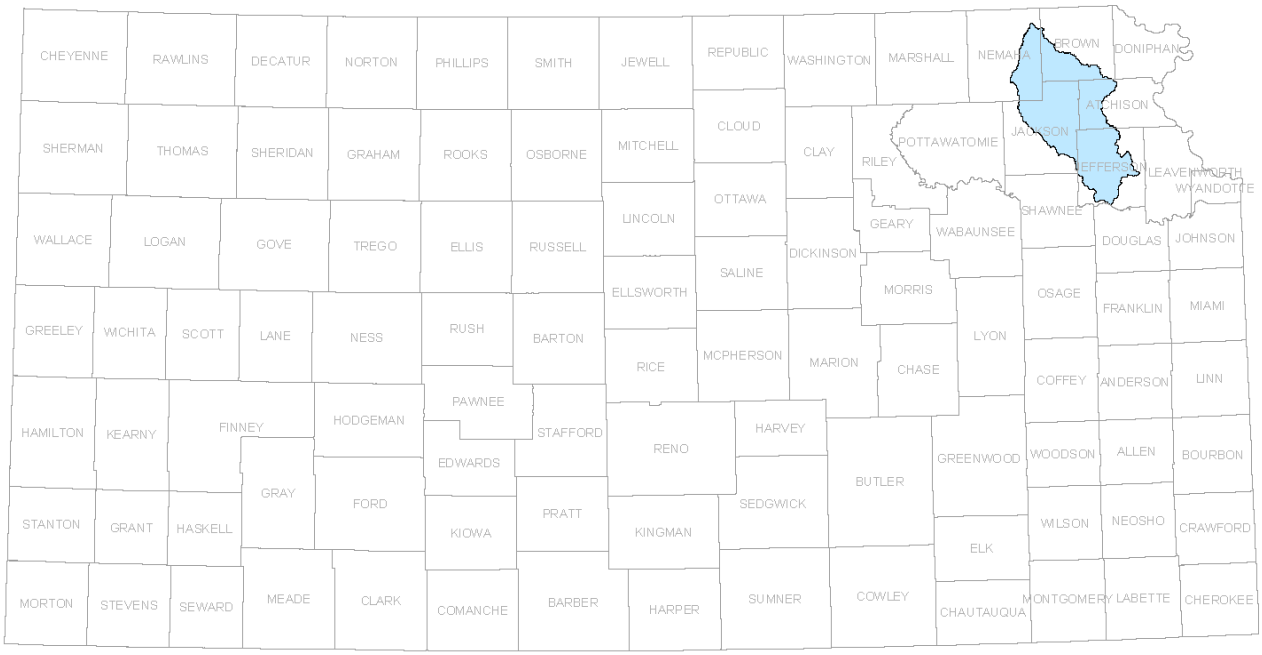
KANSAS
Rapid Watershed Assessment

Delaware River Watershed
Hydrologic Unit Code - 10270103



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Resource Profile

1.0 Purpose

This rapid watershed assessment (RWA) organizes resource information into one document that local conservationists, units of government, and others can use to identify existing resource conditions and conservation opportunities. This will enable the user to direct technical and financial resources to the local needs in the watershed. This RWA provides a brief description of the Delaware River sub-basins' natural resources, resource concerns, conservation needs, and ability to resolve natural resource issues and concerns.

2.0 Introduction

The Delaware River 8-Digit Hydrologic Unit Code (HUC) sub-basin is comprised of 740,772 acres in northeast Kansas including Brown, Nemaha, Jackson, Atchison, and Jefferson Counties. According to the National Land Cover Data (NLCD), approximately 35 percent of the sub-basin is in grain and row crop; 50 percent is in grassland, pasture, and hay; and the rest is made up of other various land uses. This sub-basin is located in the Delaware River watershed basin and drains into Perry Reservoir as it flows from northwest to southeast.

Relief Map

Resource concerns are numerous in the sub-basin. They include, but are not limited to, soil erosion, soil condition, deteriorated surface water quality, deteriorating plant conditions, inadequate fish and wildlife cover and food, and inadequate stock water. Economic issues such as the high capital costs of crop production and farm operation, and unreliable profits may delay the acceptance and implementation of conservation on agricultural lands in the sub-basin.

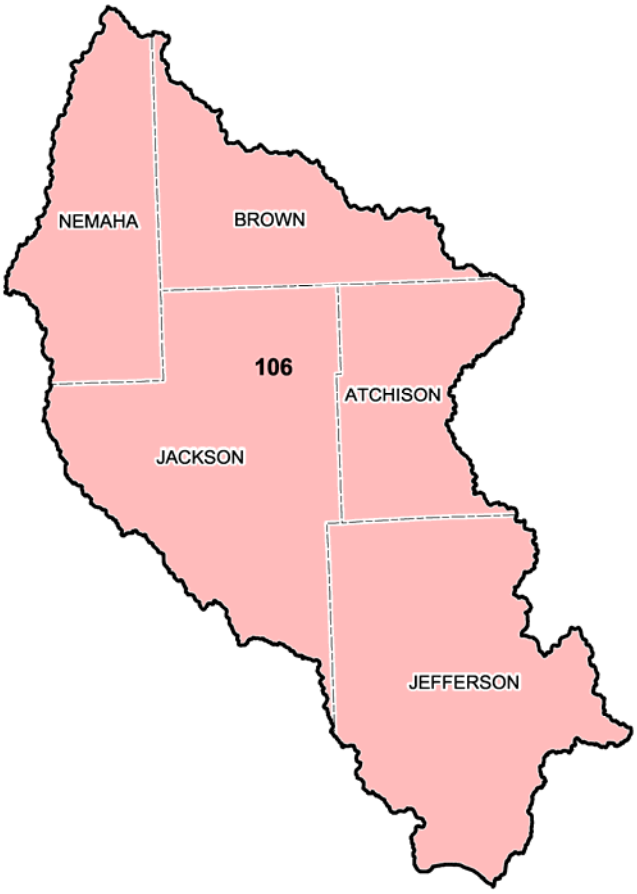
There are 4370 farms and 4370 operators in the Delaware River sub-basin. The estimated farm size in 2002 was 380 acres.

Five Natural Resources Conservation Service (NRCS) service centers, five county conservation districts, the Delaware River Watershed District, and the Glacial Hills Resource Conservation and Development (RC&D) area provide assistance in the sub-basin.

3.0 Physical Description

The physical description of the Delaware River sub-basin provides detailed information so the user can better understand the natural resources associated with this geographical land unit.

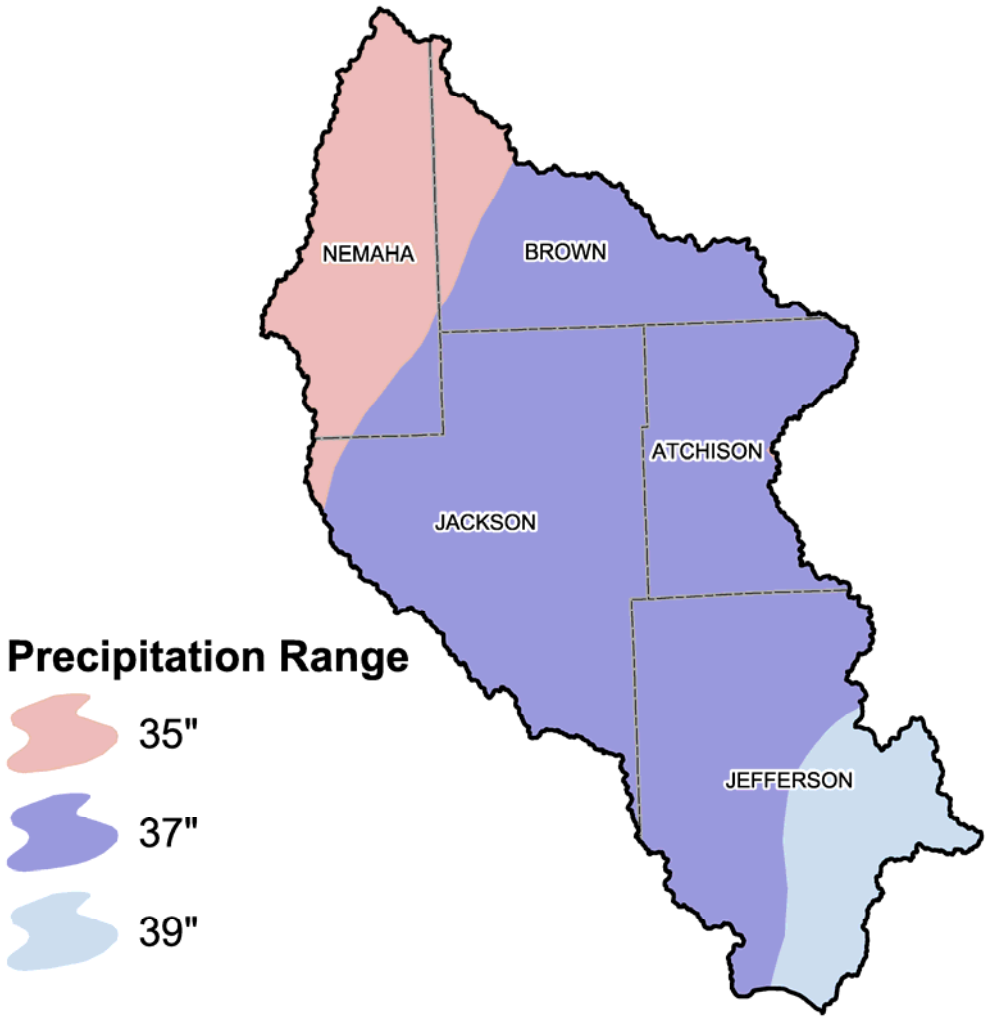
3.1 Common Resource Area Map[1]



106.1 – Nebraska and Kansas Loess Drift Hills: The Nebraska and Kansas Loess Drift Hills is a dissected glacial drift plain mantled by thick loess. The nearly level to strongly sloping ridge-tops are broad and smooth. The stream valleys are narrow with steep side-slopes. Local relief reaches to 200 feet. Soils are deep with high clay content. Pre-settlement vegetation was native tall grasses on the hills and trees along the streams and intermittent drainage-ways.

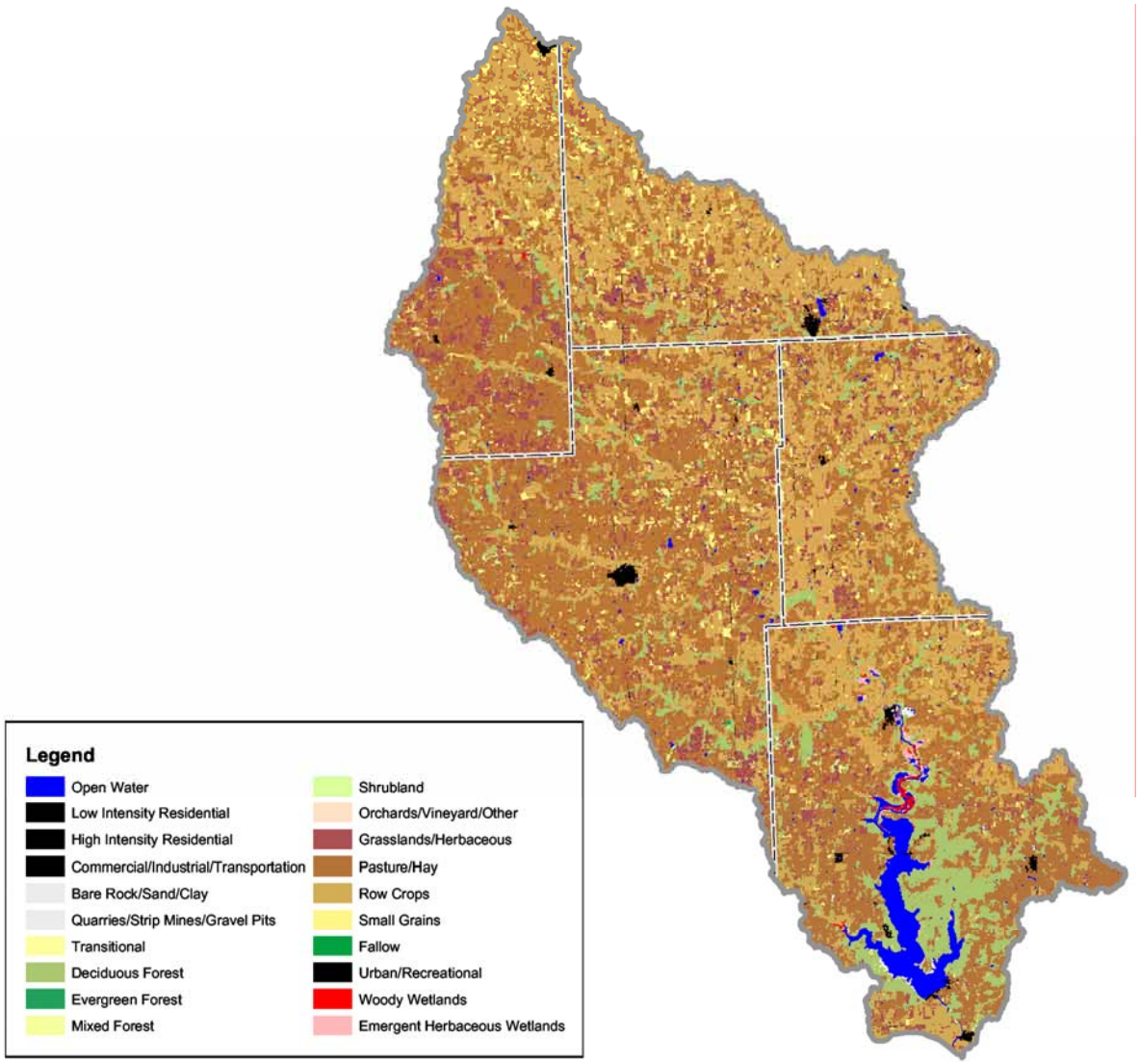
3.2 Precipitation Map[12]

The map below depicts the average precipitation occurring within the sub-basin.



