



The Maquoketa River Rapid Watershed Assessment (RWA) provides initial estimates of where conservation investments would best address the resource concerns 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 and improve soil and water resources.

The Maquoketa River 8-Digit Hydrologic Unit Code (HUC) watershed contains 1,196,824 acres (1). Twenty-six percent of the watershed is in Delaware County, 24 percent in Jackson County, 18 percent in Jones County, 16 percent in Dubuque County, 8 percent in Clinton County, 3 percent in Buchanan County, 3 percent in Fayette County, and the remaining 2 percent is split between Clayton, and Linn counties (1). Ninety-five percent of the watershed is privately owned, 1.8 percent includes municipal areas, and the remaining 3.2 percent is split between public areas, railroads, and unincorporated areas

(2). Cropland is the predominate land use in the watershed at 54.3 percent, 25.8 percent is pasture and hayland, 11.9 percent is forestland or natural areas, 7.7 percent is developed, and 0.3 percent is split between water and wetlands (3).

Elevations range from 581 feet to 1,253 feet (4). The average watershed slope is 6.0 percent (5). The primary Land Capability Class in the watershed is class 2. The Land Capability Class (LCC) breakdown for the watershed is: 2.2 percent in class 1; 38 percent in class 2; 32.4 percent in class 3; 9.9 percent in class 4; 0.9 percent in class 5; and the remaining 16.4 percent are split between classes 6, 7, and 8, (6). Rainfall ranges from 33 to 35 inches per year (7). The HUC includes, four US highways (20, 52, 61, 151), and seven state highways (13, 136, 3, 38, 64, 62, 187) (8).

Conservation assistance is provided by nine Soil and Water Conservation Districts (SWCD) and Natural Resources Conservation Service (NRCS) field offices located in Manchester, Maquoketa, Anamosa, Epworth, Dewitt, Independence, Marion, West Union, and Elkader. An office locator is found at <http://offices.sc.egov.usda.gov/locator/app>

The Maquoketa River HUC includes 11 NRCS conservation easements totaling 770.1 acres. The easements include the Emergency Watershed Protection (EWP) program, Wetlands Reserve Program (WRP), Grassland Reserve Program (GRP), and the Emergency Wetlands Reserve Program (EWRP). Forty six percent of the easements are in Delaware County, 28 percent in Jones County, 16 percent in Jackson County, 10 percent in Clinton County. (9).

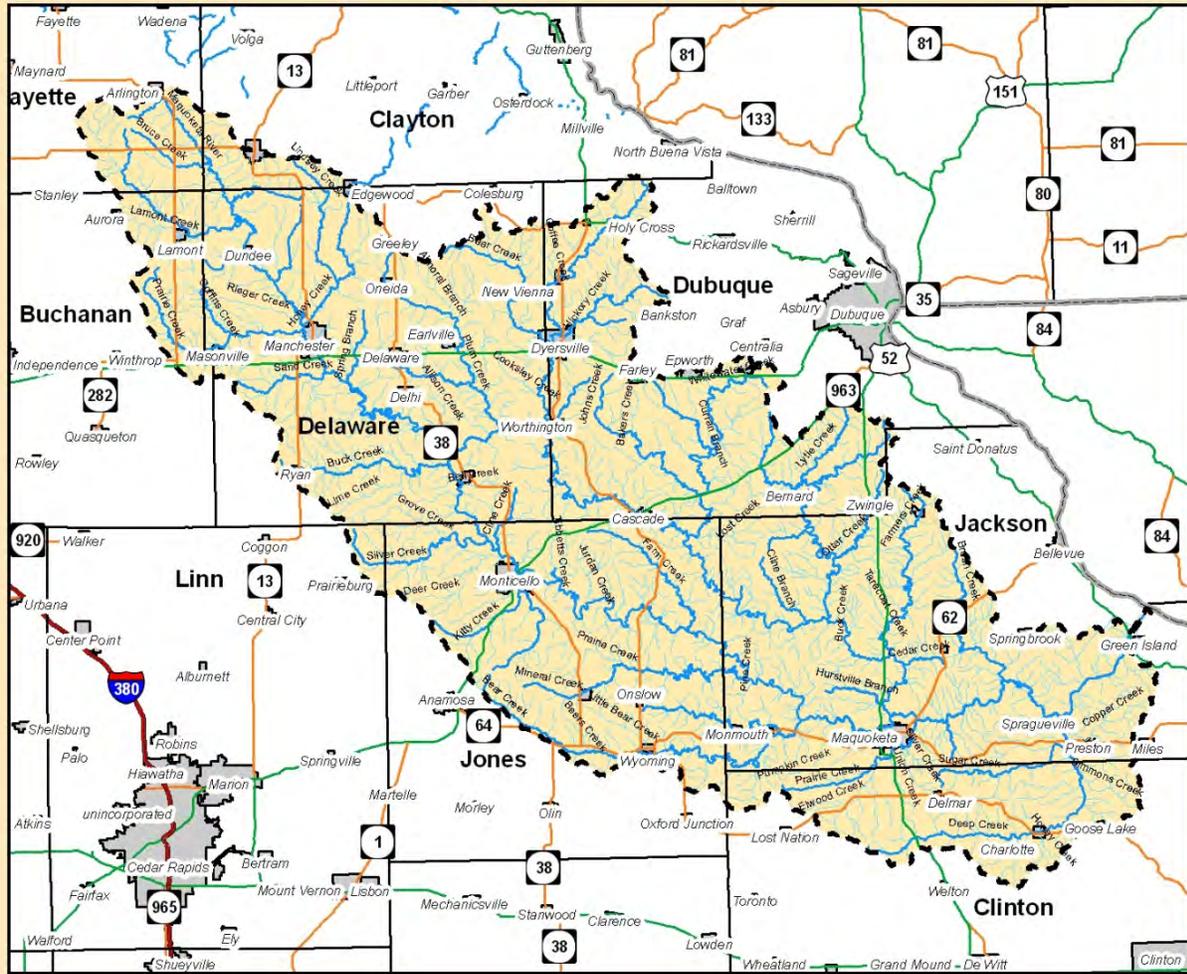
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Physical Description

Iowa Rapid Watershed Assessment

Maquoketa River Watershed - Location Map



Data Source: Project Area based on USDA-NRCS Watershed Boundary Dataset, 2008



Total Area In Watershed: 1,196,824 Acres

COUNTY	Acres	Percent
Linn	6,525	0.5%
Jones	218,793	18.3%
Jackson	281,583	23.5%
Fayette	33,269	2.8%
Dubuque	194,855	16.3%
Delaware	306,868	25.6%
Clinton	99,203	8.3%
Clayton	18,618	1.6%
Buchanan	37,109	3.1%

Legend

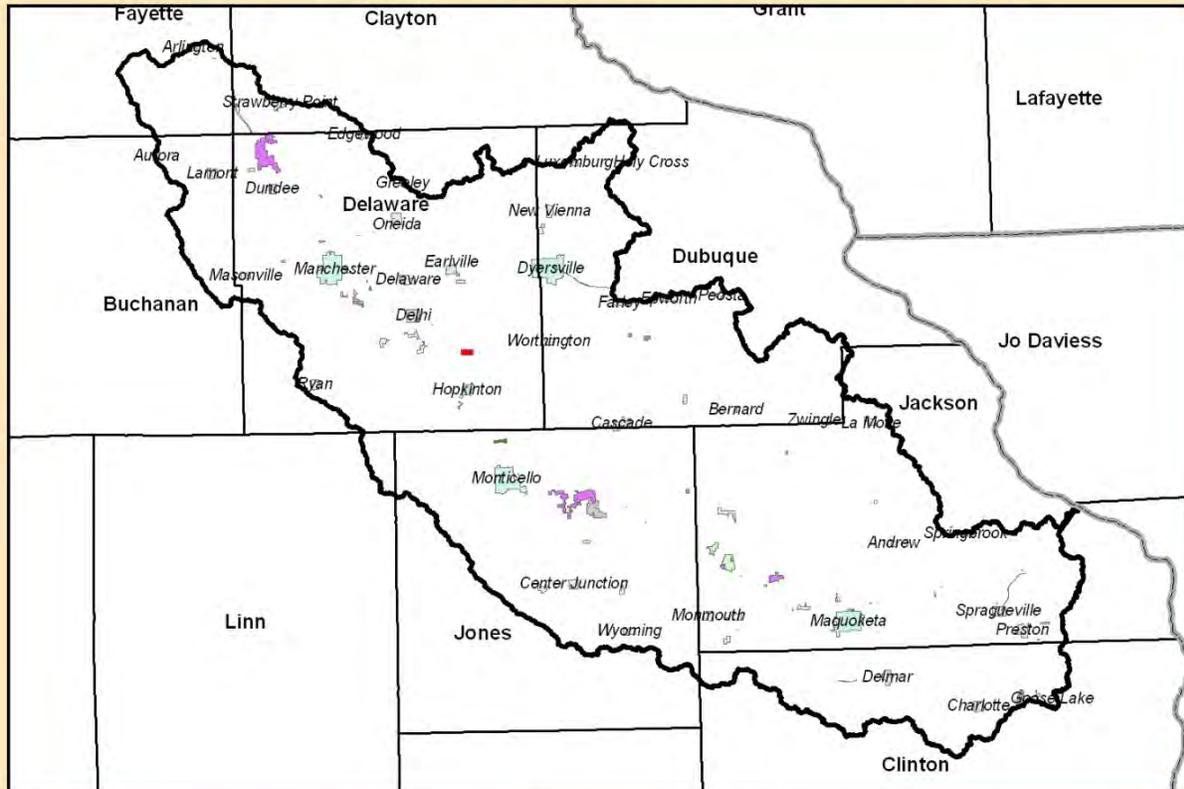
- ESRI Highway Iowa**
- INTERSTATE
 - STATE
 - US
- Rivers/Streams
 — State Boundary
 — County Boundary
 — Cities/Towns In Iowa
 - - - Maquoketa River Basin



Physical Description (continued)

Iowa Rapid Watershed Assessment

Maquoketa River - Ownership/Stewardship



Total Acres in Maquoketa River Watershed - 1,196,824

 Municipal City Boundary Acres - 21,313 (1.8% of basin)

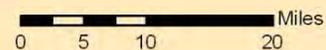
 GAP Stewardship Acres - 9,929 (0.8% of basin)

 Private Agricultural Land Acres- 1,122,854 (94.7%)

Stewardship data identifies ownership and management boundaries for conservation and recreation areas in the study area.

 Data Source: Iowa Gap Analysis Program, 01/01/2002, Iowa DNR & Iowa DOT INCORP Data Set, 1997

Owner	No. Of Areas	Acres
Private Inholdings	1	6
ACE	6	162
County Conservation Board	65	3,902
FWS	1	7
Iowa DNR	36	4,685
Local Land Trust	1	140
Private	7	872
State Land	1	16
State University	1	307
Municipal Areas	52	21,313
Estimated Road Right-of-ways - Rural	0	32,560
Private Agricultural Land (Including Homesteads)	0	1,132,854

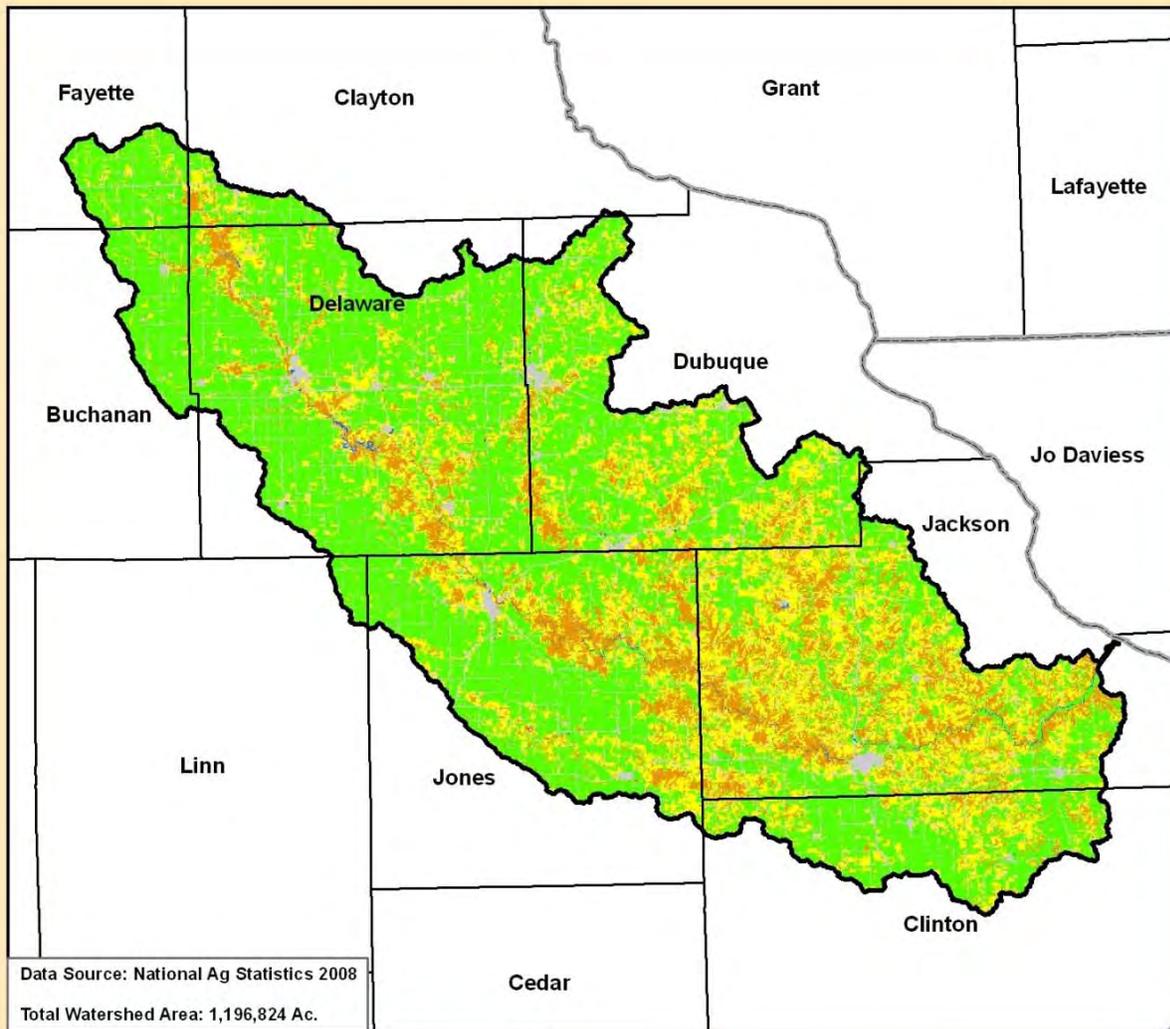


Legend

- County Boundary
- Stewardship - Maquoketa
- Iowa DNR
- State Boundary
- Private Inholding
- Local Land Trust
- Maquoketa River Basin
- ACE
- Private
- Cities - Towns Maquoketa
- County Conservation Board
- State Land
- FWS
- State University

Physical Description (continued)

Iowa Rapid Watershed Assessment
 Maquoketa River - Landuse/Landcover

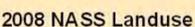
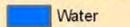
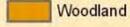


Data Source: National Ag Statistics 2008
 Total Watershed Area: 1,196,824 Ac.

