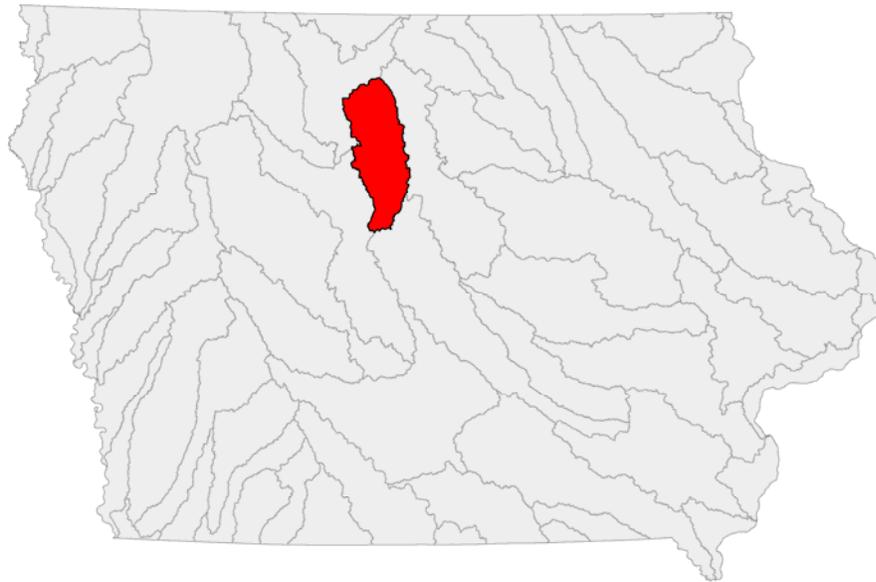


Boone River Watershed Rapid Watershed Assessment



The Boone River Rapid Watershed assessment provides initial estimates of where conservation investments would best address the resource priorities/capabilities of landowners, conservation districts, and other community organizations and stakeholders. These assessments help landowners and local leaders set priorities and determine the best actions to achieve their goals to conserve soil and water resources.

In the Boone River Watershed conservation assistance is available from NRCS service centers in the six counties that are part of the watershed (*see appendix for a list of all the service centers by county*). There are also three resource conservation and development (RC&D) regions that cover the Boone River Watershed which include: Prairie Partners in Humboldt, Prairie Winds in Garner, and Prairie Rivers of Iowa in Ames.

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Introduction

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The Boone River Watershed, 8-digit hydrologic code (HUC) subbasin, is located in the prairie pothole region of the Des Moines Lobe and covers parts of six counties, with most of the area located in Hamilton, Wright, and Hancock counties. Prior to the installation of subsurface drainage, this region had abundant wetlands, many of which were interconnected prairie potholes. Now a large portion of the region is artificially drained in order to support row crop agriculture. Approximately 99% of this watershed is privately owned with almost 90% in corn and soybean production (1). There are also over 100 animal feeding operations (AFO) in the watershed (2).

The Boone River Watershed has a drainage area of approximately 581,186 acres or 908 mi². The watershed has over 760 miles of streams that supports a diversity of fish and wildlife species, including the federally endangered species Topeka Shiner. Approximately 115 miles of stream length in the Boone River Watershed is designated as a Protected Water Area by the Iowa DNR, most of which is in the lower portion of the watershed (3,4,26). In general, the lower stretch of the river is relatively large and fast moving as it cuts through a steep forested valley. It is often utilized for recreation, such as canoeing, rafting, and fishing (4). The upper portion of the Boone River and its tributaries are smaller shallower streams with few wooded areas. One of the major threats to this watershed is water quality degradation caused by high levels nitrogen, phosphorus, bacteria and sediment loadings primarily attributed to agricultural practices (4,5).



Physical Description

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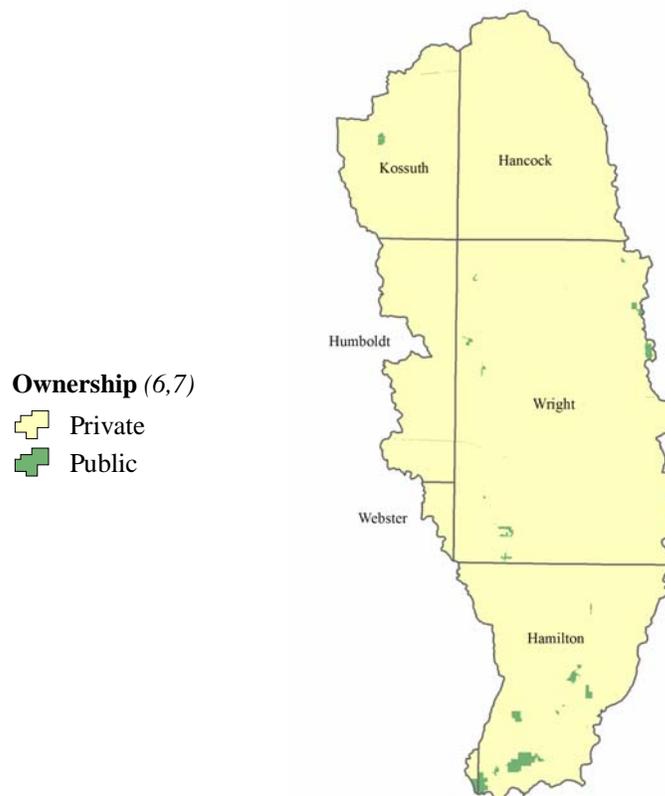
2005 Land Use/ Land Cover Common Land Units (CLU) (1)	Ownership - (GAP Stewardship (6) and IA DNR Lands (7))					
	Private		Public		Totals	%
	Acres	%	Acres	%		
Row Crops (corn/bean rotation)	509,658	85.82	243	0.04	509,902	85.86
CBOMMM*/Hayfield	2,964	0.50	205	0.03	3,169	0.53
Continuous Corn	22,932	3.86	175	0.03	23,107	3.89
CRP ^d /Grass Filterstrip	14,747	2.48	211	0.04	14,958	2.52
Developed*	11,597	1.95	7	0.00	11,604	1.95
Pasture/Grassland	13,480	2.27	131	0.02	13,611	2.29
Wildlife Areas/Water/Wetlands	1,007	0.17	54	0.01	1,061	0.18
Forest/Timber	12,977	2.19	2995	0.50	15,972	2.69
Other	471	0.08	0	0.00	471	0.08
Boone HUC Totals <i>b</i>	589,832	99.32	4022	1.00	593,855*	100.00

a: This is an estimate given by the Iowa NRCS

b: Totals are approximate due to rounding and small unknown acreages.

Special Considerations*

- CBOMMM - C = corn, B = beans, O = oats, M = meadows
- Developed land includes farmsteads, urban/residential areas outside of cities/towns, commercial, golf courses, railroads, and cemeteries
- The total land area by land use is higher than the actual watershed area because the CLU's were not clipped to the watershed boundary.



Physical Description

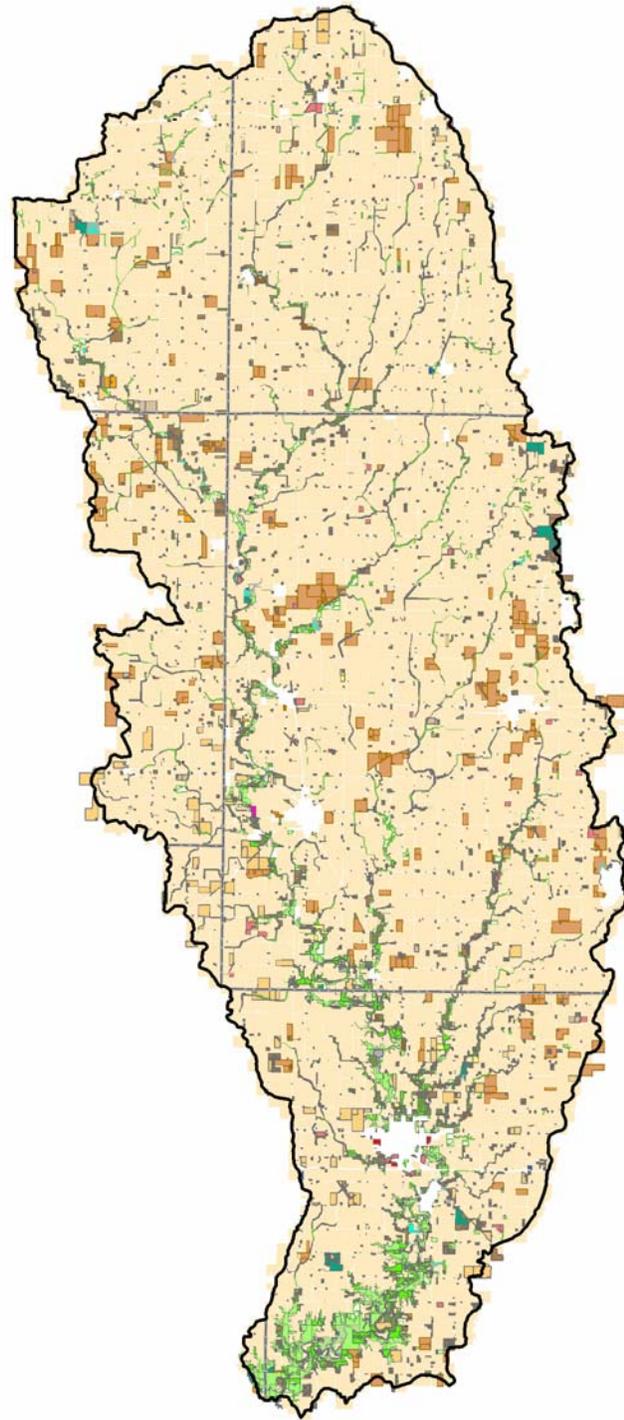
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2005 Land Use/Land Cover

based on Common Land Units (CLU)(1)

-  BB*
-  CB*
-  CBOMMM*
-  CCB*
-  Cont. Corn
-  CRP
-  Hayfield
-  Farmstead
-  Pasture
-  Grape vinyard
-  Grass filterstrip
-  Grassland
-  Public Forest
-  Public Savanna
-  Grazed Timber
-  Shrub/Scrub
-  Timber
-  Tree windbreak
-  Water (Pond/Lake)
-  Wildlife Area
-  Cemetery
-  Urban/Residential
-  Commercial
-  Golf course
-  Railroad
-  Quarry
-  Gravel pit

* B - Beans, C - Corn, M - Meadow, O - Oats



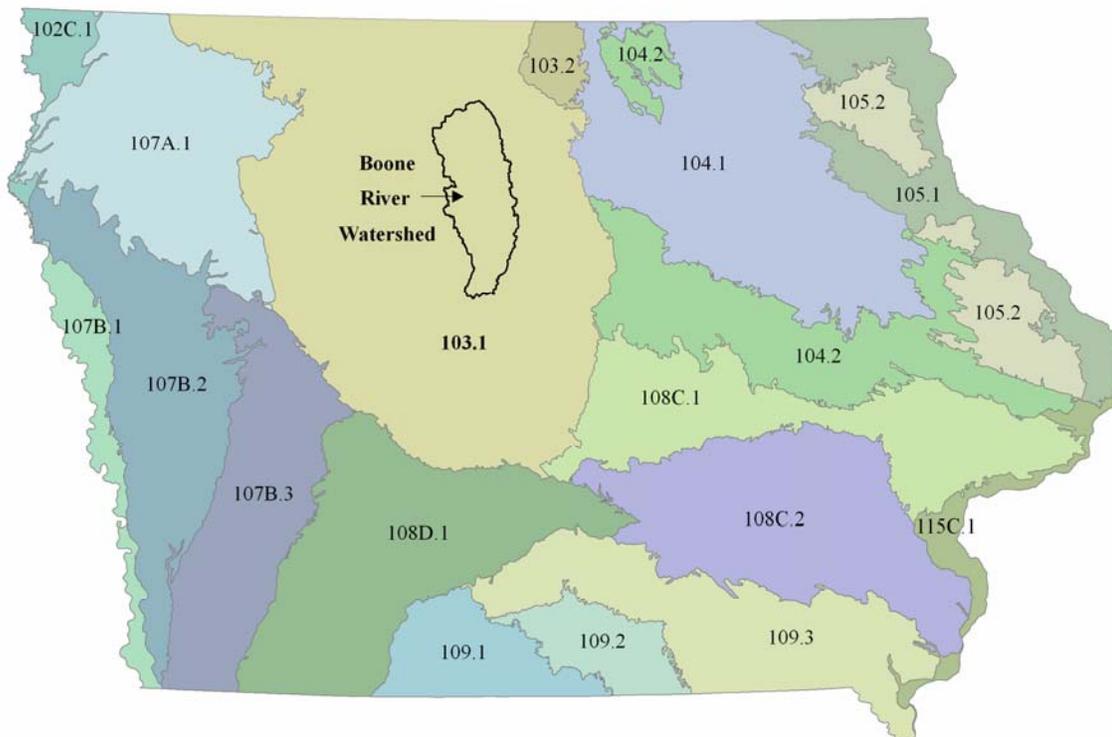
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Common Resource Areas

A Common Resource Area (CRA) is a geographic area defined by the USDA-NRCS that identifies similar areas of resource concerns, problems, and/or treatment needs (8). Natural resource information such as soil, climate, landscape conditions and human influences are considered when defining the boundaries of a CRA. The Boone River Watershed is comprised of only one Common Resource Area:

103.1 - Iowa and Minnesota Till Prairies: “Primarily loamy glacial till soils with scattered lacustrine areas, potholes, outwash and flood plains. Nearly level to gently undulating with relatively short slopes. Most of the wet soils have been artificially drained to maximize crop production. Primary land use is cropland. Corn, soybeans, sugar beets, peas and sweet corn are the major crops. Native vegetation was dominantly tall grass prairie. Resource concerns are water and wind erosion, nutrient management and water quality” (8).



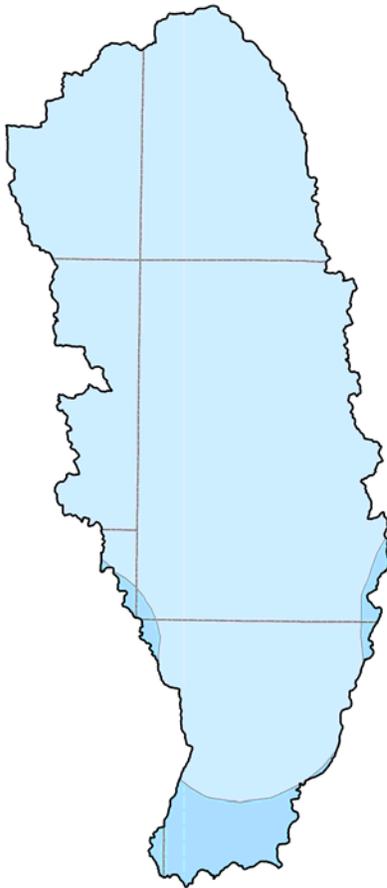
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Average Annual Precipitation (9)

Range in Inches

-  31 - 33
-  Greater than 33



Elevation (feet) (10)

-  905 - 1,020
-  1,020.1 - 1,082
-  1,082.1 - 1,116
-  1,116.1 - 1,144
-  1,144.1 - 1,178
-  1,178.1 - 1,215
-  1,215.1 - 1,313

Physical Description

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Soils, Landforms and Vegetation

The soils of the Boone River Watershed developed approximately 12,000 -14,000 years ago with the melting of the Des Moines Lobe glacier. After the ice sheet had retreated the landscape was covered in glacial till, with sand and gravel in the meltwater streams, and clay and peat left from glacial lakes (11). The glacier left behind a landscape that is relatively flat to gently rolling with till ridges and escarpments at the top and the east edge of the watershed.

The Boone River Watershed is near the southern-most extent of the Prairie Pothole Region and approximately 60% of the soils in the watershed are poorly drained (12). The watershed once was covered in tall grass prairie interspersed with wetlands, many of which were linked drainage depressions. The root system of the prairie vegetation and the accumulation of rich organic matter from these young hydric soils created deep, dark colored soil, rich in nutrients (13).

The Canisteo-Webster-Nicollet and Canisteo-Nicollet-Clarion associations are the most extensive in the watershed and are primarily associated with pothole wetlands. The Canisteo-Webster-Nicollet association is found on flat to gently sloping areas that is poorly to somewhat poorly drained. The parent material is glacial till. The Canisteo-Nicollet-Clarion association is similar but more strongly sloping because Clarion soils are a little higher in the landscape. In the southern portion of the watershed, the soils are different along the river because this area is more forested. The Hayden-Storden-Hanlon association is found along the Boone River and a few of the tributaries. The parent material of this association is glacial till and alluvium with some limestone bedrock on the steeper backslopes. These soils are found in level to very steep slopes that are moderate to well drained. The other prominent soil association in the southern portion of the watershed is the Brown-ton-Ottosen-Bode association. These soils are level to moderately sloping and range from poorly drained to well drained. The parent material is lacustrine sediment and glacial till.

The first soil survey reports to be published in the Boone River Watershed range from 1914 in Webster County to 1961 in Humboldt County. All of the soil survey reports have been updated, with the most recent surveys ranging from 1975 in Webster County (another updated version will be completed in 2008) to 2005 in Humboldt County. The Iowa Soil Properties and Interpretations Database (ISPAID) was the first complete digital soil survey for the state of Iowa, which was completed in 1996 (14). ISPAID is composed of digitized soil maps from each soil survey, most of the information in the published survey, in addition to some extra information that is not available in the surveys. A new revision comes out every time the USDA updates a county soil survey (14). At the end of 2006 the NRCS Soil Survey Geographic (SSURGO) Database was completed for all the counties in the Boone River Watershed (12). The data and maps in SSURGO correspond to all the data in the published soil survey report. The maps are digitized from the soil survey manual and the data is linked to the National Soil Information System (NASIS) Database.

