North Canadian River
Watershed Implementation Project
Phase II Final Report



FY 2010 §319(h) Project 9, Tasks 9.1, 9.3, 9.6
EPA Grant # C9-996100-15

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Introduction

In September 2007, the Oklahoma Conservation Commission (OCC) began a three-year demonstration project in the North Canadian River watershed between Lake Canton and Lake Overholser to address nonpoint source (NPS) pollution issues associated with declining water quality in the area. The North Canadian River Watershed Implementation Project focused on the implementation of Best Management Practices (BMPs), as well as education of landowners, in order to reduce NPS loading of sediment, nutrients, and bacteria, with the ultimate goal of eliminating the impairments in the watershed and improving the water quality of Lake Overholser.

The water quality of the North Canadian River in west-central Oklahoma has been a concern for over a decade, since monitoring data collected from 1997-2003 by the Oklahoma Department of Environmental Quality (ODEQ) and the Association of Central Oklahoma Governments (ACOG) indicated high levels of turbidity and bacteria. The North Canadian River flows into Lake Overholser and Lake Hefner, public water supplies for over 600,000 residents in Oklahoma City. Multiple segments of the North Canadian River above and below Oklahoma City are listed on the 303(d) list as impaired for pathogens and turbidity. Currently, Lake Overholser is impaired by turbidity, and the Lake Overholser watershed up to the Canton Dam was designated as a nutrient-limited watershed in 2006 due to Trophic State Index (TSI) values exceeding 62 in the lake.

Initial research indicated a large nonpoint source component in the impairment problems of the North Canadian watershed. Modeling of nutrient loads from upland areas using the Soil and Water Assessment Tool (SWAT) indicated that areas of cropland and riparian pasture were contributing the largest amounts of bacteria, sediment, and nutrients into the river (Storm et al. 2007). Therefore, the implementation of best management practices (BMPs) through the North Canadian River Watershed Implementation Project was targeted to areas shown in the model to have the potential to contribute a larger amount of nutrients.

Within four months of the initiation of signup for BMP implementation, all original monies slated for the 2007 project were obligated, with the two most common practices implemented being conversion of conventional tilling to no-till farming and establishment of riparian buffers through exclusion fencing. Because of this very high participation, a second phase of the project was planned to implement additional BMPs. The Phase II North Canadian River Watershed Implementation Project began in January 2010 and concluded in August 2012. Both phases of the project involved the collaboration of the Blaine, Dewey, East Canadian, and Central North Canadian River Conservation Districts, the OCC, Oklahoma State University, and 150 local landowners. Nearly one million dollars in implementation was spent in Phase I, with approximately the same amount spent in Phase II.

This report will detail the education and implementation efforts which occurred in the watershed from January 2011 through December 2012. Due to extreme drought during this project period, the assessment of water quality data collected since 2007 will be provided at a later date as a supplement to this report, once the results and methodology have been fully examined by independent statisticians. Additional implementation, education, and monitoring efforts are ongoing in the watershed through 2014, so a more detailed report will be produced in early 2015 which will reassess water quality monitoring results and provide a full accounting of project achievements since 2007.

Project Location

The specific area of the OCC's North Canadian Watershed Implementation Project is a reach of the North Canadian River from just below the Lake Canton dam in Blaine County to the Lake Overholser dam in Canadian County in west-central Oklahoma (see Figure 1). The watershed covers approximately 680 square miles in area and includes three Hydrolic Unit Codes (HUC 11) watersheds: 11100301060, 11100301070, and 11100301080. The Oklahoma watershed ID for this segment of the river is 520530.

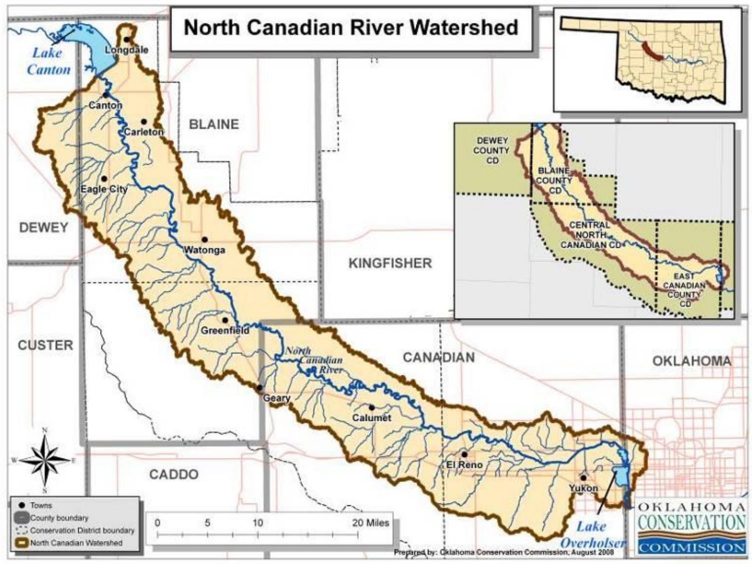


Figure 1. North Canadian River Watershed Project Area.

The majority of the watershed consists of pasture and wheat cropland; however, a small portion of the eastern section near El Reno and Yukon is urban (Figure 2). There are five confined/concentrated animal feeding operations (CAFOs) in the North Canadian Watershed which process large numbers of cattle every year. The soils in the watershed are highly erodible, primarily sandy or silty loams.