Landuse	Acres	Percent
Developed - Urban	91,777	7.7%
Hayland	15,771	1.3%
Pastureland	293,036	24.5%
Row Crop	649,899	54.3%
Water	3,324	0.3%
Wetland	595	0.0%
Woodland - Natural Areas	142,422	11.9%



Legend

-  State Boundary
-  County Boundary
-  Maquoketa River Basin
-  2008 NASS Landuse - Developed - Urban
-  2008 NASS Landuse - Hayland
-  2008 NASS Landuse - Pastureland
-  2008 NASS Landuse - Row Crop
-  2008 NASS Landuse - Water
-  2008 NASS Landuse - Wetland
-  2008 NASS Landuse - Woodland - Natural Areas


 Natural Resources Conservation Service

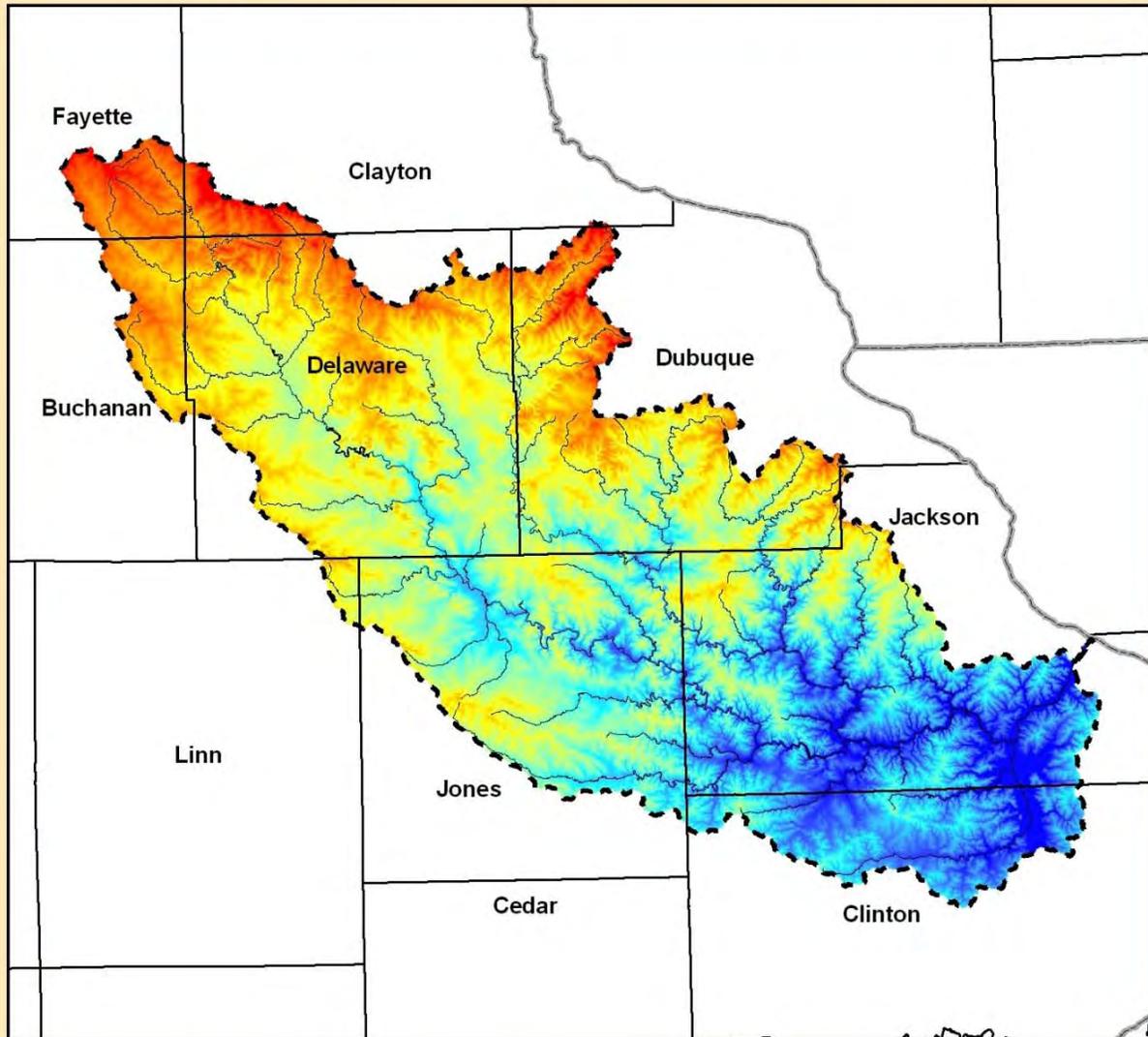
 USDA-NRCS GIS Staff

 Des Moines, IA June 2010

Physical Description (continued)

Iowa Rapid Watershed Assessment

Maquoketa Watershed - Elevation Map



Digital Elevation Model (DEM) Data from USGS 7.5' (1:24,000) Quadrangle Topographic Base Maps.
 DEM Horizontal 30 Meter Grid, Vertical Units - Feet



Total Area In Watershed: 1,196,824 Acres

Legend

-  Maquoketa River Basin
 -  State Boundary
 -  County Boundary
 -  Major Rivers/Streams
- 30 Meter DEM Value**



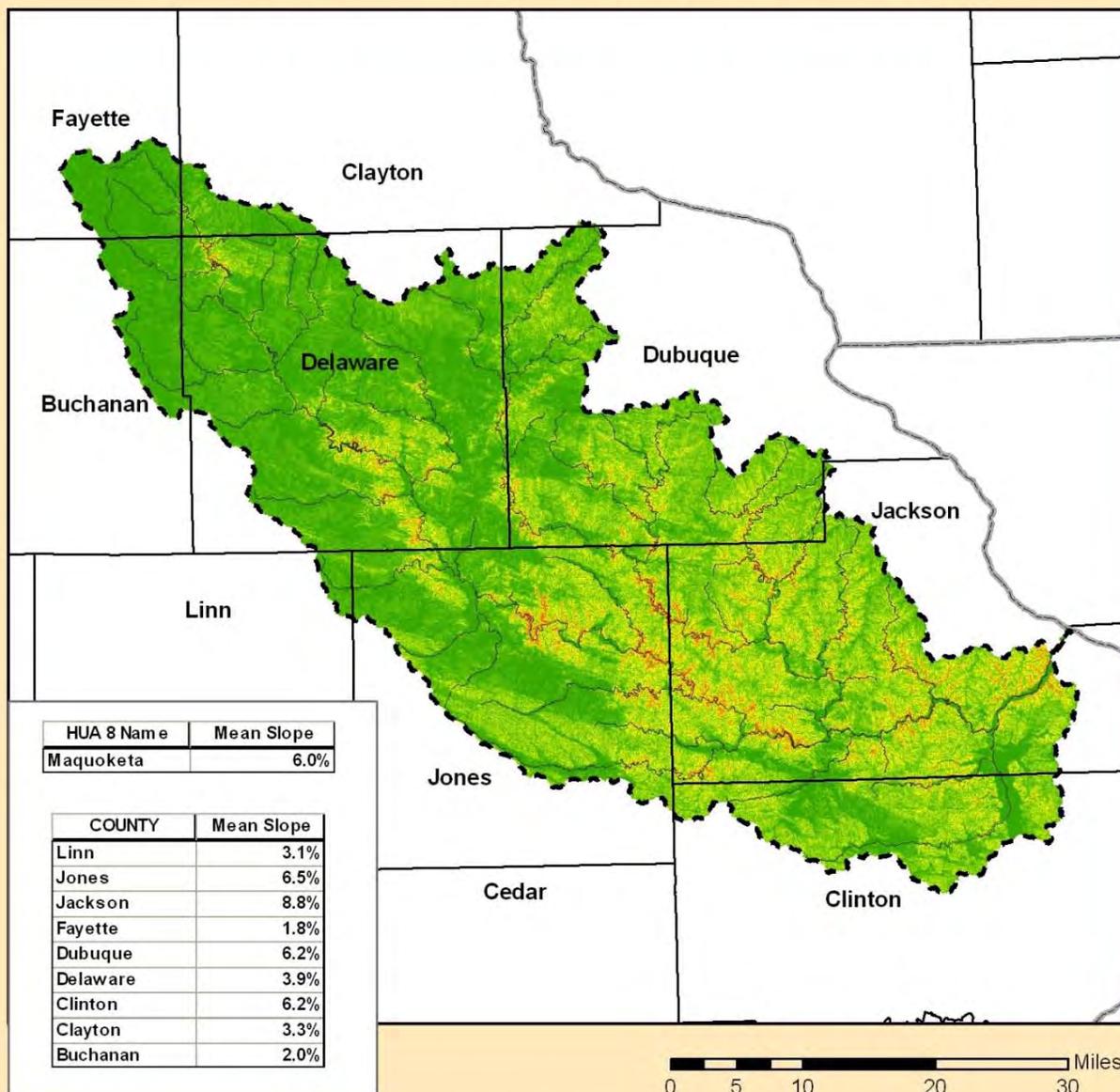
 High : 1252.66

 Low : 580.886



Physical Description (continued)

Iowa Rapid Watershed Assessment
 Maquoketa Watershed - Percent Slope



Data Source: USGS Digital Elevation Model (30M DEM)
 Average Watershed Slope: 6.0%
 Slope Calculations Done Using ArcMap Spatial Analyst Tools

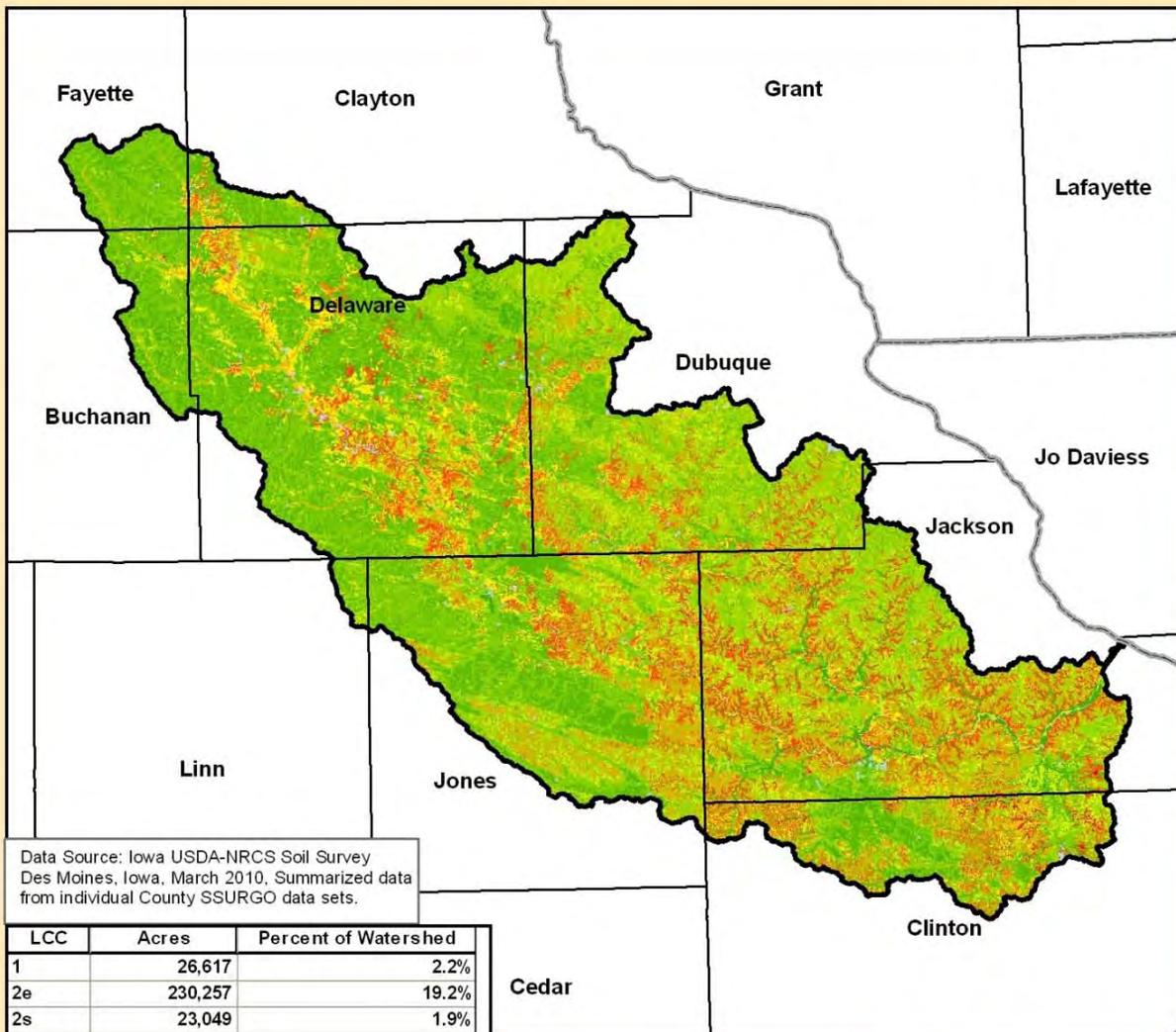
Legend

- Maquoketa River Basin
 - State Boundary
 - County Boundary
 - Major Rivers/Streams
-
- | Percent Slope (30M DEM) | |
|-------------------------|---------|
| | 0 - 3 |
| | 3 - 6 |
| | 6 - 9 |
| | 9 - 13 |
| | 13 - 17 |
| | 17 - 23 |
| | 23 - 30 |
| | 30 - 40 |
| | 40 - 85 |



Physical Description (continued)

Iowa Rapid Watershed Assessment
Maquoketa River - Land Capability Class-subclass



Data Source: Iowa USDA-NRCS Soil Survey
Des Moines, Iowa, March 2010. Summarized data
from individual County SSURGO data sets.