3.3 Land Use and Land Cover Distribution Map[3]

The map below represents the distribution of land cover and land use as defined by NLCD.



3.3.1 Land Use and Land Cover Summary Table[/3]

Land Cover/Land Use	Ownership						Totals	%
	Public		Private		Tribal			
	Acres	%	Acres	%	Acres	%		
Open Water	12,540	2%	4,358	1%	1,209	*	18,107	2
Low Intensity Residential			1,660	*	390	*	2,050	*
High Intensity Residential			532	*	187	*	719	*
Commercial/Industrial/ Transportation			1,914	*	494	*	2,408	*
Bare Rock/Sand/Clay			299	*			299	*
Quarries/Strip Mines/Gravel Pits			242	*			242	*
Deciduous Forest	2,700	*	63,154	9%	7,920	1%	73,774	10
Evergreen Forest			190	*	40	*	230	*
Mixed Forest			2,195	*	448	*	2,643	*
Shrubland			2,640	*	169	*	2,809	*
Grassland/Herbaceous	8,219	1%	58,936	8%	15,832	2%	82,987	11
Pasture/Hay			245,148	33%	46,997	6%	292,145	39
Row Crops			170,717	23%	50,616	7%	221,333	30
Small Grains			25,181	3%	9,840	1%	35,021	5
Urban/Recreational	650	*			163	*	813	*
Woody Wetlands			2,132	*	454	*	2,586	*
Emergent Herbaceous Wetlands	1,000	*	1,399	*	206	*	2,605	*
HUC Totals [a]	**25,109**	**3%**	**580,697**	**78%**	**134,962**	**18%**	**740,772**	**100%**

**: Less than 1 percent of total acres.*
[a]: Totals are approximate due to rounding and small unknown acreages.

Special Considerations for This 8-Digit HUC using NLCD data:

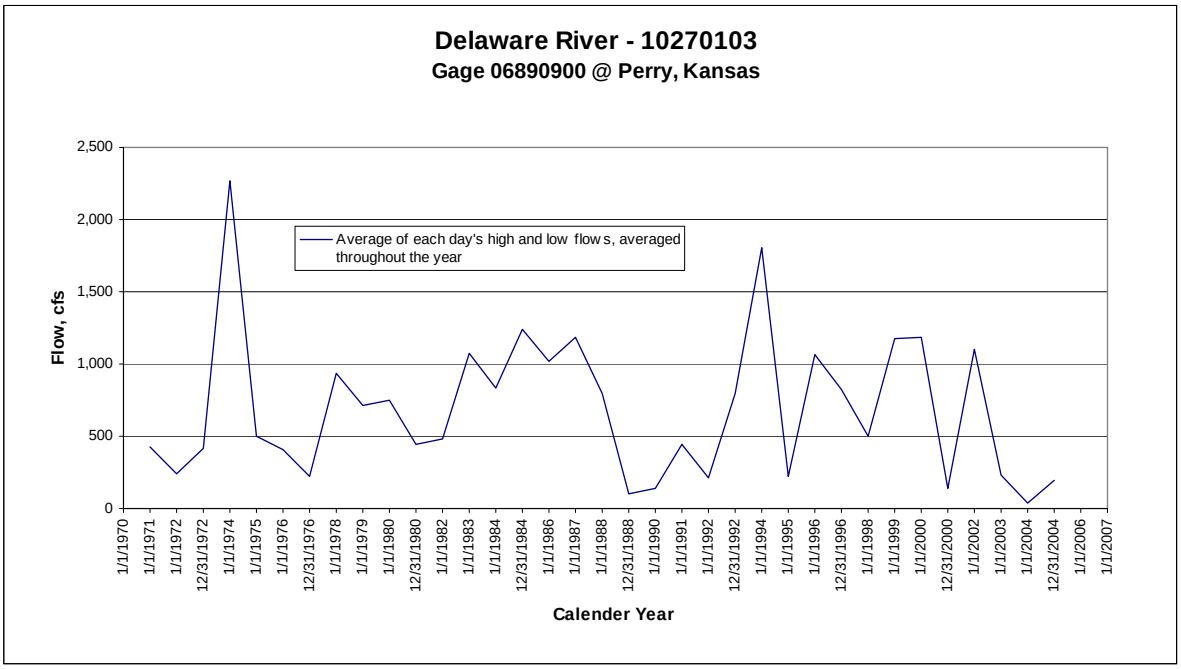
- Small grains and row crops are predominant commodities grown in rotation on just less than 35 percent in HUC.
- Grasslands/Herbaceous and Pasture/Hay makes up approximately 50 percent of the watershed.
- Forest makes up approximately 10 percent of the watershed.
- Urban land comprises less than 1 percent of HUC.

Irrigated Lands[/4]	Percent of Cropland	Percent of HUC
	<1	<1

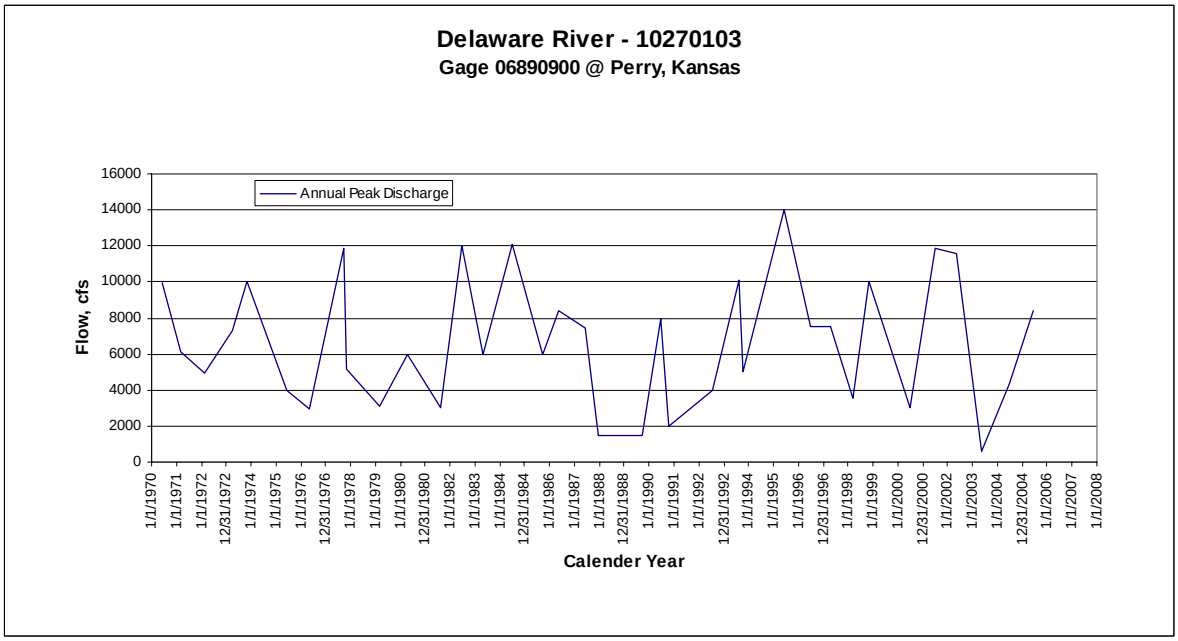
3.4 Stream Flow Data[/5]

Stream flow data has been collected since 1970 at the gage station listed below. There are three U.S. Geological Survey (USGS) stream gage stations located within the sub-basin. For this assessment, data was collected from one stream gage station on the Delaware River near Perry, Kansas.

Average Annual Daily Flow



Annual Peak Flow



3.5 Other Physical Descriptions

Stream Data[6]	Total Miles – Major (100K Hydro Geographic Information System [GIS] Layer)	637	
		ACRES	**PERCENT**
Land Cover / Use[3] Based on a 100-foot stretch on both sides of all streams in the 100K Hydro GIS Layer	Open Water	16,485	18
	Low Intensity Residential	42	0
	High Intensity Residential	4	0
	Commercial/Industrial/Transportation	156	0
	Bare Rock/Sand/Clay	56	0
	Quarries/Strip Mines/Gravel Pits	39	0
	Deciduous Forest	17,049	19
	Evergreen Forest	22	0
	Mixed Forest	481	1
	Shrubland	143	0
	Grassland/Herbaceous	5,050	6
	Pasture/Hay	29,584	33
	Row Crops	18,523	20
	Small Grains	1,633	2
	Urban/Recreational	61	0
	Woody Wetlands	817	1
	Emergent Herbaceous Wetlands	500	1
	Total Acres of 100-foot Stream Buffers	**90,642**	**100**
Land Capability Class[4]	**1** – slight limitations		
	2 – moderate limitations		
	3 – severe limitations	575,700	77
	4 – very severe limitations		
	5 – no erosion hazard, but other limitations		
	6 – severe limitations; unsuitable for cultivation; limited to pasture, range, forest		
	7 – very severe limitations; unsuitable for cultivation; limited to grazing, forest, wildlife habitat		
	8 – miscellaneous areas; limited to recreation, wildlife habitat, water supply	135,500	19
	Total	**711,200**	**96**

4.0 Resource Concerns

Resource concerns are issues related to the natural environment. Natural resources include soil, water, air, plants, animals, and humans. Local conservationists identified major resource issues by landuse that affect the Delaware River sub-basin.

4.1 Summary of Resource Concerns

Resource Concerns / Issues by Land Use								
Soil, Water, Air, Plant, Animal, plus Human (SWAPA +H) Concerns	**Specific Resource Concern / Issue**	Pasture/Hay	Grain Crops	Row Crops	Grazed Range	Forest	Wildlife	Urban
Soil Erosion	Sheet and Rill		X	X				
	Ephemeral Gully		X	X				
	Classic Gully	X						
	Streambank	X						
	Road, Roadsides and Construction Sites							X
Soil Condition	Organic Matter Depletion		X	X				
	Contaminants: Animal Waste and Other Organics - P		X	X				
Water Quality, Surface	Harmful Levels of Pesticides		X	X				
	Excessive Nutrients and Organics		X	X				
Plant Condition	Productivity, Health and Vigor	X				X		
	Noxious and Invasive Plants	X						
Animal: Fish and Wildlife	Inadequate Food	X						
	Inadequate Cover/Shelter	X						
Animal: Domestic	Inadequate Stock Water	X						
Human Economics	High Capital/Financial Costs	X		X				

Pasture / Hay

- Pastureland is commonly over-utilized, lacks needed fertility, affected by timing of grazing, and is affected by invasive weeds.
- Classic gully and streambank erosion in pasture and hayland are concerns in part due to over utilization of the plant resource and unabated livestock access to stream corridors and banks.
- Hayland lacks needed fertility, affected by timing of haying, and is affected by invasive weeds.
- Invasive/noxious species are present (e.g. *Serecia lespedeza*, Johnson Grass).

Grain and Row Crops

- Residue, nutrient, and pest management; vegetative practices; and structural practices are necessary to control erosion, protect water quality, and improve soil conditions.
- For cropland, sheet and rill erosion is greater on steeper slopes.
- Over application of nutrients and organics has created surface water quality concerns.

Forest

- Forested areas have not been managed to their full potential.