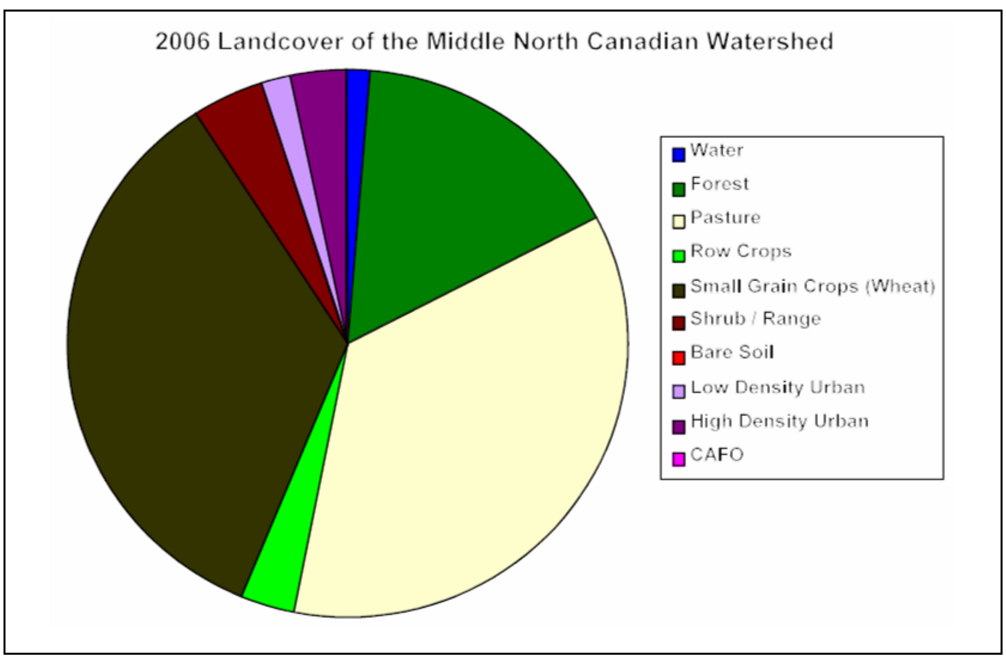


Figure 2. Land cover data for the middle North Canadian Watershed (AMEC Earth and Environmental Incorporated, 2006).

Problem Statement

In 2004, the segment of the North Canadian River between Canton Lake and Overholser Lake was listed on the 303(d) list as impaired by pathogens (*Enterococcus, E. coli,* and fecal coliform) and turbidity. In 2005, the Oklahoma Department of Environmental Quality issued a draft TMDL based on data collected from 1997-2003 for the project section of the North Canadian River, which recommended a 73% reduction in the geomean of *Enterococcus* (ODEQ 2005).

In addition, the Association of Central Oklahoma Governments (ACOG) analyzed data that was collected from May 2003 through September 2003 which included a section of the project area and an additional portion of the North Canadian River downstream from Lake Overholser. The ACOG data was used to create a draft TMDL in March 2006 that recommended approximately 73% fecal coliform load reduction and approximately 96% *Enterococcus* load reduction to restore beneficial use support to the North Canadian River in Canadian County (ODEQ 2010).

The project location area is rural, and agricultural activities are the major NPS source of impact. Riparian areas in this region are frequently compromised, either through removal of protective vegetation or through uncontrolled livestock access. The result is streambank erosion, habitat loss, and increased bacteria from animal waste, sediment, and nutrient transport into the river. Wheat production using conventional tillage methods occurred in nearly 40% of the watershed area, further contributing to the sediment issues in the watershed.

Program Partners and Management

To address these problems, the Oklahoma Conservation Commission (OCC), in cooperation with the Environmental Protection Agency (EPA), Oklahoma's Office of the Secretary of the Environment (OSE), and four local conservation districts, initiated a watershed project in 2007. Through this cost-share project, local landowners began installing conservation practices to improve water quality. The OCC, as the state's technical lead nonpoint source agency, managed the project, providing administrative support and technical guidance.

A local project coordinator and education coordinator were hired in the fall of 2007. The duties of these personnel included identifying producers in need of conservation plans based on the results of the SWAT targeting, contacting these landowners about becoming cooperators, writing conservation plans for no-till, overseeing the implementation of best management practices, and educating producers on the economic and environmental benefits of no-till management. The OCC worked with local partners to accomplish these tasks, with the ultimate goal of reducing nonpoint source pollution in the watershed. The primary partner agencies in the North Canadian River Watershed Project included:

- **Blaine, Dewey, East Canadian, and Central North Canadian River Conservation Districts and the USDA-Natural Resources Conservation Service (NRCS)**

The local conservation districts, the NRCS, and the project and education coordinators worked one-on-one with citizens of the watershed to reduce pollution and educate about the importance of protecting water resources. The districts and NRCS also organized or participated in seminars, training sessions, and BMP tours to interact with local people and provide technical

assistance and information. These agencies were critical to ensuring participation of local landowners in water quality improvement programs. In addition, the Blaine County Conservation District (CD) provided office space and support for the project coordinator, while the Central North Canadian River CD supported the Project Education Coordinator. This support included clerical support, telephone service, and internet service. Four no-till drills were purchased under Phase I of the project and were rented by the local conservation districts to participants to decrease the financial burden of converting over to no-till farming.

Local agencies often have the most accurate knowledge concerning current land management practices and local needs, so the districts recommended members for the Watershed Advisory Group, participated in that group, and worked with landowners to insure that they received their cost-share reimbursements and incentive payments.

- **Oklahoma State University Cooperative Extension Service (OCES)**

The OCES worked closely with the local conservation districts and the NRCS to promote water quality awareness through numerous educational programs in the watershed. Staff from OCES provided technical assistance to landowners and participated in workshops and tours to educate producers about the effectiveness of certain best management practices and on topics such as soil testing, no-till, and pesticide usage. No-till participants in this project received a copy of the manual *No-till Cropping Systems in Oklahoma* manual that was produced by the OCES.

- **Western Farmers Electric Cooperative (WFEC)**

The WFEC has partnered with OCC to develop a Carbon Sequestration Pilot Program in the project area. WFEC, through the OCC, provided funding for incentive payments to agricultural producers to adopt BMPs based on their ability to sequester carbon. These practices are also protective of water quality and thus the benefit is two-fold and included protecting riparian areas, converting to no-till, adopting improved grazing management plans, and converting cropland to pasture. Initial commitments totaled approximately $130,000 for the first year. In addition, WFEC worked with the OCC to support necessary research to expand the Carbon Sequestration Program in Oklahoma, which included soil testing to better estimate carbon sequestration rates of different practices in Oklahoma soils.