LCC	Acres	Percent of Watershed
1	26,617	2.2%
2e	230,257	19.2%
2s	23,049	1.9%
2w	202,667	16.9%
3e	368,521	30.8%
3s	3,795	0.3%
3w	15,223	1.3%
4e	69,780	5.8%
4s	45,153	3.8%
4w	3,106	0.3%
5w	11,310	0.9%
6e	71,678	6.0%
6s	22,989	1.9%
7e	26,697	2.2%
7s	63,301	5.3%
7w	217	0.0%
8s	2,686	0.2%
Misc	9,778	0.8%

Legend

- State Boundary
- County Boundary
- Maquoketa River Basin

Land Capability Class

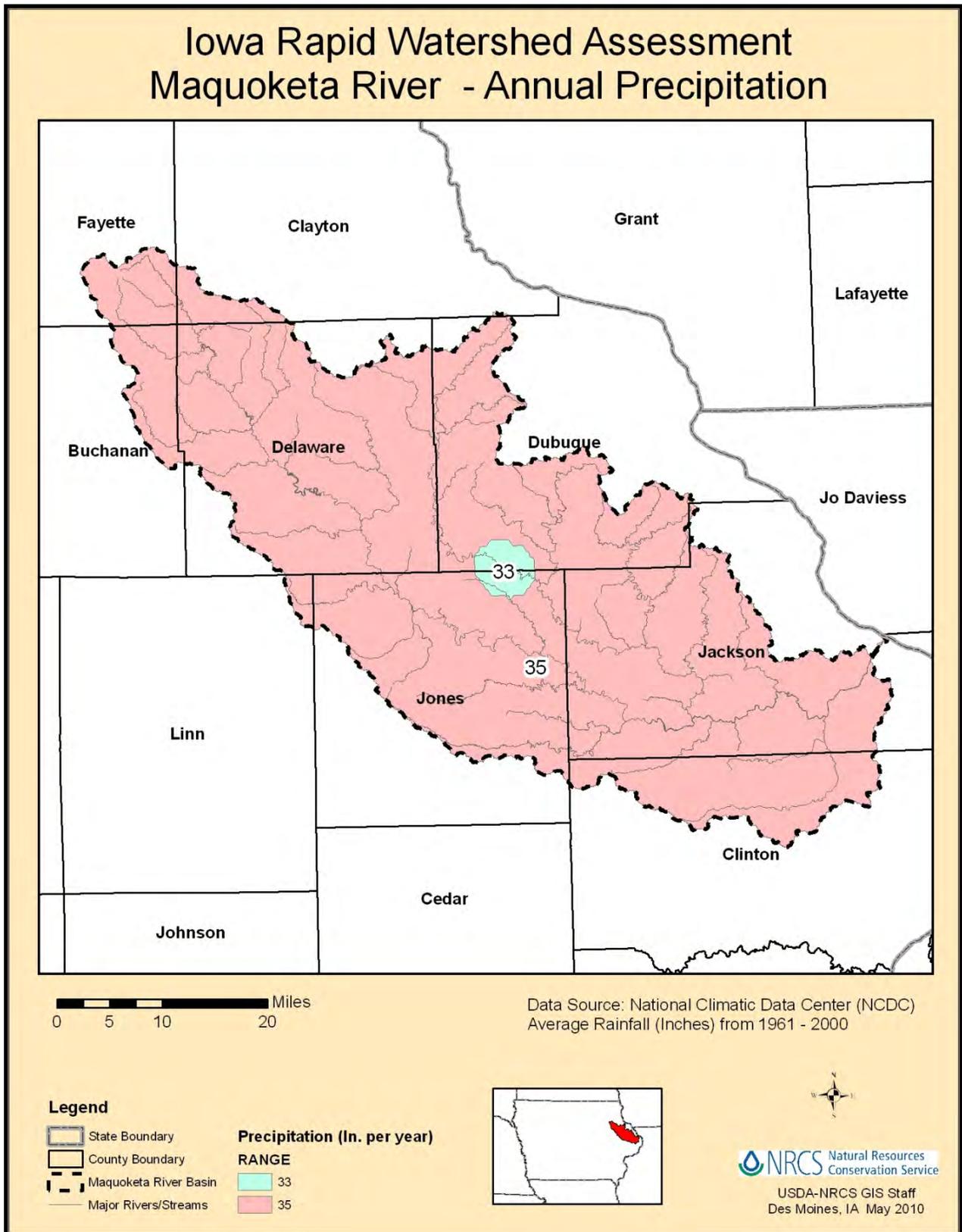
LCC

- Misc
- 1
- 2e
- 2s
- 2w
- 3e
- 3s
- 3w
- 4e
- 4s
- 4w
- 5w
- 6e
- 6s
- 7e
- 7s
- 7w
- 8s

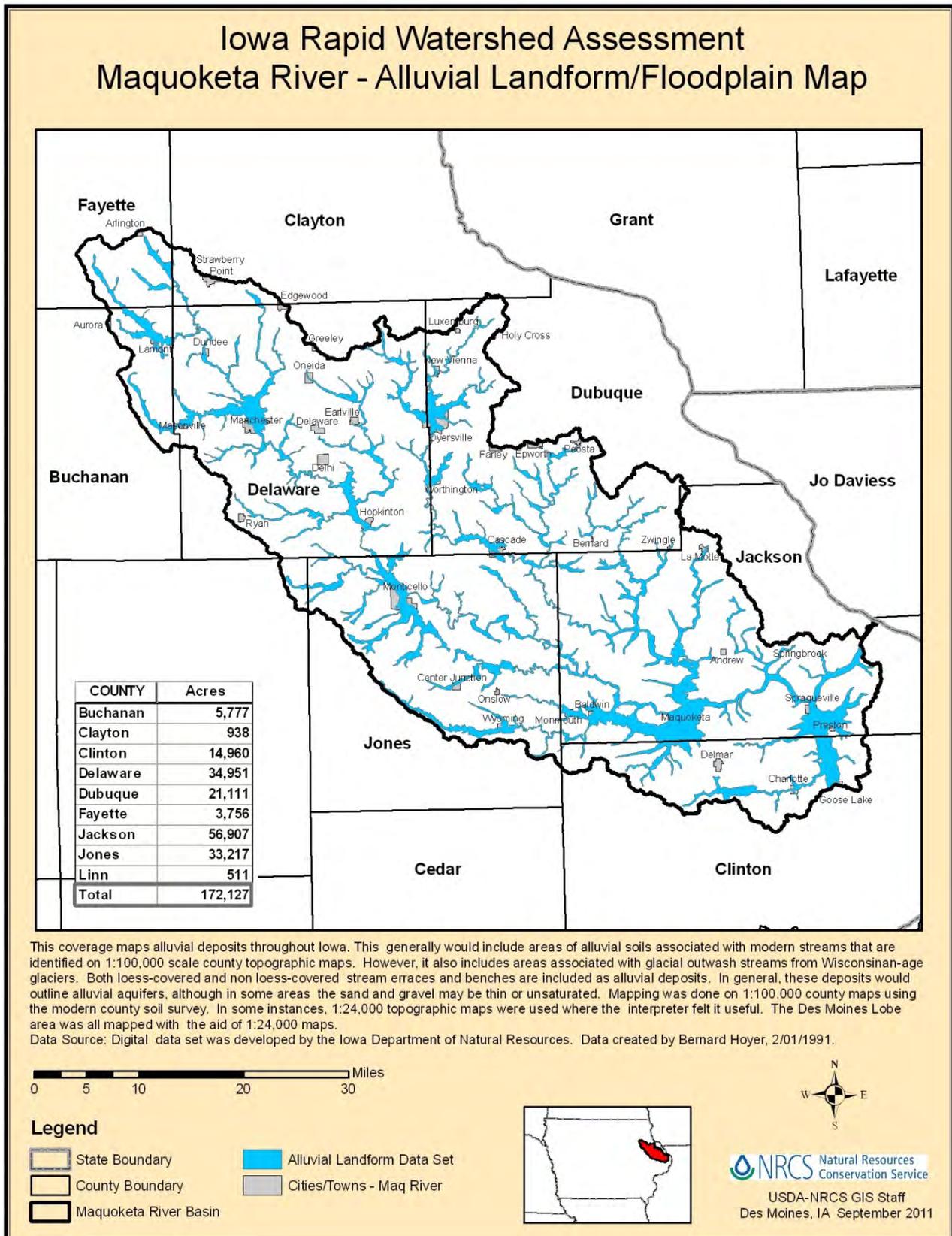
0 5 10 20 Miles

USDA-NRCS Natural Resources Conservation Service
USDA-NRCS GIS Staff
Des Moines, IA June 2010

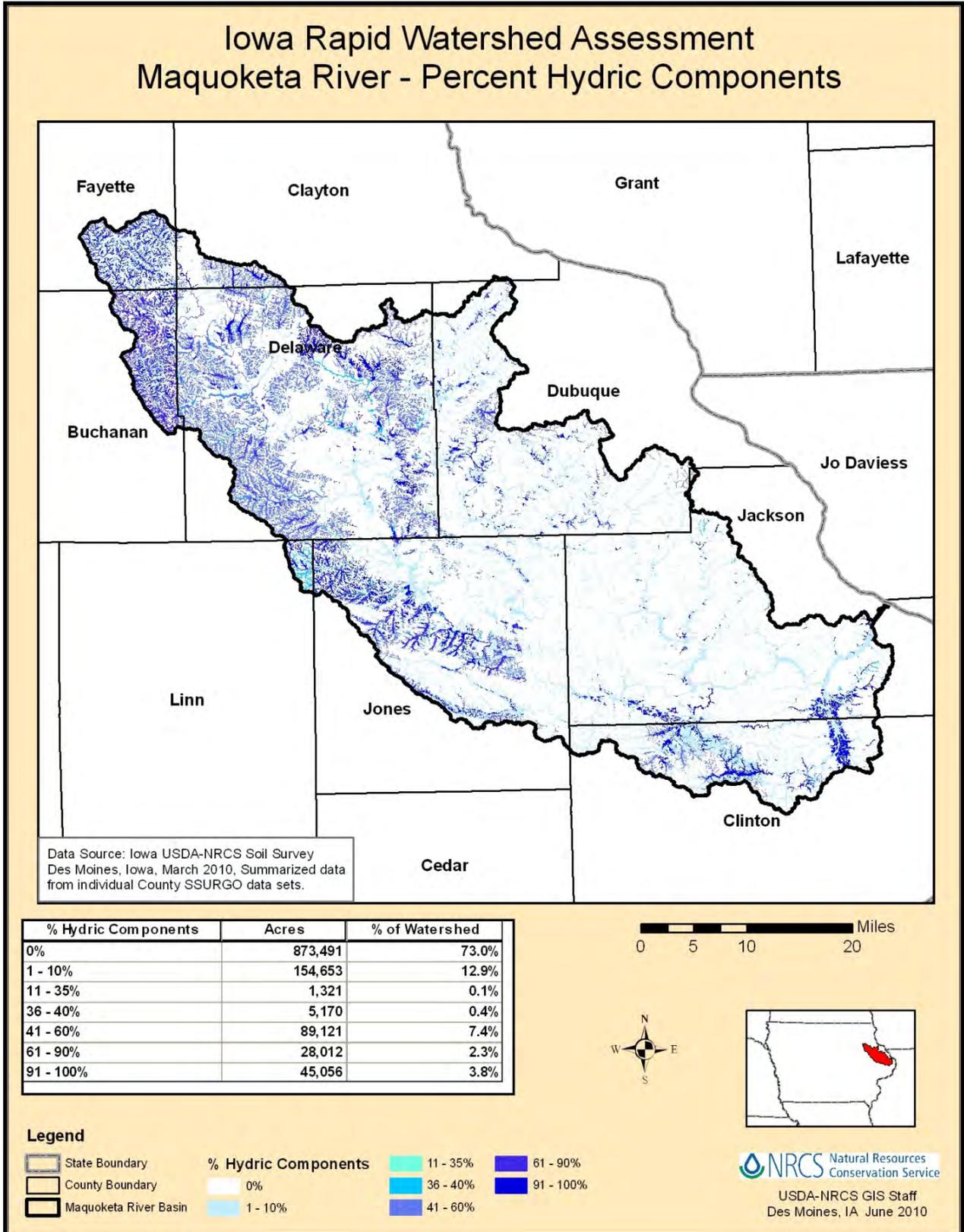
Physical Description (continued)



Physical Description (continued)