Urban

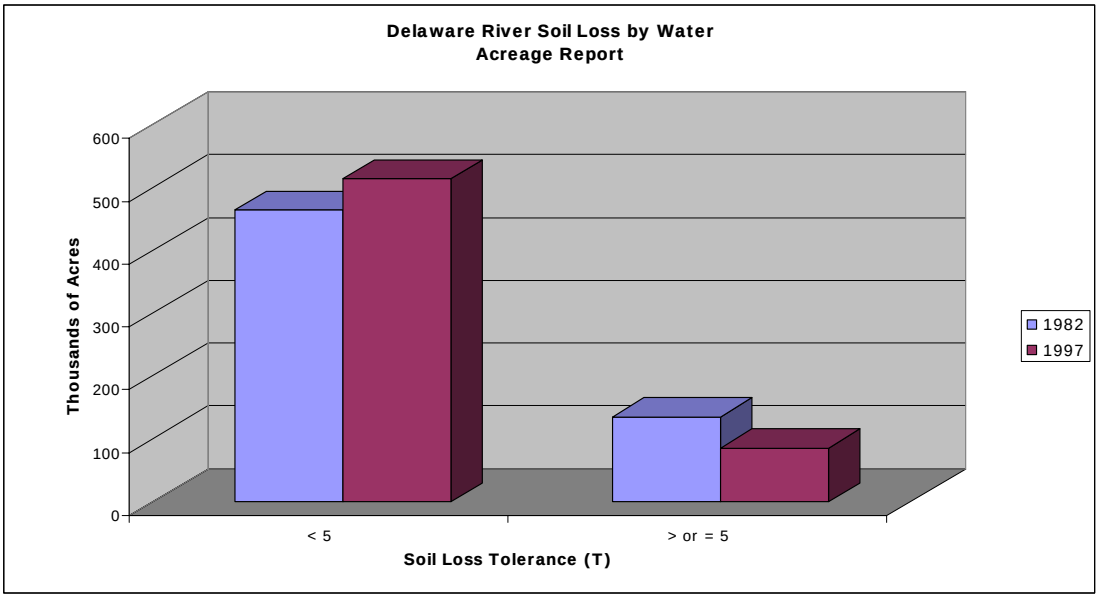
- Urban areas lack needed erosion protection during and after construction activities occur.

General

- Inputs needed to manage large agricultural operations, costs of production, and low commodity values require large capital outlay and place heavy financial burdens of landowners and producers.

4.2 Estimated Soil Loss[/4]

Soil loss through wind and water erosion is critical to consider for dealing with air and water quality issues. As airborne particulate, soil particles are a major contributor to air quality concerns. Soil loss through water erosion causes water quality impairments, as pollutants are attached to soil colloids and are transported into the stream systems. Erosion by water has been identified as a concern in this watershed.



- The National Resources Inventory (NRI) estimates indicate that agricultural land eroding through water erosion over the sustainable level of 5 tons per acre per year decreased by approximately 50,000 acres from 1982 to 1997.
- Controlling erosion not only sustains the long-term productivity of the land, but it also affects the amount of soil, pesticides, fertilizer, and other substances that move into the nation's waters.
- Through NRCS programs, many farmers and ranchers have applied conservation practices to reduce the effects of erosion by water.

4.3 Water Quality Conditions[/13]

The Kansas Department of Health and Environment (KDHE) is responsible for monitoring water quality conditions in the state of Kansas. This section has been provided by KDHE.

For up-to-date water quality condition information, visit the KDHE Web-site at:
http://www.kdheks.gov/befs/download/KS2006_305b_Reoprts.pdf

4.3.1 Confined Animal Feeding Operations

In Kansas, confined animal feeding operations (CAFOs) with an animal unit capacity of 300 or more must register with the KDHE. Waste disposal practices and the wastewater effluent quality of these registered CAFOs are closely monitored by the KDHE to determine the need for runoff control practices or structure in order to protect the waters of the state of Kansas. Because of this monitoring, registered CAFOs are not considered a significant threat to water resources within the watershed. A portion of the state's livestock population exists on small, unregistered farms. These small, unregistered livestock operations may contribute a significant source of fecal coliform bacteria and nutrients, depending on the presence and condition of waste management systems and proximity to water resources.

Confined Animal Feeding Operations Registry Table						
Animal Type	Dairy	Feedlot	Poultry	Swine	Truck-wash	Other
Number of Permitted Farms	29	33	0	20	0	1
Number of Permitted Animal Units	4,023	12,916	0	5,970	0	80

4.3.2 Public Water Supply Systems

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. The KDHE oversees more than 1,086 statewide public water supply systems including municipalities, rural water districts, and privately owned systems. These systems may serve a small community of several families to a city of more than 300,000 persons.

There are 63 Active Public Water Supply Sites located within this watershed. Though water is drawn from surface water within the watershed, much of public water supply for the area is provided by two groundwater aquifers. A portion of the Glacial Drift aquifer exists in the northern half of the watershed and is often used for rural domestic water supply. Alluvial aquifers of the Kansas River and its tributaries exist throughout the watershed and provide the primary water source for many public water supplies. Water quality in alluvial aquifers is generally good; however nitrates, minerals, pesticides, and bacteria can be pollutant concerns. Water from the glacial aquifer is generally in good condition with naturally occurring minerals and ammonia and manganese as the primary pollutant concerns.

Source Water Assessment: The 1996 amendments to the Safe Drinking Water Act required each state to develop a Source Water Assessment Program (SWAP). Additionally, each state was required to develop a Source Water Assessment (SWA) for each public water supply that treats and distributes raw source water. In Kansas, there are approximately 763 public water supplies that required SWAs. A SWA includes the following: delineation of the source water assessment area; inventory of potential contaminant sources; and susceptibility analysis. The SWA must also be made available to the public. KDHE's Watershed Management Section has implemented the Kansas SWAP plan, and all SWAs are completed.

The Safe Drinking Water Act did not require protection planning to be part of the SWAP process. On a voluntary basis, KDHE encourages public water supplies and their surrounding communities to use the SWAs as the foundation for future protection planning efforts. Source water protection information will be posted on this site as it is compiled. To obtain a copy of SWAs in this watershed visit: http://www.kdheks.gov/nps/swap/SWreports.html

4.3.3 Designated Uses

According to the Kansas Surface Water Register, the most *common* designated uses for streams and rivers in this watershed include: expected aquatic life use, primary and secondary contact recreation, domestic water supply, and food procurement. The table below lists designated uses by stream and impairments in the watershed.

Designated Uses Table								
Stream Name	**AL**	**CR**	**DS**	**FP**	**GR**	**IW**	**IR**	**LW**
Banner Cr	E	b	X					
Barnes Cr	E	b						
Bills Cr	E	b						
Brush Cr	E	C, b						
Burr Oak Cr	E	C	X					
Catamount Cr	E	C						
Cedar Cr	E	B, b		X				
Cedar Cr, North	E	C		X				
Cedar Cr, South	E	C		X				
Claywell Cr	E	C	X					
Clear Cr	E	B						
Coal Cr	E	B		X				
Delaware R	E	C, B, b	X	X	X	X	X	X
Elk Cr	E	C		X				
Grasshopper Cr	E	C, b						
Gregg Cr	E	C		X				
Honey Cr	E	b						
Little Grasshopper Cr	E	b						
Little Slough Cr	E	C						
Little Wild Horse Cr	E	C						
Mission Cr	E	B	X	X	X	X	X	X
Mosquito Cr	E	b						
Muddy Cr	E	C, b		X				
Nebo Cr	E	b						
Negro Cr	E	b						
Otter Cr	E	b						
Plum Cr	E	b		X				
Rock Cr	E	C	X	X				
Slough Cr	E	C	X	X				
Spring Cr	E	C						
Squaw Cr	E	b						
Straight Cr	E	b		X				
Tick Cr	E	C	X					
Walnut Cr	E	C		X				
Wolfley Cr	E	b		X				

AL = Aquatic Life Support
CR = Contact Recreation
DS = Domestic Water Supply
FP = Food Procurement
GR = Groundwater Recharge
IW = Industrial Water Supply
IR = Irrigation Water Supply
LW = Livestock Water Supply

E = Expected Aquatic Life Use Water
B = Primary contact recreation stream segment is by law or written permission of the landowner open to and accessible by the public.
C = Primary contact recreation stream segment is not open to and accessible by the public under Kansas law.
b = Secondary contact recreation stream segment is not open to and accessible by the public under Kansas law
X = Referenced stream segment is assigned the indicated designated use

4.3.4 Total Maximum Daily Loads

Total Maximum Daily Loads (TMDLs) are limits on the amount of pollutant entering a stream or lake, while still attaining water quality standards. The water quality standards identify the designated uses of streams, lakes, and wetlands and the level of water quality necessary to fully support these uses. The process of developing TMDLs in Kansas determines:

1. The pollutants causing water quality impairments.
2. The magnitude of the impairment relative to applicable water quality standards.
3. The overall level of pollution reduction needed to attain achievement of water quality standards.
4. The allocation of pollutant loads to be distributed among point and non-point sources in the watershed affecting the water quality limited water body.
5. Suggested corrective actions and management practices to be implemented in order to achieve the load allocations, TMDLs, and water quality standards.
6. The monitoring and evaluation strategies needed to assess the impact of corrective actions in achieving TMDLs and water quality standards.
7. Provisions for future revision of TMDLs based on those evaluations.

The following table shows the percentage of stream miles within HUC 8 11030004 that are listed on the 303d list. Section 303(d) of the Clean Water Act requires states to identify and list all water bodies where state water quality standards are not being met. Thereafter, TMDLs comprising quantitative objectives and strategies have been developed for these impaired waters within the watershed in order to achieve their water quality standards. For additional TMDL information or to download the TMDL report, visit: http://www.kdheks.gov/tmdl/index.htm

Stream Data	Total Miles – Major (100K Hydro GIS Layer)	637
	303d/TMDL Listed Streams (KDHE)	511

2006 Impaired Waters for HUC 8 1270103 with TMDLs			
HUC8	**Watersheds in TMDL**	**Priority**	**Impairments**
10270103	Banner Creek	High	Ammonia
10270103	Delaware River above Perry Lake	High	Fecal Coliform Bacteria
10270103	Elm Creek	High	Ammonia
10270103	Grasshopper Creek	High	Fecal Coliform Bacteria
10270103	Little Lake	Low	Eutrophication
10270103	Mission Lake	High	Atrazine
10270103	Mission Lake	High	Eutrophication
10270103	Sabetha Watershed Pond	Low	Eutrophication
10270103	Upper Delaware River	High	Ammonia
10270103	Upper Delaware River	High	Dissolved Oxygen
10270103	Upper Delaware River	High	Fecal Coliform Bacteria

2006 Impaired Waters Needing TMDLs	
Impaired Stream/Lake	**Impairment**
Perry Lake and Wildlife Area	Eutrophication
Atchison County Park Lake	Eutrophication
Grasshopper Creek	Copper and Zinc

Impairment definitions:

Ammonia: Ammonia is a chemical, which is toxic to fish and aquatic organisms. Sources of ammonia are livestock, septic tanks, fertilizer, municipal, and industrial waste. Conditions of high pH and temperature increase the toxicity of ammonia.

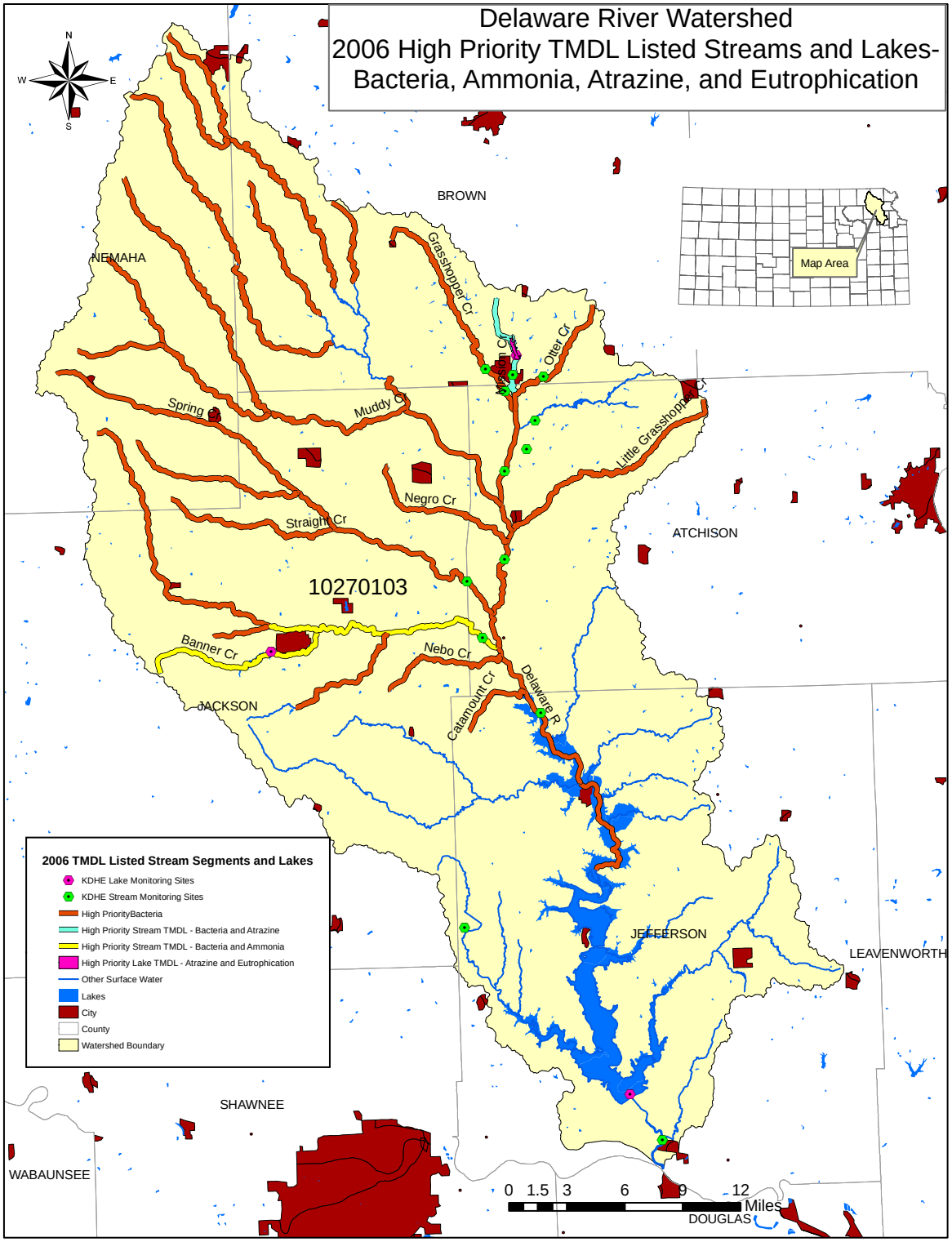
Atrazine: Atrazine is a relatively inexpensive herbicide. It is the most widely used chemical in the control of broadleaf weeds and grasses for the production of corn and milo. It may wash from soil into streams or groundwater, and in excessive amounts, can be toxic to fish and aquatic organisms and pollute public water supplies. State water quality standards for atrazine are 3 ppb.

