Background

Williamson Pond is a 26-acre publicly owned lake located about 2 miles east of the town of Williamson, in Lucas County. It has a watershed area of 1499 acres (including the lake itself). The pond was built in the 1910s to provide a water source for steam locomotives, it was transferred, with 100 acres of adjoining land, to state ownership in the 1950s and dedicated to recreational use. It has been managed since 1976 by the Lucas County Conservation Board (while still under state ownership) for fishing, boating, hunting, picnicking and other passive uses. Its designated uses are Class A1 primary contact, and Class B (LW) aquatic life. Its usage level has been estimated at about 3,000 visits/year. Private land use within the watershed is predominantly agricultural.

Water Resource Problems

Williamson Pond is on the 2002, 2004, 2006, 2008, 2010 and 2012 303(d) list of impaired waters. The Class A1 (primary contact recreation) uses are assessed (monitored) as "not supported" due to poor water transparency and high levels of chlorophyll a (algae) that violate Iowa's narrative criteria protecting against aesthetically objectionable conditions. The Class B (LW) aquatic life uses are assessed (evaluated) as "partially supported" due to sediment related turbidity and the results of a fish kill investigation in May 2007.

A Total Maximum Daily Load (TMDL) was completed in 2005 for turbidity and phosphorus. The TMDL set an annual load capacity for sediment and phosphorus at 388 tons/year and 804 lbs/year respectively.

Watershed Management Plan

In 2009, the Iowa Department of Natural Resources, Iowa Department of Agriculture and Land Stewardship – Division of Soil Conservation, Lucas County Soil and Water Conservation District and Natural Resources Conservation Services worked together to develop a watershed management plan for Williamson Pond. The watershed management plan included 9 elements of watershed planning suggested by the Environmental Protection Agency (EPA). The Williamson Pond Watershed Management Plan (WMP)[1] was finalized and approved August 2009 and was awarded Section 319 funds to begin implementing the WMP to improve the water quality and ultimately remove it from the 303(d) impaired waters list.

[1] Williamson Pond Watershed Management Plan can be downloaded from:
http://www.iowadnr.gov/Environment/WaterQuality/WatershedImprovement/WatershedPlanning/ManagementPlans.aspx

FINAL PROJECT REPORT

Financial Accountability

Watershed Improvement Review Board Funds

Grant Agreement Budget Line Item	Total Funds Approved	Total Funds Approved Amended1	Total Funds Approved Amended2	Total Funds Expended	Available Funds
0.5 FTE	$24,000	$24,000	$24,000	$20,097.56	$3,902.44
20 structures *original*	$92,500				
10 Structures *amended 1*		$43,132			
10 Structures *amended 2*			$57,799	$49,352.10	$8,446.90
Totals	$116,500	$67,132	$81,799	**$69,449.66**	$12,349.34

Total Project Funding

	Cash		In-kind		Total	
Funding Source	Approved (as amended2)	Actual	Approved	Actual	Approved	Actual
WIRB	$81,799.00	$69,449.66	$0.00	$0.00	$81,799.00	$69,449.66
Section 319-1	$136,371.00	$116,467.94			$136,371.00	$116,467.91
Section 319-2	$24,000.00	$21,912.59			$24,000.00	$21,912.59
POL	$77,891.44	$77,891.44			$77,891.44	$77,891.44
SIDCA	$22,230.00	$12,705.32			$22,230.00	$12,705.32
Landowners	$43,323.31	$43,323.31			$43,323.31	$43,323.31
Totals	$385,614.75	$341,750.26			$385,614.75	$341,750.23

WIRB fund contribution	
Approved	21%
Actual	20%

The Lucas Soil and Water Conservation Board was awarded funds for salary and cost-share for best management practices in Williamson Pond in June 2010 from DNR Section 319 and November of 2010 from WIRB. The District also applied for Publically Owned Lakes funds and was awarded them.

