

The Iowa River - Lower 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 Iowa River - Lower 8-Digit Hydrologic Unit Code (HUC) watershed contains 1,078,335 acres (1). 23.1 percent of the watershed is in Johnson County, 21.6 percent in Iowa County, 18.6 percent in Louisa County, 17.3 percent in Washington County, 11.0 percent in Poweshiek County, 5.7 percent in Keokuk County, 1.4 percent in Des Moines County, 1.2 percent in Muscatine County and less than one percent is split between Mahaska and Henry counties (1). Ninety-three percent of the watershed is privately owned agricultural land, 3 percent in municipal areas, 3 percent in rural road R.O.W.s, and the remaining 1.0 percent is split between public areas and unincorporated areas (2).

Fifty-five percent of the watershed is in row crop production, 26.2 percent is pasture or hay land, 9.2 percent is developed urban land use, 8.4 percent is woodland or natural areas, and 1.2 percent is split between water and wetlands (3). Elevations range from 513 feet to 1015 feet (4). The average watershed slope is 4.6 percent (5). The primary Land Capability Class in the watershed is class 2. The Land Capability Class (LCC) breakdown for the watershed is: 8.7 percent in class 1; 38.8 percent in class 2; 31.6 percent in class 3; 10.6 percent in class 4; 1.4 percent in class 5; 5.2 percent in class 6; and the remaining 3.7 percent is split between class 7, class 8, and miscellaneous soils (6). Rainfall ranges from 35 to 37 inches per year (7). The HUC includes two interstate highways (80 and 380), five US highways (6, 61, 63, 218, 151), and ten state highways (1, 21, 22, 27, 70, 78, 85, 92, 146, 149) (8).

Conservation assistance is provided by ten Soil and Water Conservation Districts (SWCD) and Natural Resources Conservation Service (NRCS) field offices located in Burlington, Mt. Pleasant, Williamsburg, Iowa City, Sigourney, Wapello, Oskaloosa, Muscatine, Malcom, and Washington. An office locator is found at <http://offices.sc.egov.usda.gov/locator/app>

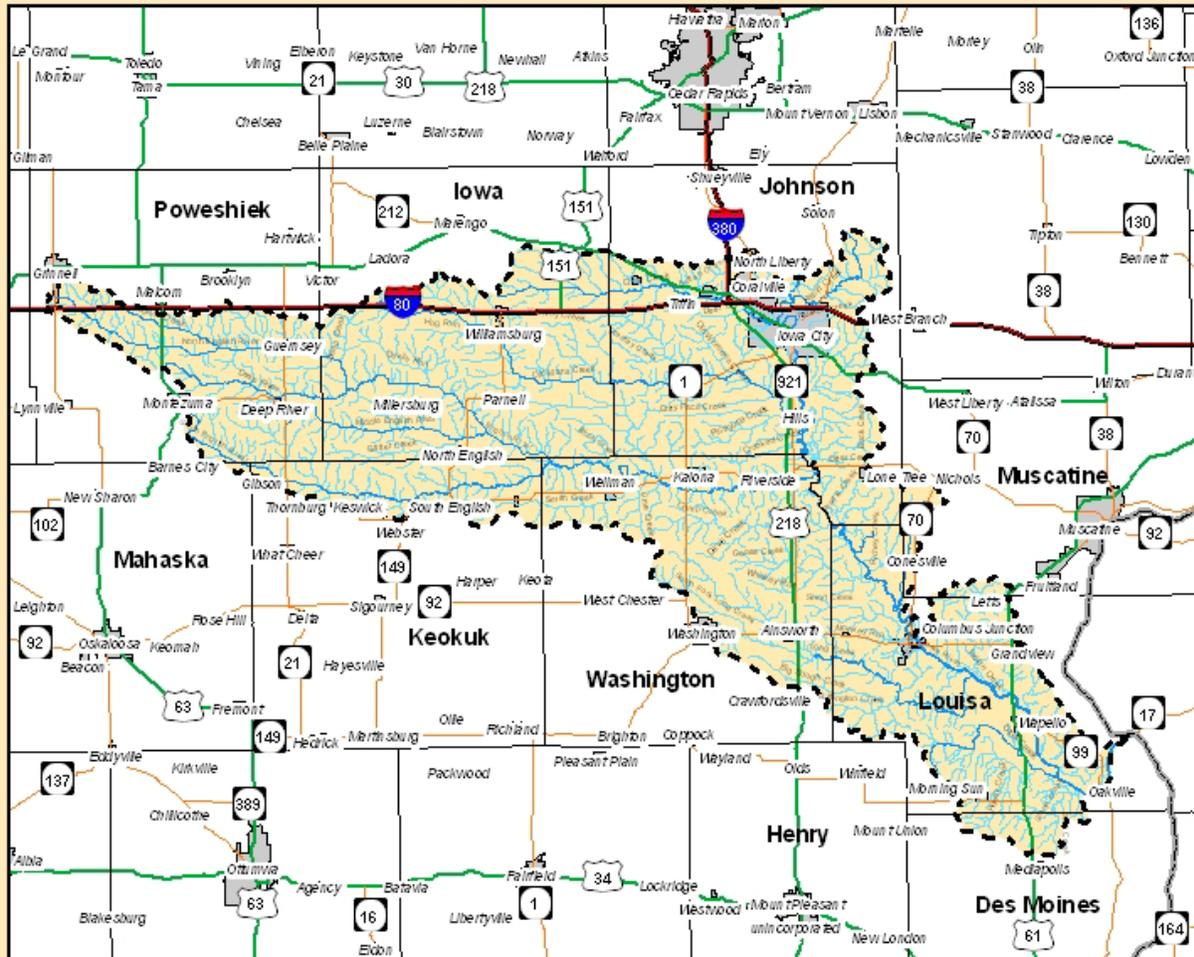
The Iowa River - Lower HUC includes 77 NRCS conservation easements totaling 10,537.2 acres. The easements include the Emergency Watershed Protection (EWP) program, Wetlands Reserve Program (WRP), and the Emergency Wetlands Reserve Program (EWRP). Sixty six percent of the easements are in Louisa County, 12 percent in Johnson County, 9 percent in Iowa County, 9 percent in Washington County, and the remaining 4 percent in Des Moines, Keokuk and Muscatine Counties (9).