Dissolved Oxygen: Oxygen available to aquatic life with the water column. State water quality standards require a stream or lake to have at 5mg/L of dissolved oxygen.

Eutrophication: Eutrophication is the enrichment of an ecosystem with nutrients, typically compounds containing nitrogen or phosphorus. Eutrophication is considered a form of pollution because it promotes plant growth, favoring certain species over others and forcing a change in species composition. In aquatic environments, enhanced growth of aquatic vegetation or phytoplankton (that is, an algal bloom) disrupts normal functioning of the ecosystem, causing a variety of problems.

Bacteria: Bacteria indicators (either fecal coliform or *E. coli*) are found in the digestive systems of warm-blooded animals. In surface waters, bacteria are an indicator of potential disease causing organisms. Potential sources of bacteria contamination in surface waters include municipal wastewater, livestock, septic systems, pets, and wildlife.

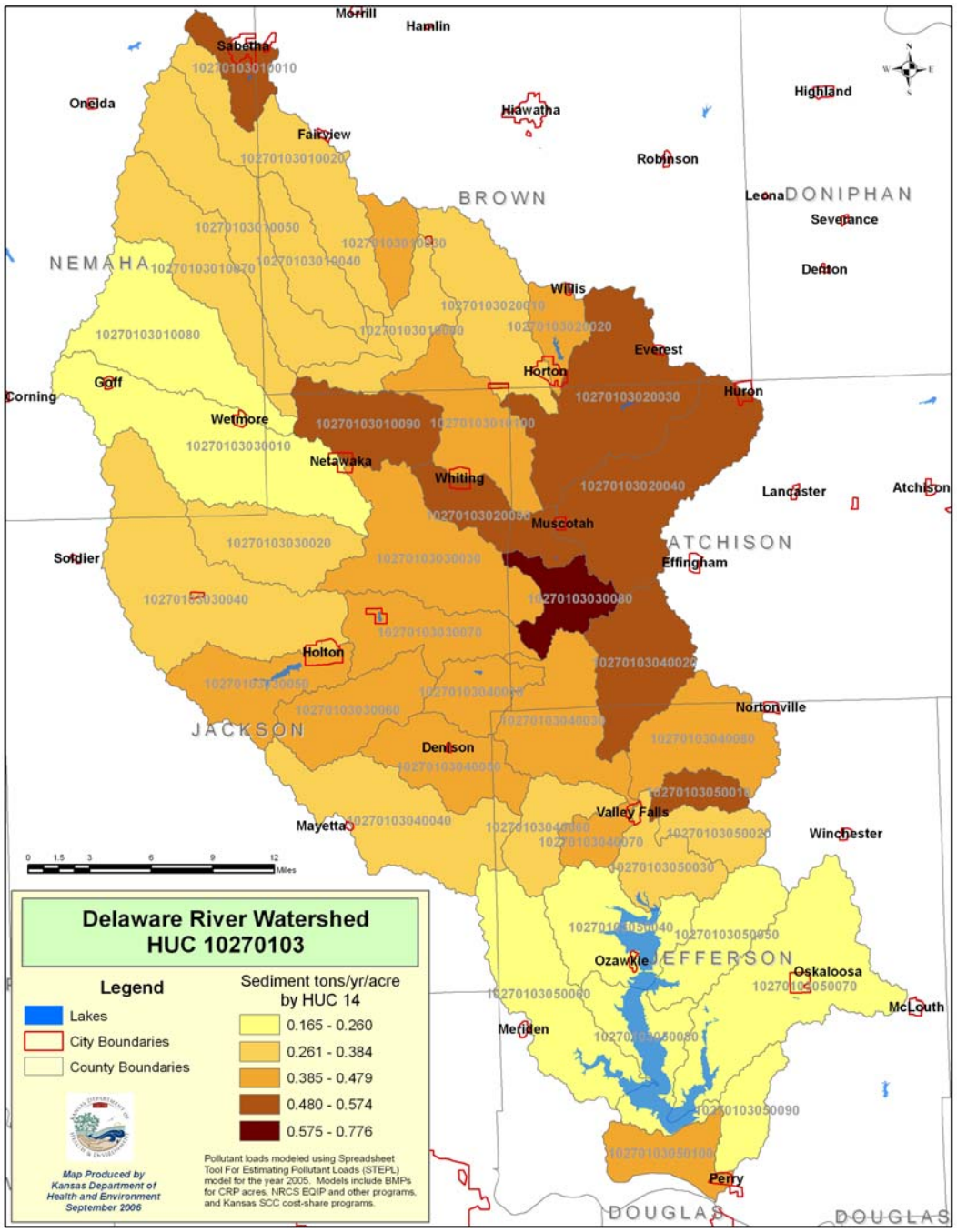
Copper, Zinc: Metals contained in sediments and runoff impairing aquatic life by toxic amounts in soft water.


Delaware River Watershed
2006 High Priority TMDL Listed Streams and Lakes-
Bacteria, Ammonia, Atrazine, and Eutrophication
N
W
E
S
BROWN
NEMAHA
Map Area
Grasshopper Cr
Mission Cr
Otter Cr
Spring Cr
Muddy Cr
Little Grasshopper Cr
Negro Cr
Straight Cr
ATCHISON
10270103
Banner Cr
Nebo Cr
Catamount Cr
Delaware R
JACKSON
JEFFERSON
LEAVENWORTH
SHAWNEE
WABAUNSEE
DOUGLAS
0 1.5 3 6 9 12
Miles
2006 TMDL Listed Stream Segments and Lakes
KDHE Lake Monitoring Sites
KDHE Stream Monitoring Sites
High PriorityBacteria
High Priority Stream TMDL - Bacteria and Atrazine
High Priority Stream TMDL - Bacteria and Ammonia
High Priority Lake TMDL - Atrazine and Eutrophication
Other Surface Water
Lakes
City
County
Watershed Boundary

4.3.5 Modeled Pollutant Loads

The following figures indicate pollutant loads (sediment, biological oxygen demand, nitrogen, and phosphorus) modeled using the Spreadsheet Tool for Estimating Pollutant Loads (STEPL) model for the year 2005. Models include best management practices for CRP acres, NRCS EQIP and other program, and Kansas SCC cost-share programs.

Sediment



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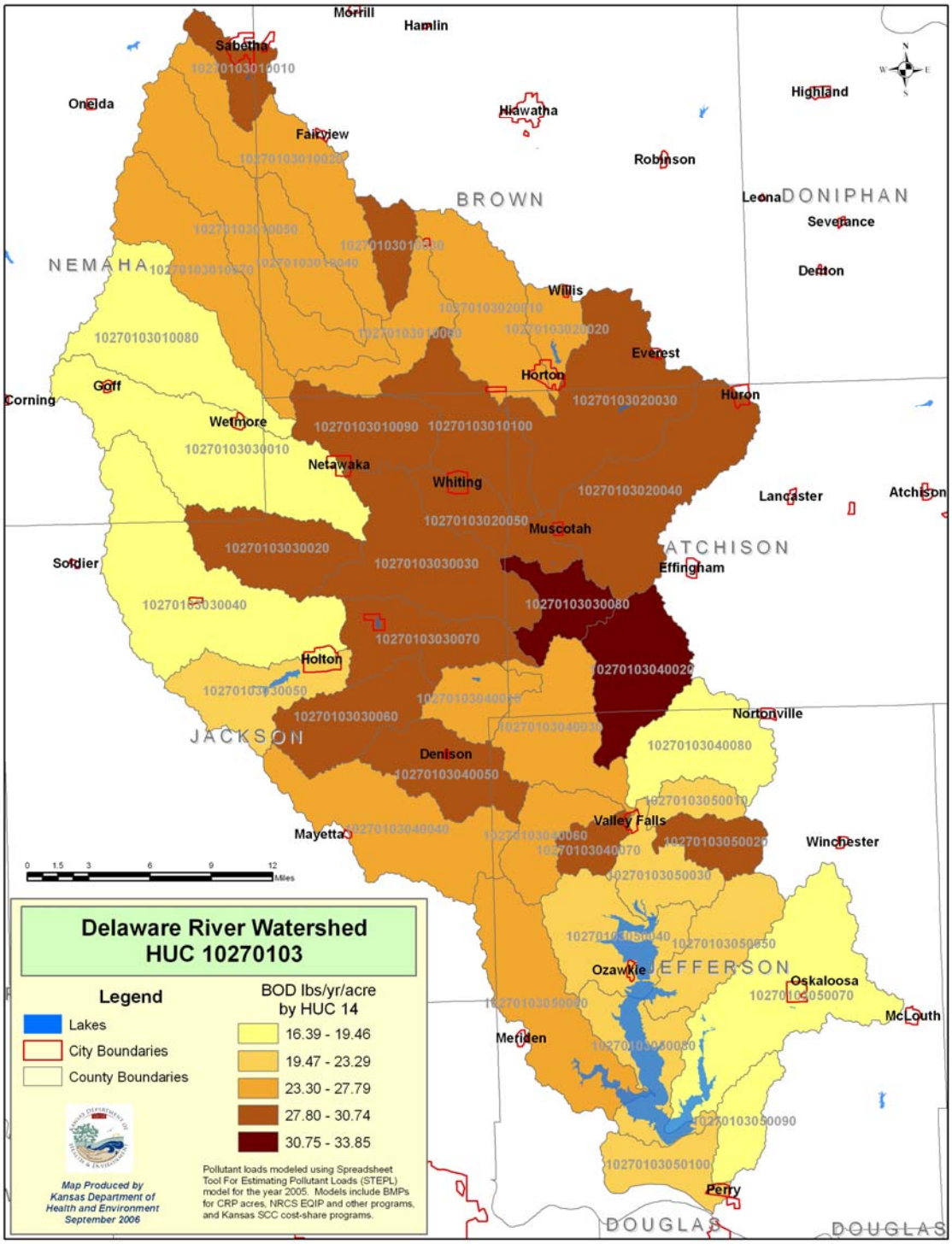
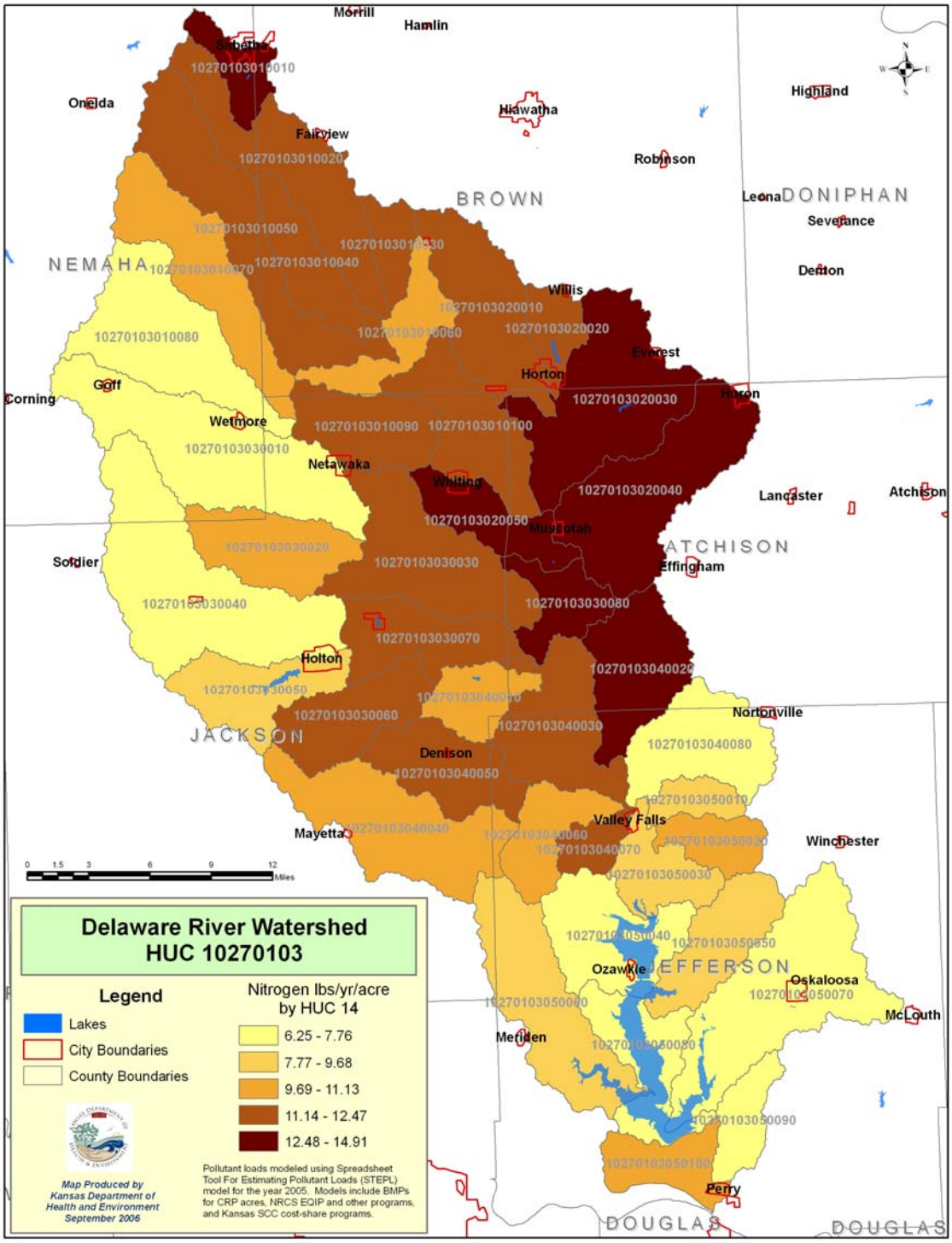
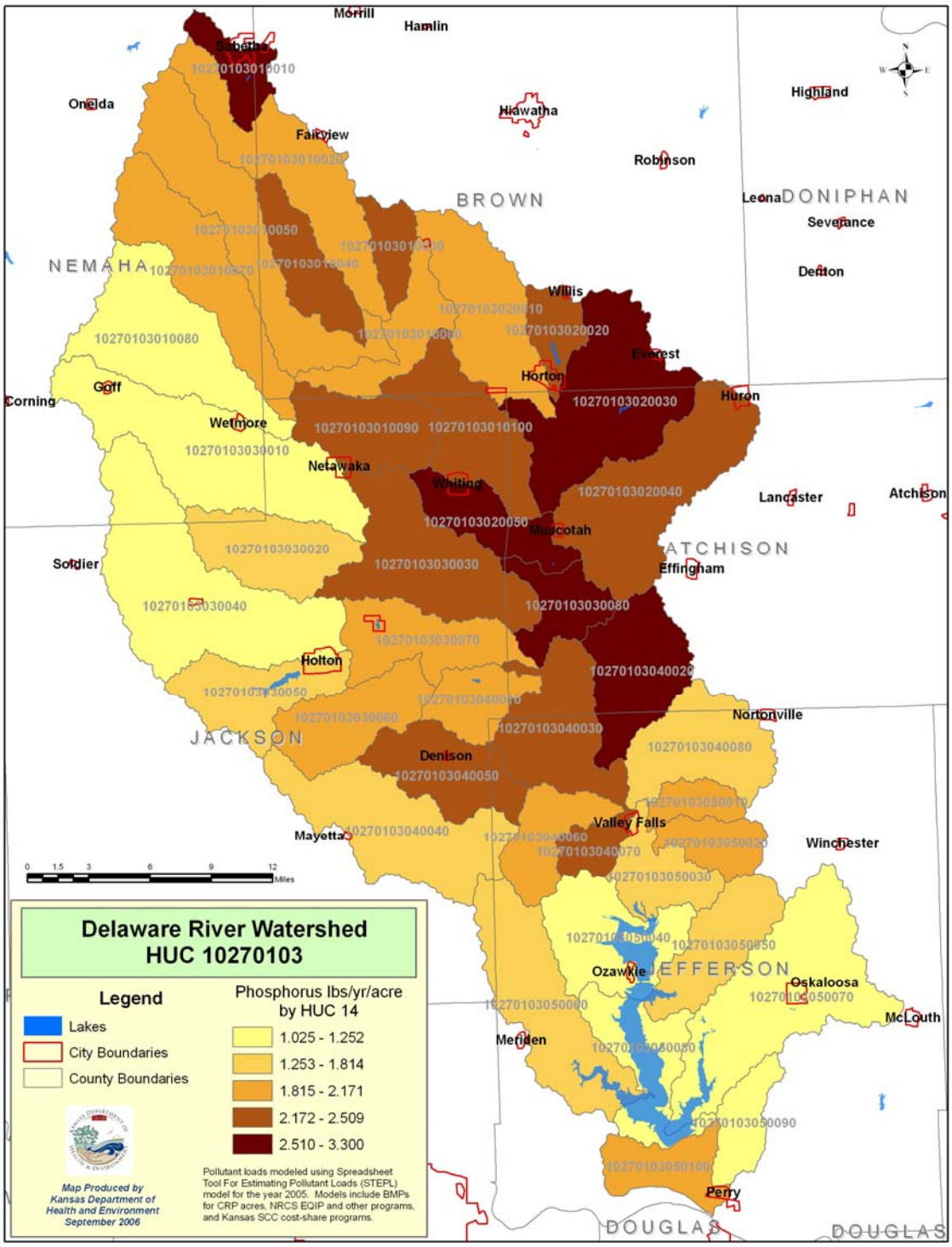
Biological Oxygen Demand (BOD)



