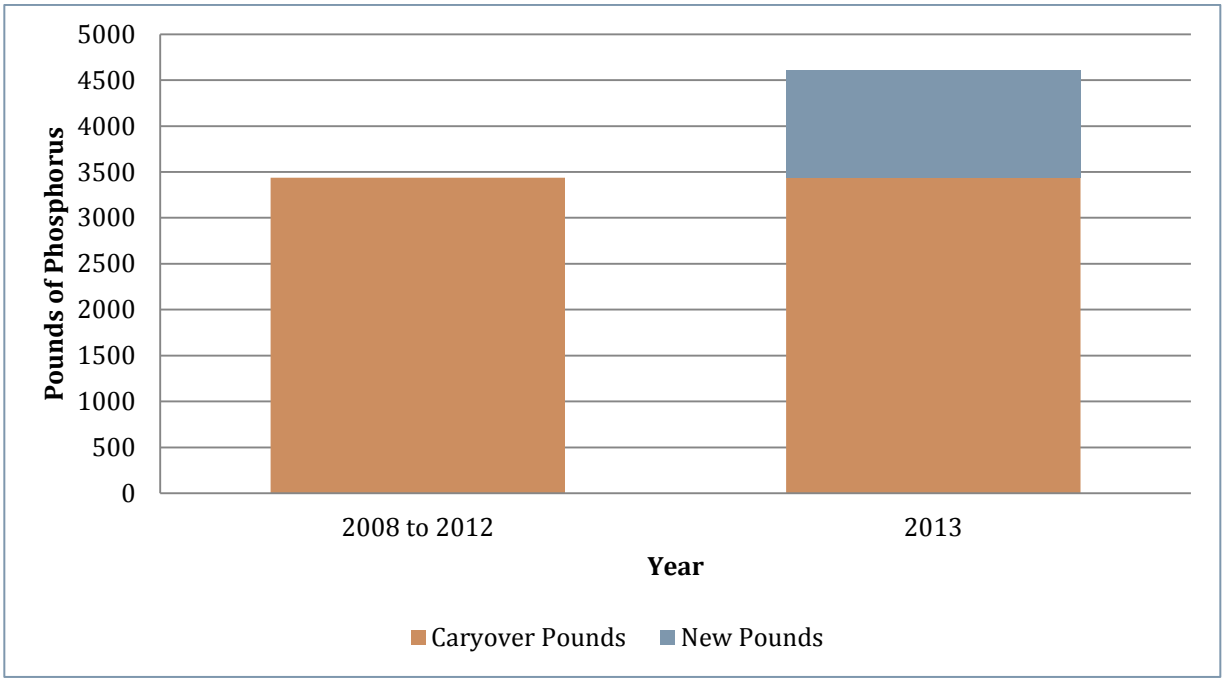
- Held a landowner and producer meeting to discuss the intent of the project and the availability of financial and technical assistance,
- Completed inventories on 7,625 of the roughly 11,000 acres (70%) of agricultural land,
- Assisted with the implementation and quantification of phosphorus reductions from practices implemented in 2013,
- Calculated the total phosphorus reductions within pilot project area from practices implemented since 2008 (4,653 pounds) (Figure 3).

TABLE 2. PRACTICES IMPLEMENTED IN THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED BETWEEN 2008 AND 2013.

Practice	Unit	2008 to 2012	2013	Total Amount
Grade Stabilization Structure	No	1		1
Grassed Waterway	Ac	5		5
Roof Runoff Structure	No	3	1	4
Heavy Use Area Protection	No	3		3
Streambank and Shoreline	Ft	850		850
Nutrient Management	Ac	4,753	573	5,326
Water and Sediment Control	No	1		1
Dane County Perpetual Easement (Lot Abandonment)	No	1		1
Wetland Restoration	Ac	0	15	15
Lot Relocation	No	0	1	1
Cover Crops	Ac	0	26	26