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Physical Description

Iowa Rapid Watershed Assessment

Iowa River, Lower Watershed - Location Map



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



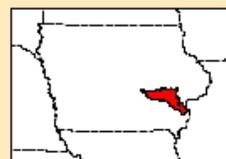
Total Area In Watershed: 1,078,335 Acres

County	Acres	Percent
Des Moines	15,131	1.4%
Henry	19	0.0%
Iowa	232,580	21.6%
Johnson	249,040	23.1%
Keokuk	61,440	5.7%
Louisia	200,271	18.6%
Mahaska	1,138	0.1%
Muscatine	13,470	1.2%
Poweshiek	118,991	11.0%
Washington	186,254	17.3%

Legend

- ESRI Highway Iowa**

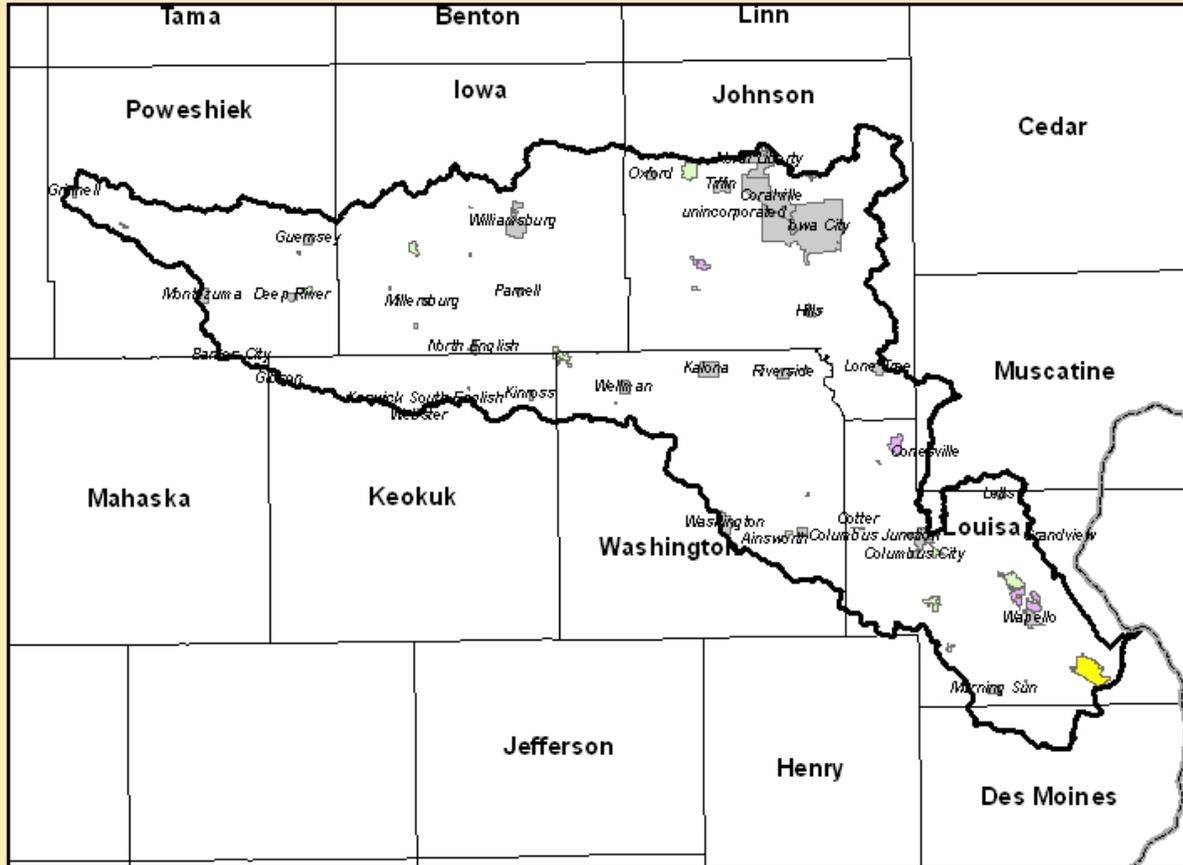
 TYPE
 - INTERSTATE
 - STATE
 - US
 - Rivers/Streams
 - State Boundary
 - County Boundary
 - Cities/Towns In Iowa
 - Iowa River, Lower, Basin



Physical Description (continued)

Iowa Rapid Watershed Assessment

Iowa River, Lower - Ownership/Stewardship



Total Acres in Lower, Iowa River Watershed - 1,078,335

 Municipal City Boundary Acres - 35,285 (3.3% of basin)

 GAP Stewardship Acres - 10,760 (1.0% of basin)

 Private Agricultural Land Acres- 1,000,487 (92.8%)

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 Inholders	1	40
ACE	4	267
County Conservation Board	36	4,913
FWS	6	2,744
Iowa DNR	12	2,790
State Land	1	5
Municipal Areas	44	35,285
Estimated Road Right-of-ways - Rural	0	31,803
Private Agricultural Land (Includes Homesteads)	0	1,000,487