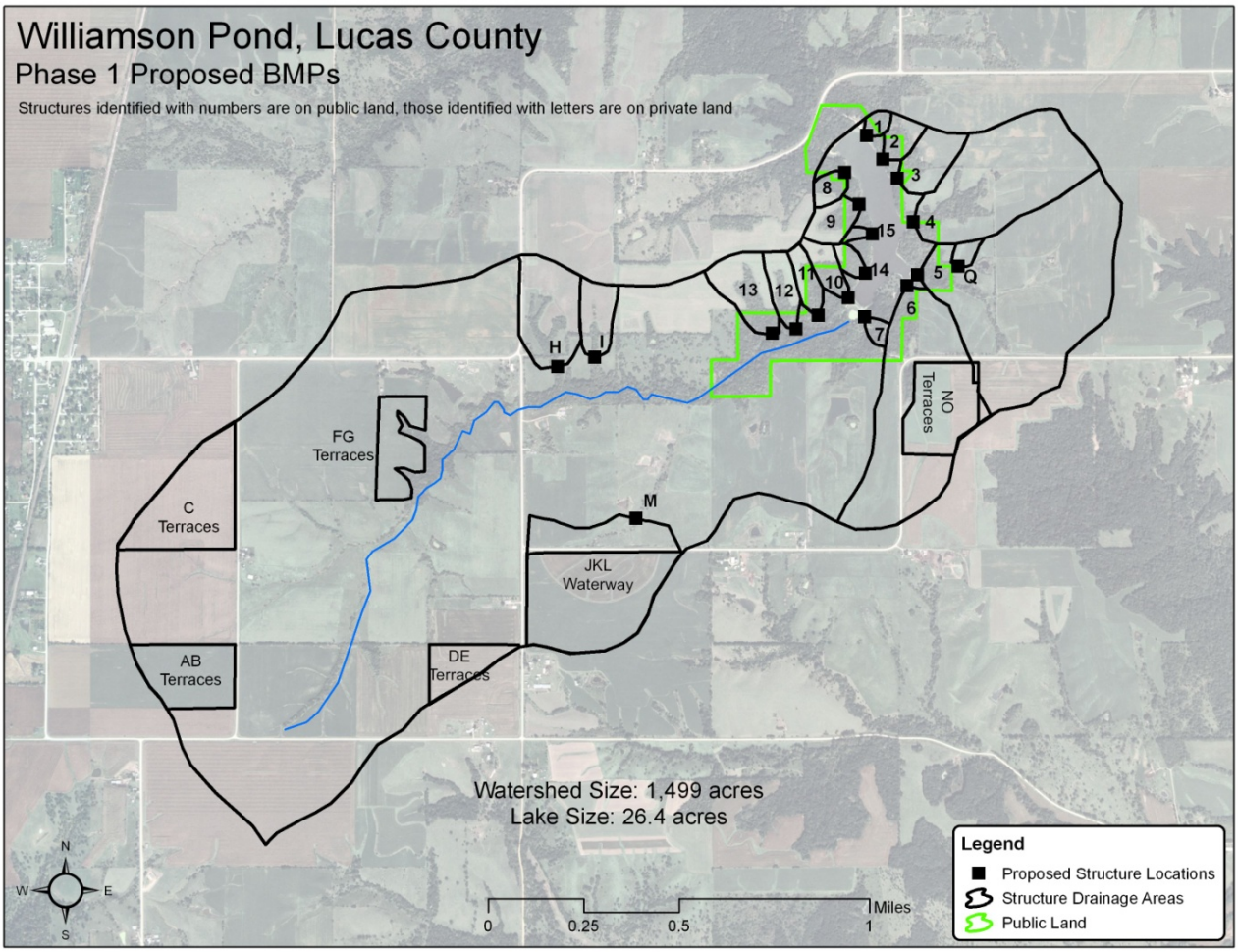
The original ask from the WIRB application:
-20 grade stabilization structures/sediment control basins
-2 acres grassed waterways
-6,750 feet of terraces