SUMMARIES OF ANNUAL PROGRESS

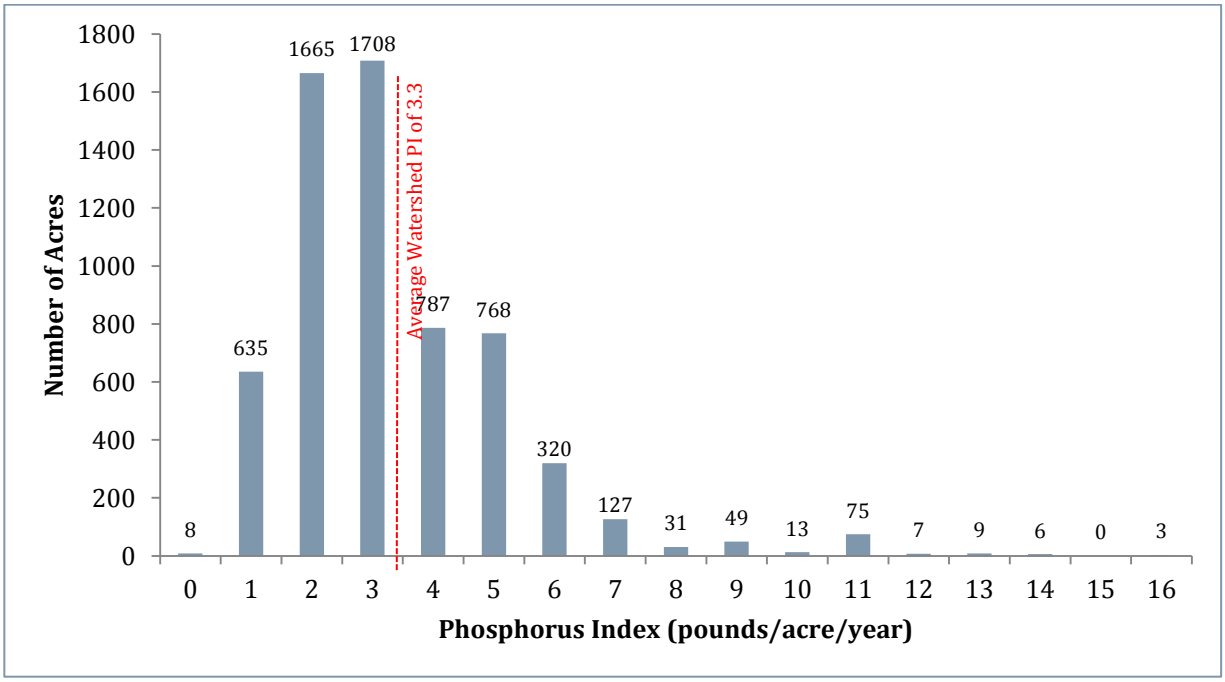
FIGURE 3. TOTAL PHOSPHORUS REDUCTIONS BY YEAR FOR THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED. PHOSPHORUS REDUCTIONS ARE BROKEN DOWN INTO CARYOVER POUNDS AND NEW POUNDS.



Evaluation of Inventory Data

Evaluation of the inventory and Phosphorus Index (PI) information revealed that fields within the pilot area had a PI range of 0 to 16 with an average of 3.3. Further analysis of the distribution of the PI values indicated that 4,016 acres (65%) had a PI below the average of 3.3 and 2,195 (35%) had a PI above 3.3 (Figure 4).

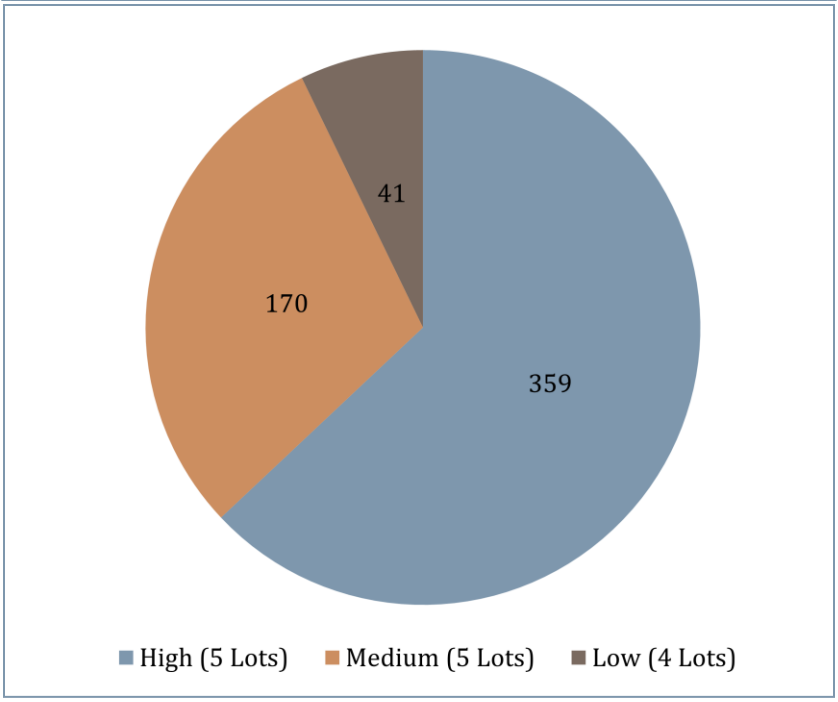
FIGURE 4. DISTRIBUTION OF PHOSPHORUS INDEX (PI) VALUES FOR CROPLAND INVENTORIED WITHIN THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED.



SUMMARIES OF ANNUAL PROGRESS

There were 14 animal lots within the watershed that were assessed; five were categorized as *high* priority as it relates to phosphorus loss, five *moderate*, and four ranked as *low*. The total amount of phosphorus being lost annually from the lots ranked *high*, *medium*, and *low* were 359 pounds, 170 pounds, and 41 pounds respectively (Figure 5). Average annual phosphorus loss per lot was 72 pounds for lots ranked *high*, 34 pounds for those ranked *medium*, and 10 pounds for lots ranked *low*.

FIGURE 5. CATEGORICAL DISTRIBUTION OF PHOSPHORUS FROM ANIMAL LOTS WITHIN THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED.