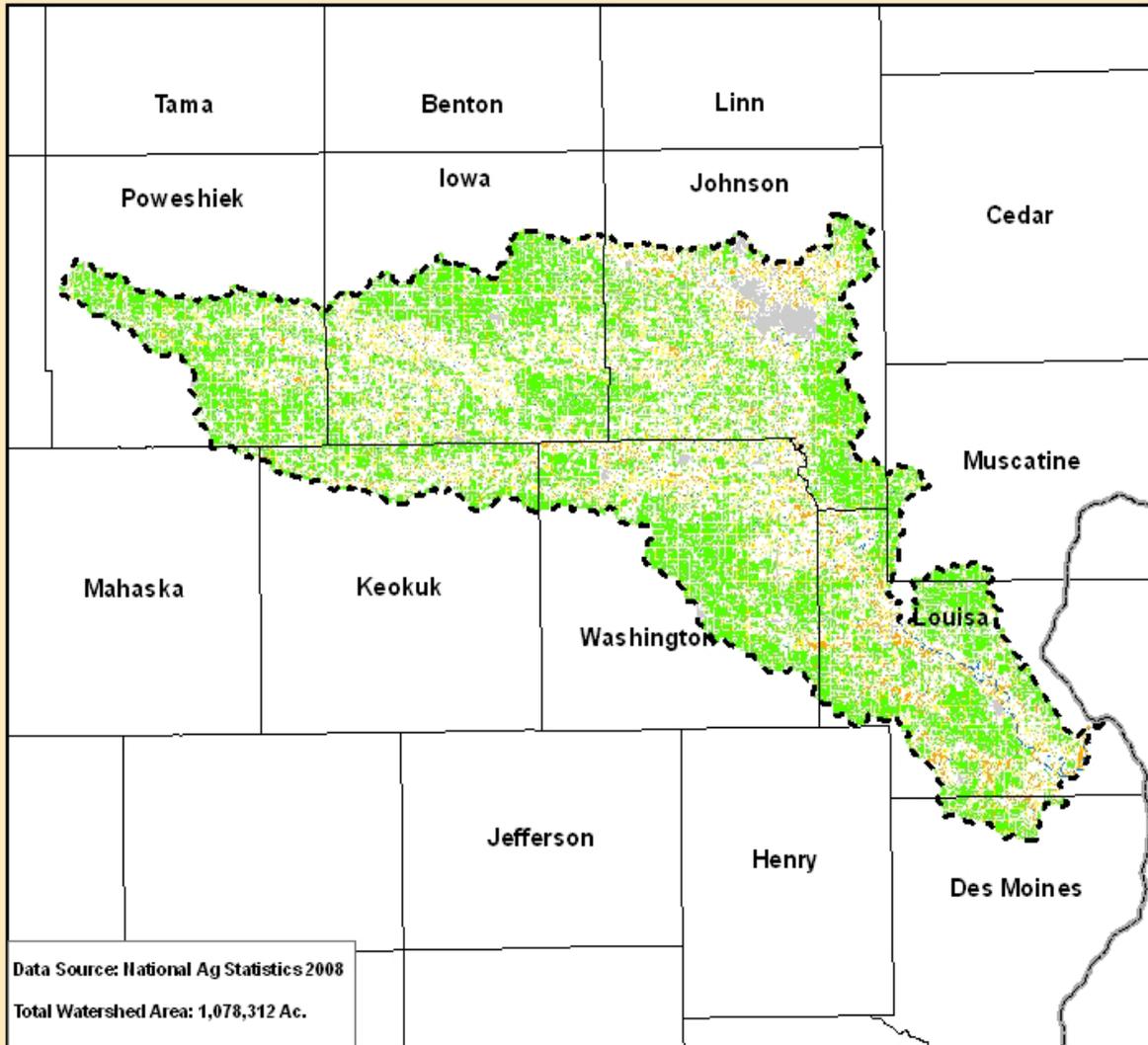
Legend

-  State Boundary
-  County Boundary
-  Iowa River, Lower, Basin
-  Cities_Towns L Iowa
- Stewardship - L. Iowa**
-  Private Inholding
-  ACE
-  County Conservation Board
-  FWS
-  Iowa DNR
-  State Land

Physical Description (continued)

Iowa Rapid Watershed Assessment

 Iowa River, Lower - Landuse/Landcover



Data Source: National Ag Statistics 2008

 Total Watershed Area: 1,078,312 Ac.