The completed practices of the project:
-3 grade stabilization structures (pond #1, pond #2, pond #3)
-6 water and sediment control basins (N. crossing, S. crossing, basin #4, basin #8, basin #9 and basin #10)
-1 livestock improvement
-13,125 feet of terraces
-2 sediment control basins

Throughout the course of the project, Kim Williams, Williamson Pond Project Coordinator, determined that the landowners on the west side of the pond were not interested in installing any structures. Therefore work only continued on the east side of the pond and in December of 2013 the project was finished. Multiple amendments were requested throughout the course of the project. There was technical errors with the NRCS designs for the practices on state land and it was determined that the project would stop construction on 3 water and sediment control basins (basin 1, basin 2 and basin 3) due to possible project overruns. NRCS and DNR staff worked with the local District office to correct the errors and move the project forward.

The WIRB Board approved a request in August 2013 to increase the cost-share rate from 34% to 50% on 4 practices (pond #1, pond #3, basin #4 and basin #10). See **Total Project Funding – Final Expenditures** table on page 7, 8 and 9 for costs per practices).

Original Plan for Williamson Pond – Phase 1

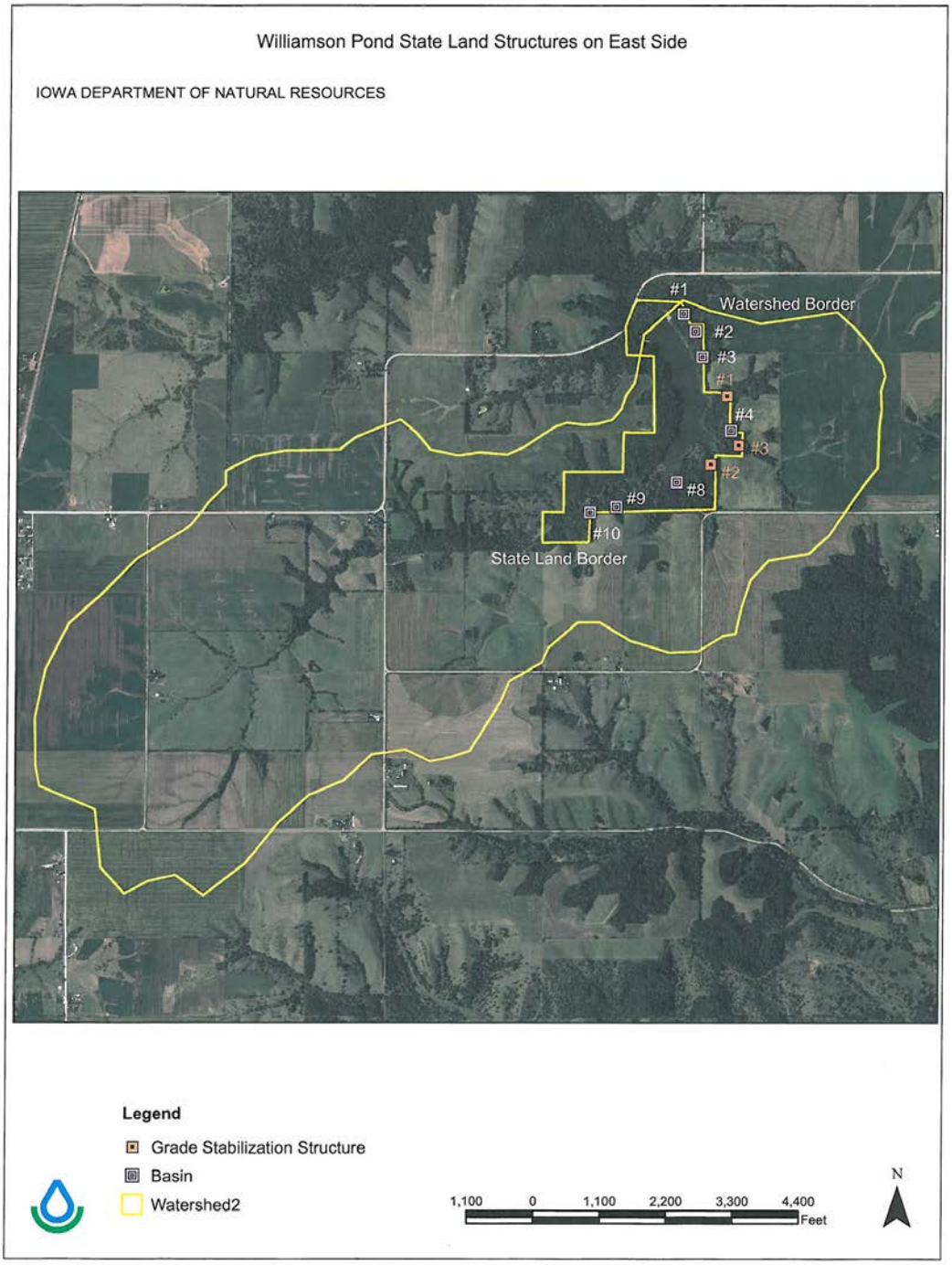


Completed Work at Williamson Pond on State Land

-3 grade stabilization structure

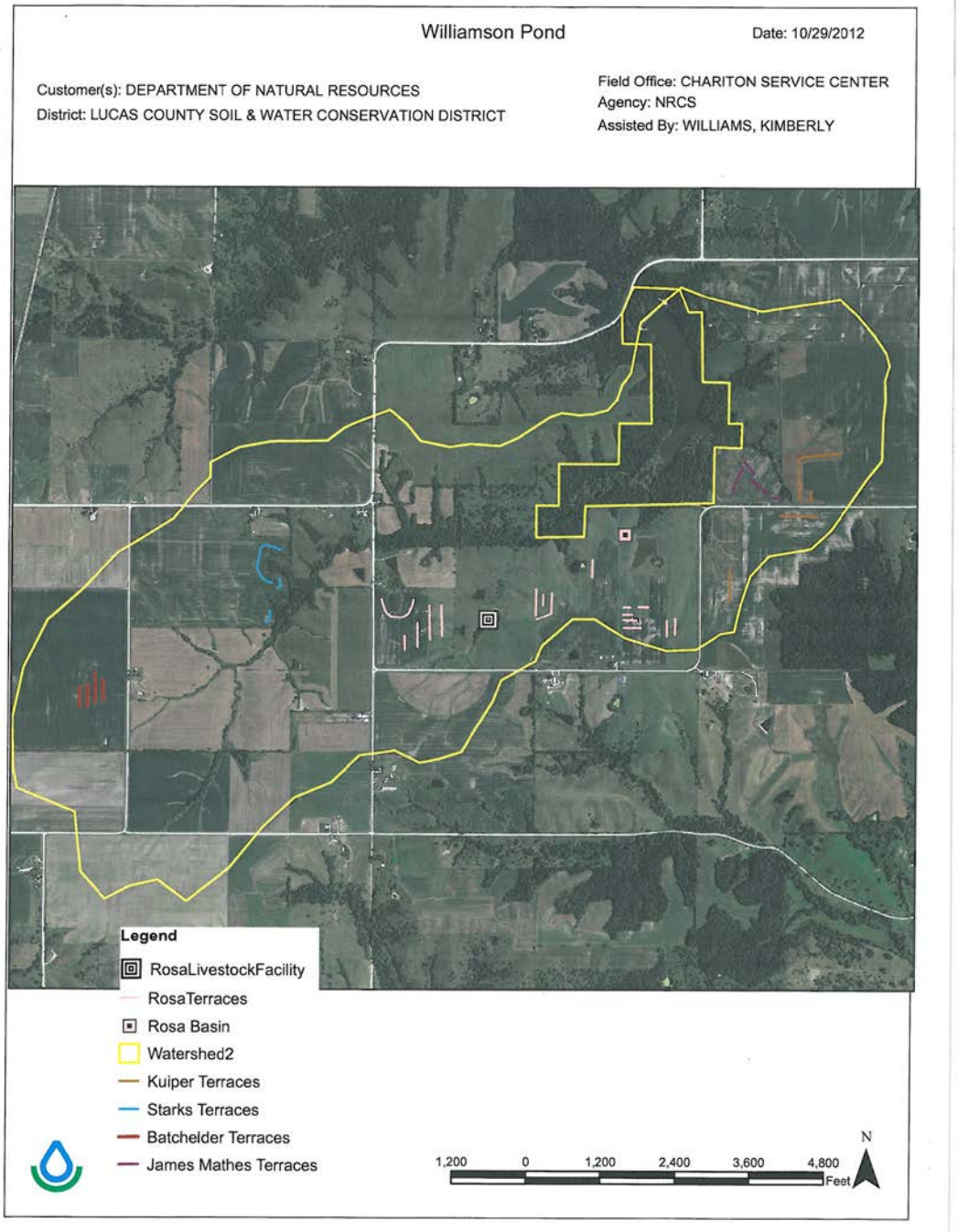
-6 water and sediment control basins (#10, #9, #8, #4 – the other two water and sediment control basins are referred to as the N Crossing and the S Crossing. These are in combination with grade stabilization structure #1 and #3).