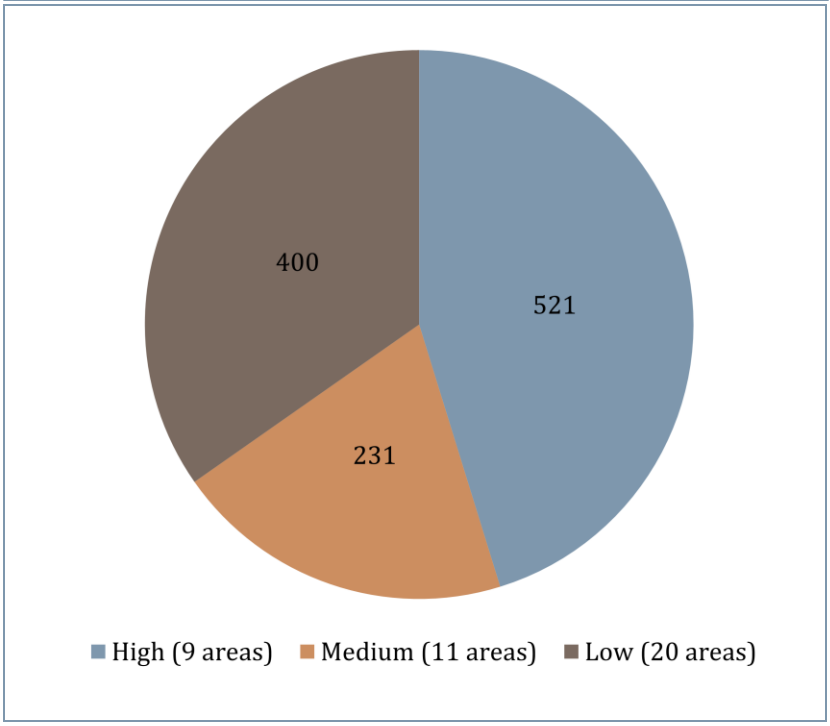


*Note that the numbers inside the pie chart are total pounds of phosphorus by category.

Before and after photos of a roof runoff structure

Concentrated flow areas were also identified through the inventory process as contributing phosphorus to nearby surface waters. These concentrated flows varied in size and length as well as phosphorous delivery to nearby surface waters. Concentrated flow areas ranked as having *high* phosphorus losses accounted for 521 pounds of phosphorus (Figure 6). These *high* ranked flow areas averaged approximately 58 pounds per concentrated flow area while the *moderate* and *low* flows averaged approximately 21 pounds. These concentrated flow areas have the potential to provide large phosphorus savings (1,153 pounds total). However, their variability in location and severity make them challenging to address. Some could be addressed with minor tillage changes while others may need the implementation of multiple conservation practices to ensure they are stabilized and are no longer a resource concern.

FIGURE 6. CATEGORICAL DISTRIBUTION OF PHOSPHORUS FROM CONCENTRATED FLOW AREAS WITHIN THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED.



*Note that the numbers inside the pie chart are total pounds of phosphorus by category.

SUMMARIES OF ANNUAL PROGRESS

YEAR 2014

This was the third year of the pilot project within the Six Mile Creek Watershed and was critical in providing Dane County with insights on practical approaches to transition from a pilot to a full scale project. Dane County continued working with landowners and producers in the pilot watershed area to develop and implement conservation plans and corresponding phosphorus reducing practices. Dane County also developed conservation delivery mechanisms that proved to be effective, as well as support tools that will be used by MMSD and WINs partners in determining participation in full scale implementation. Project highlights from this past year include:

Photo of an established harvestable buffer

- Implementation of 14 conservation practices (Table 3) that prevented 409 additional pounds of phosphorus from entering nearby surface waters within the Six Mile Creek watershed pilot area,
- Reducing a total of 4,842 pounds of phosphorus within the Six Mile Creek watershed as of 2014,
- Testing of a new harvestable buffer conservation practice and associated cost-share program,
- Obtaining baseline PI and inventory information on 78% of the agricultural land within the pilot project watershed,
- Evaluation of Phosphorus Index and Soil Test Phosphorus data from Six Mile Creek, Pheasant Branch Creek, and Waunakee Marsh watersheds,
- Continued verificaion and documentation of phosphorus reductions.

