Cheney Lake WRAPS – 9 Element Watershed Plan Summary- Reno County Conservation District

Directly addressing H P TMDLs for:

Siltation – Cheney Lake

Eutrophication (P) – Cheney Lake

Atrazine – Red Rock Creek

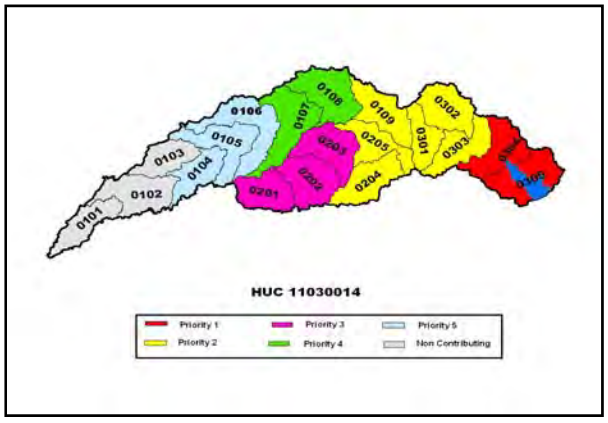
Indirectly addressing HP TMDLs for:

pH- North Fork Ninnescah River

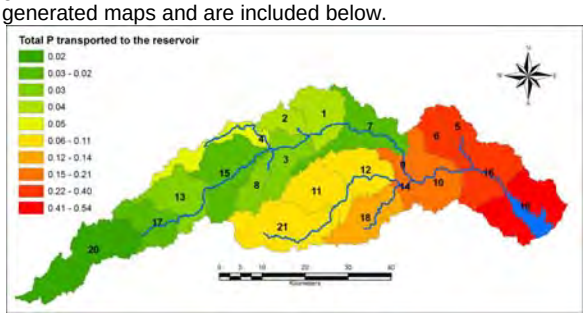
Directly addressing 303d list:

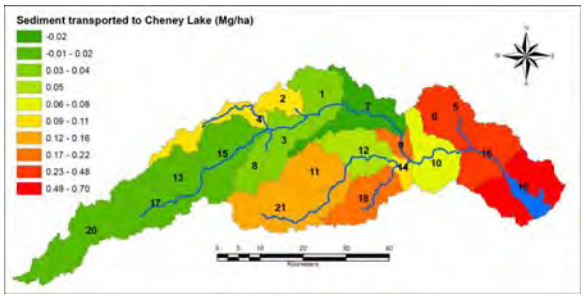
Red Rock Creek for Atrazine

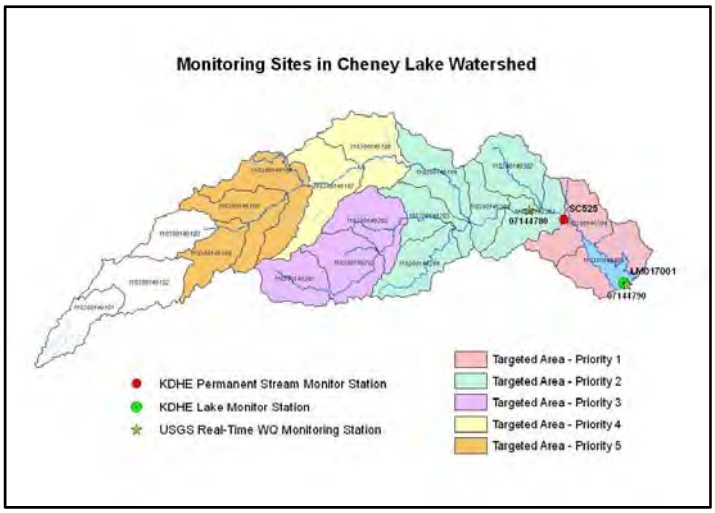
Prioritized Critical Areas for Targeting BMPs



KSU used the Soil and Water Assessment Tool (SWAT) model to estimate loading information for use in this plan. Maps generated with SWAT show similar results to the AnnAGNPS generated maps and are included below.







Targeting Considerations

- AnnAGNPS was performed on the watershed from 2005-2009 under a CEAP (Conservation Effects Assessment Project). Later SWAT was utilized to verify and help better identify target areas from pollutant load differences.
- Due to the nutrient contribution to the hypereuthrophic state of Cheney Lake from the watershed, all target areas will receive attention to both Cropland and Livestock BMP implementation.
- Livestock BMPS will treating includes confined feeding facilities, animal concentrated areas and grazingland.
- Streambanks will be considered on a case-by case basis, because from the CEAP and USDA studies, gullies were shown to have more of a potential to contribute sediment.

Cheney Lake WRAPS – 9 Element Watershed Plan Summary- Reno County Conservation District

Best Management Practices and Load Reduction Goals

Best Management Practices (BMPs) to address nutrients, sediment, atrazine, and bacteria in the watershed were chosen by the Citizen's Management Committee (CMC) (SLT) based on local acceptance/adoption rate and amount of load reduction gained per dollar spent.

Sediment Reducing Cropland BMPs

- Buffers
- Encouragement of Continuous No-till by producers
- Retain CRP contracts or retain grass as a grazing/haying system
- Convert cropland to grass
- Grassed Waterways w/or wo Terraces
- Streambank Stabilization case-by-case
- Other structural (wetland traps) or management practices that will slow run-off and reduce erosion losses.
- Reduced tillage or no-till farming

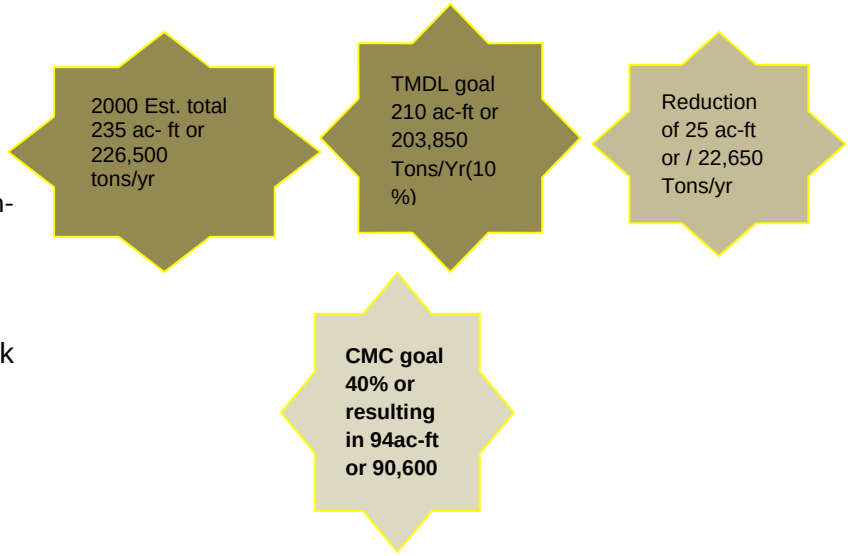
Phosphorus Reducing Cropland, Streambank and Livestock BMPs:

- Buffers
- Encouragement of Continuous No-till implementation by producers
- Preparation of Nutrient Management Plans with producers
- Terraces and Grassed Waterways
- Fertilizer/Manure Incorporation
- Retain CRP contracts or retain grass as a grazing/haying system
- Convert cropland to grass
- Other structural (wetland traps) or management practices that will slow run-off and reduce phosphorus losses.
- Vegetative filter strips between small feeding operations and streams
- Relocation of small feeding operations away from streams
- Relocation of pasture feeding sites away from streams
- Promotion of alternative watering sites away from streams

Atrazine Reducing Cropland BMPs:

- Promotion of the Use of Alternative Herbicides
- Vegetative Buffers
- Split Application
- Apply before April 15

Sediment reduction goal to meet TMDL is 235 ac-ft or 226,500 tons per year for this 25 year plan.



A 50% reduction would be needed to meet the eutrophication TMDL. At the end of this 25 year plan, if all BMPs have been implemented, 103,501 pounds will have been reduced from the watershed.

2011

Cheney Lake Watershed Restoration and Protection Plan

Contents

Table of Figures

PREFACE

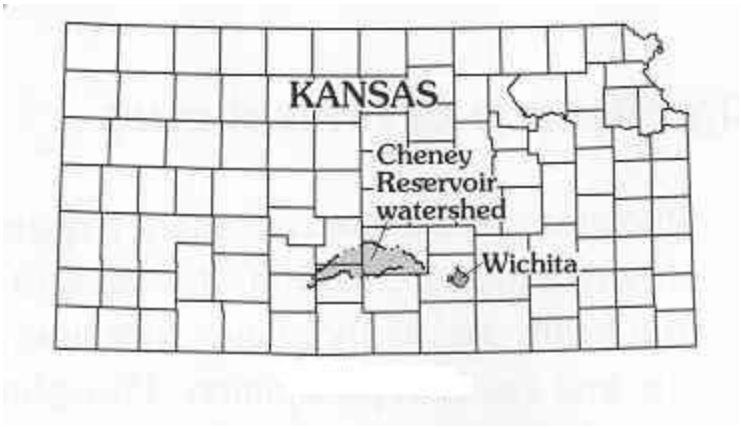
The first management plan for the Cheney Lake Watershed was written in 1994 with minor revisions in subsequent years. In 2011, in partnership with the Kansas Department of Health and Environment and the U.S. Environmental Protection Agency, the Citizen's Management Committee expanded and updated the plan including a more specific strategy for achieving watershed goals.

This plan is intended to serve as a guide for the efforts of watershed citizens and their partners in the City of Wichita and in state and federal agencies in the protection and restoration of the North Fork Ninnescah River and the Cheney Reservoir. This watershed project is guided by a commitment to citizen leadership, voluntary participation in conservation work, partnerships with other interested stakeholders, and watershed citizens actively working for clean water.

PROJECT BACKGROUND

The Cheney Lake Watershed (North Fork Ninnescah River) covers 633,000 acres within five counties in south central Kansas including portions of Reno, Stafford, Pratt, Kingman, and Kiowa counties. Over 99% of the watershed is used for agricultural purposes.

The watershed drains into Cheney Reservoir, which was designed and constructed in 1962-1964 by the Bureau of Reclamation as part of a water supply system for the City of Wichita. The reservoir was designed as a 100-year multipurpose project to act as a water supply, flood control and wildlife area. The City of Wichita currently draws 70 percent of its daily water supply from the reservoir. This water supply is also marketed to Valley Center, Andover, Derby, Rose Hill, Eastborough, Bentley, Benton, Bel Aire, Park City, Kechi, and several rural water districts.



In l992, a task force was formed to identify and alleviate potential sources of pollution in the watershed and Cheney Reservoir. The Task Force was comprised of local landowners and representatives of the Reno County Conservation District, Sedgwick County Conservation District, Reno County ASCS (FSA), Reno County Health Department, Wichita Water and Sewer Department, Reno County Extension Service, Kansas Department of Wildlife and Parks, Kansas Department of Health and Environment, Soil Conservation Service (NRCS), Bureau of Reclamation, US Fish and Wildlife, US Geological Survey, Environmental Protection Agency, Kansas Water Office and other local, state, and federal agencies.

The two primary pollutants identified in the reservoir's water are phosphorus and sediment, which affect both the quality and quantity of the water in the reservoir. Cheney Reservoir has been listed by the Kansas Department of Health and Environment with a high-priority total maximum daily load for eutrophication and siltation. Beginning in the early 1990s, Cheney Reservoir began experiencing algae blooms significant enough to produce taste and odor problems in the final water product which supplies Wichita. The unpleasant taste and odor within treated water during and after algae blooms create significant problems for Wichita consumers.

The Task Force prepared a master plan to alleviate the degradation of the reservoir and double its life. Implementation of the plan began in July l994 under the leadership of the Citizen's Management Committee (CMC) which operates as a subcommittee of the Reno County Conservation District. Cheney Lake Watershed, Inc. received status as a 501(c)(3) non-profit corporation on July 14, 1998. The Board of Directors, or CMC, is composed of seven people who own or manage land in the watershed. This board is actively engaged in the promotion of the project goals.

One of the most significant aspects of the Cheney Reservoir Watershed Project is the partnership of rural-urban stakeholders. Because the City of Wichita recognized the value of correcting pollution problems prior to water entering the reservoir, the City agreed to help farmers pay for implementation of conservation practices. Voluntary implementation of conservation work has been initiated successfully by the program through one-on-one contacts with neighbors of CMC members. CMC members also promote the project in small informal meetings with local groups of farmers.

1 PHYSICAL AND DEMOGRAPHIC CHARACTERISTICS OF CHENEY LAKE WATERSHED

A watershed is an area of land that drains to a common point. In the case of the Cheney Lake Watershed, this includes all the land draining into Cheney Reservoir. There is a portion of the North Fork of the Ninnescah River below the Cheney dam that is not included in this management plan. There are some portions of the Cheney watershed in Pratt, Stafford, and Kiowa counties that are considered non-contributing. The geology and topography of this area is such that run-off water is generally captured as groundwater instead of creating concentrated stream flow into the Ninnescah River.

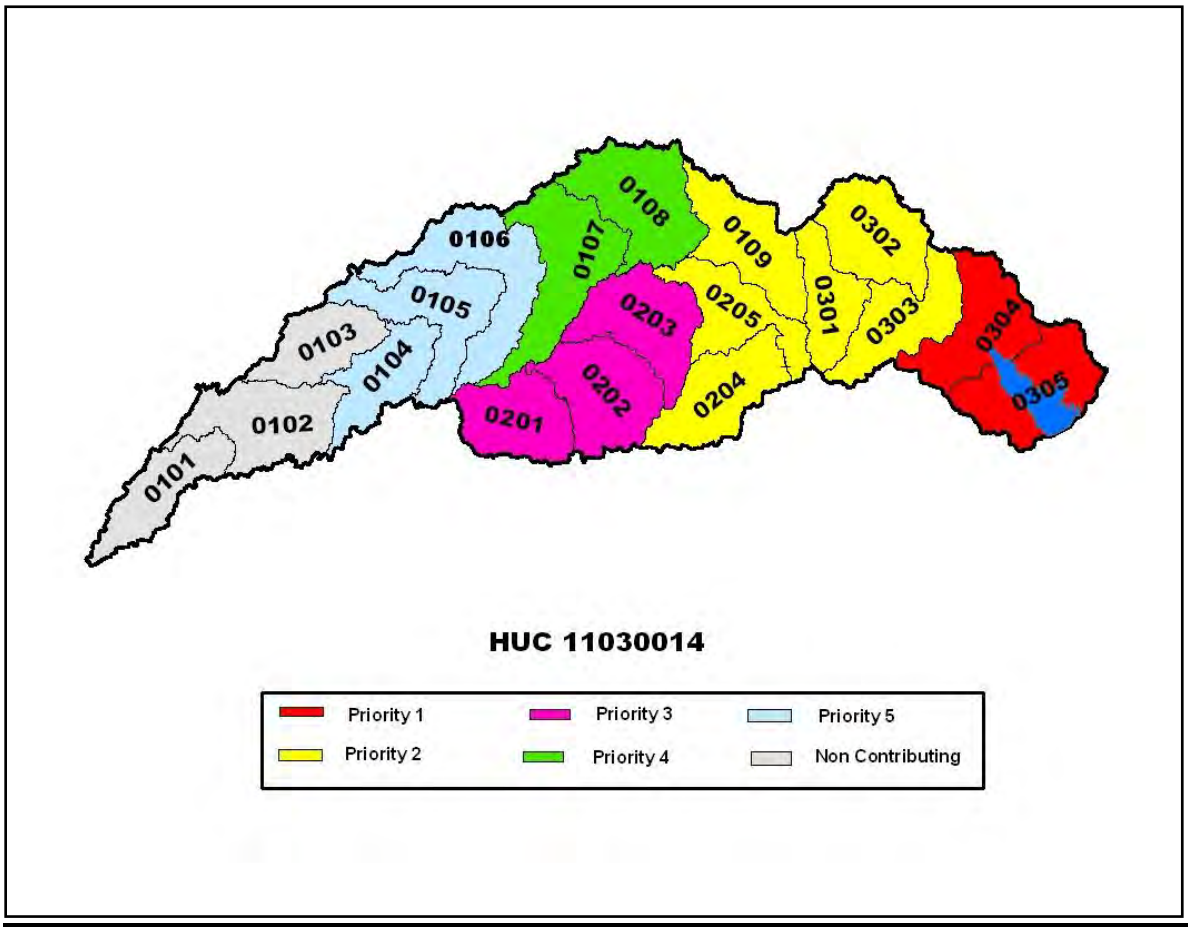


Figure 1 Hydrologic Units

Watersheds are divided into hydrologic units for purposes of identification. A numeric code called a hydrologic unit code (HUC) has been assigned to watersheds of varying sizes. The HUC for the North Fork Ninnescah is comprised of 8 digits (11030014). A watershed of this size can be further divided into smaller areas that drain to a common point. These areas are also assigned a hydrologic unit code that includes the 8 digits for the North Fork Ninnescah and additional digits that identify the specific drainage area. The map above illustrates the

hydrologic units within the Cheney Lake Watershed. The priority areas indicated in this figure are explained in greater detail in Section 3.3 on page 40.

1.1 Land Use and Management

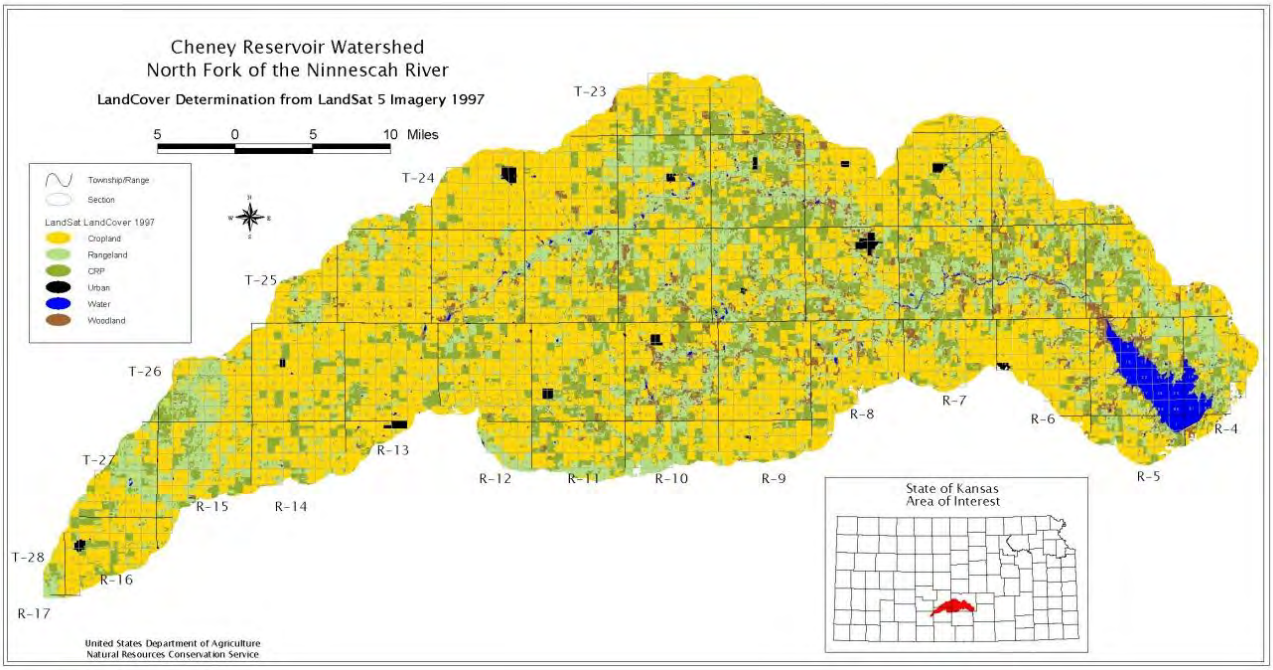


Figure 2 Land Use - Map created by Chad Volkman, Cartographer, NRCS

Land use for the Cheney Watershed consists of approximately 58% cropland, 25% rangeland, 17% CRP, with less than 1% urban land. The riparian areas are generally within rangeland. These areas are often characterized by springs and seeps or other conditions that make them too difficult to cultivate for crop production. Areas categorized as woodland are most likely in riparian areas reflecting the grassland ecosystem of south central Kansas.

Cropland in the watershed is a potential source of nutrients and sediment due to soil erosion or loss of nutrients from commercial fertilizers or applied manure in run-off water. Rangeland is a potential source of nutrients from livestock waste and possible sediment from eroded areas. Land enrolled in the Conservation Reserve Program is potentially a source of pollutants when the contract expires and the land is returned to cropping or converted to rangeland. Cropland, CRP acres, and rangeland account for approximately 99% of the acres in the watershed.

The remaining land areas may include roads, small towns, and rural dwellings. Construction projects, unvegetated road ditches, lawns, septic systems, and sewage systems would characterize pollution sources from these land uses.

1.2 Designated Uses – North Fork Ninnescah and tributaries

The Clean Water Act (CWA, 1972) requires states to establish water quality standards to "protect the public health or welfare" and "enhance the quality of water" (Section 303(c)(2)(A)). Water quality standards are to be established for waterbodies "taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agriculture, industrial, and other purposes, and also taking into consideration their use and value for navigation." (Section 303(c)(2)(A)). In addition, the CWA establishes the national goal that wherever attainable, "...water quality provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water..." (Section 101(a)(2)). To establish water quality standards, the State must determine (designate) the "use" of the water body. The chart below and the key following indicate the waterbodies within Cheney Lake Watershed and their designated uses. The Clean Water Act further requires States to implement Total Maximum Daily Loads (TMDLs) for water bodies that do not have adequate water quality to support the designated uses.

Lake/Stream Name	CUSEGA	CLASS	AL	CR	FP	DS	GR	IW	IR	LW
Ninnescah River, North Fork	1107020127	GP	S	b	X	X	X	X	X	X
Goose Creek	110702019023	GP	S	b	X	O	X	O	X	X
Unnamed Stream	1107020132	GP	S	b	O	O	X	O	X	X
Crow Creek	1107020135	GP	E	b	O	X	X	X	X	X
Dooleyville Creek	1107020129	GP	E	b	X	O	X	O	X	X
Unnamed Stream	1107020130	GP	S	b	X	X	X	X	X	X
Silver Creek	1107020128	GP	S	b	X	X	X	X	X	X
Wolf Creek	1107020121	GP	S	b	O	X	X	X	X	X
Ninnescah River, North Fork	1107020131	GP	S	b	X	X	X	X	X	X
Red Rock Creek	1107020118	GP	S	b	X	X	X	X	X	X
Cheney Lake	N/A	GP	E	A	X	X	X	X	X	X

Figure 3 Designated Uses for Water Bodies in Cheney Lake Watershed.

Key to abbreviations for designated use chart		
CUSEGA	=	channel unit segment
CLASS	=	antidegradation category
GP	=	general purpose waters
AL	=	designated for aquatic life use
E	=	expected aquatic life use water
S	=	special aquatic life use water
CR	=	designated for contact recreational use
A	=	Primary contact recreation stream segment/lake that is a public swimming area/has a posted public swimming area
b	=	Secondary contact recreation stream segment/lake that is not open to and accessible by the public under Kansas law

FP	=	designated for food procurement use
DS	=	designated for domestic water supply
GR	=	designated for ground water recharge
IW	=	designated for industrial water supply use
IR	=	designated for irrigation use
LW	=	designated for livestock watering use
X	=	referenced stream segment/lake is assigned the indicated designated use
O	=	referenced stream segment/lake does not support the indicated designated use

Figure 4 Key to Designated Uses Chart

1.3 IDENTIFICATION OF CRITICAL AREAS

The Citizens Management Committee recognizes the importance of focusing conservation education and funding on the land that is most likely to contribute sediment and nutrients to streams and the reservoir. A variety of sources including study and analysis by the Natural Resources Conservation Service, Kansas State University, and the Kansas Water Office, coupled with local knowledge were used to determine which areas should receive priority for conservation funding and educational programming.

1.3.1 NATURAL RESOURCES CONSERVATION SERVICE

In 2005-2009, the Cheney Lake Watershed participated in a Conservation Effects Assessment Project (CEAP) study to estimate the effects of U.S. Department of Agriculture (USDA) conservation practices implemented in the Cheney Watershed. This study, conducted by the Natural Resources Conservation Service, began by synthesizing and reporting information from previous assessments that were completed between 1994 and 2004. These assessments were based on land use data and conservation practices implemented within that time frame. The primary emphasis of the CEAP study was to use the Annualized Agricultural Non-point Source (AnnAGNPS) computer model to estimate the effects that conservation practices had on the water, sediment loadings and nutrient loadings to Cheney Reservoir from all upstream sources and all types of erosion.

Eight scenarios were developed to assess the potential impact to runoff, sediments, and nutrients with the implementation of a conservation practice across the entire watershed. The scenarios included implementation of mulch till on all crop acres (at least 30% residue); removal of existing conservation practices; removal of CRP with a return to conventionally tilled cropping on all crop acres; removal of existing livestock waste systems; treatment of all ephemeral gullies in cropland; use of no-till farming on all crop acres; all crop acres planted to native grass; and a reduction of soil moisture in irrigated systems from 70% of field capacity to 50% field capacity before irrigation is triggered. Not all of the scenarios were completed before the end of the CEAP study but several have given useful guidance for future conservation efforts with regard to sediment.

The CEAP study has provided some useful tools for identifying areas that are the most vulnerable to soil loss. By comparing the benchmark scenario representing 1997 conditions with the scenario representing treatment of all ephemeral gullies, a ratio of sediment load by each 200 acre cell can be established. The following graph illustrates this relationship showing that approximately 20 percent of the 200 acre cells in the watershed contribute roughly 74 percent of the sediment load to the watershed outlet at Cheney Reservoir. If it is not practical to expect treatment for every ephemeral gully then a good strategy for implementation would be to address the most vulnerable areas that contribute the greatest load.

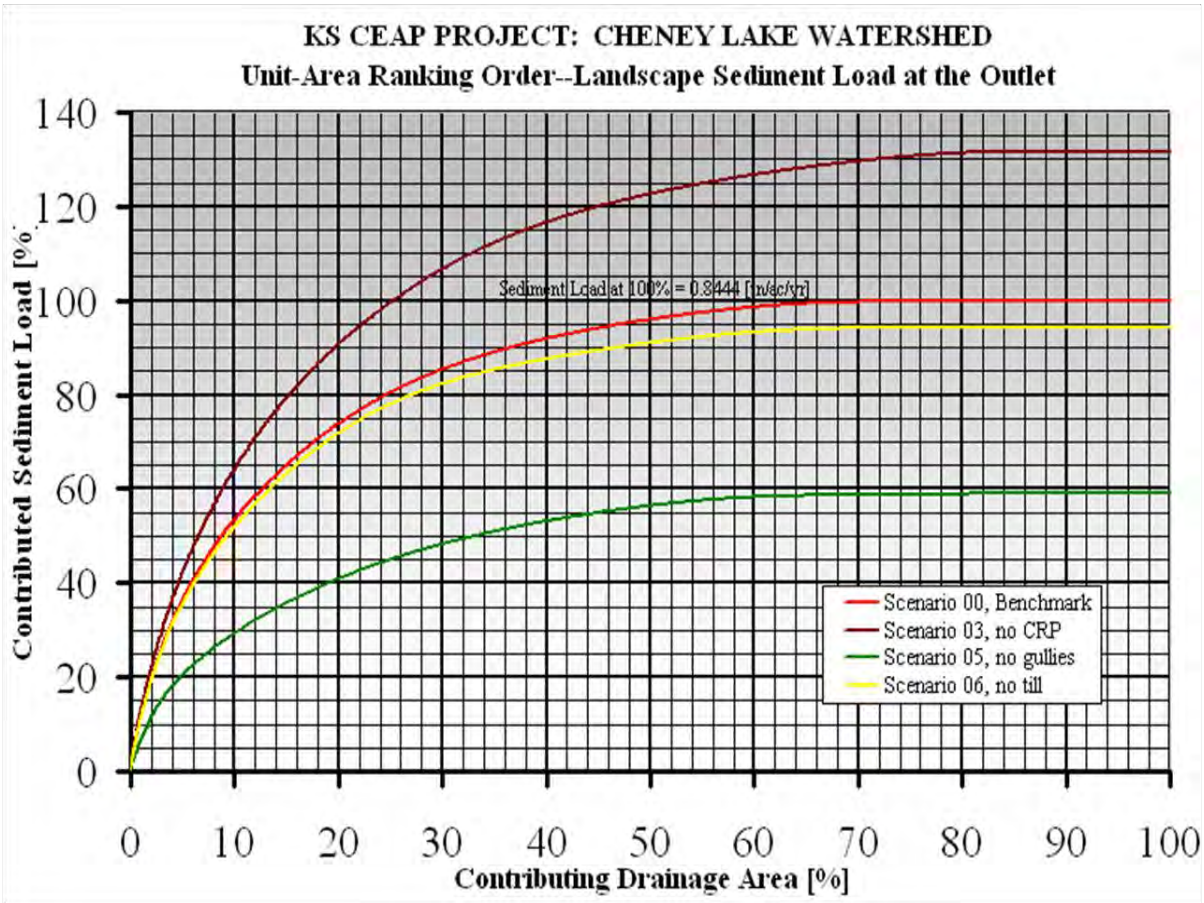


Figure 5 Ranking of Contributing Drainage Areas by Sediment Load.–

This graph shows the sediment load delivered to the watershed outlet at Cheney Reservoir according to the percentage of the drainage area that is contributing the sediment. Those areas contributing the highest sediment load are ranked first and shown as a percentage of the total drainage area. The red arc represents the benchmark condition. The brown line shows the predicted increase in loading if all CRP acres are returned to conventional cropping practices. The yellow line shows the predicted reduction in loading if all crop acres are converted to no-till cropping practices. The green line shows the predicted reduction in loading if all ephemeral gullies are treated with grassed waterways. In all instances, top ranked contributing areas (10-20% of the total area) contribute a disproportionate amount of the load. At benchmark conditions, 20% of the watershed contributes 74% of the sediment load delivered to the watershed outlet.

The relationship between sediment load at the watershed outlet and the contributing cells is illustrated spatially with a series of watershed maps. The purple-shaded areas in the following map, based on the AnnAGNPS watershed model estimates, make up the 20% of the watershed contributing 74% of the sediment. The green-shaded areas are these that contribute less than the highest percent but still above the mean contribution.

The same type of analysis was done for each scenario to determine the optimum locations for various conservation treatments. Since these maps are based on 200 acre cells, they cannot be used to pinpoint a single field but rather they provide guidance to areas that may be more vulnerable.

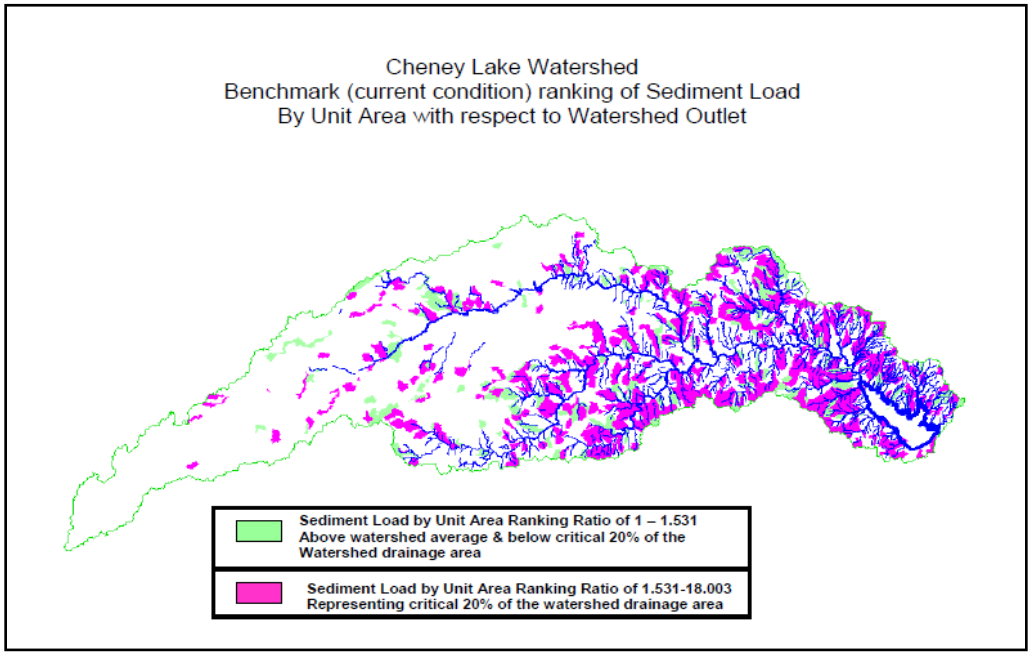


Figure 6 Benchmark Condition - ranking of sediment load by unit area

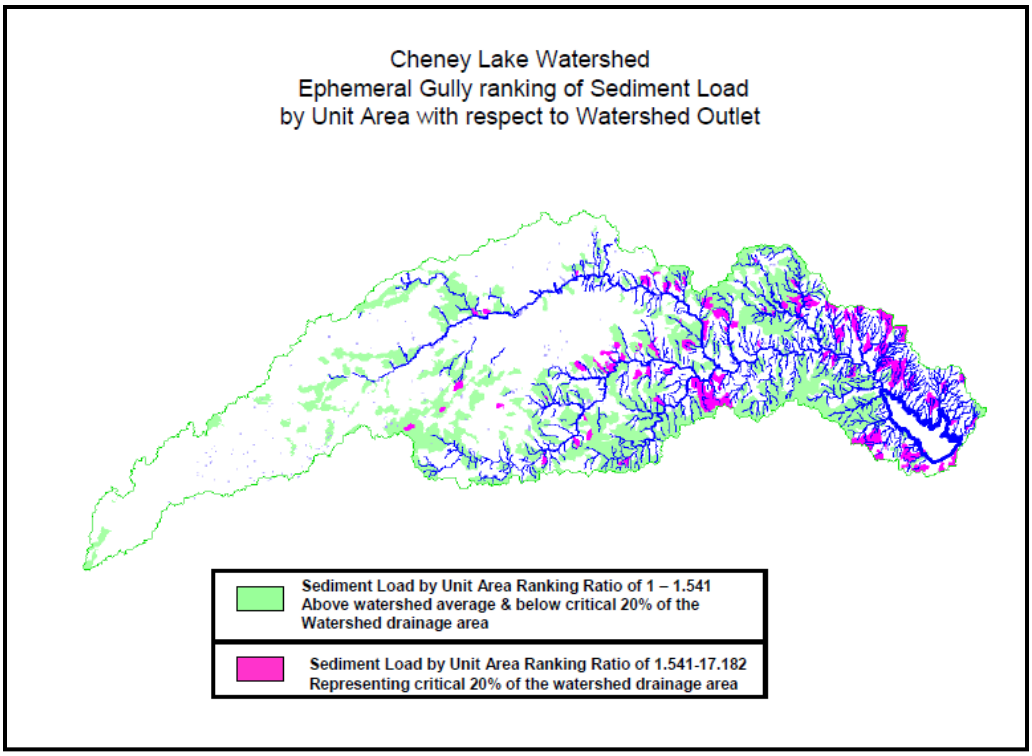


Figure 7 Ranking of sediment load from ephemeral gullies by contributing area.