Nitrogen


Delaware River Watershed
HUC 10270103
Legend
Lakes
City Boundaries
County Boundaries
Nitrogen lbs/yr/acre by HUC 14
6.25 - 7.76
7.77 - 9.68
9.69 - 11.13
11.14 - 12.47
12.48 - 14.91
Map Produced by Kansas Department of Health and Environment September 2006
Pollutant loads modeled using Spreadsheet Tool For Estimating Pollutant Loads (STEPL) model for the year 2005. Models include BMPs for CRP acres, NRCS EQIP and other programs, and Kansas SCC cost-share programs.
BROWN
NEMAHA
DONIPHAN
ATCHISON
JACKSON
JEFFERSON
DOUGLAS
Morrill
Hamlin
Sabatha
Oneida
Fairview
Hiawatha
Highland
Robinson
Leona
Severance
Denton
Willis
Everest
Horton
Huron
Goff
Corning
Wetmore
Netawaka
Whiting
Lancaster
Atchison
Muscotah
Effingham
Soldier
Holton
Nortonville
Denison
Valley Falls
Mayetta
Winchester
Ozawkie
Oskaloosa
McLouth
Meriden
Perry
10270103010010
10270103010020
10270103010050
10270103010040
10270103010080
10270103010090
10270103010100
10270103020010
10270103020020
10270103020030
10270103020040
10270103020050
10270103030010
10270103030020
10270103030030
10270103030040
10270103030070
10270103030080
10270103040020
10270103040030
10270103040050
10270103040080
10270103050010
10270103050030
10270103050050
10270103050070
10270103050090
10270103050100
Miles

Phosphorus

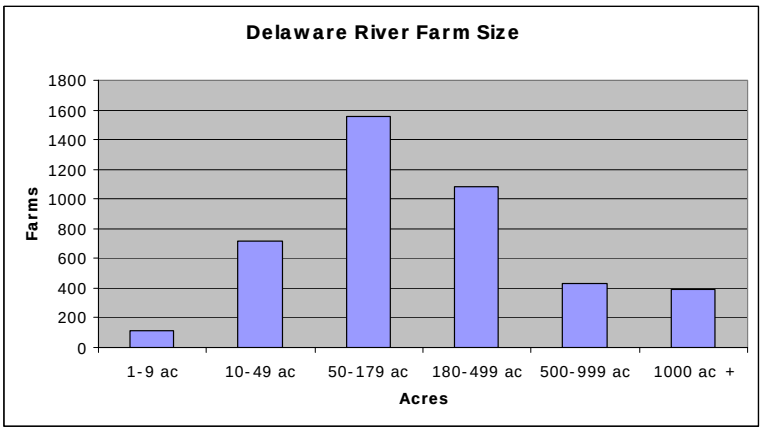

Delaware River Watershed
HUC 10270103
Legend
Lakes
City Boundaries
County Boundaries
Phosphorus lbs/yr/acre by HUC 14
1.025 - 1.252
1.253 - 1.814
1.815 - 2.171
2.172 - 2.509
2.510 - 3.300
Pollutant loads modeled using Spreadsheet Tool For Estimating Pollutant Loads (STEPL) model for the year 2005. Models include BMPs for CRP acres, NRCS EQIP and other programs, and Kansas SCC cost-share programs.
Map Produced by Kansas Department of Health and Environment September 2006
BROWN
NEMAHA
DONIPHAN
ATCHISON
JACKSON
JEFFERSON
DOUGLAS
Morrill
Hamlin
Oneida
Hiawatha
Highland
Robinson
Leona
Severance
Denton
Willis
Everest
Horton
Huron
Corning
Goff
Wetmore
Netawaka
Whiting
Lancaster
Atchison
Muncotah
Effingham
Soldier
Holton
Nortonville
Denison
Valley Falls
Mayetta
Winchester
Ozawkie
Oskaloosa
McLouth
Meriden
Perry

4.4 Threatened and Endangered Species Status [7]

The Endangered Species Act provides protection to animals that are experiencing a decline in population, or nearing extinction. The table below lists species of concern and their federal and state designation(s).

LISTED THREATENED AND ENDANGERED SPECIES			
Species Common Name (Scientific name)	***Threatened (T), Endangered (E), Proposed (P), Candidate (C)***	***Designated Critical Habitat (Y)es/(N)o***	***Listing: Federal (F), State (S)***
Animals, Vertebrates - Fishes			
Chestnut Lamprey (*Ichthyomyzon casteneaus*)	T	Y	S
Flathead Chub (*Platygobio gracilis*)	T	Y	S
Pallid Sturgeon (*Scaphirhynchus albus*)	E/E	Y	F/S
Sicklefin Chub (*Macrhybopsis meeki*)	C/E	Y	F/S
Silver Chub (*Macrhybopsis storeriana*)	E	Y	S
Silverband Shiner (*Notropis shumardi*)	T	Y	S
Sturgeon Chub (*Macrhybopsis gelida*)	C/T	Y	F/S
Topeka Shiner (*Notropis topeka*)	E/T	N	F/S
Western Silvery Minnow (*Hybognathus argyritis*)	T	Y	S
Animals, Vertebrate - Birds			
Bald Eagle (*Haliaeetus leucocephalus*)	T/T	Y	F/S
Eskimo Curlew (*Numenius borealis*)	E/E	N	F/S
Interior Least Tern (*Sterna antillarum athalassos*)	E/E	Y	F/S
Peregrine Falcon (*Falco peregrinus*)	E	N	S
Piping Plover (*Charadrius melodus*)	T/T	Y	F/S
Snowy Plover (*Charadrius alexandrinus*)	T	N	S
Whooping Crane (*Grus Americana*)	E/E	N	F/S
Animals, Vertebrate – Mammals			
Eastern Spotted Skunk (*Spilogale putorius interrupta*)	T	N	S
Animals, Vertebrate - Reptiles			
Redbelly Snake (*Storeria occipitomaculata*)	T	Y	S
Smooth Earth Snake (*Virginia valeria*)	T	Y	S
Animals, Invertebrate - Insects			
American Burying Beetle (*Nicrophorus americanus*)	E/E	N	F/S
Animals, Invertebrate – Snails			
Slender Walker Snail (*Pomatiopsis lapidaria*)	E	Y	S

5.0 Census and Social Data (2000)[/8]



Number of Farms: 4370
- Average Farm Size: 380

Number of Operators: 4370
- Full-Time Operators: 2656
- Part-Time Operators: 1714