Education and Outreach

The goal of the education program of this project was to promote lasting, widespread adoption of conservation practices over the entire watershed. The education program was guided and implemented by an Education Coordinator. Tasks completed as part of the North Canadian River Watershed education program included quarterly newsletters, brochures, and newspaper articles (copies of these items have been submitted to EPA Region 6 in Dallas, TX) as well as numerous presentations, tours, and workshops.

One of the most important efforts of the education program was the focus on helping landowners transition over to no-till farming by providing the educational tools and the equipment necessary to make the transition. No-till workshops were held to educate participants about effective ways to implement no-till farming. In addition, the Conservation Districts rented out no-till equipment, which was purchased during Phase I of the project, to producers for a nominal fee.

No-till drill rented to project participants

Tours of BMP implementation in the watershed were conducted for government representatives of Uganda and Kenya. With funding from Phase III of the project, a Demonstration Farm was established in 2011 (which will be discussed in detail in the Phase III report), and numerous educational events occurred at that venue beginning in December 2011. OCC staff worked with Oklahoma State University (OSU) specialists to host a series of field days that addressed the benefits of rotational grazing, grid soil sampling, and cover crops. Some of the visitors to the Demonstration Farm included representatives from the Oklahoma State Office of Budget and Finance, State Senate and House Budget analysts, the Executive Board and Directors of Oklahoma Farm Bureau, the OKC Sierra Club, members of Sustainability OKC, the Oklahoma River Boathouse Foundation, China's Deputy Director of Crop Production in the Ministry of Agriculture, members of the Oklahoma Association of Conservation Districts, USDA-ARS, and USDA-NRCS, in addition to local producers.

Many educational tours and workshops took place as part of the North Canadian River Project.

The education coordinator also gave presentations and set-up display booths at the 2011 National Association of Conservation Districts South Central Region Meeting, Native American Natural Resource Outreach Meetings, Dewey County Outdoor Natural Resource Day, Rotary Club, the Watonga Lions Club, no-till conferences, Masters Gardeners meetings, Conservation Day at the OK Capitol, and the Watonga City Hall. Program flyers/brochures were distributed at schools, libraries, and senior citizen centers.

One of the unique events in this project was the organization of a three-day traveling workshop on the North Canadian River watershed, which was given for 18 educators in June 2011. Participants learned about watersheds, and the North Canadian watershed in particular, through a series of hands-on activities. Topics such as ecoregions, landuse, nonpoint source pollution, groundwater, the water cycle, and BMPs were covered. Responses from the participants were extremely positive, with statements such as, “Without question, this was the best workshop of its kind that I have ever attended during my 20+ years as an educator,” and, “We walked away forever thinking differently about our environment.” One-hundred percent of the respondents to a six-month post-workshop survey stated that the workshop influenced them to change their personal and professional attitudes and behaviors with regard to watersheds, pollution, and agricultural BMPs.

Eighteen educators participated in the three-day traveling watershed workshop.

The Blue Thumb staff and the education coordinator presented the Enviroscape demonstration, which teaches ways to reduce nonpoint source pollution, to elementary and high schools and civic groups in the North Canadian River watershed. This demonstration was also given at multiple Earth Day events, Natural Resource Days, for 4-H clubs, local Rotary Clubs, and local fairs.

Models such as the Enviroscape were used to teach about nonpoint source pollution.

In addition, a Blue Thumb stream monitoring training was held in the watershed in 2011. During the two-day stream monitoring training, participants learned about stream ecology, non-point source pollutants, watersheds, and performing field collections for fish and macro-invertebrates surveys. Additionally, participants were taught how to conduct water chemistry tests, including dissolved oxygen, nitrates, nitrites, phosphates, pH, bacteria, ortho-phosphorus, chloride, and ammonia.

Blue Thumb stream monitoring team


Blue Thumb volunteers monitoring area streams

Approximately 40 volunteers were trained in Phases I and II of the project to conduct stream monitoring. Currently, four teams monitor tributaries in the North Canadian River Watershed. The Education Coordinator helped organize macroinvertebrate collections and quality assurance sessions for the stream teams in the watershed twice a year.

A Nutrient Management Workshop was given in 2012, which addressed topics such as use of nitrogen-rich strips, cover crops, nitrogen application strategies, and fertilizer injection. OSU researchers gave some of the presentations and were on hand for questions from the 34 landowners in attendance.

Detailed reports of education programs were submitted at each conservation district monthly board meeting. The minutes of each meeting, along with the reports from the education coordinator, have been submitted in hard copy format in fulfillment of workplan requirements. In addition, hard copies of flyers, quarterly newsletters, fact sheets, and brochures are included in the education binder.

Although this project is currently limited to **education** of city personnel, it is hoped that this effort will eventually result in reductions of the approximately 26% of the total phosphorus loading estimated to come from high density urban areas (especially the El Reno area). This type of outreach to the urban areas in the watershed will continue through the third phase of the project.

Targeting NPS Pollution

The Oklahoma Conservation Commission contracted with the Oklahoma State University (OSU) Biosystems and Agricultural Engineering Department to model the watershed and produce maps showing the highest potential phosphorus and nitrogen loss areas. OSU used a 2005 SWAT (Soil and Water Assessment Tool) model to predict phosphorus and nitrogen loads from the upland areas of the project area for the period of 2001 to 2005. Specifics of the SWAT modeling are found in a report by Dr. Dan Storm and associates (Storm et al. 2007).

The SWAT model showed that the largest contribution, approximately 60% of both total surface nitrogen and total phosphorus, occurs on 20% of the land in the watershed. Three land use categories contributed over 85% of the total phosphorus load in the basin: winter wheat (36%), high density urban (26%), and pasture (24%) (Table 1). The high density urban had the highest total phosphorus loss per unit area (2.38 kg/ha/yr). It accounted for only 3% of the basin area; however, it generated over a quarter of the total phosphorus load. The two non-urban land cover types that contribute total phosphorus were winter wheat and pasture.

Table 1. SWAT simulated total phosphorus by land cover for the North Canadian Basin for the period 1/2001-12/2005 (Storm et al. 2007).