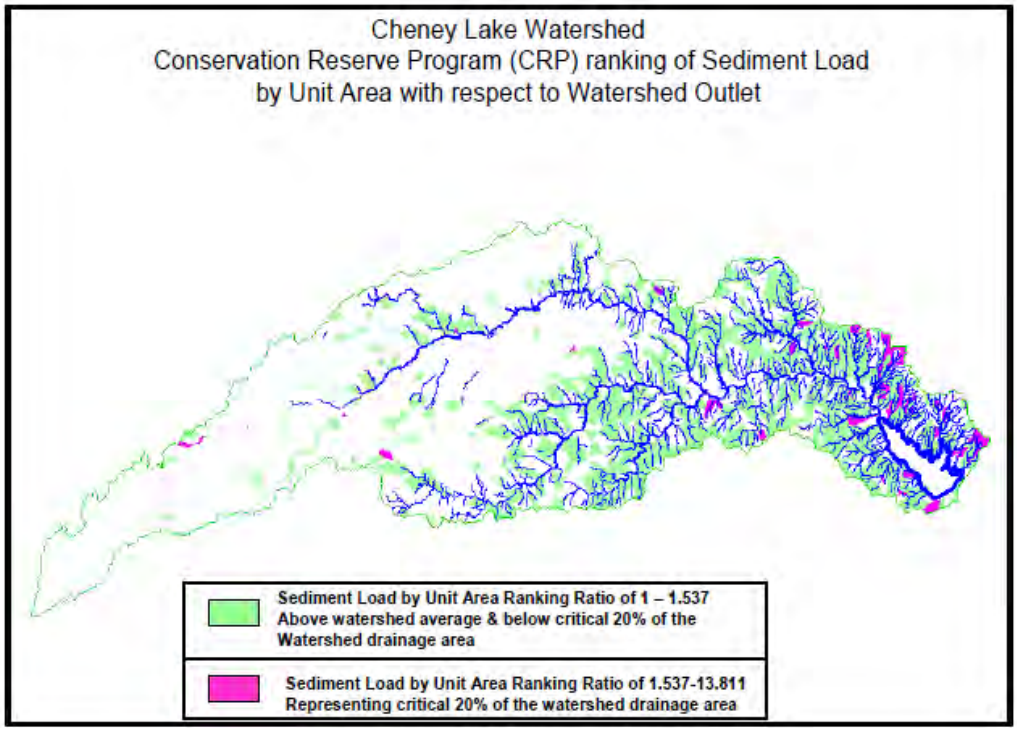


Figure 8 Ranking of potential sediment load by contributing area currently in CRP.

1.3.2 Kansas State University

Similar maps were generated by a second Conservation Effects Assessment Project (CEAP) study at Kansas State University. By using the Universal Soil Loss Equation (USLE), maps were generated that showed areas in the watershed that were most vulnerable to erosion. Unlike the AnnAGNPS generated maps, they did not illustrate delivery of sediment to the reservoir, just soil losses. However, the maps are quite similar and would indicate much the same priority areas.

KSU did use the Soil and Water Assessment Tool (SWAT) model to estimate loading information for use in this plan. Maps generated with the SWAT watershed model show similar results to the AnnAGNPS generated maps and are included below.

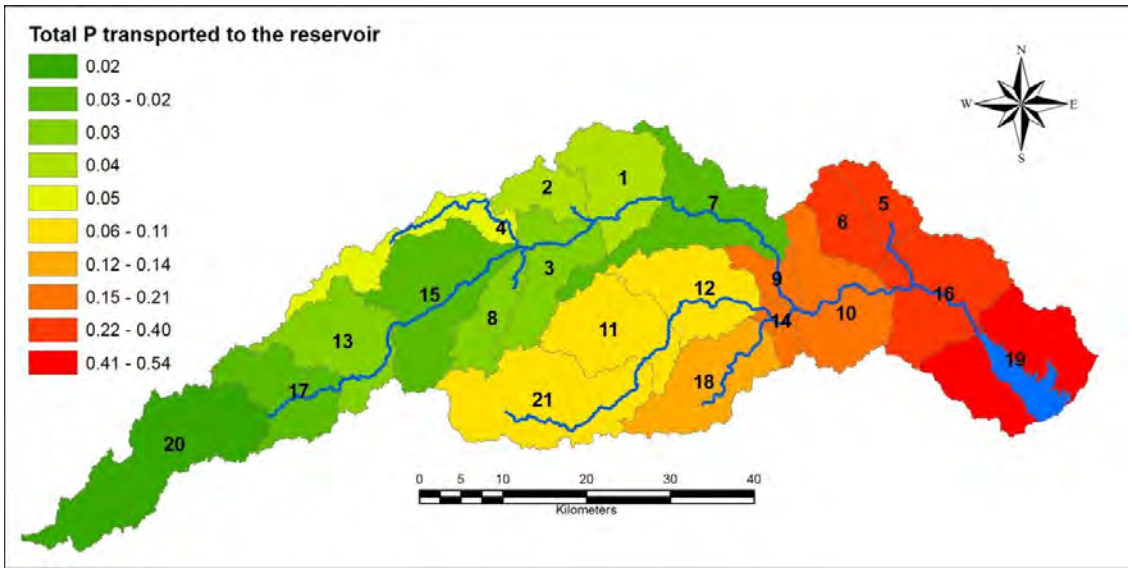


Figure 9 Total P transported from to Cheney Reservoir as projected by SWAT model. (Dr. Nathan Nelson, Kansas State University)

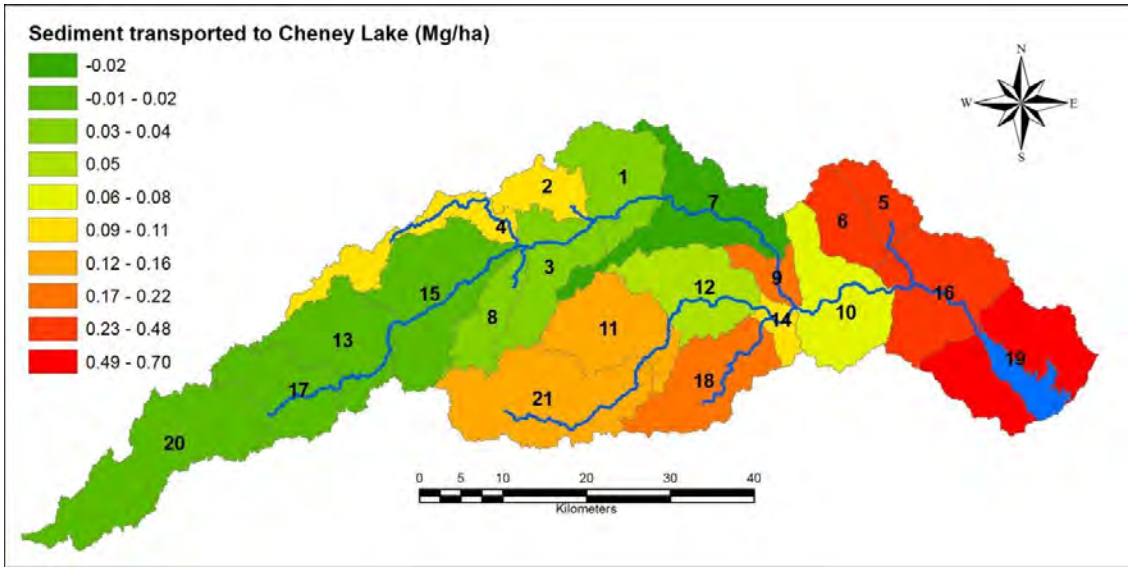


Figure 10 Sediment transported to Cheney Reservoir as projected by SWAT model. (Dr. Nathan Nelson, Kansas State University.)

1.3.3 KANSAS WATER OFFICE

In May 2011, the Kansas Water Office completed a draft report on streambank erosion using ArcGIS® to conduct a comparison study of 1991 vs. 2008 aerial photography to determine bank losses on the main stem of the North Fork Ninnescah. A total of 41 erosion sites were identified, covering 33,336 feet of unstable streambank. (Only those erosion sites covering an area 1,500 sq. feet, or more, were identified.) Bank erosion was analyzed by stream reach and Hydrologic Unit Code. Analysis indicates that a substantial portion of identified eroded sediment in the watershed is transported annually from the mainstem Reach Two (NFN2) and Reach Three (NFN3) as identified in Figure 11; at roughly 52% and 22% respectively of the sediment load from the main stem.

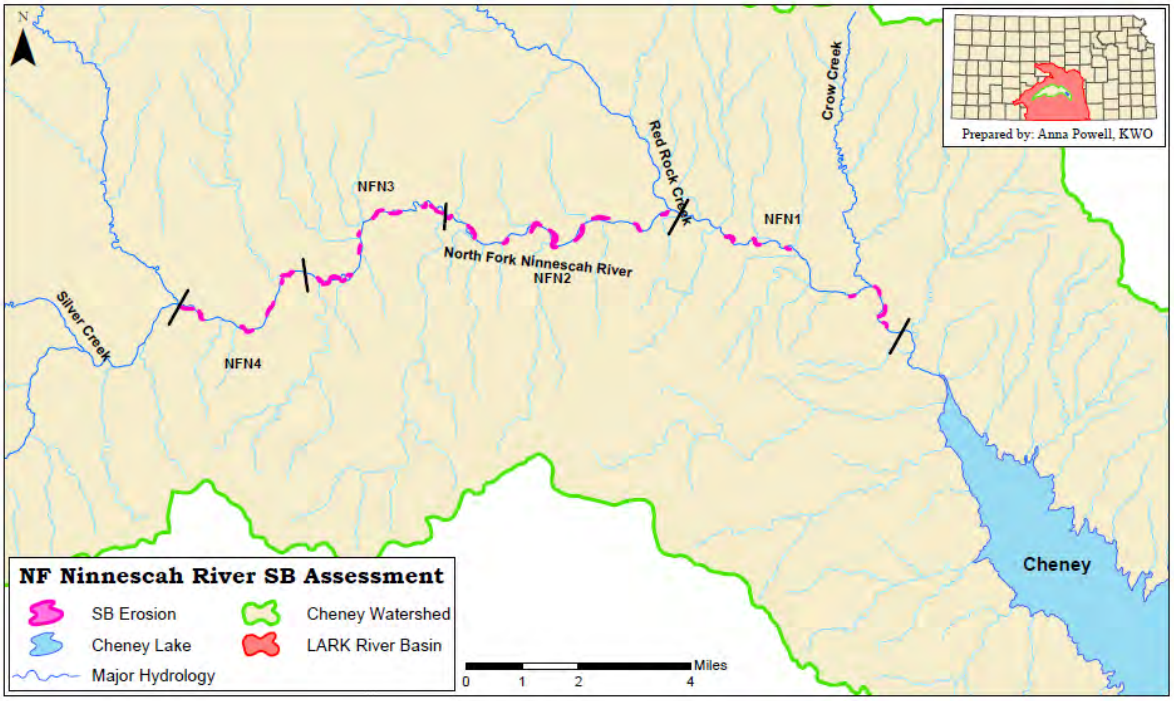


Figure 11 Mainstem North Fork Ninnescah River Streambank Assessment by Stream Reach (Anna Powell, Kansas Water Office).

1.4 TMDL AND 303(D) LISTED WATERS

The Watershed Planning Section of the Kansas Department of Health and Environment is responsible for identifying and prioritizing impaired streams, lakes, and wetlands and developing Total Maximum Daily Loads (TMDLs) for high priority water bodies. This task is required by sections 303(d) and 303(e) of the Clean Water Act. TMDLs are the maximum levels of pollutant loading that could be present in a water body and still achieve water quality standards. The development of a TMDL includes the identification of pollutant sources, the allocation of pollutant loading, and corrective actions that should be implemented for point and non-point sources affecting the impaired water body. Cheney Lake Watershed has three TMDL listings – eutrophication and siltation within Cheney Lake and pH within the North Fork Ninnescah River system.

TMDL listings for Cheney reservoir and the North Fork Ninnescah River were approved in 2000 and 2001. These listings are scheduled for review in 2011. Based upon this review, the TMDL will likely be updated. After 5 years experience with targeted implementation, the Citizen Management Committee will revise this plan in 2016 to reflect updated TMDLs.

The information on TMDLs in this plan was excerpted from the KDHE website at http://www.kdheks.gov/tmdl/index.htm. Additional information on TMDLs for this watershed is available from the KDHE website or within appendices to this document.

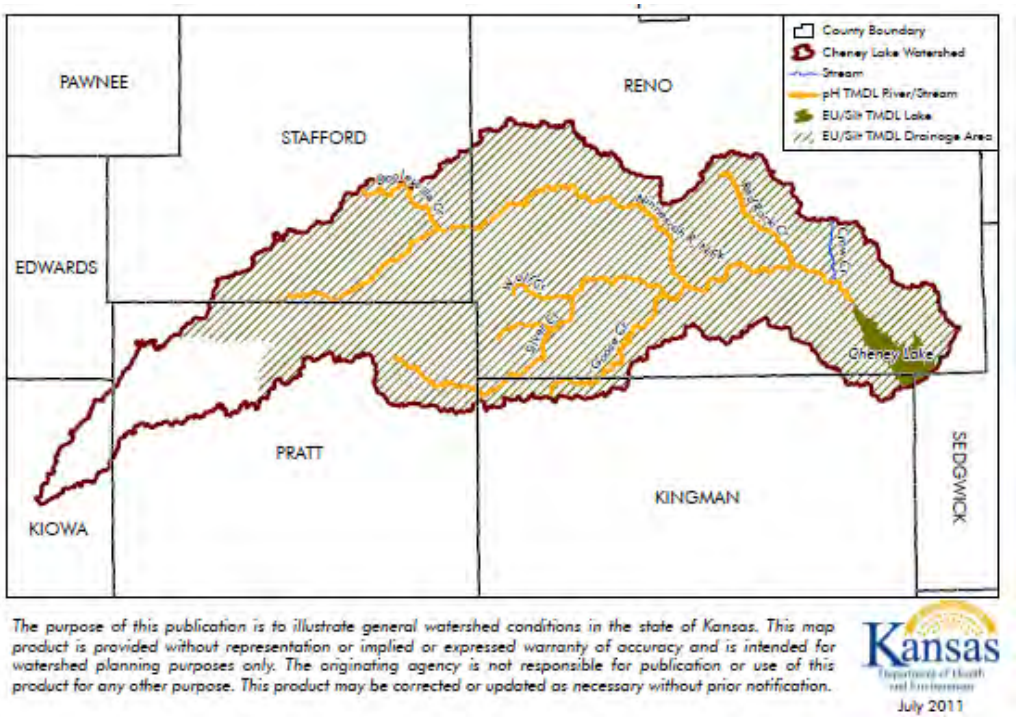


Figure 12 Water Bodies in the Cheney Lake Watershed with Total Maximum Daily Loads.

1.4.1 Cheney Lake: Eutrophication

Eutrophication occurs when a water body becomes rich in dissolved nutrients, usually phosphorus and nitrogen. The high nutrient levels often lead to algal blooms, low dissolved oxygen, and an unpleasant taste and odor even in treated water. Taste and odor problems are of special concern for the City of Wichita and its residents. Although the City has completed construction of an ozone treatment plant to reduce taste and odor in raw water, treatment levels and the resulting expenses can be reduced through management of the phosphorus entering the reservoir.

Since Cheney Lake is a federal reservoir that serves a considerable portion of Kansas' population for recreational purposes and water supply, this TMDL has been designated as High Priority for implementation.

Sampling by KDHE indicates elevated total phosphorus concentrations averaging 117 ppb. A USGS Water Resources Investigation report (97-4153) indicates higher concentrations

averaging 190 ppb. An annual phosphorus load of 213,846 pounds per year would be necessary to correspond to the concentrations seen in the lake.

The USGS graph below illustrates the rise in chlorophyll during the summer months. Typically, sediment and phosphorus are distributed through the water column as a result of wind or inflows from spring runoff. Calm days, less turbidity and higher solar radiation angles later in summer, increase the potential for an algae population explosion. This is a common situation for shallow lakes exposed to high winds.

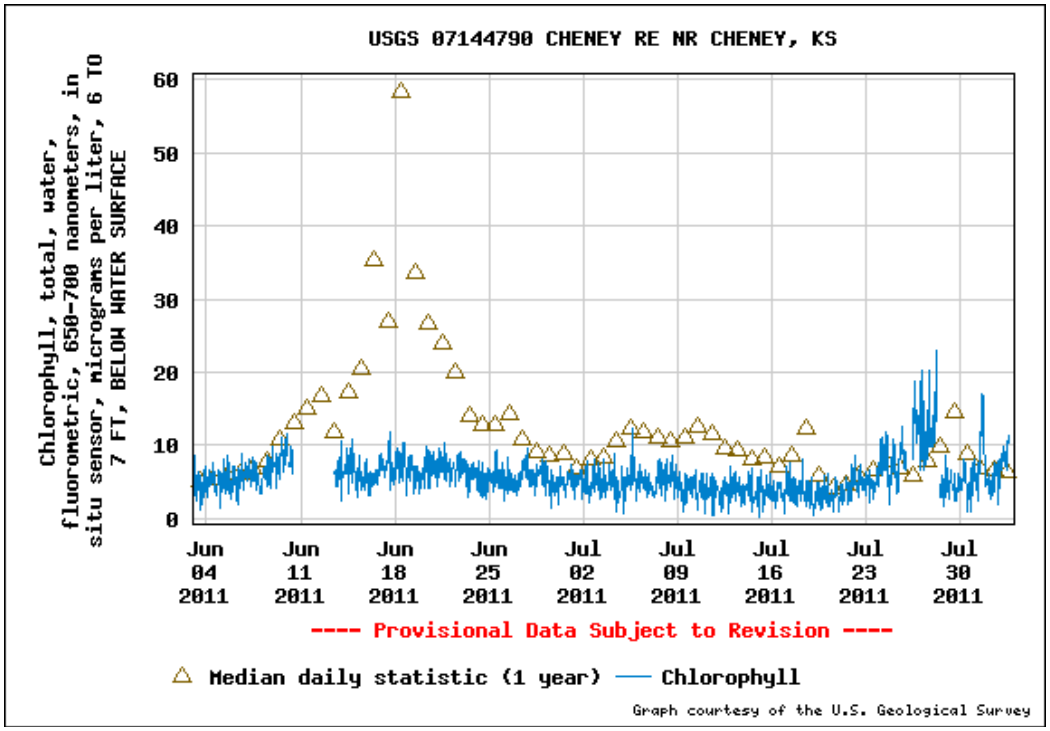


Figure 13 Example of chlorophll levels in Cheney Reservoir.

Daily chlorophyll, in situ statistics, in ug/l, for Aug 2, based on 2 years of record				
Min (2010)	Mean	Median	Max (2009)	Most Recent Instantaneous Value Aug 2
5.29	6.41	6.41	7.54	11.3

Figure 14 Example of variation in daily chlorophyll levels.

In order to prevent further degradation of the lake, the desired goal established by KDHE is to maintain summer chlorophyll *a* at concentrations at or below 6 micrograms per liter (ug/l). Through the TMDL process, KDHE has established load allocations of 2,352 pounds of phosphorus/year for point sources (municipal waste treatment plants) and 103,501 pounds of phosphorus/year for non-point sources (agricultural runoff, animal waste and household septic systems).

Subsequent analysis of sediment and nutrient data collected by USGS and KDHE will be completed to update the 303d list and refine TMDLs in 2016.

1.4.2 Cheney Lake: Siltation

Siltation refers to the deposition of sediment in the reservoir and the suspension of sediment within the lake water. Siltation reduces the capacity of the reservoir for water storage. Suspended sediments impact water quality for aquatic life, recreational purposes, and drinking water treatment.

Based on analysis by KDHE of sediment data from USGS, approximately 235 acre-feet of sediment are deposited annually. The amount of deposition within the conservation pool was 104,217 tons (8,000 acre feet). This is 15 percent of the design criteria.

To improve the quality of the water column and an implied reduction in loading, the goal set by KDHE would be to increase the average transparency as measured by Secchi Disc to 0.61 meters (2 feet).

There are no point sources contributing sediment so 100% of the load is allocated to non-point sources (runoff from agricultural land). The allocated load reflects a 10% reduction in average sediment load or 210 acre-feet/year. The Citizen's Management Committee has set its own goal of a 40% reduction in siltation (90,600 lbs.) to achieve the desired goal of extending the life of Cheney Reservoir to 200 years based on sediment storage.

The TMDL for siltation is closely tied to the TMDL for eutrophication. Implementation practices for either concern will help address the other. For that reason, this TMDL is a High Priority for implementation.

1.4.3 North Fork Ninnescah River: pH

A pH measurement indicates whether a solution is acidic or alkaline as measured on a scale of 0 to 14. A reading of 7 is neutral while lower numbers indicate increasing acidity and higher numbers indicate alkalinity. Water quality standards for the State of Kansas state that artificial sources of pollution shall not cause the pH of any surface water outside of a zone of initial dilution to be below 6.5 and above 8.5 (KAR 28-16-28e(c)(2)(C). These standards are established as "fully supporting aquatic life".

Most aquatic life is adapted to a specific range of pH levels. Extreme pH can have a negative impact on fish, aquatic insects, and other aquatic life. High pH may also increase the toxicity of other substances.

The main stem of the North Fork Ninnescah from the reservoir and to a point near Stafford and tributaries of Goose Creek, Red Rock Creek, and Silver Creek have consistent pH readings above 8.5 during the spring and summer-fall. These streams are clear, shallow, and wide with a sandy substrate allowing for light penetration and warming of the water. When sufficient nutrients are available for plant growth, these conditions support the growth of phytoplankton primarily during the spring, summer, and early fall.

As the phytoplankton take up carbon dioxide and release oxygen during the photosynthetic process, the result is an increase in pH that peaks in the afternoon, when the greatest amount

of radiant energy reaches the river. The pH impairment in the river is linked to nitrate and phosphorus levels. Algae can be active beyond the growing season. A look at other USGS data indicate periods in winter where pH levels jump over 8.5, indicating some photosynthesis is occurring. Although this is predominantly a summertime event, it is not strictly seasonal to the exclusion of occurrences during other months (KDHE, Watershed Planning Section).

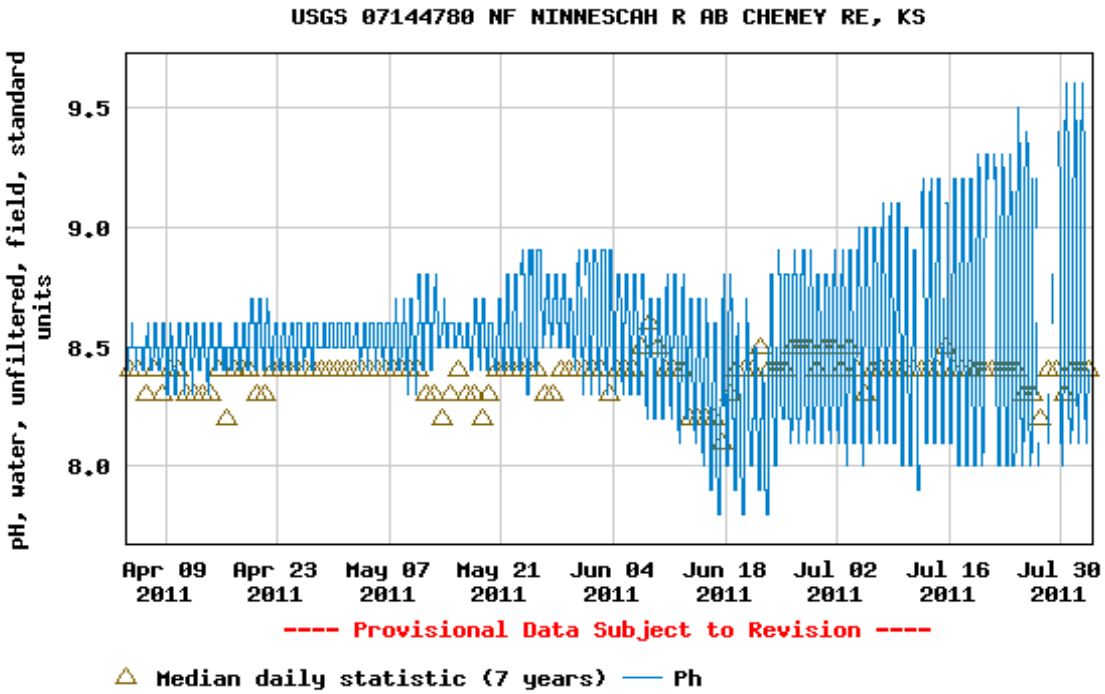


Figure 15 Example of pH readings for the North Fork Ninnescah, April-July 2011.

Daily ph statistics, in std units, for Aug 2 based on 11 years of record more

Min (2001)	25th percen-tile	Most Recent Instantaneous Value Aug 2	Mean	Median	75th percen-tile	Max (2008)
8.3	8.3	8.4	8.4	8.4	8.5	8.7

Figure 16 Example of daily pH statistics for the North Fork Ninnescah.

KDHE has set an interim management goal for this TMDL to reduce nitrate and phosphorus averages from 1.0 mg/l and 0.16 mg/l to 1.0 mg/l and 0.14 mg/l, respectively. The load allocation from point sources (municipal waste treatment facilities) is 3.2 pounds/day for nitrate and 0.45 pounds/day for phosphorus. The load allocation from non-point sources (agricultural runoff, animal waste, and household septic systems) is 27-432 pounds/day for nitrate and 3.8-60 pounds/day for phosphorus. It is anticipated that a reduction in nutrient availability, as set forth in this plan through the nutrient load reduction goals, will indirectly reduce spikes in pH levels. KDHE has stated that the desired condition for this TMDL is for less than 10% of future samples to have a pH greater than 8.5.

1.4.4 Red Rock Creek: Atrazine

USGS testing in 1997-1999 did indicate the presence of atrazine in Red Rock Creek on multiple occasions that were in excess of the Kansas Water Quality Criterion of 3 ppb. Complete results of the pesticide testing may be found at http://ks.water.usgs.gov/Kansas/qw/cheney/ .

In lieu of the establishment of a TMDL regarding atrazine for Red Rock Creek, KDHE requested in 2006 that this stream segment be designated as a 4(b) water under the 303(d) listing guidance of EPA. That request was ultimately denied by EPA and the stream reverted to Category 5 (impaired, needing a TMDL) in 2008. Nonetheless, KDHE chose to defer TMDL development while the CMC addressed the atrazine issue through their watershed management program. The CMC included improved management of atrazine use in this subwatershed as part of the management plan for the watershed. Subsequent testing by Kansas State University in 2008-2009 indicated much lower levels of atrazine in Red Rock Creek. KDHE will examine the Red Rock Creek atrazine data during the 2011 TMDL cycle in the Lower Arkansas Basin and make a determination whether to suggest delisting the impairment with the 2012 303(d) list or develop a TMDL for atrazine in 2011 or 2016 that incorporates the program and practices of the Cheney watershed plan.

KDHE believes if analysis of the data shows Atrazine levels staying at or below the Kansas Surface Water Quality Standards, the Category 5 designation may be changed to Category 2 through implemented NPS practice attained water quality standards. This would demonstrate meeting EPA's SP 12 performance measure for watershed management helping to meet water quality standards or substantial water quality improvement.

1.5 Pollutant Sources within the Watershed

1.5.1 Point Sources

The only identified point source discharges in the watershed are the communities of Arlington, Stafford, Turon, Partridge, Sylvia, and Preston. The 2010 populations in all but Arlington declined from 2000 levels, hence the community waste loads are in decline. The total design flow from the five cities amounts to less than 0.5 cfs. The corresponding wasteload allocation is likely less than that expressed by the 2000 TMDL (and this plan). This will be taken into consideration by KDHE when the TMDLs are reviewed in 2011, and subsequently by the CMC in 2016 when the plan is updated. There are a number of towns that do not discharge wastewater to the North Fork Ninnescah nor the lake (Abbyville, Reno Co. Sewer District #1, Plevna, Sylvia). Additionally, KDWP operates facilities in the State Park that do not discharge waste water to the lake.

1.5.2 Non-Point Sources

Watershed non-point sources are estimated to contribute 99% of the total pollutant load to the lake. Agricultural non-point sources of nutrients and sediment include soil erosion, livestock waste, and commercial fertilizers.

Another potential pollution source is from suburban development near the reservoir. Most of the current homes have septic tanks and lateral systems to handle their domestic waste, but some lagoons are also used. Very little information is currently available on the impact of this development, but care should be exercised to assure that these developments do not have a negative impact on water quality in the reservoir. Development pressure west of Wichita has increased since 2000. Reno County has implemented a sanitation code that addresses household waste systems and private water wells. There is also a 3 mile buffer around Cheney Reservoir that is zoned agricultural and requires 10 acres on which to build.

1.6 NPDES Permitted Facilities

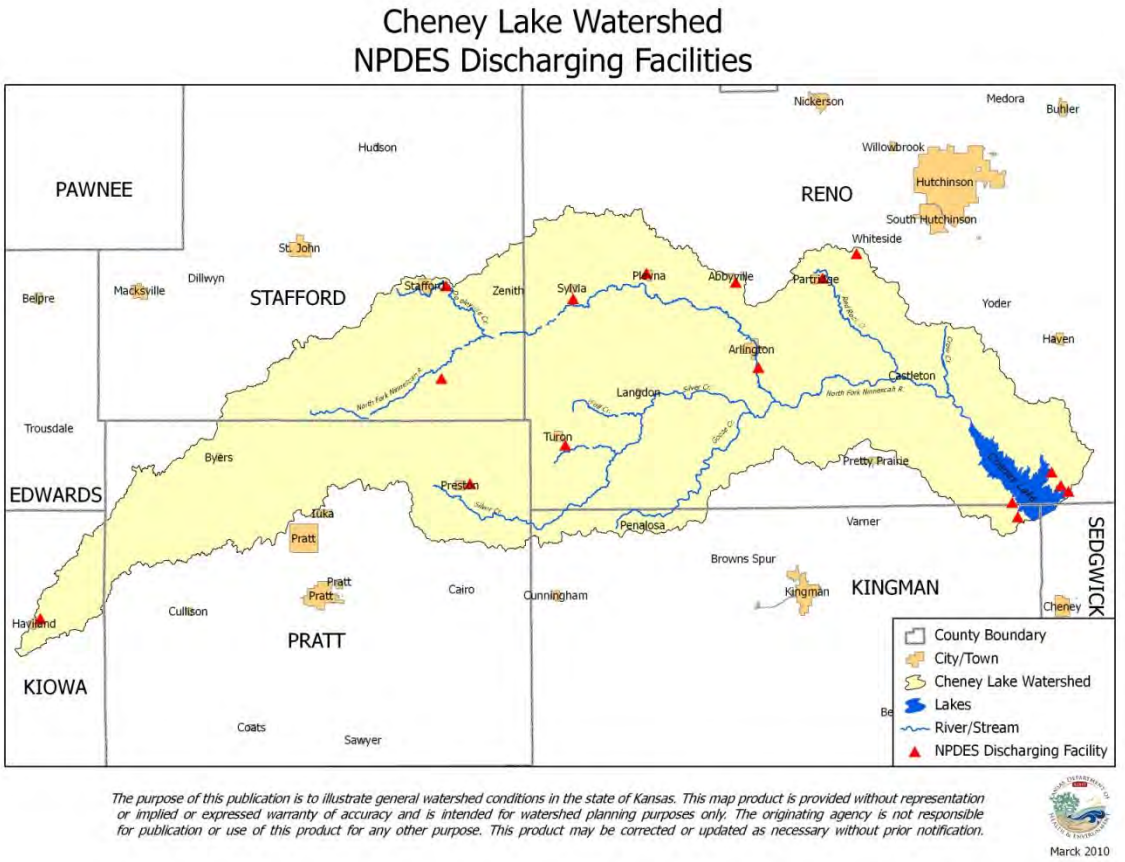


Figure 17 NPDES Discharging Facilities

As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an NPDES permit; however, industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. In Kansas, the NPDES permit program is administered by the Kansas Department of Health and Environment (KDHE).