Note: Basins 1, 2 and 3 were cancelled due to project overruns



Completed Watershed Work

-1 livestock improvement
-13,125 feet of terraces
-2 sediment control basins



Total Project Funding – Final Expenditures

FY2010	Expended Amount	Funding Source
Salary and benefits	$9,736.00	319-1
Cultural Investigation	$3,936.00	319-1
Travel and training	$75.00	319-1
Information and education	$373.48	319-1
Water Monitoring	$4,631.63	319-2
Total	**$18,752.11**	
FY2011	**Amount**	**Funding Source**
Salary and benefits	$10,445.00	319-1
Salary and benefits	$6,000.00	WIRB
Travel and training	$205.45	319-1
Supplies	$168.89	319-1
Information and education	$321.23	319-1
Water Monitoring	$10,477.01	319-2
Best management practices:		
Terraces	$22,071.68	POL
Livestock Watering Facility	$472.95	319-1
Grade Stabilization Structure	$15,460.05	POL
Private Landowner Share	$34,965.70	Cash
Total	**$100,587.96**	
FY2012	**Amount**	**Funding Source**
Salary and benefits	$8,652.41	319-1
Salary and benefits	$5,476.77	WIRB
Travel and training	$250.00	319-1
Supplies	$0	319-1
Information and education	$0	319-1
Water Monitoring	$5,690.90	319-2
Best management practices:		
Terraces	$16,831.91	POL
Water/Sediment Control Basin	$2,358.19	POL
Private Landowner Share	$8,357.61	Cash
Total	**$47,617.79**	
FY2013	**Amount**	**Funding Source**
Salary and benefits	$7,868.96	319-1
Salary and benefits	$7,085.81	WIRB
Travel and training	$0	319-1
Supplies	$0	319-1
Information and education	$0	319-1
Water Monitoring	$1,113.05	319-2

Best management practices:		
Terraces	$21,169.61	POL
Total	**$37,237.43**	
FY2014	**Amount**	Funding Source
Salary and benefits	$1,570.00	319-1
Salary and benefits	$1,534.98	WIRB
Public Land BMPs Pond 1	$15,897.71	WIRB
Public Land BMPs Pond 1	$15,897.71	319-1
Public Land BMPs Pond 2 (SIDCA)	$12,705.32	SIDCA
Public Land BMPs Pond 2 (SIDCA)	$12,705.32	319-1
Public Land BMPs Pond 3	$11,777.10	WIRB
Public Land BMPs Pond 3	$11,777.10	319-1
Public Land BMPs N. Crossing - Water and Sediment Control Basin	$3,951.67	WIRB
Public Land BMPs N. Crossing - Water and Sediment Control Basin	$7,670.89	319-1
Public Land BMPs S. Crossing - Water and Sediment Control Basin	$1,859.03	WIRB
Public Land BMPs S. Crossing - Water and Sediment Control Basin	$3,608.71	319-1
Public Land BMPs Basin 1 (Construction Cancelled)	$147.05	319-1
Public Land BMPs Basin 2 (Construction Cancelled)	$156.30	319-1
Public Land BMPs Basin 3 (Construction Cancelled)	$209.80	319-1
Public Land BMPs Basin 4	$3,756.58	WIRB
Public Land BMPs Basin 4	$3,756.58	319
Public Land BMPs Basin 8	$1,790.45	WIRB