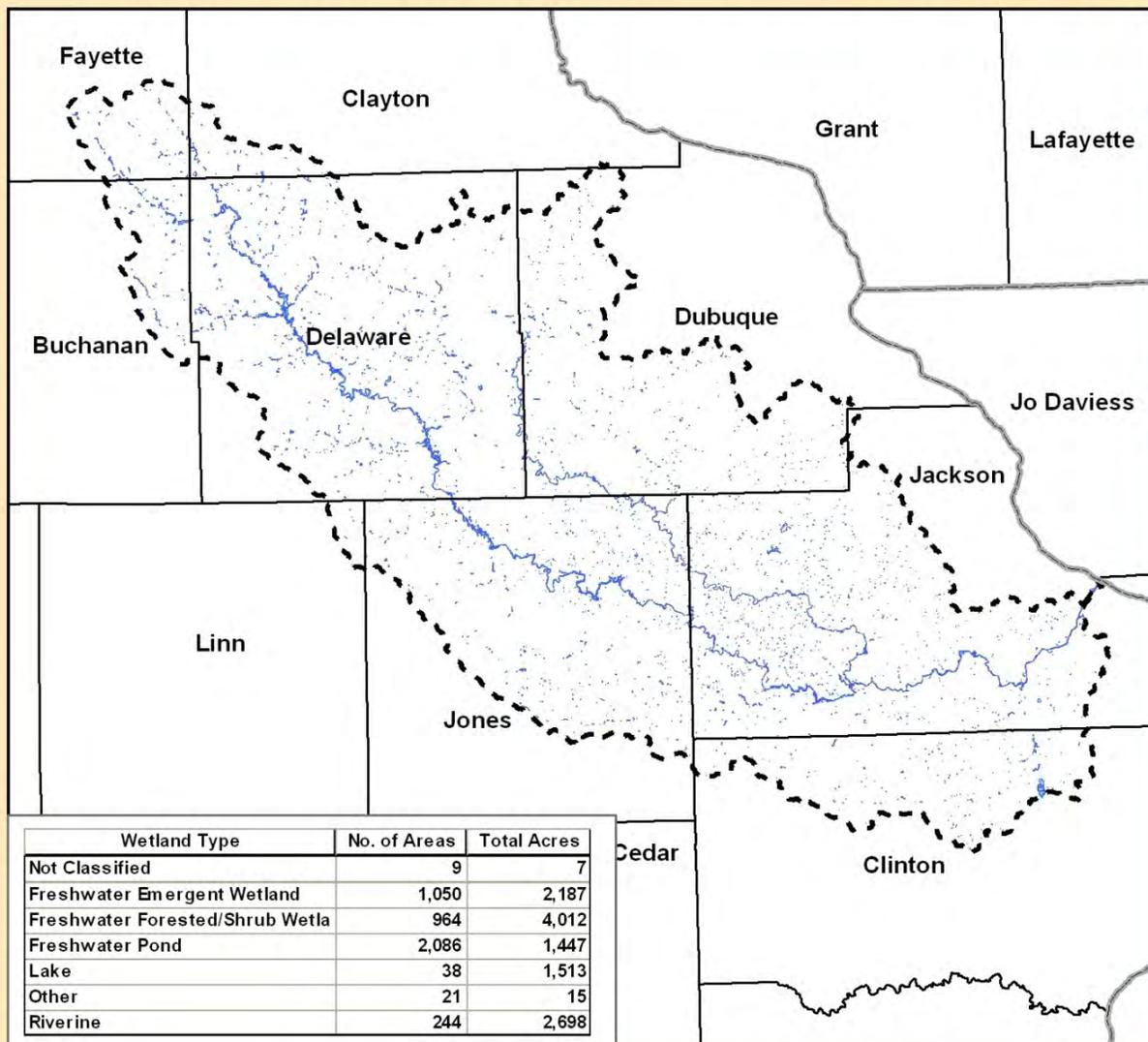
Physical Description (continued)



Physical Description (continued)

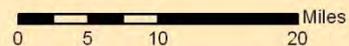
Iowa Rapid Watershed Assessment

Maquoketa River - National Wetland Inventory



Wetland Type	No. of Areas	Total Acres
Not Classified	9	7
Freshwater Emergent Wetland	1,050	2,187
Freshwater Forested/Shrub Wetla	964	4,012
Freshwater Pond	2,086	1,447
Lake	38	1,513
Other	21	15
Riverine	244	2,698

Total NWI Areas: 11,879 Acres



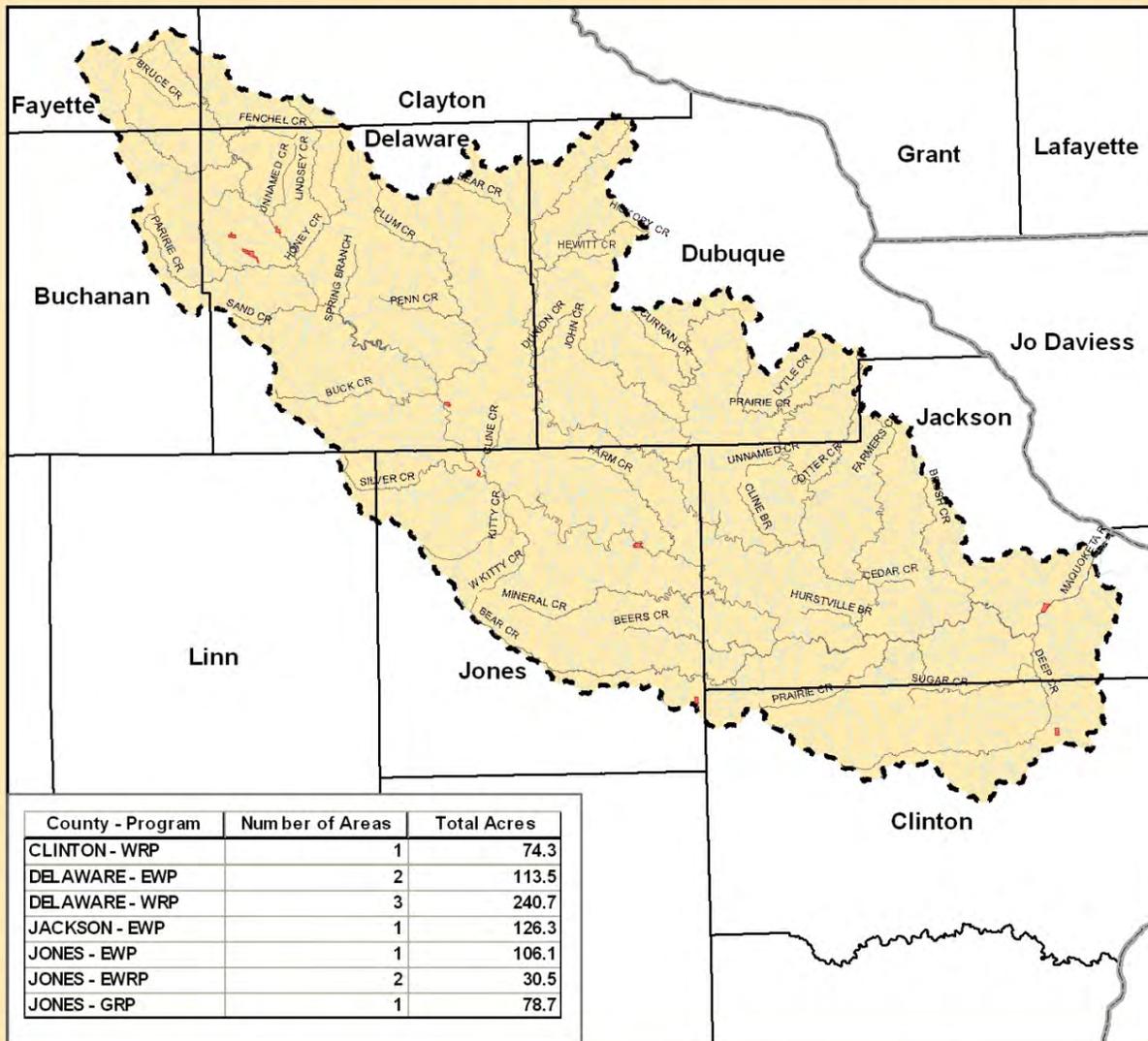
Legend

-  State Boundary
-  County Boundary
-  Wetland Areas - Maquoketa
-  Maquoketa River Basin

U.S. Fish and Wildlife Service, 200605. ia_nwi: Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC. FWS/OBS-79/31. U.S. Fish and Wildlife Service, Branch of Habitat Assessment, Washington, D.C..

Physical Description (continued)

**Iowa Rapid Watershed Assessment
 Maquoketa River - NRCS Conservation Easements**



Data Source: USDA - NRCS Easement Programs Team.
 Maquoketa River Basin Total Easement Acres: 770.1
 Digitized Easement Areas reflect completed/closed easements
 as well as enrolled/pending closed easements.



Legend

- State Boundary
- County Boundary
- Maquoketa River Basin
- Conservation Easements
- Major Rivers/Streams
- Minor Streams

NRCS Conservation Easement Programs

- EWP - Emergency Watershed Protection Program - Floodplain Easements**
- EWRP - Emergency Wetlands Reserve Program**
- FRPP - Farm and Ranch Lands Protection Program**
- GRP - Grassland Reserve Program**
- WRP - Wetlands Reserve Program**

Physical Description (continued)

Common Resource Areas

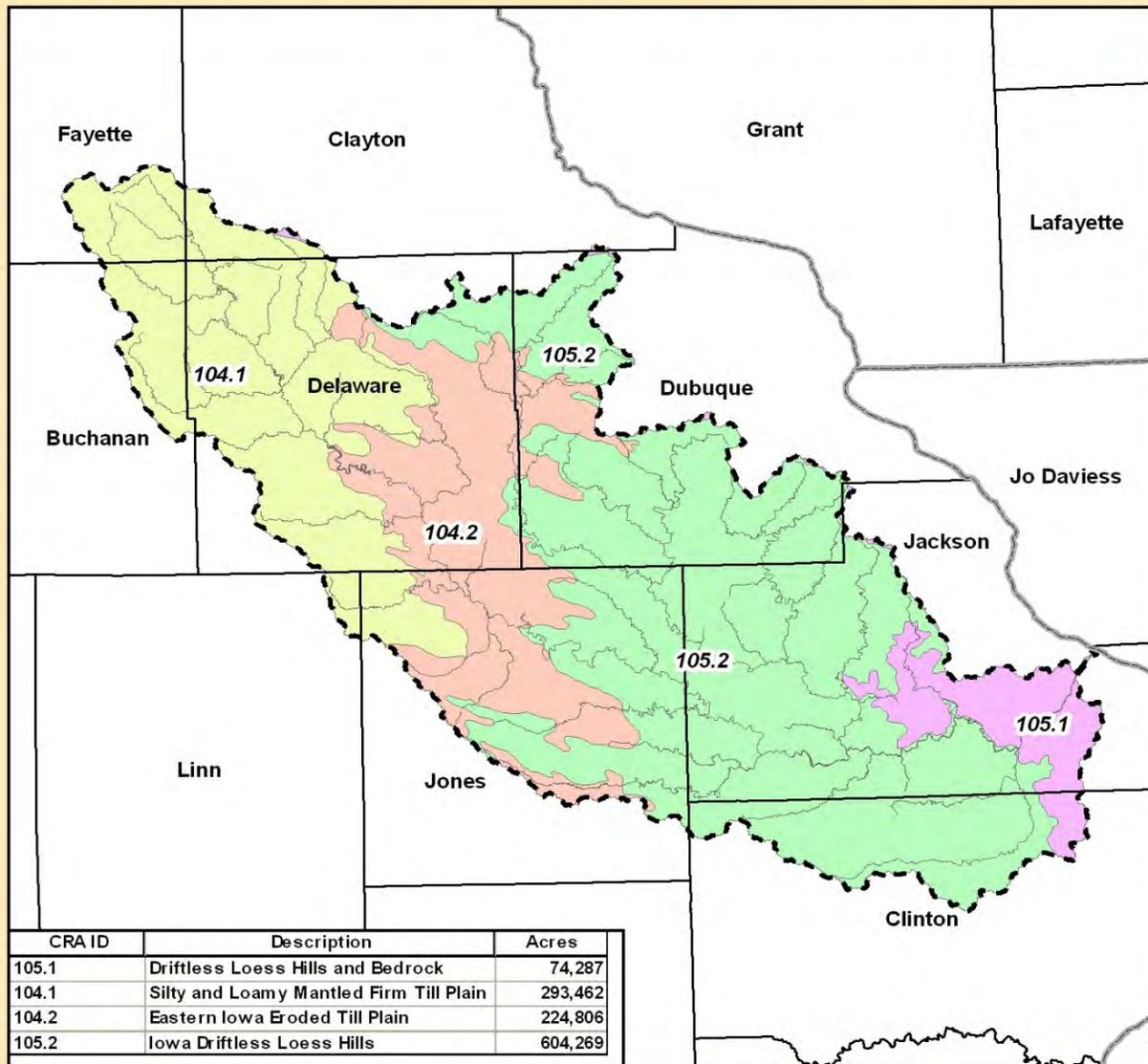
The Middle Cedar River HUC includes portions of four National Common Resource Areas (CRA): 104.1; 104.2; 105.1 and 105.2. Area 105.2 is the predominate CRA at 50.5 percent of the watershed CRA 104.1, 24.5 percent, 104.2, 18.8 percent, and 105.1 at 6.2 percent (11, 12).

The CRAs delineated below for the Maquoketa River HUC are described in the next section (for additional information, see <http://soils.usda.gov/survey/geography/cra.html>). A CRA is defined as a geographical area where resource concerns, problems, or treatment needs are similar. It is considered a subdivision of an existing Major Land Resource Area (MLRA) map delineation or polygon. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographic boundaries of a CRA (11, 12). (General Manual Title 450, Subpart C, §401.21)

Physical Description (continued)

Iowa Rapid Watershed Assessment

Maquoketa River - Common Resource Areas



Data Source: USDA - NRCS Iowa State Soils Office
 Part of the National Coordinated Common Resource Area
 (CRA) Geographic Database
<http://soils.usda.gov/survey/geography/cra.html>

Legend

-  State Boundary
-  County Boundary
-  Maquoketa River Basin
-  Major Rivers/Streams

Common Resource Areas

- Code, Description**
-  104.1, Silty and Loamy Mantled Firm Till Plain
 -  104.2, Eastern Iowa Eroded Till Plain
 -  105.1, Driftless Loess Hills and Bedrock
 -  105.2, Iowa Driftless Loess Hills



Common Resource Area Descriptions (11, 12)

The National Coordinated CRA Geographic Database provides:

- A consistent CRA geographic database;
- CRA geographic data compatible with other GIS data digitized from 1:250,000 scale maps, such as land use/land cover, political boundaries, Digital General Soil Map of the U.S. (updated STATSGO), and ecoregion boundaries;
- A consistent (correlated) geographic index for Conservation Management Guide Sheet information and the eFOTG;
- A geographic linkage with the national MLRA framework.

104.2 Eastern Iowa Eroded Till – Plain

This area is made up of broad upland, nearly level to moderately sloping, moderately well drained to poorly drained soils that formed in silty/loamy material over glacial till. Many low gradient drainage ways are common in this unit. Native vegetation was mostly prairie with timber and brush in valleys and steeper side slopes. Corn and soybeans are common crops with many swine and poultry production facilities. Resource concerns are soil erosion, water quality and nutrient management.