Of the sixteen NPDES permits in the watershed for municipal wastewater treatment facilities, there are five that are designed to overflow. The cities of Arlington, Partridge, Stafford, and

Turon have discharging, waste stabilization ponds. In 2000, Preston had a single stage, trickling filter system which was upgraded in 2006 to a discharging, waste stabilization pond. KDHE and NRCS have estimated that these point sources contribute 1- 2% of the total annual phosphorus load.

These small cities are not required to have NPDES Phase II stormwater permits but they may still concentrate stormwater runoff that is delivered to the stream system. Only the cities of Arlington, Turon, and Stafford have a significant amount of paving.

1.7 LIVESTOCK OPERATIONS

Confined Livestock

Any livestock facility with an animal unit capacity of 300 or more or a facility with a daily discharge regardless of size must register with the Kansas Department of Health and Environment (KDHE). Any facility, no matter what animal capacity, is required to register if KDHE investigates them due to a complaint and the facility is found to pose a significant pollution potential. Facilities which register with KDHE will be site-inspected for significant pollution potential. If facility is found to not be a significant pollution potential by KDHE, they can be certified if they follow management practices recommended and approved by KDHE. These include but are not limited to: regular cleaning of stalls, managing manure storage areas, etc. Facilities with 300 animal units up to 999 (known as Confined Feeding Facilities (CFFs) identified with a significant pollution potential must obtain a State of Kansas Livestock Waste Management Permit. Facilities of 1,000 animal units or more, known as Confined Animal Feeding Operations (CAFOs), must obtain an NPDES Livestock Waste Management Permit (Federal). Operations with a daily discharge, such as a dairy operation that generates an outflow from the milking barn on a daily basis, are required to have a permit. See www.kdheks.gov/feedlots for more information.

Unconfined Concentrated Animal Areas

Unconfined areas of animal concentration such as watering areas, loafing areas or feeding areas can also pose a pollution potential if not managed properly. These are potential sources of nutrients, sediment, and bacteria. Management practices for these areas can include alternative water supplies, rotational grazing, proper mineral and feed placement, and proper manure application to cropland.

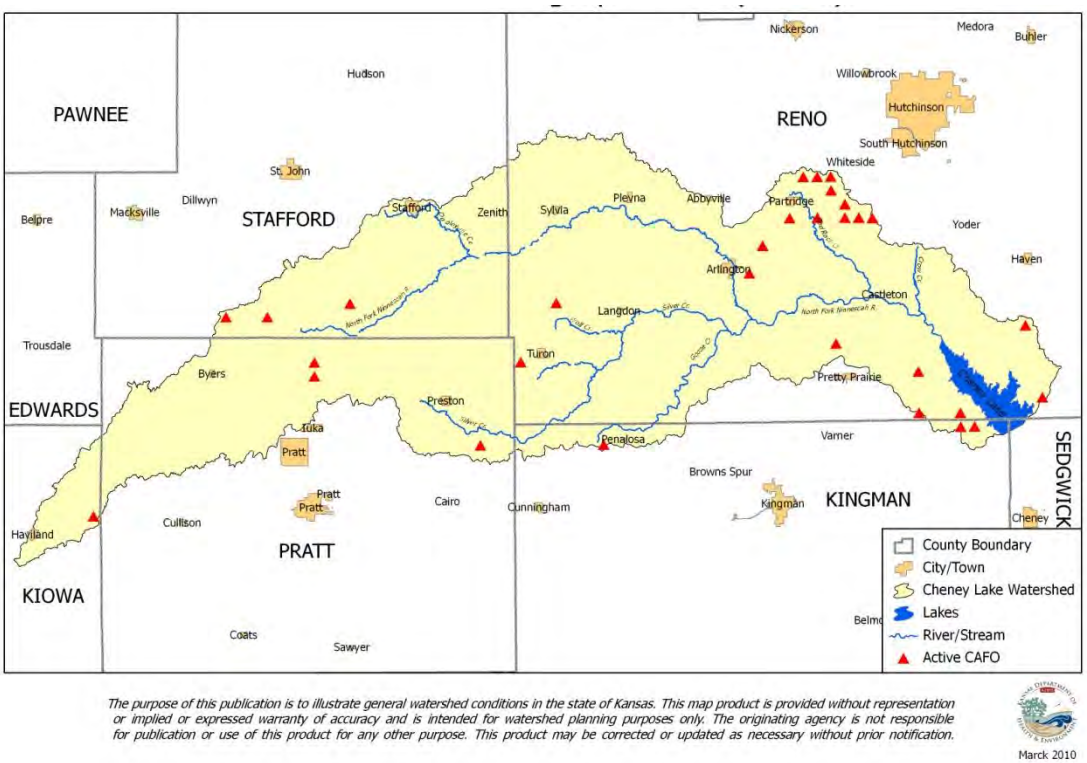


Figure 18 Confined Animal Feeding Operations

The map above shows active confined animal feeding operations within the Cheney Lake watershed. Primarily these operations are beef feedlots and small dairies (less than 150 head). Permitted facilities are required to have a management plan for containing and utilizing manure and lot runoff. Livestock waste facilities can be useful tools for management of livestock waste but waste material must be land applied from the containment facilities in a manner that does not jeopardize water resources. Within the Cheney Lake watershed, producers should apply livestock waste by matching the phosphorus content of the waste with soil test recommendations to avoid over-application of phosphorus in areas prone to runoff.

1.8 Public Water Sources

Cheney Reservoir is a primary water supply for the City of Wichita and other communities that purchase water from Wichita. More than 350,000 people are dependent on this surface water source for at least 70% of their water supply. As noted within the TMDL section, the reservoir is impaired by siltation and eutrophication. Both are a threat to the suitability of the source as a public water supply.

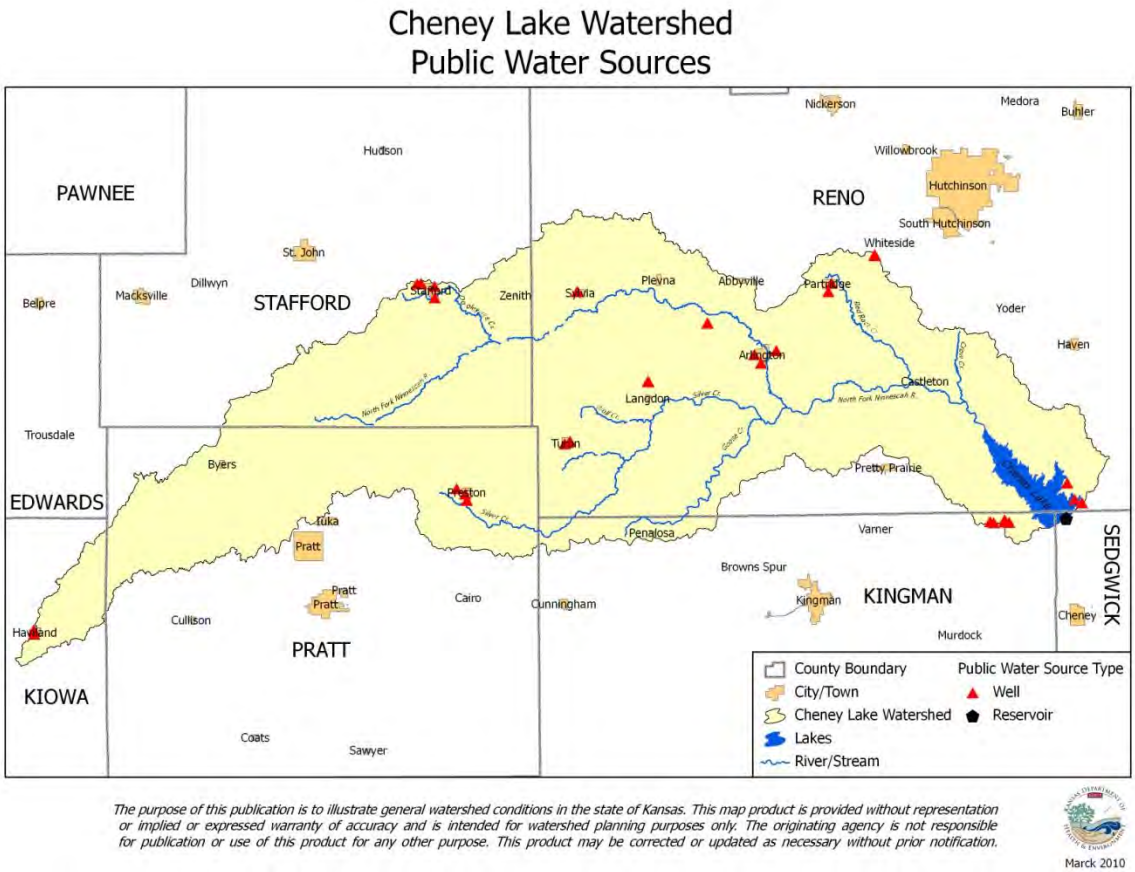


Figure 19 Public Water Sources

The Cheney watershed is also the location for public water source wells for a number of small cities and public facilities. In the State of Kansas, a public water supply system is defined by Kansas Statutes Annotated (K.S.A.) 65-162a and Kansas Administrative Regulations (K.A.R.) 28-15a-2 as a "system for delivery to the public of piped water for human consumption that has at least 10 service connections or regularly serves at least 25 individuals daily at least 60 days out of the year." These systems are regulated by the state to assure the citizenry safe and pathogen-free drinking water. Private domestic/residential groundwater wells are not considered a public water supply system and are not regulated by the PWSS.

Table 1. Population Served by Public Water Supply

Public Water Supplier	Population Served
Wichita customers	398,965
Derby	
Valley Center	5858
Andover	9114
Rose Hill	
Eastborough	
Bentley	519
Benton	806
Bel Aire	6797
Park City	8029
Kechi	1796
Wichita	366,046
Turon	435
Haviland	469
Stafford	1032
Arlington	434
Cheney	2033
Preston	159
Garden Plain	859
Garden Plain High School	1
Garden Plain Grade School	1
Camp Kanza	300
Fairfield High School	240
Dutch Kitchen	325
Partridge Grade School	160
Pleasant View Academy	
Cheney State Park, Marina	25
Cheney State Park, M & M Point	25
St. Joseph Catholic School	
Total Non-Wichita	6498
Total Population served	**405,463**

Besides the City of Wichita, public water supply systems with wells in the watershed include Haviland, Stafford, Arlington, Preston, Turon, Cheney, Garden Plain, Camp Kanza, Fairfield High School, Dutch Kitchen, Partridge Grade School, Pleasantview Academy, Cheney State Park Marina, Cheney State Park M and M Point, and St. Joseph Catholic School (see map). The City of Arlington has completed the Delineation of Wellhead Protection Areas for Public Water Supply Wells.

1.9 HIGH QUALITY WATERS

The State of Kansas has designated high quality waters in several categories including Special Aquatic Life Use (SALU) waters. SALU waters, as defined by K.A.R. 28-16-28d (b)(2)(A) "means surface waters that contain combinations of habitat types and indigenous biota not found commonly in the state, or surface waters that contain representative populations of threatened or endangered species." The surface waters of Cheney Lake Watershed including Red Rock Creek, Silver Creek, and the main stem of the North Fork Ninnescah are designated SALU waters.

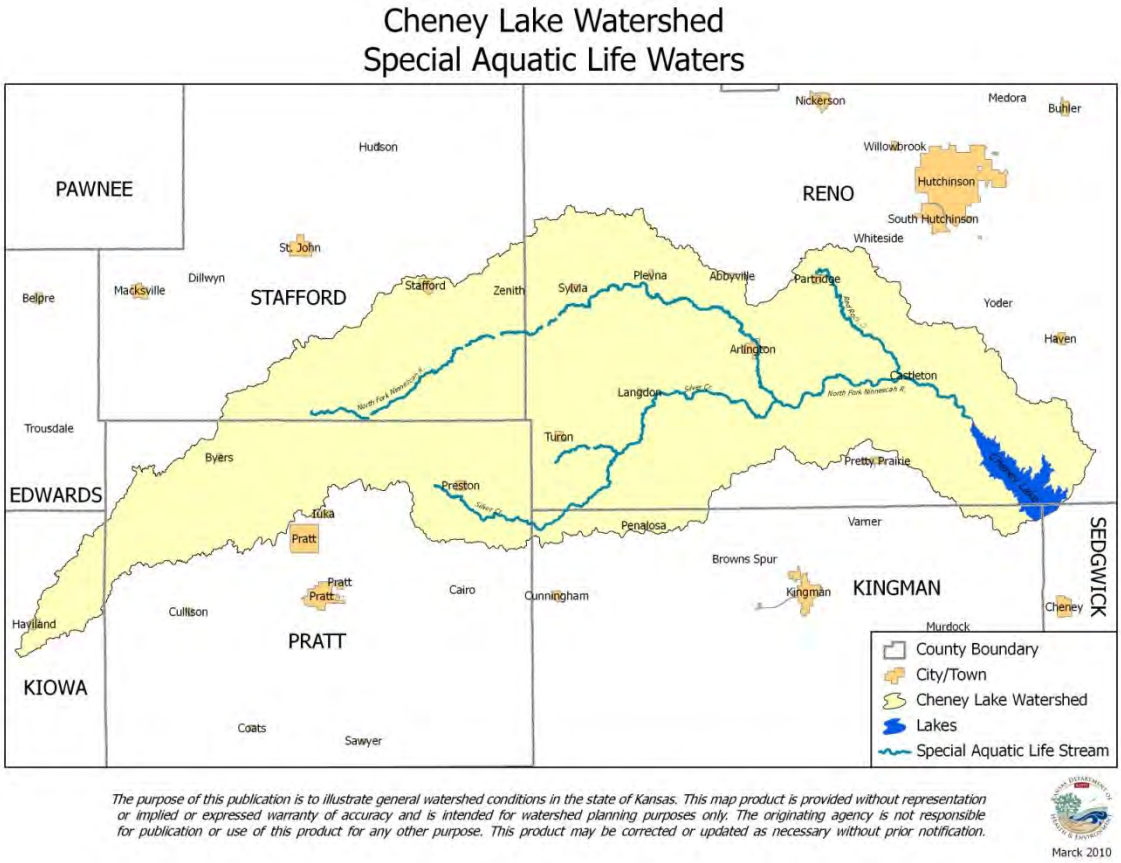


Figure 20 Special Aquatic Life Waters

Threatened and endangered species in Cheney watershed include the Arkansas Darter (Etheostoma cragini), a small perch which is listed as threatened in Kansas and as a candidate for federal listing by the U.S. Fish and Wildlife Service. The Arkansas Darter is found on the main stem of the North Fork of the Ninnescah River from the Stafford and Reno County line to the river's confluence with the South Fork in Sedgwick County. It is typically found, as well, in most any of the spring-fed tributaries of the North Fork Ninnescah. These shallow-water habitats without strong current are also good places to find watercress, a vegetative cover that provides the Arkansas darter hiding places from predators. The Arkansas darter

will dive head-first into the muddy substrate when frightened and remain hidden by the cloud of silt suspended in the water.

Spawning occurs in early spring when the male is brightly colored with an orange-red belly. Although this darter will live 3 years, most of the spawning population is in its first year. Impoundments on streams restrict movement of the darters and for that reason the timing for construction of conservation projects on streams may be altered to prevent disruptions in spawning. Depletion of groundwater, which results in streams going dry, is one of the major causes for the decline of the Arkansas darter.

1.10 Management of Public Land

Land surrounding the Cheney Reservoir is Public Land under the control of the Bureau of Reclamation. The Kansas Department of Wildlife and Parks administers the recreation areas at Cheney Reservoir, including some 1,900 acres of land and over 5,400 acres of water, and over 5,200 acres of land and 4,100 acres of water for conservation and management of migratory birds and other wildlife. Part of the land is leased to local farmers with guidance from KDWP regarding crop rotations and land management.

KDWP personnel at Cheney Reservoir and Wildlife Area site major concerns including shoreline erosion, control of invasive species (red cedar, sericea lespedezia, Russian olive, white perch, zebra mussels, etc.), and road maintenance.

1.11 Watershed Demographics

According to the 2000 Census, the population of the Cheney Lake Watershed is 3,647 with 1,528 households. Maps below show population by subwatershed for urban and rural areas. There are approximately 1,000 farm operations within the watershed (1994). Subwatersheds with higher rural population numbers may be of interest in that those areas are more reliant on household septic systems. The higher density of rural population may also indicate other issues that could impact water quality.

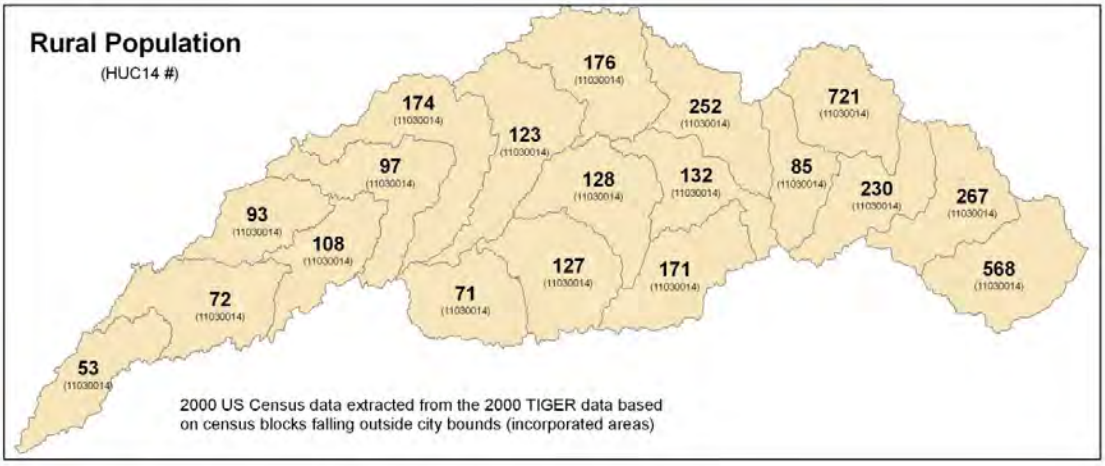


Figure 21 Rural Population. **Map courtesy of Dr. Nathan Nelson, Dept. of Agronomy, Kansas State University, 2009**

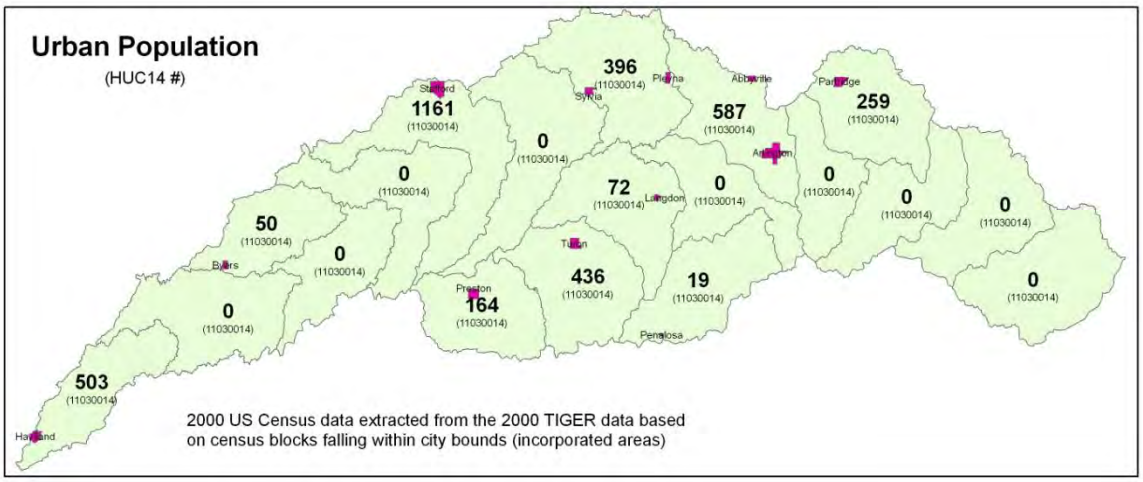


Figure 22 Urban Population.Map courtesy of Dr. Nathan Nelson, Dept. of Agronomy, Kansas State University, 2009

2 CHENEY LAKE WATERSHED NEEDS ASSESSMENT

2.1 CROPLAND NEEDS

The watershed modeling that has been done in the Cheney Lake Watershed included inputs of existing land use and common agricultural practices for the study area. The modeling work produced options that could be implemented to achieve pollutant reduction goals. A review team that included local NRCS personnel, the watershed staff, and local farmers developed a list of conservation practices that were not already in place and were most likely to be adopted within the priority areas. This list was used to develop the load reduction projections.

Within the priority areas, crop production is historically continuous wheat production with conventional tillage. Interest in no-till farming is high and opportunities for increased adoption are expected. The identification of more than 1,000 ephemeral gullies in crop fields using aerial photo imagery would point to the need for additional terraces and grassed waterways.

Ephemeral gully in cropland

There is strong interest in wetland creation from the recreational community. This is recognized as an opportunity to promote wetland to capture cropland runoff.

In our work with small dairies in the Red Rock Creek sub-watershed we often see small farms with a disproportionate ratio of livestock to land area for manure application. A conservative estimate of lactating dairy cows in the Red Rock Creek sub-watershed would be 1,155 animals with an additional 1,100 animals on those farms as calves, developing heifers, and dry cows. There is a need for export of manure to adjoining farms for better utilization of the nutrients. For that reason the review team added waste utilization to the list of cropland practices.

2.2 LIVESTOCK NEEDS

Although there are some existing livestock inventories that have been compiled on a county-wide basis for portions of the watershed, we were able to identify discrepancies with known data so that we were reluctant to use the inventories.

To get a basic idea of livestock numbers, we considered the acres of rangeland in each priority area and common stocking rates. Within Priority Area 1 (see page 42), there are approximately 25,955 acres of rangeland. Stocking rates in that area tend to be about 1 cow/7 acres. At that rate we could expect 3,708 animals (cattle and horses). Nearly all of that rangeland would have stream access whether or not it is a dependable source of water.

Within Priority Area 2 (page 42), there are approximately 50,542 acres of rangeland. At a slightly more moderate rate of 1 cow/8 acres, we would expect 6,318 animals (cattle and horses). A lesser proportion of this rangeland would have stream access but nearly all streams in this area would be bordered by rangeland with livestock access.

Alternate water sources for livestock.

Nearly 100% of the confined animal feeding operations in the watershed have waste systems in place. For instance, in Priority Area 2 there is a 10,000 head feedlot that operates under a NPDES permit and there is no identified need to further address livestock waste issues at that facility.

The watershed needs with regard to livestock are focused primarily on rangeland management, winter feeding areas, and small, short-term confinement operations. For water quality concerns, the proximity of such operations to a stream is the primary factor of interest. The review team developed a list of conservation practices that would improve overall management of rangeland with a special emphasis on decreasing the impact of livestock on watershed streams. Rotational grazing, alternate water sources, and the

relocation of seasonal feeding and confinement areas away from streams would all reduce nutrient loading to streams and would be acceptable to local livestock producers.

2.3 Other Local Needs

As a result of interviews with local Kansas Wildlife and Parks personnel and a tour of the wildlife areas around Cheney Reservoir in 2010, we have identified three local issues in that area: shoreline erosion, road maintenance, and invasive species. An additional issue might be inadequate budget to actively manage wildlife areas and farmland to their greatest potential for water quality and wildlife.

Example of shoreline erosion at Cheney Reservoir.

The overarching goal would be to minimize water quality impacts to the reservoir from KDWP land adjacent to the lake. The objectives would be to reduce erosion, siltation, and nutrient loading from KDWP land. Methods to achieve these objectives would include the following measures:

- Stabilize eroding shorelines with riprap or other structures that protect the shoreline.
- Stabilize and maintain roadways, prevent off-road traffic, and close unnecessary roads.
- Reduce tillage and increase residue or living crops on cropland.
- Reestablish prairie ecosystem on KDWP lands that have been infested with invasive tree species.

No cost analysis has been done for these actions. Potential partners to achieve the goals could include: KDWP, Bureau of Reclamation, City of Wichita, Cheney Lake Watershed, Ninnescah Sailing Association, the State of Kansas, and the Cheney Lake Association.

3 POLLUTANT LOAD REDUCTION GOALS AND PRACTICES TO BE IMPLEMENTED

3.1 POLLUTANT LOAD REDUCTION GOALS

The following chart indicates the estimated current levels of each identified pollutant within the Cheney Lake Watershed, the TMDL goal and the corresponding reduction required. This information was drawn from TMDL documents compiled by KDHE. The siltation information is based on a 2001 USGS sedimentation study that estimated the mean annual sediment loading in the reservoir. For siltation of the reservoir, the Citizens Management Committee (CMC) has set a higher goal than the TMDL so both goals are listed. The CMC goal for siltation to achieve the desired goal of extending the life of Cheney Reservoir to 200 years is based on sediment storage.

The CMC goals for sedimentation and phosphorus were established in 1995 using the AGNPS (Agricultural Non-Point Source) computer model. The modeling process (data gathering, documenting current land use conditions, loading computer model, etc.) was completed during June and July 1993.

Two goals for the entire watershed were established for consideration in the AGNPS model in 1993: (1.) reducing annual sediment loading by 45%; and (2.) reducing annual phosphorus loading by 45%. AGNPS was used to compare results from different conservation practices to see the relative impact of implementing a particular management practice. By combining monitoring information from USGS with the AGNPS model a relationship has been established between soil characteristics and land use activities with regard to potential nutrient transport. Subsequent data collection and analysis since 1995 will be of assistance if the CMC wishes to reevaluate their goals.

There are good indications that the mean annual loading of sediment being used to estimate current loading is much higher than the sediment load that has been measured during most years. Usually the sediment measured on an annual basis is below the TMDL and the CMC goal. Fewer than seven high flow events in the history of the reservoir have contributed such high sediment loads that the mean loading is higher than actual loading in 37 of the 45 years of impoundment. This information needs further documentation but it will have implications for sediment management.

The following chart shows estimates of current loading levels, the goals for loading levels, and the reduction needed to reach the goal.

Table 2. Current loading levels, goals, and reductions needed to meet goals.

Phosphorus - Cheney Reservoir	**lb/year**
Estimated 2000 level	213,846
TMDL Goal	105,853
(Point sources)	2,352
(non-point sources)	103,501
Reduction (approx 50%)	107,993
Siltation - Cheney Reservoir	**acre-ft or T/year**
Estimated 2000 level	235/226,500
TMDL Goal (10% reduction)	210/203,850
Reduction	25/22,650
CMC Goal (40% reduction)	141/135,900
CMC Reduction goal	94/90,600

3.2 Conservation Practices for Pollutant Reduction

The Cheney Lake Watershed Citizens Management Committee (CMC) has selected a list of conservation practices that they have determined will be acceptable to watershed land managers to achieve reductions in pollutant levels reaching Cheney Reservoir. See the chart on page 46 for detailed descriptions of each conservation practice. Specific acreages and numbers of projects that need to be implemented per year were determined through estimates of potential adoption rates and modeling of water quality impacts using the Soil and Water Assessment Tool (SWAT) model. This list of conservation practices was approved by the CMC as listed below for each pollutant reduction goal. Kansas State University (Dr. Nathan Nelson, Robert Wilson, and Josh Roe) assisted with the development of this list of conservation practices and their impact. For additional information on the SWAT model and the data sources for this modeling project, refer to Appendix A.

Table 3. Cheney WRAPS Cropland Conservation Practices, Costs, and Reduction Efficiencies					
Conservation Practice	**Cost per Treated Acre**	**Available Cost-Share**	**Erosion Reduction Efficiency**	**Phosphorous Reduction Efficiency**	**Nitrogen Reduction Efficiency**
Permanent Vegetation (2% adoption rate annually)	$150	75%	95%	95%	95%
Grassed Waterways (10% adoption rate)*	$170	75%	40%	40%	40%
No-Till (2% Area 1, 10% Area 2)	$78	39%	75%	40%	25%
Terraces (10% adoption rate)	$102	75%	30%	30%	30%
Wetland Creation**	$1,500	75%	30%	30%	25%
Waste Utilization Plan	$114	70%	25%	25%	25%
**10 treated acres/acre of waterway* ***10 treated acres/acre of wetland*					

Table 4. Cheney WRAPS Livestock Conservation Practices, Costs, and Reduction Efficiencies						
Conservation Practice	**Unit Cost**	**After Cost-Share***	**Approx P Reduction Efficiency**	**Phosphorous Reduction Estimated (pounds)**	**Additional Installations (Goal)**	**Total Estimated P Reduction**
Relocated Pasture Feeding Site	$2,203	$1,102	50-90%	76	25	1,911
Off-Stream Watering System	$3,795	$1,898	85%	76	75	5,733
Rotational Grazing	$7,000	$3,500	50%	140	50	7,000
Relocate Feeding Pens	$7,000	$3,500	50%	957	13	12,441

**50% Cost-Share from USDA Environmental Quality Incentive Program for Livestock Practices*

A common conservation practice to address siltation and eutrophication is the installation of riparian buffers. This conservation practice is not specifically included in the list of expected conservation practices for the Cheney Lake Watershed. Riparian buffers are typically established on cropland adjoining streams. Within the Cheney watershed there are few acres of cropland adjoining perennial streams. As illustrated by the landuse map on page 8, most streams in the watershed are bordered by rangeland because farming these acres is too difficult.

These existing rangeland buffers can be beneficial to water quality but such landuse patterns create other challenges with overgrazing, dependence on streams as water sources for livestock and degradation of banks from trailing. The livestock conservation practices were

chosen to address these issues. Because these pastures are often small and/or narrow, total exclusion is often impractical unless the landowner is willing to manage the property for recreational uses instead of grazing. Livestock conservation practices are chosen to encourage landowners to move feeding and watering facilities away from streams and to develop pasture rotations that will reduce the time that livestock have access to streams. Pasture rotations are also designed to provide adequate rest for forages so that they will provide healthy, vigorous roots and top growth on the rangeland.

Buffers can be useful for the intermittent and ephemeral streams that extend into cropland areas within the Cheney watershed. Ephemeral gullies have been identified as a primary source of sediment and nutrient loading in this watershed. However, most conservation programs that fund buffer establishment do not "fit" well in these situations. Because of this, we will achieve a similar effect with the establishment of permanent grass on cropland acres, wetlands to capture runoff from cropland, and grassed waterways to stabilize ephemeral drainage patterns within cropland. Whenever possible, we will utilize buffer programs but we recognize the difficulty of achieving load reduction goals with traditional buffers in riparian areas.

The table below shows the estimated load reductions of sediment and phosphorus using these practices for cropland and livestock over a 25 year period to meet the TMDL.

Table 5. Estimated load reductions by year for sediment and phosphorus.

Sediment					Phosphorous				
Year	Cropland Reduction (tons)	% of TMDL	% of CMC Goal		Year	Cropland Reduction (lbs)	Livestock Reduction (lbs)	Total Reduction (lbs)	% of TMDL
2005-2010	2,295	10%	3%		**2005-2010**	2,296	18,599	20,895	20%
1	6,893	30%	8%		1	5,243	20,142	25,384	25%
2	11,492	51%	13%		2	5,893	20,727	26,621	26%
3	16,090	71%	18%		3	8,840	22,270	31,110	30%
4	20,688	91%	23%		4	11,786	22,856	34,642	33%
5	25,286	112%	28%		5	14,733	24,399	39,132	38%
6	29,885	132%	33%		6	17,679	24,984	42,664	41%
7	34,483	152%	38%		7	20,626	26,527	47,153	46%
8	39,081	173%	43%		8	23,572	27,113	50,685	49%
9	43,679	193%	48%		9	26,519	28,656	55,175	53%
10	48,278	213%	53%		10	29,466	29,241	58,707	57%
11	52,876	233%	58%		11	32,412	30,784	63,196	61%
12	57,474	254%	63%		12	35,359	31,370	66,729	64%
13	62,072	274%	69%		13	38,305	32,913	71,218	69%
14	66,671	294%	74%		14	41,252	33,498	74,750	72%
15	71,269	315%	79%		15	44,198	35,041	79,240	77%

16	75,867	335%	84%		16	47,145	35,627	82,772	80%
17	80,465	355%	89%		17	50,091	37,170	87,261	84%
18	85,064	376%	94%		18	53,038	37,755	90,793	88%
19	89,662	396%	99%		19	55,985	39,298	95,283	92%
20	94,260	416%	104%		20	58,931	39,884	98,815	95%
21	98,858	436%	109%		21	61,878	41,427	103,304	100%
22	103,457	457%	114%		22	64,824	42,012	106,837	103%
23	108,055	477%	119%		23	67,771	43,555	111,326	108%
24	112,653	497%	124%		24	70,717	44,141	114,858	111%
25	117,251	518%	129%		25	73,664	45,684	119,348	115%
Sediment TMDL :		**22,650**	**tons**		**Phosphorous TMDL:**		**103,501**	**Pounds**	
CMC Goal:		**90,600**	**tons**						

The table below shows the same estimated reduction achieved by all cropland practices or livestock practices as a percent of the total goal for both sediment and phosphorus. More extensive analysis of load reduction achieved by each specific practice from the designated list is available in Appendix B (soil erosion) and Appendix C (phosphorus).