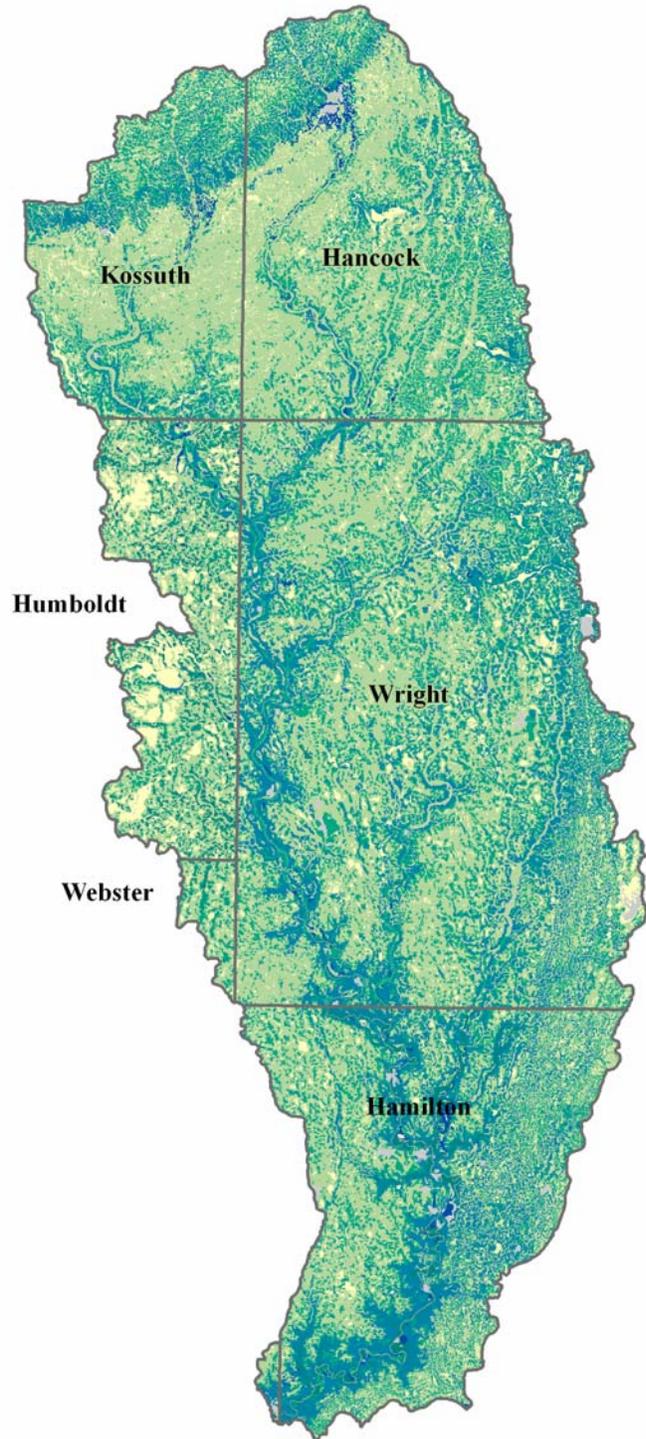
Physical Description

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Drainage Classification

The drainage classification refers to the frequency and duration of soil saturation during soil formation under natural conditions (15). Areas on the landscape that have been altered by human activity, such as artificial drainage, are not part of this classification. The purpose of drainage classes is to provide better insight on the capacity of soil for agriculture, forestry, wildlife, and recreation (15).

Approximately 54% of the Boone River Watershed is poorly drained. Nearly 319,000 acres of the poorly drained and very poorly drained landscape is in row crop agriculture (calculated using land use data from page 4). Ninety-three percent of all the poorly drained and very poorly soils in the watershed are in row crop agriculture.



Drainage Class (12)	Acres	% Area
Excessively drained	25	.004
Somewhat excessively drained	3,924	0.7
Well drained	91,454	15.9
Moderately well drained	16,023	2.8
Somewhat poorly drained	3,924	0.7
Poorly drained	311,939	54.1
Very poorly drained	33,643	5.8
No Data	4,686	0.8

Physical Description

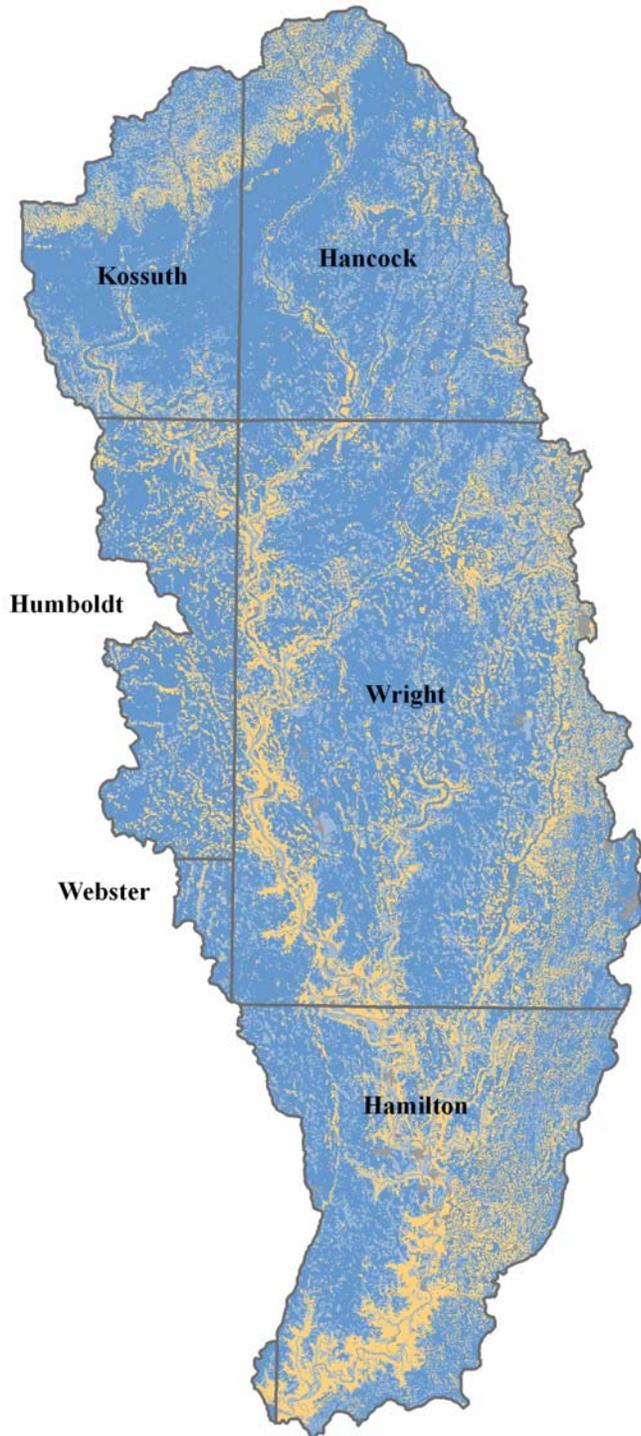
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Hydric Soils

Hydric soils are saturated, flooded or ponded sufficiently during the growing season to periodically produce anaerobic conditions in the upper part of the soil (16). These soils are wet enough to support the growth and regeneration of hydrophytic vegetation (16). Soils that have been altered by artificial drainage are considered hydric regardless of drainage modification because these soils still have hydric characteristics and could still support a wetland if the hydrology was restored (17).

A majority of the Boone River Watershed has All Hydric soils. Approximately ninety-four percent of the All Hydric soils are in row crop agriculture (*calculated using land use data from page 4*).

Hydric Soils (12)	Acres	% Area
All Hydric	344,788	59.3
Partially Hydric	105,429	18.1
Not Hydric	125,943	21.7
No Data	5,023	0.9



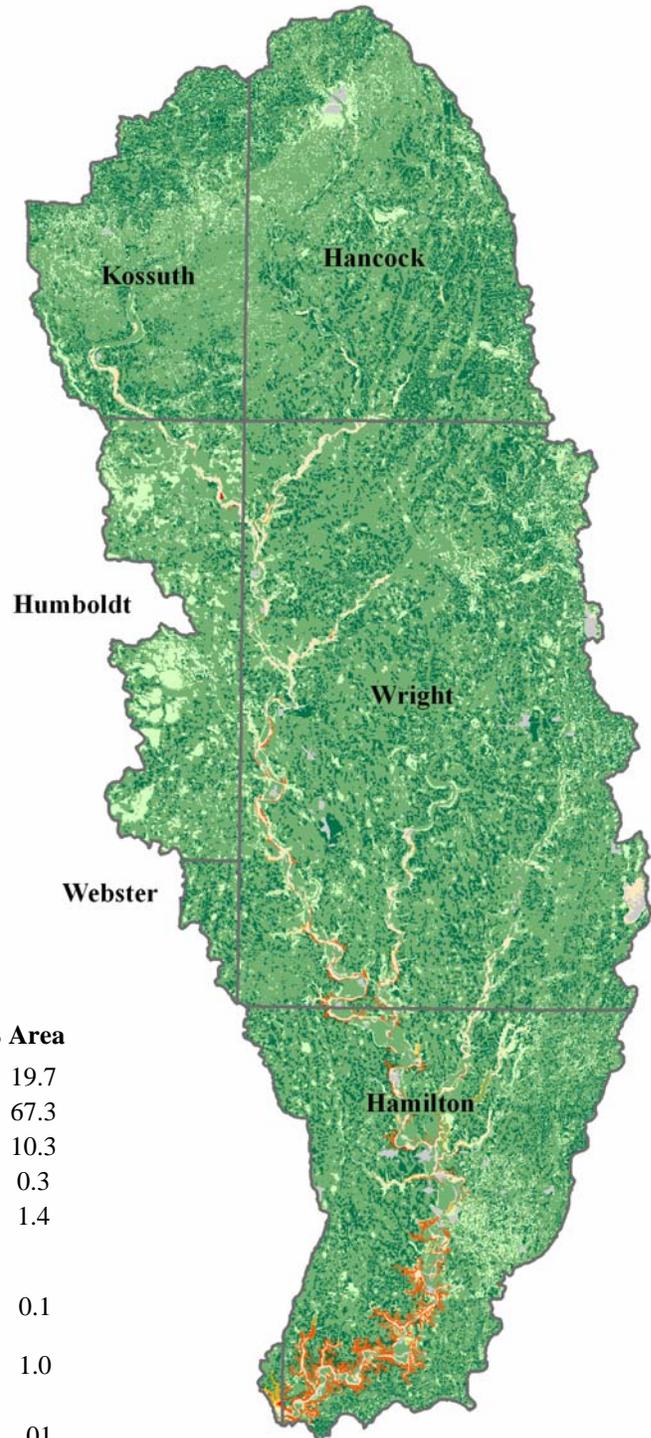
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Land Capability Classification (LCC)

The land capability classification represents the suitability of soils for common field crops. Soils are grouped together based on limitations for cultivated crops and pasture plants and the capability of soils to be productive without deteriorating over time (15). The land capability class is divided into capability classes (1-8) and subclasses (e, w, s, c) (15). For simplicity, only the capability class is shown in the map to the right.

Eighty-six percent of the Boone River watershed has slight to moderate limitations. A majority of the severe to very severe limitations occur along the river valley.



Land Capability Class (12)	Acres	% Area
1 - Slight Limitations	113,254	19.7
2 - Moderate Limitation	387,654	67.3
3 - Severe Limitations	59,210	10.3
4 - Very Severe Limitations	1,982	0.3
5 - No Erosion Hazard - but other limitations exist that are impractical to remove, that limit their use	7,825	1.4
6 - Severe Limitations: Limited to Pasture, Range, & Forest	665	0.1
7 - Severe Limitations: Limited to Grazing, Forest, & Wildlife Habitat	5,531	1.0
8 - Miscellaneous Area	42	.01
No Data or Water	5,021	0.9

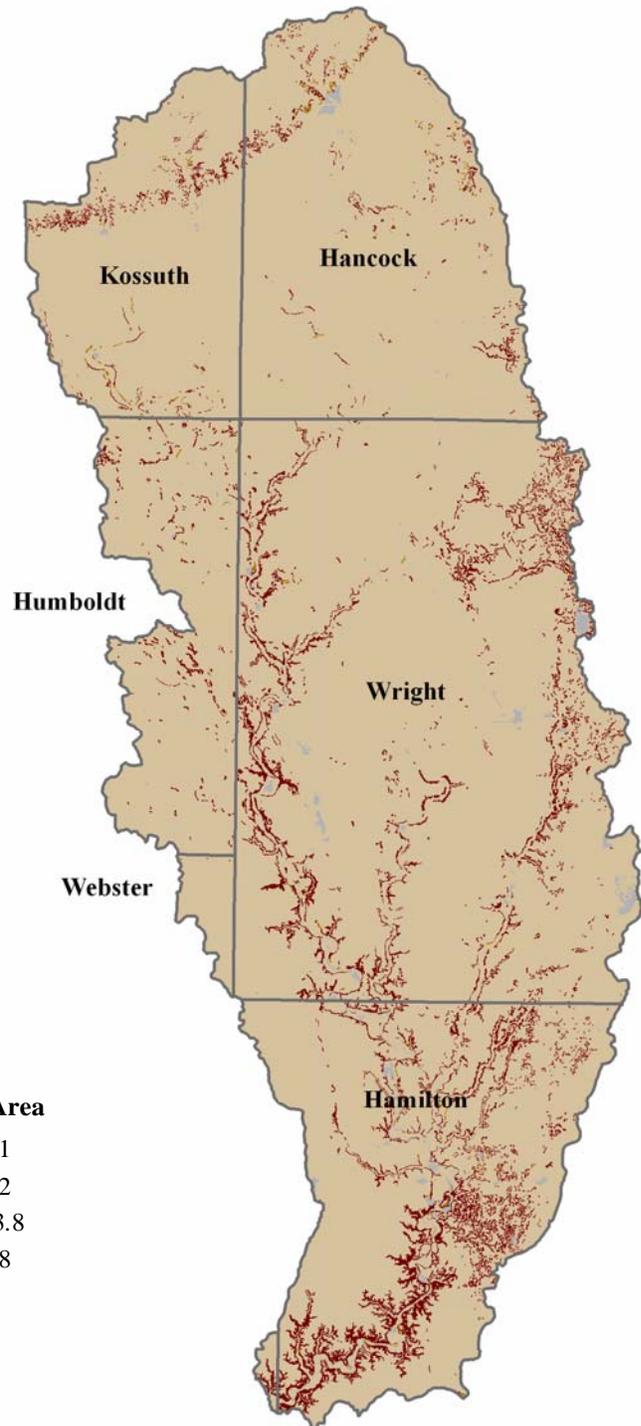
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Highly Erodible Land (HEL) Based on Water HEL

Water HEL is a National Food Security Act definition of a soil mapping unit with certain physical characteristics that make it prone to water erosion. If it is not properly managed, it is susceptible to excessive erosion rates when under agricultural productions. Soil loss for HEL soils is determined according to the Universal Soil Loss Equation (18). Generally, soils in Land Capability classes 3 and 4 and 6-8 are considered highly erodible (see page 11).

Only 5.1% of the watershed is considered highly erodible land. The map to the right shows the areas susceptible to water HEL, most of which is concentrated in the river valleys and along the moraine of the Boone River Watershed. Of the land that is considered highly erodible by water approximately 17,800 acres are in row crop agriculture (calculated using land use data from page 4).



Highly Erodible Land

Based on Water (12)

	Acres	% Area
Highly Erodible Land	29,915	5.1
Potentially Highly Erodible Land	1,364	0.2
Not Highly Erodible Land	545,174	93.8
No Data	4,731	0.8



Physical Description

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Subsurface Drainage

Subsurface drainage is commonly installed in soils that are poorly drained to increase agricultural production. The use of artificial drainage lowers the water table making what would be a wetland or wet meadow area, dryer, more productive farm land.

One of the challenges with using an artificially drained system is the maintenance of water quality before it reaches the stream. Fertilized fields lose excess nitrate-nitrogen (NO₃) into the drain that directly enters neighboring streams. If these areas were not artificially drained, NO₃ and other nutrients could be reduced by other conservation systems such as streamside buffers and/or wetlands before entering the stream.

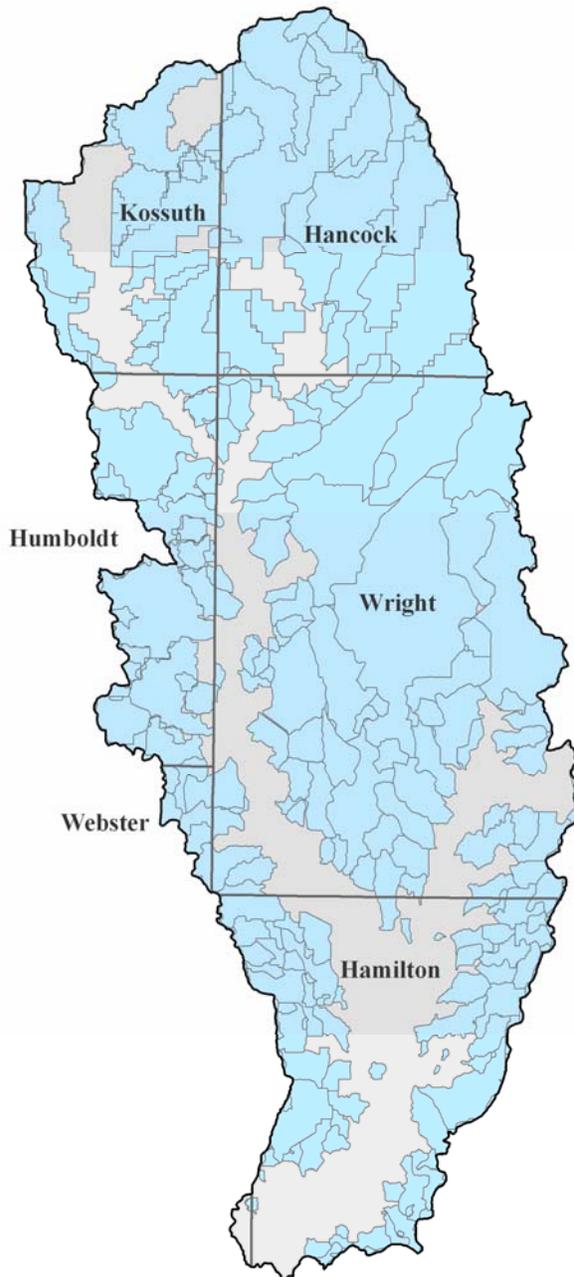
Literature suggests that drainage tiles were first installed in the 1880's in Iowa (19). Not long after the installation of the tiles, drainage districts were being formed to legally secure the outlets (19). Now these districts are comprised of elected Drainage District Trustees that are legally authorized and expected to assure the drains are maintained, and do not affect neighboring lands.