104.1 Silty and Loamy Mantled – Firm Till Plain

Gently sloping to very steep dissected till plain. Soils are predominantly well drained and are formed in thin silty material over loamy till, underlain by sedimentary bedrock. Cropland and grazing land on ridge tops and valley bottoms with a mix of dairy, beef, and cash grain agricultural enterprises. Deciduous forest on side slopes. Primary resource concerns are cropland erosion, surface water quality, grazing land and forestland productivity, and soil erosion during timber harvest.

105.1 Driftless Loess Hills and Bedrock

Highly dissected hills and valleys. Well drained and moderately well drained silty soils over bedrock residuum. Predominantly cropland and grazing land on ridge tops and valley bottoms with a mix of dairy, beef and cash grain agricultural enterprises. Deciduous forest on steep side slopes. Primary resource concerns are cropland soil erosion, surface water quality, grazing land and forestland productivity, stream bank erosion, and erosion during timber harvest.

105.2 – Iowa Driftless Loess Hills

This area consists of gently sloping to very steep soils on moderately broad to narrow ridges with highly dissected side slopes. Most of the soils formed in loess or colluvium from loess. Native vegetation was mostly deciduous forest. Deciduous forest dominates the steeper side slopes. Corn, soybeans, hay supporting cash crop and dairy and swine operations are dominant. Resource concerns are soil water erosion, soil quality, water quality and nutrient management.

Physical Description (continued)

Geology

This watershed is drained by the Maquoketa River, the North Fork of the Maquoketa River, and their numerous tributaries. The largest of these are Coffins Creek, Honey Creek, Plum Creek, Whitewater Creek, Lytle Creek, Bear Creek and Deep Creek. In general, soils and landforms of the watershed are developed in deposits laid down by ice and water over the last two million years during the Pleistocene and Holocene Epochs. However, the glacial materials here in northeast Iowa are thinner than in most of the rest of the state. Bedrock is less than 25 feet below the surface in most of the watershed. Exceptions are northeast Buchanan County and large areas in Delaware County, where the depth to bedrock can be 150 feet or more.

The Paleozoic bedrock in the Maquoketa watershed consists almost entirely of Silurian dolomite. Small areas of eastern Buchanan and western Delaware counties are underlain by Silurian and Devonian limestone. Older Ordovician shale and dolomite were exposed prior to glaciations by erosion of a north-south-trending bedrock valley in eastern Delaware County, which is now buried by unconsolidated deposits. Rock exposures, quarries, and very shallow bedrock are common throughout the watershed and steep dolomite bluffs occur in several places along the Maquoketa River. Sinkholes are scattered throughout the watershed, with the greatest concentration occurring in Jackson County.

The landscape of the Maquoketa RWA area includes three of Iowa's seven physiographic provinces (landform regions). Most of the lower half of the watershed is in the Southern Iowa Drift Plain. Here, windblown silty loess several feet thick blankets dense Pre-Illinoian till deposited at least a half million years ago. The loess also overlies weathered bedrock in many places where the till has been eroded away. The landscape is highly dissected by a well-established drainage network and is characterized by narrow ridges and short, steep side slopes. The directional flow of many of the tributary channels is controlled by the joint pattern of the carbonate bedrock. Channels carved deep into the land surface have since been partially filled by Holocene alluvial sediments of the DeForest Formation. Elevations from the head to the mouth of the watershed range from about 1,200 to 570 feet.

Most of the upper half of the watershed is on the lowan Erosion Surface, including nearly all of Delaware County and parts of Dubuque and Jones counties. This is a landscape that developed on the older Pre-Illinoian till as a result of the intense periglacial conditions and strong winds associated with the Late Wisconsinan glacial advance that formed the Des Moines Lobe to the west. In many places, the erosion left behind a lag deposit called a "stone line," which is covered by thin loess or loamy sediments of variable thickness. The landscape is generally level to gently rolling, with long slopes. Level floodplains and terraces occur along the rivers and their tributaries and are widest near the towns of Manchester, Monticello, and Maquoketa.

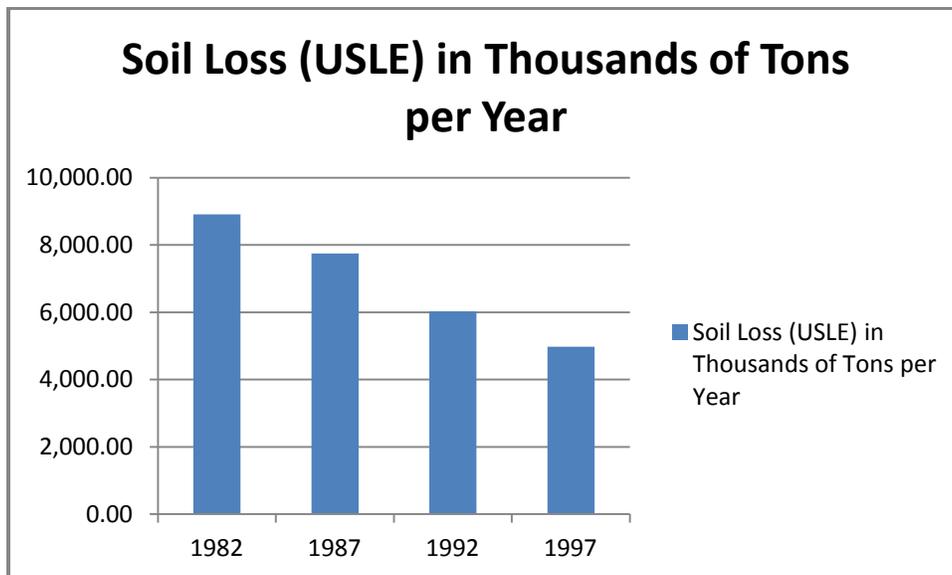
Soils in the watershed parallel the landform regions. On the lowan Erosion Surface, the predominant soils are silt loams developed in thin loess over till (Dinsdale) and loams formed in thin loamy sediments over till (Kenyon-Clyde and Ostrander). On the Southern Iowa Drift Plain, the dominant soil types are silt loams formed in thick loess (Fayette-Downs), and silt loams and loams formed in thin loess over weathered rock (Nordness). These soils vary from well-drained to poorly drained depending on their landscape position and subsoil texture. Alluvial soils in the drainages are generally poorly drained and include silt loams, silty clay loams and loams. In some reaches of the Maquoketa River valley, they overlie sand and gravel deposits. (29)

Physical Description (continued)

Soil Loss

Water erosion (sheet and rill) from cropland accounts for nearly 90 percent of Iowa’s soil erosion. In Iowa, there has been a steady decline in sheet and rill erosion from 1982 to 1997, but on average soil erosion remains above the sustainable levels. In order to maintain sustainable levels of soil stability, soil erosion should not exceed the soil “T” value. The “T” value ranges from 1 ton/acre/year to 5 tons/acre/year.

National Resource Inventory (NRI) estimates for sheet and rill erosion by water on cropland and pastureland (USLE) in the Maquoketa River Watershed decreased by approximately 3,934,400 tons/year (44 percent) between 1982 and 1997. The standard error for this estimate is 339,037 tons for 1997 and 592,609 for 1982. The margin of error at the 95% confidence limit is obtained by multiplying the standard error by 1.96 (18).



Water Quality

Under Section 303(d) of the Clean Water Act, states are required from "time to time" to submit a list of waters for which effluent limits will not be sufficient to meet all state water quality standards. EPA has defined "time to time" to mean April 1 of even numbered years. The failure to meet water quality standards might be due to an individual pollutant, multiple pollutants, "pollution," or an unknown cause of impairment. The 303(d) listing process includes waters impaired by point sources and nonpoint sources of pollutants. States must also establish a priority ranking for the listed waters, taking into account the severity of pollution and uses. The EPA regulations that govern 303(d) listing can be found in the Code of Federal Regulations 40 CFR 130.7.

The Iowa Department of Natural Resources compiles this impaired water list, or 303(d) listing. The 303(d) listing is composed of those lakes, wetlands, streams, rivers, and portions of rivers that do not meet all state water quality standards. These are considered "impaired water bodies" and states are required to calculate total maximum daily loads (TMDLs) for pollutants causing impairments (19).

Bacteria, nutrients, and biological pollutants and their affects are the major pollutants impacting surface waters of the Maquoketa River Watershed. Surface waters, especially lakes and ponds, have a repeated history of algal blooms. A variety of human activities contribute directly to pollutant loads in the water bodies, including intensive row crop agriculture; urban storm runoff; failing septic systems; and Confined Animal Feeding Operations (CAFOs). The change in hydrology due to stream channel straightening, subsurface drainage systems, wetland destruction, and lack of perennial groundcover has resulted in flashy stream flows, thus contributing to stream down cutting and increased stream bank instability.

Conservation practices that can be used to address these water quality issues include erosion control structures, residue management, nutrient management, riparian buffers, drainage control structures, wetland restoration, urban Best Management Practices (BMPs), and improved septic systems (20).

For more information on water quality and the Iowa Department of Natural Resources (IDNR) Water Quality Index, go to the following website:

<http://www.igsb.uiowa.edu/wqm/Data/WQI/WQI.htm>

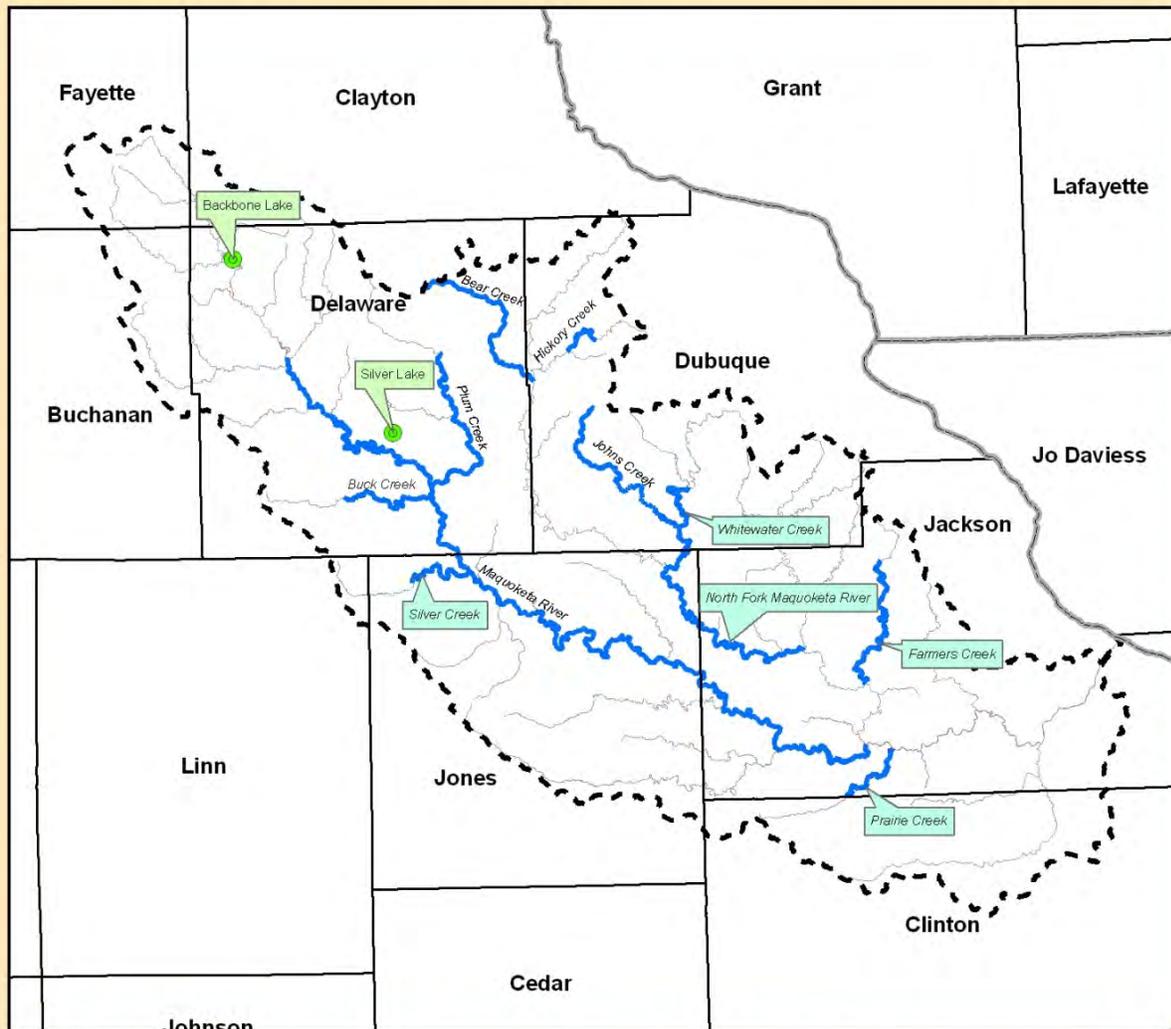
For more information on water quality and IDNR's Regional Watershed Assessment Tool go to the following website: <http://programs.iowadnr.gov/iowawaterweb/rwa.aspx>

This assessment tool should be beneficial to watershed stakeholders who are interested in improving water resources at the watershed scale. The first DNR regional watershed assessment covers nutrients. Assessments of other issue areas will follow as they are developed. Note that the text for each HUC-8 assessment is the same, but the data, charts, and maps provided are specific to the individual watershed. For locating the watershed on the website type the watershed name in the "For" box and click on Go.

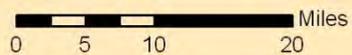
This website is a work in progress so not all watersheds and issue areas are completed yet.

Physical Description (continued)

Iowa Rapid Watershed Assessment
 Maquoketa River - 303 (d) Listed Impaired Waters



Purpose :This digital, geographically referenced data set was developed by the Iowa Department of Natural Resources to carry out agency responsibilities related to management, protection, and development of Iowa's natural resources.



Supplementary Information : Iowa's 2006 Section 303(d) list of impaired waters contains Category 5 waters of Iowa's 2006 Integrated Report. Category 5 waterbodies can be defined as those impaired by a pollutant and in need of a TMDL.