Table 6. Estimated load reductions for cropland and livestock conservation practices as a percentage of total goals.

Sediment			
Conservation Practice Category	**Total Load Reduction (tons)**	**% of Sediment TMDL**	**% of CMC Goal**
Cropland	117,251	517.7%	129.4%
Total	**117,251**	**517.7%**	**129.4%**
Phosphorous			
Conservation Practice Category	**Total Load Reduction (lbs)**	**% of Phosphorous TMDL**	
Livestock	45,684	44%	
Cropland	73,664	71%	
Total	**73,664**	**115%**	

The following tables provide similar information regarding estimated pollutant reductions with more detailed estimates of reductions for each conservation practice over a 25 year time frame. The three tables show soil erosion reduction for cropland conservation practices and phosphorus load reductions for both cropland and livestock practices.

Table 7. Annual Soil Erosion Reduction for Cropland Practices (Tons)							
Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	571	1,202	1,314	902	13	597	4,598
2	1,142	2,404	2,627	1,803	26	1,194	9,197
3	1,713	3,606	3,941	2,705	38	1,792	13,795
4	2,284	4,808	5,255	3,606	51	2,389	18,393
5	2,855	6,010	6,568	4,508	64	2,986	22,991
6	3,426	7,212	7,882	5,409	77	3,583	27,590
7	3,997	8,414	9,196	6,311	90	4,181	32,188
8	4,568	9,616	10,509	7,212	103	4,778	36,786
9	5,139	10,818	11,823	8,114	115	5,375	41,384
10	5,710	12,020	13,137	9,015	128	5,972	45,983
11	6,281	13,222	14,450	9,917	141	6,570	50,581
12	6,852	14,424	15,764	10,818	154	7,167	55,179
13	7,423	15,627	17,078	11,720	167	7,764	59,777
14	7,994	16,829	18,391	12,621	179	8,361	64,376
15	8,565	18,031	19,705	13,523	192	8,959	68,974
16	9,136	19,233	21,019	14,424	205	9,556	73,572
17	9,706	20,435	22,332	15,326	218	10,153	78,170
18	10,277	21,637	23,646	16,228	231	10,750	82,769
19	10,848	22,839	24,959	17,129	244	11,347	87,367
20	11,419	24,041	26,273	18,031	256	11,945	91,965
21	11,990	25,243	27,587	18,932	269	12,542	96,563
22	12,561	26,445	28,900	19,834	282	13,139	101,162
23	13,132	27,647	30,214	20,735	295	13,736	105,760
24	13,703	28,849	31,528	21,637	308	14,334	110,358
25	14,274	30,051	32,841	22,538	320	14,931	114,956

Table 8. Annual Phosphorous Runoff Reduction for Cropland Practices (lbs)							
Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	391	823	541	617	8	566	2,947
2	782	1,646	1,082	1,234	17	1,133	5,893
3	1,172	2,468	1,623	1,851	25	1,699	8,840
4	1,563	3,291	2,165	2,468	33	2,266	11,786
5	1,954	4,114	2,706	3,085	42	2,832	14,733
6	2,345	4,937	3,247	3,702	50	3,398	17,679
7	2,736	5,759	3,788	4,320	58	3,965	20,626
8	3,127	6,582	4,329	4,937	67	4,531	23,572
9	3,517	7,405	4,870	5,554	75	5,098	26,519
10	3,908	8,228	5,411	6,171	84	5,664	29,466
11	4,299	9,051	5,953	6,788	92	6,230	32,412
12	4,690	9,873	6,494	7,405	100	6,797	35,359
13	5,081	10,696	7,035	8,022	109	7,363	38,305
14	5,471	11,519	7,576	8,639	117	7,929	41,252
15	5,862	12,342	8,117	9,256	125	8,496	44,198
16	6,253	13,164	8,658	9,873	134	9,062	47,145
17	6,644	13,987	9,199	10,490	142	9,629	50,091
18	7,035	14,810	9,741	11,107	150	10,195	53,038
19	7,426	15,633	10,282	11,725	159	10,761	55,985
20	7,816	16,455	10,823	12,342	167	11,328	58,931
21	8,207	17,278	11,364	12,959	175	11,894	61,878
22	8,598	18,101	11,905	13,576	184	12,461	64,824
23	8,989	18,924	12,446	14,193	192	13,027	67,771
24	9,380	19,747	12,987	14,810	200	13,593	70,717
25	9,770	20,569	13,528	15,427	209	14,160	73,664

Table 9. Total Annual Phosphorous Load Reduction for Livestock Practices (lbs)					
Year	Relocate Pasture Feeding Site	Off-Stream Watering System	Rotational Grazing	Relocate Feeding Pens	Total
1	76	229	280	957	1,543
2	153	459	560	957	2,128
3	229	688	840	1,914	3,671
4	306	917	1,120	1,914	4,257
5	382	1,147	1,400	2,871	5,800
6	459	1,376	1,680	2,871	6,385
7	535	1,605	1,960	3,828	7,928
8	611	1,834	2,240	3,828	8,514
9	688	2,064	2,520	4,785	10,057
10	764	2,293	2,800	4,785	10,642
11	841	2,522	3,080	5,742	12,185
12	917	2,752	3,360	5,742	12,771
13	994	2,981	3,640	6,699	14,314
14	1,070	3,210	3,920	6,699	14,899
15	1,147	3,440	4,200	7,656	16,442
16	1,223	3,669	4,480	7,656	17,028
17	1,299	3,898	4,760	8,613	18,571
18	1,376	4,128	5,040	8,613	19,156
19	1,452	4,357	5,320	9,570	20,699
20	1,529	4,586	5,600	9,570	21,285
21	1,605	4,816	5,880	10,527	22,828
22	1,682	5,045	6,160	10,527	23,413
23	1,758	5,274	6,440	11,484	24,956
24	1,834	5,503	6,720	11,484	25,542
25	1,911	5,733	7,000	12,441	27,085

3.3 SELECTION OF PRIORITY AREAS

The Citizen's Management Committee has used the information on estimated loading from the SWAT and AnnAGNPS computer models, paired with local knowledge of each subwatershed, to identify areas that should have priority for cost share funding and incentive payments. The highest priority area includes the two HUCs around Cheney Reservoir (110300140304 and 110300140305). The second priority area includes HUCs 110300140303, 110300140302, 110300140301, 110300140109, 110300140205, 110300140204. These 1st and 2nd priority areas were designated in 2009 as priority for specific watershed programs such as incentive payments for cropland converted to perennial grass.

There will not be a differentiation between priority areas for livestock practices and cropland practices. The livestock practices that have been identified (off-stream watering, relocation of feeding areas or livestock pens) are primarily related to livestock operations that are in close proximity to streams and could commonly be found in any part of Priority Area 1 or 2. Therefore, the livestock practices (except for rotational grazing) are further targeted within priority areas to those operations that are located on or near streams.

The recommended cropland conservation practices are also appropriate for all parts of Priority Area 1 and 2. One practice, Waste Utilization, is primarily intended to address manure application from dairy operations in the Red Rock Creek subwatershed (110300140302) but other waste utilization plans would be beneficial throughout Priority Areas 1 and 2.

All load reduction estimates and cost estimates are based on conservation work in Priority Areas 1 and 2. A third priority area includes 110300140201, 110300140202, and 110300140203. The fourth priority area includes 110300140107 and 110300140108. Priority 5 area includes 110300140104, 110300140105, and 110300140106. Priority areas 3, 4, and 5 will continue to be eligible for Wichita cost share for conservation work and any completed projects will be documented.

HUCs 110300101, 110300102, and 110300103 are considered non-contributing to the reservoir.

Table 10. Priority Areas by HUC

Priority 1	110300140304
	110300140305
Priority 2	110300140301
	110300140302
	110300140303
	110300140204
	110300140205
	110300140109
Priority 3	110300140201
	110300140202
	110300140203
Priority 4	110300140107
	110300140108
Priority 5	110300140104
	110300140105
	110300140106
Non-contributing	110300140101
	110300140102
	110300140103

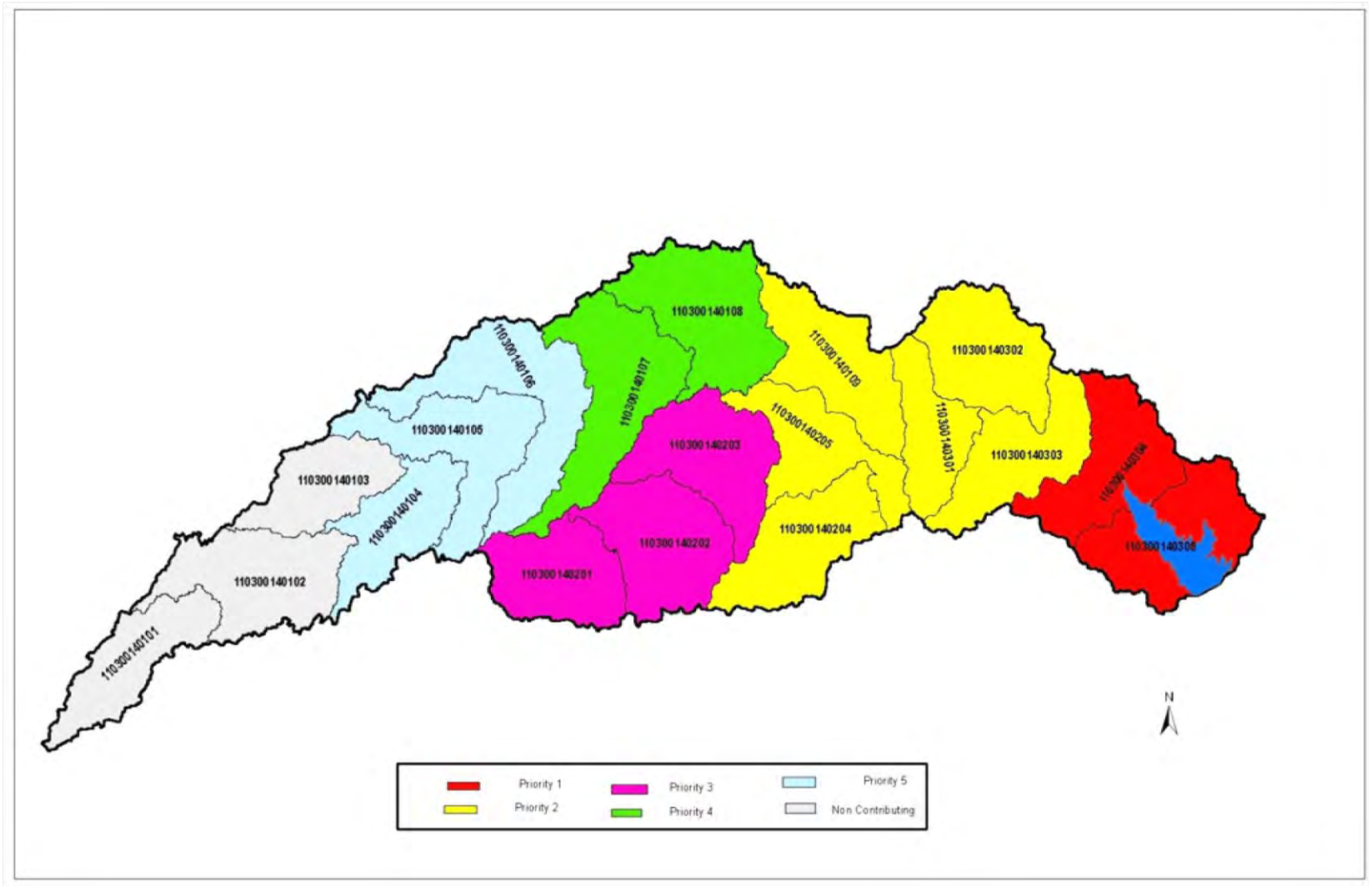


Figure 23 Priority Areas for Cheney Lake Watershed Restoration and Protection Actions

In general, non-point source pollutants originate primarily from cropland – about 40% of suspended sediment measured in the stream originates from sheet and rill erosion and 40% from ephemeral gully erosion. Stream analysis by NRCS identifies less than 20% of suspended sediment comes from streambanks. Streambanks on the main stem are a significant source of total sediment transported to the reservoir. Bank stabilization projects along the main stem may be important to protect roads, bridges, and structures. There are at least two projects in the watershed that were installed at a high cost to protect state or county roads. One project north of Arlington stabilized about 100 feet of the Ninnescah near a highway and bridge at a cost of $350,000. Experience with other bank stabilization projects in this watershed that have been less than successful indicate that addressing cropland may be a more cost effective option for success in reducing sediment and nutrient loads.

This information paired with the CEAP modeling would indicate the following conservation practices would be most effective at reducing sediment loading in the priority watersheds:

- Retain CRP contracts or retain grass as a grazing/haying system
- Convert cropland to grass
- Grassed waterways with or without terraces
- Other structural or management practices that will slow run-off and reduce erosion losses.
- Reduced tillage or no-till farming
- Wetland projects that trap sediment and slow run-off

As noted on pages 34-35, riparian buffers were not included in the list of conservation practices to be used to reach load reduction goals but they will be used when appropriate.

Generally phosphorus loading will mirror sediment loading. Additional analysis on nutrients will be completed by NRCS in 2011 and will be added to this management plan as completed.

The conservation practices deemed most likely to be adopted within each subwatershed are delineated in the Appendices with adoption rates and expected load reductions.

4 SCHEDULE FOR IMPLEMENTATION AND MEASURABLE MILESTONES

The Citizens Management Committee, working with Watershed staff and NRCS personnel in Reno County, reviewed the list of conservation practices and potential adoption rates within the watershed priority areas. The following two tables show an implementation schedule by year with short, medium, and long term goals that would achieve the goals for reductions in soil erosion and phosphorus loading within 25 years. This schedule should be reviewed on a 5 year basis to determine whether the goals are being met and what adjustments should be made in the schedule. Detailed tables of adoption rate by sub-watershed are available in Appendix D. Short, Medium and Long Term Adoption Goals by sub-watershed are available in Appendix E.

	Table 21. Annual Cropland Conservation Practice Adoption (treated acres)							
	Year	**Permanent Vegetation**	**Grassed Waterways**	**No-Till**	**Terraces**	**Wetlands**	**Waste Utilization**	**Total Adoption**
Short Term	1	202	1,012	822	1,012	12	750	3,811
	2	202	1,012	822	1,012	12	750	3,811
	3	202	1,012	822	1,012	12	750	3,811
	4	202	1,012	822	1,012	12	750	3,811
	5	202	1,012	822	1,012	12	750	3,811
Total		*1,012*	*5,062*	*4,108*	*5,062*	*60*	*3,750*	*19,054*
Medium Term	6	202	1,012	822	1,012	12	750	3,811
	7	202	1,012	822	1,012	12	750	3,811
	8	202	1,012	822	1,012	12	750	3,811
	9	202	1,012	822	1,012	12	750	3,811
	10	202	1,012	822	1,012	12	750	3,811
Total		*2,025*	*10,123*	*8,217*	*10,123*	*120*	*7,500*	*38,108*
Long Term	11	202	1,012	822	1,012	12	750	3,811
	12	202	1,012	822	1,012	12	750	3,811
	13	202	1,012	822	1,012	12	750	3,811
	14	202	1,012	822	1,012	12	750	3,811
	15	202	1,012	822	1,012	12	750	3,811
	16	202	1,012	822	1,012	12	750	3,811
	17	202	1,012	822	1,012	12	750	3,811
	18	202	1,012	822	1,012	12	750	3,811
	19	202	1,012	822	1,012	12	750	3,811
	20	202	1,012	822	1,012	12	750	3,811
	21	202	1,012	822	1,012	12	750	3,811
	22	202	1,012	822	1,012	12	750	3,811
	23	202	1,012	822	1,012	12	750	3,811
	24	202	1,012	822	1,012	12	750	3,811
	25	202	1,012	822	1,012	12	750	3,811
Total		*5,062*	*25,308*	*20,542*	*25,308*	*300*	*18,750*	*95,270*

	Table 22. Annual Livestock Conservation Practice Adoption				
	Year	**Relocate Pasture Feeding Site**	**Off-Stream Watering System**	**Rotational Grazing**	**Relocate Feeding Pens**
Short Term	1	1	3	2	1
	2	1	3	2	0
	3	1	3	2	1
	4	1	3	2	0
	5	1	3	2	1
Total		*5*	*15*	*10*	*3*
Medium Term	6	1	3	2	0
	7	1	3	2	1
	8	1	3	2	0
	9	1	3	2	1
	10	1	3	2	0
Total		*10*	*30*	*20*	*5*
Long Term	11	1	3	2	1
	12	1	3	2	0
	13	1	3	2	1
	14	1	3	2	0
	15	1	3	2	1
	16	1	3	2	0
	17	1	3	2	1
	18	1	3	2	0
	19	1	3	2	1
	20	1	3	2	0
	21	1	3	2	1
	22	1	3	2	0
	23	1	3	2	1
	24	1	3	2	0
	25	1	3	2	1
Total		*25*	*75*	*50*	*13*

5 IDENTIFICATION OF FINANCIAL AND TECHNICAL RESOURCES

The Citizens Management Committee has selected the conservation practices listed in this plan that will be used to address impairments. The CMC has determined that these conservation practices will be the focus of implementation funding from WRAPS for each category (cropland, livestock). Most of the practices will reduce loading of both sediment and nutrients.

Definition of Conservation Terms, Derivation of Cost Estimates, and Efficiency Assumptions

Cropland Conservation Practices:

No-Till: A farming system that manages the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round, while limiting soil-disturbing activities to only those necessary to place nutrients, condition residue, and plant crops. This practice includes planting methods commonly referred to as no-till, strip till, direct seed, zero till, slot till, or zone till. We are assuming 75% erosion reduction efficiency, 40% phosphorous reduction efficiency. WRAPS groups and KSU Ag Economists have decided $8 an acre for 10 years is an adequate payment to entice producers to convert cropland from conventional tillage to no-till.

Waste utilization plan: The development of a management plan outlining the amount, source, placement, form and timing of the application of nutrients and soil amendments. Implementation of a waste utilization plan involves testing the soil and the amendments (if not commercially controlled) to match available nutrients to crop needs. We assume 25% erosion reduction efficiency and 25% P reduction efficiency. WRAPS groups and KSU Ag Economists have decided $7.80 an acre for 10 years is an adequate payment to entice producers to adopt waste utilization planning.

Grassed Waterway: A natural or constructed channel that is shaped or graded and established with suitable vegetation. It can be used to prevent gully formation or as an outlet to convey water from terraces. On average for Kansas fields, a one acre waterway will treat 10 acres of cropland. We are assuming 40% erosion reduction efficiency, 40% phosphorous reduction efficiency. Cost estimates for waterways average $1700 per acre using average cost of installation.

Permanent vegetation: Planting a portion of or all of an annually cropped field to perennial vegetation such as native grass for a period of at least 10 years. We assume 95% erosion reduction efficiency, 95% phosphorous reduction efficiency. Cost is estimated at $150 an acre.

Terraces: Earth embankments and/or channel constructed across the slope to intercept runoff water and trap soil. This is one of the oldest and most common conservation practices. We assume 30% erosion reduction efficiency and 30% phosphorous reduction efficiency. Average cost is $1.02 per linear foot.

Wetland Creation: To restore or create wetland conditions where water covers the soil, or is present at the surface of the soil all year or for varying periods of the year, including the growing

season. We assume 30% erosion and P reduction efficiency. One acre of wetland will treat 10 acres of cropland, on average. Average construction cost is $15,000 per acre.

Livestock Conservation Practices:

Relocated Feedlot: Move feedlot or pens away from a stream, waterway, or body of water to increase filtration and waste removal of manure. This practice may be highly variable in price. We are assuming an average of $7,000 per facility to cover fencing, watering systems, and concrete. We assume a P reduction of 30-80%.

Relocated Pasture Feeding Site: Move a seasonal feeding site that is in a pasture away from a stream, waterway, or body of water to increase the filtration and waste removal (eg. move bale feeders away from stream). This practice is highly variable in price. We estimate an average of $2,203 per facility to cover alternate watering systems, feed pads, etc. We assume a P reduction of 30-80%.

Off-Stream Watering System: A livestock watering point established at a stable location an adequate distance from a stream or other water body. Studies show cattle will drink from tank over a stream or pond 80% of the time. We assume this practice has a 10-25 year lifespan and the average P reduction is 30-98% with greater efficiencies for limited stream access. The cost for this practice can also be quite variable but we are assuming a cost of $3,795 installed for a solar powered system, including the present value of maintenance costs.

Rotational Grazing: A grazing system that involves rotating livestock within a pasture to spread manure more uniformly and allow grass adequate rest to regenerate. Expenses may involve significant cross fencing and additional watering sites. We assume a 40-60% P Reduction Efficiency. Cost is variable but we assume a cost of approximately $7,000 with complex systems being significantly more expensive.

Note: Reduction efficiencies and cost estimates developed by Josh Roe, KSU Research and Extension with review by the Citizens Management Committee.

The following tables show costs associated with the selected conservation practices and costs of implementation beyond known funding sources. Detailed information by sub-watershed is provided in Appendix C.

Table 11. Estimated Costs for Cropland Conservation Practices to Address the Siltation and Eutrophication TMDLs for Cheney Reservoir. **Table prepared by Josh Roe, KSU Extension.**

Total Annual Cost, Cropland Practices							
Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Nutrient Management	Total Cost
1	$30,370	$172,096	$63,836	$103,257	$18,000	$85,500	$473,059
2	$31,281	$177,259	$65,751	$106,355	$18,540	$88,065	$487,251
3	$32,219	$182,576	$67,724	$109,546	$19,096	$90,707	$501,869
4	$33,186	$188,054	$69,756	$112,832	$19,669	$93,428	$516,925
5	$34,182	$193,695	$71,848	$116,217	$20,259	$96,231	$532,432
6	$35,207	$199,506	$74,004	$119,704	$20,867	$99,118	$548,405
7	$36,263	$205,491	$76,224	$123,295	$21,493	$102,091	$564,857
8	$37,351	$211,656	$78,511	$126,994	$22,138	$105,154	$581,803
9	$38,472	$218,006	$80,866	$130,803	$22,802	$108,309	$599,257
10	$39,626	$224,546	$83,292	$134,728	$23,486	$111,558	$617,235
11	$40,815	$231,282	$85,791	$138,769	$24,190	$114,905	$635,752
12	$42,039	$238,221	$88,364	$142,932	$24,916	$118,352	$654,825
13	$43,300	$245,367	$91,015	$147,220	$25,664	$121,903	$674,469
14	$44,599	$252,728	$93,746	$151,637	$26,434	$125,560	$694,703
15	$45,937	$260,310	$96,558	$156,186	$27,227	$129,326	$715,545
16	$47,315	$268,119	$99,455	$160,872	$28,043	$133,206	$737,011
17	$48,735	$276,163	$102,439	$165,698	$28,885	$137,202	$759,121
18	$50,197	$284,448	$105,512	$170,669	$29,751	$141,318	$781,895
19	$51,703	$292,981	$108,677	$175,789	$30,644	$145,558	$805,352
20	$53,254	$301,771	$111,937	$181,063	$31,563	$149,925	$829,512
21	$54,851	$310,824	$115,295	$186,494	$32,510	$154,423	$854,398
22	$56,497	$320,149	$118,754	$192,089	$33,485	$159,055	$880,030
23	$58,192	$329,753	$122,317	$197,852	$34,490	$163,827	$906,430
24	$59,937	$339,646	$125,986	$203,787	$35,525	$168,742	$933,623
25	$61,736	$349,835	$129,766	$209,901	$36,590	$173,804	$961,632
Dollar figures based on 2010 dollars and adjusted 3% annually for inflation.							
Costs do not reflect any cost share opportunities.							

Table 12. Estimated Costs Not Covered by Known Cost Share for Cropland Conservation Practices to Address the Siltation and Eutrophication TMDLs for Cheney Reservoir. **Table prepared by Josh Roe, KSU Extension.**

Cost Not Covered by Known Cost-Share Opportunities, Cropland Conservation Practices							
Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Nutrient Management	Total Cost
1	$7,592	$43,024	$38,940	$25,814	$4,500	$25,650	$145,521
2	$7,820	$44,315	$40,108	$26,589	$4,635	$26,420	$149,886
3	$8,055	$45,644	$41,312	$27,386	$4,774	$27,212	$154,383
4	$8,296	$47,013	$42,551	$28,208	$4,917	$28,028	$159,015
5	$8,545	$48,424	$43,827	$29,054	$5,065	$28,869	$163,785
6	$8,802	$49,877	$45,142	$29,926	$5,217	$29,735	$168,699
7	$9,066	$51,373	$46,497	$30,824	$5,373	$30,627	$173,760
8	$9,338	$52,914	$47,891	$31,748	$5,534	$31,546	$178,972
9	$9,618	$54,501	$49,328	$32,701	$5,700	$32,493	$184,341
10	$9,906	$56,136	$50,808	$33,682	$5,871	$33,467	$189,872
11	$10,204	$57,821	$52,332	$34,692	$6,048	$34,471	$195,568
12	$10,510	$59,555	$53,902	$35,733	$6,229	$35,506	$201,435
13	$10,825	$61,342	$55,519	$36,805	$6,416	$36,571	$207,478
14	$11,150	$63,182	$57,185	$37,909	$6,608	$37,668	$213,702
15	$11,484	$65,078	$58,900	$39,047	$6,807	$38,798	$220,113
16	$11,829	$67,030	$60,667	$40,218	$7,011	$39,962	$226,717
17	$12,184	$69,041	$62,487	$41,424	$7,221	$41,161	$233,518
18	$12,549	$71,112	$64,362	$42,667	$7,438	$42,396	$240,524
19	$12,926	$73,245	$66,293	$43,947	$7,661	$43,667	$247,740
20	$13,313	$75,443	$68,282	$45,266	$7,891	$44,977	$255,172
21	$13,713	$77,706	$70,330	$46,624	$8,128	$46,327	$262,827
22	$14,124	$80,037	$72,440	$48,022	$8,371	$47,717	$270,712
23	$14,548	$82,438	$74,613	$49,463	$8,622	$49,148	$278,833
24	$14,984	$84,911	$76,852	$50,947	$8,881	$50,622	$287,198
25	$15,434	$87,459	$79,157	$52,475	$9,148	$52,141	$295,814
Dollar figures based on 2010 dollars and adjusted 3% annually for inflation.							
Costs reflect remaining costs that would not be covered by known cost share opportunities.							

Table 13. Estimated Costs for Livestock Conservation Practices to Address the Siltation and Eutrophication TMDLs for Cheney Reservoir. **Table prepared by Josh Roe, KSU Extension.**

Total Annual Cost, Livestock Conservation Practices					
Year	Relocate Pasture Feeding Site	Off-Stream Watering System	Rotational Grazing	Relocate Feeding Pens	Total
1	$2,203	$11,385	$14,000	$7,000	$34,588
2	$2,269	$11,727	$14,420	$0	$28,416
3	$2,337	$12,078	$14,853	$7,426	$36,694
4	$2,407	$12,441	$15,298	$0	$30,146
5	$2,479	$12,814	$15,757	$7,879	$38,929
6	$2,554	$13,198	$16,230	$0	$31,982
7	$2,630	$13,594	$16,717	$8,358	$41,300
8	$2,709	$14,002	$17,218	$0	$33,930
9	$2,791	$14,422	$17,735	$8,867	$43,815
10	$2,874	$14,855	$18,267	$0	$35,996
11	$2,961	$15,300	$18,815	$9,407	$46,483
12	$3,049	$15,760	$19,379	$0	$38,188
13	$3,141	$16,232	$19,961	$9,980	$49,314
14	$3,235	$16,719	$20,559	$0	$40,514
15	$3,332	$17,221	$21,176	$10,588	$52,317
16	$3,432	$17,737	$21,812	$0	$42,981
17	$3,535	$18,270	$22,466	$11,233	$55,504
18	$3,641	$18,818	$23,140	$0	$45,599
19	$3,750	$19,382	$23,834	$11,917	$58,884
20	$3,863	$19,964	$24,549	$0	$48,376
21	$3,979	$20,563	$25,286	$12,643	$62,470
22	$4,098	$21,179	$26,044	$0	$51,322
23	$4,221	$21,815	$26,825	$13,413	$66,274
24	$4,348	$22,469	$27,630	$0	$54,447
25	$4,478	$23,143	$28,459	$14,230	$70,310
Dollar figures based on 2010 dollars and adjusted 3% annually for inflation.					
Costs do not reflect any cost share opportunities.					

Table 14. Estimated Costs Not Covered by Known Cost Share Opportunities for Livestock Conservation Practices to Address the Siltation and Eutrophication TMDLs for Cheney Reservoir. **Table prepared by Josh Roe, KSU Extension.**

Cost Not Covered by Known Cost-Share Opportunities, Livestock Conservation Practices					
Year	Relocate Pasture Feeding Site	Off-Stream Watering System	Rotational Grazing	Relocate Feeding Pens	Total
1	$1,102	$5,693	$7,000	$3,500	$17,294
2	$1,135	$5,863	$7,210	$0	$14,208
3	$1,169	$6,039	$7,426	$3,713	$18,347
4	$1,204	$6,220	$7,649	$0	$15,073
5	$1,240	$6,407	$7,879	$3,939	$19,465
6	$1,277	$6,599	$8,115	$0	$15,991
7	$1,315	$6,797	$8,358	$4,179	$20,650
8	$1,355	$7,001	$8,609	$0	$16,965
9	$1,395	$7,211	$8,867	$4,434	$21,908
10	$1,437	$7,427	$9,133	$0	$17,998
11	$1,480	$7,650	$9,407	$4,704	$23,242
12	$1,525	$7,880	$9,690	$0	$19,094
13	$1,570	$8,116	$9,980	$4,990	$24,657
14	$1,618	$8,360	$10,280	$0	$20,257
15	$1,666	$8,610	$10,588	$5,294	$26,159
16	$1,716	$8,869	$10,906	$0	$21,491
17	$1,768	$9,135	$11,233	$5,616	$27,752
18	$1,821	$9,409	$11,570	$0	$22,799
19	$1,875	$9,691	$11,917	$5,959	$29,442
20	$1,931	$9,982	$12,275	$0	$24,188
21	$1,989	$10,281	$12,643	$6,321	$31,235
22	$2,049	$10,590	$13,022	$0	$25,661
23	$2,111	$10,907	$13,413	$6,706	$33,137
24	$2,174	$11,235	$13,815	$0	$27,224
25	$2,239	$11,572	$14,230	$7,115	$35,155
Dollar figures based on 2010 dollars and adjusted 3% annually for inflation.					
Costs reflect remaining costs that would not be covered by known cost share opportunities.					

Table 15. Estimated Costs for Conservation Practices (Cropland, Livestock) to Address the Siltation and Eutrophication TMDLs for Cheney Reservoir. **Table prepared by Josh Roe, KSU Extension.**

Cost Not Covered by Known Cost-Share Opportunities - by Category			
Year	Cropland	Livestock	Total Annual Cost
1	$145,521	$17,294	$162,815
2	$149,886	$14,208	$164,094
3	$154,383	$18,347	$172,730
4	$159,015	$15,073	$174,088
5	$163,785	$19,465	$183,250
6	$168,699	$15,991	$184,690
7	$173,760	$20,650	$194,409
8	$178,972	$16,965	$195,937
9	$184,341	$21,908	$206,249
10	$189,872	$17,998	$207,870
11	$195,568	$23,242	$218,810
12	$201,435	$19,094	$220,529
13	$207,478	$24,657	$232,135
14	$213,702	$20,257	$233,959
15	$220,113	$26,159	$246,272
16	$226,717	$21,491	$248,207
17	$233,518	$27,752	$261,270
18	$240,524	$22,799	$263,323
19	$247,740	$29,442	$277,181
20	$255,172	$24,188	$279,360
21	$262,827	$31,235	$294,062
22	$270,712	$25,661	$296,373
23	$278,833	$33,137	$311,970
24	$287,198	$27,224	$314,422
25	$295,814	$35,155	$330,969
Dollar figures based on 2010 dollars and adjusted 3% annually for inflation.			
Costs reflect remaining costs that would not be covered by known cost share opportunities.			

The following chart indicates potential funding sources and programs that may be used to implement conservation practices in the Cheney Lake Watershed. The Conservation Reserve Program is used extensively in this watershed with nearly 20% of the land enrolled in CRP. The

EQIP program and state cost share programs provide significant conservation funding that is matched with additional funds from the City of Wichita. The City of Wichita also provides some funding for incentive payments to convert cropland to permanent vegetation.