Land Cover Type	Fraction of Basin (%)	Area (hectares)	Total Phosphorus (Kg/ha/yr)	Total Phosphorus (Kg/yr)	Percent Contribution
Agricultural Row Crop	2.6	4743	0.31	1462	3%
Bare Soil	<0.5	56	1.68	95	0%
CAFO (Pasture)	0.5	972	0.19	186	0%
Forest (Mixed)	15.3	28037	0.05	1367	3%
Pasture	34.6	63510	0.19	12073	24%
Point Source (Yukon WWTP)	0	NA	NA	362	1%
Rangeland Brushy	3.8	7046	0.19	1363	3%
Urban -High Density	3.0	5524	2.38	13132	26%
Urban - Low Density	1.4	2557	0.75	1909	4%
Water	1.0	1879	0	0	0%
Winter Wheat	37.8	69373	0.28	19111	36%

The SWAT model was also used to estimate reductions in phosphorus loading due to a variety of BMPs: conservation tillage, no tillage, land conversion from agriculture to pasture, contour tillage, buffer strips on agricultural lands, and conversion of grazing pasture land to hay fields. The model assumed complete adoption of the BMPs to achieve the load reductions, which was not a realistic assumption, but this allowed examination of the relative effectiveness of the BMPs in the project. As shown in Table 2, all BMPs are expected to result in some reduction in total phosphorus load. The largest reduction of total phosphorus loading (28%) was seen from the addition of a 10 meter riparian buffer strip on all agricultural land uses. The next largest reduction in total phosphorus was expected on land converted from agriculture to pasture and contour plowing.

Table 2. SWAT simulated total phosphorus loads and expected load reductions for best management practices (BMP) implemented in the North Canadian River Watershed Project.

Best Management Practice	Total Phosphorus Load (Kg/yr)	Load Reduction
Default - No BMP	30,200	
Conservation Tillage	26,700	12%
No Tillage	28,900	4%
Contour Plowing	24,600	19%
Pasture Conversion from Row Crops	24,000	21%
Buffer Strip (10 meters)	21,700	28%
Pasture Conversion from Grazing to Hay	25,300	16%

Demonstration of Best Management Practices

The focus of this project was to reduce nonpoint source pollution from agricultural activity. Based on recommendations from the SWAT model and previous projects, a variety of best management practices (BMPs) were offered to landowners. A Watershed Advisory Group (WAG), established in 2007, suggested best management practices for the watershed and corresponding cost-share rates, as shown below. The Nutrient Management BMPs were approved by the WAG as cost-share options in 2012.

Best Management Practices		Cost-Share Rate
Erosion Control		**80%**
Components:	(1) Vegetative Planting	
	(2) Field Border	
	(3) Residue Management	
	(4) Structural Practices	
	(5) Roadside Concerns	
Conversion from Conventional Tillage to No-till Farming		
$19.70 per acre per year		
Riparian Areas-Buffer Zones		**90%**
Components:	(1) Vegetative Planting	
	(2) Stream Crossings	
	(3) Fencing	
	(4) Off Site Watering	
Livestock Management		**80%**
Components:	(1) Vegetative Establishment	
	(2) Cross Fencing	
	(3) Watering Facilities	
	(4) Heavy Use Areas	
	(5) Nutrient Management	
Septic Concerns & Special Projects		**90%**
Components:	(1) Septic Systems with Tank & Lateral Lines	
	(2) Rock Reed Absorption Filters with Septic Tank	
	(3) Residential Sewage Lagoons	
	(4) Other	
Nutrient Management		
Components:	(1) Cover Crops	$16/acre
	(2) Grid/Landform Soil Sampling	**45%**

All landowners in the North Canadian River Watershed Project area were eligible for cost-share assistance regardless of the number of acres they owned. Targeting results were used to locate critical areas in the watershed where implementation would show the greatest

Watershed Advisory Group (WAG) meeting

improvements to water quality. Individuals who lived in a critical, hotspot area (based on the SWAT model) were contacted by the project coordinator or education coordinator and the conservation district and strongly encouraged to participate in the program. Once interested landowners were identified, the conservation district boards approved applications, and the project coordinator developed conservation plans.

The maximum cost share assistance to any one landowner was $50,000, and cost-share rates were generally set at 80-90%, requiring a 10-20% match from the landowner. The Oklahoma Conservation Commission approved the list of practices and the cost-share rates at the monthly Commission meeting on December 3, 2007.

The Oklahoma Carbon Program initiated a pilot project in conjunction with the North Canadian River Project, which allowed additional funding to be given to producers who installed certain BMPs. Specifically, no-till, conversion to grasslands, and riparian buffers are BMPs that have been shown to sequester carbon while also providing water quality benefits. Twenty-two producers participated in the Carbon Pilot Program and received funding for 7,201 acres of no-till, 297 of converted grasslands, and 124 acres of riparian buffer. This equates to 3,193 metric tons of carbon dioxide equivalent being sequestered rather than released into the atmosphere during 2011.

One hundred and forty-nine landowners have installed BMPs during Phases I and II of this project. **As of August 2012, a total of $924,976 was spent on Phase II BMP implementation,** of which landowners provided $73,933, and the remainder was a combination of federal and state funding. The location of BMP implementation is shown in Figure 3, below. This represents nearly 13% of the project area participating in implementation of BMPs.