Public Land BMPs Basin 8	$3,475.58	319
Public Land BMPs Basin 9	$2,834.68	WIRB
Public Land BMPs Basin 9	$5,502.61	319-1
Public Land BMPs Basin 10	$7,484.89	WIRB
Public Land BMPs Basin 10	$7,484.89	319-1
Total	**$137,554.95**	

Total Public Land WIRB = $49,352.10
Total Public Land 319 = $72,392.52
Total Public Land SIDCA = $12,705.32

Totals by Funding Sources		
	$69,449.66	*WIRB*
	$116,467.91	*319-1*
	$21,912.56	*319-2*
	$12,705.32	*SIDCA*
	$77,891.44	*POL*
	$43,323.31	*Landowners/Cash*
Total	**$341,750.23**	All Sources

Environmental Accountability

Below are the estimates for sediment and phosphorus delivery reduction to the lake. These were calculated using RUSLE and the Iowa Sediment Delivery Calculator.

Federal Fiscal Year	BMP Type	Sediment Delivery Reduction (tons/yr)	Phosphorus Reduction (lbs./yr)	Acres Treated
FY2010	-	-	-	-
FY2011	Grade Stabilization Structure (1)	225	293	1
	Terraces (3585 ft)	100	134	26
FY2012	Sediment Control Structure (1)	8	10	2
	Terraces (4810 ft)	29	38	30
FY2013	Sediment Control Structures	1,056	1,373	293

	Terraces (4730 ft)	62	81	47
FY2014	Grade Stabilization Structures/Ponds (3)	850	1105	49
	Water and Sediment Control Basins (6 – includes N. and S. Crossing)	99	128.77	22
Totals		2,429	3,163	470

Water Data Analysis and Interpretation

Project 319 monitoring on Williamson Pond began in May of 2010 and ended October 2011 due to federal budget constraints. The monitoring results are discussed below, however it is important to remember that it is unlikely to see impacts from best management practices during this time of monitoring.

Site locations were established for Williamson Pond to provide an idea of the delivery of nutrients and other pollutants to the lake through the main tributary (West Inlet) and the amount of pollutants leaving the lake through the overflow structure (North Outlet). The goal of the monitoring program is to demonstrate reductions in delivery of pollutants to the lake through time at the West Inlet site and to show improved water quality leaving the lake through the outlet as well. As part of the standardized ambient lake monitoring for DNR, water monitoring by Iowa State University showed that water clarity at Williamson pond has declined since 2005. The goal for Iowa lakes is to achieve at least 1 meter of water clarity during the spring and summer months.

During 2010, water clarity at Williamson Pond was less than half that value at 0.5 meters. Heavy rainfall increases stream flow and erosion from the watershed, which increases the amount of sediment washing into the lake and decreases lake clarity. Sediment washing into the lake also contains the nutrient, phosphorus, which causes algae blooms and further decreases lake clarity.

Monitoring on the stream flow into Williamson Pond and the outlet of the lake occurred during 2010 and 2011. Preliminary analysis of the data show mixed results. From the two years of monitoring, it appears that phosphorus levels entering the lake decreased in 2011. The decreased amount of phosphorus coming from the land surrounding Williamson Pond could be a result of the best management practices that have been implemented as part of the watershed project. However, the total amount of sediment ("total suspended solids") was higher in 2011 compared to 2010. The reason for this is not known at this point in time, but may be related to higher stream flows in 2011 carrying more sediment.