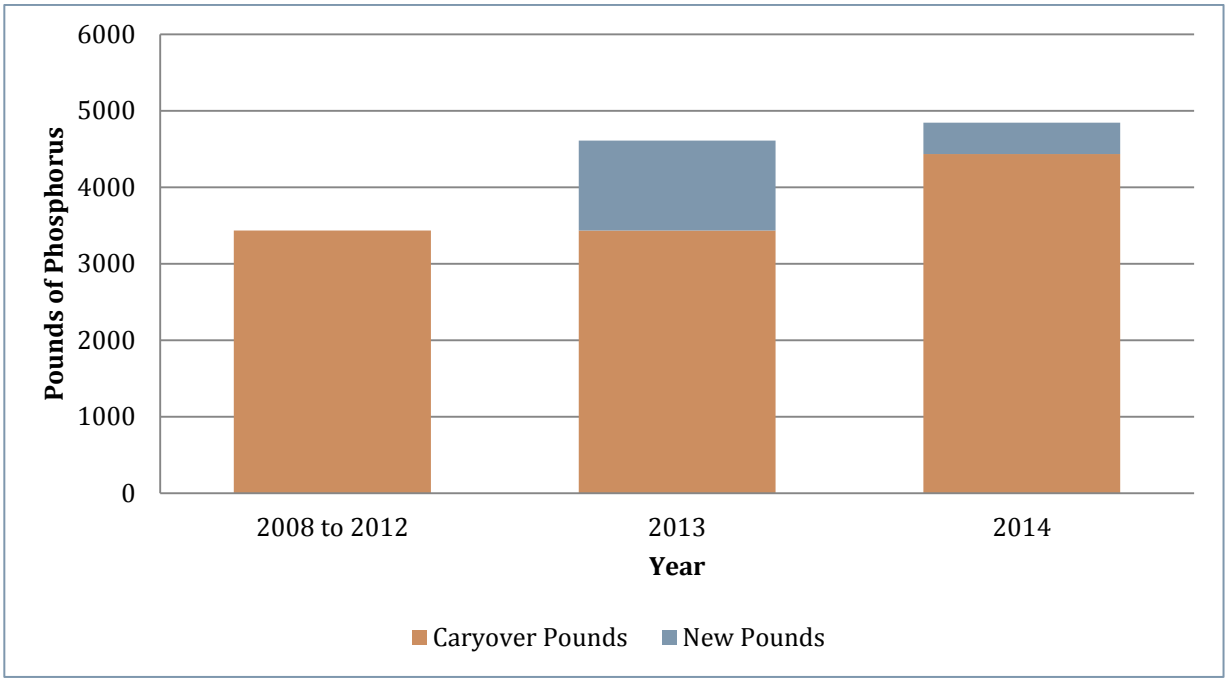
SUMMARIES OF ANNUAL PROGRESS

TABLE 3. PRACTICES IMPLEMENTED IN THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED BETWEEN 2008 AND 2014

Practice	Unit	2008 to 2012	2013	2014	Total Amount
Grade Stabilization Structure	No	1	0	0	1
Grassed Waterway	Ac	5	0	0	5
Roof Runoff Structure	No	3	1	0	4
Heavy Use Area Protection	No	3	0	0	3
Streambank and Shoreline	Ft	850	0	0	850
Nutrient Management	Ac	4,753	573	1,576	6,902
Water and Sediment Control	No	1	0	1	2
Dane County Perpetual Easement (Lot Abandonment)	No	1	0	0	1
Wetland Restoration	Ac	0	15	0	15
Lot Relocation	No	0	1	0	1
Cover Crops	Ac	0	26	0	26
Waste Storage	No	0	0	1	1
Waste Storage Closure	No	0	0	2	2
Harvestable Buffer	Ac	0	0	9.3	9.3

A total of 4,842 pounds of phosphorus was reduced from the pilot watershed in 2014 (Figure 7). This total includes a combination of new and carryover pounds. Carryover pounds result from practices installed in previous years that have long practice lifespans. For example, a harvestable buffer may have a lifespan of five years in which case the phosphorus reduction from that buffer can be taken each year for five years. A nutrient management plan is only good for one year and thus the corresponding phosphorus reduction is only good for the year in which the plan was verified. Carryover pounds will fluctuate from year to year depending on the suite of practices verified and implemented. Each practice has an expected lifespan and corresponding phosphorus reduction. Further evaluation of the data indicates that 3,436 pounds was reduced from 2008 to 2012 and 4,608 was reduced in 2013.

FIGURE 7. TOTAL PHOSPHORUS REDUCTIONS BY YEAR FOR THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED. PHOSPHORUS REDUCTIONS ARE BROKEN DOWN INTO CARRYOVER POUNDS AND NEW POUNDS.



Phosphorus Index Comparisons

Evaluation of the most recent PI information for fields located in the pilot watershed and adjacent watersheds was conducted in order to assess the amount of phosphorus currently leaving agricultural fields. Fields within the Pheasant Branch, Waunakee Marsh, and Six Mile Creek watersheds resulted in area weighted averages of 2.7, 3.0, and 3.1 respectively. Categorical PI evaluations revealed that 52% (2,017 acres) of inventoried field acres in Pheasant Branch, 40% (3,604 acres) of inventoried field acres in Waunakee Marsh, and 39% (2,496 acres) of inventoried field acres in Six Mile Creek had PI vales between 0 and 2 (Table 4). These field acres have a low priority in allocating resources to implement conservation practices given the low potential for reducing phosphorus loadings to nearby surface waters. Less than 1% of all the total field acres inventoried in each of the three watersheds had PI values greater than 6.

TABLE 4. THE NUMBER OF INVENTORIED CROPLAND ACRES WITHIN IDENTIFIED PHOSPHORUS INDEX (PI) CATEGORIES FOR WAUNAKEE MARSH, PHEASANT BRANCH, AND SIX MILE CREEK WATERSHEDS.

	Watershed (Acres)			
Phosphorus Index (PI)	**Pheasant**	**Waunakee**	**Six Mile**	***Total Inventory**
0 - 2	2,017 (51.7%)	3,604 (40.4%)	2,496 (38.9%)	11,920 (46.2%)
3 - 4	1,445 (37.0%)	3,645 (40.8%)	2,792 (43.5%)	10,172 (39.4%)
5 - 6	427 (10.9%)	1,622 (18.2 %)	1,101 (17.2%)	3,601 (14.0%)
> 6	15 (0.4%)	56 (0.6%)	26 (0.4%)	107 (0.4%)
Area Weighted Average PI	2.7	3.0	3.1	-
Number of Fields	345	650	428	1,750
Total Acres	3,904	8,927	6,415	25,800

* Note *Total Inventory* includes fields within Pheasant Branch, Waunakee Marsh, and Six Mile Creek Watersheds as well as fields outside of these watersheds that were included in the inventory.