On the next page, the map on the left indicates the drainage districts (21) and the map on the right depicts the likely extent of tile-drained soils in the Boone River Watershed. Since actual locations of agricultural drainage is not available, using criteria established by Dr. Dan Jaynes, USDA ARS National Soil Tilth Laboratory, and based on soil characteristics, gives us an idea of where subsurface drainage would likely be necessary for crop production (20). The specific criteria are slope (high value) less than or equal to 2%, either poor or very poor drainage, and soils with a very slow infiltration rate when thoroughly wet (hydrological soil group D). Approximately 60% of the watershed potential has subsurface drainage according to Jaynes criteria, using the SSURGO soils dataset (12).

Physical Description

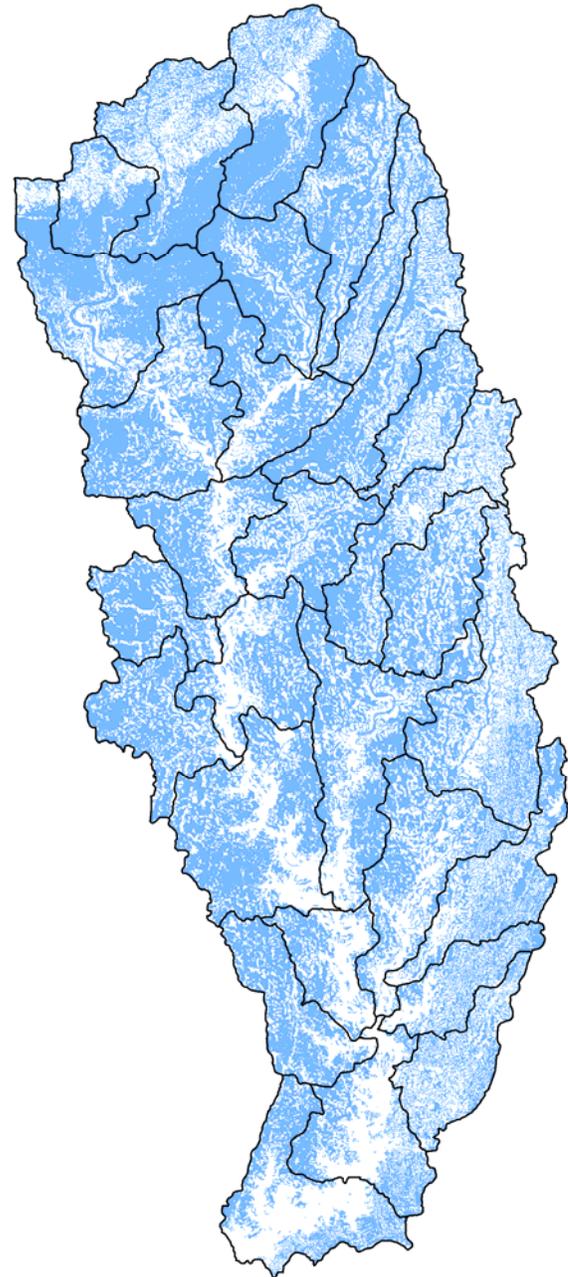
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Subsurface Drainage *con't*



Drainage Districts (21)

- Drainage Districts
- County Boundaries



Potential Subsurface Drainage Locations (12,20)

- Potential Drainage Tile Locations
- Huc 12 Watersheds

Physical Description

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Surface Water Assessment

The Boone River and its tributaries are important recreationally and biologically. Canoeing, rafting, and fishing are common activities, specifically in the lower portion of the Boone River. The watershed has a diversity of fish and mussel species, some of which are state and federally listed (*see page 25-26*).

The stream flow and stream data is acquired by the USGS at several locations throughout Iowa. In the Boone River Watershed there is one gage near Webster City, IA (22). Further summary information is available at the USGS National Water Information Systems website (22).

		Acre-Feet	
Stream Flow Data	USGS 05481000 Boone River near Webster City, IA (22)	Total Avg. Yield*	315,569
		May-Sept. Avg. Yield	105,053
			Cubic Feet/Second
		Total Avg. Yield*	436
		May-Sept. Avg. Yield	605
		Miles	Percent
Stream Data	Total-Miles - Major (100K Hydro GIS Layer) (23)	761	NA
	303d/TMDL Listed Streams (24)	1.2	0.2%
	Protected Streams (26)	115	15%
		Number	Percent
	Number of Fish species (1932-2002) (25)	58	NA
	Number of State and Federal Listed Fish Species (52) (<i>See pages 23-25 for further information</i>)	4	7%
	Number of Mussel Species (4)	22	NA
Number of Federal and State Listed Mussel Species (52) (<i>See pages 23-25 for further information</i>)	6	27%	
* Total Average Yield dates are 10/01/2005 - 09/30/2006			

Physical Description

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Surface Water Assessment *con't*

Land use can have a great impact on the quality of streams. In the table below a 180-ft buffer on either side of the stream was used to calculate land use directly next to the stream. One hundred and eighty feet was selected as an example because 180-ft is the maximum distance for NRCS practice standard 391, riparian forest buffer.

		Acres	Percent
2005 Riparian Land Cover/Use (1, 23) <i>Based on a 180-foot buffer on both sides of all streams in the 100K hydro GIS layer.</i>	Row Crops (Corn/Bean Rotation)	15,142	49.54
	CBOMMM*/Hayfield	203	0.67
	Continuous Corn	635	2.08
	CRP/Grass Filterstrip	4,969	16.26
	Developed	457	1.50
	Pasture/Grassland	5,204	17.03
	Wildlife Areas/Water/Wetlands	270	0.88
	Forest/Timber	3,562	11.65
	Other	122	0.40
	Total Acres of 180-foot Stream Buffers**	30,563	100.00
* C - Corn, B - Beans, O - Oats, M - Meadow			
** The 100-ft stream buffer is actually 18,678 miles. The figure given in the table is smaller because some data is missing, primarily roads and urban.			

Physical Description and Resource Priorities/Capabilities

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Surface Waters Assessment *con't*

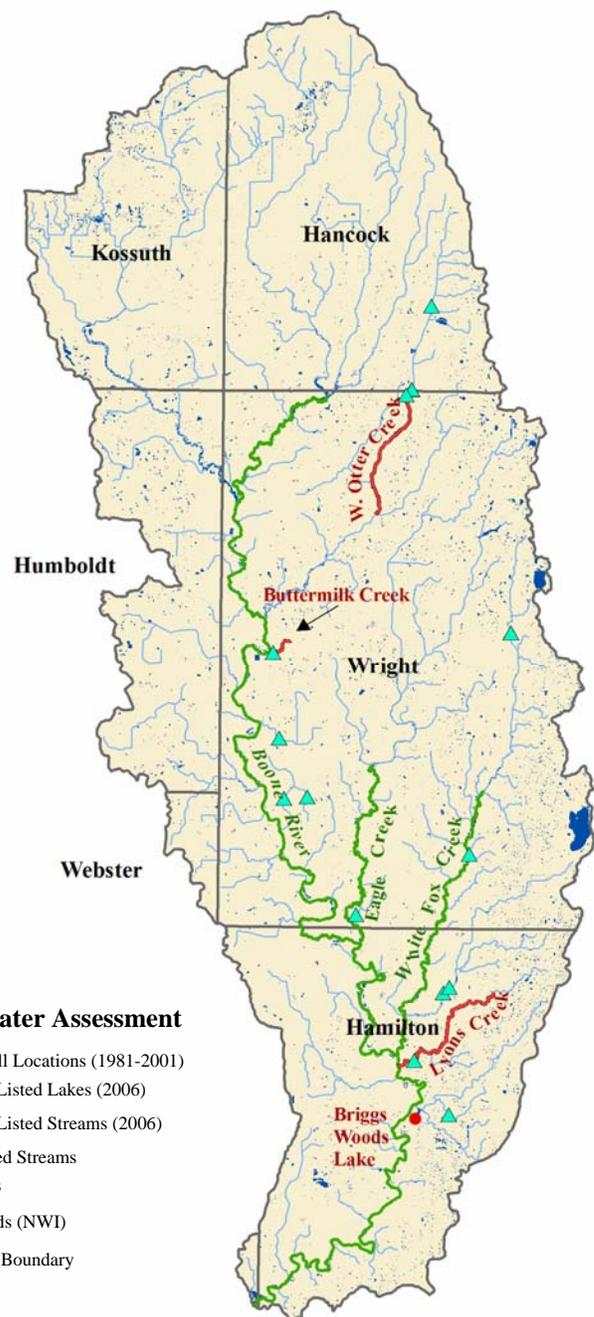
303(d) listed streams / lakes (24) (2006)

- Streams listed as impaired due to pollutants entering surface waters that have not been treated sufficiently to meet water quality standards. Section 303(d) of the Clean Water Act establishes that states are to list impaired waters (303(d)) and submit the list to the EPA every even numbered year. Iowa DNR is responsible for placing waterbodies that do not meet water quality standards on the 303(d) list of impaired waters.

Protected Streams (26) - Streams in Iowa that have been designated as being protected from channel straightening in Chapter 72 of the Iowa Code. Channel changes are not allowed for protected streams because of current or potential detrimental affects on wildlife, fish, water quality, recreation, soil erosion, public health or other landowner rights. There are approximately 115 miles of Protected Streams in the Boone River Watershed (26).

Wetlands (NWI - National Wetland Inventory) (27) – Records of wetland locations developed by the U.S. Fish & Wildlife Service. Wetlands are interpreted from aerial photography, so some wetlands are missing due to limitations of scale, photo quality, inventory techniques and other factors.

Fish Kills (66) – Locations of fish kills reported to the DNR. The causes of the kills vary from animal waste, fertilizer, industrial chemicals, and unknown causes. There has been an estimated 538, 000 fish killed at nine of the sites between 1981 and 2001. Seven of the sites do not have fish kill numbers reported due to unreliable data.



Resource Priorities/Capabilities

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Surface Waters Assessment *con't*

2006 Water Quality Concerns - 303d List and TMDL Parameters						
Impaired Streams (303d) (24,28)						
Segment	Water Body	Miles	Use Impaired	Cause	Class	Use Class
IA 04-UDM-0247_0	Buttermilk Creek	1.2	General Use	Organic enrichment/ Low DO	5a	General use
IA 04-UDM-0215_0	Lyons Creek	7.7	General Use	Biological	5b	General use
IA 04-UDM-0253_1	West Otter Creek	6.6	General Use	Biological	5b	General use
Impaired Lakes (303d) (24, 28)						
Segment	Water Body	Acres	Use Impaired	Cause	Class	Use Class
IA 04-UDM-01880-L_0	Briggs Woods Lake	59	Aquatic Life	Organic enrichment/ low DO	5a	A1, B(LW)

See Appendix A (page 47) for definitions

Waterbodies requiring a TMDL

Organic enrichment and low dissolved oxygen (DO) are the primary water quality impairments requiring a TMDL in the Boone River Watershed. A biological assessment was conducted to determine stream water quality and habitat integrity for Buttermilk Creek. Briggs Woods Lake was assessed as fully supporting Class A1 uses and only partially supporting class general uses. Nutrient loading is the primary concern for aquatic life in this lake.

In 2006 a biological assessment was conducted by the Iowa DNR on Buttermilk Creek as part of the EPA's Regional Environmental Monitoring and Assessment Program (REMAP) (29). The Fish Index of Biotic Integrity (FIBI) score was 42 (Fair)* and the Benthic Macroinvertebrate Index of Biotic Integrity (BMIBI) was 17, 14, and 19 (Poor)* (29, 30). This segment of Buttermilk Creek was therefore assessed as partially supporting aquatic life or general use. The organic enrichment and low DO in Buttermilk Creek are due to poorly treated or untreated wastewater discharging into the stream (29). There were documented complaints in 2002 of toilet paper in the stream and the stream bottom being covered with a gray substance (29). There was also documentation of large colonies of blood worms residing in the stream suggesting organic enrichment and low dissolved oxygen (29).

Lyons Creek has been assessed as partially supported for aquatic life because of a fish kill that occurred in September 2001 (29). The kill started at a tile line in an industrial park area in Webster City, but the cause of the fish kill has not yet been identified (29). There were approximately 7,200 fish killed on Lyons Creek (29).

* The assessment looks at 12 metrics for BMIBI and 12 metrics for FIBI that are summed together to get a number between 0 (poor) and 100 (excellent).



Resource Priorities/Capabilities

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Surface Waters Assessment *con't*

Waterbodies requiring a TMDL

West Otter Creek was also assessed as partially supporting aquatic life because of a fish kill that occurred in 2000 (29). The origin of the fish kill has not yet been identified (29). There were approximately 273,000 fish killed on West Otter Creek (29).

There was also a reported fish kill at Briggs Woods Lake in 2005 attributed to low dissolved oxygen and excessive growth of submergent vegetation (29). It was estimated that 1000 bluegill of various ages were killed but many other live fish were also found to be in the lake (29). Nutrient loading to the water column is a concern in this Lake (29).

As of April 2008, TMDL's are scheduled for Buttermilk Creek by 2009, Lyons Creek by 2011 (subject to change), and Briggs Woods Lake by 2009.

* *The assessment looks at 12 metrics for BMIBI and 12 metrics for FIBI that are summed together to get a number between 0 (poor) and 100 (excellent).*



Resource Priorities/Capabilities

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Water Erosion (Sheet and Rill)

Water erosion from cropland accounts for nearly 90% of Iowa's soil erosion (31). In Iowa there has been a steady decline in sheet and rill erosion from 1982 to 1997 but on average soil erosion remains above sustainable levels (31,33,34). In order to maintain high levels of soil productivity soil erosion should not exceed the "T" value established for a particular soil mapping unit. In Iowa, "T" ranges from 2-5 tons/acre/year. However, sediment losses well below "T" may still be detrimental to stream water quality and aquatic integrity.

National Resources Inventory (NRI)

In the Boone River Watershed overall soil loss (tons/year) due to water erosion, decreased approximately 4,000 acres from 1982 to 1997 according to the NRI data (32). In 1982 the Boone River Watershed had a soil loss of approximately 2.7 tons/acre/year, attributed to water erosion, with 85% from cultivated cropland (32). In 1997 soil loss decreased slightly to 2.5 tons/acre/year with 68% from cultivated cropland (32). These numbers are well below the tolerable level of five tons/acre/year.

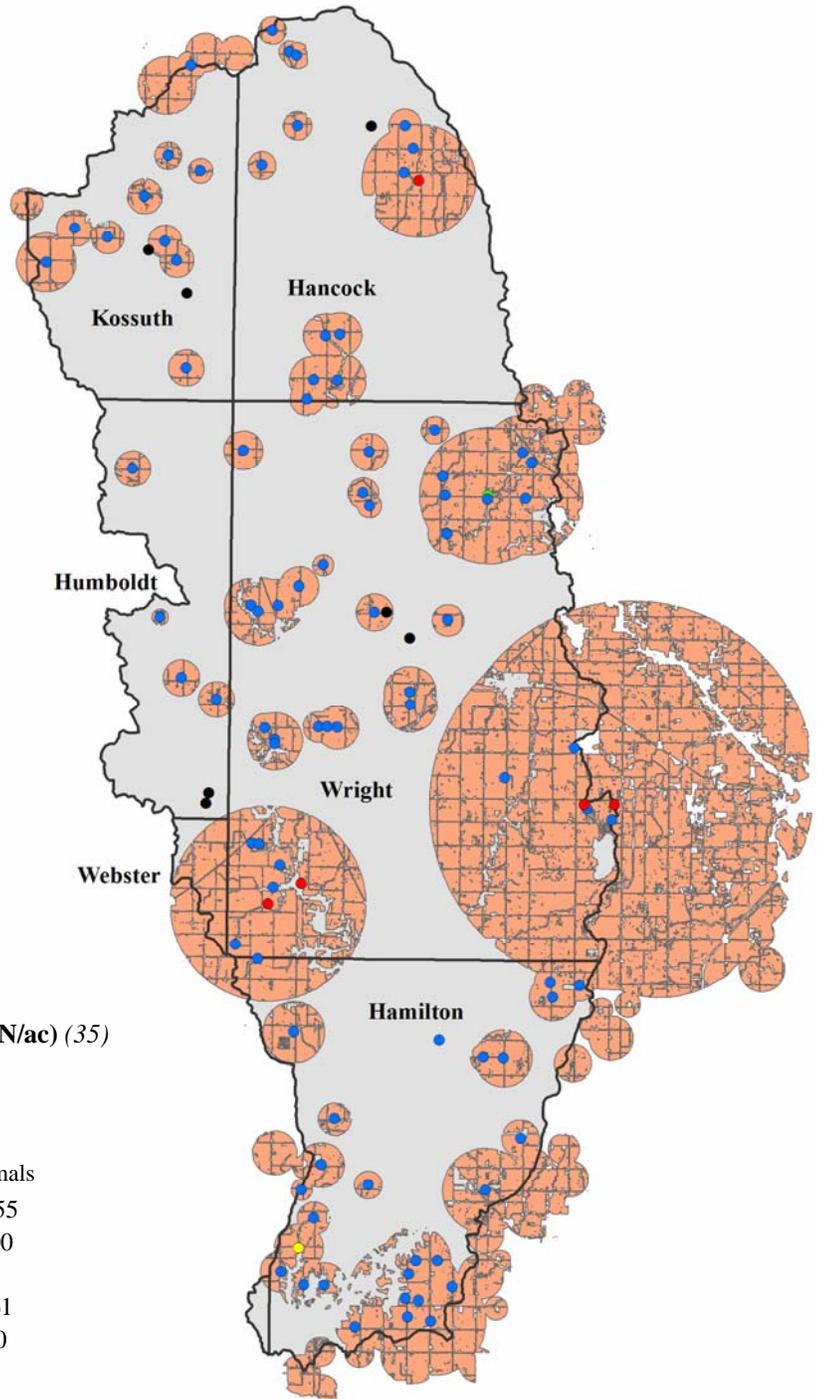
Resource Priorities/Capabilities

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Estimated Manure Application Areas

In Iowa, manure from livestock is commonly spread on cropland as fertilizer (35). Potential challenges with using manure as a fertilizer include bacteria and nutrients from the manure delivered to the stream via surface runoff or subsurface drainage networks (35). This is also a potential problem from cattle feedlots and pastures, but there are few to no cattle facilities in the Boone River Watershed (2).