Table 16. Potential Funding Sources for Conservation Practices

Potential Funding Sources	Potential Funding Programs
Natural Resources Conservation Service	Environmental Quality Incentives Program (EQIP) Wetland Reserve Program (WRP) Wildlife Habitat Incentive Program (WHIP)
Farm Service Agency	Conservation Reserve Program (CRP) Continuous Sign-up CRP
EPA/KDHE	Section 319 funds Kansas State Water Plan
Kansas Alliance for Wetlands and Streams	-
State Conservation Commission/Conservation Districts	Water Resources Cost-Share Program Non-Point Source Pollution Control Program Wetland and Riparian Protection Program
Stumps Trust	-
Pheasants Forever	-
City of Wichita	-

Technical assistance is critical for the design, implementation, and maintenance of conservation practices. The Project Coordinator and the Cheney Public Relations coordinator provide part of the technical assistance as part of their regular duties with funding from WRAPS and from the City of Wichita. Natural Resources Conservation Service technicians, conservationists, range specialists, and engineers provide key assistance as part of their regular duties. From time to time, assistance may be required from KSU extension staff, Kansas Alliance for Wetlands and Streams staff, No-till on the Plains staff, or private engineers.

Table 17. Technical Assistance Needed to Implement Conservation Practices

	Conservation Practice	Technical Assistance	Projected Annual Cost
Cropland	reduced tillage	Cheney Project Coordinator Cheney PR Coordinator NRCS Field Staff KSU Extension No-till on the Plains	Cheney Project Coordinator* Cheney PR Coordinator* NRCS (no WRAPS cost) KSU Extension (no WRAPS cost) KAWS $7,500 No-till on the Plains $5,000
	nutrient management	Cheney Project Coordinator Cheney PR Coordinator NRCS Field Staff KSU Extension	
	waterways; terraces	NRCS field staff	
	permanent vegetation	Cheney Project Coordinator Cheney PR staff NRCS Range Specialist	
	wetland creation	Cheney Project Coordinator Cheney PR Coordinator NRCS field/ area staff KAWS	
	Total Projected Annual Cost for Technical Assistance to Implement Cropland Conservation Practices:		**$12,500***

	Conservation Practice	Technical Assistance	Projected Annual Cost
Livestock	Relocate pasture feeding site	Cheney Project Coordinator Cheney PR Coordinator NRCS Field Staff KSU Extension	Cheney Project Coordinator* Cheney PR Coordinator* NRCS (no WRAPS cost) KSU extension (no WRAPS cost)
	Off-stream watering systems	Cheney Project Coordinator Cheney PR staff NRCS Field Staff KSU Extension	
	Rotational Grazing systems	Cheney Project Coordinator Cheney PR Coordinator NRCS Range Specialist KSU Extension	
	Relocate Feeding Pens	Cheney Project Coordinator Cheney PR Coordinator NRCS Field Staff KSU Extension	
	Total Projected Annual Cost for Technical Assistance to Implement Livestock Conservation Practices:		**$0***

* Cheney Project Coordinator and Cheney PR Coordinator provide technical assistance and the majority of Information and Education activities. The Project Coordinator is paid with

WRAPS funds (~$50,000 annually). The PR Coordinator is a contract employee of Cheney Lake Watershed, Inc. paid with funding from the City of Wichita and some matching funds from WRAPS funds (~$40,000 total annually with ~$10,000 from WRAPS).

6 INFORMATION AND EDUCATION PLAN

6.1 I & E ACTIVITIES, COSTS, AND AUDIENCE

Information and education activities are the primary method for creating change within the watershed. Often implementation projects start with ideas generated at educational programs. The Citizens Management Committee has stated that the most effective water quality practice involves a change in thinking on the part of landowners. People who understand the problem will think creatively on a daily basis to implement solutions that fit their land and their management. These solutions may not require any technical assistance or cost share funding. Those that do require some type of assistance will have a greater chance of long-term success because the landowner understands and desires the successful outcome.

Within our watershed, we strive to provide opportunities to increase general watershed awareness and to offer more specialized information on particular land management options. A key component of our information and education efforts is farmer-to-farmer outreach with participants sharing information with their neighbors and encouraging others to try new ideas. One-on-one outreach by project staff members is also important to building a watershed-wide culture of conservation.

The following table delineates educational/informational methods and activities that will be used in the Cheney Lake Watershed to build awareness of water quality, encourage involvement in water quality efforts, and provide information on specific management practices that could be implemented by landowners.

Table 18. Information and Education Activities to Support Implementation Work

Practice	Target Audience	Activity/Event	Time Frame	Estimated Cost	Responsible Agency
Implementation of Cropland Conservation Practices					
Permanent Vegetation	Landowners	promote grass incentives with signs, news articles, brochures	ongoing	staff time*; General Watershed Education expenses (i.e. newsletter)	Cheney Lake Watershed
	Landowners	promote cost share program for fence around expired CRP	ongoing	staff time*; General Watershed Education expenses (i.e. newsletter)	Cheney Lake Watershed
	Landowners	demonstration - convert crop acres to grass	50 acres	$3,500	Cheney Lake Watershed
	Farm Service Agency, Kansas State Technical Committee	participate in State Technical Committee meetings to maintain CRP priority areas for Cheney as needed	annually	$300 annually for travel expense	Cheney Lake Watershed
Grassed Waterways and Terraces	Landowners and operators	press releases prior to cost share deadlines	spring and fall	staff time*	Cheney Lake Watershed
		one-on-one visits	ongoing	staff time*	Cheney Lake Watershed
No-till farming	Landowners	no-till workshop on converting CRP land to cropping with reduced tillage	summer annually	$500/event	Cheney Lake Watershed
	Operators in areas targeted for potential to change	field day or farm tour or workshop	summer annually	$1000/yr	Cheney Lake Watershed
	1st time attendees in areas targeted for potential to change	scholarships to No-till on the Plains Winter Conference	January annually	$500/yr	Cheney Lake Watershed
Waste Utilization	Dairy producers and adjacent landowners	soil health workshop and/or demonstration project on manure as soil amendment	spring	$200/yr	Cheney Lake Watershed
		display and participation at Reno County Dairy Herd Improvement events	winter and summer - annual	$50/year	Cheney Lake Watershed
Wetland Creation	Landowners with recreation interests	field day	late summer or fall every other year	$250 every other year	Cheney Lake Watershed
No-till farming and year-round grazing	Livestock and crop producers	cover crop demonstration	spring annually	$3,500	Cheney Lake Watershed
		Total Estimated Cost of Implementing Cropland Conservation Practices:		**$9,800***	

Practice	Target Audience	Activity/Event	Time Frame	Estimated Cost	Responsible Agency
Implementation of Livestock Conservation Practices					
Relocate Pasture Feeding Sites	Cow-calf producers	one-on-one visits	on-going	staff time*	Cheney Lake Watershed
		newsletter article	fall or spring	staff time*	Cheney Lake Watershed
		workshop on winter grazing, feeding areas, etc	winter - annual	$800	Cheney Lake Watershed
Alternative Watering	Livestock producers with live streams on property	workshop on watering systems, rotational grazing	winter - annual	$1,000	Cheney Lake Watershed
		demonstration project	spring to summer	$3,500	Cheney Lake Watershed
Rotational Grazing	Livestock producers	rotational grazing workshops	winter - annual	$1,000	Cheney Lake Watershed
		field day	spring or summer - every other year	$250 every other year	Cheney Lake Watershed
Total Estimated Cost of Implementing Livestock Conservation Practices:				**$16,350***	

Table 19. Information and Education Activities for Youth and Adults

	Target Audience	Activity/Event	Time Frame	Estimated Cost	Responsible Agency
General Watershed Education					
Youth Education	4th grade students	Water Festival	Annual (Winter-Spring)	Staff time*	Reno County Health Department
	K-12 Students	EARTH Workshop	Annual - Spring	$50 mileage	Sedgwick County Extension
	Elementary classrooms in the watershed	Stream workshops and classroom presentations	1-3/yr. every other year	$2,000 on alternating years	Cheney Lake Watershed, Inc.
	3rd grade students	Day on the Farm workshop	Annual (Winter-Spring)	Staff time*	Reno County Farm Bureau
	K-12 Students	Poster and essay contests on conservation themes	Annual - ongoing	No WRAPS Cost	Conservation Districts
Total Estimated Cost of Youth Education per year:				$2,050*	

* Cheney Project Coordinator and Cheney PR Coordinator provide technical assistance and the

majority of Information and Education activities. The Project Coordinator is paid with WRAPS funds (~$50,000 annually). The PR Coordinator is a contract employee of Cheney Lake Watershed, Inc. paid with funding from the City of Wichita and some matching funds from WRAPS funds (~$40,000 total annually with ~$10,000 from WRAPS).

	Target Audience	Activity/Event	Time Frame	Estimated Cost	Responsible Agency
Adult Education	General public	Website	Ongoing	$150/yr	Cheney Lake Watershed
	Watershed landowners and operators	Newsletter	4 issues/year	$500/yr	Cheney Lake Watershed
	Watershed landowners and operators	Brochures - general watershed info	Reprint as needed	$50/yr	Cheney Lake Watershed
	Watershed landowners and operators	One-on-one outreach on conservation work and cost share opportunities	Ongoing	Staff time*	Cheney Lake Watershed
	Watershed landowners and operators	Small group meetings - tailored to interests of CMC host and watershed area, including cost-share, conservation practices	3/year	$300/year	Cheney Lake Watershed
	Watershed landowners and operators	Signs identifying most successful projects	8/year	$5/year for vinyl letters	Cheney Lake Watershed
	Watershed landowners and operators	River Friendly Farms assessment mtgs	2/year	$50/mtg	Kansas Rural Center; Cheney Lake Watershed
	Women landowners	Focus groups to provide information on conservation	3/yr	Staff time*	Kansas Rural Center
	Watershed residents	Conservation awards	Annual - ongoing	No WRAPS cost	Conservation Districts
			Total Estimated Cost of Adult Education per year:	$1,105*	
			Total Estimated Cost of Youth & Adult Education per year:	**$3,155***	
			Total Estimated Cost of all I and E categories per year:	**$29,305***	

* In addition to the costs delineated for Information and Education activities in the previous tables, most of the activities rely on staff time from the Cheney Lake Watershed project office. The paid staff and volunteer Citizens Management Committee provide educational

programming, one-on-one outreach, and technical assistance to achieve the goals of the project. The following table shows expenses related to staff for Cheney Lake Watershed. The Project Coordinator and Clerical Staff are paid with WRAPS funds (~$50,000 annually and ~$15,000 annually). The PR Coordinator is a contract employee of Cheney Lake Watershed, Inc. paid with funding from the City of Wichita and some matching funds from WRAPS funds (~$40,000 total annually with ~$10,000 from WRAPS).

Table 20. Expense for Watershed Staff

	Time Frame	Estimated Cost	Responsible Agency	
Project Management				
Project Coordinator	Annual - ongoing	$50,000	Reno Co Conservation District	1.0 FTE
Outreach Coordinator - Public Relations	Annual - ongoing	$40,000	Cheney Lake Watershed, Inc.	1.0 FTE
Clerical	Annual - ongoing	$15,000	Reno Co Conservation District	.5 FTE
Total Annual Cost of Watershed Staff:		**$105,000**		

6.2 Determining Success of I & E Events

The ultimate success of the information and education program for the watershed is measured by the implementation of conservation practices and changes in management that protect water quality. Since it is difficult to make direct ties between each I and E event and implementation projects we will also monitor some more easily tracked indicators of effectiveness.
We do track all conservation practices that are implemented in the watershed using cost share from the City of Wichita. This data base includes location, cost, sources of funding, and type of project. With the help of KDHE we translate the implementation into an estimate of load reduction. We do try to track some other changes in land use, management, or project implementation that we can identify but in a less systematic way. Some of these include tillage practice surveys, periodic survey of changes in management practices, track participation in incentive programs for conservation practices.

Success for educational programs begins with good planning to reach the intended audience with the right message. Prior to events we develop objectives regarding target audience and message. Invitations (postal service and phone calls) are sent to a list of potential attendees based on location, potential for change, interest in the topic, and other criteria. In some cases the event is also publicized generally to attract other producers who have an interest. They may be people that we overlooked or they may manage land that is less critical in the watershed but they provide support and perspective to those we have invited specifically. We attempt to contact attendees after events to determine response and need for more information.
For events, we record the number of attendees with some indication of the number of people from priority areas of the watershed in relation to a goal established for that event. If we are able

to discern implementation of a project as a direct result of an event, we will track that information. We record anecdotal information from attendees regarding the utility of the information that they received.

For events that are multi-day or more intense than a field day or farmer meeting, we use some form of written evaluation to assess the methods for outreach, education, and follow-up. However, these forms of written evaluation seem less effective in measuring success than monitoring attendance of the key audience, inquiries regarding topics addressed, and changes in land management. Our education strategies are continually adjusted in response to the success of our events and comments from our audience.

7 WATER QUALITY MILESTONES AND MONITORING NETWORK

7.1 WATER QUALITY MILESTONES TO DETERMINE IMPROVEMENTS

The goal of the Cheney Lake WRAPS plan is to restore water quality for uses supportive of aquatic life, domestic water supply, and recreation for Cheney Lake. The plan specifically addresses the high priority eutrophication and siltation TMDLs for Cheney Lake. In order to reach the load reduction goals associated with the Cheney Lake impairments, an implementation schedule for conservation practices spanning 22 years has been developed.

The selected practices included in the plan will be implemented throughout the targeted areas within the Cheney Lake watershed. Water quality milestones have been developed for Cheney Lake, along with additional indicators of water quality. The purpose of the milestones and indicators is to measure water quality improvements associated with the implementation schedule contained in this plan.

In order to provide additional water quality information associated with this plan, separate water quality milestones are also included for the North Fork Ninnescah River. These water quality indicators will enable KDHE and the Cheney Lake WRAPS to measure water quality improvements within the watershed above Cheney Lake, which should directly affect the water quality of the lake itself.

7.2 WATER QUALITY MILESTONES FOR CHENEY LAKE

As previously stated, in order to reach the load reduction goals for Cheney Lake, an implementation schedule for conservation practices spanning 22 years has been developed. Several water quality milestones and indicators have been developed for Cheney Lake, as included herein. In addition to water quality measures, such as concentrations of total phosphorus and secchi depth measurements, the lake sedimentation rate for Cheney Lake will be utilized to determine the effectiveness of the practices implemented as part of the sediment load reduction goals outlined in the plan.

As included in the siltation TMDL for Cheney Lake, the estimated sedimentation rate, as provided by the Kansas Water Office in 2000, was approximately 235 acre-feet/year. As part of the water quality assessment, the sedimentation rate will continue to be analyzed throughout the life of this plan. A movement toward the desired sedimentation rate of 210 acre-feet/year, or a 10% reduction, is considered a water quality goal associated with the sediment load reductions goals of this plan.

The table on the following page includes 10-year water quality goals, as well as long term water quality goals for various parameters monitored in Cheney Lake.

Water Quality Milestones for Cheney Lake								
	Current Condition* (2001-2010) Median TP	10-Year Goal		Long Term Goal		Current Condition** (1990 - 2008) Secchi (Avg)	10-Year Goal	Long Term Goal
		Improved Condition (2011 - 2021) Median TP	Total Reduction Needed	Improved Condition Median TP	Total Reduction Needed		Improved Condition (2011 - 2021) Secchi (Avg)	Improved Condition Secchi (Avg)
Sampling Site	**Total Phosphorus (median of data collected during indicated period), ppb**					**Secchi (average of data collected during indicated period), m**		
Cheney Lake (USGS Site)	100	90	**10**	80	**20**	0.58	**Secchi depth > 0.61**	**Maintain Average Secchi depth > 1.0**
	Current Condition** (1990-2008) Chlorophyll a	10-Year Goal		Long Term Goal				
		Improved Condition (2011 - 2021) Chlorophyll a	Total Reduction Needed	Improved Condition Chlorophyll a				
Sampling Site	**Chlorophyll a (average of data collected during indicated period), ppb**							
Cheney Lake LM017001	18.6	13	**5.6**	**Maintain Average Chlorophyll a ≤ 10**				

*The current condition for TP was calculated utilizing USGS water quality data for samples taken from April through October from 2001 through 2010.

**The current conditions for Secchi depth and Chlorophyll a were calculated utilizing sampling data from the KDHE lake monitoring station at Cheney Lake from 1990 to 2008.

7.3 Water Quality Milestones for the North Fork Ninnescah River

While the primary focus of this plan are the high priority eutrophication and siltation TMDLs for Cheney Lake, it is anticipated that due to the implementation plan for the targeted areas within the watershed, water quality improvements may also be achieved in the major lake tributaries of the North Fork Ninnescah River. The table on the following page includes water quality goals for total phosphorus (TP), dissolved oxygen (DO), total suspended solids (TSS), and pH in the North Fork Ninnescah River.

Water Quality Milestones for North Fork Ninnescah River							
	Current Condition (2001 - 2010)* Median TP	10-Year Goal		Long Term Goal		Current Condition (2001 - 2010)* Average DO	Long Term Goal
		Improved Condition (2011 - 2021) Median TP	Total Reduction Needed	Improved Condition Median TP	Total Reduction Needed		Improved Condition DO
Sampling Sites	**Total Phosphorus (median of data collected during indicated period), ppb**					**Dissolved Oxygen (data collected during indicated period), ppm**	
North Fork Ninnescah R. (USGS Site)	117	100	**17**	80	**37**	10.2	**Maintain DO > 5 for all samples**
	Current Condition (2001 - 2010)* Average TSS	10-Year Goal		Long Term Goal		Current Condition (2001 - 2010)** % Samples pH > 8.5	Long Term Goal
		Improved Condition (2011 - 2021) Average TSS	Total Reduction Needed	Improved Condition Average TSS	Total Reduction Needed		Improved Condition % Samples pH > 8.5
Sampling Sites	**TSS (average of data collected during indicated period), ppm**					**Percent of Samples with pH > 8.5 (data collected during indicated period)**	
North Fork Ninnescah R. (USGS Site)	56	50	**6**	40	**16**	13%	**Less than 10% of samples pH > 8.5**

*The current conditions for TP, DO and TSS were calculated utilizing USGS water quality data for samples taken from 2001 through 2010.

**The current condition for pH was calculated utilizing sampling data from the KDHE monitoring station at North Fork Ninnescah from 2001 to 2010.

7.4 Additional Water Quality Indicators

In addition to the monitoring data, other water quality indicators can be utilized by KDHE and the Stakeholder Leadership Team. Such indicators may include anecdotal information from the Stakeholder Leadership Team and other citizen groups within the watershed (skin rash outbreaks, fish kills, nuisance odors), which can be used to assess short-term deviations from water quality standards. These additional indicators can act as trigger-points that might initiate further revisions or modifications to the WRAPS plan by KDHE and the Stakeholder Leadership Team.

- Taste and odor issues in public water supply from Cheney Lake
- Occurrence of algal blooms in Cheney Lake
- Visitor traffic to Cheney Lake
- Boating traffic in Cheney Lake
- Trends of quantity and quality of fishing in Cheney Lake

- Beach closings at Cheney Lake
- No fish kills on North Fork Ninnescah River

7.5 Monitoring Water Quality Progress

7.5.1 Current Monitoring Network

KDHE continues to monitor water quality in the Cheney Lake watershed by maintaining the monitoring stations located within the watershed. The map below indicates the locations of the monitoring sites located within the Cheney Lake watershed, as well as the targeted areas for implementation that have been identified and discussed in previous sections of this plan.

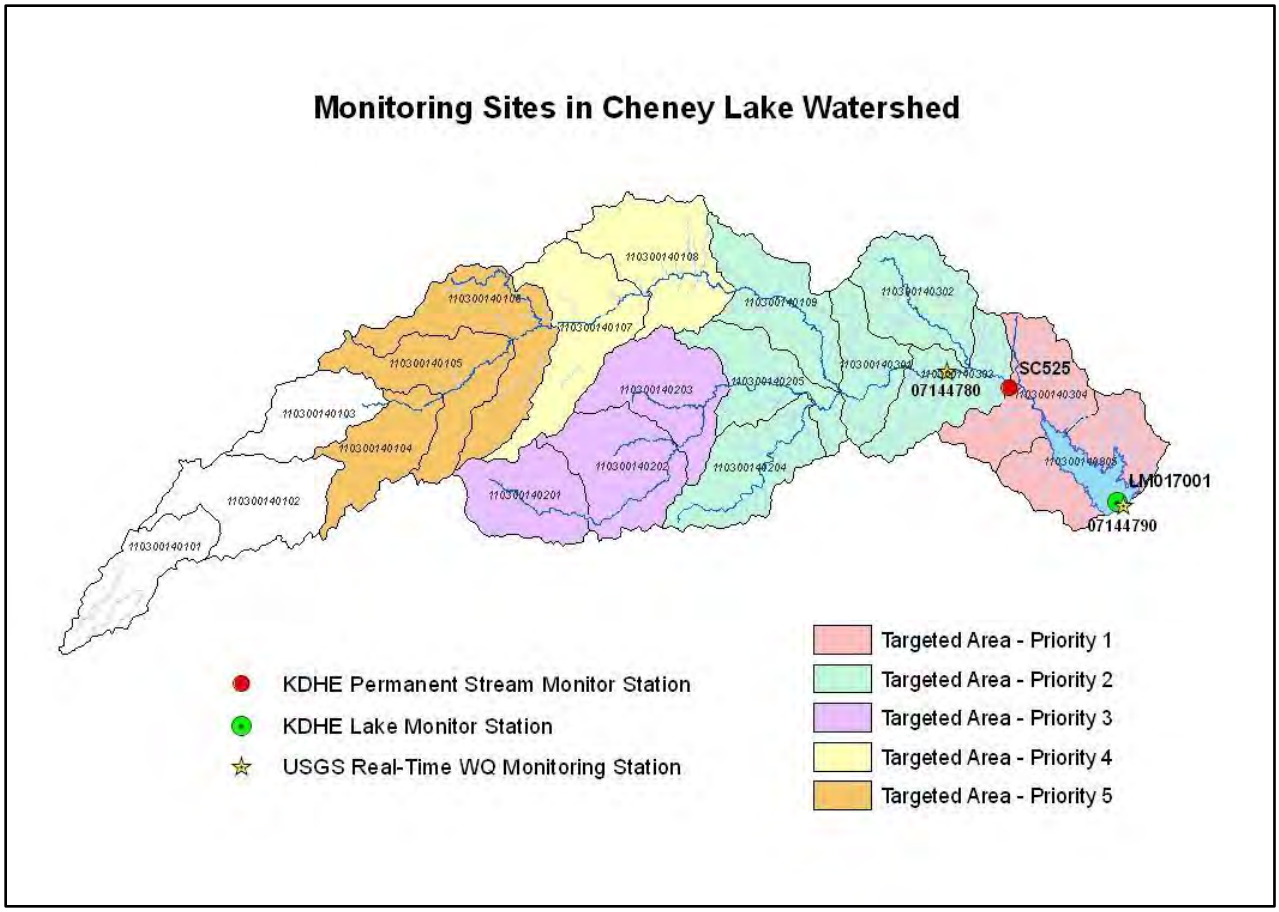


Figure 24 Monitoring Sites

The map shows the permanent KDHE monitoring station located within the Cheney Lake watershed. The KDHE permanent monitoring sites are continuously sampled for nutrients, *E. Coli* bacteria, chemicals, turbidity, alkalinity, dissolved oxygen, pH, ammonia and metals. The pollutant indicators tested for each site may vary depending on the season at collection time and other factors. The KDHE lake monitoring sites are typically sampled every 3 years. Typically, the lake monitoring takes place annually between April and October.

The U. S. Geological Survey has two monitoring stations in this watershed. One is located in the reservoir and one is on the North Fork Ninnescah River (as shown on the above map). These both have real-time data collection for 15- to 60-minute intervals, stored onsite, and then transmitted to USGS offices hourly. This type of data assures flow, runoff and daily fluxes are accounted for thus minimizing data interpretation and assumptions. Less interpretation and assumptions result in more accurate analysis leading to more realistic conclusions and decisions. On the river site, it may also help better indentify responses to practice implementation. The lake site measurements would have a much longer lag time for response to practice implementation due to in-lake loading. The current funding sources for USGS monitoring in this watershed are the City of Wichita (62.5%) and USGS (37.5%). This joint funding agreement is in effect through 2015.

7.5.2 Future Monitoring Needs

Additional monitoring in high priority sub-watersheds would provide useful data. There is good indication from other watershed studies that monitoring needs to be conducted on small scale watersheds in order to detect water quality trends. Resumption of monitoring at the Red Rock and Goose Creek sites that were previously monitored by USGS would be useful. But a paired watershed study within one of these subwatersheds would hold the greatest potential to document water quality improvements.

We would propose a 3 to 5 year study of paired watersheds within either the Goose Creek or Red Rock Creek sub-watershed with intensive implementation of conservation work in one drainage area during the monitoring period. Monitoring would include total phosphorus, total nitrogen, bacteria, atrazine (if Red Rock), and other chemical constituents. Previous USGS studies (1996-2000) indicated that Red Rock Creek had the largest nutrient concentrations and yields of any subwatershed area within the Cheney watershed. That might be one reason for monitoring within the Red Rock Creek subwatershed.

The key to creating a robust dataset on water quality trends is good research design and analysis. We do not feel that volunteer or student-run projects would provide the quality of data that would justify the expense of monitoring. Because we have USGS data from the earlier time frame we would want to maintain the consistency and quality of data collection and analysis by having USGS perform the paired watershed study. We are estimating that the costs for such a study would be $150,000 annually for a 3 to 5 year study. However, we would expect that USGS could share in the cost of the study and perhaps the City of Wichita would be willing to bear a portion of the cost as well.

Whether or not this study is initiated in the Cheney Lake Watershed, we feel that such a study in the State of Kansas would help demonstrate the potential for water quality improvement with focused voluntary implementation of conservation work. Such a project would also provide insight into the strategies needed to transition from random conservation work to focused implementation.

7.5.3 Evaluation of Monitoring Data

Monitoring data in the Cheney Lake watershed will be used to determine water quality progress, track water quality milestones, and to determine the effectiveness of the implementation of conservation practices outlined in the plan. The schedule of review for the monitoring data will be tied to the water quality milestones that have been developed, as well as the frequency of the sampling data. It should be noted that the current TMDLs for Cheney Lake are scheduled to be reviewed by KDHE in the fall of 2011. Monitoring data will be utilized at that time to determine necessary modifications to the TMDL.

The implementation schedule and water quality milestones for the Cheney Lake watershed extend through a 25-year period from 2011 to 2036. Throughout that period, KDHE will continue to analyze and evaluate the monitoring data collected. After the first ten years of monitoring and implementation of conservation practices, KDHE will evaluate the available water quality data to determine whether the water quality milestones have been achieved. If milestones are not achieved, KDHE will assist the Cheney Lake Citizens Management Committee in analyzing and understanding the context for non-achievement, as well as the need to review and/or revise the water quality milestones included in the plan. KDHE and the Citizens Management Committee can address any necessary modifications or revisions to the plan based on the data analysis. In 2036, at the end of the plan, a determination can be made as to whether the water quality standards have been attained.

In addition to the planned review of the monitoring data and water quality milestones, KDHE and the Stakeholder Leadership Team may revisit the plan in shorter increments. This would allow KDHE and the Citizens Management Committee to evaluate new information, incorporate any revisions to applicable TMDLs, or address any potential water quality indicators that might trigger an immediate review.

*NOTE: Sub-watersheds in the tables within the Appendices are not HUC 12 or 14 based, but rather are delineated by the SWAT computer model used to estimate watershed loading. See the map below for sub-watershed areas corresponding to the tables.

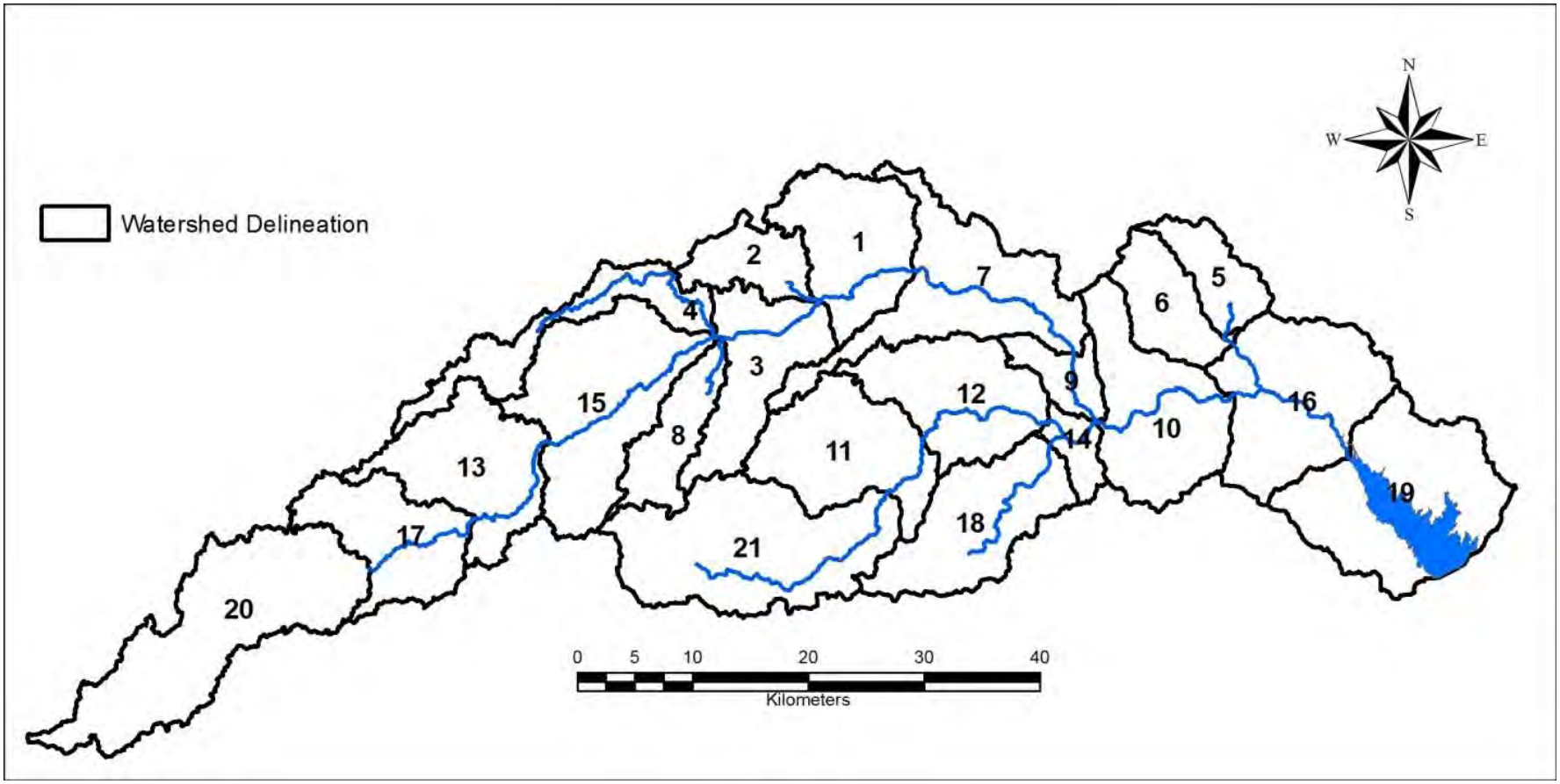


Figure 25 Sub-watersheds as delineated by the SWAT model for loading estimates.

8 APPENDIX A: SWAT AND DATA SOURCES

The Cheney Lake Watershed was assessed using the Soil and Water Assessment Tool (SWAT) by Kansas State University Department of Agronomy. SWAT was used as an assessment tool to estimate annual average pollutant loadings such as nutrients and sediment that are coming from the land into the stream. At the end of simulation runs the average annual loads are calculated for each subwatershed.

The SWAT model was developed by USDA-ARS from numerous equations and relationships that have evolved from years of runoff and erosion research in combination with other models used to estimate pollutant loads from animal feedlots, fertilizer and agrochemical applications, etc. The SWAT model has been tested for a wide range of regions, conditions, practices, and time scales.

Evaluation of monthly and annual streamflow and pollutant outputs indicate SWAT functioned well in a wide range of watersheds. The model directly accounts for many types of common agricultural conservation practices, including terraces and small ponds; management practices, including fertilizer applications; and common landscape features, including grass waterways. The model incorporates various grazing management practices by specifying amount of manure applied to the pasture or grassland, grazing periods, and amount of biomass consumed or trampled daily by the livestock. Septic systems, NPDES discharges, and other point-sources are considered as combined point-sources and applied to inlets of subwatersheds. These features made SWAT a good tool for assessing rural watersheds in Kansas.