Soil Test Phosphorus Comparisons

Elevated soil test phosphorus levels can be a major contributor to the soluble fraction of total phosphorus loadings. Soil test phosphorus values are a required parameter when calculating the Phosphorus Index (PI) and were evaluated over time. The NRCS's 590 standard requires new soil tests to be taken every 4 years with the most recent soil test data being used to calculate the PI.

The University of Wisconsin's *Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops in Wisconsin (A2809)* recommends, for most soils in Dane County, that the application of phosphorus on fields testing higher than 35 ppm be set to 0. However, starter fertilizer is still recommended for some crops such as corn. Results of the most recent soil samples used in calculating the phosphorus index reveal that less than 20% of all the inventoried acres within each project watershed have a soil test phosphorus value between 0 and 35 parts per million (ppm) (Table 5). A further evaluation of the soil samples indicates that approximately 20% of all the inventoried acres have soil test phosphorus values of 36 to 50 ppm with roughly 60% of the remaining field acres in each watershed having a soil test phosphorus value greater than 50 ppm. The area weighted average soil test phosphorus value for each watershed was 86.5, 68.6, and 77.6 ppm for Pheasant Branch, Waunakee Marsh, and Six Mile Creek respectively.

SUMMARIES OF ANNUAL PROGRESS

TABLE 5. THE NUMBER OF INVENTORIED CROPLAND ACRES WITHIN IDENTIFIED SOIL TEST PHOSPHORUS CATEGORIES FOR WAUNAKEE MARSH, PHEASANT BRANCH, AND SIX MILE CREEK WATERSHEDS.

	Watershed (Acres)			
Soil Test Phosphorus (ppm)	**Pheasant**	**Waunakee**	**Six Mile**	***Total Inventory**
0 – 35	571 (14.6%)	1,851 (20.8%)	1,264 (19.7%)	8,119 (28.5%)
36 – 50	772 (19.8%)	1,522 (17.1%)	1,260 (19.6%)	5,475 (19.2%)
51 – 100	1,286 (32.9%)	3,797 (42.6%)	2,502 (39.0%)	10,022 (35.2%)
101 – 200	1,031 (26.4%)	1,675 (18.8%)	1,307 (20.4%)	4,441 (15.6%)
201 – 550	244 (6.3%)	72 (0.8%)	82 (1.3%)	429 (1.5%)
Average Soil Test P	86.5	68.6	77.6	67.5
Number of Fields	345	650	428	1,869
Total Acres	3,904	8,917	6,415	28,486

* Note *Total Inventory* includes fields within Pheasant Branch, Waunakee Marsh, and Six Mile Creek Watersheds as well as fields outside of these watersheds that were included in the inventory.

YEAR 2015

This past year (2015) was the final year of the pilot project. Dane County worked with landowners and producers within the watershed on voluntary implementation of conservation practices and plans. Key project highlights from calendar year 2015 include:

- Assisting with the implementation of 18 conservation practices (Table 6) that reduced 483 additional pounds of phosphorus within the Six Mile Creek watershed.
- Calculating a total phosphorus reduction of 5,167 pounds from practices implemented from 2008 to 2015.
- Continued verification and documentation of phosphorus reductions.
- Evaluation on the impacts of legacy sediment on water quality within the Dorn Creek Watershed.

SUMMARIES OF ANNUAL PROGRESS

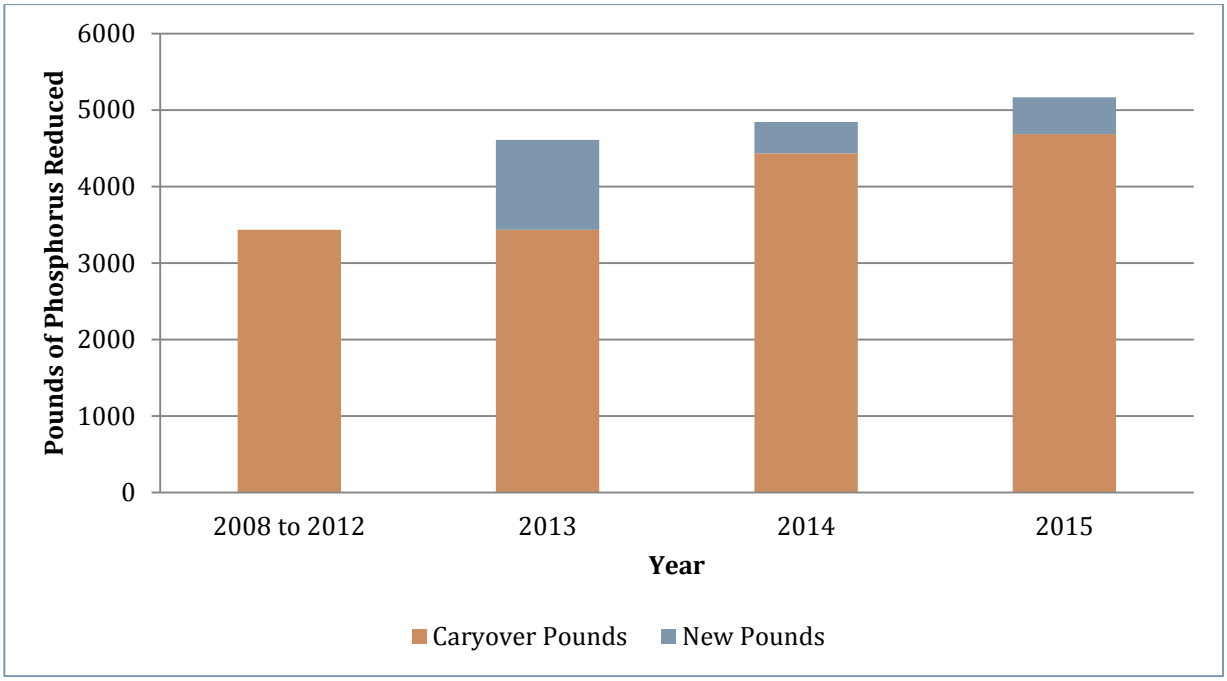
TABLE 6. PRACTICES IMPLEMENTED IN THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED BETWEEN 2008 AND 2015.