Iowa Department of Natural Resources, 20080813, Lakes in Iowa Listed as Impaired in 2006 Under the Clean Water Act



Legend

- State Boundary
- County Boundary
- Maquoketa River Basin
- Major Rivers/Streams
- Maq_ImpLakes
- Maq_ImpStreams

Water Quality (continued)

Water Quality Concerns Data Graph/Table (19)

Impaired Water Bodies	Algae	pH	Biological	Bacteria	Nutrients	Turbidity	Siltation	Fish Kill	Low DO
Shrickers Slough (MAQ-0005-L_0)	X					X			
Rock Creek (MAQ-0010_1)									X
Elk River (MAQ-0030_1)			X						
Maquoketa River (MAQ-0060_2)			X	X					
Maquoketa River (MAQ-0060_3)			X	X					
Silver Lake (MAQ-00680-L_0)	X	X							X
Backbone Lake (MAQ-0090-L_0)				X					
Central Park Lake (MAQ-01580-L_0)	X	X		X					
Silver Creek (MAQ-0200_0)			X						
Buck Creek (MAQ-0210_0)			X						
Plum Creek (MAQ-0220_1)			X					X	
North Fork Maquoketa River (NMQ-0010_1)				X					
North Fork Maquoketa River (NMQ-0010_2)			X						

Impaired Water Bodies	Algae	pH	Biological	Bacteria	Nutrients	Turbidity	Siltation	Fish Kill	Low DO
North Fork Maquoketa River (NMQ-0020_1)			X						
Farmers Creek (NMQ-0040_0)			X						
Whitewater Creek (NMQ_0100_1)			X						
Johns Creek (NMQ-0110_0)			X						
Johns Creek (NMQ-0111_0)			X					X	
Bear Creek (NMQ-0140_0)			X					X	
Bear Creek (NMQ-0141_0)			X					X	
Hickory Creek (NMQ-0160_0)			X						

The schedule of TMDL development can be found at:

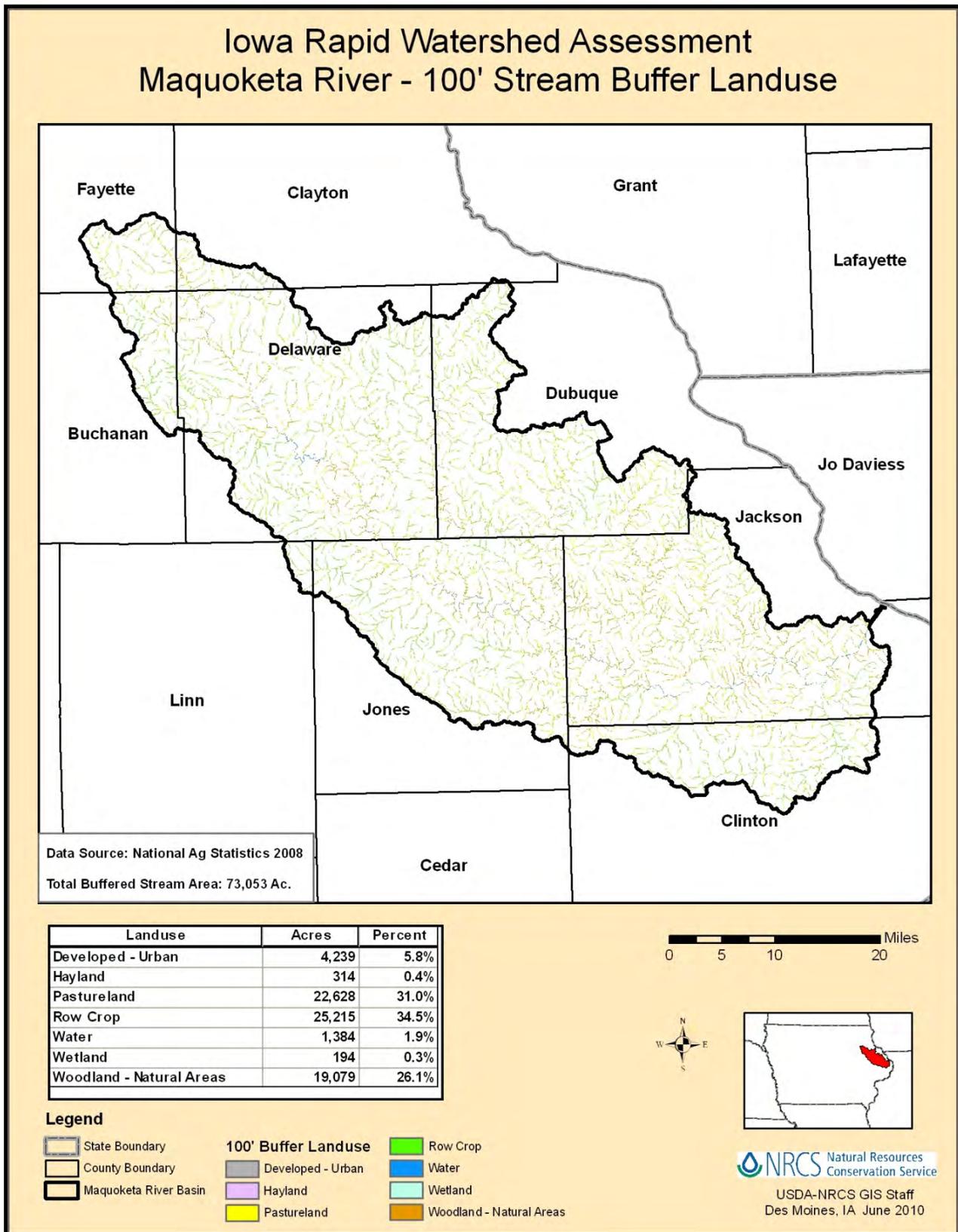
<http://www.iowadnr.gov/Environment/WaterQuality/WatershedImprovement/WatershedResearchData/WaterImprovementPlans/PlanSchedule.aspx>

Water Quality (continued)

Watershed Projects, Plans, Studies, and Assessments	
Flood of June 4-5, 2002, in the Maquoketa River Basin (34)	
Iowa Watershed Improvement Review Board (WIRB) Projects (31)	IDNR TMDLs (30)
<i>Funded 2006</i>	
6027 Leisure Lake Watershed	
6015 Big Bear Creek	
<i>Funded 2007</i>	
7021 Sand Creek Watershed	
7043 North Fork Maquoketa River Headwaters – Coffee Creek Watershed Improvement Association	<i>Scheduled 2012</i> Central Park Lake
<i>Funded 2009</i>	
9006-003 Bear Creek Watershed	
9008-005 Hewitt Creek	
9014-010 Lytle Creek	
Water Quality Improvement Projects* (33)	
Spring Branch Creek Watershed Project (Delaware County) Completed	
Upper Maquoketa River Watershed Project (Fayette County) Completed	
Mineral Creek Water Quality Project (Jones County) Completed	
Jones Co. Urban-Rural Watersheds Project (Jones County) Completed	
South Fork Maquoketa River Water Quality Project (Buchanan County) Active	
Prairie Creek Water Quality Project (Clinton County) Active	
Farmers Creek Watershed Project (Jackson County) Active	
Bear Creek Watershed Project (Delaware County) Active	

* Listing includes past efforts in the watershed, and ongoing studies and assessments. Projects funded through the following programs: Water Quality Protection Fund, Watershed Protection Fund, and IDNR 319 Program

Water Quality (continued)



Threatened and Endangered Species (17)

	SPECIES	Status	
		State	Federal
Animals	Lake Sturgeon (<i>Acipenser fulvescens</i>)	E	
	Slippershell Mussel (<i>Alasmodonta viridis</i>)	E	
	Henslow's Sparrow (<i>Ammodramus henslowii</i>)	T	
	Cylindrical Papershell (<i>Anodontoidea ferussachianus</i>)	T	
	Red-shouldered Hawk (<i>Buteo lineatus</i>)	E	
	Iowa Pleistocene Snail (<i>Discus macclintocki</i>)	E	E
	Blanding's Turtle (<i>Emydoidea blandingii</i>)	T	
	Wild Indigo Dusky Wing (<i>Erynnis baptisiae</i>)	S	
	Columbine Dusky Wing (<i>Erynnis lucilius</i>)	S	
	Least Darter (<i>Etheostoma microperca</i>)	E	
	Bald Eagle (<i>Haliaeetus leucocephalus</i>)	S	
	Ottoe Skipper (<i>Hesperia ottoe</i>)	S	
	American Brook Lamprey (<i>Lampetra appendix</i>)	T	
	Creek Heelsplitter (<i>Lasmigona compressa</i>)	T	
	Blacknose Shiner (<i>Notropis heterolepis</i>)	T	
	Plains Pocket Mouse (<i>Perognathus flavescens</i>)	E	
	Zabulon Skipper (<i>Poanes zabulon</i>)	S	
	King Rail (<i>Rallus elegans</i>)	E	
	Creeper (<i>Strophitus undulates</i>)	T	
	Ornate Box Turtle (<i>Terrapene ornate</i>)	T	
Ellipse (<i>Venustaconcha ellipsiformis</i>)	T		
Variable Pleistocene Vertigo (<i>Vertigo hubrichti variabilis</i>)	T		
Bluff Vertigo (<i>Vertigo meramecensis</i>)	E		

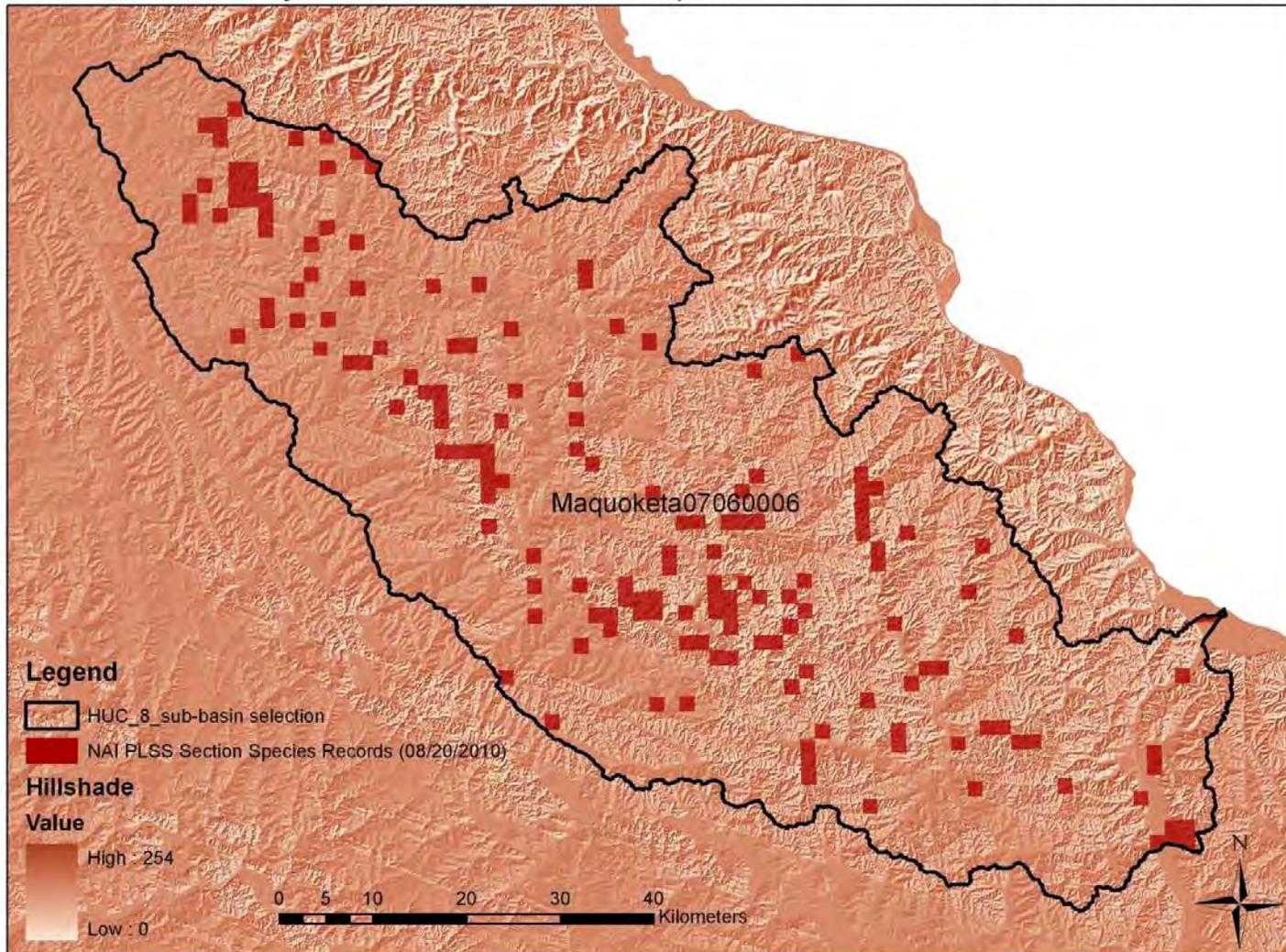
	SPECIES	Status	
		State	Federal
Plants	Northern Monkshood (<i>Aconitum noveboracense</i>)	T	T
	Muskroot (<i>Adoxa moschatellina</i>)	S	
	Roundstem Foxglove (<i>Agalinis gattingeri</i>)	T	
	Nodding Onion (<i>Allium cernuum</i>)	T	
	Shadbush (<i>Amelanchier sanguine</i>)	S	
	Paw Paw (<i>Asimina triloba</i>)	S	
	Ricebutton Aster (<i>Aster dumosus</i>)	E	
	Flat Top White Aster (<i>Aster pubentior</i>)	S	
	Kitten Tails (<i>Besseyia bullii</i>)	T	
	Bog Birch (<i>Betula pumila</i>)	T	
	Prairie Moonwort (<i>Botrychium campestre</i>)	S	
	Sweet Indian Plantain (<i>Cacalia suaveolens</i>)	T	
	Grass Pink (<i>Calopogon tuberosus</i>)	S	
	Low Bindweed (<i>Calystegia spithamea</i>)	S	
	Prince's Pine (<i>Chimaphila umbellata</i>)	T	
	Golden Saxifrage (<i>Chrysosplenium iowense</i>)	T	
	Hill's Thistle (<i>Cirsium hillii</i>)	S	
	Spotted Coralroot (<i>Corallorhiza maculate</i>)	T	
	Spreading Hawthorn (<i>Crataegus disperma</i>)	S	
	Pretty Dodder (<i>Cuscuta indecora</i>)	S	
	Showy Lady's Slipper (<i>Cypripedium reginae</i>)	T	
	Northern Panic-grass (<i>Dichanthelium boreale</i>)	E	
	Slim-leaved Panic Grass (<i>Dichanthelium linearifolium</i>)	T	
	Marginal Shield Fern (<i>Dryopteris marginalis</i>)	T	
	Purple Coneflower (<i>Echinacea purpurea</i>)	S	
	Dwarf Scouring-rush (<i>Equisetum scirpoides</i>)	S	
	Woodland Horsetail (<i>Equisetum sylvaticum</i>)	T	
	Tall Cotton Grass (<i>Eriophorum angustifolium</i>)	S	
Upland Boneset (<i>Eupatorium sessilifolium</i>)	S		
Slender Fimbry (<i>Fimbristylis autumnalis</i>)	S		