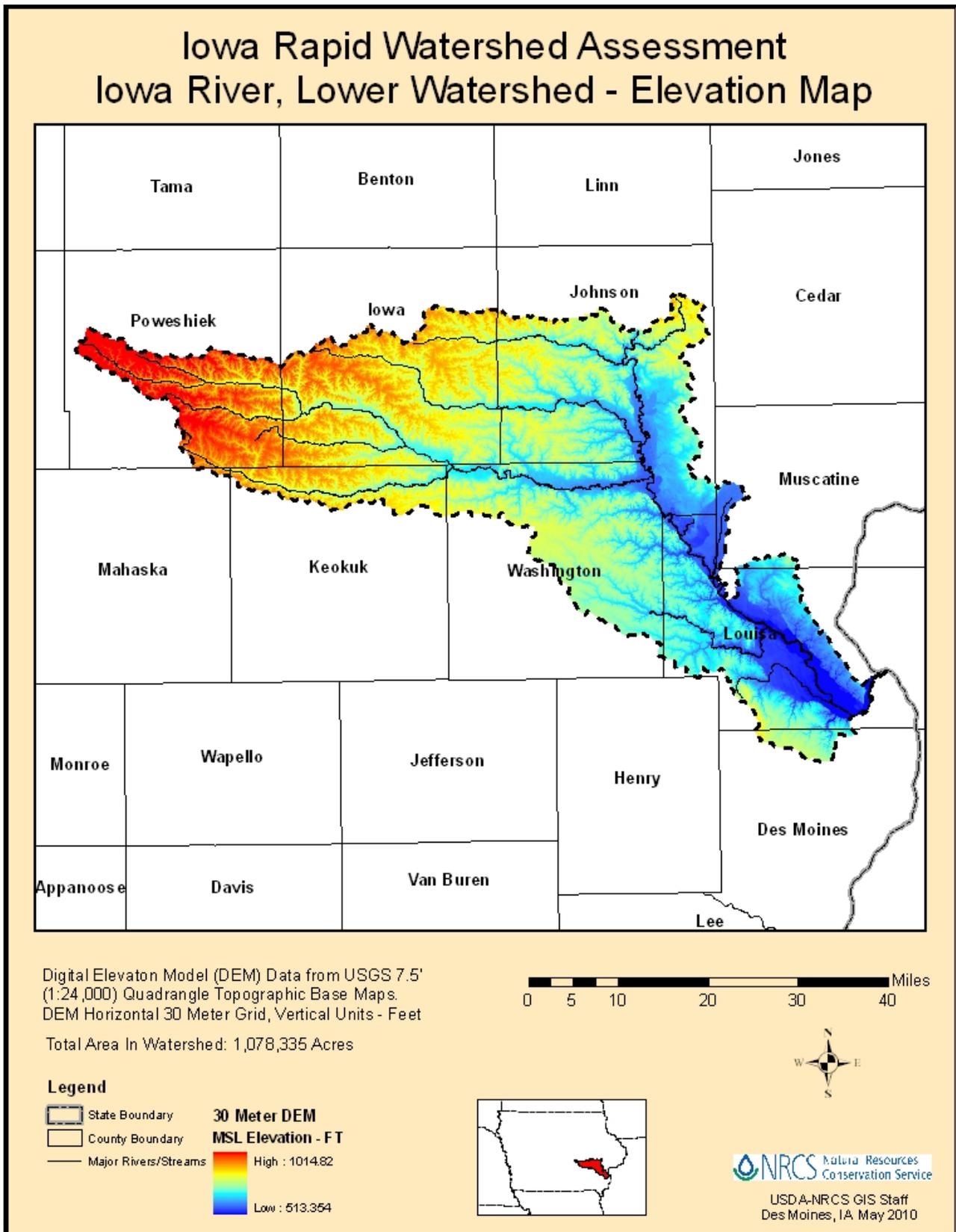
Landuse	Acres	Percent
Developed - Urban	99,676	9.2%
Hayland	8,943	0.8%
Pastureland	273,436	25.4%
Row Crop	592,911	55.0%
Water	8,483	0.8%
Wetland	3,926	0.4%
Woodland - Natural Areas	90,937	8.4%



Legend

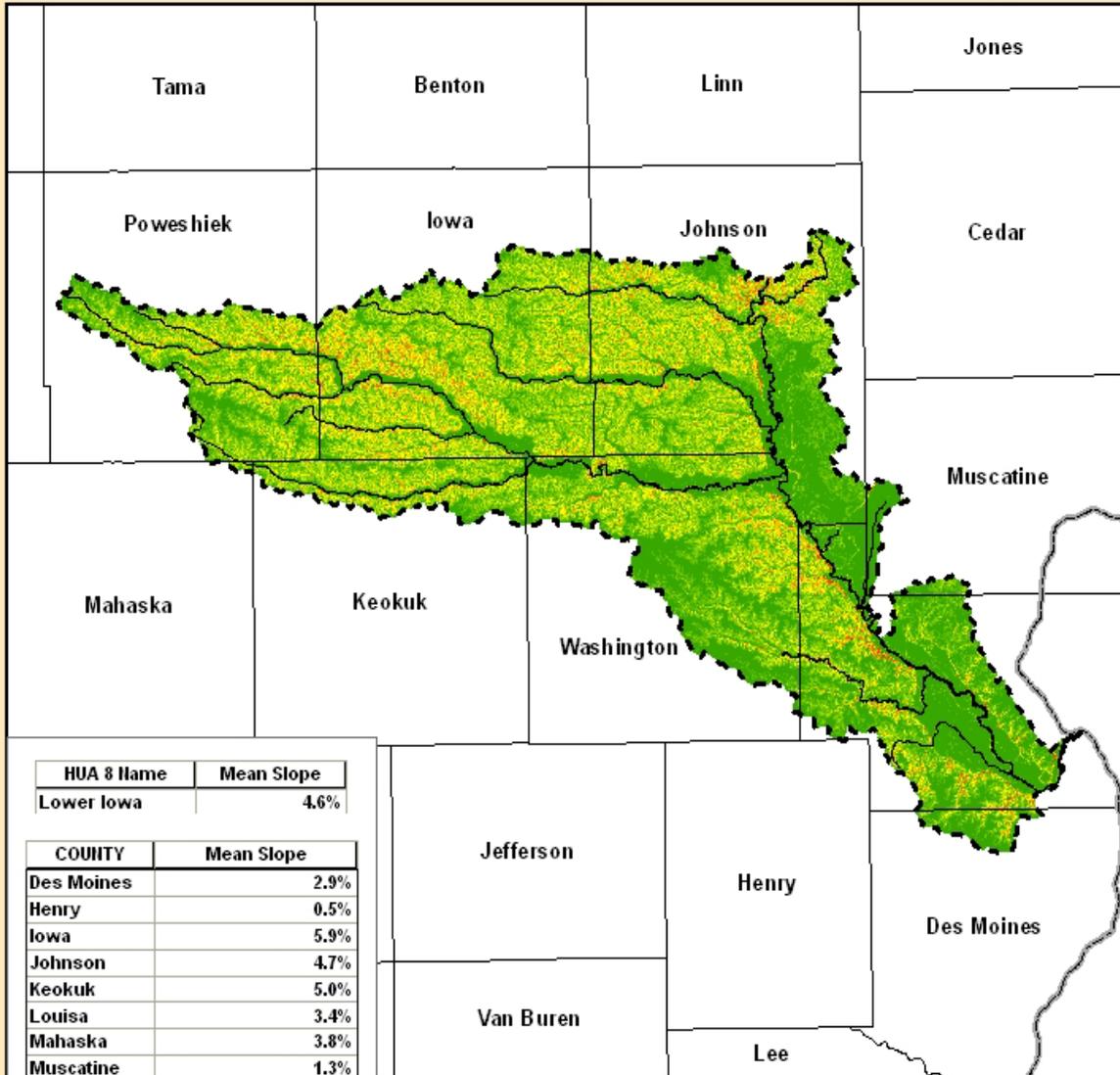
-  State Boundary
-  County Boundary
-  Iowa River, Lower, Basin
- 2008 NASS Landuse**
-  Developed - Urban
-  Hayland
-  Pastureland
-  Row Crop
-  Water
-  Wetland
-  Woodland - Natural Areas