Practice	Unit	2008 to 2012	2013	2014	2015	Total Amount
Grade Stabilization Structure	No	1	0	0	0	1
Grassed Waterway	Ac	5	0	0	0	5
Roof Runoff Structure	No	3	1	0	0	4
Heavy Use Area Protection	No	3	0	0	0	3
Streambank and Shoreline	Ft	850	0	0	0	850
Nutrient Management	Ac	4,753	573	1,576	4,786	11,688
Water and Sediment Control	No	1	0	1	1	3
Dane County Perpetual Easement (Lot Abandonment)	No	1	0	0	0	1
Wetland Restoration	Ac	0	15	0	0	15
Lot Relocation	No	0	1	0	0	1
Cover Crops	Ac	0	26	0	0	26
Waste Storage	No	0	0	1	0	1
Waste Storage Closure	No	0	0	2	0	2
Harvestable Buffer	Ac	0	0	9.3	0	9.3

In 2015 a total of 5,167 pounds of phosphorus was reduced from the pilot watershed (Figure 8). This total includes a combination of new and carryover pounds. Further evaluation of the data indicates that 4,684 pounds was reduced from practices implemented from 2008 to 2014 and 483 was reduced from practices in 2015. The below figure shows the portion of the total phosphorus reduced, by year, from practices installed in previous years (carryover pounds) and those installed in any given year (new pounds) starting in 2008. Carryover pounds will fluctuate from year to year depending on the suite of practices verified and implemented. Each practice has an expected lifespan and corresponding phosphorus reduction.

SUMMARIES OF ANNUAL PROGRESS

FIGURE 8. YEARLY PHOSPHORUS REDUCTIONS WITHIN THE SIX MILE CREEK ADAPTIVE MANAGEMENT PILOT WATERSHED.



Legacy Sediment

Upland conservation practice implementation and subsequent water quality improvements can often times be masked by instream sediment and nutrient transport. Understanding the impacts of these instream sediments as they relate in particular to phosphorus is important to both improving water quality and achieving the goals of the adaptive management pilot project.

Photo of Six Mile and Dorn Creek

Dane County worked collaboratively with the Wisconsin Department of Natural Resources (WDNR) and partners on collecting sediment cores and water samples within Dorn Creek (located within the pilot watershed). These samples were then analyzed by Wisconsin State Lab of Hygiene (WSLOH) for phosphorus concentrations as well as other water quality constituents. The purpose of this evaluation was to better understand the interactions between instream sediment bound phosphorus and the overlying water column. Data is currently being analyzed and evaluated and permits have been obtained to move forward with removal of the sediments from the stream along with stabilization of the removed sediments on adjacent land. Continued monitoring will also occur during and after the sediment has been removed.

Photo of legacy sediment in Dorn Creek

Full Scale Transition

Photo of Lake Mendota and Lake Monona

During the last two years of the pilot project (2014 and 2015), efforts were undertaken to support the potential transition to a full scale adaptive management project. These efforts included the development of a detailed cost model as well as a Dane County Strategic Implementation Plan for Adaptive Management. In addition, focus for implementing conservation practices was expanded beyond the pilot project area to the entire Yahara River Watershed, which includes the Badfish Creek watershed, to help build a footing for full scale implementation (Table 7). Other key accomplishments included:

- Quantifying phosphorus reductions from implemented practices (Figure 9).
- Developing, submitting, and receiving a funding award of a USDA-Natural Resources Conservation Service (NRCS) – Regional Conservation Partnership Program (RCPP) project entitled *Reducing Total Phosphorus and Sediment Loads in the Yahara Watershed through Wisconsin's Adaptive Management Option*.
- Developing and submitting for approval to the US Environmental Protection Agency (EPA) and WDNR a nine key element watershed plan for the Door Creek watershed.