The SWAT model is a physically based, deterministic, continuous, watershed scale simulation model developed by the USDA Agricultural Research Service. ArcSWAT version 2009.93.5 with the ArcGIS version 9.3 interface was used. It uses spatially distributed data on topography, soils, land cover, land management, and weather to predict water, sediment, nutrient, and pesticide yields. A modeled watershed is divided spatially into subwatersheds using digital elevation data according to the drainage area specified by the user. Subwatersheds are modeled as having non-uniform slope, uniform climatic conditions determined from the nearest weather station, and they are further subdivided into lumped, non-spatial hydrologic response units (HRUs) consisting of all areas within the subwatershed having similar soil, land use, and slope characteristics. The use of HRUs allows slope, soil, and land-use heterogeneity to be simulated within each subwatershed, but ignores pollutant attenuation between the source area and stream and limits

spatial representation of wetlands, buffers, and other conservation practices within a subwatershed.

The model includes subbasin, reservoir, and channel routing components:

1. The subbasin component simulates runoff and erosion processes, soil water movement, evapotranspiration, crop growth and yield, soil nutrient and carbon cycling, and pesticide and bacteria degradation and transport. It allows simulation of a wide array of agricultural structures and practices, including tillage, fertilizer and manure application, subsurface drainage, irrigation, ponds and wetlands, and edge-of-field buffers. Sediment yield is estimated for each subbasin with the Modified Universal Soil Loss Equation (MUSLE). The hydrology model supplies estimates of runoff volume and peak runoff rates. The crop management factor is evaluated as a function of above ground biomass, residue on the surface, and the minimum C factor for the crop.

2. The reservoir component detains water, sediments, and pollutants, and degrades nutrients, pesticides and bacteria during detention. This component was not used during the simulations.

3. The channel component routes flows, settles and entrains sediment, and degrades nutrients, pesticides and bacteria during transport. SWAT produces daily results for every subwatershed outlet, each of which can be summed to provide daily, monthly, and annual load estimates. The sediment deposition component is based on fall velocity, and the sediment degradation component is based on Bagnold's stream power concepts. Bed degradation is adjusted by the USLE soil erodibility and cover factors of the channel and the floodplain. The sediment deposition was utilized, but the channel degradation and nutrient degradation components were not utilized in the simulations.

Data for the Cheney Lake SWAT model were collected from a variety of reliable online and printed data sources and knowledgeable agency personnel within the watershed. Input data and their online sources are:

1. 30-meter DEM (USGS National Elevation Dataset)
2. 30-m USDA National Crop Data Layer from 2006, 2007, 2008, and 2009 were combined to produce spatially distributed cropping system information (USDA-NRCS)
3. Soil Survey Geographic (SSURGO) soil dataset (USDA-NRCS)
4. NCDC NOAA daily weather data (NOAA National Climatic Data Center)

5. Point sources from KDHE were assessed based on permited discharges and interviews with discharge system operators. The discharges were minimal relative to other watershed features and were therefore not included in the model.
6. Crop rotations based on muli-year analysis of the USDA NCDL and local knowledge of farming practices.
7. Grazing management practices (local knowledge)

9 APPENDIX B: DETAILED SOIL EROSION REDUCTION BY SUB WATERSHED

Sub Watershed #5 Annual Soil Erosion Reduction (Tons)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	51	108	202	81	1	318	760
2	102	215	403	161	2	635	1,519
3	153	323	605	242	3	953	2,279
4	204	430	807	323	4	1,270	3,039
5	256	538	1,009	403	5	1,588	3,798
6	307	646	1,210	484	6	1,905	4,558
7	358	753	1,412	565	7	2,223	5,318
8	409	861	1,614	646	8	2,540	6,077
9	460	968	1,816	726	9	2,858	6,837
10	511	1,076	2,017	807	10	3,175	7,597
11	562	1,184	2,219	888	11	3,493	8,356
12	613	1,291	2,421	968	12	3,810	9,116
13	664	1,399	2,623	1,049	13	4,128	9,876
14	715	1,506	2,824	1,130	14	4,446	10,636
15	767	1,614	3,026	1,210	15	4,763	11,395
16	818	1,721	3,228	1,291	16	5,081	12,155
17	869	1,829	3,429	1,372	17	5,398	12,915
18	920	1,937	3,631	1,452	18	5,716	13,674
19	971	2,044	3,833	1,533	19	6,033	14,434
20	1,022	2,152	4,035	1,614	20	6,351	15,194
21	1,073	2,259	4,236	1,695	21	6,668	15,953
22	1,124	2,367	4,438	1,775	22	6,986	16,713
23	1,175	2,475	4,640	1,856	23	7,303	17,473
24	1,227	2,582	4,842	1,937	24	7,621	18,232
25	1,278	2,690	5,043	2,017	25	7,938	18,992

Sub Watershed #6 Annual Soil Erosion Reduction (Tons)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	59	125	235	94	1	280	794
2	119	250	469	188	2	559	1,587
3	178	375	704	281	3	839	2,381

4	238	500	938	375	4	1,119	3,174
5	297	626	1,173	469	4	1,398	3,968
6	357	751	1,407	563	5	1,678	4,761
7	416	876	1,642	657	6	1,958	5,555
8	475	1,001	1,877	751	7	2,238	6,348
9	535	1,126	2,111	844	8	2,517	7,142
10	594	1,251	2,346	938	9	2,797	7,935
11	654	1,376	2,580	1,032	10	3,077	8,729
12	713	1,501	2,815	1,126	11	3,356	9,522
13	772	1,626	3,049	1,220	12	3,636	10,316
14	832	1,751	3,284	1,314	13	3,916	11,109
15	891	1,877	3,518	1,407	13	4,195	11,903
16	951	2,002	3,753	1,501	14	4,475	12,696
17	1,010	2,127	3,988	1,595	15	4,755	13,490
18	1,070	2,252	4,222	1,689	16	5,034	14,283
19	1,129	2,377	4,457	1,783	17	5,314	15,077
20	1,188	2,502	4,691	1,877	18	5,594	15,870
21	1,248	2,627	4,926	1,970	19	5,874	16,664
22	1,307	2,752	5,160	2,064	20	6,153	17,457
23	1,367	2,877	5,395	2,158	21	6,433	18,251
24	1,426	3,002	5,630	2,252	21	6,713	19,044
25	1,486	3,128	5,864	2,346	22	6,992	19,838

Sub Watershed #7 Annual Soil Erosion Reduction (Tons)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	5	11	20	8	0	0	44
2	10	21	40	16	0	0	88
3	15	32	60	24	0	0	132
4	20	43	80	32	0	0	176
5	25	54	101	40	0	0	220
6	31	64	121	48	0	0	264
7	36	75	141	56	1	0	308
8	41	86	161	64	1	0	352
9	46	97	181	72	1	0	396
10	51	107	201	80	1	0	440
11	56	118	221	88	1	0	484
12	61	129	241	97	1	0	529
13	66	139	261	105	1	0	573
14	71	150	281	113	1	0	617
15	76	161	302	121	1	0	661
16	81	172	322	129	1	0	705
17	87	182	342	137	1	0	749

18	92	193	362	145	1	0	793
19	97	204	382	153	2	0	837
20	102	214	402	161	2	0	881
21	107	225	422	169	2	0	925
22	112	236	442	177	2	0	969
23	117	247	462	185	2	0	1,013
24	122	257	483	193	2	0	1,057
25	127	268	503	201	2	0	1,101

Sub Watershed #9 Annual Soil Erosion Reduction (Tons)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	17	35	66	27	1	0	146
2	34	71	133	53	1	0	292
3	50	106	199	80	2	0	437
4	67	142	266	106	3	0	583
5	84	177	332	133	3	0	729
6	101	212	398	159	4	0	875
7	118	248	465	186	5	0	1,021
8	135	283	531	212	5	0	1,166
9	151	319	597	239	6	0	1,312
10	168	354	664	266	6	0	1,458
11	185	389	730	292	7	0	1,604
12	202	425	797	319	8	0	1,750
13	219	460	863	345	8	0	1,896
14	235	496	929	372	9	0	2,041
15	252	531	996	398	10	0	2,187
16	269	566	1,062	425	10	0	2,333
17	286	602	1,129	451	11	0	2,479
18	303	637	1,195	478	12	0	2,625
19	320	673	1,261	505	12	0	2,770
20	336	708	1,328	531	13	0	2,916
21	353	744	1,394	558	14	0	3,062
22	370	779	1,461	584	14	0	3,208
23	387	814	1,527	611	15	0	3,354
24	404	850	1,593	637	16	0	3,499
25	420	885	1,660	664	16	0	3,645

Sub Watershed #10 Annual Soil Erosion Reduction (Tons)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	49	102	192	77	1	0	420

2	97	205	384	154	1	0	841
3	146	307	576	230	2	0	1,261
4	195	410	768	307	2	0	1,682
5	243	512	960	384	3	0	2,102
6	292	614	1,152	461	4	0	2,523
7	340	717	1,344	538	4	0	2,943
8	389	819	1,536	614	5	0	3,363
9	438	922	1,728	691	6	0	3,784
10	486	1,024	1,920	768	6	0	4,204
11	535	1,126	2,112	845	7	0	4,625
12	584	1,229	2,304	922	7	0	5,045
13	632	1,331	2,496	998	8	0	5,466
14	681	1,433	2,688	1,075	9	0	5,886
15	730	1,536	2,880	1,152	9	0	6,306
16	778	1,638	3,072	1,229	10	0	6,727
17	827	1,741	3,264	1,306	11	0	7,147
18	875	1,843	3,456	1,382	11	0	7,568
19	924	1,945	3,648	1,459	12	0	7,988
20	973	2,048	3,840	1,536	12	0	8,409
21	1,021	2,150	4,032	1,613	13	0	8,829
22	1,070	2,253	4,224	1,689	14	0	9,249
23	1,119	2,355	4,416	1,766	14	0	9,670
24	1,167	2,457	4,608	1,843	15	0	10,090
25	1,216	2,560	4,800	1,920	16	0	10,511

Sub Watershed #12 Annual Soil Erosion Reduction (Tons)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	18	38	72	29	0	0	158
2	37	77	144	58	1	0	316
3	55	115	216	87	1	0	474
4	73	154	289	115	1	0	632
5	91	192	361	144	1	0	790
6	110	231	433	173	2	0	948
7	128	269	505	202	2	0	1,106
8	146	308	577	231	2	0	1,264
9	164	346	649	260	3	0	1,423
10	183	385	721	289	3	0	1,581
11	201	423	794	317	3	0	1,739
12	219	462	866	346	4	0	1,897
13	238	500	938	375	4	0	2,055
14	256	539	1,010	404	4	0	2,213
15	274	577	1,082	433	4	0	2,371

16	292	616	1,154	462	5	0	2,529
17	311	654	1,226	491	5	0	2,687
18	329	693	1,299	519	5	0	2,845
19	347	731	1,371	548	6	0	3,003
20	366	770	1,443	577	6	0	3,161
21	384	808	1,515	606	6	0	3,319
22	402	847	1,587	635	7	0	3,477
23	420	885	1,659	664	7	0	3,635
24	439	923	1,732	693	7	0	3,793
25	457	962	1,804	721	7	0	3,951

Sub Watershed #14 Annual Soil Erosion Reduction (Tons)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	14	29	54	22	1	0	119
2	27	58	108	43	1	0	238
3	41	86	162	65	2	0	356
4	55	115	216	86	3	0	475
5	68	144	270	108	4	0	594
6	82	173	324	130	4	0	713
7	96	202	378	151	5	0	831
8	109	230	432	173	6	0	950
9	123	259	486	194	7	0	1,069
10	137	288	540	216	7	0	1,188
11	150	317	594	238	8	0	1,307
12	164	346	648	259	9	0	1,425
13	178	374	702	281	9	0	1,544
14	191	403	756	302	10	0	1,663
15	205	432	810	324	11	0	1,782
16	219	461	864	346	12	0	1,901
17	233	490	918	367	12	0	2,019
18	246	518	972	389	13	0	2,138
19	260	547	1,026	410	14	0	2,257
20	274	576	1,080	432	15	0	2,376
21	287	605	1,134	454	15	0	2,494
22	301	633	1,188	475	16	0	2,613
23	315	662	1,242	497	17	0	2,732
24	328	691	1,296	518	17	0	2,851
25	342	720	1,350	540	18	0	2,970

Sub Watershed #18 Annual Soil Erosion Reduction (Tons)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	60	127	238	95	0	0	520
2	120	254	475	190	1	0	1,041
3	181	380	713	285	1	0	1,561
4	241	507	951	380	2	0	2,081
5	301	634	1,189	475	2	0	2,601
6	361	761	1,426	570	3	0	3,122
7	422	887	1,664	666	3	0	3,642
8	482	1,014	1,902	761	4	0	4,162
9	542	1,141	2,139	856	4	0	4,682
10	602	1,268	2,377	951	5	0	5,203
11	662	1,395	2,615	1,046	5	0	5,723
12	723	1,521	2,852	1,141	6	0	6,243
13	783	1,648	3,090	1,236	6	0	6,763
14	843	1,775	3,328	1,331	7	0	7,284
15	903	1,902	3,566	1,426	7	0	7,804
16	964	2,028	3,803	1,521	8	0	8,324
17	1,024	2,155	4,041	1,616	8	0	8,845
18	1,084	2,282	4,279	1,711	9	0	9,365
19	1,144	2,409	4,516	1,807	9	0	9,885
20	1,204	2,536	4,754	1,902	10	0	10,405
21	1,265	2,662	4,992	1,997	10	0	10,926
22	1,325	2,789	5,230	2,092	11	0	11,446
23	1,385	2,916	5,467	2,187	11	0	11,966
24	1,445	3,043	5,705	2,282	12	0	12,486
25	1,505	3,169	5,943	2,377	12	0	13,007

Sub Watershed #16 Annual Soil Erosion Reduction (Tons)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	129	271	102	203	3	0	707
2	257	541	203	406	6	0	1,414
3	386	812	305	609	9	0	2,121
4	514	1,083	406	812	13	0	2,828
5	643	1,354	508	1,015	16	0	3,535
6	772	1,624	609	1,218	19	0	4,242
7	900	1,895	711	1,421	22	0	4,949
8	1,029	2,166	812	1,624	25	0	5,656
9	1,157	2,437	914	1,827	28	0	6,363
10	1,286	2,707	1,015	2,031	31	0	7,070
11	1,415	2,978	1,117	2,234	34	0	7,778

12	1,543	3,249	1,218	2,437	38	0	8,485
13	1,672	3,520	1,320	2,640	41	0	9,192
14	1,800	3,790	1,421	2,843	44	0	9,899
15	1,929	4,061	1,523	3,046	47	0	10,606
16	2,058	4,332	1,624	3,249	50	0	11,313
17	2,186	4,603	1,726	3,452	53	0	12,020
18	2,315	4,873	1,827	3,655	56	0	12,727
19	2,443	5,144	1,929	3,858	59	0	13,434
20	2,572	5,415	2,031	4,061	63	0	14,141
21	2,701	5,686	2,132	4,264	66	0	14,848
22	2,829	5,956	2,234	4,467	69	0	15,555
23	2,958	6,227	2,335	4,670	72	0	16,262
24	3,086	6,498	2,437	4,873	75	0	16,969
25	3,215	6,768	2,538	5,076	78	0	17,676

Sub Watershed #19 Annual Soil Erosion Reduction (Tons)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	169	356	134	267	5	0	931
2	338	712	267	534	10	0	1,861
3	507	1,068	401	801	15	0	2,792
4	676	1,424	534	1,068	20	0	3,723
5	846	1,780	668	1,335	25	0	4,653
6	1,015	2,136	801	1,602	30	0	5,584
7	1,184	2,492	935	1,869	34	0	6,514
8	1,353	2,848	1,068	2,136	39	0	7,445
9	1,522	3,204	1,202	2,403	44	0	8,376
10	1,691	3,560	1,335	2,670	49	0	9,306
11	1,860	3,916	1,469	2,937	54	0	10,237
12	2,029	4,272	1,602	3,204	59	0	11,168
13	2,199	4,629	1,736	3,471	64	0	12,098
14	2,368	4,985	1,869	3,738	69	0	13,029
15	2,537	5,341	2,003	4,005	74	0	13,960
16	2,706	5,697	2,136	4,272	79	0	14,890
17	2,875	6,053	2,270	4,540	84	0	15,821
18	3,044	6,409	2,403	4,807	89	0	16,751
19	3,213	6,765	2,537	5,074	94	0	17,682
20	3,382	7,121	2,670	5,341	99	0	18,613
21	3,552	7,477	2,804	5,608	103	0	19,543
22	3,721	7,833	2,937	5,875	108	0	20,474
23	3,890	8,189	3,071	6,142	113	0	21,405
24	4,059	8,545	3,204	6,409	118	0	22,335
25	4,228	8,901	3,338	6,676	123	0	23,266

10 APPENDIX C: DETAILED PHOSPHORUS LOAD REDUCTION BY SUB WATERSHED

Sub Watershed #5 Annual Phosphorous Runoff Reduction (pounds)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	46	96	96	72	1	284	595
2	91	192	192	144	2	568	1,190
3	137	289	289	216	3	852	1,785
4	183	385	385	289	4	1,136	2,381
5	229	481	481	361	5	1,420	2,976
6	274	577	577	433	5	1,704	3,571
7	320	674	674	505	6	1,988	4,166
8	366	770	770	577	7	2,272	4,761
9	411	866	866	649	8	2,556	5,356
10	457	962	962	722	9	2,840	5,952
11	503	1,058	1,058	794	10	3,124	6,547
12	548	1,155	1,155	866	11	3,408	7,142
13	594	1,251	1,251	938	12	3,692	7,737
14	640	1,347	1,347	1,010	13	3,975	8,332
15	686	1,443	1,443	1,082	14	4,259	8,927
16	731	1,539	1,539	1,155	15	4,543	9,523
17	777	1,636	1,636	1,227	15	4,827	10,118
18	823	1,732	1,732	1,299	16	5,111	10,713
19	868	1,828	1,828	1,371	17	5,395	11,308
20	914	1,924	1,924	1,443	18	5,679	11,903
21	960	2,021	2,021	1,515	19	5,963	12,498
22	1,005	2,117	2,117	1,588	20	6,247	13,094
23	1,051	2,213	2,213	1,660	21	6,531	13,689
24	1,097	2,309	2,309	1,732	22	6,815	14,284
25	1,143	2,405	2,405	1,804	23	7,099	14,879

Sub Watershed #6 Annual Phosphorous Runoff Reduction (pounds)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	60	126	126	95	1	282	691
2	120	253	253	189	2	565	1,381
3	180	379	379	284	3	847	2,072
4	240	505	505	379	4	1,130	2,763
5	300	632	632	474	5	1,412	3,454
6	360	758	758	568	5	1,695	4,144

7	420	884	884	663	6	1,977	4,835
8	480	1,011	1,011	758	7	2,259	5,526
9	540	1,137	1,137	853	8	2,542	6,216
10	600	1,263	1,263	947	9	2,824	6,907
11	660	1,390	1,390	1,042	10	3,107	7,598
12	720	1,516	1,516	1,137	11	3,389	8,289
13	780	1,642	1,642	1,232	12	3,672	8,979
14	840	1,769	1,769	1,326	13	3,954	9,670
15	900	1,895	1,895	1,421	14	4,236	10,361
16	960	2,021	2,021	1,516	14	4,519	11,052
17	1,020	2,147	2,147	1,611	15	4,801	11,742
18	1,080	2,274	2,274	1,705	16	5,084	12,433
19	1,140	2,400	2,400	1,800	17	5,366	13,124
20	1,200	2,526	2,526	1,895	18	5,649	13,814
21	1,260	2,653	2,653	1,990	19	5,931	14,505
22	1,320	2,779	2,779	2,084	20	6,213	15,196
23	1,380	2,905	2,905	2,179	21	6,496	15,887
24	1,440	3,032	3,032	2,274	22	6,778	16,577
25	1,500	3,158	3,158	2,369	23	7,061	17,268

Sub Watershed #7 Annual Phosphorous Runoff Reduction (pounds)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	4	9	9	7	0	0	30
2	9	19	19	14	0	0	61
3	13	28	28	21	0	0	91
4	18	38	38	28	0	0	122
5	22	47	47	35	0	0	152
6	27	56	56	42	0	0	182
7	31	66	66	49	0	0	213
8	36	75	75	56	1	0	243
9	40	85	85	63	1	0	274
10	45	94	94	71	1	0	304
11	49	103	103	78	1	0	334
12	54	113	113	85	1	0	365
13	58	122	122	92	1	0	395
14	63	132	132	99	1	0	425
15	67	141	141	106	1	0	456
16	71	150	150	113	1	0	486
17	76	160	160	120	1	0	517
18	80	169	169	127	1	0	547
19	85	179	179	134	1	0	577
20	89	188	188	141	1	0	608

21	94	197	197	148	1	0	638
22	98	207	207	155	2	0	669
23	103	216	216	162	2	0	699
24	107	226	226	169	2	0	729
25	112	235	235	176	2	0	760

Sub Watershed #9 Annual Phosphorous Runoff Reduction (pounds)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	13	28	28	21	1	0	91
2	27	56	56	42	1	0	182
3	40	84	84	63	2	0	273
4	53	112	112	84	2	0	364
5	67	140	140	105	3	0	455
6	80	168	168	126	3	0	546
7	93	196	196	147	4	0	637
8	107	224	224	168	4	0	728
9	120	252	252	189	5	0	819
10	133	280	280	210	5	0	910
11	147	308	308	231	6	0	1,000
12	160	337	337	252	6	0	1,091
13	173	365	365	273	7	0	1,182
14	186	393	393	294	7	0	1,273
15	200	421	421	315	8	0	1,364
16	213	449	449	337	8	0	1,455
17	226	477	477	358	9	0	1,546
18	240	505	505	379	9	0	1,637
19	253	533	533	400	10	0	1,728
20	266	561	561	421	10	0	1,819
21	280	589	589	442	11	0	1,910
22	293	617	617	463	11	0	2,001
23	306	645	645	484	12	0	2,092
24	320	673	673	505	12	0	2,183
25	333	701	701	526	13	0	2,274

Sub Watershed #10 Annual Phosphorous Runoff Reduction (pounds)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	37	78	78	58	0	0	251
2	74	155	155	117	1	0	502
3	111	233	233	175	1	0	753
4	148	311	311	233	2	0	1,004

5	185	389	389	291	2	0	1,255
6	221	466	466	350	3	0	1,507
7	258	544	544	408	3	0	1,758
8	295	622	622	466	4	0	2,009
9	332	699	699	525	4	0	2,260
10	369	777	777	583	5	0	2,511
11	406	855	855	641	5	0	2,762
12	443	933	933	699	6	0	3,013
13	480	1,010	1,010	758	6	0	3,264
14	517	1,088	1,088	816	7	0	3,515
15	554	1,166	1,166	874	7	0	3,766
16	591	1,243	1,243	933	8	0	4,018
17	628	1,321	1,321	991	8	0	4,269
18	664	1,399	1,399	1,049	8	0	4,520
19	701	1,477	1,477	1,107	9	0	4,771
20	738	1,554	1,554	1,166	9	0	5,022
21	775	1,632	1,632	1,224	10	0	5,273
22	812	1,710	1,710	1,282	10	0	5,524
23	849	1,787	1,787	1,341	11	0	5,775
24	886	1,865	1,865	1,399	11	0	6,026
25	923	1,943	1,943	1,457	12	0	6,277

Sub Watershed #12 Annual Phosphorous Runoff Reduction (pounds)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	13	28	28	21	0	0	91
2	27	56	56	42	0	0	181
3	40	84	84	63	1	0	272
4	53	112	112	84	1	0	362
5	67	140	140	105	1	0	453
6	80	168	168	126	1	0	543
7	93	196	196	147	2	0	634
8	106	224	224	168	2	0	725
9	120	252	252	189	2	0	815
10	133	280	280	210	2	0	906
11	146	308	308	231	2	0	996
12	160	336	336	252	3	0	1,087
13	173	364	364	273	3	0	1,177
14	186	392	392	294	3	0	1,268
15	200	420	420	315	3	0	1,359
16	213	448	448	336	3	0	1,449
17	226	476	476	357	4	0	1,540
18	240	504	504	378	4	0	1,630

19	253	532	532	399	4	0	1,721
20	266	560	560	420	4	0	1,811
21	279	588	588	441	5	0	1,902
22	293	616	616	462	5	0	1,993
23	306	644	644	483	5	0	2,083
24	319	672	672	504	5	0	2,174
25	333	700	700	525	5	0	2,264

Sub Watershed #14 Annual Phosphorous Runoff Reduction (pounds)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	9	18	18	13	0	0	58
2	17	36	36	27	1	0	116
3	26	54	54	40	1	0	175
4	34	72	72	54	2	0	233
5	43	89	89	67	2	0	291
6	51	107	107	81	3	0	349
7	60	125	125	94	3	0	407
8	68	143	143	107	4	0	465
9	77	161	161	121	4	0	524
10	85	179	179	134	5	0	582
11	94	197	197	148	5	0	640
12	102	215	215	161	5	0	698
13	111	233	233	174	6	0	756
14	119	251	251	188	6	0	814
15	128	268	268	201	7	0	873
16	136	286	286	215	7	0	931
17	145	304	304	228	8	0	989
18	153	322	322	242	8	0	1,047
19	162	340	340	255	9	0	1,105
20	170	358	358	268	9	0	1,163
21	179	376	376	282	10	0	1,222
22	187	394	394	295	10	0	1,280
23	196	412	412	309	10	0	1,338
24	204	430	430	322	11	0	1,396
25	213	447	447	336	11	0	1,454

Sub Watershed #18 Annual Phosphorous Runoff Reduction (pounds)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	41	87	87	65	0	0	281
2	83	174	174	131	1	0	563

3	124	261	261	196	1	0	844
4	166	348	348	261	1	0	1,125
5	207	436	436	327	2	0	1,406
6	248	523	523	392	2	0	1,688
7	290	610	610	457	2	0	1,969
8	331	697	697	523	3	0	2,250
9	372	784	784	588	3	0	2,532
10	414	871	871	653	3	0	2,813
11	455	958	958	719	4	0	3,094
12	497	1,045	1,045	784	4	0	3,376
13	538	1,133	1,133	849	4	0	3,657
14	579	1,220	1,220	915	5	0	3,938
15	621	1,307	1,307	980	5	0	4,219
16	662	1,394	1,394	1,045	5	0	4,501
17	704	1,481	1,481	1,111	6	0	4,782
18	745	1,568	1,568	1,176	6	0	5,063
19	786	1,655	1,655	1,241	6	0	5,345
20	828	1,742	1,742	1,307	7	0	5,626
21	869	1,830	1,830	1,372	7	0	5,907
22	910	1,917	1,917	1,437	7	0	6,189
23	952	2,004	2,004	1,503	8	0	6,470
24	993	2,091	2,091	1,568	8	0	6,751
25	1,035	2,178	2,178	1,634	8	0	7,032

Sub Watershed #16 Annual Phosphorous Runoff Reduction (pounds)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	79	167	33	125	2	0	408
2	159	335	67	251	4	0	815
3	238	502	100	376	6	0	1,223
4	318	669	134	502	8	0	1,631
5	397	837	167	627	10	0	2,038
6	477	1,004	201	753	12	0	2,446
7	556	1,171	234	878	14	0	2,854
8	636	1,338	268	1,004	15	0	3,261
9	715	1,506	301	1,129	17	0	3,669
10	795	1,673	335	1,255	19	0	4,077
11	874	1,840	368	1,380	21	0	4,484
12	954	2,008	402	1,506	23	0	4,892
13	1,033	2,175	435	1,631	25	0	5,300
14	1,113	2,342	468	1,757	27	0	5,707
15	1,192	2,510	502	1,882	29	0	6,115

16	1,272	2,677	535	2,008	31	0	6,523
17	1,351	2,844	569	2,133	33	0	6,930
18	1,431	3,012	602	2,259	35	0	7,338
19	1,510	3,179	636	2,384	37	0	7,746
20	1,589	3,346	669	2,510	39	0	8,153
21	1,669	3,514	703	2,635	41	0	8,561
22	1,748	3,681	736	2,761	43	0	8,969
23	1,828	3,848	770	2,886	44	0	9,376
24	1,907	4,015	803	3,012	46	0	9,784
25	1,987	4,183	837	3,137	48	0	10,192

Sub Watershed #19 Annual Phosphorous Runoff Reduction (pounds)

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total
1	88	185	37	139	3	0	451
2	175	369	74	277	5	0	901
3	263	554	111	416	8	0	1,352
4	351	739	148	554	10	0	1,802
5	439	924	185	693	13	0	2,253
6	526	1,108	222	831	15	0	2,703
7	614	1,293	259	970	18	0	3,154
8	702	1,478	296	1,108	20	0	3,604
9	790	1,663	333	1,247	23	0	4,055
10	877	1,847	369	1,385	26	0	4,505
11	965	2,032	406	1,524	28	0	4,956
12	1,053	2,217	443	1,663	31	0	5,406
13	1,141	2,401	480	1,801	33	0	5,857
14	1,228	2,586	517	1,940	36	0	6,307
15	1,316	2,771	554	2,078	38	0	6,758
16	1,404	2,956	591	2,217	41	0	7,208
17	1,492	3,140	628	2,355	43	0	7,659
18	1,579	3,325	665	2,494	46	0	8,110
19	1,667	3,510	702	2,632	49	0	8,560
20	1,755	3,695	739	2,771	51	0	9,011
21	1,843	3,879	776	2,910	54	0	9,461
22	1,930	4,064	813	3,048	56	0	9,912
23	2,018	4,249	850	3,187	59	0	10,362
24	2,106	4,434	887	3,325	61	0	10,813
25	2,194	4,618	924	3,464	64	0	11,263

11 APPENDIX D: COSTS ASSOCIATED WITH CONSERVATION PRACTICES

Sub Watershed #5 Total Annual Cost Before Cost-Share, Cropland Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$2,382	$13,500	$6,170	$8,100	$1,500	$42,750	$74,402
2	$2,454	$13,905	$6,355	$8,343	$1,545	$44,033	$76,634
3	$2,527	$14,322	$6,545	$8,593	$1,591	$45,353	$78,933
4	$2,603	$14,752	$6,742	$8,851	$1,639	$46,714	$81,301
5	$2,681	$15,195	$6,944	$9,117	$1,688	$48,116	$83,740
6	$2,762	$15,650	$7,152	$9,390	$1,739	$49,559	$86,252
7	$2,845	$16,120	$7,367	$9,672	$1,791	$51,046	$88,840
8	$2,930	$16,603	$7,588	$9,962	$1,845	$52,577	$91,505
9	$3,018	$17,102	$7,815	$10,261	$1,900	$54,154	$94,250
10	$3,108	$17,615	$8,050	$10,569	$1,957	$55,779	$97,078
11	$3,202	$18,143	$8,291	$10,886	$2,016	$57,452	$99,990
12	$3,298	$18,687	$8,540	$11,212	$2,076	$59,176	$102,990
13	$3,397	$19,248	$8,796	$11,549	$2,139	$60,951	$106,080
14	$3,499	$19,825	$9,060	$11,895	$2,203	$62,780	$109,262
15	$3,604	$20,420	$9,332	$12,252	$2,269	$64,663	$112,540
16	$3,712	$21,033	$9,612	$12,620	$2,337	$66,603	$115,916
17	$3,823	$21,664	$9,900	$12,998	$2,407	$68,601	$119,394
18	$3,938	$22,314	$10,197	$13,388	$2,479	$70,659	$122,975
19	$4,056	$22,983	$10,503	$13,790	$2,554	$72,779	$126,665
20	$4,178	$23,673	$10,818	$14,204	$2,630	$74,962	$130,465
21	$4,303	$24,383	$11,143	$14,630	$2,709	$77,211	$134,379
22	$4,432	$25,114	$11,477	$15,069	$2,790	$79,528	$138,410
23	$4,565	$25,868	$11,822	$15,521	$2,874	$81,913	$142,562
24	$4,702	$26,644	$12,176	$15,986	$2,960	$84,371	$146,839
25	$4,843	$27,443	$12,541	$16,466	$3,049	$86,902	$151,244

Sub Watershed #6 Total Annual Cost Before Cost-Share, Cropland BMPs

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$3,145	$17,821	$8,144	$10,693	$1,500	$42,750	$84,053
2	$3,239	$18,356	$8,389	$11,013	$1,545	$44,033	$86,575
3	$3,336	$18,906	$8,640	$11,344	$1,591	$45,353	$89,172
4	$3,437	$19,474	$8,899	$11,684	$1,639	$46,714	$91,847
5	$3,540	$20,058	$9,166	$12,035	$1,688	$48,116	$94,602
6	$3,646	$20,660	$9,441	$12,396	$1,739	$49,559	$97,440
7	$3,755	$21,279	$9,725	$12,768	$1,791	$51,046	$100,364
8	$3,868	$21,918	$10,016	$13,151	$1,845	$52,577	$103,375
9	$3,984	$22,575	$10,317	$13,545	$1,900	$54,154	$106,476
10	$4,103	$23,253	$10,626	$13,952	$1,957	$55,779	$109,670
11	$4,226	$23,950	$10,945	$14,370	$2,016	$57,452	$112,960
12	$4,353	$24,669	$11,274	$14,801	$2,076	$59,176	$116,349
13	$4,484	$25,409	$11,612	$15,245	$2,139	$60,951	$119,839
14	$4,618	$26,171	$11,960	$15,703	$2,203	$62,780	$123,435
15	$4,757	$26,956	$12,319	$16,174	$2,269	$64,663	$127,138
16	$4,900	$27,765	$12,688	$16,659	$2,337	$66,603	$130,952
17	$5,047	$28,598	$13,069	$17,159	$2,407	$68,601	$134,880
18	$5,198	$29,456	$13,461	$17,673	$2,479	$70,659	$138,927
19	$5,354	$30,339	$13,865	$18,204	$2,554	$72,779	$143,095
20	$5,515	$31,249	$14,281	$18,750	$2,630	$74,962	$147,387
21	$5,680	$32,187	$14,709	$19,312	$2,709	$77,211	$151,809
22	$5,850	$33,153	$15,151	$19,892	$2,790	$79,528	$156,363
23	$6,026	$34,147	$15,605	$20,488	$2,874	$81,913	$161,054
24	$6,207	$35,172	$16,073	$21,103	$2,960	$84,371	$165,886
25	$6,393	$36,227	$16,556	$21,736	$3,049	$86,902	$170,862