There are approximately 110 animal feeding operations (AFO) in the Boone River Watershed (see table below) (2). The map to the right shows how much nitrogen from manure would be spread on the row crop land surrounding the AFO if it was applied at the agronomic rate of 160 lb N/ac for a two year crop rotation (5,35).



Estimated Manure Application Zones (160 lb N/ac) (35)

- Manure Receiving Areas
- County Boundaries

Animal Feeding Operations (AFO) (2)

	# of Farms	# of Animals
● Chicken	6	6,211,255
● Turkey	2	100,800
● Chicken and Turkey	-	-
● Hog	94	519,961
● Unknown	8	2,350

Resource Priorities/Capabilities

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Environmental Facilities/Sites Subject to Environmental Regulation

Solid Waste Permit Facilities include (36):

- municipal and industrial waste landfills
- transfer stations
- compost facilities and some recycling centers
- land application, landfarming and beneficial reuse
- appliance demanufacturing
- cathode ray tube device collection and recycling

Underground Storage Tanks (39)

- Storage of substances, primarily petroleum products

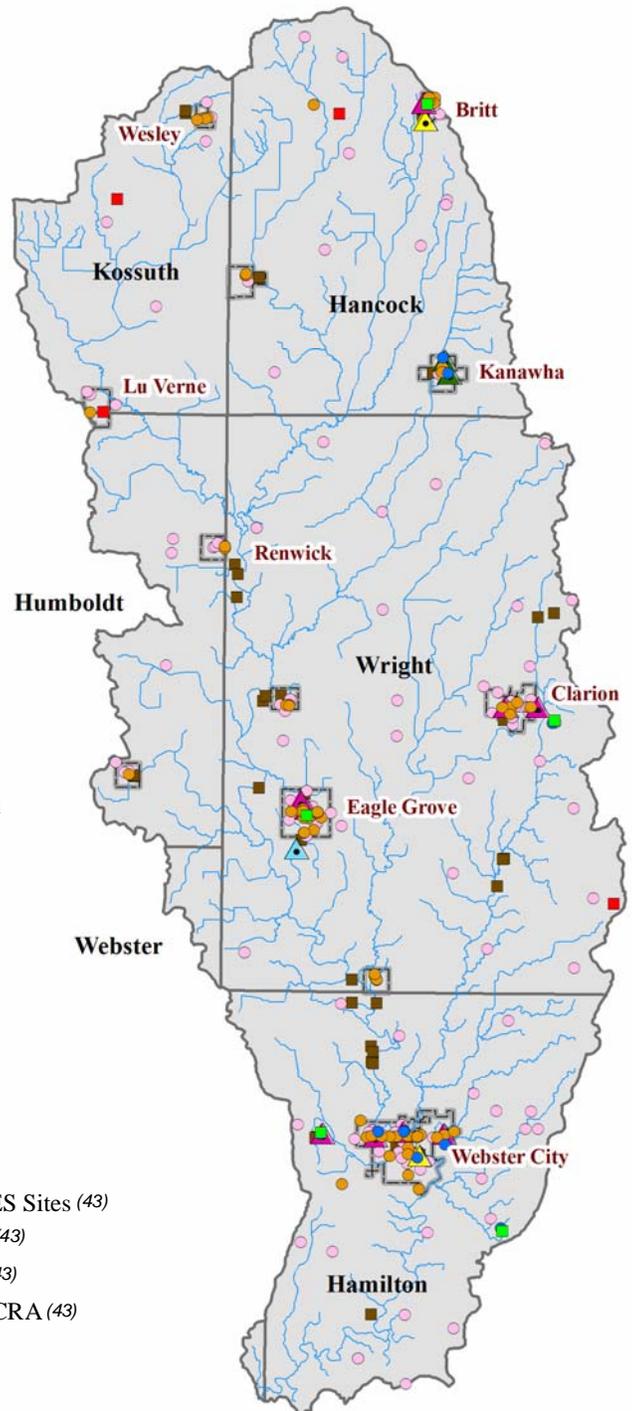
National Pollutant Discharge Elimination System (NPDES) (43) - Regulates the discharge of wastewater into surface waters

Resource Conservation and Recovery Act (RCRA) (43) – Management of hazardous waste in treatment, storage or disposal units

Toxic Release Inventory System (TRIS) (43) – Data on manufacturing facilities that release toxic chemicals into the environment through the air, water, and land.

Non-National Priority Sites (40) – Hazardous waste sites that did not make the final EPA National Priority List (NPL) (NPL- sites eligible for extensive, long-term clean-up actions under the Superfund program)

Unsewered Communities (41) – Small communities with aging septic systems or drain tile networks that discharge sewage directly into surface waters. In Kossuth County there are 184 homes without septic systems. The other counties do not have information available.



Environmental Facilities/Sites

- | | |
|---|--------------------------|
| ■ Solid Waste Permit Facilities (37) | ▲ Major NPDES Sites (43) |
| ● Leaking Underground Storage Tanks(38) | ▲ RCRA Sites (43) |
| ○ Underground Storage Tanks (39) | ▲ TRIS Sites (43) |
| ● Non-National Priority Sites (40) | ▲ TRIS and RCRA (43) |
| ■ Unsewered Communities(41) | ⊕ Towns |
| ■ Wastewater Treatment Plants (42) | |

Resource Priorities/Capabilities

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Major Air Facilities

There are three Title V air permit facilities and four construction permit facilities in the Boone River Watershed. Title V air permits, of the Clean Air Act, are required from all major sources and some minor sources of air pollution (44). The permit requires facilities to meet emission limits, in addition to monitoring, record keeping and reporting in order to maintain permit compliance (44). Construction permits monitor all processes that emit contaminants, such as dust, fumes and/or vapors into the air (45). All of the facilities with Title V air permits in the Boone River Watershed also have construction permits (46).



Biofuel Plants

In the state of Iowa, as of May 2007, there were approximately 60 operating or proposed biofuel plants (47). There is currently one ethanol plant in the Boone River Watershed located in Goldfield, IA called Corn, LP (47). The feedstock at this plant is corn and the current capacity is 50 million gallons/year (47). It is estimated that 2-4 gallons of water is required for every gallon of ethanol produced. This means that the Corn, LP plant would use 100 million gallons of water per year using the multiplier of 2 gallons of water/gallon of ethanol.

Resource Priorities/Capabilities

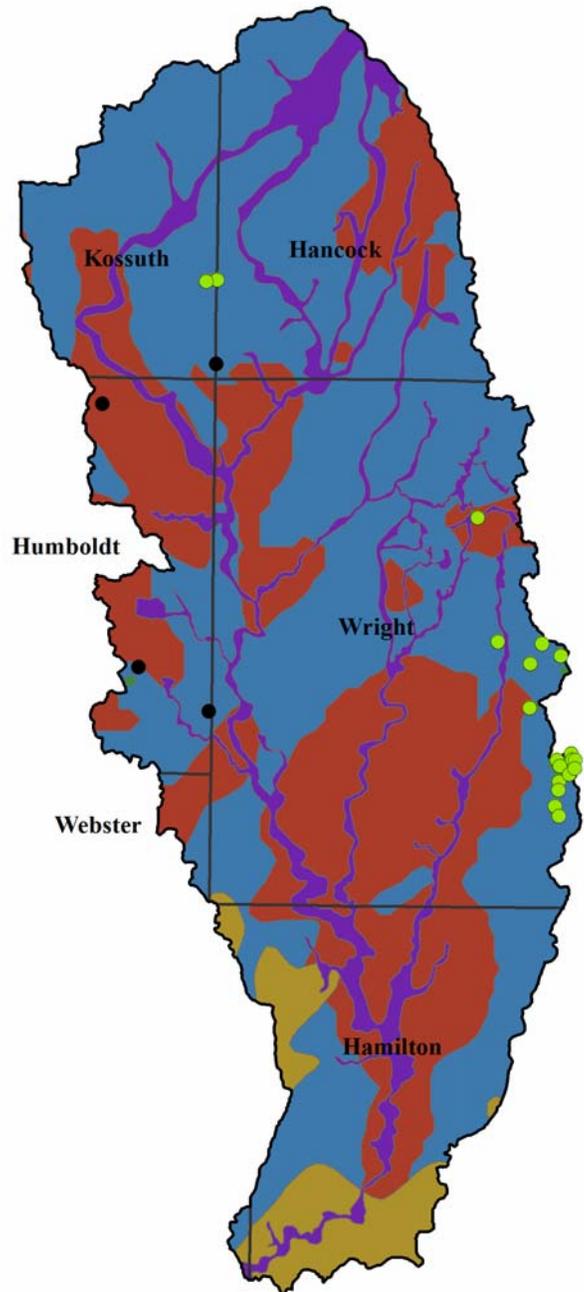
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Ground Water

The groundwater vulnerability regions are areas with similar hydrogeologic characteristics and are therefore areas thought to have similar potentials for groundwater and/or well contamination (48). The regions were mapped looking at geologic, soil, bedrock aquifers, thickness of Quaternary deposits, alluvial aquifers, sinkholes and agricultural drainage wells (48).

Challenges

As mentioned earlier in the physical description of the Boone River Watershed, a common source of agricultural drainage is the use of subsurface or artificial drainage. Another less common type of drainage is the use of agricultural drainage wells (ADW), a chamber installed into the bedrock that funnels drainage water through a drilled shaft into the underlying bedrock (49). The chamber portion is a discharge point for drainage tiles as well as being a receptacle for surface water runoff (49, 50). There is evidence that these ADWs have great potential to contaminate groundwater because they are an open conduit at the surface which allows nutrients, pesticides and bacteria to enter groundwater via subsurface drainage and runoff (49,50). There are approximately 292 ADWs in Iowa.



Groundwater Vulnerability Regions (48)

-  Variable Bedrock Aquifers; Thin Drift Confinement
-  Variable Bedrock Aquifers; Moderate Drift Confinement
-  Variable Bedrock Aquifers; Shale Confinement
-  Alluvial Aquifers
-  Agricultural Drainage Wells Buffer (400-meters)

Agricultural Drainage Wells (51)

-  Active wells
-  Closed Wells

Resource Priorities/Capabilities

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Fish and Wildlife

The primary sources of information on fish and wildlife in the Boone River Watershed are the Iowa DNR's Natural Inventory database (52), the Iowa DNR's biological assessment of streams and rivers (53), and The Nature Conservancy's (TNC) Boone River Watershed Ecological Assessment (4). The Iowa DNR Natural Areas Inventory is a database of state and federal listed species and their distributions in Iowa by county (52). The IDNR's biological assessment of streams and rivers involves the sampling of fish and benthic macroinvertebrates in order to assess the stream or river's biotic integrity (53). The TNC ecological assessment is an assessment specific to the Boone River Watershed that looks at the Upper and Lower portions of the watershed separately and focuses on Key Ecological Attributes (KEA) of fresh water ecological communities (4). Another assessment that just started recently by IDNR is the Multiple Species Inventory and Monitoring Program (MSIM) (54). It is a standardized assessment/survey intended to provide a basic inventory of all wildlife using a randomized sampling design (54). Currently this program has only covered seven counties, so is not included in this assessment, but could be a useful dataset for future watershed planning.

According to The Nature Conservancy's assessment, the fresh water mussel community is in poor condition throughout the whole watershed (4). The state of Iowa lists two species as threatened and four as endangered, one of which is listed as critical on the federal list (52) (see page 25).

The assessment of fish composition and health is listed as fair throughout the watershed, but it is likely that fish health is better in the lower portion of the watershed where the stream is larger, deeper, and has more riparian forest (4, 55). The Iowa DNR sampled several sites in the watershed and used a fish index of biotic integrity (FIBI) to categorize stream health (see table in Appendix, page 48). The assessment looks at 12 metrics that are summed together to get a number between 0 (poor) and 100 (excellent) (53). The FIBI average score for the watershed, for all years (1994–2006), was 49.76 or a fair rating out of 25 sites sampled (55). In 2006 three sites were sampled and the condition of fish as an indicator of stream health was also rated fair (55). None of the sites for any of the years fell into the poor category, but there were several sites received good scores (55). There are four fish listed as threatened on the state list, including the Topeka Shiner, *Notropis topeka*, (endangered on the federal list) that potentially reside in the Boone River Watershed (52) (see page 25). There are four segments equaling 17 miles in Wright and Hamilton counties that are designated as critical stream habitat for the Topeka Shiner (56). Critical habitat is defined as essential habitat for the conservation of threatened and endangered species, but there is no regulatory authority involved with this designation (56).

The benthic macroinvertebrates assemblage status is also fair, according the TNC ecological assessment (4). The BMIBI average for the whole watershed from 1994-2006 was 49.62 or a fair rating, according the IDNR biological assessment (see table in Appendix, page 48) (55). This is out of 21 sites because there were four sites without a BMIBI score. There are two sites in the 11 year period with poor ratings and both are on Otter Creek. (55). In 2006 two sites were sampled throughout the watershed and again, both were on Otter Creek. The condition of the benthic macroinvertebrates as an indicator of stream health was poor at one site and fair at the other (55).

Resource Priorities/Capabilities

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Fish and Wildlife *Con't*

Currently there is little information available on the wildlife of the Boone River Watershed, other than TNC's Boone River Watershed Ecological Assessment and the Natural Areas Inventory database (see next two pages). As more counties are completed in the Multiple Species Inventory and Monitoring Program (MSIM) (54) this could be a source for wildlife status and distributions throughout the watershed.

There is speculation that beaver in the watershed are doing well but there is little population data available (4). River otters were released in the Boone River in 1986, 10 males and 10 females, (63) but little information is known about the current population. There are six birds that are listed on the state and federal list, one mammal that is on the state list, and three amphibian and reptiles on the state list (52) (see below and page 26). There are also six insects, mostly butterflies, listed as threatened or a species of concern on the state list (52) (see page 26).

Federal and State Listed Species

S = Species of Concern – species which problems of status or distribution are suspected but not documented, thus are not protected by law.

T = Threatened – species that are likely to become endangered if factors affecting its vulnerability are not reversed.

E = Endangered – is any fish, plant, or wildlife species that is protected by law because it is in danger of extinction through part of its range.

Federal and State Listed Species (52)										
	Name		Status		County					
	Common	Scientific	State	Federal	Hamilton	Kossuth	Hancock	Humboldt	Wright	Webster
Reptiles and Amphibians	Blanding's Turtle	<i>Emydoidea blandingii</i>	T		x	x	x		x	
	Smooth Green Snake	<i>Liochlorophis vernalis</i>	S			x			x	x
	Mudpuppy	<i>Necturus maculosus</i>	T							x
Fish	Blacknose Shiner	<i>Notropis heterolepis</i>	T						x	x
	Orangethroat Darter	<i>Etheostoma spectabile</i>	T							x
	Topeka Shiner	<i>Notropis topeka</i>	T	E	x	x	x	x	x	x
	Western Sand Darter	<i>Ammocrypta clara</i>	T							x

Resource Priorities/Capabilities

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Federal and State Listed Species (52) Con't										
	Name		Status		County					
	Common	Scientific	State	Federal	Hamilton	Kossuth	Hancock	Humboldt	Wright	Webster
Freshwater Mussels	Creeper	<i>Strophitus undulatus</i>	T		x			x		x
	Cylindrical Papershell	<i>Anodontoidea ferussacianus</i>	T		x					
	Pistolgrip	<i>Tritogonia verrucosa</i>	E							x
	Round Pigtoe	<i>Pleurobema sintoxia</i>	E		x					x
	Sheepnose	<i>Plethobasus cyphus</i>	E	S						x
	Yellow Sandshell	<i>Lampsilis teres</i>	E					x		x
Birds	Black Tern	<i>Chlidonias niger</i>	S				x			
	Long-eared Owl	<i>Asio otus</i>	T							x
	Northern Harrier	<i>Circus cyaneus</i>	E			x				
	Piping Plover	<i>Charadrius melodus</i>	E	T		x				
	Short-eared Owl	<i>Asio flammeus</i>	E			x				
Insects	Acadian Hairstreak	<i>Satyrium acidicum</i>	S						x	
	Arogos Skipper	<i>Atrytone arogos</i>	S			x				
	Broad-winged Skipper	<i>Poanes viator</i>	S			x				
	Mulberry Wing	<i>Poanes massasoit</i>	T			x				
	Powesheik Skipperling	<i>Oarisma powesheik</i>	T			x	x			
	Regal Fritillary	<i>Speyeria idalia</i>	S			x				
Mammals	Southern Red-backed Vole	<i>Clethrionomys gapperi</i>	E				x			
Plants	Bog Willow	<i>Salix pedicellaris</i>	T				x			
	Buckbean	<i>Menyanthes trifoliata</i>	T						x	
	Earleaf Foxglove	<i>Tomanthera auriculata</i>	S			x			x	x
	Fragrant False Indigo	<i>Amorpha nana</i>	T			x				
	Lesser Bladderwort	<i>Utricularia minor</i>	S				x			
	Prairie Bush Clover	<i>Lespedeza leptostachya</i>	T	T		x				
	Roundleaf Sundew	<i>Drosera rotundifolia</i>	E				x			
	Rush Aster	<i>Aster junciformis</i>	T				x			
	Swamp Thistle	<i>Cirsium muticum</i>	S				x			
	Water Shield	<i>Brasenia schreberi</i>	S		x		x			
Woolly Milkweed	<i>Asclepias lanuginosa</i>	T							x	

Resource Priorities/Capabilities

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Federal and State Listed Species (52) Con't										
	Name		Status		County					
	Common	Scientific	State	Federal	Hamilton	Kossuth	Hancock	Humboldt	Wright	Webster
Plants	Creeping Sedge	Carex chordorrhiza	E				x			
	Glomerate Sedge	Carex aggregata	S							x
	Green's Rush	Juncus greenei	S				x			
	Large-leaf Pondweed	Potamogeton amplifolius	S				x			
	Meadow Bluegrass	Poa wolfii	S		x					
	Oval Ladies'-tresses	Spiranthes ovalis	T							x
	Philadelphia Panic Grass	Panicum philadelphicum	T				x			
	Richardson Sedge	Carex richardsonii	S			x				
	Sedge	Carex cephalantha	S				x			
	Showy Lady's Slipper	Cypripedium reginae	T		x					x
	Slender Cotton Grass	Eriophorum gracile	T				x			
	Slender Ladies'-tresses	Spiranthes lacera	T						x	
	Small White Lady's Slipper	Cypripedium candidum	S		x	x			x	
	Tall Cotton Grass	Eriophorum angustifolium	S		x					
	Western Prairie Fringed Orchid	Platanthera praeclara	T	T	x	x			x	x
Glandular Wood Fern	Dryopteris intermedia	T							x	
Oak Fern	Gymnocarpium dryopteris	T					x			

Resource Priorities/Capabilities

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SWAPA + H

SWAPA + H stands for soils, water, air, plants, animals + humans. SWAPA + H is used in watershed and ecosystem planning to identify natural systems and how they relate to social/economic conditions. The table below lists the resource priorities/capabilities of stakeholders and landowners, which were then ranked from 1 (poor) to 5 (excellent) on how each land use, listed at the top, affects that concern.