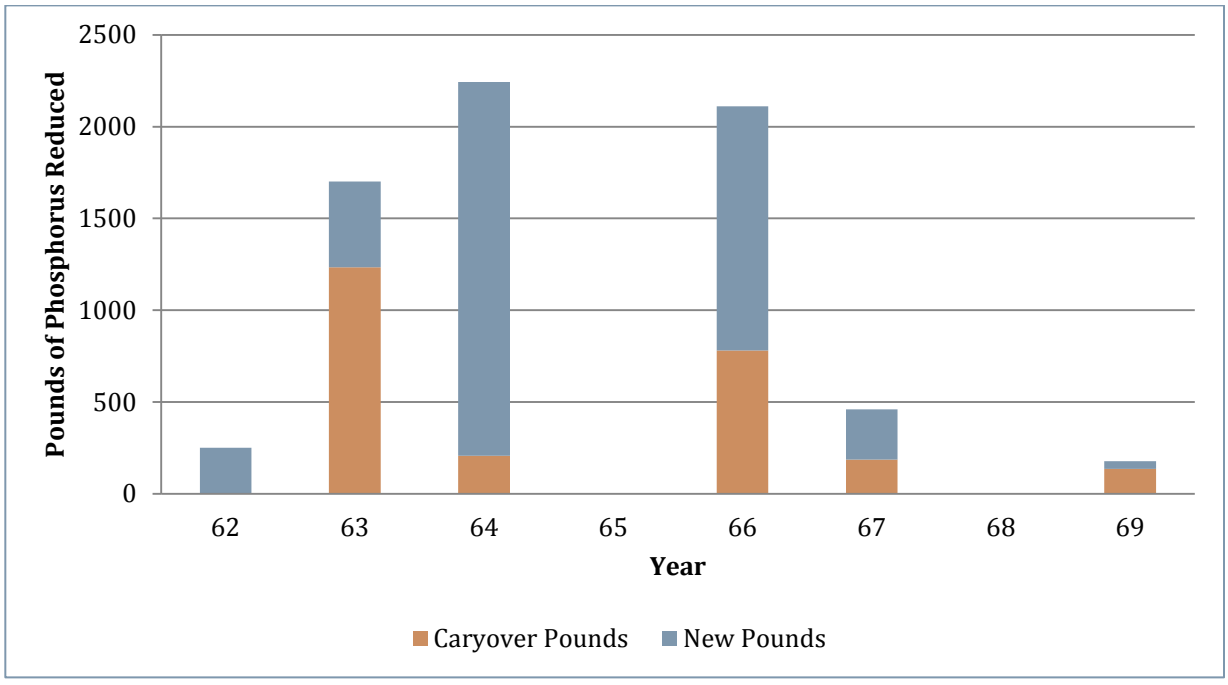
TABLE 7. PRACTICES IMPLEMENTED IN THE ENTIRE YAHARA WATERSHED SINCE 2013

Practice	Unit	2013	2014	2015	Total Amount
Grade Stabilization Structure	No	0	2	1	3
Grassed Waterway	Ac	0	5.4	9.9	15.3
Roof Runoff Structure	No	0	1	1	2

FULL SCALE TRANSITION

Practice	Unit	2013	2014	2015	Total Amount
Heavy Use Area Protection	No	1	0	1	2
Nutrient Management	Ac	0	10,280	20,574	30,854
Water and Sediment Control	No	0	1	2	3
Wetland Restoration	Ac	0	0	0	0
Lot Relocation	No	0	0	0	0
Cover Crops	Ac	0	0	293.5	293.5
Waste Storage Closure	No	0	2	0	2
Harvestable Buffer	Ac	0	15.2	52.1	67.3
Diversion	Ft	0	0	1650	1650

FIGURE 9. TOTAL PHOSPHORUS REDUCTIONS WITHIN THE ENTIRE YAHARA WATERSHED BY TMDL REACH AS OF DECEMBER 2015



*Note that this figure does not include practices from 2008 to 2012. Efforts are underway to verify practice locations as well as corresponding phosphorus reductions using current models and methodologies.

FULL SCALE TRANSITION

Cost Model

Dane County in collaboration with MMSD helped develop a cost model to estimate the cost associated with implementing a full scale adaptive management project. The model takes into account conservation practice phosphorus reductions and lifespans, staff time and costs, conservation practice costs, the distribution of practice types across the watershed, and time frame in which set phosphorus reduction goals are striving to be achieved.

Strategic Implementation Plan for Adaptive Management

Dane County developed a three phase Strategic Implementation Plan for Adaptive Management that provides a reasonable level of assurance that phosphorus reduction goals for the project will be achieved. Through these strategies, conservation practices are being efficiently prioritized, identified, implemented, verified, maintained, and reported. As a result, phosphorus reductions associated with these practices can be appropriately credited towards the overall project goals. Components of this three phase plan have and will continue to be incorporated into current workflows; providing continued progress and increased confidence in the overall success of the adaptive management effort. The three phase approach consists of: *Phase 1*- a watershed evaluation, prioritization of non-point source contributing areas, and inventory of source areas; *Phase 2* - implementation of conservation practices and quantification of phosphorus reductions; and *Phase 3* - verification of installed practices and reporting on progress.