Physical Description (continued)



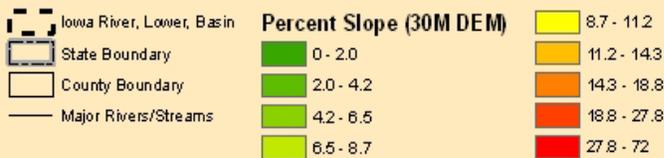
Physical Description (continued)

**Iowa Rapid Watershed Assessment
 Iowa River, Lower Watershed - Percent Slope**



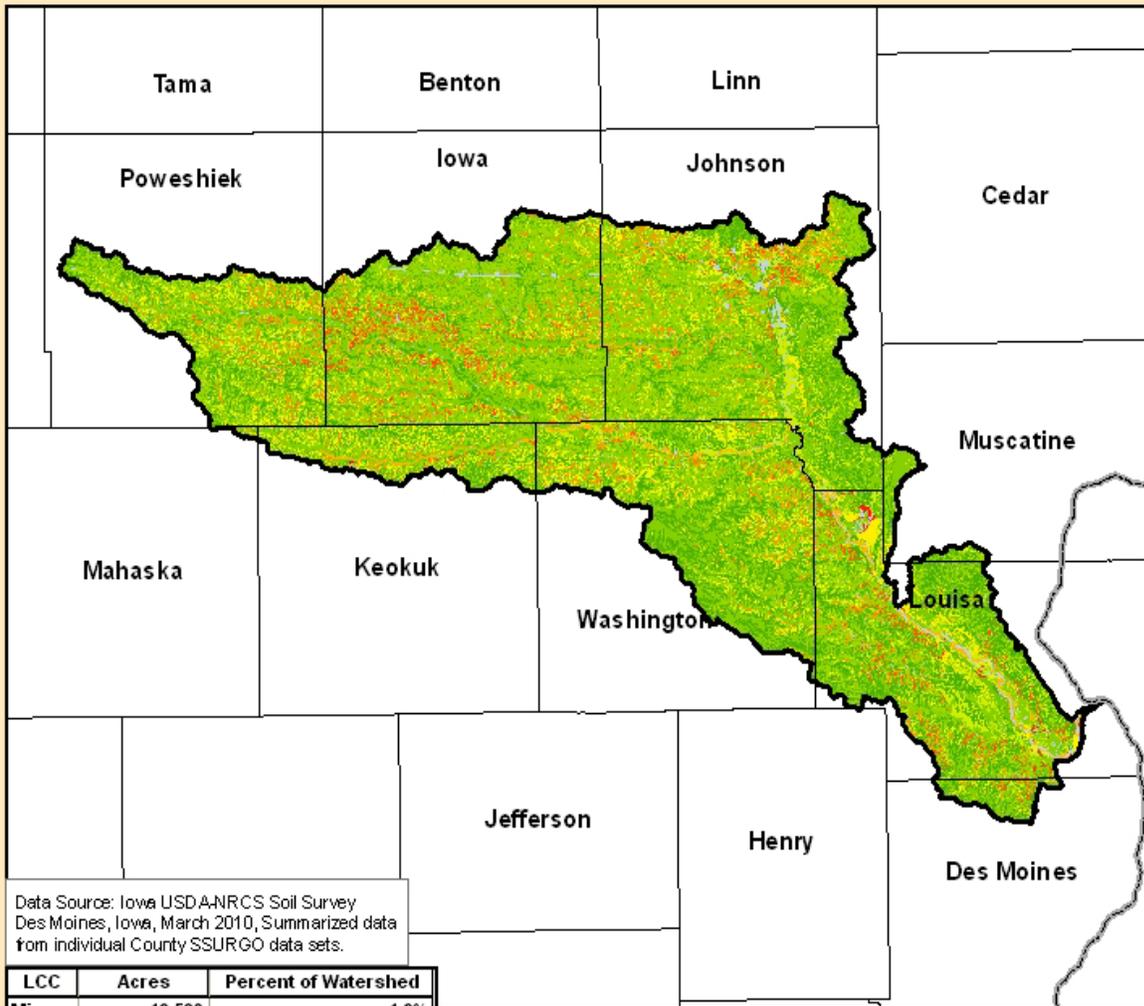
Data Source: USGS Digital Elevation Model (30M DEM)
 Average Watershed Slope: 4.6%
 Slope Calculations Done Using ArcMap Spatial Analyst Tools

Legend



Physical Description (continued)

Iowa Rapid Watershed Assessment
Iowa River, Lower - 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
Misc	12,583	1.2%
1	93,603	8.7%
2e	182,581	16.9%
2s	10,414	1.0%
2w	225,703	20.9%
3e	301,870	28.0%
3s	5,123	0.5%
3w	33,724	3.1%
4e	95,162	8.8%
4s	16,917	1.6%
4w	2,285	0.2%
5w	15,468	1.4%
6e	53,359	4.9%
6s	2,736	0.3%
7e	22,898	2.1%
7s	2,570	0.2%
7w	1,277	0.1%
8s	62	0.0%