SWAPA + H* Priorities/Concerns	Specific Resource Priorities/Concerns	Row Crops	Livestock Operations	CRP/Grass Filterstrip	Pasture/Grazed Timber/Grassland	Forest/Timber	Hayfield	Farmsteads	Urban	Rural Residential Development
Soil	Erosion Runoff	X			X				X	X
	Gullies	X			X				X	X
	Stream Bank Erosion	X							X	X
	Channel Instability	X								
	Tillage	X								
	Nitrogen Management	X								
	Soil Quality - Impacts	X								
	Nutrient Management	X								
Water Quantity	Wetlands Drained	X								
	First flush after rain events	X							X	
	Linked depression system	X	X	X	X	X	X	X	X	X
	Hydrologic Alteration	X							X	X
	Flooding Problems	X								
	Straightening Creeks	X								
Surface Water Quality	Decline in Fish	X		X	X					
	Pesticides	X							X	X
	Failing septic systems							X		X
	Aquatic Integrity (flow, habitat)	X	X		X					
	Sedimentation	X			X				X	X
	Phosphorus	X	X						X	X
	Nitrogen	X							X	X
	Open tile lines	X								
	Linked depression system	X	X	X	X	X	X	X	X	X
	Storm Water Discharge								X	X
	emerging contaminants	X						X	X	X
	Physical debris/trash							X	X	X
	Bacteria	X	X	X	X	X	X	X	X	X
	Dissolved Oxygen	X	X						X	X
Ground Water Quality	Nitrate	X							X	X
	Arsenic - Well Water							X		X
	Linked depression system	X	X	X	X	X	X	X	X	X

Resource Priorities/Capabilities

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SWAPA + H con't

SWAPA + H* Priorities/Concerns	Specific Resource Priorities/Concerns	Row Crops	Livestock Operations	CRP/Grass Filterstrip	Pasture/Grazed Timber/Grassland	Forest/Timber	Hayfield	Farmsteads	Urban	Rural Residential Development
Air Quality	Odor--Nuisance		X							
	Road Dust	X								
	Particulates		X					X		
	Ammonia		X							
Plants	Native plants not managed properly	X			X					
	Lack of Native Plant Habitat	X			X				X	X
	Fragmentation of Native Plants	X							X	X
	Invasive Species			X				X		
	Health and Vigor of Corn/Bean Plants	X								
	Overgrazing				X					
	Forest cover/diversity - stream corridor				X	X				
Animal	Wildlife Habitat (food, cover, shelter)	X							X	X
	Endangered Species	X								
	Development on the River - affect wildlife									X
	Wildlife habitat fragmentation				X				X	X
	Too Many CAFO's being built		X							
Human	Aesthetic value on river & wildlife viewing								X	X
	Rural Development									X
	Recreation								X	X
	Perception of farmers	X	X							
	Market Trends	X								
	Low community well being							X	X	X
	High capital/ financial costs	X	X							
	Outreach on Nutrient Management	X	X							
	Lack of Technical Assistance	X	X	X						
High land values resulting in less protected land	X									

Resource Priorities/Capabilities

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SWAPA + H *con't*

Row Crops

Surface water quality is a concern in areas of row crop agriculture, which is the primary land use in the Boone River Watershed. Soil erosion is a challenge in fields using conventional tillage practices especially in fields planted to the stream bank. Under these conditions, sheet and rill erosion can carry sediment and nutrients easily to the stream channel. No till and minimum mulch till practices leave residues on the field that protect the soil from raindrop impact and slows sheet and rill erosion. However, even under these conditions, surface runoff can concentrate and move directly to the channel unless it is intercepted by a perennial plant cover in the form of a riparian forest buffer or a grass filter. The buffer system not only slows concentrated flow, but also protects streambanks from erosion and provides benefits such as temperature control and carbon inputs to the stream ecosystem.

Another challenge in row crop agriculture is hydrologic alteration created by ditching or subsurface drainage. Subsurface drainage provides a direct route for nutrients, particularly nitrate-N (NO_3), and pesticides to enter surface waters; and ditches provide a shorter distance for these pollutants to reach the stream. Excess nutrients in the stream can lead to eutrophication, lowering the amount of dissolved oxygen, affecting the aquatic integrity. There are also some subsurface drainage outlets that empty into agricultural drainage wells, which is a concern for groundwater quality. Subsurface drainage also has the potential to affect stream discharge and its timing. Water enters the subsurface drainage rather than further percolating through the soil or being slowed by vegetation before reaching the stream. The result is more water reaching the stream at a faster rate, creating the potential for stream bank erosion.

Human economics related to row crop agriculture are also a concern in the watershed. Row crop agriculture is associated with high levels of capital investment and financial expenditures and operate in relatively volatile economic conditions in terms of the value of the outputs and cost of the inputs. Many best management practices associated with row crop agriculture also may come with high capital requirements. There are federal and state programs available to reduce some of these capital costs.

Livestock Operations

The primary natural resource priorities/capabilities associated with livestock operations are water and air pollution. There is a zero tons/yr discharge allowance for livestock operations by size by state law. The concern is manure application and spills (35). Excess phosphorus, nitrogen and bacteria are carried to the stream by runoff and through subsurface drainage. Excess nutrients in the stream can lead to eutrophication, lowering the amount of dissolved oxygen, affecting the aquatic integrity. Air quality (specifically odor, particulates, ammonia) associated with CAFOs are also a concern, although there is limited data available. There are over 100 animal feeding operations in the Boone River Watershed, which could potentially be contributing to air quality

Resource Concerns

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SWAPA + H *con't*

Livestock Operations *con't*

issues. Potential air quality issues associated with livestock operations include: effects on human and animal health, impacts on property values, increased risk of nuisance litigation and NO_x pollution (57).

Human economics are also a concern in the watershed. Livestock production is associated with high levels of capital investment and financial expenditures and often require high labor inputs and operate in relatively volatile economic conditions in terms of the value of the outputs and cost of the inputs. Many best management practices associated with livestock production and manure management also may come with high capital requirements.

Urban

Urban areas were also identified as a concern in the Boone River Watershed. As land use changes from agricultural to urban the surface is replaced with an impermeable surface that decreases infiltration greatly, increasing runoff and rate. Some of the more common impacts on water quality in urban areas include runoff carrying bacteria from human and animal waste, chemical fertilizers applied to lawns and golf courses, and sediment (65). In addition an impermeable surface allows a greater volume of runoff to move at a faster rate, since water cannot percolate through the soil, resulting in more flooding.

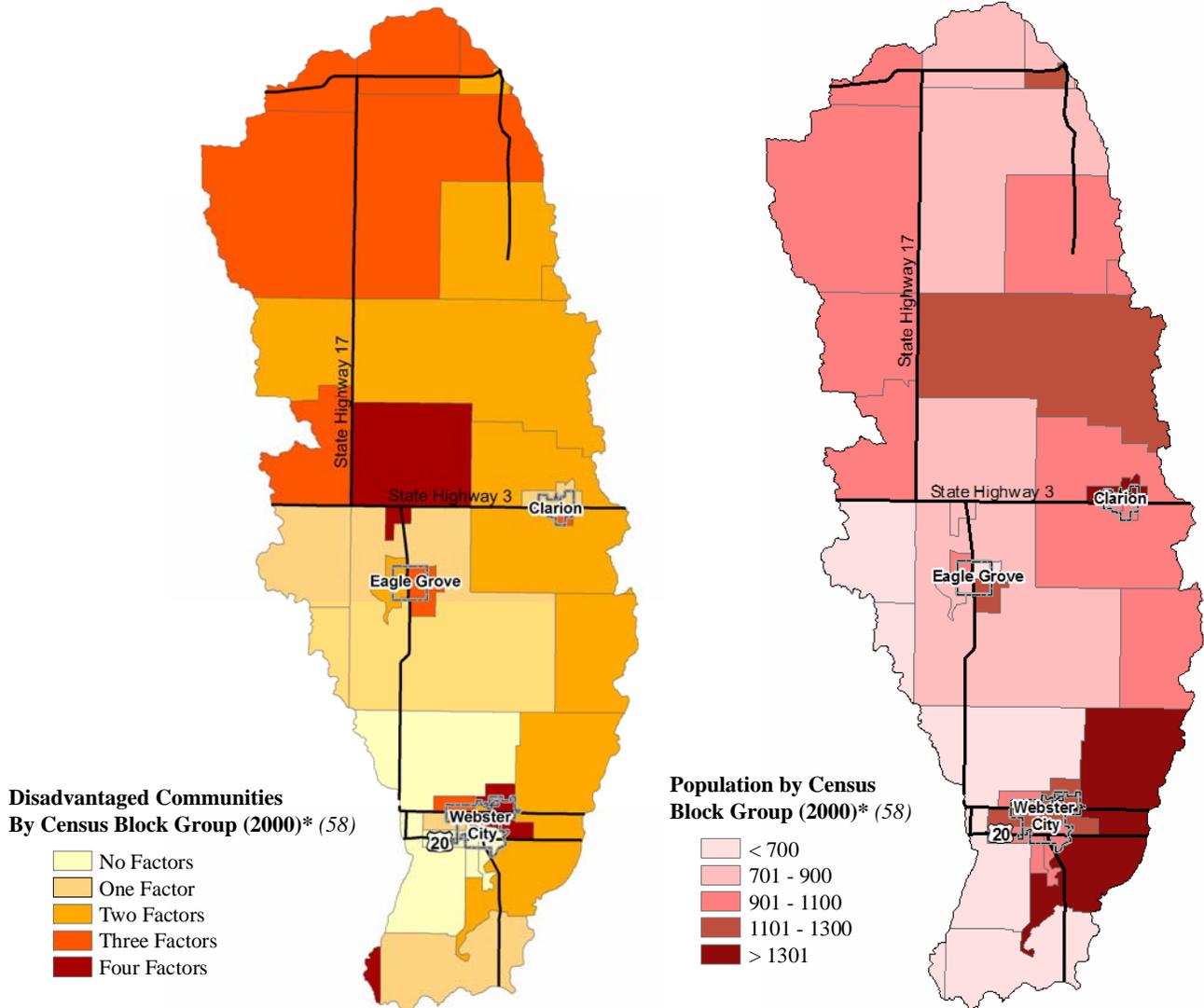
Point Source pollution is also a concern. Industrial and municipal facilities/infrastructures can impact a stream, due to excess sewage, nutrients, pesticides, metals or other contaminants discharging into the stream. Other potential point sources specific to the Boone River Watershed include leaking underground storage tanks and hazardous waste sites (*see map page 21*). While all that is mentioned here is common in urban landscapes little information is available that is specific to the Boone River Watershed, except the information on page 21 of this document. Since urban was identified as a concern in the Boone River Watershed, urbanization should be investigated further in future studies or watershed plans.

Rural Residential Development

Rural residential development is defined as the building of new homes in rural areas and/or the expansion or sprawl of urban areas into a once rural countryside. Residents, stakeholders and agencies identified rural residential development as a priority in the Boone River Watershed. The impact of rural residential development on surface water quality in the watershed was of particular concern. Concerns include pesticide and fertilizer usage on lawns, in addition to bacteria from domestic pet waste and failing septic systems reaching streams. Other topics of concern include homes being built on the river restricting views and access for recreation. There is also concern for wildlife and plant habitat being lost and fragmented.

U.S. Census Bureau Demographic Data

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* The numbers above are for the entire block group. The block groups have been clipped to the watershed boundary so numbers are approximate.

Census

A disadvantaged community for the purposes of the map on the left includes per capita income, median housing value, percent unemployed, and percent below poverty. Each block group received a factor of one if it was below (per capital income and median housing value) or above (percent unemployed and number of individuals with income below poverty) the statewide average. The statewide averages in 2000 are as follows: per capita income - \$19,065, median housing value - \$80,141, percent unemployed – 2.8%, and percent below poverty – 9.3%. These were then added together for each block group and reported in the above map. For example, those with a factor of four fit all four criteria.

The map on the right is total population by census block group and reports the total population residing in that block group. The estimated total population* for Boone River Watershed in 2000 was 34,544.



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NRCS Social Survey

Estimated Level of Willingness and Ability to Participate in Conservation (67) : 50%

- **Timing - Low**

There is a need for significant adjustments in technical assistance, financial assistance, and a dedicated marketing effort to achieve a successful participation rate in a reasonable amount of time.

- **Management: Low**

Management skills and a combination of educational assistance and technical assistance needs to be significantly increased to achieve a successful participation rate.

- **Technical Assistance: Medium**

The technical delivery system needs minor modifications.

- **Information/Education Assistance: Medium**

The existing information/education deliver system needs minor modifications.

- **Financial Assistance: Medium**

Existing financial incentives need to be expanded or increased to improve the participation rate and accelerate participation.

NASS Farm Census Data

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2002 Agricultural Census Data (59)		Hamilton	Hancock	Humboldt	Kossuth	Webster	Wright
	County (acres)	369,322	366,539	278,658	623,249	459,712	372,190
Farms	Farms (number)	797	827	606	1,340	932	752
	Land in farms (acres)	348,216	322,322	270,868	591,814	417,019	345,490
Cropland (Acres)	Total cropland (acres)	326,719	308,573	253,275	559,739	387,383	327,057
	Total cropland - Harvested cropland (acres)	313,870	298,798	246,764	543,736	371,464	316,591
Farms by Size (Acres)	1 to 9 acres	61	60	46	92	60	67
	10 to 49 acres	163	138	71	160	149	120
	50 to 179 acres	149	167	119	269	194	132
	180 to 499 acres	182	232	187	380	247	181
	500 to 999 acres	144	146	104	296	147	133
	1,000 acres or more	98	84	79	143	135	119
Market Value of Agricultural Products Sold (\$1,000)	All Agricultural Products	234,900	141,590	96,637	261,017	153,972	225,747
	Crops	87,729	80,160	65,807	145,372	106,886	87,751
	Livestock, poultry, and their products	147,171	61,429	30,829	115,645	47,086	137,996
Government Payments	Government payments (farms)	606	610	451	1,038	688	581
	Government payments (\$1,000)	4,837	5,067	3,758	10,247	6,320	5,048
Principal Operator (Number)	Primary occupation - Farming	602	654	469	1,016	702	548
	Primary occupation - Other (not farming)	195	173	137	324	230	204
	Days worked off farm - Any	428	430	328	710	483	418
	Days worked off farm - 200 days or more	291	256	184	344	301	251
Inventory of Livestock and Poultry (Number)	Cattle and calves - Milk cows	0	296	0	632	216	0
	Cattle and calves - Beef cows	0	2,331	0	5,801	3,098	1,497
	Cattle and calves	5,593	9,669	11,677	31,462	7,423	4,855
	Hogs and pigs	467,250	200,651	96,333	423,442	146,614	322,024
	Sheep and lambs	890	2,339	626	2,055	697	1,555
	Layers 20 weeks old and older	0	0	0	2,787	0	0
Selected Crops Harvested (Acres)	Corn for grain	164,589	156,396	127,427	287,388	187,455	161,449
	Corn for silage or greenchop	754	932	1,405	2,965	1,527	216
	Oats for grain	483	575	290	1,006	648	246
	Soybeans for beans	144,979	137,638	115,902	245,524	178,461	152,937
	Forage - land used for all hay and all haylage, grass silage, and greenchop	2,719	3,724	1,974	5,218	3,704	1,969
	Vegetables harvested for sale	26	0	9	2,099	102	0

Progress/Status

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Watershed Projects, Plans, Studies, and Assessments		
Organizations	Projects	Status
IOWATER Watershed Monitoring Group	Eagle Grove High School Science Class	Ongoing
	Wright County Water Quality Education Program*	Ongoing
EPA Citizen-based Watershed Groups	Wright County Adult Water Quality Project	Ongoing
	Wright County Water Monitoring (School)*	Ongoing
Prairie Rivers of Iowa RC&D	<i>Boone River Watershed Project</i> ^a	
The Nature Conservancy	Ecological Assessment	Completed - 2005
	Refinement of Ecological Assessment	2007
Iowa Soybean Association ^b	In-field Trials and Demonstrations	Ongoing
Iowa Soybean Association ^c	Landowner Environmental Education	Completed
Iowa State University (ISU) ^d	Boone River Watershed Economic Model	2008
ISU Leopold Center for Sustainable Agriculture, Prairie Rivers RC&D, ISU-CARD	Gordon's Marsh Economic Evaluation	Completed
Prairie Rivers RC&D & USDA-ARS Soil Tilth Lab	Controlled Drainage Project	2009
Iowa Native Lands Inc.	Prairie Remnant Survey	NA
Watershed Alliance/Council	Iowa Association of County Conservation Boards	Ongoing
IDALS-DSC	Buttermilk Creek Watershed Development Grant	Completed
Iowa Soybean Association	Water Sampling	Ongoing
USDA-ARS Soil Tilth Lab, Prairie Rivers RC&D	Char Study	Ongoing
Iowa DNR	Protected Waters Plan	2008

* - These are the same programs under two different organizations

a - The overall project is the Boone River Watershed Project coordinated by the Prairies Rivers RC&D. There are several partners participating in sub-projects that are listed above.

b - Other partners include Prairie Rivers RC&D, NRCS, Conservation Districts of Iowa, Hamilton & Hardin SWCD.

c - Funds were obtained from the Iowa DNR Resource Enhancement and Protection Program.

d - Other partners include Prairie Rivers RC&D, The Leopold Center for Sustainable Agriculture, and various farmer and stakeholders.