Regional Conservation Partnership Program

The Regional Conservation Partnership Program (RCPP) is a new program developed by the NRCS and authorized under the 2014 Farm Bill. Its intention is to promote partnerships that work within a given area to promote conservation practices, with a significant focus on water quality improvement. Under RCPP, federal resources can be leveraged with other partner resources. Federal financial resources are allocated through four already existing NRCS programs; Environmental Quality Incentive Program (EQIP), Conservation Stewardship Program (CSP), Agricultural Conservation Easement Program (ACEP), and Healthy Forests Reserve Program (HFRP). Roughly $400 million was available in 2014/2015. Dane County partnered with the Madison Metropolitan Sewage District, NRCS, Clean Lakes Alliance, Sand County Foundation, Yahara WINS and UW-

Madison in submitting a project proposal for work within the Yahara Watershed. The RCPP project is entitled *Reducing Total Phosphorus and Sediment Loads in the Yahara Watershed through Wisconsin's Adaptive Management Option* and has six primary objectives;

1. Continued implementation of NRCS conservation practices
2. Testing/developing innovative practices
    a. Harvestable buffers
    b. Legacy sediment removal
    c. Regional manure storage (planning)
    d. Low disturbance manure injection
3. Implement a comprehensive water quality monitoring program
4. Quantify phosphorus reductions
5. Develop an EPA 9-step watershed implementation plan
6. Conduct outreach and education

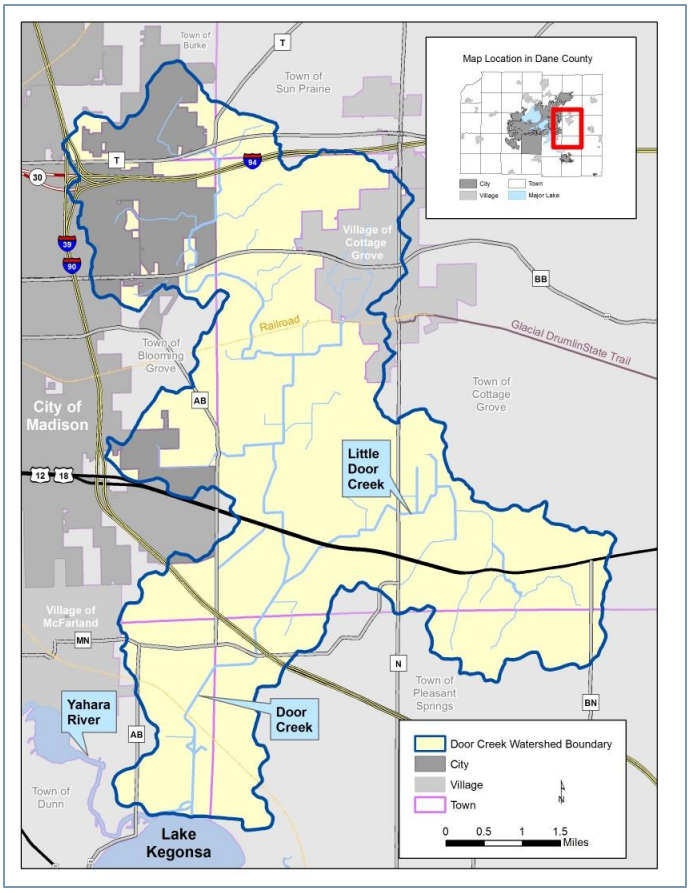
Dane County and partners were notified in January, 2015 that the project was selected for funding (one of four in Wisconsin). The time frame for the project is five years with a total budget of approximately $5.4 million. NRCS will provide $1.3 million in funding with partners providing roughly $4.1 million over the five years.

Nine Key Element Plan-Door Creek

In an effort to gain knowledge on EPA's and WDNR's process for development and approval of nine key element (9KE) watershed plans while also furthering the adaptive management project Dane County developed a 9KE plan for the Door Creek watershed (Figure 10). This knowledge is important in that it will help Dane County determine the level of resources needed to develop and implement a 9KE plan as well as evaluate the effectiveness of the plans. The Door Creek watershed was identified as the second largest contributor of phosphorus within the larger Yahara watershed. The 9KEs consist of: 1) identify pollutant sources; 2) estimate pollutant reductions; 3) describe and identify management measures that address pollutant reductions; 4) estimate technical and financial resource assistance needs; 5) describe information and education efforts; 6) develop an implementation schedule; 7) set implementation milestones; 8) develop implementation success criteria; and 9) develop a monitoring component to evaluate effectiveness. The plan was submitted in 2015 for review by both EPA and WDNR with comments received, revisions made, and resubmittal of the plan completed. Dane County

is currently waiting to hear on final approval. Meanwhile, implementation of the plan has already commenced with conservation practices currently being implemented and phosphorus reductions being quantified. Complete implementation of the plan is anticipated to take 10 years.

FIGURE 10. MAP OF THE DOOR CREEK WATERSHED.



CONCLUSION

Conclusion

A total of 5,167 pounds of phosphorus was reduced within the Six Mile Creek watershed over the course of the more than three years pilot testing the adaptive management compliance option. In addition, efforts accomplished to support full scale transition of adaptive management resulted in total phosphorus reductions throughout the entire Yahara River watershed of 6,947 pounds. Some of the valuable information that was gained included how to; verify practice implementation, quantify phosphorus reductions, gather inventory information for prioritizing conservation efforts, and leveraging multiple cost-share programs. Combining this information with the Strategic Implementation Plan for Adaptive Management, cost model, Regional Conservation Partnership Program project, and Door Creek Nine Key Element Watershed Plan has provided Dane County and Yahara WINs with the opportunity for a relatively smooth transition from a pilot project to a full scale Yahara Watershed adaptive management project. The full scale project is anticipated to commence sometime in early 2017.

Photo of the Yahara Watershed and Cherokee Marsh