5.1 Estimated Level of Willingness and Ability to Participate in Conservation[/9]

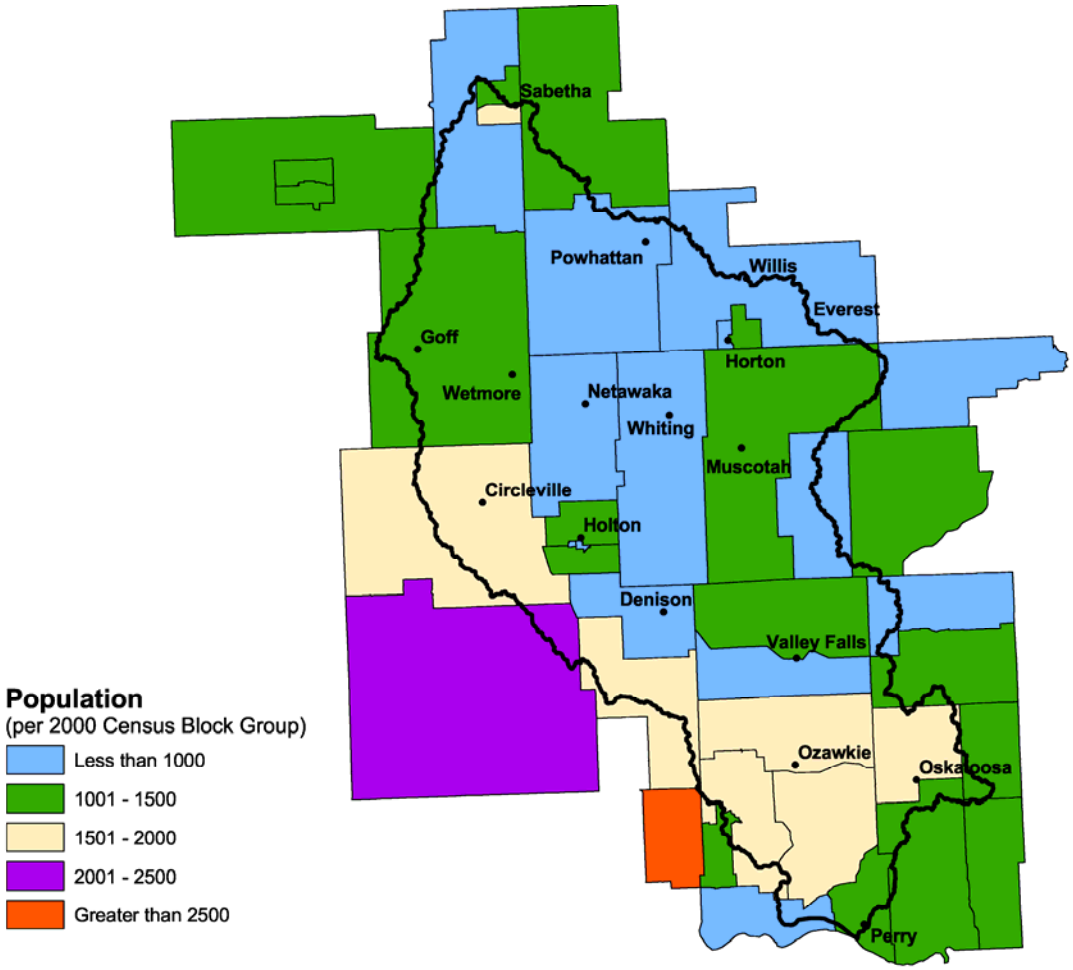
The Delaware River Watershed exhibits a good likelihood of full participation in the first five years of the project with moderate adjustments in technical and financial assistance, and conservation marketing. Management skills and a combination of educational assistance and technical assistance could be increased, although, to improve the participation rate. On average, there are no concerns with the availability of technical assistance in the watershed. The existing information and education delivery system may need minor modifications to improve effectiveness. Existing financial incentives need major expansion or substantial increases to achieve successful participation rates in a reasonable amount of time.

5.2 Evaluation of Social Capital[/10]

Social capital is defined as bonds of trust that arise between people interacting in everyday life. Local conservationists developed a summary of social capital for this sub-basin and concluded the following:

> Collectively, communities in the Delaware River sub-basin are reported to be effective at solving problems. Some small communities are very close knit and are willing to assist their neighbors by pooling their resources. Dry climatic conditions over the past decade have affected the community's economic capital, which has led to a decreased state of social well-being and thus less likely to address resource concerns.

5.3 Population Distribution Map (2000)



6.0 Conservation Progress

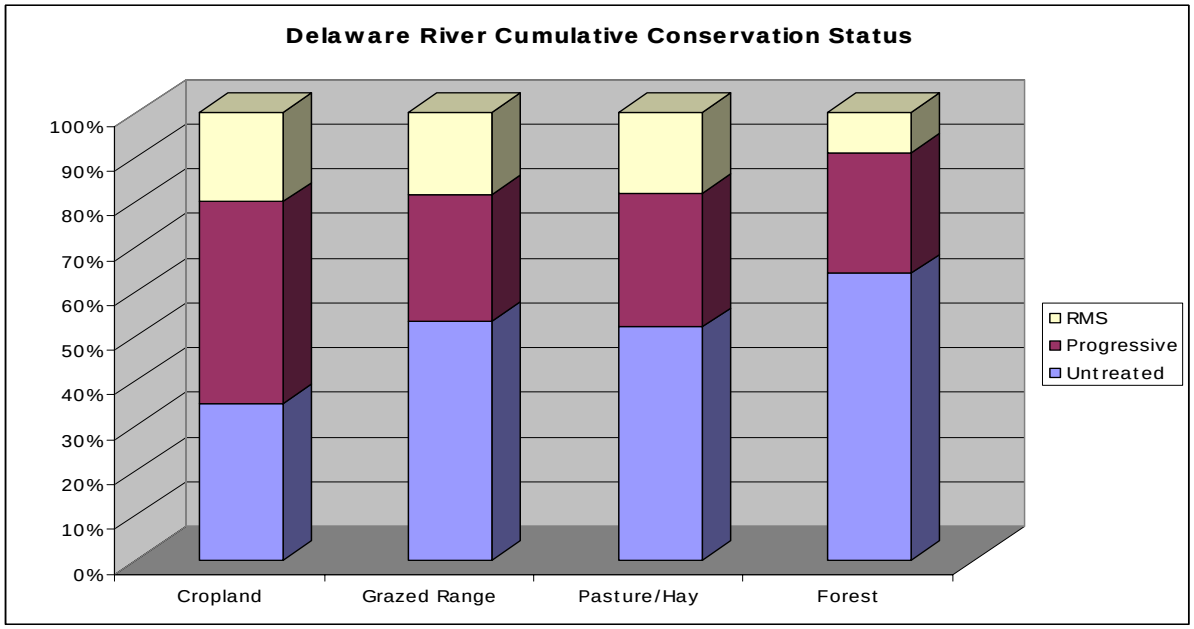
Conservation on the land is defined by the progress made by local landowners and operators addressing resource issues. Progress is typically accomplished through private, local, state, and federal funds. This data is current through the date the RWA was published. For up-to-date NRCS Performance Results System (PRS) information visit: http://ias.sc.egov.usda.gov/prsreport2006/

6.1 Reported Conservation Progress (2002 – 2006)

PRS Data	FY02	FY03	FY04	FY05	FY06	Avg/Year	Total
Total Conservation Systems Planned (ac)	18,983	15,195	N/A	31,069	21,198	21,611	86,445
Total Conservation Systems Applied (ac)	25,475	15,298	N/A	22,459	14,342	19,394	77,574
Conservation Treatment (Units/Acres)							
Brush Management (ac)			2,065	1,966	2,107	2,046	6,138
Conservation Crop Rotation (ac)			6,642	7,814	6,037	6,831	20,493
Contour Buffer Strips (ac)	20	9	7			12	36
Contour Farming (ac)			4,729	2,866	4,133	3,909	11,728
Cover Crop (ac)			36	84	49	56	169
Critical Area Planting (ac)			96	1,166	111	458	1,373
Diversion (ft)			3,709	2,981		3,345	6,690
Fence (ft)			8,494	11,031	8,935	9,487	28,460
Field Border (ft)			737		4,600	2,669	5,337
Filter Strip (ac)	180	155	98	75	56	113	564
Forage Harvest Management (ac)			1,511	729	325	855	2,565
Forest Stand Improvement (ac)		57		10	4	24	71
Grassed Waterway (ac)	41	22	54	52	29	40	198
Nutrient Management (ac)	9,341	6,898	3,705	12,140	4,304	7,278	36,388
Pasture and Hay Planting (ac)			183	276	89	183	548
Pest Management (ac)	11,044	9,682	6,518	14,479	5,276	9,400	46,999
Pipeline (ft)			837	210	597	548	1,644
Pond (no)			12	9	7	9	28
Prescribed Burning (ac)			122	1,587	186	632	1,895
Prescribed Grazing (ac)	1,411	3,200	4,164	2,792	1,212	2,556	12,779
Range Planting (ac)			457	369	430	419	1,256
Residue Management, Mulch Till (ac)	8,443	2,521	1,275	685	2,164	3,018	15,088
Residue Management, No-Till/Strip Till (ac)	5,737	5,423	2,987	6,567	3,369	4,817	24,083
Residue Management, Seasonal (ac)			2,019	861	401	1,094	3,281
Restoration and Management Rare and Declining Habitats (ac)			525		204	365	729
Riparian Forest Buffer (ac)		6	4			5	10
Streambank and Shoreline Protection (ft)	600					600	600
Terrace (ft)			163,003	200,318	202,680	188,667	566,001
Tree/Shrub Establishment (ac)	12	7	4	1	1	5	25
Underground Outlet (ft)			15,246	22,288	44,478	27,337	82,012
Upland Wildlife Habitat Management (ac)	3,090	2,801	5,141	9,291	4,805	5,026	25,128
Use Exclusion (ac)			2,434	1,922	1,553	1,970	5,909
Waste Storage Facility (no)				3		3	3
Waste Utilization (ac)			137	85		111	222
Water and Sediment Control Basin (no)			1	7	3	4	11
Watering Facility (no)			4	1	3	3	8
Wetland Creation (ac)			1	5		3	6
Wetland Enhanced (ac)	10					10	10
Wetland Wildlife Habitat Management (ac)	10			5		8	15
Windbreak/Shelterbelt Establishment (ft)			11,430	300		5,865	11,730

6.2 Cumulative Conservation Status

Conservation plans developed and applied from 1995 to 2005 are projected in the following chart.



Progress over the last 10 years has been focused on:

- Nutrient and pest management on cropland.
- Confined Animal Feeding Operations.
- Erosion control on cropland.

Much of the forest, grazed range, pasture, and hayland are untreated (benchmark).

Note: Estimates are based on information received from local conservationists in the watershed.

6.3 Other Watershed Projects

Watershed Projects, Plans, Studies, and Assessments			
NRCS Watershed Projects[/11]		**Watershed Plans, Studies, and Assessments**[/12]	
Name	**Status**	**Name**	**Status**
Upper Delaware and Tributaries	Complete	Spring-Straight Creeks	Planning
Nebo Creek	Complete	Cedar Creek	Waiting
Elk Creek	Active	Nemaha-Brown Watershed Joint District No. 7	Active
Little Delaware-Mission Creeks	Complete		
Grasshopper-Coal Creek	Active		
Thompsonville Watershed	Complete		
KDHE TMDL Plans[/6]		**Watershed Restoration and Protection Strategy Plans**[/13]	
Name	**Status**	**Name**	**Status**
		Delaware River Watershed Restoration and Protection Strategy (WRAPS)	Development

6.4 Lands Removed from Production through Farm Bill Programs[/14]

Conservation Reserve Program (CRP)[a]: **34,246 acres**

Wetlands Restoration Program (WRP): **None**

Grassland Reserve Program (GRP): **None**

Farm and Ranch Land Protection Program (FRPP): **None**

[a] Data from 2006 Farm Service Agency, CRP information

7.0 Footnotes/Bibliography

All data is provided "as is." There are no warranties, express or implied, including the warranty of fitness for a particular purpose, accompanying this document. Use for general planning purposes only.

1. Common Resource Area Map – Information available online at: http://efotg.nrcs.usda.gov/treemenuFS.aspx; select Section I, E. Maps, 2. Common Resource Area Maps (CRA).

2. Precipitation Map - United States Department of Agriculture, National Weather and Climate Service. Online reference information available at: ftp://gateway1.ftw.nrcs.usda.gov/GatewayCatalogDetails/MetaData/PRCIPANN%5Cprecip_a_ks.txt

3. National Land Cover Dataset (NLCD) - Originator: U.S. Geological Survey (USGS); Information available online at: http://edcwww.cr.usgs.gov/programs/lccp/nationallandcover.html

4. ESTIMATES FROM THE 1997 NRI DATABASE (REVISED DECEMBER 2000) REPLACE ALL PREVIOUS REPORTS AND ESTIMATES. Comparisons made using data published for the 1982, 1987, or 1992 NRI may produce erroneous results. This is because of changes in statistical estimation protocols and because all data collected prior to 1997 were simultaneously reviewed (edited) as 1997 NRI data were collected. All definitions are available in the glossary. In addition, this December 2000 revision of the 1997 NRI data updates information released in December 1999 and corrects a computer error discovered in March 2000. For more information: http://www.nrcs.usda.gov/technical/NRI/

5. Kansas stream flow data available from the Department of the Interior, U.S. Geological Survey online at: http://waterdata.usgs.gov/ks/nwis/rt

6. Department of Health and Environment, Total Maximum Daily Loads (TMDL) Strategies, http://www.kdheks.gov/tmdl/

7. U.S. Fish and Wildlife Service, Mountain-Prairie Endangered Species List, Kansas (January 2005) http://www.mountain-prairie.fws.gov/endspp/CountyLists/KANSAS.htm . The Kansas Department of Wildlife and Parks, Threatened and Endangered Species, http://www.kdwp.state.ks.us/news/other_services/threatened_and_endangered_species

8. Data were taken from the 2002 Agricultural Census and adjusted by percent of HUC in the county or by percent of zip code area in the HUC, depending on the level of data available.