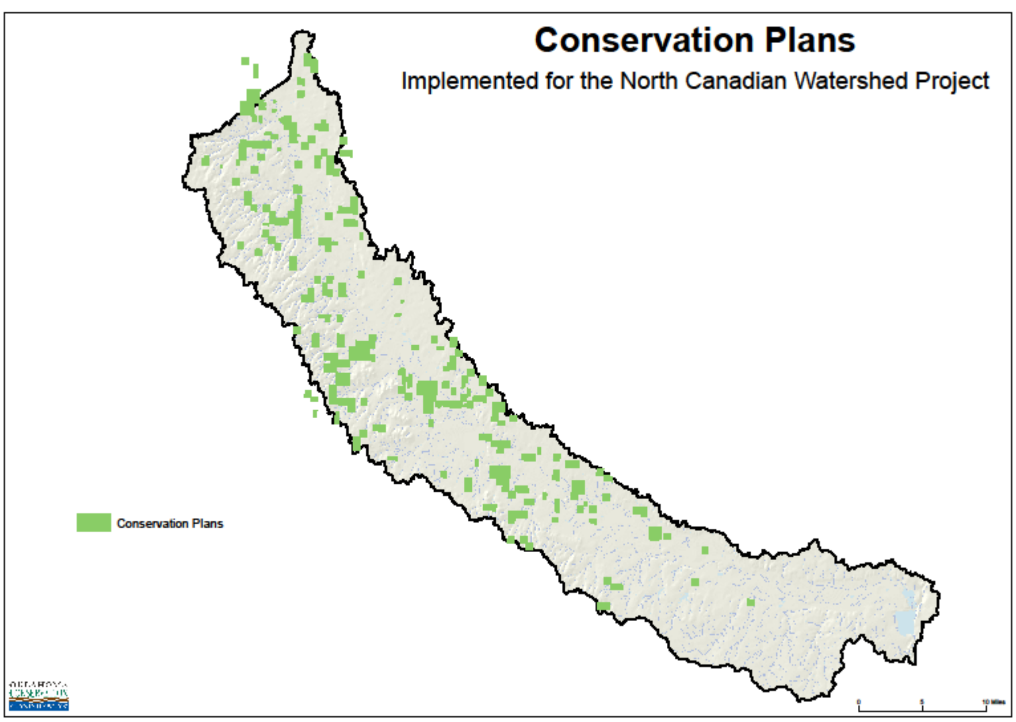


Figure 3. Location of BMP implementation in the North Canadian River Watershed Project area.

No-till farming was a high priority BMP for the North Canadian River Watershed project. Incentive payments of $19.70 per acre per year were provided to landowners who signed up to convert conventional tillage crops over to no-till crops. To help promote this practice, four no-till drills were purchased and housed at each of the local conservation districts in Phase I of the project. These drills were rented out to landowners at a nominal charge so that producers could try out the process before making the very costly purchase themselves. **A total of 25,797 acres were enrolled in no-till through this project in 2011 and 2012,** as shown in Figure 4, below.

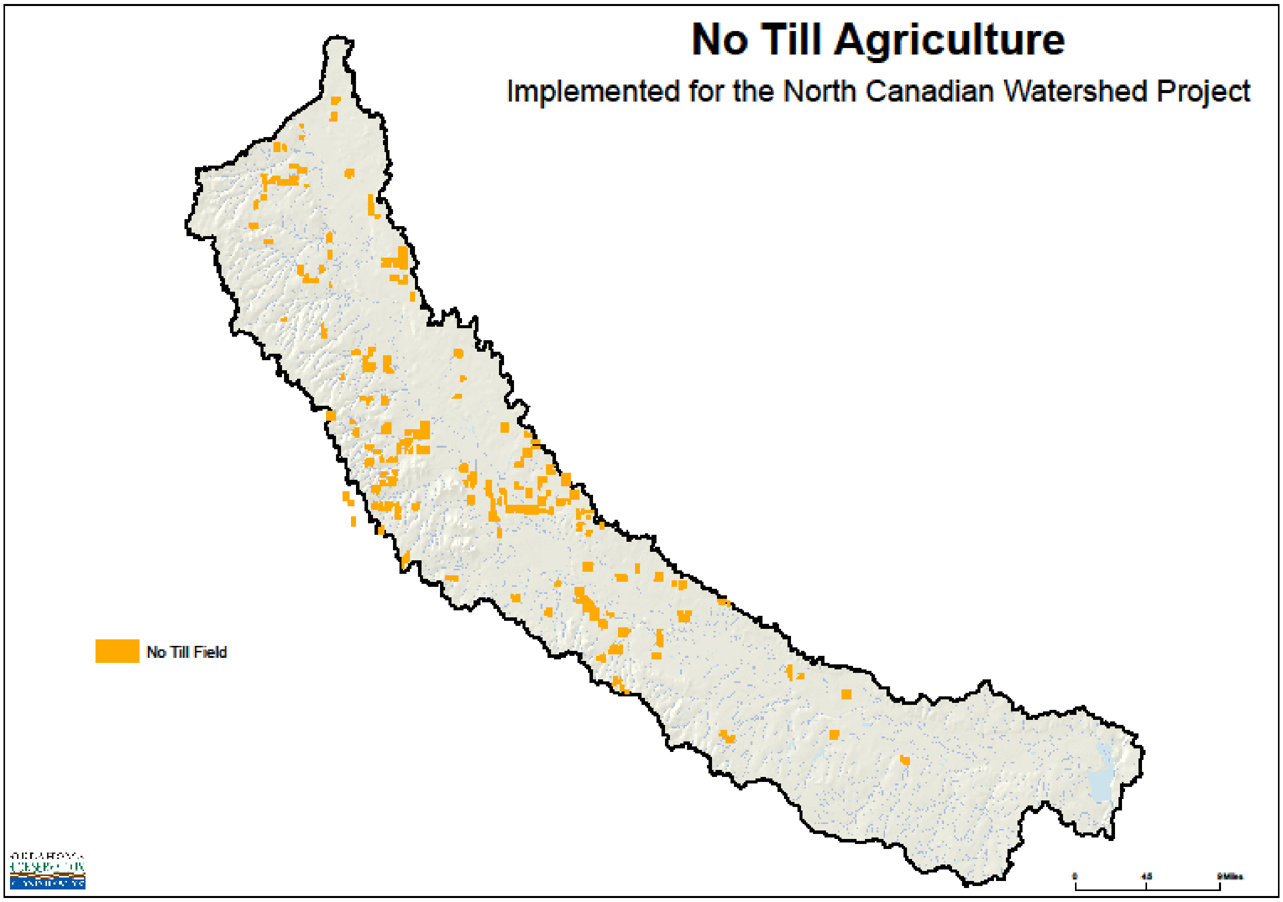


Figure 4. Location of no-till implementation in the North Canadian River Watershed Project area.