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PRMS Data	Planned FY05	Applied FY05	Planned FY06	Applied FY06	Planned FY07	Applied FY07
Total Conservation Systems (ac) (60)	24,922	14,704	27,978	20,205	16,292	14,697
Conservation Practices (61)						
Brush Management (314) (ac)			27		237	30
Composting Facility (317) (no)			1		1	
Comprehensive Nutrient Management Plan (100) (no)	2	2	1		6	
Conservation Cover (327) (ac)	1,772	1,549	1,729	867	764	1,985
Conservation Crop Rotation (328) (ac)	12,187	4,503	11,900	8,102	5,726	3,298
Contour Buffer Strips (332) (ac)			5		2	1
Contour Farming (330) (ac)			11	2	16	16
Cover Crop (340) (ac)			1			
Critical Area Planting (342) (ac)	1		2	2	1	1
Dike (356) (ft)	1,000		700	700		
Early Successional Habitat Development/Management (647) (ac)	41	10	533	38	1,556	167
Fence (382) (ft)		1,200	2,232			608
Field Border (386) (ft)			214,462	75,085	12,245	76,625
Filter Strip (393) (ac)	574	374	383	226	305	108
Firebreak (394) (ft)		71	3,920			
Forage Harvest Management (511) (ac)			4	4	30	
Forest Stand Improvement (666) (ac)			245		501	30
Grade Stabilization Structure (410) (no)		2	1	1	1	2
Grassed Waterway (412) (ac)	45	31	53	52	107	12
Nutrient Management (590) (ac)	41,745	8,837	24,981	5,177	13,008	8,282
Pasture and Hay Planting (512) (ac)		3	92	50	77	59
Pest Management (595) (ac)	36,264	5,513	24,395	1,438	12,871	6,795
Pipeline (516) (ft)		1,000				
Pond (378) (no)					1	1
Prescribed Burning (338) (ac)	37	12	44		109	7
Prescribed Grazing (528) (ac)	0	10	25	0	45	11
Recreation Land Grading and Shaping (566) (ac)	375	375				
Residue and Tillage Management, Mulch Till (345) (ac)	19,900	2,827	19,380	12,633	7,401	3,346
Residue and Tillage Management, No-Till/Strip Till/Direct Seed (329) (ac)	1,785	2,155	1,385	818	1,203	1,143
Residue and Tillage Management, Ridge Till (346) (ac)	150	185	378	378	146	0

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Conservation Practices <i>con't</i>	Planned FY05	Applied FY05	Planned FY06	Applied FY06	Planned FY07	Applied FY07
Residue Management, Seasonal (344) (ac)			420	420		
Restoration and Management of Rare and Declining Habitats (643) (ac)	10	10	34	25		9
Riparian Forest Buffer (391) (ac)	39	36	21	23	3	9
Stream Habitat Improvement and Management (395) (ac)			25			
Streambank and Shoreline Protection (580) (ft)			750	750		
Stripcropping (585) (ac)					16	16
TA Application (912) (no)			255	100		
TA Check-Out (913) (no)			100	100		
TA Design (911) (no)			255	100		
TA Planning (910) (no)			155			
Terrace (600) (ft)	3,088	3,088	950	950		
Tree/Shrub Establishment (612) (ac)	36	34	25	12	26	17
Upland Wildlife Habitat Management (645) (ac)	1,505	1,168	2,126	1,440	1,497	885
Use Exclusion (472) (ac)	1,724	1,419	1,446	654	928	832
Waste Storage Facility (313) (no)	2		1		6	
Water and Sediment Control Basin (638) (no)			1			1
Wetland Enhancement (659) (ac)		25				
Wetland Restoration (657) (ac)	801	532	253	176	252	274
Wetland Wildlife Habitat Management (644) (ac)	701	588	222	155	313	307
Windbreak/Shelterbelt Establishment (380) (ft)	8,610	144	3,273	2,623		

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Farm Bill Program Acres, Funding, and Contracts							
	Program	Acres in the Watershed					
2007*	CRP	14,747					
	WRP	418					
	Program	Hamilton	Hancock	Humboldt	Kossuth	Webster	Wright
2006	Acres						
	EQIP	4,175	1,923	2,954	1,066	2,333	2,778
	WHIP	30	0	0	0	0	16
	WRP	0	0	0	0	0	0
	Funding						
	EQIP	\$273,300	\$117,749	\$107,525	\$178,822	\$270,081	\$159,696
	WHIP	\$6,480	\$0	\$0	\$0	\$0	\$3,916
	WRP	\$0	\$0	\$0	\$0	\$0	\$0
	Contracts						
	EQIP	18	18	11	7	21	19
	WHIP	1	0	0	0	0	1
	WRP	0	0	0	0	0	0
	2004	Acres					
CSP		0	0	0	71,232	0	0
GRP		0	0	0	0	0	0
WRP			110		152		73
Funding							
CSP		\$0	\$0	\$0	\$5,519,480	\$0	\$0
GRP		\$0	\$0	\$0	\$0	\$0	\$0
WRP			\$312,620		\$500,986		\$192,913
Contracts							
CSP		0	0	0	105	0	0
GRP		0	0	0	0	0	0
WRP		0	1	0	1	0	1
2003		Acres					
	EQIP	NA	NA	NA	NA	NA	NA
	WHIP	NA	NA	NA	NA	NA	NA
	GRP	0	0	0	0	0	0
	WRP	0	211	0	0	0	0
	Funding						
	EQIP	\$91,670	\$31,739	\$45,069	\$81,608	\$66,103	\$112,833
	WHIP	\$0	\$20,027	\$0	\$0	\$38,321	\$0
	GRP	\$0	\$0	\$0	\$0	\$0	\$0
	WRP	\$0	\$425,140	\$0	\$0	\$0	\$0
	Contracts						
	EQIP	NA	NA	NA	NA	NA	NA
	WHIP	0	1	0	0	3	0
GRP	0	0	0	0	0	0	
WRP	0	3	0	0	0	0	

* The 2007 acres listed are for land units currently enrolled in the program through September 30, 2007, so there are multiple years included in the totals.

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Summary of Farm Service Agency Practices (Acres) for all Active CRP Contracts, 1992-2008 (64)							
Practice	Code	Hamilton	Hancock	Humboldt	Kossuth	Webster	Wright
Introduced Grasses	CP1	9.7	165.0	1.3	390.3	0.0	119.8
Native Grasses	CP2	151.1	177.0	273.7	359.5	248.0	728.6
Tree Planting	CP3	0.0	0.8	0.0	0.3	0.0	1.9
Hardwood Tree Planting	CP3A	21.9	9.0	0.0	11.5	9.4	78.5
Wildlife Habitat Corridor (SU 10+)	CP4B	0.0	4.2	17.8	45.9	0.0	3.7
Wildlife Habitat (SU 10+)	CP4D	1,458.4	1,555.6	320.6	1,854.5	823.1	2,245.8
Field Windbreaks (SU 10+)	CP5A	0.7	12.2	46.6	121.5	54.9	26.5
Grass Waterways (SU 10+)	CP8A	210.4	115.1	73.8	76.2	137.4	181.4
Wildlife Water	CP9	22.4	27.3	342.1	14.6	58.6	190.9
Established Grass	CP10	35.8	484.1	119.2	946.1	46.1	490.6
Established Trees	CP11	19.0	21.2	10.1	25.9	0.0	27.7
Wildlife Food Plots	CP12	8.3	7.9	23.0	41.0	20.3	11.2
Contour Grass Strips	CP15A	14.7	19.9	38.3	3.3	23.4	26.8
Contour Grass Strips Terraces	CP15B	0.0	0.0	0.0	0.0	3.3	0.0
Shelterbelt Establishment (SU 10+)	CP16A	36.0	8.8	21.4	55.1	18.3	16.5
Living Snow Fences (SU 10+)	CP17A	1.5	0.0	2.8	28.7	4.7	2.7
Filter Strips	CP21	3,819.0	3,181.1	2,409.0	4,307.3	4,973.2	3,581.2
Riparian Buffers	CP22	112.0	52.1	524.1	75.6	27.2	141.0
Wetland Restoration	CP23	293.2	1,093.9	1,100.0	1,330.2	1,170.9	2,424.7
Wetland Rest. Non-Floodplain	CP23A	40.2	151.7	0.0	118.4	157.3	88.9
Rare and Declining Habitat	CP25	217.5	576.1	254.2	816.8	672.1	529.8
Farmable Wetland Pilot Wetland	CP27	1,295.4	839.8	737.6	1,489.9	1,270.6	1,359.5
Farmable Wetland Pilot Buffer	CP28	3,368.8	2,080.3	1,995.9	3,782.3	3,155.8	3,471.9
Marginal Pastureland Wildlife Habitat	CP29	36.9	10.1	17.9	278.8	93.1	6.3
Marginal Pastureland Wetland Buffer	CP30	0.0	0.0	118.7	31.3	15.4	32.0
Upland Bird Habitat Buffers	CP33	537.5	558.3	149.0	166.3	1,461.6	198.3

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Boone River Watershed		
USDA - NRCS Service Center Locations		
County	City	Phone Number
Hancock	Garner, IA	(641) 923-2837
Wright	Clarion, IA	(515) 532-2165
Hamilton	Webster City, IA	(515) 832-2916
Kossuth	Algona, IA	(515) 295-5156
Humboldt	Humboldt, IA	(515) 332-3337
Webster	Fort Dodge, IA	(515) 573-4411

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Water Quality Criteria (62)	
General Categories	
Category	Description
1	All designated uses are met
2	Some of the designated uses are met, but there are insufficient data to determine if the remaining designated uses are met.
3	Insufficient data to determine whether any designated uses are met.
4	Waterbody is impaired or threatened but a TMDL is not needed.
5	Waterbody is impaired or a threatened but a TMDL is needed.
Specific Categories	
Category	Description
1	All designated uses met
2a	Some designated uses met; insufficient data to determine whether other uses are met
2b	At least one designated use is met with at least one other use potentially impaired based on an "evaluated" assessment
3a	Insufficient data to determine whether any designated uses are met
3b	Insufficient data to determine whether any designated uses are met but at least one use is potentially impaired based on "evaluated" assessment
4a	All TMDLs need to result in attainment of all applicable water quality standards have been approved or established by EPA
4b	Other required control measures are expected to result in the attainment of water quality standards in a reasonable period of time
4c	The impairment or threat is not caused by a pollutant
4d	Waterbody assessed as "impaired" due to a fish kill where enforcement action was taken to address the source of the kill: no TMDL required
5a	Waterbody is impaired or threatened and a TMDL is needed
5b	Impairment is based on results of biological monitoring or a fish kill investigation where specific causes and/or sources of the impairment have not yet been identified
Use Class	
Class	Description
A1	Primary human contact recreation
A2	Secondary human contact recreational use
A3	Children's recreational use
B(WW)	Significant resource warm water aquatic life
B(LR)	Limited resource warm water aquatic life
B(CW)	Cold water aquatic life
B(LW)	Aquatic life of lakes and wetlands
C	Source of water supply

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Boone River Watershed IDNR Biological Assessment (1994-2006) (55)				
Stream Name	Nearest Landmark	Sample Date	FIBI	BMIBI
White Fox Creek	Webster City	07/07/94	52	58
White Fox Creek	Webster City	10/12/94	46	69
Boone River	Webster City	06/13/95	45	NA
Boone River	Webster City	08/22/95	60	NA
White Fox Creek	Webster City	11/20/95	51	42
Boone River	Webster City	05/14/96	49	34
White Fox Creek	Webster City	09/10/96	57	67
Drainage Ditch 49	Webster City	11/05/96	52	42
Buttermilk Creek	Webster City	04/23/97	52	35
White Fox Creek	Webster City	08/25/97	59	71
White Fox Creek	Webster City	11/10/97	41	45
White Fox Creek	Webster City	05/13/98	49	47
White Fox Creek	Bells Mill Park- Stratford	09/17/98	70	67
Lyons Creek	Otter Creek WA - Goldfield	08/10/00	45	79
White Fox Creek	Webster City	08/30/00	48	62
White Fox Creek	Holmes	08/31/00	50	55
White Fox Creek	Eagle Grove -- Remap #38	08/14/02	44	59
White Fox Creek	Webster City -- Remap #10	09/09/02	49	48
Drainage Ditch 49	Eagle Grove -- Remap #38	10/07/02	56	39
Lyons Creek	Renwick - Remap #91	08/20/03	32	NA
Otter Creek	Goldfield - Remap 132	07/28/04	41	15
White Fox Creek	Bells Mill Park- Stratford	09/28/04	73	57
Boone River	Webster City - LC1	08/22/06	46	NA
Otter Creek	Webster City - LC2	08/23/06	35	33
Otter Creek	Goldfield - BMC1	09/05/06	42	18

Current Conditions for Row Crop

Row Crop		Quantity		Costs		Effects								Implementation						
Mgmt System	Practice Name	Code	Units	Quantity (Total 2005-2007)	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQIP	WHIP	CRP	WRP	GLC	IFIP
BM1	Soil Erosion - Sheet and Rill																			
	Conservation Cover	327	ac	4,401	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Conservation Crop Rotation	328	ac	15,903	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Contour Buffer Strips	332	ac	1	\$40.00	2%	2	2	1	1	2	1	4	1	-	-	X	-	-	X
	Contour Farming	330	ac	18	\$10.00	0%	2	2	1	1	0	0	1	1	-	-	-	-	-	X
	Critical Area Planting	342	ac	3	\$137.50	3%	4	3	4	2	2	1	5	2	X	-	X	-	-	X
	Field Border	386	ft	151,710	\$0.35	1%	2	2	0	2	2	0	5	1	-	-	X	-	-	X
	Residue Management, No-Till/Strip Till	329	ac	4,116	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Residue Management, Mulch Till	345	ac	18,806	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
	Terrace	600	ft	4,038	\$1.50	0%	1	1	1	1	1	0	2	0	-	-	-	-	-	X
BM2	Soil Erosion - Ephemeral Gully																			
	Conservation Cover	327	ac	4,401	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Conservation Crop Rotation	328	ac	15,903	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Contour Buffer Strips	332	ac	1	\$40.00	2%	2	2	1	1	2	1	4	1	-	-	X	-	-	X
	Contour Farming	330	ac	18	\$10.00	0%	2	2	1	1	0	0	1	1	-	-	-	-	-	X
	Critical Area Planting	342	ac	3	\$137.50	3%	4	3	4	2	2	1	5	2	X	-	X	-	-	X
	Field Border	386	ft	151,710	\$0.35	1%	2	2	0	2	2	0	5	1	-	-	X	-	-	X
	Grade Stabilization Structure	410	no	5	\$10,000.00	1%	1	0	1	2	2	0	0	0	-	-	X	-	-	X
	Grassed Waterway	412	ac	95	\$2,500.00	2%	3	-1	3	2	1	1	4	1	-	-	X	-	-	
	Residue Management, No-Till/Strip Till	329	ac	4,116	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Residue Management, Mulch Till	345	ac	18,806	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
	Terrace	600	ft	4,038	\$1.50	0%	1	1	1	1	1	0	2	0	-	-	-	-	-	X
BM3	Soil Erosion - Classic Gully																			
	Critical Area Planting	342	ac	3	\$137.50	3%	4	3	4	2	2	1	5	2	X	-	X	-	-	X
	Grade Stabilization Structure	410	no	5	\$10,000.00	1%	1	0	1	2	2	0	0	0	-	-	X	-	-	X
	Grassed Waterway	412	ac	95	\$2,500.00	2%	3	-1	3	2	1	1	4	1	-	-	X	-	-	
	Pond	378	no	1	\$16,000.00	1%	1	2	1	1	3	5	2	0	X	-	-	-	-	
	Terrace	600	ft	4,038	\$1.50	0%	1	1	1	1	1	0	2	0	-	-	-	-	-	X
	Water and Sediment Control Basin	638	no	1	\$3,250.00	3%	3	3	1	1	0	1	0	0	-	-	-	-	-	
BM4	Soil Erosion - Streambank																			
	Critical Area Planting	342	ac	3	\$137.50	3%	4	3	4	2	2	1	5	2	X	-	X	-	-	X
	Filter Strip	393	ac	708	\$2,000.00	2%	2	2	3	2	2	1	5	1	-	-	X	-	-	X
	Grade Stabilization Structure	410	no	5	\$10,000.00	1%	1	0	1	2	2	0	0	0	-	-	X	-	-	X
	Riparian Forest Buffer	391	ac	68	\$317.00	1%	2	3	3	3	4	4	4	2	-	-	X	-	-	