	SPECIES	Status	
		State	Federal
Plants	Rough Bedstraw (<i>Galium asprellum</i>)	S	
	Small Fringed Gentian (<i>Gentianopsis procera</i>)	S	
	Spring Avens (<i>Geum vernum</i>)	S	
	Bitterweed (<i>Helenium amarum</i>)	S	
	Soft Rush(<i>Juncus effuses</i>)	S	
	Hairy Pinweed (<i>Lechea villosa</i>)	T	
	Prairie Bush Clover (<i>Lespedeza leptostachya</i>)	T	T
	Crowfoot Clubmoss (<i>Lycopodium digitatum</i>)	S	
	Rock Clubmoss (<i>Lycopodium porophilum</i>)	T	
	Tall Millet-grass (<i>Milium effusum</i>)	S	
	Rock Sandwort (<i>Minuartia michauxii</i>)	S	
	Small Sundrops (<i>Oenothera perennis</i>)	T	
	Northern Adder's-tongue (<i>Ophioglossum pusillum</i>)	S	
	Clustered Broomrape (<i>Orobanche fasciculata</i>)	E	
	Cinnamon Fern (<i>Osmunda cinnamomea</i>)	E	
	Royal Fern (<i>Osmunda regalis</i>)	T	
	Eastern Prairie Fringed Orchid (<i>Platanthera leucophaea</i>)	E	T
	Western Prairie Fringed Orchid (<i>Platanthera praeclara</i>)	T	T
	Meadow Bluegrass (<i>Poa wolfii</i>)	S	
	Shrubby Cinquefoil (<i>Potentilla fruticosa</i>)	T	
	Alderleaf Buckthorn (<i>Rhamnus alnifolia</i>)	S	
	Prickly Rose (<i>Rosa acicularis</i>)	E	
	Toothcup (<i>Rotala ramosior</i>)	S	
	Prairie Pink (<i>Sabatia campestris</i>)	S	
Sage Willow (<i>Salix candida</i>)	S		

	SPECIES	Status	
		State	Federal
Plants	Shinning Willow (<i>Salix lucida</i>)	T	
	Smith Bulrush (<i>Scirpus smithii</i>)	S	
	Ledge Spikemoss (<i>Selaginella rupestris</i>)	S	
	Great Plains Ladies'-tresses (<i>Spiranthes magnicamporum</i>)	S	
	Oval Ladies-tresses (<i>Spiranthes ovalis</i>)	T	
	Rosy Twisted Stalk (<i>Streptopus roseus</i>)	T	
	Long Beechfern (<i>Thelypteris phegopteris</i>)	E	
	Earleaf Foxglove (<i>Tomanthera auriculata</i>)	S	
	Low Sweet Blueberry (<i>Vaccinium angustifolium</i>)	T	
	Valerian (<i>Valeriana edulis</i>)	S	
	Violet (<i>Viola macloskeyi</i>)	S	
	Summer Grape (<i>Vitis aestivalis</i>)	S	
	E = Endangered Species T = Threatened Species S = Candidate/Species of Concern		

Threatened and Endangered Species

Iowa Natural Areas Inventory Threatened, Endangered, and Special Concern Species
Records by PLSS Section for Maquoketa River HUC 8 07060006

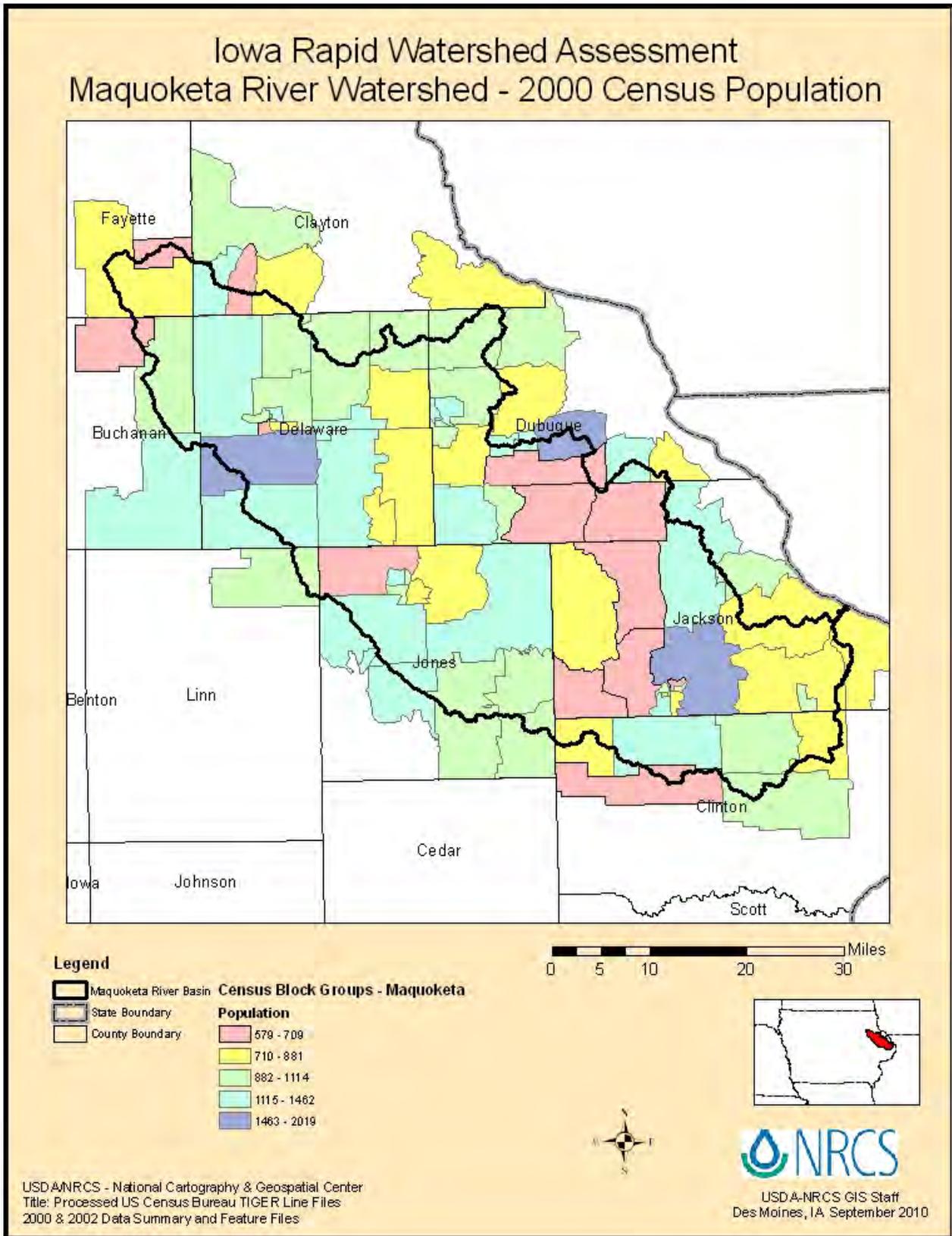


Census and Social Data

There are 6,056 total farm operators in the watershed. Of these, 4,465 are male and 1,589 are female. Seventy seven percent of the farm operators in the watershed are full time farmers (23).

There are 4,019 farms in the Maquoketa River Watershed with farm size ranging from one acre to over 1,000 acres. Size of farms: 10 percent are 1-9 acres; 19 percent are 10-49 acres; 30 percent are 50-179 acres; 27 percent are 180-499 acres; 10 percent are 500-999 acres; and 4 percent are over 1,000 acres. The Census of Agriculture is authorized under Public Law (PL) 105-113 and uses the definition of a farm as any place from which \$1,000 or more of agricultural products are produced and sold, or normally would have been sold, during the census year (23).

Census and Social Data (continued)



Census and Social Data (continued)

NASS Farm Operators Per County Maquoketa River Watershed

COUNTY	Acres	Percent	Operators	Female Operators	Male Operators	Full-Part Time Operators	Full Time Op	Part Time Op
Buchanan	37,109	3.10%	176	48	128	195	138	56
Clayton	18,618	1.60%	93	26	67	96	71	26
Clinton	99,203	8.30%	414	96	318	485	346	139
Delaware	306,868	25.60%	1,875	529	1,345	1,926	1,387	539
Dubuque	194,855	16.30%	1,139	283	855	1,164	819	345
Fayette	33,269	2.80%	143	36	107	160	116	44
Jackson	281,583	23.50%	1,177	318	859	1,342	964	378
Jones	218,793	18.30%	1,010	245	765	1,065	789	276
Linn	6,525	0.50%	29	8	21	32	23	9
Total	1,190,298	100.00%	6,056	1589	4,465	6,465	4,653	1,812

* Full Time Operators - On Farm Operators > 200 days per year

Data Source: 2007 National Ag Statistics
County numbers obtained by correlating the percent county which lies within the watershed to determine an estimated number (shown in table).

USDA-NASS Quickstats Query
Weblink - <http://quickstats.nass.usda.gov/>

Sector: Demographics
Community: Operators
Data Item: Operators (All), Operators - Female
Domain: Total
Locale: County State: Iowa Counties: Select All
Year: 2007

USDA-NASS Quickstats Query
Weblink - <http://quickstats.nass.usda.gov/>

Sector: Demographics
Community: Operators
Data Item: Operators, Principal
Domain: Primary Occupation
Locale: County State: Iowa Counties: Select All
Year: 2007

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Census and Social Data (continued)

Total Farms By Size Per County Maquoketa River Watershed

COUNTY	Acres	% of Watershed	1 - 10 Ac	10 - 50 Ac	50 - 179 Ac	180 - 499 Ac	500 - 999 Ac	> 1000 Ac
BUCHANAN	37,109	3.1%	18	22	29	27	15	8
CLAYTON	18,618	1.6%	5	10	19	18	6	2
CLINTON	99,203	8.3%	33	57	72	73	32	20
DELAWARE	306,868	25.6%	150	231	339	345	119	33
DUBUQUE	194,855	16.3%	50	140	256	205	67	14
FAYETTE	33,269	2.8%	8	19	27	28	12	6
JACKSON	281,583	23.5%	51	178	279	211	66	37
JONES	218,793	18.3%	78	115	167	174	88	40
LIHH	6,525	0.5%	2	5	6	4	2	1
Total	1,196,823	100.0%	395	777	1,194	1,085	407	161

Data Source: 2007 National Ag Statistics
County numbers obtained by correlating the percent county which lies within the watershed to determine an estimated number (shown in table).

USDA-NASS Quickstats Query
Weblink - <http://quickstats.nass.usda.gov/>
Sector: Economics
Community: Farm Operations
Data Item: Farm Operations
Domain: Area Operated
Locale: County State: Iowa Counties: Select All

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Resource Concerns

Resource Concerns by Land Use

Pasture (14)

Typical vegetation consists of introduced cool season species. Predominant grass species are Tall Fescue, Orchard grass, Smooth Brome grass, and possibly Kentucky Bluegrass. Legumes present include White and Red Clover, Birdsfoot Trefoil or Alfalfa. Management regimes are diverse and range from continuous overgrazing to ultra-high density intensively managed grazing systems. Classic gully erosion may be present on abusively grazed areas and are generally follow areas that receive excess surface runoff. Stream bank erosion may be significant where livestock have access to streams and particularly where endophyte infected fescue is the predominant forage causing livestock to spend excessive time cooling in water bodies. In time, undesirable species such as locust and other trees, thistles and other native and non-natives may invade pastures and decrease the productivity of the forage. Soil compaction and disturbance on cattle paths and around water sources can increase soil erosion and create a niche for undesirable plant species. Lack of watering systems is the primary barrier to developing rotational grazing systems.

Cropland (16, 32)

Cropland is intensively used, primarily for corn and soybeans production, with a considerable amount of hayland in the southern half of the watershed. Hayland consist of introduce species, predominantly Smooth Bromegrass, Orchardgrass, Red Clover, and Alfalfa. Hayland is generally part of a rotation with corn, soybeans, and oats. The average watershed slope is 6 percent. Soil erosion (sheet and rill, and ephemeral gully), over-application of nutrients (commercial and manure-based) and pesticides, and the effects of these on water quality are the primary resource concerns. Corn acres increased in recent years, compared to soybean and hayland acres, due to increased grain prices.

Natural Areas/Forestland (35)

Natural areas in the Maquoketa River Watershed consist of a mix of native trees and shrubs. Oaks and hickories dominate dry upland sites and occupy 48%of the forestland. Sugar maple-basswood, is increasing on upland sites due to individual tree selection timber harvesting techniques. Silver maple-cottonwood-American elm-green ash dominates the bottomland/floodplain forest sites. Overall, the health of forests is in relatively good condition, with minimal annual losses to oak wilt, Dutch elm disease and other pathogens. But forests are stressed from severe weather, livestock grazing, invasive species and poor logging practices. Severe weather has been the biggest impact on the health of Iowa's existing forests from ice storms, early wet heavy snow storms, strong winds/tornadoes and flooding over the last decade that break, blow down, uproot or kill trees. Resource concerns include noxious and invasive species, forestland productivity, health and vigor, and conversion of forestland to cropland.

Resource Concern Trends

Focus of Past 7 Years of Progress

Efforts in the past seven years have included: promotion of conservation tillage and no-till; promotion of Conservation Reserve Program (CRP) and contract extensions to protect sensitive lands; application of comprehensive nutrient and pest management plans; and the implementation of water quality improvement projects.