Riparian area buffer zones have been shown to be one of the most effective methods of reducing the amount of sediment, nutrients, and bacteria entering streams. The SWAT model estimated that the conservation practice with the largest reduction of total phosphorus loading was the addition of a 10 meter buffer strip on all agricultural land uses. Because of the benefit of riparian area protection to water quality, landowners were given the option of riparian protection with total livestock exclusion for $90.00/acre/year for 3 years. **A total of 454 acres of riparian area (Figure 5) were protected by offering exclusion incentive payments to landowners, and 18,710 linear feet (3.5 miles) of fencing were installed for riparian area protection.** Photos below illustrate the stabilizing riparian vegetation that becomes reestablished once livestock are excluded.

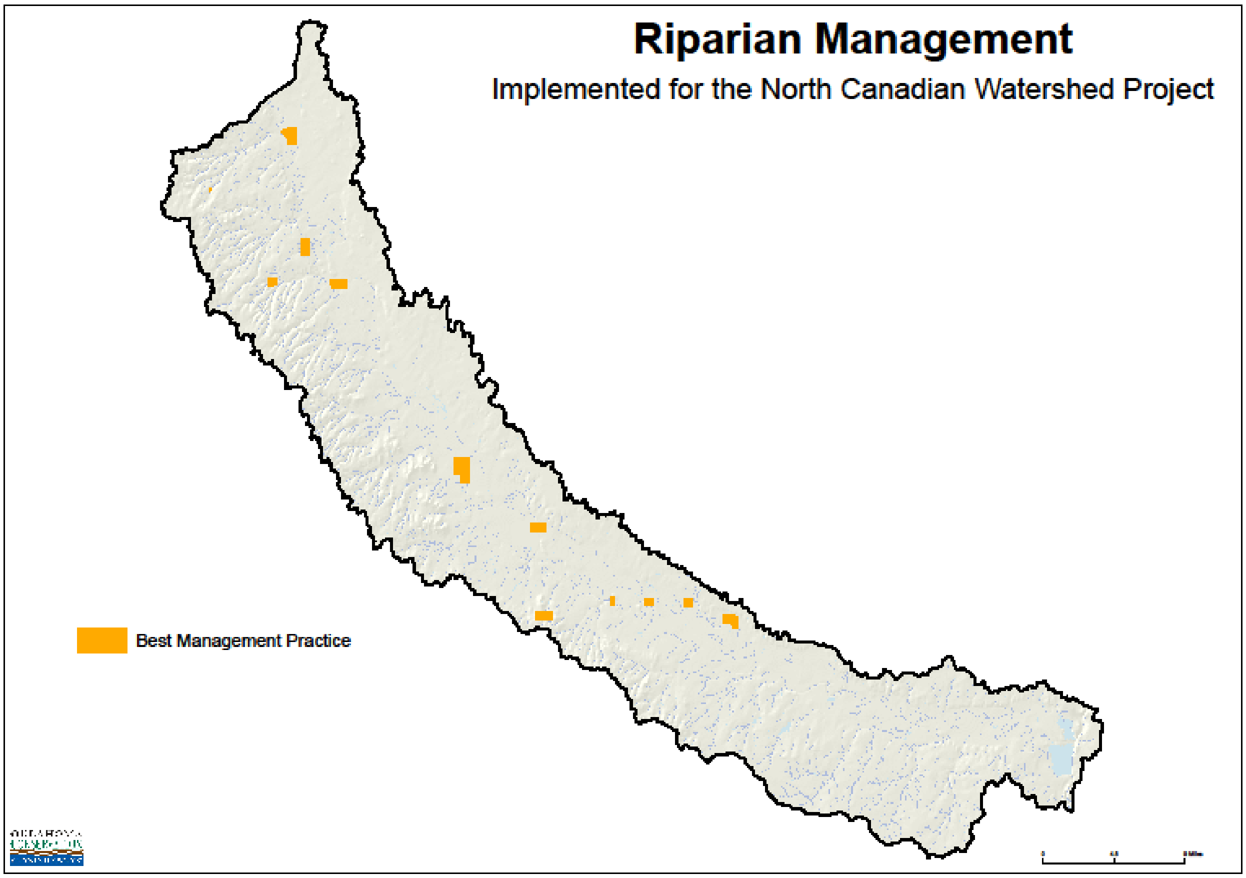
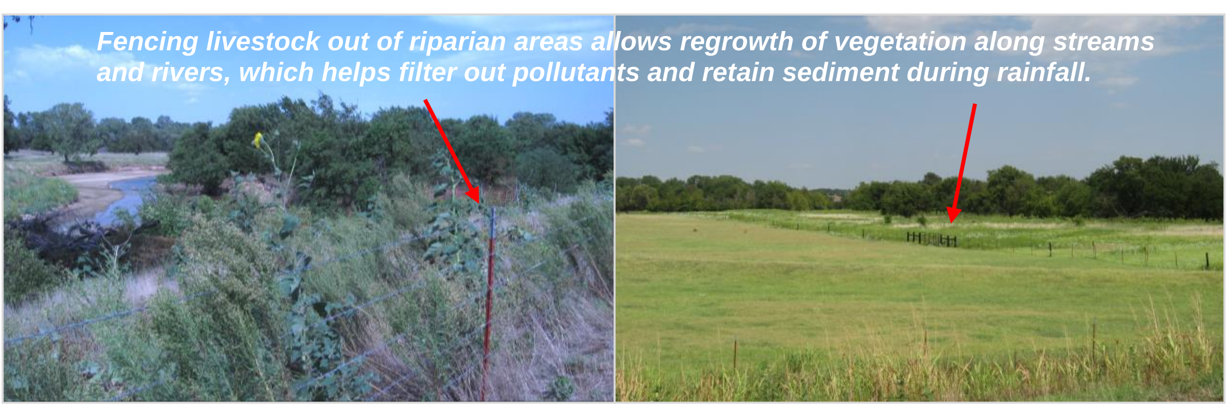


Figure 5. Location of riparian buffers established in the North Canadian River watershed.



2009: Cattle trails into the river have caused erosion.

2012: Vegetation has regrown in the previously bare area after installation of riparian fencing.