Total Phosphorus

The total amount of phosphate, including dissolved and particulate forms, is reported as Total Phosphorus. While not all forms of phosphorus are as readily available for uptake by plants as others, the measurement of total phosphorus is useful in the interpretation of the nutrient availability in a water body. Currently, the State of Iowa does not have a

Total Phosphorus (TP) water quality standard, but a general rule of thumb is that total phosphorus levels no greater than 0.1 mg/L or part per million (ppm) is desirable for Iowa's streams or rivers and no greater than 0.035 mg/L for lakes and ponds to maintain healthy aquatic systems free of excessive algae growth.

For years 2010 and 2011 show that for both of the Williamson Pond sites (West Inlet and North Outlet) Total Phosphorus (TP) exceeds 0.1 mg/L several times during the year. The West Inlet site had TP values in excess of 0.7 mg/L in May and June of 2010, which corresponded to some very high flow values. TP levels at the West Inlet decreased later in 2010, but were still significantly above 0.1 for the entire year. The TP levels entering Williamson Pond are significantly above the desired in lake TP value (0.035 mg/L) and suggest that the amount of TP entering the lake is not sustainable for the lake. Ideally, the inlet values would be closer to the goal of 0.035 mg/L since there is little chance for biological processing or removal of the TP before the phosphorus enters the lake system. The North Outlet site also shows significantly elevated TP values, however the values at this site are consistently lower than the values seen at the West Inlet, which is to be expected given that settling of sediment particles will occur in the lake and much of the phosphorus is bound to the sediment. Peak levels in TP at the North Outlet site mirror the flow rates during 2010. In 2011, while increased stream flow is associated with higher TP values, the increase in TP is not as dramatic as what was seen in 2010.

Total Suspended Solids

Total Suspended Solids (or TSS) is a measure of the suspended organic and inorganic solids in water. Currently, Iowa does not have a water quality standard for TSS and the median statewide stream concentration is 59 mg/L. TSS values at the West Inlet are upwards of 100 times the statewide median and are related to increases in stream flow. The outlet TSS values are significantly lower, as would be expected, given the settling of solid particles within Williamson Pond.

Williamson Pond Lake Trends

Monitoring data collected by Iowa State University for the Iowa Department of Natural Resources show that water clarity at Williamson pond has declined since 2005. Water clarity reached a peak in 2003 at slightly more than 3 meters, but has been less than a meter since June of 2005. During 2010, water clarity has been less than half that value at 0.5 m. The goal for Iowa lakes is to achieve at least 1 meter of water clarity during the spring and summer months. The excessive amounts of rainfall during the latter half of the 2000s are likely related to the decreases in water clarity observed in Williamson Pond. Heavy rainfall increases stream flow and erosion from the watershed and increases sediment delivery, which in turn results in higher levels of lake turbidity. Lake turbidity levels spiked significantly in 2009. Additionally, sediment delivered from the watershed will contain higher levels of phosphorus, which spurs algae growth. Excessive algae growth can also decrease water clarity. Phosphorus levels have shown a rapid increase during the second half of the 2000s.

Continued monitoring in the Williamson Pond watershed will likely demonstrate the impacts of best management practices implemented around the watershed, although there

may be a time lag between the implementation of the practice and the improvement in the lake water quality. The project needs additional years of monitoring to be completed to make water monitoring meaningful – especially after the construction of the East Side Structures. Due to budget constraints water monitoring has been ceased at this time. It may be beneficial to revisit monitoring at this project within a few years.

Program Accountability

One of the first challenges with this project was the lack of willingness of landowner involvement on the western side of Williamson Pond. Another challenge was the technical errors in the designs which significantly held up the project and produced project overruns. Fortunately these errors were noticed by DNR and NRCS staff prior to completing all structures and they were able to reduce project overruns as much as possible. Constructing structures on state land can be cumbersome and time-consuming; this should be taken into account when funding projects. It would also be beneficial to know landowner willingness prior to funding a project.