Current Conditions for Row Crop

Row Crop		Quantity		Costs		Effects								Implementation						
Mgmt System	Practice Name	Code	Units	Quantity (Total 2005-2007)	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQIP	WHIP	CRP	WRP	GLC	IFIP
	Streambank and Shoreline Protection	580	ft	750	\$20.00	10%	4	2	3	2	2	1	4	3	-	-	-	-	-	
BM5	Soil Condition - Organic Matter Depletion																			
	Conservation Crop Rotation	328	ac	15,903	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Cover Crop	340				1%														
	Nutrient Management	590	ac	22,296	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
	Residue Management, No-Till/Strip Till	329	ac	4,116	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Residue Management, Mulch Till	345	ac	18,806	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
BM6	Water Quantity - Excessive Runoff, Flooding, or Ponding																			
	Contour Buffer Strips	332	ac	1	\$40.00	2%	2	2	1	1	2	1	4	1	-	-	X	-	-	X
	Pond	378	no	1	\$16,000.00	1%	1	2	1	1	3	5	2	0	X	-	-	-	-	
	Terrace	600	ft	4,038	\$1.50	0%	1	1	1	1	1	0	2	0	-	-	-	-	-	X
	Water and Sediment Control Basin	638	no	1	\$3,250.00	3%	3	3	1	1	0	1	0	0	-	-	-	-	-	
	Wetland Enhancement	659	ac	25	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	-	-	-	
	Wetland Restoration	657	ac	982	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	X	X	-	
	Wetland Wildlife Habitat Management	644	ac	1,050	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
BM7	Water Quantity - Excessive Subsurface Water																			
	Wetland Enhancement	659	ac	25	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	-	-	-	
	Wetland Restoration	657	ac	982	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	X	X	-	
	Wetland Wildlife Habitat Management	644	ac	1,050	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
BM8	Water Quality - Excessive Nutrients in Groundwater																			
	Conservation Crop Rotation	328	ac	15,903	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Nutrient Management	590	ac	22,296	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
BM9	Water Quality - Excessive Nutrients in Surface Waters																			
	Nutrient Management	590	ac	22,296	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
BM10	Water Quality - Excessive Suspended and Bedded Sediments in Surface Waters																			
	Conservation Cover	327	ac	4,401	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Conservation Crop Rotation	328	ac	15,903	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Contour Buffer Strips	332	ac	1	\$40.00	2%	2	2	1	1	2	1	4	1	-	-	X	-	-	X
	Contour Farming	330	ac	18	\$10.00	0%	2	2	1	1	0	0	1	1	-	-	-	-	-	X
	Critical Area Planting	342	ac	3	\$137.50	3%	4	3	4	2	2	1	5	2	X	-	X	-	-	X
	Field Border	386	ft	151,710	\$0.35	1%	2	2	0	2	2	0	5	1	-	-	X	-	-	X

Current Conditions for Row Crop

Row Crop		Quantity		Costs		Effects								Implementation						
Mgmt System	Practice Name	Code	Units	Quantity (Total 2005-2007)	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQIP	WHIP	CRP	WRP	GLC	IFIP
	Filter Strip	393	ac	708	\$2,000.00	2%	2	2	3	2	2	1	5	1	-	-	X	-	-	X
	Grade Stabilization Structure	410	no	5	\$10,000.00	1%	1	0	1	2	2	0	0	0	-	-	X	-	-	X
	Grassed Waterway	412	ac	95	\$2,500.00	2%	3	-1	3	2	1	1	4	1	-	-	X	-	-	
	Nutrient Management	590	ac	22,296	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
	Residue Management, Mulch Till	345	ac	18,806	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
	Residue Management, No-Till/Strip Till	329	ac	4,116	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Riparian Forest Buffer	391	ac	68	\$317.00	1%	2	3	3	3	4	4	4	2	-	-	X	-	-	
	Streambank and Shoreline Protection	580	ft	750	\$20.00	10%	4	2	3	2	2	1	4	3	-	-	-	-	-	
	Terrace	600	ft	4,038	\$1.50	0%	1	1	1	1	1	0	2	0	-	-	-	-	-	X
	Water and Sediment Control Basin	638	no	1	\$3,250.00	3%	3	3	1	1	0	1	0	0	-	-	-	-	-	
BM11	Aquatic Integrity - Excessive Temperature, Low Dissolved Oxygen, Habitat Alteration																			
	Conservation Cover	327	ac	4,401	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Riparian Forest Buffer	391	ac	68	\$317.00	1%	2	3	3	3	4	4	4	2	-	-	X	-	-	
	Streambank and Shoreline Protection	580	ft	750	\$20.00	10%	4	2	3	2	2	1	4	3	-	-	-	-	-	
	Tree/Shrub Establishment	612	ac	63	\$285.00	0%	3	2	2	2	4	3	5	3	-	-	X	-	X	X
	Wetland Wildlife Habitat Management	644	ac	1,050	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
BM12	Plant Condition - Threatened or Endangered Plant Species																			
	Conservation Cover	327	ac	4,401	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Upland Wildlife Habitat Management	645	ac	3,493	\$150.00	0%	2	0	0	2	5	2	4	2	X	-	X	X	X	
	Wetland Wildlife Habitat Management	644	ac	1,050	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
BM13	Plant Condition - Productivity, Health, and Vigor																			
	Brush Management	314	ac	30	\$87.50	1%	2	1	1	0	3	2	4	-2	-	X	-	-	-	
	Conservation Cover	327	ac	4,401	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Conservation Crop Rotation	328	ac	15,903	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Filter Strip	393	ac	708	\$2,000.00	2%	2	2	3	2	2	1	5	1	-	-	X	-	-	X
	Nutrient Management	590	ac	22,296	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
	Pest Management	595	ac	13,746	\$4.00	0%	3	2	1	4	3	4	4	3	X	-	X	-	-	
	Riparian Forest Buffer	391	ac	68	\$317.00	1%	2	3	3	3	4	4	4	2	-	-	X	-	-	
	Tree/Shrub Establishment	612	ac	63	\$285.00	0%	3	2	2	2	4	3	5	3	-	-	X	-	X	X
	Windbreak/Shelterbelt Establishment	380	ft	2,767	\$350.00	1%	3	2	1	2	4	4	5	3	-	-	-	-	-	X
BM14	Fish and Wildlife - Inadequate Food																			
	Conservation Cover	327	ac	4,401	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Conservation Crop Rotation	328	ac	15,903	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	

Current Conditions for Row Crop

Row Crop		Quantity			Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Quantity (Total 2005-2007)	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQIP	WHIP	CRP	WRP	GLC	IFIP
	Pond	378	no	1	\$16,000.00	1%	1	2	1	1	3	5	2	0	X	-	-	-	-	
	Residue Management, Mulch Till	345	ac	18,806	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
	Residue Management, No-Till/Strip Till	329	ac	4,116	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Upland Wildlife Habitat Management	645	ac	3,493	\$150.00	0%	2	0	0	2	5	2	4	2	X	-	X	X	X	
	Wetland Wildlife Habitat Management	644	ac	1,050	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
	Wetland Enhancement	659	ac	25	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	-	-	-	
	Wetland Restoration	657	ac	982	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	X	X	-	
BM15	Fish and Wildlife - Inadequate Shelter																			
	Conservation Cover	327	ac	4,401	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Contour Buffer Strips	332	ac	1	\$40.00	2%	2	2	1	1	2	1	4	1	-	-	X	-	-	X
	Field Border	386	ft	151,710	\$0.35	1%	2	2	0	2	2	0	5	1	-	-	X	-	-	X
	Residue Management, Mulch Till	345	ac	18,806	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
	Residue Management, No-Till/Strip Till	329	ac	4,116	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Tree/Shrub Establishment	612	ac	63	\$285.00	0%	3	2	2	2	4	3	5	3	-	-	X	-	X	X
	Upland Wildlife Habitat Management	645	ac	3,493	\$150.00	0%	2	0	0	2	5	2	4	2	X	-	X	X	X	
	Wetland Enhancement	659	ac	25	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	-	-	-	
	Wetland Restoration	657	ac	982	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	X	X	-	
	Wetland Wildlife Habitat Management	644	ac	1,050	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
	Windbreak/Shelterbelt Establishment	380	ft	2,767	\$350.00	1%	3	2	1	2	4	4	5	3	-	-	-	-	-	X
BM16	Fish and Wildlife - Threatened and Endangered Species																			
	Upland Wildlife Habitat Management	645	ac	3,493	\$150.00	0%	2	0	0	2	5	2	4	2	X	-	X	X	X	
	Wetland Wildlife Habitat Management	644	ac	1,050	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	

Future Conditions for Row Crop																			
Row Crop			Units	Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQIP	WHIP	CRP	WRP	GLC	IFIP
RMS1																			
	Conservation Cover	327	ac	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Conservation Crop Rotation	328	ac	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Contour Buffer Strips	332	ac	\$40.00	2%	2	2	1	1	2	1	4	1	-	-	X	-	-	X
	Contour Farming	330	ac	\$10.00	0%	2	2	1	1	0	0	1	1	-	-	-	-	-	X
	Cover Crop	340			1%														
	Critical Area Planting	342	ac	\$137.50	3%	4	3	4	2	2	1	5	2	X	-	X	-	-	X
	Diversion	362			2%														X
	Field Border	386	ft	\$0.35	1%	2	2	0	2	2	0	5	1	-	-	X	-	-	X
	Residue Management, No-Till/Strip Till	329	ac	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Residue Management, Mulch Till	345	ac	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
	Terrace	600	ft	\$1.50	0%	1	1	1	1	1	0	2	0	-	-	-	-	-	X
	Underground Outlet	620			3%														
RMS2	Soil Erosion - Ephemeral Gully																		
	Conservation Cover	327	ac	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Conservation Crop Rotation	328	ac	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Contour Buffer Strips	332	ac	\$40.00	2%	2	2	1	1	2	1	4	1	-	-	X	-	-	X
	Contour Farming	330	ac	\$10.00	0%	2	2	1	1	0	0	1	1	-	-	-	-	-	X
	Cover Crop	340			1%														
	Critical Area Planting	342	ac	\$137.50	3%	4	3	4	2	2	1	5	2	X	-	X	-	-	X
	Diversion	362			2%														X
	Field Border	386	ft	\$0.35	1%	2	2	0	2	2	0	5	1	-	-	X	-	-	X
	Grade Stabilizaton Structure	410	no	\$10,000.00	1%	1	0	1	2	2	0	0	0	-	-	X	-	-	X
	Grassed Waterway	412	ac	\$2,500.00	2%	3	-1	3	2	1	1	4	1	-	-	X	-	-	
	Residue Management, No-Till/Strip Till	329	ac	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Residue Management, Mulch Till	345	ac	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
	Terrace	600	ft	\$1.50	0%	1	1	1	1	1	0	2	0	-	-	-	-	-	X
	Underground Outlet	620			3%														
RMS3	Soil Erosion - Classic Gully																		
	Critical Area Planting	342	ac	\$137.50	3%	4	3	4	2	2	1	5	2	X	-	X	-	-	X
	Diversion	362			2%														X
	Grade Stabilizaton Structure	410	no	\$10,000.00	1%	1	0	1	2	2	0	0	0	-	-	X	-	-	X
	Grassed Waterway	412	ac	\$2,500.00	2%	3	-1	3	2	1	1	4	1	-	-	X	-	-	
	Pond	378	no	\$16,000.00	1%	1	2	1	1	3	5	2	0	X	-	-	-	-	
	Terrace	600	ft	\$1.50	0%	1	1	1	1	1	0	2	0	-	-	-	-	-	X
	Underground Outlet	620			3%														

Future Conditions for Row Crop																			
Row Crop			Units	Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQUIP	WHIP	CRP	WRP	GLC	IFIP
	Water and Sediment Control Basin	638	no	\$3,250.00	3%	3	3	1	1	0	1	0	0	-	-	-	-	-	
RMS4	Soil Erosion - Streambank																		
	Critical Area Planting	342	ac	\$137.50	3%	4	3	4	2	2	1	5	2	X	-	X	-	-	X
	Filter Strip	393	ac	\$2,000.00	2%	2	2	3	2	2	1	5	1	-	-	X	-	-	X
	Grade Stabilization Structure	410	no	\$10,000.00	1%	1	0	1	2	2	0	0	0	-	-	X	-	-	X
	In-Channel Structures																		
	Riparian Forest Buffer	391	ac	\$317.00	1%	2	3	3	3	4	4	4	2	-	-	X	-	-	
	Streambank and Shoreline Protection	580	ft	\$20.00	10%	4	2	3	2	2	1	4	3	-	-	-	-	-	
RMS5	Soil Condition - Organic Matter Depletion																		
	Conservation Crop Rotation	328	ac	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Cover Crop	340			1%														
	Nutrient Management	590	ac	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
	Residue Management, No-Till/Strip Till	329	ac	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Residue Management, Mulch Till	345	ac	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
RMS6	Water Quantity - Excessive Runoff, Flooding, or Ponding																		
	Contour Buffer Strips	332	ac	\$40.00	2%	2	2	1	1	2	1	4	1	-	-	X	-	-	X
	Dam, Diversion	348			3%														
	Pond	378	no	\$16,000.00	1%	1	2	1	1	3	5	2	0	X	-	-	-	-	
	Structure for Water Control	587			1%														
	Subsurface Drain	606			3%														
	Terrace	600	ft	\$1.50	0%	1	1	1	1	1	0	2	0	-	-	-	-	-	X
	Underground Outlet	620			3%														
	Water and Sediment Control Basin	638	no	\$3,250.00	3%	3	3	1	1	0	1	0	0	-	-	-	-	-	
	Wetland Enhancement	659	ac	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	-	-	-	
	Wetland Restoration	657	ac	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	X	X	-	
	Wetland Wildlife Habitat Management	644	ac	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
RMS7	Water Quantity - Excessive Subsurface Water																		
	Controlled Drainage																		
	Structure for Water Control	587			1%														
	Subsurface Drain	606			3%														
	Wetland Enhancement	659	ac	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	-	-	-	
	Wetland Restoration	657	ac	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	X	X	-	
	Wetland Wildlife Habitat Management	644	ac	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
RMS8	Water Quality - Excessive Nutrients in Groundwater																		

Future Conditions for Row Crop																			
Row Crop			Units	Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQIP	WHIP	CRP	WRP	GLC	IFIP
	Conservation Crop Rotation	328	ac	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Cover Crop	340			1%														
	Nutrient Management	590	ac	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
RMS9	Water Quality - Excessive Nutrients in Surface Waters																		
	Biofilters																		
	Conservation Crop Rotation	328	ac	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Controlled Drainage																		
	Cover Crop	340			1%														
	Nutrient Management	590	ac	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
	Wetland Restoration	657	ac	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	X	X	-	
RMS10	Water Quality - Excessive Suspended and Bedded Sediments in Surface Waters																		
	Conservation Cover	327	ac	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Conservation Crop Rotation	328	ac	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Contour Buffer Strips	332	ac	\$40.00	2%	2	2	1	1	2	1	4	1	-	-	X	-	-	X
	Contour Farming	330	ac	\$10.00	0%	2	2	1	1	0	0	1	1	-	-	-	-	-	X
	Cover Crop	340			1%														
	Critical Area Planting	342	ac	\$137.50	3%	4	3	4	2	2	1	5	2	X	-	X	-	-	X
	Diversion	362			2%														X
	Field Border	386	ft	\$0.35	1%	2	2	0	2	2	0	5	1	-	-	X	-	-	X
	Filter Strip	393	ac	\$2,000.00	2%	2	2	3	2	2	1	5	1	-	-	X	-	-	X
	Grade Stabilization Structure	410	no	\$10,000.00	1%	1	0	1	2	2	0	0	0	-	-	X	-	-	X
	Grassed Waterway	412	ac	\$2,500.00	2%	3	-1	3	2	1	1	4	1	-	-	X	-	-	
	Nutrient Management	590	ac	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
	Residue Management, Mulch Till	345	ac	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
	Residue Management, No-Till/Strip Till	329	ac	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Riparian Forest Buffer	391	ac	\$317.00	1%	2	3	3	3	4	4	4	2	-	-	X	-	-	
	Streambank and Shoreline Protection	580	ft	\$20.00	10%	4	2	3	2	2	1	4	3	-	-	-	-	-	
	Terrace	600	ft	\$1.50	0%	1	1	1	1	1	0	2	0	-	-	-	-	-	X
	Underground Outlet	620			3%														
	Water and Sediment Control Basin	638	no	\$3,250.00	3%	3	3	1	1	0	1	0	0	-	-	-	-	-	
RMS11	Aquatic Integrity - Excessive Temperature, Low Dissolved Oxygen, Habitat Alteration																		
	Conservation Cover	327	ac	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	In-Channel Structures																		
	Riparian Forest Buffer	391	ac	\$317.00	1%	2	3	3	3	4	4	4	2	-	-	X	-	-	

Future Conditions for Row Crop																			
Row Crop			Units	Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQIP	WHIP	CRP	WRP	GLC	IFIP
	Streambank and Shoreline Protection	580	ft	\$20.00	10%	4	2	3	2	2	1	4	3	-	-	-	-	-	
	Tree/Shrub Establishment	612	ac	\$285.00	0%	3	2	2	2	4	3	5	3	-	-	X	-	X	X
	Wetland Wildlife Habitat Management	644	ac	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
RMS12	Plant Condition - Threatened or Endangered Plant Species																		
	Conservation Cover	327	ac	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Upland Wildlife Habitat Management	645	ac	\$150.00	0%	2	0	0	2	5	2	4	2	X	-	X	X	X	
	Wetland Wildlife Habitat Management	644	ac	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
RMS13	Plant Condition - Productivity, Health, and Vigor																		
	Brush Management	314	ac	\$87.50	1%	2	1	1	0	3	2	4	-2	-	X	-	-	-	
	Conservation Cover	327	ac	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Conservation Crop Rotation	328	ac	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Field Windbreak	392			1%														
	Filter Strip	393	ac	\$2,000.00	2%	2	2	3	2	2	1	5	1	-	-	X	-	-	X
	Nutrient Management	590	ac	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
	Pest Management	595	ac	\$4.00	0%	3	2	1	4	3	4	4	3	X	-	X	-	-	
	Riparian Forest Buffer	391	ac	\$317.00	1%	2	3	3	3	4	4	4	2	-	-	X	-	-	
	Tree/Shrub Establishment	612	ac	\$285.00	0%	3	2	2	2	4	3	5	3	-	-	X	-	X	X
	Windbreak/Shelterbelt Renovation	650			3%														X
	Windbreak/Shelterbelt Establishment	380	ft	\$350.00	1%	3	2	1	2	4	4	5	3	-	-	-	-	-	X
RMS14	Fish and Wildlife - Inadequate Food																		
	Conservation Cover	327	ac	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Conservation Crop Rotation	328	ac	\$50.00	0%	2	4	2	2	2	3	4	2	X	-	X	-	-	
	Cover Crop	340			1%														
	Early Successional Habitat	647	ac	\$5.23	1%	2	0	0	-2	4	1	4	0	-	-	X	X	-	
	Field Windbreak	392			1%														
	Pond	378	no	\$16,000.00	1%	1	2	1	1	3	5	2	0	X	-	-	-	-	
	Grasses and Legumes in Rotation	411			1%														
	Residue Management, Mulch Till	345	ac	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
	Residue Management, No-Till/Strip Till	329	ac	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Upland Wildlife Habitat Management	645	ac	\$150.00	0%	2	0	0	2	5	2	4	2	X	-	X	X	X	
	Wetland Wildlife Habitat Management	644	ac	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
	Wetland Creation	658			1%														
	Wetland Enhancement	659	ac	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	-	-	-	
	Wetland Restoration	657	ac	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	X	X	-	
RMS15	Fish and Wildlife - Inadequate Shelter																		