Over-grazed and poorly grassed fields and pastures can be significant sources of erosion in the watershed. To reduce the amount of turbidity entering into the river, supplemental grass planting was offered to landowners. **A total of 98 acres of grass was planted to create healthy pastures** (Figure 6), which will reduce the amounts of nutrient and sediment which enter the river due to runoff.

Cross-fencing was installed to keep pastures in optimal condition and prevent overgrazing by allowing rotational grazing. Rotating cattle to different pastures reduces patches of bare soil associated with extended periods of loafing in certain locations. **A total of 1,446 linear feet of cross-fencing was installed** to allow rotational grazing.

Pastures with riparian fencing and cross-fencing were supplied with an alternative water source for livestock. Studies have shown that off-stream water sources can substantially reduce the impact of cattle on water quality. **Eight wells were drilled to supply alternative water for livestock excluded from streams. A total of two solar pumps and three watering tanks were installed under this project.**

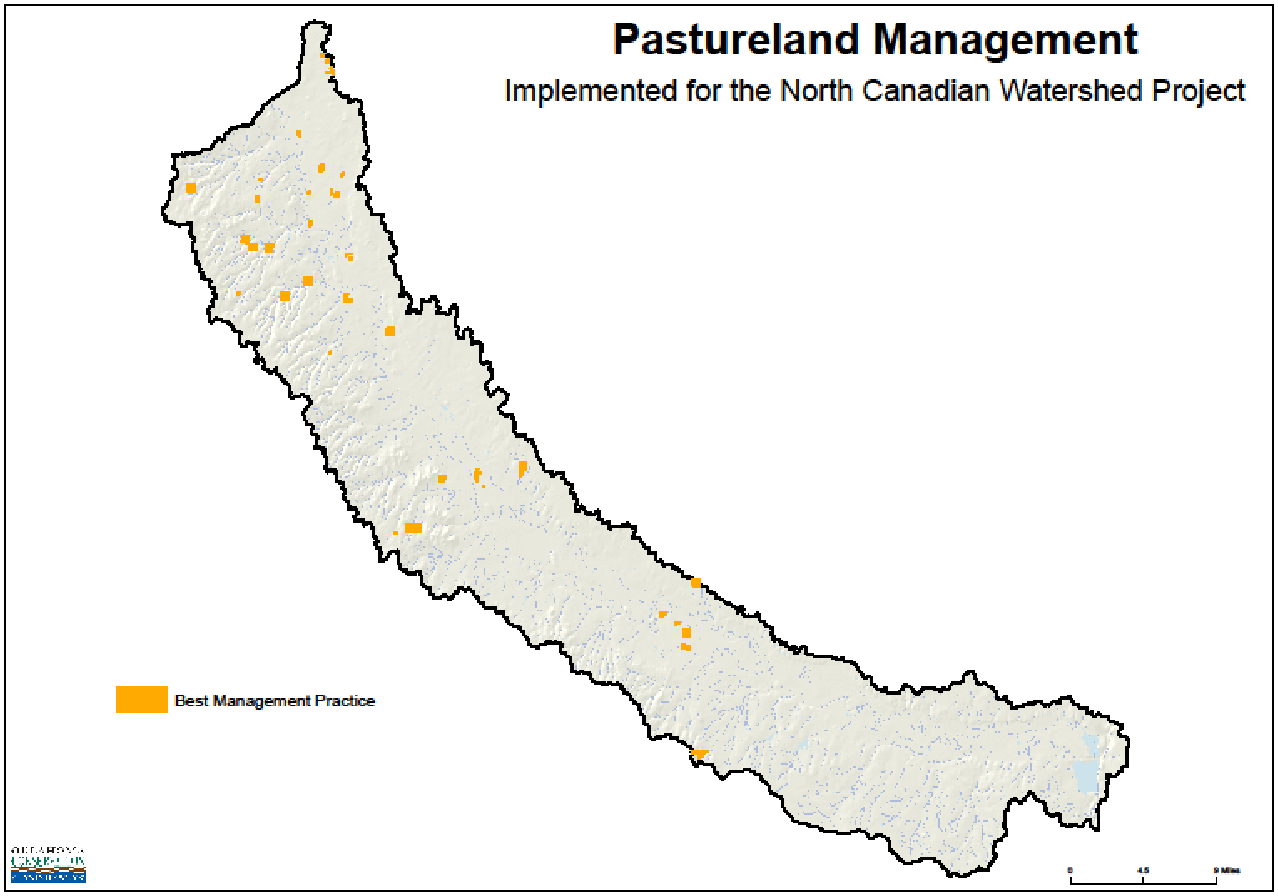


Figure 6. Location of pastureland BMPs implemented in the North Canadian River Watershed Project area.

Rural waste (septic) systems were offered to residents in the watershed who may not have septic tanks or whose tanks are in bad repair in order to decrease the amount of residential sewer pollution entering the river and tributaries. **A total of seven rural waste systems were installed under this project.**

Measures of Success

One of the preliminary methods to measure the success of this project is to look at the expected load reductions based on the amount of BMP implementation that was completed. Based on calculations using the STEP-L model to estimate load reductions from BMPs installed just in 2011 and 2012, nitrogen loading was reduced by 30,818 pounds per year, phosphorus loading was reduced by 3,509 pounds per year, and sediment loading was reduced by 401 tons per year. As BMPs mature, it is expected that even greater load reductions will result. Additional BMPs are being installed through the third phase of the project as well.

As shown in Figure 7, some sort of BMP implementation occurred in 12.2% of the watershed acres, with 14.7% of the “hotspot” areas, as determined by the SWAT modeling discussed earlier, having BMPs. Installing BMPs in these high potential phosphorus loss areas should result in more effective load reductions.