Sub Watershed #7 Total Annual Cost Before Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$3,044	$17,252	$7,884	$10,351	$1,500	$0	$40,032
2	$3,136	$17,769	$8,121	$10,662	$1,545	$0	$41,233
3	$3,230	$18,303	$8,364	$10,982	$1,591	$0	$42,470
4	$3,327	$18,852	$8,615	$11,311	$1,639	$0	$43,744
5	$3,427	$19,417	$8,874	$11,650	$1,688	$0	$45,056
6	$3,529	$20,000	$9,140	$12,000	$1,739	$0	$46,408
7	$3,635	$20,600	$9,414	$12,360	$1,791	$0	$47,800
8	$3,744	$21,218	$9,696	$12,731	$1,845	$0	$49,234
9	$3,857	$21,854	$9,987	$13,113	$1,900	$0	$50,711
10	$3,972	$22,510	$10,287	$13,506	$1,957	$0	$52,232
11	$4,091	$23,185	$10,596	$13,911	$2,016	$0	$53,799
12	$4,214	$23,881	$10,913	$14,328	$2,076	$0	$55,413
13	$4,341	$24,597	$11,241	$14,758	$2,139	$0	$57,076
14	$4,471	$25,335	$11,578	$15,201	$2,203	$0	$58,788
15	$4,605	$26,095	$11,925	$15,657	$2,269	$0	$60,551
16	$4,743	$26,878	$12,283	$16,127	$2,337	$0	$62,368
17	$4,885	$27,684	$12,652	$16,611	$2,407	$0	$64,239
18	$5,032	$28,515	$13,031	$17,109	$2,479	$0	$66,166
19	$5,183	$29,370	$13,422	$17,622	$2,554	$0	$68,151
20	$5,338	$30,251	$13,825	$18,151	$2,630	$0	$70,196
21	$5,499	$31,159	$14,240	$18,695	$2,709	$0	$72,302
22	$5,664	$32,094	$14,667	$19,256	$2,790	$0	$74,471
23	$5,833	$33,056	$15,107	$19,834	$2,874	$0	$76,705
24	$6,008	$34,048	$15,560	$20,429	$2,960	$0	$79,006
25	$6,189	$35,070	$16,027	$21,042	$3,049	$0	$81,376

Sub Watershed #9 Total Annual Cost Before Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$1,233	$6,985	$3,192	$4,191	$1,500	$0	$17,101
2	$1,270	$7,195	$3,288	$4,317	$1,545	$0	$17,614
3	$1,308	$7,410	$3,387	$4,446	$1,591	$0	$18,142
4	$1,347	$7,633	$3,488	$4,580	$1,639	$0	$18,687
5	$1,387	$7,862	$3,593	$4,717	$1,688	$0	$19,247
6	$1,429	$8,098	$3,701	$4,859	$1,739	$0	$19,825
7	$1,472	$8,341	$3,812	$5,004	$1,791	$0	$20,420
8	$1,516	$8,591	$3,926	$5,154	$1,845	$0	$21,032
9	$1,562	$8,849	$4,044	$5,309	$1,900	$0	$21,663
10	$1,608	$9,114	$4,165	$5,468	$1,957	$0	$22,313
11	$1,657	$9,387	$4,290	$5,632	$2,016	$0	$22,982
12	$1,706	$9,669	$4,419	$5,801	$2,076	$0	$23,672
13	$1,757	$9,959	$4,551	$5,975	$2,139	$0	$24,382
14	$1,810	$10,258	$4,688	$6,155	$2,203	$0	$25,113
15	$1,865	$10,566	$4,828	$6,339	$2,269	$0	$25,867
16	$1,920	$10,883	$4,973	$6,530	$2,337	$0	$26,643
17	$1,978	$11,209	$5,123	$6,725	$2,407	$0	$27,442
18	$2,037	$11,545	$5,276	$6,927	$2,479	$0	$28,265
19	$2,099	$11,892	$5,434	$7,135	$2,554	$0	$29,113
20	$2,161	$12,248	$5,598	$7,349	$2,630	$0	$29,987
21	$2,226	$12,616	$5,765	$7,570	$2,709	$0	$30,886
22	$2,293	$12,994	$5,938	$7,797	$2,790	$0	$31,813
23	$2,362	$13,384	$6,117	$8,031	$2,874	$0	$32,767
24	$2,433	$13,786	$6,300	$8,271	$2,960	$0	$33,750
25	$2,506	$14,199	$6,489	$8,520	$3,049	$0	$34,763

Sub Watershed #10 Total Annual Cost Before Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$3,711	$21,029	$9,610	$12,617	$1,500	$0	$48,468
2	$3,822	$21,660	$9,899	$12,996	$1,545	$0	$49,922
3	$3,937	$22,310	$10,196	$13,386	$1,591	$0	$51,419
4	$4,055	$22,979	$10,501	$13,787	$1,639	$0	$52,962
5	$4,177	$23,668	$10,816	$14,201	$1,688	$0	$54,551
6	$4,302	$24,378	$11,141	$14,627	$1,739	$0	$56,187
7	$4,431	$25,110	$11,475	$15,066	$1,791	$0	$57,873
8	$4,564	$25,863	$11,819	$15,518	$1,845	$0	$59,609
9	$4,701	$26,639	$12,174	$15,983	$1,900	$0	$61,398
10	$4,842	$27,438	$12,539	$16,463	$1,957	$0	$63,239
11	$4,987	$28,261	$12,915	$16,957	$2,016	$0	$65,137
12	$5,137	$29,109	$13,303	$17,465	$2,076	$0	$67,091
13	$5,291	$29,982	$13,702	$17,989	$2,139	$0	$69,103
14	$5,450	$30,882	$14,113	$18,529	$2,203	$0	$71,177
15	$5,613	$31,808	$14,536	$19,085	$2,269	$0	$73,312
16	$5,782	$32,763	$14,973	$19,658	$2,337	$0	$75,511
17	$5,955	$33,745	$15,422	$20,247	$2,407	$0	$77,777
18	$6,134	$34,758	$15,884	$20,855	$2,479	$0	$80,110
19	$6,318	$35,801	$16,361	$21,480	$2,554	$0	$82,513
20	$6,507	$36,875	$16,852	$22,125	$2,630	$0	$84,989
21	$6,702	$37,981	$17,357	$22,788	$2,709	$0	$87,538
22	$6,904	$39,120	$17,878	$23,472	$2,790	$0	$90,164
23	$7,111	$40,294	$18,414	$24,176	$2,874	$0	$92,869
24	$7,324	$41,503	$18,967	$24,902	$2,960	$0	$95,655
25	$7,544	$42,748	$19,536	$25,649	$3,049	$0	$98,525

Sub Watershed #12 Total Annual Cost Before Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$2,924	$16,570	$7,573	$9,942	$1,500	$0	$38,509
2	$3,012	$17,067	$7,800	$10,240	$1,545	$0	$39,664
3	$3,102	$17,579	$8,034	$10,548	$1,591	$0	$40,854
4	$3,195	$18,107	$8,275	$10,864	$1,639	$0	$42,080
5	$3,291	$18,650	$8,523	$11,190	$1,688	$0	$43,342
6	$3,390	$19,209	$8,779	$11,526	$1,739	$0	$44,643
7	$3,492	$19,786	$9,042	$11,871	$1,791	$0	$45,982
8	$3,596	$20,379	$9,313	$12,228	$1,845	$0	$47,361
9	$3,704	$20,991	$9,593	$12,594	$1,900	$0	$48,782
10	$3,815	$21,620	$9,880	$12,972	$1,957	$0	$50,246
11	$3,930	$22,269	$10,177	$13,361	$2,016	$0	$51,753
12	$4,048	$22,937	$10,482	$13,762	$2,076	$0	$53,305
13	$4,169	$23,625	$10,797	$14,175	$2,139	$0	$54,905
14	$4,294	$24,334	$11,121	$14,600	$2,203	$0	$56,552
15	$4,423	$25,064	$11,454	$15,038	$2,269	$0	$58,248
16	$4,556	$25,816	$11,798	$15,489	$2,337	$0	$59,996
17	$4,692	$26,590	$12,152	$15,954	$2,407	$0	$61,796
18	$4,833	$27,388	$12,516	$16,433	$2,479	$0	$63,650
19	$4,978	$28,210	$12,892	$16,926	$2,554	$0	$65,559
20	$5,128	$29,056	$13,279	$17,434	$2,630	$0	$67,526
21	$5,281	$29,928	$13,677	$17,957	$2,709	$0	$69,552
22	$5,440	$30,825	$14,087	$18,495	$2,790	$0	$71,638
23	$5,603	$31,750	$14,510	$19,050	$2,874	$0	$73,787
24	$5,771	$32,703	$14,945	$19,622	$2,960	$0	$76,001
25	$5,944	$33,684	$15,393	$20,210	$3,049	$0	$78,281

Sub Watershed #14 Total Annual Cost Before Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$890	$5,042	$2,304	$3,025	$1,500	$0	$12,761
2	$916	$5,193	$2,373	$3,116	$1,545	$0	$13,144
3	$944	$5,349	$2,444	$3,209	$1,591	$0	$13,538
4	$972	$5,509	$2,518	$3,306	$1,639	$0	$13,944
5	$1,001	$5,675	$2,593	$3,405	$1,688	$0	$14,362
6	$1,031	$5,845	$2,671	$3,507	$1,739	$0	$14,793
7	$1,062	$6,020	$2,751	$3,612	$1,791	$0	$15,237
8	$1,094	$6,201	$2,834	$3,721	$1,845	$0	$15,694
9	$1,127	$6,387	$2,919	$3,832	$1,900	$0	$16,165
10	$1,161	$6,578	$3,006	$3,947	$1,957	$0	$16,650
11	$1,196	$6,776	$3,097	$4,066	$2,016	$0	$17,150
12	$1,232	$6,979	$3,189	$4,187	$2,076	$0	$17,664
13	$1,269	$7,188	$3,285	$4,313	$2,139	$0	$18,194
14	$1,307	$7,404	$3,384	$4,442	$2,203	$0	$18,740
15	$1,346	$7,626	$3,485	$4,576	$2,269	$0	$19,302
16	$1,386	$7,855	$3,590	$4,713	$2,337	$0	$19,881
17	$1,428	$8,091	$3,697	$4,854	$2,407	$0	$20,477
18	$1,471	$8,333	$3,808	$5,000	$2,479	$0	$21,092
19	$1,515	$8,583	$3,923	$5,150	$2,554	$0	$21,724
20	$1,560	$8,841	$4,040	$5,305	$2,630	$0	$22,376
21	$1,607	$9,106	$4,162	$5,464	$2,709	$0	$23,048
22	$1,655	$9,379	$4,286	$5,628	$2,790	$0	$23,739
23	$1,705	$9,661	$4,415	$5,796	$2,874	$0	$24,451
24	$1,756	$9,951	$4,547	$5,970	$2,960	$0	$25,185
25	$1,809	$10,249	$4,684	$6,149	$3,049	$0	$25,940

Sub Watershed #18 Total Annual Cost Before Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$5,891	$33,384	$15,256	$20,030	$1,500	$0	$76,061
2	$6,068	$34,385	$15,714	$20,631	$1,545	$0	$78,343
3	$6,250	$35,417	$16,185	$21,250	$1,591	$0	$80,693
4	$6,438	$36,479	$16,671	$21,888	$1,639	$0	$83,114
5	$6,631	$37,574	$17,171	$22,544	$1,688	$0	$85,608
6	$6,830	$38,701	$17,686	$23,220	$1,739	$0	$88,176
7	$7,034	$39,862	$18,217	$23,917	$1,791	$0	$90,821
8	$7,245	$41,058	$18,763	$24,635	$1,845	$0	$93,546
9	$7,463	$42,289	$19,326	$25,374	$1,900	$0	$96,352
10	$7,687	$43,558	$19,906	$26,135	$1,957	$0	$99,243
11	$7,917	$44,865	$20,503	$26,919	$2,016	$0	$102,220
12	$8,155	$46,211	$21,118	$27,726	$2,076	$0	$105,287
13	$8,399	$47,597	$21,752	$28,558	$2,139	$0	$108,445
14	$8,651	$49,025	$22,404	$29,415	$2,203	$0	$111,699
15	$8,911	$50,496	$23,077	$30,297	$2,269	$0	$115,050
16	$9,178	$52,011	$23,769	$31,206	$2,337	$0	$118,501
17	$9,454	$53,571	$24,482	$32,143	$2,407	$0	$122,056
18	$9,737	$55,178	$25,216	$33,107	$2,479	$0	$125,718
19	$10,029	$56,833	$25,973	$34,100	$2,554	$0	$129,489
20	$10,330	$58,538	$26,752	$35,123	$2,630	$0	$133,374
21	$10,640	$60,295	$27,555	$36,177	$2,709	$0	$137,375
22	$10,959	$62,103	$28,381	$37,262	$2,790	$0	$141,497
23	$11,288	$63,966	$29,233	$38,380	$2,874	$0	$145,741
24	$11,627	$65,885	$30,110	$39,531	$2,960	$0	$150,114
25	$11,976	$67,862	$31,013	$40,717	$3,049	$0	$154,617

Sub Watershed #16 Total Annual Cost Before Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$3,897	$22,083	$2,018	$13,250	$3,000	$0	$44,248
2	$4,014	$22,745	$2,079	$13,647	$3,090	$0	$45,576
3	$4,134	$23,428	$2,141	$14,057	$3,183	$0	$46,943
4	$4,258	$24,131	$2,206	$14,478	$3,278	$0	$48,351
5	$4,386	$24,855	$2,272	$14,913	$3,377	$0	$49,802
6	$4,518	$25,600	$2,340	$15,360	$3,478	$0	$51,296
7	$4,653	$26,368	$2,410	$15,821	$3,582	$0	$52,835
8	$4,793	$27,159	$2,482	$16,296	$3,690	$0	$54,420
9	$4,937	$27,974	$2,557	$16,784	$3,800	$0	$56,052
10	$5,085	$28,813	$2,634	$17,288	$3,914	$0	$57,734
11	$5,237	$29,678	$2,713	$17,807	$4,032	$0	$59,466
12	$5,394	$30,568	$2,794	$18,341	$4,153	$0	$61,250
13	$5,556	$31,485	$2,878	$18,891	$4,277	$0	$63,087
14	$5,723	$32,430	$2,964	$19,458	$4,406	$0	$64,980
15	$5,895	$33,403	$3,053	$20,042	$4,538	$0	$66,929
16	$6,071	$34,405	$3,145	$20,643	$4,674	$0	$68,937
17	$6,254	$35,437	$3,239	$21,262	$4,814	$0	$71,005
18	$6,441	$36,500	$3,336	$21,900	$4,959	$0	$73,136
19	$6,634	$37,595	$3,436	$22,557	$5,107	$0	$75,330
20	$6,833	$38,723	$3,539	$23,234	$5,261	$0	$77,589
21	$7,038	$39,884	$3,645	$23,931	$5,418	$0	$79,917
22	$7,250	$41,081	$3,755	$24,649	$5,581	$0	$82,315
23	$7,467	$42,313	$3,867	$25,388	$5,748	$0	$84,784
24	$7,691	$43,583	$3,983	$26,150	$5,921	$0	$87,328
25	$7,922	$44,890	$4,103	$26,934	$6,098	$0	$89,947

Sub Watershed #19 Total Annual Cost Before Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$3,252	$18,430	$1,684	$11,058	$3,000	$0	$37,424
2	$3,350	$18,983	$1,735	$11,390	$3,090	$0	$38,547
3	$3,450	$19,552	$1,787	$11,731	$3,183	$0	$39,703
4	$3,554	$20,139	$1,841	$12,083	$3,278	$0	$40,895
5	$3,660	$20,743	$1,896	$12,446	$3,377	$0	$42,121
6	$3,770	$21,365	$1,953	$12,819	$3,478	$0	$43,385
7	$3,883	$22,006	$2,011	$13,204	$3,582	$0	$44,687
8	$4,000	$22,666	$2,072	$13,600	$3,690	$0	$46,027
9	$4,120	$23,346	$2,134	$14,008	$3,800	$0	$47,408
10	$4,244	$24,047	$2,198	$14,428	$3,914	$0	$48,830
11	$4,371	$24,768	$2,264	$14,861	$4,032	$0	$50,295
12	$4,502	$25,511	$2,332	$15,307	$4,153	$0	$51,804
13	$4,637	$26,276	$2,402	$15,766	$4,277	$0	$53,358
14	$4,776	$27,065	$2,474	$16,239	$4,406	$0	$54,959
15	$4,919	$27,877	$2,548	$16,726	$4,538	$0	$56,608
16	$5,067	$28,713	$2,624	$17,228	$4,674	$0	$58,306
17	$5,219	$29,574	$2,703	$17,745	$4,814	$0	$60,055
18	$5,376	$30,461	$2,784	$18,277	$4,959	$0	$61,857
19	$5,537	$31,375	$2,868	$18,825	$5,107	$0	$63,712
20	$5,703	$32,317	$2,954	$19,390	$5,261	$0	$65,624
21	$5,874	$33,286	$3,042	$19,972	$5,418	$0	$67,592
22	$6,050	$34,285	$3,134	$20,571	$5,581	$0	$69,620
23	$6,232	$35,313	$3,228	$21,188	$5,748	$0	$71,709
24	$6,419	$36,373	$3,324	$21,824	$5,921	$0	$73,860
25	$6,611	$37,464	$3,424	$22,478	$6,098	$0	$76,076

Sub Watershed #5 Total Annual Cost After Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$596	$3,375	$3,763	$2,025	$375	$12,825	$22,959
2	$613	$3,476	$3,876	$2,086	$386	$13,210	$23,648
3	$632	$3,581	$3,993	$2,148	$398	$13,606	$24,357
4	$651	$3,688	$4,112	$2,213	$410	$14,014	$25,088
5	$670	$3,799	$4,236	$2,279	$422	$14,435	$25,841
6	$690	$3,913	$4,363	$2,348	$435	$14,868	$26,616
7	$711	$4,030	$4,494	$2,418	$448	$15,314	$27,414
8	$733	$4,151	$4,629	$2,491	$461	$15,773	$28,237
9	$754	$4,275	$4,767	$2,565	$475	$16,246	$29,084
10	$777	$4,404	$4,910	$2,642	$489	$16,734	$29,956
11	$800	$4,536	$5,058	$2,721	$504	$17,236	$30,855
12	$824	$4,672	$5,209	$2,803	$519	$17,753	$31,781
13	$849	$4,812	$5,366	$2,887	$535	$18,285	$32,734
14	$875	$4,956	$5,527	$2,974	$551	$18,834	$33,716
15	$901	$5,105	$5,693	$3,063	$567	$19,399	$34,728
16	$928	$5,258	$5,863	$3,155	$584	$19,981	$35,769
17	$956	$5,416	$6,039	$3,250	$602	$20,580	$36,843
18	$984	$5,578	$6,220	$3,347	$620	$21,198	$37,948
19	$1,014	$5,746	$6,407	$3,447	$638	$21,834	$39,086
20	$1,044	$5,918	$6,599	$3,551	$658	$22,489	$40,259
21	$1,076	$6,096	$6,797	$3,657	$677	$23,163	$41,467
22	$1,108	$6,279	$7,001	$3,767	$698	$23,858	$42,711
23	$1,141	$6,467	$7,211	$3,880	$719	$24,574	$43,992
24	$1,175	$6,661	$7,427	$3,997	$740	$25,311	$45,312
25	$1,211	$6,861	$7,650	$4,116	$762	$26,071	$46,671

Sub Watershed #6 Total Annual Cost After Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$786	$4,455	$4,968	$2,673	$375	$12,825	$26,083
2	$810	$4,589	$5,117	$2,753	$386	$13,210	$26,865
3	$834	$4,727	$5,271	$2,836	$398	$13,606	$27,671
4	$859	$4,868	$5,429	$2,921	$410	$14,014	$28,501
5	$885	$5,014	$5,592	$3,009	$422	$14,435	$29,356
6	$911	$5,165	$5,759	$3,099	$435	$14,868	$30,237
7	$939	$5,320	$5,932	$3,192	$448	$15,314	$31,144
8	$967	$5,479	$6,110	$3,288	$461	$15,773	$32,078
9	$996	$5,644	$6,293	$3,386	$475	$16,246	$33,041
10	$1,026	$5,813	$6,482	$3,488	$489	$16,734	$34,032
11	$1,057	$5,988	$6,677	$3,593	$504	$17,236	$35,053
12	$1,088	$6,167	$6,877	$3,700	$519	$17,753	$36,105
13	$1,121	$6,352	$7,083	$3,811	$535	$18,285	$37,188
14	$1,155	$6,543	$7,296	$3,926	$551	$18,834	$38,303
15	$1,189	$6,739	$7,515	$4,043	$567	$19,399	$39,452
16	$1,225	$6,941	$7,740	$4,165	$584	$19,981	$40,636
17	$1,262	$7,149	$7,972	$4,290	$602	$20,580	$41,855
18	$1,300	$7,364	$8,211	$4,418	$620	$21,198	$43,111
19	$1,338	$7,585	$8,458	$4,551	$638	$21,834	$44,404
20	$1,379	$7,812	$8,711	$4,687	$658	$22,489	$45,736
21	$1,420	$8,047	$8,973	$4,828	$677	$23,163	$47,108
22	$1,463	$8,288	$9,242	$4,973	$698	$23,858	$48,521
23	$1,506	$8,537	$9,519	$5,122	$719	$24,574	$49,977
24	$1,552	$8,793	$9,805	$5,276	$740	$25,311	$51,476
25	$1,598	$9,057	$10,099	$5,434	$762	$26,071	$53,021

Sub Watershed #7 Total Annual Cost After Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$761	$4,313	$4,809	$2,588	$375	$0	$12,846
2	$784	$4,442	$4,954	$2,665	$386	$0	$13,232
3	$807	$4,576	$5,102	$2,745	$398	$0	$13,629
4	$832	$4,713	$5,255	$2,828	$410	$0	$14,037
5	$857	$4,854	$5,413	$2,913	$422	$0	$14,458
6	$882	$5,000	$5,575	$3,000	$435	$0	$14,892
7	$909	$5,150	$5,743	$3,090	$448	$0	$15,339
8	$936	$5,304	$5,915	$3,183	$461	$0	$15,799
9	$964	$5,464	$6,092	$3,278	$475	$0	$16,273
10	$993	$5,627	$6,275	$3,376	$489	$0	$16,761
11	$1,023	$5,796	$6,463	$3,478	$504	$0	$17,264
12	$1,054	$5,970	$6,657	$3,582	$519	$0	$17,782
13	$1,085	$6,149	$6,857	$3,690	$535	$0	$18,316
14	$1,118	$6,334	$7,063	$3,800	$551	$0	$18,865
15	$1,151	$6,524	$7,275	$3,914	$567	$0	$19,431
16	$1,186	$6,719	$7,493	$4,032	$584	$0	$20,014
17	$1,221	$6,921	$7,718	$4,153	$602	$0	$20,614
18	$1,258	$7,129	$7,949	$4,277	$620	$0	$21,233
19	$1,296	$7,343	$8,188	$4,406	$638	$0	$21,870
20	$1,335	$7,563	$8,433	$4,538	$658	$0	$22,526
21	$1,375	$7,790	$8,686	$4,674	$677	$0	$23,202
22	$1,416	$8,023	$8,947	$4,814	$698	$0	$23,898
23	$1,458	$8,264	$9,215	$4,958	$719	$0	$24,615
24	$1,502	$8,512	$9,492	$5,107	$740	$0	$25,353
25	$1,547	$8,767	$9,776	$5,260	$762	$0	$26,114

Sub Watershed #9 Total Annual Cost After Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$308	$1,746	$1,947	$1,048	$375	$0	$5,424
2	$317	$1,799	$2,006	$1,079	$386	$0	$5,587
3	$327	$1,853	$2,066	$1,112	$398	$0	$5,755
4	$337	$1,908	$2,128	$1,145	$410	$0	$5,927
5	$347	$1,965	$2,192	$1,179	$422	$0	$6,105
6	$357	$2,024	$2,257	$1,215	$435	$0	$6,288
7	$368	$2,085	$2,325	$1,251	$448	$0	$6,477
8	$379	$2,148	$2,395	$1,289	$461	$0	$6,671
9	$390	$2,212	$2,467	$1,327	$475	$0	$6,872
10	$402	$2,278	$2,541	$1,367	$489	$0	$7,078
11	$414	$2,347	$2,617	$1,408	$504	$0	$7,290
12	$427	$2,417	$2,695	$1,450	$519	$0	$7,509
13	$439	$2,490	$2,776	$1,494	$535	$0	$7,734
14	$453	$2,564	$2,860	$1,539	$551	$0	$7,966
15	$466	$2,641	$2,945	$1,585	$567	$0	$8,205
16	$480	$2,721	$3,034	$1,632	$584	$0	$8,451
17	$495	$2,802	$3,125	$1,681	$602	$0	$8,705
18	$509	$2,886	$3,218	$1,732	$620	$0	$8,966
19	$525	$2,973	$3,315	$1,784	$638	$0	$9,235
20	$540	$3,062	$3,414	$1,837	$658	$0	$9,512
21	$557	$3,154	$3,517	$1,892	$677	$0	$9,797
22	$573	$3,249	$3,622	$1,949	$698	$0	$10,091
23	$590	$3,346	$3,731	$2,008	$719	$0	$10,394
24	$608	$3,446	$3,843	$2,068	$740	$0	$10,706
25	$626	$3,550	$3,958	$2,130	$762	$0	$11,027

Sub Watershed #10 Total Annual Cost After Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$928	$5,257	$5,862	$3,154	$375	$0	$15,577
2	$956	$5,415	$6,038	$3,249	$386	$0	$16,044
3	$984	$5,577	$6,219	$3,346	$398	$0	$16,525
4	$1,014	$5,745	$6,406	$3,447	$410	$0	$17,021
5	$1,044	$5,917	$6,598	$3,550	$422	$0	$17,532
6	$1,076	$6,095	$6,796	$3,657	$435	$0	$18,058
7	$1,108	$6,277	$7,000	$3,766	$448	$0	$18,599
8	$1,141	$6,466	$7,210	$3,879	$461	$0	$19,157
9	$1,175	$6,660	$7,426	$3,996	$475	$0	$19,732
10	$1,211	$6,860	$7,649	$4,116	$489	$0	$20,324
11	$1,247	$7,065	$7,878	$4,239	$504	$0	$20,934
12	$1,284	$7,277	$8,115	$4,366	$519	$0	$21,562
13	$1,323	$7,496	$8,358	$4,497	$535	$0	$22,209
14	$1,362	$7,720	$8,609	$4,632	$551	$0	$22,875
15	$1,403	$7,952	$8,867	$4,771	$567	$0	$23,561
16	$1,445	$8,191	$9,133	$4,914	$584	$0	$24,268
17	$1,489	$8,436	$9,407	$5,062	$602	$0	$24,996
18	$1,533	$8,689	$9,689	$5,214	$620	$0	$25,746
19	$1,579	$8,950	$9,980	$5,370	$638	$0	$26,518
20	$1,627	$9,219	$10,280	$5,531	$658	$0	$27,314
21	$1,676	$9,495	$10,588	$5,697	$677	$0	$28,133
22	$1,726	$9,780	$10,906	$5,868	$698	$0	$28,977
23	$1,778	$10,073	$11,233	$6,044	$719	$0	$29,846
24	$1,831	$10,376	$11,570	$6,225	$740	$0	$30,742
25	$1,886	$10,687	$11,917	$6,412	$762	$0	$31,664

Sub Watershed #12 Total Annual Cost After Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$731	$4,143	$4,619	$2,486	$375	$0	$12,353
2	$753	$4,267	$4,758	$2,560	$386	$0	$12,724
3	$776	$4,395	$4,901	$2,637	$398	$0	$13,106
4	$799	$4,527	$5,048	$2,716	$410	$0	$13,499
5	$823	$4,662	$5,199	$2,797	$422	$0	$13,904
6	$847	$4,802	$5,355	$2,881	$435	$0	$14,321
7	$873	$4,946	$5,516	$2,968	$448	$0	$14,751
8	$899	$5,095	$5,681	$3,057	$461	$0	$15,193
9	$926	$5,248	$5,852	$3,149	$475	$0	$15,649
10	$954	$5,405	$6,027	$3,243	$489	$0	$16,118
11	$982	$5,567	$6,208	$3,340	$504	$0	$16,602
12	$1,012	$5,734	$6,394	$3,441	$519	$0	$17,100
13	$1,042	$5,906	$6,586	$3,544	$535	$0	$17,613
14	$1,074	$6,083	$6,784	$3,650	$551	$0	$18,141
15	$1,106	$6,266	$6,987	$3,760	$567	$0	$18,686
16	$1,139	$6,454	$7,197	$3,872	$584	$0	$19,246
17	$1,173	$6,648	$7,413	$3,989	$602	$0	$19,824
18	$1,208	$6,847	$7,635	$4,108	$620	$0	$20,418
19	$1,245	$7,052	$7,864	$4,231	$638	$0	$21,031
20	$1,282	$7,264	$8,100	$4,358	$658	$0	$21,662
21	$1,320	$7,482	$8,343	$4,489	$677	$0	$22,312
22	$1,360	$7,706	$8,593	$4,624	$698	$0	$22,981
23	$1,401	$7,938	$8,851	$4,763	$719	$0	$23,670
24	$1,443	$8,176	$9,117	$4,905	$740	$0	$24,380
25	$1,486	$8,421	$9,390	$5,053	$762	$0	$25,112

Sub Watershed #14 Total Annual Cost After Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$222	$1,260	$1,406	$756	$375	$0	$4,020
2	$229	$1,298	$1,448	$779	$386	$0	$4,140
3	$236	$1,337	$1,491	$802	$398	$0	$4,265
4	$243	$1,377	$1,536	$826	$410	$0	$4,392
5	$250	$1,419	$1,582	$851	$422	$0	$4,524
6	$258	$1,461	$1,629	$877	$435	$0	$4,660
7	$266	$1,505	$1,678	$903	$448	$0	$4,800
8	$274	$1,550	$1,729	$930	$461	$0	$4,944
9	$282	$1,597	$1,780	$958	$475	$0	$5,092
10	$290	$1,645	$1,834	$987	$489	$0	$5,245
11	$299	$1,694	$1,889	$1,016	$504	$0	$5,402
12	$308	$1,745	$1,946	$1,047	$519	$0	$5,564
13	$317	$1,797	$2,004	$1,078	$535	$0	$5,731
14	$327	$1,851	$2,064	$1,111	$551	$0	$5,903
15	$336	$1,907	$2,126	$1,144	$567	$0	$6,080
16	$347	$1,964	$2,190	$1,178	$584	$0	$6,263
17	$357	$2,023	$2,255	$1,214	$602	$0	$6,450
18	$368	$2,083	$2,323	$1,250	$620	$0	$6,644
19	$379	$2,146	$2,393	$1,288	$638	$0	$6,843
20	$390	$2,210	$2,465	$1,326	$658	$0	$7,049
21	$402	$2,277	$2,539	$1,366	$677	$0	$7,260
22	$414	$2,345	$2,615	$1,407	$698	$0	$7,478
23	$426	$2,415	$2,693	$1,449	$719	$0	$7,702
24	$439	$2,488	$2,774	$1,493	$740	$0	$7,933
25	$452	$2,562	$2,857	$1,537	$762	$0	$8,171