Future Conditions for Row Crop																			
Row Crop			Units	Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQIP	WHIP	CRP	WRP	GLC	IFIP
	Conservation Cover	327	ac	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Contour Buffer Strips	332	ac	\$40.00	2%	2	2	1	1	2	1	4	1	-	-	X	-	-	X
	Cover Crop	340			1%														
	Early Successional Habitat	647	ac	\$5.23	1%	2	0	0	-2	4	1	4	0	-	-	X	X	-	
	Field Border	386	ft	\$0.35	1%	2	2	0	2	2	0	5	1	-	-	X	-	-	X
	Hedgerow Planting	422			5%														
	Residue Management, Mulch Till	345	ac	\$33.00	0%	3	0	0	0	0	0	0	0	X	-	X	-	-	
	Residue Management, No-Till/Strip Till	329	ac	\$14.00	0%	4	0	0	0	0	0	0	0	X	-	-	-	-	X
	Tree/Shrub Establishment	612	ac	\$285.00	0%	3	2	2	2	4	3	5	3	-	-	X	-	X	X
	Upland Wildlife Habitat Management	645	ac	\$150.00	0%	2	0	0	2	5	2	4	2	X	-	X	X	X	
	Wetland Creation	658			1%														
	Wetland Enhancement	659	ac	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	-	-	-	
	Wetland Restoration	657	ac	\$675.00	1%	3	1	3	2	4	2	4	1	-	-	X	X	-	
	Wetland Wildlife Habitat Management	644	ac	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
	Windbreak/Shelterbelt Establishment	380	ft	\$350.00	1%	3	2	1	2	4	4	5	3	-	-	-	-	-	X
	Windbreak/Shelterbelt Renovation	650			3%														X
RMS16	Fish and Wildlife - Threatened and Endangered Species																		
	Conservation Cover	327	ac	\$95.00	3%	2	2	2	2	2	0	4	2	X	-	X	X	-	X
	Early Successional Habitat	647	ac	\$5.23	1%	2	0	0	-2	4	1	4	0	-	-	X	X	-	
	Hedgerow Planting	422			5%														
	Upland Wildlife Habitat Management	645	ac	\$150.00	0%	2	0	0	2	5	2	4	2	X	-	X	X	X	
	Wetland Wildlife Habitat Management	644	ac	\$7.00	1%	3	0	3	2	4	2	4	1	-	-	X	X	-	
RMS17	Air Quality - Road Dust																		
	Dust Control Products																		
	Use Exclusion																		

Current Conditions for Livestock Operations																				
Livestock Operations			Quantity		Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Quantity (Total 2005-2007)	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQIP	WHIP	CRP	WRP	GLC	IFIP
BM1	Water Quality - Harmful Levels of Pathogens in Surface Water																			
	Nutrient Management	590	ac	22,296	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
BM2	Air Quality - Objectionable Odors																			
	Tree/Shrub Establishment	612	ac	63	\$285.00	0%	3	2	2	2	4	3	5	3	-	-	X	-	X	
	Windbreak/Shelterbelt Establishment	380	ft	2,767	\$350.00	1%	3	2	1	2	4	4	5	3	-	-	-	-	-	

Future Conditions for Livestock Operations																			
Livestock Operations			Units	Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQUIP	WHIP	CRP	WRP	GLC	IFIP
RMS1	Water Quality - Harmful Levels of Pathogens in Surface Water																		
	Composting Facility	317			2%														
	Nutrient Management	590	ac	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
	Waste Storage Facility	313			2%														
	Waste Treatment Lagoon	359			2%														
	Waste Utilization	633			1%														
RMS2	Air Quality - Objectionable Odors																		
	Composting Facility	317			2%														
	Tree/Shrub Establishment	612	ac	\$285.00	0%	3	2	2	2	4	3	5	3	-	-	X	-	X	X
	Windbreak/Shelterbelt Establishment	380	ft	\$350.00	1%	3	2	1	2	4	4	5	3	-	-	-	-	-	X
	Windbreak/Shelterbelt Renovation	650			3%														X
	Waste Storage Facility	313			2%														
	Waste Treatment Lagoon	359			2%														
	Waste Utilization	633			1%														
RMS3	Water Quality - Excessive Nutrients in Surface Waters																		
	Composting Facility	317			2%														
	Nutrient Management	590	ac	\$10.00	0%	2	2	0	2	1	3	3	2	X	-	X	-	-	
	Waste Storage Facility	313			2%														
	Waste Treatment Lagoon	359			2%														
	Waste Utilization	633			1%														
RMS4	Air Quality - Ammonia																		
	Composting Facility	317			2%														
	Waste Storage Facility	313			2%														
	Waste Treatment Lagoon	359			2%														
	Waste Utilization	633			1%														

Future Conditions for Rural Residential Development																			
Rural Residential Development			Units	Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQUIP	WHIP	CRP	WRP	GLC	IFIP
RMS1	Soil Erosion Control																		
	Compost Blankets																		
	Grading Strategies																		
	Mulching																		
	Rolled Erosion Control Products																		
	Vegetative Establishment																		
RMS2	Sediment Control																		
	Compost Filter Berms																		
	Compost Socks																		
	Filter Strip	393	ac	\$2,000.00	2%	2	2	3	2	2	1	5	1	-	-	X	-	-	X
	Georidge																		
	Inlet Protection Devices																		
	Rock Check Dams																		
	Sediment Control Basins																		
	Silt Fences																		
RMS3	Septic Sytems																		
	Constructed Wetland																		
	Gravelless Chamber																		
	Media Filter																		
	Mound System																		
	Pressure Dosing																		
	Sand Filter																		
	Septic Tank																		
	Soil Drainfield																		
	Waterless Toilet																		
RMS4	Water Quantity - Excessive Stormwater Discharge																		
	Bioretention Cells																		
	Bioswales																		
	Infiltration Trenches																		
	Native Landscaping																		
	Permeable Paving Alternatives																		
	Rain Gardens																		
	Soil Quality Restoration																		
RMS5	Water Quality - Excessive Nutrients in Surface Waters																		
	Bioretention Cells																		

Future Conditions for Rural Residential Development																			
Rural Residential Development			Units	Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQIP	WHIP	CRP	WRP	GLC	IFIP
	Bioswales																		
	Constructed Wetland																		
	Infiltration Trenches																		
	Low Maintenance Lawn																		
	Native Landscaping																		
	Residential Onsite Wastwater Treatment																		
RMS6	Water Quality - Harmful Levels of Pathogens in Surface Water																		
	Bioretention Cells																		
	Bioswales																		
	Constructed Wetland																		
	Infiltration Trenches																		
	Native Landscaping																		
	Residential Onsite Wastwater Treatment																		
RMS7	Fish and Wildlife - Plant Community Fragmentation																		
	Backyard Pond																		
	Backyard Wetland																		
	Low Maintenance Lawn																		
	Native Landscaping																		
	Terracing																		
	Tree/Shrub Establishment																		
	Wildlife Habitat																		
RMS8	Fish and Wildlife - Inadequate Shelter																		
	Backyard Pond																		
	Backyard Wetland																		
	Low Maintenance Lawn																		
	Native Landscaping																		
	Terracing																		
	Tree/Shrub Establishment																		
	Wildlife Habitat																		

Future Conditions for Urban																			
Urban			Units	Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQIP	WHIP	CRP	WRP	GLC	IFIP
RMS1	Soil Erosion Control																		
	Compost Blankets		sf	\$0.55															
	Grading Strategies		cy	\$5-\$12															
	Mulching																		
	Rolled Erosion Control Products																		
	Vegetative Establishment		sf	\$0.25															
RMS2	Sediment Control																		
	Compost Filter Berms																		
	Compost Socks		lf	\$4.00															
	Filter Strip	393	ac	\$2,000.00	0.02	2	2	3	2	2	1	5	1	-	-	X	-	-	X
	Georidge																		
	Inlet Protection Devices																		
	Rock Check Dams		cf	\$45.00															
	Sediment Control Basins		ac	\$1,000.00															
	Silt Fences		lf	\$2.00															
RMS3	Septic Sytems																		
	Community Wastewater Treatment																		
	Constructed Wetland		sf	\$20.00															
	Gravelless Chamber																		
	Media Filter																		
	Mound System																		
	Pressure Dosing																		
	Sand Filter																		
	Septic Tank																		
	Soil Drainfield																		
	Waterless Toilet																		
RMS4	Water Quantity - Excessive Stormwater Discharge																		
	Bioretention Cells		sf	\$20.00															
	Bioswales		sf	\$20.00															
	Infiltration Trenches		sf	\$20.00															
	Native Landscaping		ac	\$1500-\$2000															
	Permeable Paving Alternatives		sf	\$12-\$18															
	Rain Gardens		sf	\$10-\$20															
	Soil Quality Restoration		sf	\$2.55															
RMS5	Water Quality - Excessive Nutrients in Surface Waters																		

Future Conditions for Urban																			
Urban			Units	Costs		Effects								Implementation					
Mgmt System	Practice Name	Code	Units	Unit Cost	Op. & Maint. Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality	Fish and Wildlife	Domestic Animals	Plant Condition	Air Quality	EQUIP	WHIP	CRP	WRP	GLC	IFIP
	Bioretention Cells		sf	\$20.00															
	Bioswales		sf	\$20.00															
	Constructed Wetland		sf	\$20.00															
	Infiltration Trenches		sf	\$20.00															
	Low Maintenance Lawn		sf	\$0.10															
	Native Landscaping		ac	\$1500-\$2000															
	Residential Onsite Wastewater Treatment																		
RMS6	Water Quality - Harmful Levels of Pathogens in Surface Water																		
	Bioretention Cells		sf	\$20.00															
	Bioswales		sf	\$20.00															
	Constructed Wetland		sf	\$20.00															
	Infiltration Trenches		sf	\$20.00															
	Native Landscaping		ac	\$1500-\$2000															
	Residential Onsite Wastewater Treatment																		
RMS7	Fish and Wildlife - Plant Community Fragmentation																		
	Backyard Pond																		
	Backyard Wetland		sf	\$20.00															
	Low Maintenance Lawn		sf	\$0.10															
	Native Landscaping		ac	\$1500-\$2000															
	Terracing		lf	\$4.00															
	Tree/Shrub Establishment																		
	Wildlife Habitat																		
RMS8	Fish and Wildlife - Inadequate Shelter																		
	Backyard Pond																		
	Backyard Wetland																		
	Low Maintenance Lawn		sf	\$0.10															
	Native Landscaping		ac	\$1500-\$2000															
	Terracing		lf	\$4.00															
	Tree/Shrub Establishment																		
	Wildlife Habitat																		

Boone River Watershed Assessment Matrix Summary

Boone		BM																		
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Current conditions	Practice Name	Acres	Soil Erosion - Sheet and Rill	Soil Erosion - Ephemeral Gully	Soil Erosion - Classic Gully	Soil Erosion - Streambank	Soil Condition - Organic Matter Depletion	Water Quantity - Excessive Runoff, Flooding, or Ponding	Water Quantity - Excessive Subsurface Water	Water Quality - Excessive Nutrients in Groundwater	Water Quality - Excessive Nutrients in Surface Waters	Water Quality - Excessive Suspended and Bedded Sediments in Surface Waters	Aquatic Integrity - Excessive Temperature, Low Dissolved Oxygen, Habitat Alteration	Plant Condition - Threatened or Endangered Plant Species	Plant Condition - Productivity, Health, and Vigor	Fish and Wildlife - Inadequate Food	Fish and Wildlife - Inadequate Shelter	Fish and Wildlife - Threatened and Endangered Species	Water Quality - Harmful Levels of Pathogens in Surface Water	Air Quality - Objectionable Odors
Practice Code	Practice Name																			
314	Brush Management													X						
327	Conservation Cover		X	X						X		X	X	X	X	X	X			
328	Conservation Crop Rotation		X	X		X						X		X	X					
329	Residue Management, No-Till/Strip Till		X	X		X						X				X	X			
345	Residue Management, Mulch Till		X	X		X						X				X	X			
330	Contour Farming		X	X								X								
332	Contour Buffer Strips		X	X				X				X					X			
340	Cover Crop					X						X								
342	Critical Area Planting		X	X	X	X														
378	Pond				X			X								X				
380	Windbreak/Shelterbelt Establishment														X		X			X
386	Field Border		X	X								X					X			
391	Riparian Forest Buffer					X						X	X		X					
393	Filter Strip					X						X			X					
410	Grade Stabilization Structure			X	X	X						X								
412	Grassed Waterway			X	X							X								
580	Streambank and Shoreline Protection					X						X	X							
590	Nutrient Management					X			X	X	X				X				X	
595	Pest Management														X					
600	Terrace		X	X	X		X					X								X
612	Tree/Shrub Establishment												X		X		X			
638	Water and Sediment Control Basin				X		X					X								
644	Wetland Wildlife Habitat Management						X	X					X	X		X	X	X		
645	Upland Wildlife Habitat Management													X		X	X	X		
657	Wetland Restoration						X	X								X	X			
659	Wetland Enhancement						X	X								X	X			

Boone River Watershed Assessment Matrix Summary

Boone		RMS																																											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37							
Future conditions	Practice Name	Soil Erosion - Sheet and Rill	Soil Erosion - Ephemeral Gully	Soil Erosion - Classic Gully	Soil Erosion - Streambank	Soil Condition - Organic Matter Depletion	Water Quantity - Excessive Runoff, Flooding, or Ponding	Water Quantity - Excessive Subsurface Water	Water Quality - Excessive Nutrients in Groundwater	Water Quality - Excessive Nutrients in Surface Waters	Water Quality - Excessive Suspended and Bedded Sediments in Surface Waters	Aquatic Integrity - Excessive Temperature, Low Dissolved Oxygen, Habitat Alteration	Air Quality - Road Dust	Plant Condition - Threatened or Endangered Plant Species	Plant Condition - Productivity, Health, and Vigor	Fish and Wildlife - Inadequate Food	Fish and Wildlife - Inadequate Shelter	Fish and Wildlife - Threatened and Endangered Species	Water Quality - Excessive Nutrients in Surface Waters	Water Quality - Harmful Levels of Pathogens in Surface Water	Air Quality - Objectionable Odors	Air Quality - Ammonia	Soil Erosion Control	Sediment Control	Septic Systems	Water Quantity - Excessive Stormwater Discharge	Water Quality - Excessive Nutrients in Surface Waters	Water Quality - Harmful Levels of Pathogens in Surface Water	Fish and Wildlife - Plant Community Fragmentation	Fish and Wildlife - Inadequate Shelter	Soil Erosion Control	Sediment Control	Septic Systems	Water Quantity - Excessive Stormwater Discharge	Water Quality - Excessive Nutrients in Surface Waters	Water Quality - Harmful Levels of Pathogens in Surface Water	Fish and Wildlife - Plant Community Fragmentation	Fish and Wildlife - Inadequate Shelter							
	Practice Code	Practice Name																																											
313	Waste Storage Facility																		X	X	X	X																							
314	Brush Management														X																														
317	Composting Facility																		X	X	X	X																							
327	Conservation Cover	X	X							X	X		X	X	X	X	X																												
328	Conservation Crop Rotation	X	X		X			X	X	X					X	X																													
329	Residue Management, No-Till/Strip Till	X	X		X					X						X	X																												
345	Residue Management, Mulch Till	X	X		X					X						X	X																												
330	Contour Farming	X	X							X																																			
332	Contour Buffer Strips	X	X			X				X							X																												
340	Cover Crop	X	X		X			X	X	X						X	X																												
342	Critical Area Planting	X	X	X	X					X																																			
348	Dam, Diversion						X																																						
359	Waste Treatment Lagoon																		X	X	X	X																							
362	Diversion	X	X	X						X																																			
378	Pond			X		X										X																													
380	Windbreak/Shelterbelt Establishment														X		X				X																								
386	Field Border	X	X							X							X																												
391	Riparian Forest Buffer				X					X	X				X																														
392	Field Windbreak														X	X																													
393	Filter Strip				X					X					X									X																					
410	Grade Stabilization Structure		X	X	X					X																																			
411	Grasses and Legumes in Rotation															X																													
412	Grassed Waterway		X	X						X																																			
422	Hedgerow Planting																X	X																											
580	Streambank and Shoreline Protection				X					X	X																																		
587	Structure for Water Control					X	X																																						
590	Nutrient Management					X		X	X	X					X				X	X																									
595	Pest Management														X																														
600	Terrace	X	X	X		X				X																																			
606	Subsurface Drain					X	X																																						
612	Tree/Shrub Establishment											X			X		X																												
620	Underground Outlet	X	X	X		X				X																																			
633	Waste Utilization																		X	X	X	X																							