9. Conservation participation was estimated using NRCS Social Sciences Technical Note 1801, Guide for Estimating Participation in Conservation, 2004. Four categories of indicators were evaluated: Personal characteristics, farm structural characteristics, perceptions of conservation, and community context. Estimates are based on information received from local conservationists in the watershed.

10. Social capital is an indicator of the community's ability and willingness to work together to solve problems. A high amount of social capital helps a community to be physically healthy, socially progressive, and economically vigorous. A low amount of social capital typically results in community conflict, lack of trust and respect, and unsuccessful attempts to solve problems. The evaluation is based on NRCS Technical Report Release 4.1, March, 2002: Adding up Social Capital: an Investment in Communities. Local conservationists provided information to measure social capital.

Footnotes/Bibliography Continued

All data is provided "as is." There are no warranties, express or implied, including the warranty of fitness for a particular purpose, accompanying this document. Use for general planning purposes only.

11. Natural Resources Conservation Service, Watershed Projects Planned and Authorized, http://www.nrcs.usda.gov/programs/watershed/Purpose. Natural Resources Conservation Service, Kansas online information at: http://www.ks.nrcs.usda.gov/programs/pl566/

12. Natural Resources Conservation Service, Watershed Plans, Studies, and Assessments completed, http://www.nrcs.usda.gov/programs/watershed/Surveys_Plng.html#Watershed%20Surveys%20and%20Plan

13. Kansas Department of Health and Environment, Bureau of Water, Watershed Management Section, http://www.kdheks.gov/nps/wraps/index.htm

14. Natural Resources Conservation Service, Kansas, Program Information is located at: http://www.ks.nrcs.usda.gov/programs/

7.1 Additional On-line Resources

1. US Environmental Protection Agency (EPA), EnviroMapper for Water, http://map8.epa.gov/scripts/esrimap.dll?name=NHDMapper&Cmd=ZoomInByCat&qc=3&th=6&lc=00010200000110_0000&fipsCode=10270103

2. US EPA Surf Your Watershed at: http://cfpub.epa.gov/surf/huc.cfm?huc_code=10270103

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Assessment

Introduction

This assessment matrix has been developed to provide an estimate of conservation systems, which may be needed to address resource concerns identified in the RWA Resource Profile. This can also be described as likely future conditions within the watershed.

Conservation systems have been described in this assessment as systems of conservation practices developed to address resource concerns on various landuses. Systems include benchmark and resource management systems. Benchmark (BM) systems are best described as land units that have had no treatment or one or more resource concerns treated with conservation practices. Resource management systems (RMS) are described as land units which have all known resource concerns treated with conservation practices. The level of treatment to an individual resource concern is credited when the practice(s) used meet or exceed a predetermined level of treatment, known as quality criteria.

Only priority resource concerns have been described in this RWA. These concerns were identified by local resource professionals. Other resource concerns likely exist within the watershed but only make up a small percentage of what needs to be treated. Further investigation and analysis will need to be completed in order to better define all resource concerns.

Resource professionals provided an estimate by percent of conservation systems that will likely be applied to BM systems and untreated land units to address resource concerns identified in the resource profile. These systems are not meant to be comprehensive or address all resource concerns for each land unit in the watershed; rather, only the typical system of conservation practices that could be applied. Numerous alternatives and combinations of practices exist that should be made available to landowners and producers in order to meet their desired level of treatment.

Federal programs identified to implement conservation systems include, but are not limited to; Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), and WRP. Other funding available for implementation includes various private, local, and state program funds.

This assessment provides estimates only that have been developed using local conservationists and work groups to identify resource concerns, participation rates, and conservation systems likely to be applied. This information was merged with state average cost lists and estimated operation and maintenance costs to generate a cost estimate by individual practice for each conservation system projected to be applied.

Further investigation and analysis within the watershed is required to identify all resource concerns and locations of conservation practices and systems needed to address resource concerns.

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1.0 Cropland

1.1 Dryland

1.1.1 Current Conditions	Cultivated / Non-Cultivated*	Dryland	Irrigated	Total	
Total Cropland	340,000	338,800	1,200	340,000	Acres
Cropland Needing Treatment	79,500	79,500	0	79,500	Acres
Cropland Currently at RMS Level**	68,000	67,760	240	68,000	Acres
Cropland Currently at Progressive Level***	153,000	152,460	540	153,000	Acres
Cropland Currently at Untreated Level	119,000	118,580	420	119,000	Acres
Typical Cropland-Dryland Management Unit	80				

Note: Irrigated cropland will not be considered for treatment as it makes up less than 1 percent of total cropland in HUC.

** Non-cultivated cropland is cropland that has been planted to a perennial crop such as alfalfa.*
*** RMS level is a level of treatment that meets or exceeds NRCS quality criteria as defined in the electronic Field Office Technical Guide*
**** Progressive level defines a management unit that does not have all resource concerns treated to the RMS level.*
Note: For this analysis, all untreated units and progressive systems will be treated to RMS level.

Current Conditions for Cropland - Dryland

Management Systems		Quantity		Costs		Effects			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Soil Erosion	Soil Condition	Water Quantity	Quality, Surface
BM1		Ac.	118,580			-3	-1	-3	-2
	Conservation Cropping Rotation	Ac.	118,580						
	Conventional Tillage	Ac.	118,580						
BM2			152,460			0	-1	-2	-1
	Conservation Cropping Rotation	Ac.	152,460						
	Residue Management	Ac.	152,460						
	Terrace	Ac.	30,492						
RMS1		Ac.	67,760			+1	0	0	+1
	Conservation Cropping Rotation	Ac.	67,760						
	Conservation Tillage	Ac.	67,760						
	Nutrient Management	Ac.	67,760						
	Pest Management	Ac.	67,760						
	Terrace	Ac.	13,552						

Note: Effects are described as a numerical value placed on benchmark conditions and degree of change from benchmark conditions by various conservation systems. Scale ranges from -5 (most damaging to resources) to +5 (least damaging, best protection offered by treatment).

Desired / Estimated Participation Rates

	Proposed Practice Change	Rate	Acres
	Cropland-Dryland Conservation System	59%	46,905
	Cropland-Irrigation Conservation System	59%	0
		Total	46,905

Estimates:
27,000 Acres needing terraces
79,500 Acres needing treatment
32,595 Acres are not expected to be treated

1.1.2 Future Conditions	Total	BM1	BM2	RMS1	RMS2
Crop - Dryland	338,800	67,241	156,895	109,975	4,691

Future Conditions for Cropland - Dryland

Management Systems		Quantity		Costs		Effects				Implementation			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality, Surface	EQIP	WHIP	WRP	Other
BM1		Ac.	67,241			-3	-1	-3	-2				
	Conservation Cropping Rotation	Ac.	67,241		$40,344								
	Residue Management	Ac.	67,241		$1,479								
BM2		Ac.	156,895			0	-1	-2	-1				
	Conservation Cropping Rotation	Ac.	156,895		$94,137								
	Residue Management	Ac.	156,895		$3,452								
	Terrace	Ac.	31,379		$3,727,813								
RMS1		Ac.	109,975			+3	+2	+2	+2				
	Conservation Cropping Rotation	Ac.	109,975	$659,847	$65,985								
	Conservation Tillage	Ac.	109,975	$989,771	$98,977					X			
	Nutrient Management	Ac.	109,975	$879,796	$87,980					X			
	Pest Management	Ac.	109,975	$659,847	$65,985					X			
	Terrace Restoration	Ft.	5,945,940	$5,351,346	$133,784								
	Terrace	Ft.	47,200	$42,480	$1,062					X			X
RMS2		Ac.	4,691			+4	+4	+2	+4				
	Cover And Green Manure Crop	Ac.	4,691	$93,810	$9,381								
	Range Planting	Ac.	4,691	$140,715	$1,407					X			
	Total RMS Costs			**$8,817,612**	**$4,331,785**								

1.1.3 Potential RMS Effects Summary for Cropland - Dryland

Cost Items and Programs	Costs	O&M Costs
Potential Farm Bill Programs		
Annual Management Incentives (3 yrs - Incentive Payments)		$461,893
Operator Investment (25% Cost Share)	$2,204,403	
Federal Costs (75% Cost Share)	$6,613,209	
Total RMS Costs	**$8,817,612**	**$4,331,785**
Estimated Level of Participation	59%	
Total acres projected to be in RMS System	114,665	
Total Annual Crop Production Benefit	$131,494	

Beneficial Effects of Proposed RMS System

- Improves soil condition
- Increases soil organic matter
- Improves water quality by reducing erosion and sediment delivery to streams

2.0 Grazed Range

2.1 Native Grassland

2.1.1 Current Conditions	Grazed	Ungrazed	Total	
Total Grazed Range	99,000	0	99,000	Acres
Grazed Range Needing Treatment	35,000	0	35,000	
Total Range with Brush Invasion	60,000	0	60,000	Acres
Typical Range Management Unit	160			

** RMS level is a level of treatment that meets or exceeds NRCS quality criteria as defined in the electronic Field Office Technical Guide*
*** Progressive level defines a management unit that does not have all resource concerns treated to the RMS level.*
Note: For this analysis, all untreated units and progressive systems will be treated to RMS level.

Current Conditions for Grazed Range

Grazed Range		Quantity		Costs		Effects			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Plant Condition	Water Storage	Habitat	WQ
BM1		Ac.	35,000			-3	-1	-3	-2
	Pond	No.	55						
	Watering Facility	No.	164						
	Fence	Mi.	438						
BM2		Ac.	64,000			0	+1	+1	+1
	Prescribed Grazing	Ac.	64,000						
	Pond	No.	100						
	Watering Facility	No.	400						
	Pipeline	Ft.	1,040,000						
	Fence	Mi.	800						

Note: Effects are described as a numerical value placed on benchmark conditions and degree of change from benchmark conditions by various conservation systems. Scale ranges from -5 (most damaging to resources) to +5 (least damaging, best protection offered by treatment)

Desired / Estimated Participation Rates

	Proposed Practice Change	Rate	Acres
	Grazing System	59%	20,650
	Brush Management	59%	35,400
	Prescribed Burning	59%	20,650

2.1.2 Future Conditions		Total	BM1	BM2	RMS
	Grazed Range	99,000	14,350	64,000	20,650

Future Conditions for Grazed Range

Grazed Range and Forestlands		Quantity		Costs		Effects				Implementation			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Plant Condition	Water Storage	Habitat	WQ	EQIP	WHIP	WRP	Other
BM1		Ac.	14,350			-3	-1	-3	-2				
	Pond	No.	22		$2,691								
	Watering Facility	No.	67		$3,094								
	Fence	Mi.	179		$37,884								
BM2		Ac.	64,000			0	+1	+1	+1				
	Prescribed Grazing	Ac.	64,000		$63,360								
	Pond	No.	100		$12,000								
	Watering Facility	No.	300		$13,800								
	Pipeline	Ft.	780,000		$14,040								
	Fence	Mi.	800		$168,960								
RMS		Ac.	20,650			+3	+3	+3	+3				
	Prescribed Grazing	Ac.	20,650	$61,950	$20,444					X			
	Fence	Mi.	129	$1,362,900	$5					X			X
	Brush Management	Ac.	35,400	$1,770,000	$53,100					X	X		
	Prescribed Burning	Ac.	20,650	$41,300	$41					X	X		
	Pond	No.	200	$2,400,000	$24,000					X			X
	Watering Facility	No.	700	$1,610,000	$32,200					X			X
	Pipeline	Ft.	1,820,000	$3,276,000	$32,760					X			X
	Streambank & Shoreline Protection	Ft.	400,000	$24,000,000	$480,000					X			
	Total RMS Costs			**$34,522,150**	**$958,379**								

2.1.3 Potential RMS Effects Summary for Grazed Range

Cost Items and Programs	Costs	O&M Costs
Potential Farm Bill Programs		
Annual Management Incentives (3 yrs - Incentive Payments)		$20,485
Operator Investment (25% Cost Share)	$8,630,538	
Federal Costs (75% Cost Share)	$25,891,613	
Total RMS Costs	**$34,522,150**	**$958,379**
Estimated Level of Participation	59%	
Total acres projected to be in RMS System	20,650	
Total Annual Forage Production Benefits	$354,805	

Beneficial Effects of Proposed RMS System

- Improves plant condition, health and vigor
- Improves upland wildlife habitat for prairie chicken and other range dependant species
- Improves water quality by reducing erosion and sediment delivery to streams

3.0 Pasture

3.1 Non-irrigated Pasture

3.1.1 Current Conditions	Grazed	Ungrazed	Total	
Total Pasture	211,000	0	211,000	Acres
Pasture Needing Treatment	126,000	0	126,000	Acres
Typical Pasture Management Unit	80			

** RMS level is a level of treatment that meets or exceeds NRCS quality criteria as defined in the electronic Field Office Technical Guide.*
*** Progressive level defines a management unit that does not have all resource concerns treated to the RMS level.*
Note: For this analysis, all untreated units and progressive systems will be treated to RMS level.