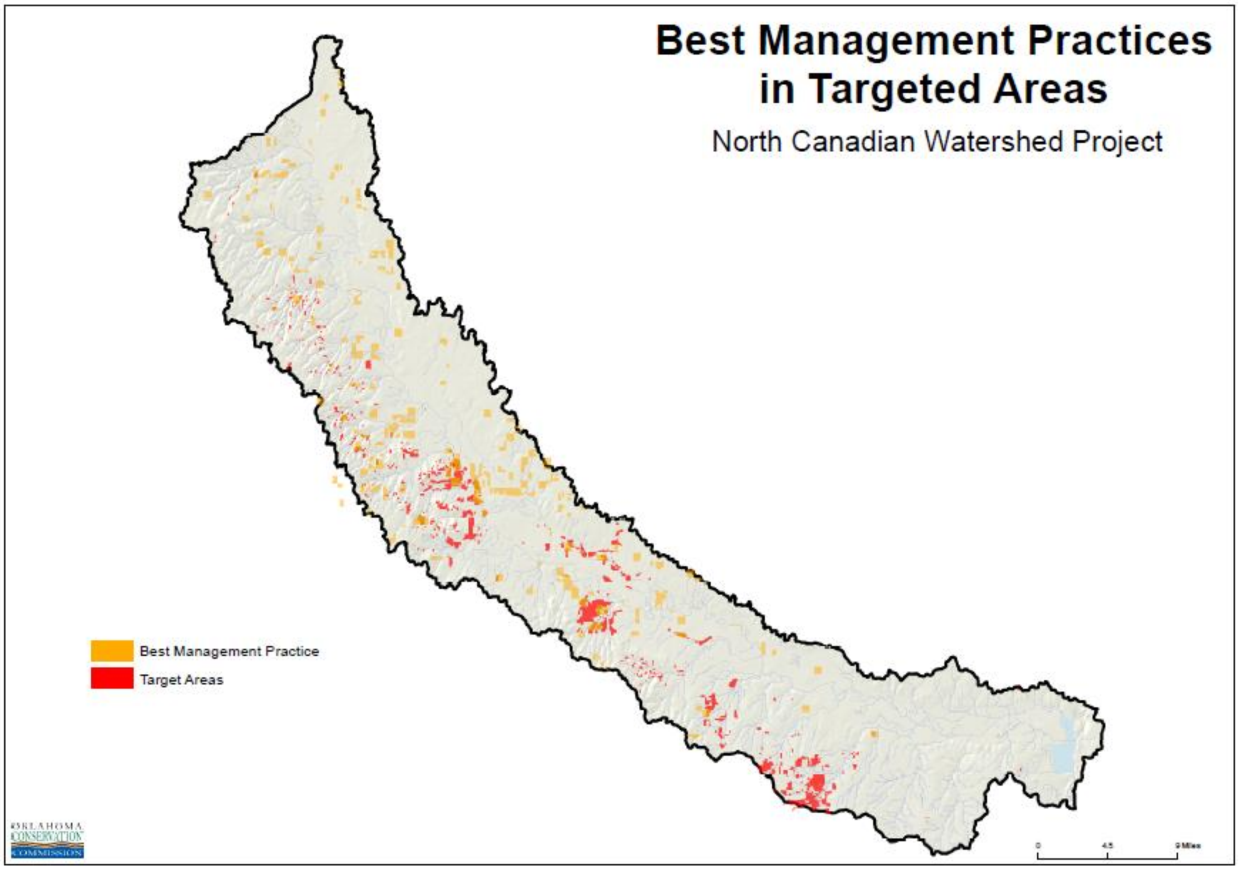


Figure 7. Implementation of BMPs in relation to potentially high phosphorus load areas.

A more robust method to gauge success is to monitor the water quality in the project area. Monitoring for this project was set up using an "upstream-downstream" paired design, developed in accordance with requirements outlined in Clausen and Spooner (1993). Monitoring began in June 2008 and is ongoing. Water samples were collected by automated water samplers at three locations on the North Canadian River in the project area: just below Canton Dam, near El Reno, and just above Lake Overholser. Monitoring was conducted in an identical fashion at all sites through the calibration and treatment periods, as required in the paired watershed design. The automated samplers were programmed to obtain continuous, flow-weighted samples which were composited over a one-week period. These samples were collected at least weekly (more often if rain had occurred). If the autosampler had malfunctioned, a grab sample was obtained and submitted to the lab.

Water quality samples were analyzed for ortho-phosphorus, total phosphorus, nitrate-nitrogen, ammonium nitrogen, and total Kjeldahl nitrogen (TKN). *Escherichia coli* and *Enterococcus* bacteria were assessed weekly during the recreation season only (May 1-September 30). The OCC also conducted routine physico-chemical monitoring at each site on a weekly basis throughout the length of the project. This included the following field parameters: dissolved oxygen, pH, temperature, turbidity, conductivity, instantaneous discharge, and alkalinity. Monthly grab samples will be analyzed for total suspended solids (TSS), chloride, and sulfate.

After obtaining and analyzing preliminary data from the three monitoring sites, it was determined that the lowest site, just above Lake Overholser in Yukon, was not conveying any information about the effects of BMP implementation, so monitoring at that site was discontinued. Due to a historic drought in Oklahoma during the project period, further data analysis is required to verify whether or not benefits of the BMPs are evident in the water quality monitoring data. Further analysis by an independent statistical expert is pending, and results from that analysis will be provided in a supplement to this report. In addition, the project and data collection are ongoing, and further data analysis will be reported at the end of the Phase III project, in order to gather information during what will hopefully be a more “normal” weather pattern.

Follow-up

Additional EPA funding in this project area is allowing continued BMP implementation from January 2013 through December 2014. Practices offered through this extension project will be the same as in the original North Canadian River project. The goal is to implement BMPs in more of the targeted “hotspot” areas of the watershed. This next phase of the project is expected to be even more successful due to visible improvements in the watershed and testimony from producers who have participated in the previous projects. It takes time in a watershed to build landowners’ trust and acceptance of best management practices, especially for practices which are relatively new to the area such as no-till and riparian fencing.

Although it was not anticipated that water quality would improve measurably in the North Canadian River during the short project period due to the installation of BMPs, it is anticipated that it will not decline and that improvements may be observed a couple of years from now, when a more lengthy collection period of autosampler water quality data is analyzed. The OCC will include a detailed water quality analysis with calculated load reductions in the final report at the end of Phase III of the North Canadian River project (December 2014).

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