Sub Watershed #18 Total Annual Cost After Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$1,473	$8,346	$9,306	$5,008	$375	$0	$24,508
2	$1,517	$8,596	$9,586	$5,158	$386	$0	$25,243
3	$1,563	$8,854	$9,873	$5,313	$398	$0	$26,000
4	$1,609	$9,120	$10,169	$5,472	$410	$0	$26,780
5	$1,658	$9,393	$10,474	$5,636	$422	$0	$27,584
6	$1,707	$9,675	$10,789	$5,805	$435	$0	$28,411
7	$1,759	$9,965	$11,112	$5,979	$448	$0	$29,263
8	$1,811	$10,264	$11,446	$6,159	$461	$0	$30,141
9	$1,866	$10,572	$11,789	$6,343	$475	$0	$31,046
10	$1,922	$10,890	$12,143	$6,534	$489	$0	$31,977
11	$1,979	$11,216	$12,507	$6,730	$504	$0	$32,936
12	$2,039	$11,553	$12,882	$6,932	$519	$0	$33,924
13	$2,100	$11,899	$13,269	$7,140	$535	$0	$34,942
14	$2,163	$12,256	$13,667	$7,354	$551	$0	$35,990
15	$2,228	$12,624	$14,077	$7,574	$567	$0	$37,070
16	$2,295	$13,003	$14,499	$7,802	$584	$0	$38,182
17	$2,363	$13,393	$14,934	$8,036	$602	$0	$39,328
18	$2,434	$13,795	$15,382	$8,277	$620	$0	$40,507
19	$2,507	$14,208	$15,843	$8,525	$638	$0	$41,723
20	$2,583	$14,635	$16,319	$8,781	$658	$0	$42,974
21	$2,660	$15,074	$16,808	$9,044	$677	$0	$44,263
22	$2,740	$15,526	$17,313	$9,316	$698	$0	$45,591
23	$2,822	$15,992	$17,832	$9,595	$719	$0	$46,959
24	$2,907	$16,471	$18,367	$9,883	$740	$0	$48,368
25	$2,994	$16,966	$18,918	$10,179	$762	$0	$49,819

Sub Watershed #16 Total Annual Cost After Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$974	$5,521	$1,231	$3,312	$750	$0	$11,789
2	$1,003	$5,686	$1,268	$3,412	$773	$0	$12,142
3	$1,034	$5,857	$1,306	$3,514	$796	$0	$12,507
4	$1,065	$6,033	$1,345	$3,620	$820	$0	$12,882
5	$1,097	$6,214	$1,386	$3,728	$844	$0	$13,268
6	$1,129	$6,400	$1,427	$3,840	$869	$0	$13,666
7	$1,163	$6,592	$1,470	$3,955	$896	$0	$14,076
8	$1,198	$6,790	$1,514	$4,074	$922	$0	$14,499
9	$1,234	$6,994	$1,560	$4,196	$950	$0	$14,934
10	$1,271	$7,203	$1,606	$4,322	$979	$0	$15,382
11	$1,309	$7,419	$1,655	$4,452	$1,008	$0	$15,843
12	$1,349	$7,642	$1,704	$4,585	$1,038	$0	$16,318
13	$1,389	$7,871	$1,755	$4,723	$1,069	$0	$16,808
14	$1,431	$8,107	$1,808	$4,864	$1,101	$0	$17,312
15	$1,474	$8,351	$1,862	$5,010	$1,134	$0	$17,831
16	$1,518	$8,601	$1,918	$5,161	$1,168	$0	$18,366
17	$1,563	$8,859	$1,976	$5,316	$1,204	$0	$18,917
18	$1,610	$9,125	$2,035	$5,475	$1,240	$0	$19,485
19	$1,659	$9,399	$2,096	$5,639	$1,277	$0	$20,069
20	$1,708	$9,681	$2,159	$5,808	$1,315	$0	$20,671
21	$1,760	$9,971	$2,224	$5,983	$1,355	$0	$21,292
22	$1,812	$10,270	$2,290	$6,162	$1,395	$0	$21,930
23	$1,867	$10,578	$2,359	$6,347	$1,437	$0	$22,588
24	$1,923	$10,896	$2,430	$6,537	$1,480	$0	$23,266
25	$1,980	$11,223	$2,503	$6,734	$1,525	$0	$23,964

Sub Watershed #19 Total Annual Cost After Cost-Share, Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization Plan	Total Cost
1	$813	$4,607	$1,028	$2,764	$750	$0	$9,962
2	$837	$4,746	$1,058	$2,847	$773	$0	$10,261
3	$863	$4,888	$1,090	$2,933	$796	$0	$10,569
4	$888	$5,035	$1,123	$3,021	$820	$0	$10,886
5	$915	$5,186	$1,156	$3,111	$844	$0	$11,213
6	$943	$5,341	$1,191	$3,205	$869	$0	$11,549
7	$971	$5,502	$1,227	$3,301	$896	$0	$11,896
8	$1,000	$5,667	$1,264	$3,400	$922	$0	$12,253
9	$1,030	$5,837	$1,302	$3,502	$950	$0	$12,620
10	$1,061	$6,012	$1,341	$3,607	$979	$0	$12,999
11	$1,093	$6,192	$1,381	$3,715	$1,008	$0	$13,389
12	$1,125	$6,378	$1,422	$3,827	$1,038	$0	$13,790
13	$1,159	$6,569	$1,465	$3,941	$1,069	$0	$14,204
14	$1,194	$6,766	$1,509	$4,060	$1,101	$0	$14,630
15	$1,230	$6,969	$1,554	$4,181	$1,134	$0	$15,069
16	$1,267	$7,178	$1,601	$4,307	$1,168	$0	$15,521
17	$1,305	$7,394	$1,649	$4,436	$1,204	$0	$15,987
18	$1,344	$7,615	$1,698	$4,569	$1,240	$0	$16,466
19	$1,384	$7,844	$1,749	$4,706	$1,277	$0	$16,960
20	$1,426	$8,079	$1,802	$4,847	$1,315	$0	$17,469
21	$1,469	$8,322	$1,856	$4,993	$1,355	$0	$17,993
22	$1,513	$8,571	$1,912	$5,143	$1,395	$0	$18,533
23	$1,558	$8,828	$1,969	$5,297	$1,437	$0	$19,089
24	$1,605	$9,093	$2,028	$5,456	$1,480	$0	$19,662
25	$1,653	$9,366	$2,089	$5,620	$1,525	$0	$20,252

12 APPENDIX E: ADOPTION RATES FOR CONSERVATION PRACTICES

Sub Watershed #5 Annual Adoption (treated acres), Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
1	16	79	79	79	1	375	630
2	16	79	79	79	1	375	630
3	16	79	79	79	1	375	630
4	16	79	79	79	1	375	630
5	16	79	79	79	1	375	630
6	16	79	79	79	1	375	630
7	16	79	79	79	1	375	630
8	16	79	79	79	1	375	630
9	16	79	79	79	1	375	630
10	16	79	79	79	1	375	630
11	16	79	79	79	1	375	630
12	16	79	79	79	1	375	630
13	16	79	79	79	1	375	630
14	16	79	79	79	1	375	630
15	16	79	79	79	1	375	630
16	16	79	79	79	1	375	630
17	16	79	79	79	1	375	630
18	16	79	79	79	1	375	630
19	16	79	79	79	1	375	630
20	16	79	79	79	1	375	630
21	16	79	79	79	1	375	630
22	16	79	79	79	1	375	630
23	16	79	79	79	1	375	630
24	16	79	79	79	1	375	630
25	16	79	79	79	1	375	630

Sub Watershed #6 Annual Adoption (treated acres), Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
1	21	105	105	105	1	375	711
2	21	105	105	105	1	375	711
3	21	105	105	105	1	375	711
4	21	105	105	105	1	375	711
5	21	105	105	105	1	375	711
6	21	105	105	105	1	375	711

7	21	105	105	105	1	375	711
8	21	105	105	105	1	375	711
9	21	105	105	105	1	375	711
10	21	105	105	105	1	375	711
11	21	105	105	105	1	375	711
12	21	105	105	105	1	375	711
13	21	105	105	105	1	375	711
14	21	105	105	105	1	375	711
15	21	105	105	105	1	375	711
16	21	105	105	105	1	375	711
17	21	105	105	105	1	375	711
18	21	105	105	105	1	375	711
19	21	105	105	105	1	375	711
20	21	105	105	105	1	375	711
21	21	105	105	105	1	375	711
22	21	105	105	105	1	375	711
23	21	105	105	105	1	375	711
24	21	105	105	105	1	375	711
25	21	105	105	105	1	375	711

Sub Watershed #7 Annual Adoption (treated acres), Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
1	20	101	101	101	1	0	326
2	20	101	101	101	1	0	326
3	20	101	101	101	1	0	326
4	20	101	101	101	1	0	326
5	20	101	101	101	1	0	326
6	20	101	101	101	1	0	326
7	20	101	101	101	1	0	326
8	20	101	101	101	1	0	326
9	20	101	101	101	1	0	326
10	20	101	101	101	1	0	326
11	20	101	101	101	1	0	326
12	20	101	101	101	1	0	326
13	20	101	101	101	1	0	326
14	20	101	101	101	1	0	326
15	20	101	101	101	1	0	326
16	20	101	101	101	1	0	326
17	20	101	101	101	1	0	326
18	20	101	101	101	1	0	326
19	20	101	101	101	1	0	326

20	20	101	101	101	1	0	326
21	20	101	101	101	1	0	326
22	20	101	101	101	1	0	326
23	20	101	101	101	1	0	326
24	20	101	101	101	1	0	326
25	20	101	101	101	1	0	326

Sub Watershed #9 Annual Adoption (treated acres), Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
1	8	41	41	41	1	0	132
2	8	41	41	41	1	0	132
3	8	41	41	41	1	0	132
4	8	41	41	41	1	0	132
5	8	41	41	41	1	0	132
6	8	41	41	41	1	0	132
7	8	41	41	41	1	0	132
8	8	41	41	41	1	0	132
9	8	41	41	41	1	0	132
10	8	41	41	41	1	0	132
11	8	41	41	41	1	0	132
12	8	41	41	41	1	0	132
13	8	41	41	41	1	0	132
14	8	41	41	41	1	0	132
15	8	41	41	41	1	0	132
16	8	41	41	41	1	0	132
17	8	41	41	41	1	0	132
18	8	41	41	41	1	0	132
19	8	41	41	41	1	0	132
20	8	41	41	41	1	0	132
21	8	41	41	41	1	0	132
22	8	41	41	41	1	0	132
23	8	41	41	41	1	0	132
24	8	41	41	41	1	0	132
25	8	41	41	41	1	0	132

Sub Watershed #10 Annual Adoption (treated acres), Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
1	25	124	124	124	1	0	397
2	25	124	124	124	1	0	397

3	25	124	124	124	1	0	397
4	25	124	124	124	1	0	397
5	25	124	124	124	1	0	397
6	25	124	124	124	1	0	397
7	25	124	124	124	1	0	397
8	25	124	124	124	1	0	397
9	25	124	124	124	1	0	397
10	25	124	124	124	1	0	397
11	25	124	124	124	1	0	397
12	25	124	124	124	1	0	397
13	25	124	124	124	1	0	397
14	25	124	124	124	1	0	397
15	25	124	124	124	1	0	397
16	25	124	124	124	1	0	397
17	25	124	124	124	1	0	397
18	25	124	124	124	1	0	397
19	25	124	124	124	1	0	397
20	25	124	124	124	1	0	397
21	25	124	124	124	1	0	397
22	25	124	124	124	1	0	397
23	25	124	124	124	1	0	397
24	25	124	124	124	1	0	397
25	25	124	124	124	1	0	397

Sub Watershed #12 Annual Adoption (treated acres), Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
1	19	97	97	97	1	0	313
2	19	97	97	97	1	0	313
3	19	97	97	97	1	0	313
4	19	97	97	97	1	0	313
5	19	97	97	97	1	0	313
6	19	97	97	97	1	0	313
7	19	97	97	97	1	0	313
8	19	97	97	97	1	0	313
9	19	97	97	97	1	0	313
10	19	97	97	97	1	0	313
11	19	97	97	97	1	0	313
12	19	97	97	97	1	0	313
13	19	97	97	97	1	0	313
14	19	97	97	97	1	0	313
15	19	97	97	97	1	0	313

16	19	97	97	97	1	0	313
17	19	97	97	97	1	0	313
18	19	97	97	97	1	0	313
19	19	97	97	97	1	0	313
20	19	97	97	97	1	0	313
21	19	97	97	97	1	0	313
22	19	97	97	97	1	0	313
23	19	97	97	97	1	0	313
24	19	97	97	97	1	0	313
25	19	97	97	97	1	0	313

Sub Watershed #14 Annual Adoption (treated acres), Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
1	6	30	30	30	1	0	96
2	6	30	30	30	1	0	96
3	6	30	30	30	1	0	96
4	6	30	30	30	1	0	96
5	6	30	30	30	1	0	96
6	6	30	30	30	1	0	96
7	6	30	30	30	1	0	96
8	6	30	30	30	1	0	96
9	6	30	30	30	1	0	96
10	6	30	30	30	1	0	96
11	6	30	30	30	1	0	96
12	6	30	30	30	1	0	96
13	6	30	30	30	1	0	96
14	6	30	30	30	1	0	96
15	6	30	30	30	1	0	96
16	6	30	30	30	1	0	96
17	6	30	30	30	1	0	96
18	6	30	30	30	1	0	96
19	6	30	30	30	1	0	96
20	6	30	30	30	1	0	96
21	6	30	30	30	1	0	96
22	6	30	30	30	1	0	96
23	6	30	30	30	1	0	96
24	6	30	30	30	1	0	96
25	6	30	30	30	1	0	96

Sub Watershed #18 Annual Adoption (treated acres), Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
1	39	196	196	196	1	0	629
2	39	196	196	196	1	0	629
3	39	196	196	196	1	0	629
4	39	196	196	196	1	0	629
5	39	196	196	196	1	0	629
6	39	196	196	196	1	0	629
7	39	196	196	196	1	0	629
8	39	196	196	196	1	0	629
9	39	196	196	196	1	0	629
10	39	196	196	196	1	0	629
11	39	196	196	196	1	0	629
12	39	196	196	196	1	0	629
13	39	196	196	196	1	0	629
14	39	196	196	196	1	0	629
15	39	196	196	196	1	0	629
16	39	196	196	196	1	0	629
17	39	196	196	196	1	0	629
18	39	196	196	196	1	0	629
19	39	196	196	196	1	0	629
20	39	196	196	196	1	0	629
21	39	196	196	196	1	0	629
22	39	196	196	196	1	0	629
23	39	196	196	196	1	0	629
24	39	196	196	196	1	0	629
25	39	196	196	196	1	0	629

Sub Watershed #16 Annual Adoption (treated acres), Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
1	26	130	26	130	2	0	314
2	26	130	26	130	2	0	314
3	26	130	26	130	2	0	314
4	26	130	26	130	2	0	314
5	26	130	26	130	2	0	314
6	26	130	26	130	2	0	314
7	26	130	26	130	2	0	314
8	26	130	26	130	2	0	314
9	26	130	26	130	2	0	314
10	26	130	26	130	2	0	314

11	26	130	26	130	2	0	314
12	26	130	26	130	2	0	314
13	26	130	26	130	2	0	314
14	26	130	26	130	2	0	314
15	26	130	26	130	2	0	314
16	26	130	26	130	2	0	314
17	26	130	26	130	2	0	314
18	26	130	26	130	2	0	314
19	26	130	26	130	2	0	314
20	26	130	26	130	2	0	314
21	26	130	26	130	2	0	314
22	26	130	26	130	2	0	314
23	26	130	26	130	2	0	314
24	26	130	26	130	2	0	314
25	26	130	26	130	2	0	314

Sub Watershed #19 Annual Adoption (treated acres), Cropland Conservation Practices

Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
1	22	108	22	108	2	0	262
2	22	108	22	108	2	0	262
3	22	108	22	108	2	0	262
4	22	108	22	108	2	0	262
5	22	108	22	108	2	0	262
6	22	108	22	108	2	0	262
7	22	108	22	108	2	0	262
8	22	108	22	108	2	0	262
9	22	108	22	108	2	0	262
10	22	108	22	108	2	0	262
11	22	108	22	108	2	0	262
12	22	108	22	108	2	0	262
13	22	108	22	108	2	0	262
14	22	108	22	108	2	0	262
15	22	108	22	108	2	0	262
16	22	108	22	108	2	0	262
17	22	108	22	108	2	0	262
18	22	108	22	108	2	0	262
19	22	108	22	108	2	0	262
20	22	108	22	108	2	0	262
21	22	108	22	108	2	0	262
22	22	108	22	108	2	0	262
23	22	108	22	108	2	0	262

24	22	108	22	108	2	0	262
25	22	108	22	108	2	0	262

13 APPENDIX F: DETAILED SHORT, MEDIUM, AND LONG TERM GOALS BY SUB WATERSHED

Sub Watershed #5 Annual Adoption (treated acres), Cropland Conservation Practices

	Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
Short Term	1	16	79	79	79	1	375	630
	2	16	79	79	79	1	375	630
	3	16	79	79	79	1	375	630
	4	16	79	79	79	1	375	630
	5	16	79	79	79	1	375	630
Total		*79*	*397*	*397*	*397*	*5*	*1,875*	*3,151*
Medium Term	6	16	79	79	79	1	375	630
	7	16	79	79	79	1	375	630
	8	16	79	79	79	1	375	630
	9	16	79	79	79	1	375	630
	10	16	79	79	79	1	375	630
Total		*159*	*794*	*794*	*794*	*10*	*3,750*	*6,301*
Long Term	11	16	79	79	79	1	375	630
	12	16	79	79	79	1	375	630
	13	16	79	79	79	1	375	630
	14	16	79	79	79	1	375	630
	15	16	79	79	79	1	375	630
	16	16	79	79	79	1	375	630
	17	16	79	79	79	1	375	630
	18	16	79	79	79	1	375	630
	19	16	79	79	79	1	375	630
	20	16	79	79	79	1	375	630
	21	16	79	79	79	1	375	630
	22	16	79	79	79	1	375	630
	23	16	79	79	79	1	375	630
	24	16	79	79	79	1	375	630
	25	16	79	79	79	1	375	630
Total		*397*	*1,985*	*1,985*	*1,985*	*25*	*9,375*	*15,753*

Sub Watershed #6 Annual Adoption (treated acres), Cropland Conservation Practices

	Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
Short Term	1	21	105	105	105	1	375	711
	2	21	105	105	105	1	375	711
	3	21	105	105	105	1	375	711
	4	21	105	105	105	1	375	711
	5	21	105	105	105	1	375	711
Total		*105*	*524*	*524*	*524*	*5*	*1,875*	*3,557*
Medium Term	6	21	105	105	105	1	375	711
	7	21	105	105	105	1	375	711
	8	21	105	105	105	1	375	711
	9	21	105	105	105	1	375	711
	10	21	105	105	105	1	375	711
Total		*210*	*1,048*	*1,048*	*1,048*	*10*	*3,750*	*7,115*
Long Term	11	21	105	105	105	1	375	711
	12	21	105	105	105	1	375	711
	13	21	105	105	105	1	375	711
	14	21	105	105	105	1	375	711
	15	21	105	105	105	1	375	711
	16	21	105	105	105	1	375	711
	17	21	105	105	105	1	375	711
	18	21	105	105	105	1	375	711
	19	21	105	105	105	1	375	711
	20	21	105	105	105	1	375	711
	21	21	105	105	105	1	375	711
	22	21	105	105	105	1	375	711
	23	21	105	105	105	1	375	711
	24	21	105	105	105	1	375	711
	25	21	105	105	105	1	375	711
Total		*524*	*2,621*	*2,621*	*2,621*	*25*	*9,375*	*17,786*

Sub Watershed #7 Annual Adoption (treated acres), Cropland Conservation Practices

	Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
Short Term	1	20	101	101	101	1	0	326
	2	20	101	101	101	1	0	326
	3	20	101	101	101	1	0	326
	4	20	101	101	101	1	0	326
	5	20	101	101	101	1	0	326
Total		*101*	*507*	*507*	*507*	*5*	*0*	*1,629*
Medium Term	6	20	101	101	101	1	0	326
	7	20	101	101	101	1	0	326
	8	20	101	101	101	1	0	326
	9	20	101	101	101	1	0	326
	10	20	101	101	101	1	0	326
Total		*203*	*1,015*	*1,015*	*1,015*	*10*	*0*	*3,257*
Long Term	11	20	101	101	101	1	0	326
	12	20	101	101	101	1	0	326
	13	20	101	101	101	1	0	326
	14	20	101	101	101	1	0	326
	15	20	101	101	101	1	0	326
	16	20	101	101	101	1	0	326
	17	20	101	101	101	1	0	326
	18	20	101	101	101	1	0	326
	19	20	101	101	101	1	0	326
	20	20	101	101	101	1	0	326
	21	20	101	101	101	1	0	326
	22	20	101	101	101	1	0	326
	23	20	101	101	101	1	0	326
	24	20	101	101	101	1	0	326
	25	20	101	101	101	1	0	326
Total		*507*	*2,537*	*2,537*	*2,537*	*25*	*0*	*8,144*

Sub Watershed #9 Annual Adoption (treated acres), Cropland Conservation Practices

	Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
Short Term	1	8	41	41	41	1	0	132
	2	8	41	41	41	1	0	132
	3	8	41	41	41	1	0	132
	4	8	41	41	41	1	0	132
	5	8	41	41	41	1	0	132
Total		*41*	*205*	*205*	*205*	*5*	*0*	*662*
Medium Term	6	8	41	41	41	1	0	132
	7	8	41	41	41	1	0	132
	8	8	41	41	41	1	0	132
	9	8	41	41	41	1	0	132
	10	8	41	41	41	1	0	132
Total		*82*	*411*	*411*	*411*	*10*	*0*	*1,325*
Long Term	11	8	41	41	41	1	0	132
	12	8	41	41	41	1	0	132
	13	8	41	41	41	1	0	132
	14	8	41	41	41	1	0	132
	15	8	41	41	41	1	0	132
	16	8	41	41	41	1	0	132
	17	8	41	41	41	1	0	132
	18	8	41	41	41	1	0	132
	19	8	41	41	41	1	0	132
	20	8	41	41	41	1	0	132
	21	8	41	41	41	1	0	132
	22	8	41	41	41	1	0	132
	23	8	41	41	41	1	0	132
	24	8	41	41	41	1	0	132
	25	8	41	41	41	1	0	132
Total		*205*	*1,027*	*1,027*	*1,027*	*25*	*0*	*3,312*

Sub Watershed #10 Annual Adoption (treated acres), Cropland Conservation Practices

	Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
Short Term	1	25	124	124	124	1	0	397
	2	25	124	124	124	1	0	397
	3	25	124	124	124	1	0	397
	4	25	124	124	124	1	0	397
	5	25	124	124	124	1	0	397
Total		*124*	*619*	*619*	*619*	*5*	*0*	*1,984*
Medium Term	6	25	124	124	124	1	0	397
	7	25	124	124	124	1	0	397
	8	25	124	124	124	1	0	397
	9	25	124	124	124	1	0	397
	10	25	124	124	124	1	0	397
Total		*247*	*1,237*	*1,237*	*1,237*	*10*	*0*	*3,968*
Long Term	11	25	124	124	124	1	0	397
	12	25	124	124	124	1	0	397
	13	25	124	124	124	1	0	397
	14	25	124	124	124	1	0	397
	15	25	124	124	124	1	0	397
	16	25	124	124	124	1	0	397
	17	25	124	124	124	1	0	397
	18	25	124	124	124	1	0	397
	19	25	124	124	124	1	0	397
	20	25	124	124	124	1	0	397
	21	25	124	124	124	1	0	397
	22	25	124	124	124	1	0	397
	23	25	124	124	124	1	0	397
	24	25	124	124	124	1	0	397
	25	25	124	124	124	1	0	397
Total		*619*	*3,093*	*3,093*	*3,093*	*25*	*0*	*9,921*

Sub Watershed #12 Annual Adoption (treated acres), Cropland Conservation Practices

	Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
Short Term	1	19	97	97	97	1	0	313
	2	19	97	97	97	1	0	313
	3	19	97	97	97	1	0	313
	4	19	97	97	97	1	0	313
	5	19	97	97	97	1	0	313
Total		*97*	*487*	*487*	*487*	*5*	*0*	*1,565*
Medium Term	6	19	97	97	97	1	0	313
	7	19	97	97	97	1	0	313
	8	19	97	97	97	1	0	313
	9	19	97	97	97	1	0	313
	10	19	97	97	97	1	0	313
Total		*195*	*975*	*975*	*975*	*10*	*0*	*3,129*
Long Term	11	19	97	97	97	1	0	313
	12	19	97	97	97	1	0	313
	13	19	97	97	97	1	0	313
	14	19	97	97	97	1	0	313
	15	19	97	97	97	1	0	313
	16	19	97	97	97	1	0	313
	17	19	97	97	97	1	0	313
	18	19	97	97	97	1	0	313
	19	19	97	97	97	1	0	313
	20	19	97	97	97	1	0	313
	21	19	97	97	97	1	0	313
	22	19	97	97	97	1	0	313
	23	19	97	97	97	1	0	313
	24	19	97	97	97	1	0	313
	25	19	97	97	97	1	0	313
Total		*487*	*2,437*	*2,437*	*2,437*	*25*	*0*	*7,823*

Sub Watershed #14 Annual Adoption (treated acres), Cropland Conservation Practices

	Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
Short Term	1	6	30	30	30	1	0	96
	2	6	30	30	30	1	0	96
	3	6	30	30	30	1	0	96
	4	6	30	30	30	1	0	96
	5	6	30	30	30	1	0	96
Total		*30*	*148*	*148*	*148*	*5*	*0*	*480*
Medium Term	6	6	30	30	30	1	0	96
	7	6	30	30	30	1	0	96
	8	6	30	30	30	1	0	96
	9	6	30	30	30	1	0	96
	10	6	30	30	30	1	0	96
Total		*59*	*297*	*297*	*297*	*10*	*0*	*959*
Long Term	11	6	30	30	30	1	0	96
	12	6	30	30	30	1	0	96
	13	6	30	30	30	1	0	96
	14	6	30	30	30	1	0	96
	15	6	30	30	30	1	0	96
	16	6	30	30	30	1	0	96
	17	6	30	30	30	1	0	96
	18	6	30	30	30	1	0	96
	19	6	30	30	30	1	0	96
	20	6	30	30	30	1	0	96
	21	6	30	30	30	1	0	96
	22	6	30	30	30	1	0	96
	23	6	30	30	30	1	0	96
	24	6	30	30	30	1	0	96
	25	6	30	30	30	1	0	96
Total		*148*	*741*	*741*	*741*	*25*	*0*	*2,398*

Sub Watershed #18 Annual Adoption (treated acres), Cropland Conservation Practices

	Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
Short Term	1	39	196	196	196	1	0	629
	2	39	196	196	196	1	0	629
	3	39	196	196	196	1	0	629
	4	39	196	196	196	1	0	629
	5	39	196	196	196	1	0	629
Total		*196*	*982*	*982*	*982*	*5*	*0*	*3,147*
Medium Term	6	39	196	196	196	1	0	629
	7	39	196	196	196	1	0	629
	8	39	196	196	196	1	0	629
	9	39	196	196	196	1	0	629
	10	39	196	196	196	1	0	629
Total		*393*	*1,964*	*1,964*	*1,964*	*10*	*0*	*6,294*
Long Term	11	39	196	196	196	1	0	629
	12	39	196	196	196	1	0	629
	13	39	196	196	196	1	0	629
	14	39	196	196	196	1	0	629
	15	39	196	196	196	1	0	629
	16	39	196	196	196	1	0	629
	17	39	196	196	196	1	0	629
	18	39	196	196	196	1	0	629
	19	39	196	196	196	1	0	629
	20	39	196	196	196	1	0	629
	21	39	196	196	196	1	0	629
	22	39	196	196	196	1	0	629
	23	39	196	196	196	1	0	629
	24	39	196	196	196	1	0	629
	25	39	196	196	196	1	0	629
Total		*982*	*4,909*	*4,909*	*4,909*	*25*	*0*	*15,735*

Sub Watershed #16 Annual Adoption (treated acres), Cropland Conservation Practices

	Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
Short Term	1	26	130	26	130	2	0	314
	2	26	130	26	130	2	0	314
	3	26	130	26	130	2	0	314
	4	26	130	26	130	2	0	314
	5	26	130	26	130	2	0	314
Total		*130*	*650*	*130*	*650*	*10*	*0*	*1,569*
Medium Term	6	26	130	26	130	2	0	314
	7	26	130	26	130	2	0	314
	8	26	130	26	130	2	0	314
	9	26	130	26	130	2	0	314
	10	26	130	26	130	2	0	314
Total		*260*	*1,299*	*260*	*1,299*	*20*	*0*	*3,138*
Long Term	11	26	130	26	130	2	0	314
	12	26	130	26	130	2	0	314
	13	26	130	26	130	2	0	314
	14	26	130	26	130	2	0	314
	15	26	130	26	130	2	0	314
	16	26	130	26	130	2	0	314
	17	26	130	26	130	2	0	314
	18	26	130	26	130	2	0	314
	19	26	130	26	130	2	0	314
	20	26	130	26	130	2	0	314
	21	26	130	26	130	2	0	314
	22	26	130	26	130	2	0	314
	23	26	130	26	130	2	0	314
	24	26	130	26	130	2	0	314
	25	26	130	26	130	2	0	314
Total		*650*	*3,248*	*650*	*3,248*	*50*	*0*	*7,844*

Sub Watershed #19 Annual Adoption (treated acres), Cropland Conservation Practices

	Year	Permanent Vegetation	Grassed Waterways	No-Till	Terraces	Wetlands	Waste Utilization	Total Adoption
Short Term	1	22	108	22	108	2	0	262
	2	22	108	22	108	2	0	262
	3	22	108	22	108	2	0	262
	4	22	108	22	108	2	0	262
	5	22	108	22	108	2	0	262
Total		*108*	*542*	*108*	*542*	*10*	*0*	*1,311*
Medium Term	6	22	108	22	108	2	0	262
	7	22	108	22	108	2	0	262
	8	22	108	22	108	2	0	262
	9	22	108	22	108	2	0	262
	10	22	108	22	108	2	0	262
Total		*217*	*1,084*	*217*	*1,084*	*20*	*0*	*2,622*
Long Term	11	22	108	22	108	2	0	262
	12	22	108	22	108	2	0	262
	13	22	108	22	108	2	0	262
	14	22	108	22	108	2	0	262
	15	22	108	22	108	2	0	262
	16	22	108	22	108	2	0	262
	17	22	108	22	108	2	0	262
	18	22	108	22	108	2	0	262
	19	22	108	22	108	2	0	262
	20	22	108	22	108	2	0	262
	21	22	108	22	108	2	0	262
	22	22	108	22	108	2	0	262
	23	22	108	22	108	2	0	262
	24	22	108	22	108	2	0	262
	25	22	108	22	108	2	0	262
Total		*542*	*2,710*	*542*	*2,710*	*50*	*0*	*6,555*

14 APPENDIX H: PARTNERS – CHENEY LAKE WATERSHED

ORGANIZATION	CONTACT	TITLE	PHONE	EMAIL	WEBSITE
City of Wichita, Water and Sewer Dept.	Deb Ary	Supt of Production and Pumping	316-268-4578	dary@wichita.gov	
Farm Service Agency	Adrian Polansky	State Executive Director	785-539-3531	adrian.polansky@ks.usda.gov	
Kansas Alliance for Wetlands and Streams	Harold Klaege	Director	785-820-1619	hklaege@kaws.org	www.kaws.org
Kansas Rural Center	Mary Fund	Interim Director	785-873-3431	ksrc@rainbowtel.net	www.kansasruralcenter.org
KDA - Division of Conservation	Greg Foley	Director	785-296-3600	Greg.Foley@kda.ks.gov	www.ksda.gov/doc/
Kansas Environmental Leadership Program	Brandi Nelson	Organizer	785-532-3828	nelsonbm @ ksu.edu	www.ksre.ksu.edu/kelp
Kingman County Conservation District	Pam Stasa	District Manager	620-532-2741	pam.stasa@ks.nacdnet.net	
Kansas Center for Ag Resources and Environment	Dan Devlin	Director	(785) 532-0393	ddevlin@ksu.edu	www.kcare.ksu.edu/
KSU Extension - Reno County	Cody Barilla	Ag Agent	620-662-2371	cbarilla@ksu.edu	www.reno.ksu.edu
KSU Extension - Sedgwick County	Tonya Bronleewe	Ag and Natural Resources Agent	(316) 660-0100	Tonyab@ksu.edu	www.sedgwick.ksu.edu
Kansas State University - Agronomy	Nathan Nelson	Agronomy - research	(785) 532-5115	nonelson@ksu.edu	
No-till on the Plains	Jana Lindly	Program Coordinator	888-330-5142	jana.lindley@notill.org	www.notill.org
NRCS	Jess Crockford	Asst. State Con.	620-663-3501	jess.crockford@ks.usda.gov	
NRCS	Lyle Frees	Natural Reource Specialist	785-823-4553	lyle.frees@ks.usda.gov	

NRCS, West National Technology Center	Barry Southerland	Fluvial Geomorphologist	(503) 273-2436	barry.southerland@por.usda.gov	
Pheasants Forever	Tony Jacobs	Western KS field rep	(785) 764-6240	tjacobs@pheasantsforever.org	www.pheasantsforever.org
Pratt County Conservation District	Sheryl Stevenson	District Manager	620-672-2503	sheryl.stevenson@ks.nacdnet.net	
Reno County Conservation District	Jan Richardson	District Manager	620-669-8161	jan.richardson@ks.nacdnet.net	
Reno County Farm Bureau Association	Carol Miller	County Coordinator	620-663-4251	renofb@kfb.org	www.renofba.com
Reno County Health Dept.	Darcy Bayse	Environmental Health Director	620-294-2901	darcy.basye@renogov.org	www.renogov.org/health
Stafford County Conservation District	Zoe Staub	District Manager	620-549-3480	zoe.staub@ks.nacdnet.net	
George Stumps Wildlife Trust Fund	Citizens State Bank And Trust	Administrator	785-472-3141		