Current Conditions for Non-irrigated Pasture

Pasture		Quantity		Costs		Effects				
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Soil Erosion	Plant Condition	Fish and Wildlife Food/Cover /Shelter	Stock Water	Economics
BM1		Ac.	126,000			-3	-1	-3	0	-2
	Pond	No.	1,575							
	Watering Facility	No.	1,575							
	Fence	Mi.	2,363							
RMS		Ac.	85,000			+3	+3	+1	+2	+2
	Prescribed Grazing	Ac.	85,000							
	Pond	No.	1,063							
	Watering Facility	No.	1,063							
	Pipeline	Ft.	318,750							
	Pest Management	Ac.	85,000							
	Nutrient Management	Ac.	85,000							
	Fence	Mi.	1,594							

Note: Effects are described as a numerical value placed on benchmark conditions and degree of change from benchmark conditions by various conservation systems. Scale ranges from -5 (most damaging to resources) to +5 (least damaging, best protection offered by treatment).

Desired/Estimated Participation Rates

	Proposed Practice Change	Rate	Acres
	Pasture System	59%	74,340

3.1.2 Future Conditions	Total	BM1	RMS
Pasture	211,000	51,660	159,340

Future Conditions for Non-irrigated Pasture

Pasture		Quantity		Costs		Effects					Implementation			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Soil Erosion	Plant Condition	Fish and Wildlife Food/Cover /Shelter	Stock Water	Economics	EQIP	WHIP	WRP	Other
BM1		Ac.	51,660			-3	-1	-3	0	-2				
	Pond	No.	81		$9,686									
	Water Facility	No.	242		$29,059									
	Fence	Mi.	969		$204,574									
RMS		Ac.	159,340			+3	+3	+1	+2	+2				
	Prescribed Grazing	Ac.	159,340	$478,020	$157,747						X	X		
	Pond	No.	996	$5,575,500	$119,505						X	X		X
	Watering Facility	No.	996	$1,068,638	$45,810						X			X
	Pipeline	Ft.	298,763	$250,898	$5,378						X			X
	Pest Management	Ac.	159,340	$446,040	$95,604						X			
	Nutrient Management	Ac.	159,340	$594,720	$127,472						X			
	Fence	Mi.	465	$929	$630,986						X	X		X
	Total RMS Costs			**$8,414,744**	**$1,425,821**									

3.1.3 Potential RMS Effects Summary for Non-irrigated Pasture

Cost Items and Programs	Costs	O&M Costs
Potential Farm Bill Programs		
Annual Management Incentives (3 yrs - Incentive Payments)		$380,823
Operator Investment (25% Cost Share)	$2,103,686	
Federal Costs (75% Cost Share)	$6,311,058	
Total RMS Costs	**$8,414,744**	**$1,425,821**
Estimated Level of Participation	59%	
Total acres projected to be in RMS System	159,340	
Total Annual Forage Production Benefits	$98,406	

Beneficial Effects of Proposed RMS System

- Increases soil residue levels, reducing detachment and transport of soil
- Improves plant condition, health and vigor
- Increases food, cover, and shelter for wildlife
- Increases available stock water supply and quality
- Increases long-term income through improved livestock gains from increased forage availability

4.0 Forest

4.1 Forest - Private

4.1.1 Current Conditions	Forest	Private	Public	Total	
Total Forest	77,000	74,300	2,700	77,000	Acres
Forest Needing Treatment	65,450	63,155	2,295	65,450	Acres
Forest Currently at RMS Level**	3,850	3,715	135	3,850	Acres
Forest Currently at Progressive Level***	7,700	7,430	270	7,700	Acres
Forest Currently at Untreated Level	65,450	63,155	2,295	65,450	Acres

** RMS Level is a level of treatment that meets or exceeds NRCS quality criteria as defined in the electronic Field Office Technical Guide.*
*** Progressive level defines a management unit that does not have all resource concerns treated to the RMS level.*
Note: For this analysis, identified treatment units will be treated to RMS level at the expected adoption rate.

Current Conditions for Forest - Private

Management Systems		Quantity		Costs		Effects
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Productivity, Health and Vigor
BM1		Ac.	63,155			-4
	No Treatment	Ac.	63,155			
BM2			7,430			0
	Forest Stand Improvement	Ac.	7,430			
	Pest Management	Ac.	7,430			
RMS1		Ac.	3,715			+2
	Forest Stand Improvement	Ac.	3,715			
	Tree/Shrub Pruning	Ac.	3,715			
	Pest Management	Ac.	3,715			
	Upland Wildlife Habitat Management	Ac.	3,715			

Note: Effects are described as a numerical value placed on benchmark conditions and degree of change from benchmark conditions by various conservation systems. Scale ranges from -5 (most damaging to resources) to +5 (least damaging, best protection offered by treatment)

Desired / Estimated Participation Rates

	Proposed Practice Change	Rate	Acres
	Conservation System Forest - Private	59%	37,261
	Conservation System Forest - Public	0%	0
		Total	37,261

4.1.2 Future Conditions	Total	BM1	BM2	RMS1	RMS2
Conservation Systems Forest - Private (Ac.)	74,300	25,894	7,430	22,346	18,631

Future Conditions for Forest - Private

Management Systems		Quantity		Costs		Effects	Implementation			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Productivity, Health and Vigor	EQIP	WHIP	WRP	Other
BM1		Ac.	25,894			-4				
	No Treatment	Ac.	25,894		$6,473					
BM2		Ac.	7,430			0				
	Forest Stand Improvement	Ac.	7,430		$8,545					
	Pest Management	Ac.	7,430		$4,458					
RMS1		Ac.	22,346			+2				
	Forest Stand Improvement	Ac.	5,586	$1,284,879	$6,424		X	X		X
	Tree/Shrub Pruning	Ac.	5,586	$335,186	$6,704		X			X
	Pest Management	Ac.	22,346	$111,784	$13,407		X	X		
	Upland Wildlife Habitat Management	Ac.	22,346	$1,676,765	$25,139		X	X		
RMS2		Ac.	18,631			+3				
	Forest Stand Improvement	Ac.	4,658	$1,071,267	$5,356		X	X		X
	Tree/Shrub Pruning	Ac.	4,658	$279,461	$5,589		X			X
	Pest Management	Ac.	18,631	$111,784	$11,178		X	X		
	Upland Wildlife Habitat Management	Ac.	18,631	$1,676,765	$20,960		X	X		
	Use Exclusion	Ac.	18,631	$149,046	$149					
	Total RMS Costs			**$6,696,938**	**$114,383**					

4.1.3 Potential RMS Effects Summary for Forest - Private

Cost Items and Programs	Costs	O&M Costs
Potential Farm Bill Programs		
Annual Management Incentives (3 yrs - Incentive Payments)		$24,586
Operator Investment (25% Cost Share)	$1,674,234	
Federal Costs (75% Cost Share)	$5,022,703	
Total RMS Costs	**$6,696,938**	**$114,383**
Estimated Level of Participation	59%	
Total acres projected to be in RMS System	40,976	
Total Annual Forest Production Benefit	$68,113	

Beneficial Effects of Proposed RMS System

Improves Forest Stand Health and Plant Condition

5.0 Animal Feeding Operations (AFO)

5.1 AFO - Private

5.1.1 Current Conditions	Permitted CAFOs	Other Confined Livestock Facilities	Concentrated Non-confined Livestock Operations	Total	
Estimated AFO (no.)	32	500	1200	1,732	No.
AFO Needing Treatment	0	500	1,200	1,700	No.

** RMS level is a level of treatment that meets or exceeds NRCS quality criteria as defined in the electronic Field Office Technical Guide.*
*** Progressive level defines a management unit that does not have all resource concerns treated to the RMS level.*
Note: For this analysis, untreated units and progressive systems will be treated to RMS level at the expected adoption rate.

Current Conditions for AFO - Private

Management Systems		Quantity		Costs		Effects
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Water Quality
BM1		No.	1,700			-4
	No Treatment	No.	1,700			
RMS		No.	32			+3
	Waste Storage Facility	No.	16			
	Pond Sealing or Lining	No.	16			
	Manure Transfer	No.	32			
	Composting Facility	No.	10			
	Animal Mortality Facility	No.	10			
	Waste Treatment Lagoon	No.	26			
	Solid/Liquid Waste Separation Facility	No.	10			
	Critical Area Seeding	Ac.	160			
	Fence	LF	32,000			

Note: Effects are described as a numerical value placed on benchmark conditions and degree of change from benchmark conditions by various conservation systems. Scale ranges from -5 (most damaging to resources) to +5 (least damaging, best protection offered by treatment).

Desired/Estimated Participation Rates

	Proposed Practice Change	Rate	Acres
	Conservation System AFO - Private	59%	1,003
		Total	1,003

5.1.2 Future Conditions	Total	BM1	RMS
Conservation Systems AFO - Private (No.)	1,732	697	1,035

Future Conditions for AFO - Private

Management Systems		Quantity		Costs		Effects	Implementation			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Water Quality	EQIP	WHIP	WRP	Other
BM1		No.	697			-4				
	No Treatment	No.	697							
RMS		No.	1,035			+3				
	Waste Storage Facility	No.	518	$25,075,000	$258,750		X			X
	Pond Sealing or Lining	No.	518	$5,717,100	$29,498		X			X
	Manure Transfer	No.	1,035	$6,820,400	$70,380		X			
	Composting Facility	No.	311	$4,513,500	$46,575		X			X
	Animal Mortality Facility	No.	311	$6,018,000	$62,100		X			X
	Waste Treatment Lagoon	No.	828	$13,640,800	$140,760		X			X
	Solid/Liquid Waste Separation Facility	No.	311	$18,054	$373		X			X
	Critical Area Seeding	Ac.	5,175	$551,650	$5,693		X			X
	Fence	LF	1,035,000	$2,006,000	$41,400		X			X
	Total RMS Costs			**$64,360,504**	**$655,528**					

5.1.3 Potential RMS Effects Summary for AFO - Private

Cost Items and Programs	Costs	O&M Costs
Potential Farm Bill Programs		
Annual Management Incentives (3 yrs - Incentive Payments)		$70,380
Operator Investment (25% Cost Share)	$16,090,126	
Federal Costs (75% Cost Share)	$48,270,378	
Total RMS Costs	**$64,360,504**	**$655,528**
Estimated Level of Participation	59%	
Total Annual Animal Feeding Operation Benefit	$650,160	

Beneficial Effects of Proposed RMS System

Reduces Excessive Organics and Nutrients from Entering Stream Systems and Degrading Water Quality

6.0 Hay

6.1 Non-irrigated Hay

6.1.1 Current Conditions	Hay	
Total Hay	211,311	Acres
Hay Needing Treatment	126,315	Acres
Typical Hay Management Unit	80	

** RMS level is a level of treatment that meets or exceeds NRCS quality criteria as defined in the electronic Field Office Technical Guide.*
*** Progressive level defines a management unit that does not have all resource concerns treated to the RMS level.*
Note: For this analysis, all untreated units and progressive systems will be treated to RMS level.

Current Conditions for Non-irrigated Hay

Hay		Quantity		Costs		Effects				Note: Effects are described as a numerical value placed on benchmark conditions and degree of change from benchmark conditions by various conservation systems. Scale ranges from -5 (most damaging to resources) to +5 (least damaging, best protection offered by treatment).
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Soil Erosion	Plant Condition	Fish and Wildlife Habitat	Economics	
BM1		Ac.	126,315			-1	-1	-3	-2	
	No Treatment	No.	126,315							
RMS1		Ac.	84,996			+2	+2	+1	+1	
	Forage Harvest Management	Ac.	84,996							
	Nutrient Management	No.	84,996							
	Pest Management	No.	84,996							

Desired/Estimated Participation Rates

	Proposed Practice Change	Rate	Acres
	Hay System	59%	74,526

6.1.2 Future Conditions	Total	BM1	RMS1
Hay	211,311	51,789	159,522

Future Conditions for Non-irrigated Hay

Hay		Quantity		Costs		Effects				Implementation			
	Practices	Unit	Quantity	Annual Incentive Cost	Annual O&M Cost	Soil Erosion	Plant Condition	Fish and Wildlife Habitat	Economics	EQIP	WHIP	WRP	Other
BM1		Ac.	51,789			-1	-1	-3	-2				
	No Treatment	Ac.	51,789										
RMS1		Ac.	159,522			+2	+2	+1	+1				
	Forage Harvest Management	Ac.	159,522	$819,784	$17,547					X			
	Nutrient Management	Ac.	159,522	$596,207	$127,617					X			
	Pest Management	Ac.	159,522	$372,629	$95,713					X			
	Total RMS Costs			**$1,788,620**	**$240,878**								

6.1.3 Potential RMS Effects Summary for Non-irrigated Hay

Cost Items and Programs	Costs	O&M Costs
Potential Farm Bill Programs		
Annual Management Incentives (up to 3 yrs - Incentive Payments)	$1,788,620	
Operator Investment		$240,878
Federal Costs	$1,788,620	
Total RMS Costs	**$1,788,620**	**$240,878**
Estimated Level of Participation	59%	
Total acres projected to be in RMS System	159,522	
Total Annual Forage Production Benefits	$20,295	

Beneficial Effects of Proposed RMS System

Improves plant condition, health and vigor
Improves water quality by reducing erosion and sediment delivery to streams