Legend

-  State Boundary
-  County Boundary
-  Iowa River, Lower, Basin

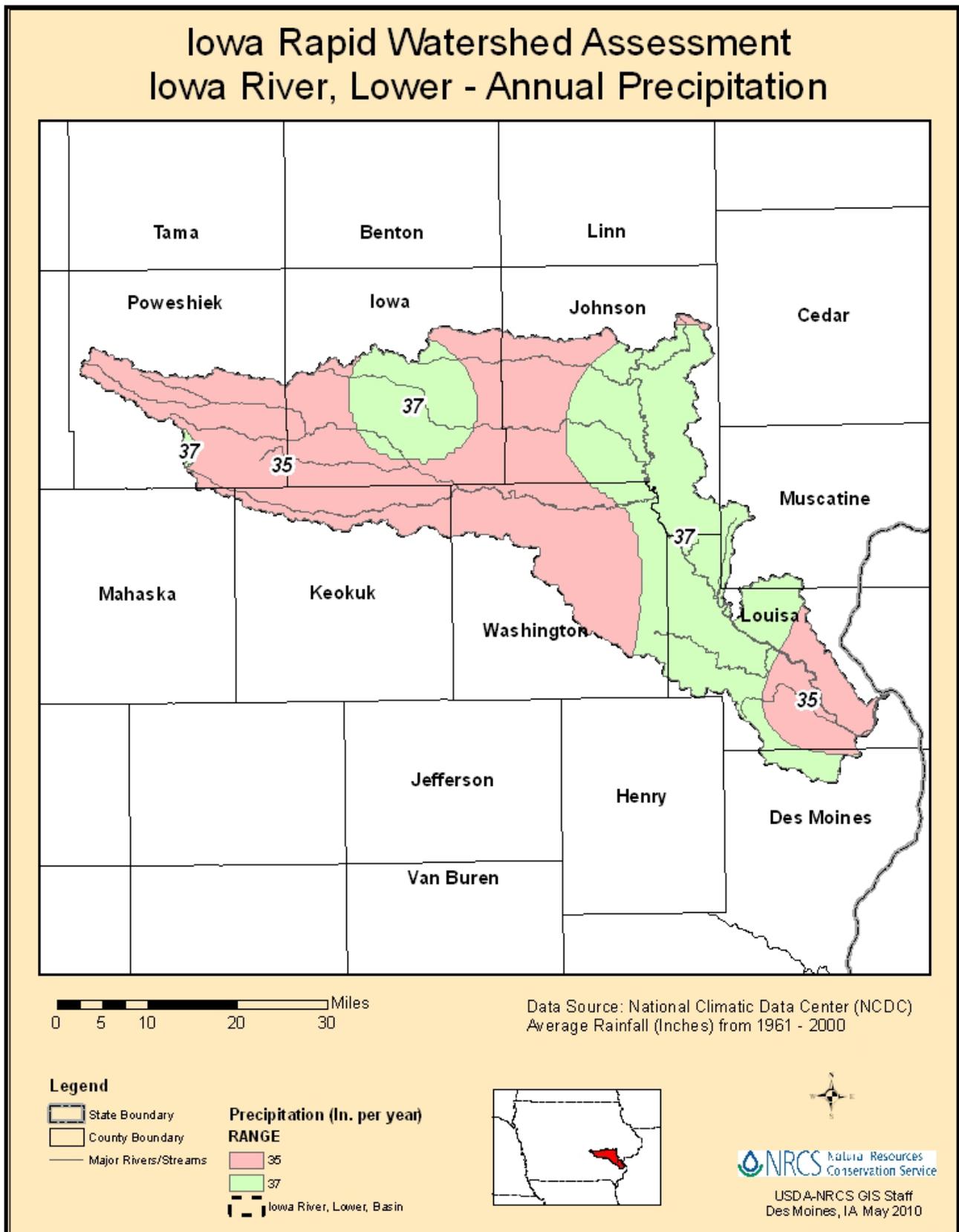
Land Capability Class

- LCC
-  Misc
 -  1
 -  2e
 -  2s
 -  2w
 -  3e
 -  3s

-  3w
-  4e
-  4s
-  4w
-  5w
-  6e
-  6s
-  7e
-  7s
-  7w
-  8s



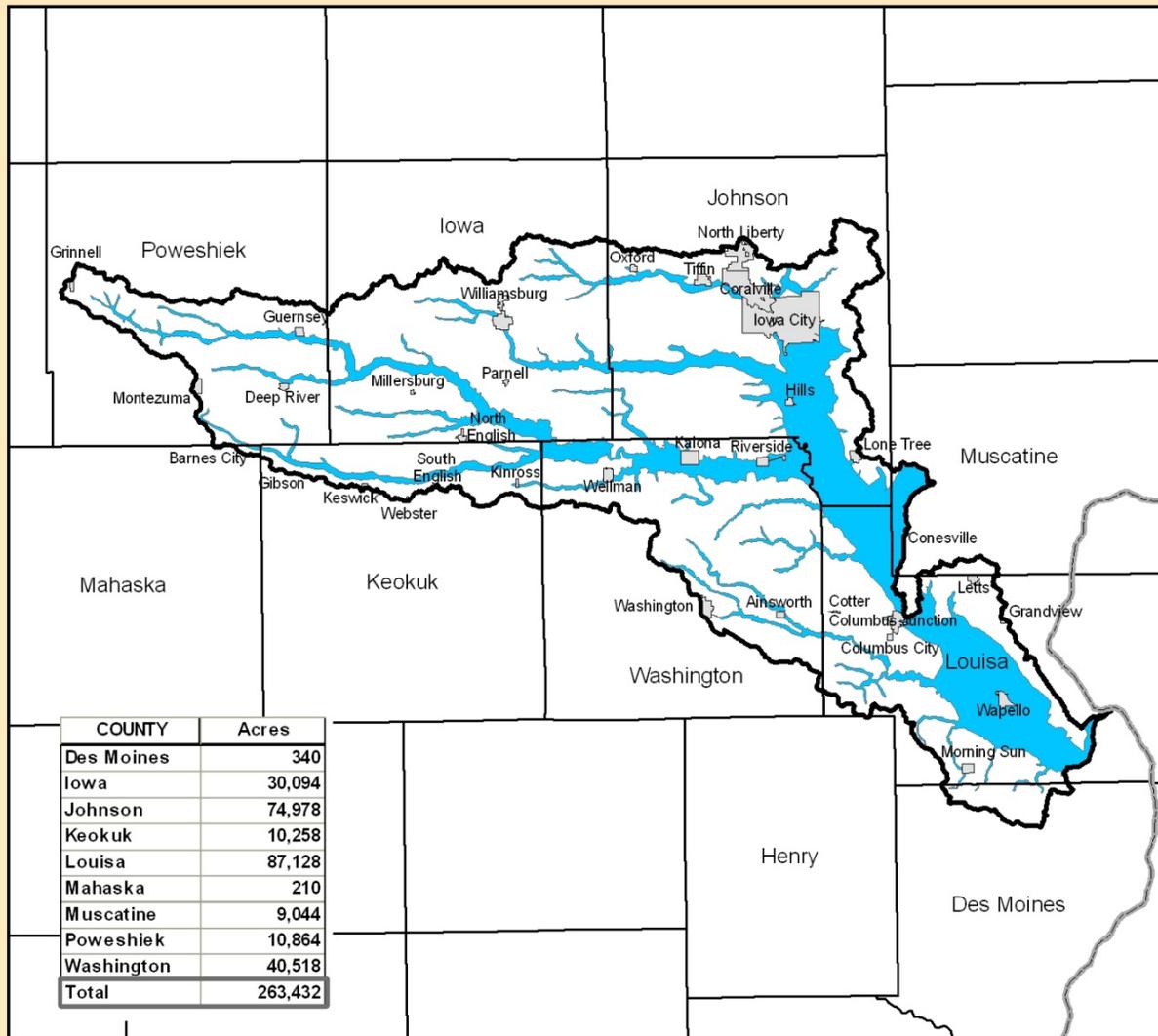
Physical Description (continued)



Physical Description (continued)

Iowa Rapid Watershed Assessment

Lower Iowa River - Alluvial Landform/Floodplain Map



This coverage maps alluvial deposits throughout Iowa. This generally would include areas of alluvial soils associated with modern streams that are identified on 1:100,000 scale county topographic maps. However, it also includes areas associated with glacial outwash streams from Wisconsin-age glaciers. Both loess-covered and non loess-covered stream terraces and benches are included as alluvial deposits. In general, these deposits would outline alluvial aquifers, although in some areas the sand and gravel may be thin or unsaturated. Mapping was done on 1:100,000 county maps using the modern county soil survey. In some instances, 1:24,000 topographic maps were used where the interpreter felt it useful. The Des Moines Lobe area was all mapped with the aid of 1:24,000 maps.

Data Source: Digital data set was developed by the Iowa Department of Natural Resources. Data created by Bernard Hoyer, 2/01/1991.