Urban flooding, streambank erosion, and surface water quality are issues especially in areas of the rural-urban interface. These issues have resulted in increased technical assistance in urban areas

Resource Concerns that Require Ongoing Attention

Technical assistance and attention will continue regarding soil erosion by water, especially on cropland. Recent increases in grain prices have caused fewer CRP contracts to be renewed, and existing pasture and forestland to be brought into crop production. The loss of pastureland and forestland on highly erodible lands is a trend that has resulted in significant increases in soil erosion, sedimentation, and run off requiring technical assistance (32). Ongoing efforts are needed to increase utilization of conservation tillage, no-till, and contoured buffer strips. Educational activities are needed to promote extension of expiring CRP contracts.

In the Maquoketa River Watershed, urban natural resource concerns will be an ongoing issue. Urban Best Management Practices (BMPs) will be implemented and increased education of developers, cities, and urban residents will continue (13, 21).

A resource concern that will draw increasing attention and need for technical assistance in the future is the topic of renewable energy and biomass systems, now a highlight of the current Farm Bill.

There is increased interest in agricultural diversification and market support for alternative crops, including specialty and organic crop production, direct and local marketing opportunities, and non-traditional needs for technical assistance. The region has the soils, climate and resources to produce and add value to a wide variety of alternative agriculture crops and products. (24)

Other concerns that will be addressed in the future include the preservation, protection, and enhancement of natural areas, including rare plant and animal species. This will require species inventories and an educational campaign.

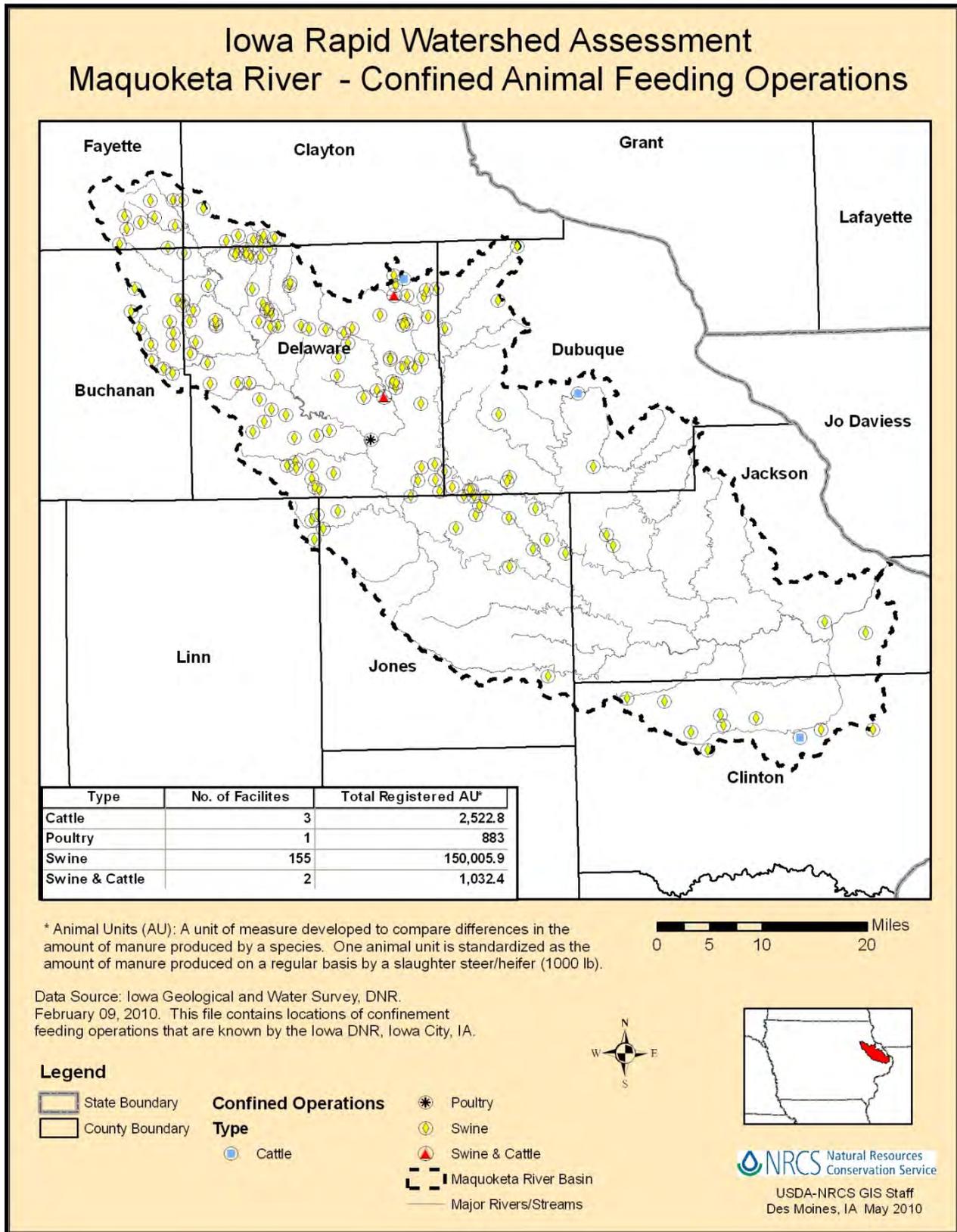
In the state of Iowa, as of October 2009, there were approximately 57 biofuel plants that are in operation or under construction. At this time, there is one bio diesel plant that is operating in the Maquoketa River Watershed, located at Farley, Iowa. It is reported that 2 - 4 gallons of water is required for every gallon of biofuel produced, creating a concern about water quantity (25).

Cont. from page 34...

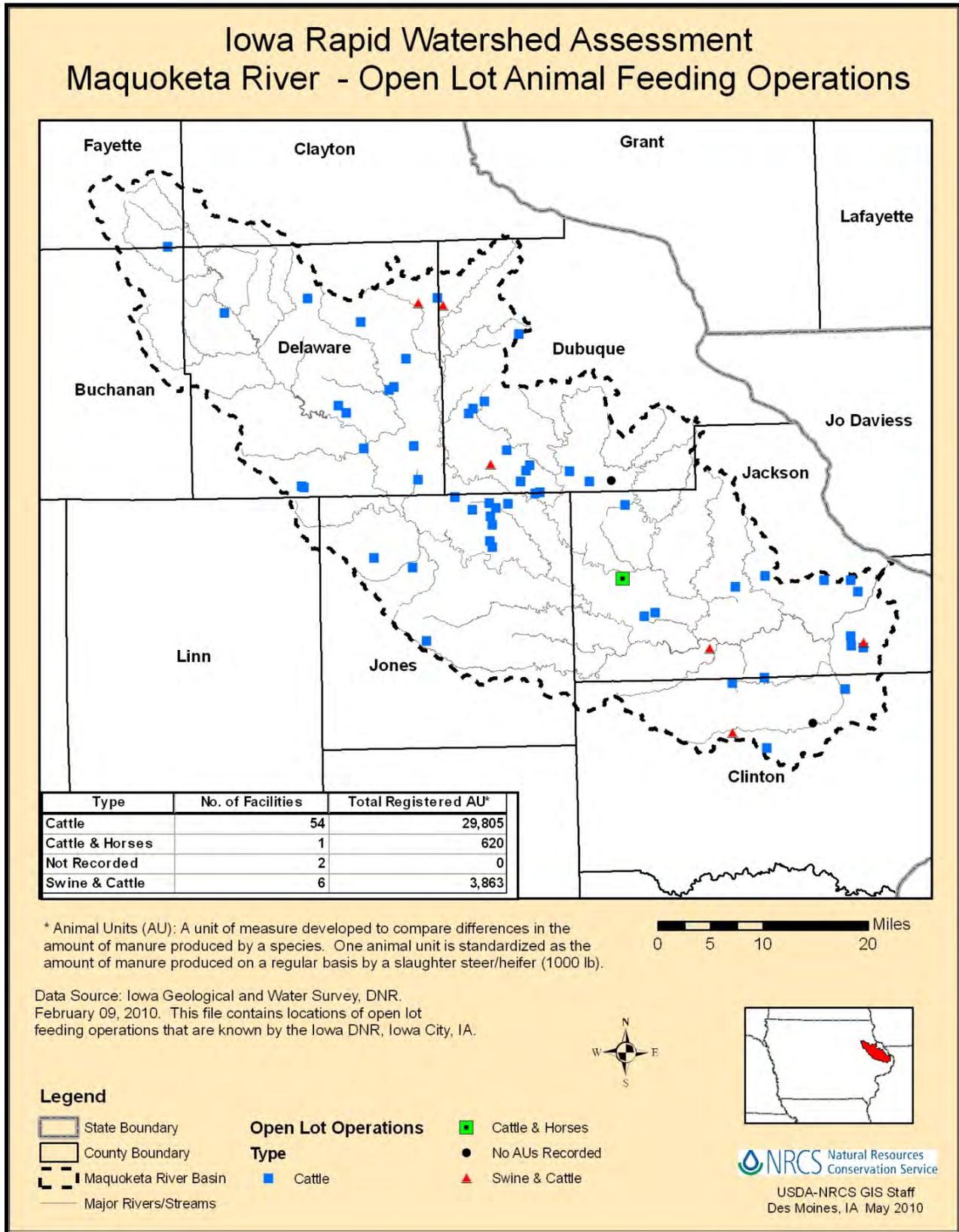
Water quality concerns are increased by manure from livestock that is commonly spread on cropland as fertilizer. Using manure as a fertilizer creates potential water quality challenges from bacteria and nutrients delivered through runoff and subsurface drainage. Stream bank erosion in the region has been related to livestock overgrazing of the stream and river banks (15).

The primary natural resource concerns with animal feeding operations are water and air pollution. Manure contains the nutrients nitrogen and phosphorus, which, when not managed properly on agricultural land, can pollute nearby streams, lakes, and other waters. EPA's regulation of Animal Feeding Operations (AFOs) and Confined Animal Feeding Operations (CAFOs) provide pollution prevention and environmental protection, while maintaining the country's economic and agricultural competitiveness (26). There are 161 Confined Animal Feeding Operations (CAFO) in the watershed, with a total of 154,444 animal units. Ninety-six percent of the CAFOs are swine and the remaining 4 percent are split between swine-cattle operations, poultry, and cattle (27). There are 63 Animal Feeding Operations (AFO) in the watershed, with a total number of 34,288 animal units. Eighty-six percent of the AFOs are cattle, 10 percent swine and cattle, 1 percent cattle and horses, and 3 percent not recorded (28).

Resource Concerns (continued)



Resource Concerns (continued)



Resource Concerns Table

The table below lists the resource concerns and priorities of stakeholders and landowners in the watershed. The concerns were summarized from the Environmental Quality Incentive Program (EQIP) resource concerns developed in each county. (22)

Resource Concerns/Issues by Land Use					
SWAPA *	Specific Resource Concerns/Issues	Cropland	Pasture	Natural Areas	Urban
Soil Erosion	Sheet and Rill	X			
	Ephemeral Gully	X			
	Classic Gully	X	X	X	X
	Streambank	X	X	X	
	Wind	X			
	Shoreline			X	
Water Quality, Surface	Excessive Suspended Sediment & Turbidity	X	X	X	X
	Excessive Nutrients & Organics	X	X		
	Harmful level of Pesticides	X			X
	Harmful level of Pathogens		X		
Water Quality, Ground	Excessive Nutrients & Organics	X	X		
	Harmful level of Pesticides	X			
Water Quantity	Excessive Runoff, Flooding or Ponding	X	X	X	X
	Excessive Seepage	X			
Soil Condition	Animal Waste & Other Organics (N,P,K)	X			
	Organic Matter Depletion	X			
Plant Condition	Productivity, Health, and Vigor		X	X	
	Forage Quality and Palatability		X		
	Noxious and Invasive Species			X	
Domestic Animals	Inadequate Quantity & Quality Feed & Forage		X		
	Inadequate Stock Water		X		
	Inadequate Shelter		X		
	Stress and Mortality		X		
Air Quality	Excessive Green House Gas, (CO2)				X
	Objectionable Odors				X
	Particulate Matter (PM10)				X
	Particulate Matter (PM 2.5)				X
Wildlife	Inadequate cover & shelter		X	X	
	T & E Species			X	
	Inadequate Food, Water and Space			X	
	Plant Community Fragmentation			X	

* SWAPA: - Soil, Water, Air, Plants, and Animals

Special Considerations

Iowa source water faces increasing pressure from development, pollution, land use changes, and growing demands for drinking water. Source water is a lake, stream, river, or aquifer where drinking water is obtained. Source Water Protection (SWP) is the act of preventing contaminants from entering public drinking water sources. SWP includes ground water (wellhead) protection and surface water protection. (10)

Iowa Department of Natural Resources' (IDNR) SWP Program has three different phases to the SWP Program: SWP Assessments (Phase 1), the SWP Plan (Phase 2) and Implementation (Phase 3). In addition, the program has recently included implementation as part of the SWP planning. Communities will be targeted for developing a plan if their water supply systems have finished water with nitrate levels of 5 mg/L or greater and trending upward, and public wells not having a confining layer (termed as "shallow well"). (10)

IDNR's SWP Program has developed a list of Priority Community Water Supplies. The Maquoketa River Watershed includes four Priority SWP communities, including the town of Strawberry Point, which is located in Clayton County. The watershed also includes the Priority SWP communities of Manchester located in Delaware County, Monticello, located in Jones County, and Charlotte located in Clinton County. These communities are identified by the DNR SWP Program as four of the top 40 priority communities listed for high nitrates. (10)

There are also several communities in the watershed whose drinking water systems are susceptible. Susceptibility is based on the geologic characteristics of the aquifer and is independent of well vulnerability. Aquifer susceptibility is determined by examining the geologic logs for the public wells being modeled and/or other nearby wells for the thickness of any impermeable material, referred to as confining beds, above the aquifer. (10)

Human Considerations: Implementation of conservation practices and enhancements has the potential for change in management and cost of production. Installation of practices will have an upfront cost and require maintenance. In the short run, increased management may be required as new techniques are learned. Land may be taken out of production for installation of practices or conversion to other uses, such as wildlife habitat. Long term benefits should result from increased soil health, benefits to water quality, improved domestic livestock, air quality, and wildlife habitat. Other considerations by humans in the watershed may include recreation, rural and urban perceptions, market trends and how they relate to conservation practice costs, profitability, and current high land values.

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