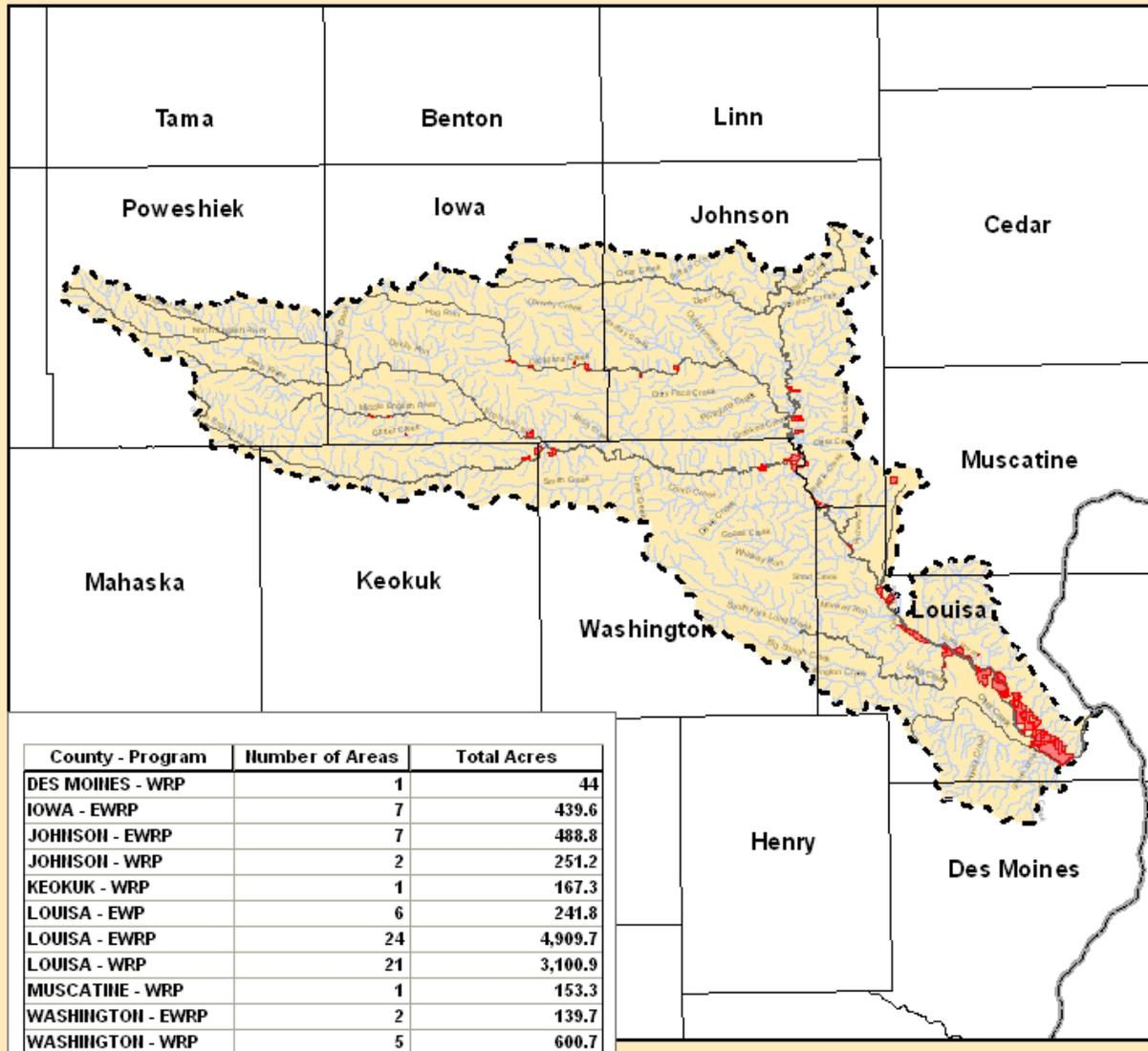
Legend

-  State Boundary
-  County Boundary
-  Lower Iowa River Basin
-  Alluvial Landform Data Set
-  Cities/Towns - Lower Iowa



Physical Description (continued)

**Iowa Rapid Watershed Assessment
Iowa River, Lower - NRCS Conservation Easements**



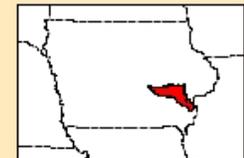
Data Source: USDA - NRCS Easement Programs Team.
Iowa River, Lower Total Easement Acres: 10,537.2
Digitized Easement Areas reflect completed/closed easements as well as enrolled/pending closed easements.

Legend

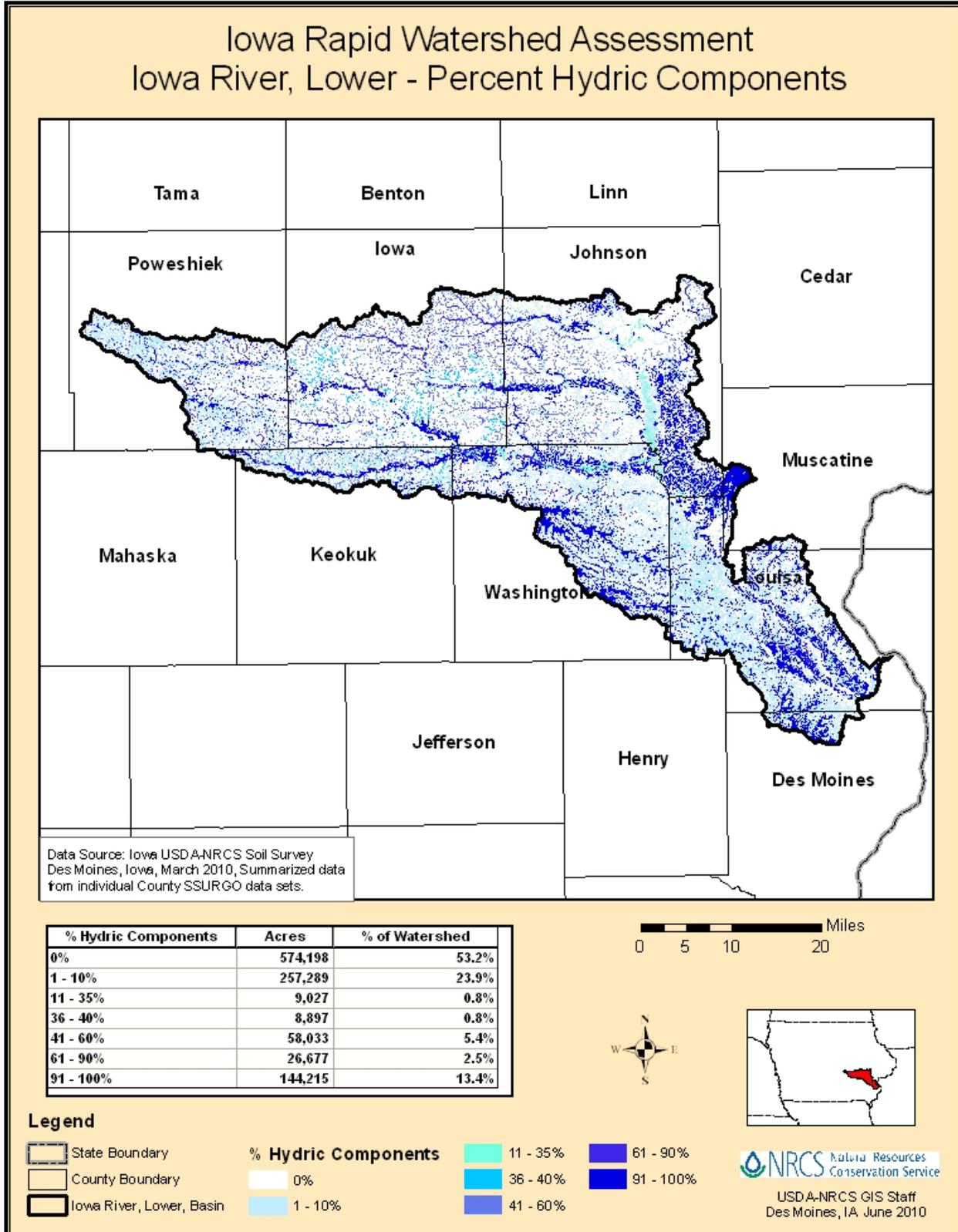
-  State Boundary
-  County Boundary
-  Conservation Easements
-  Major Rivers/Streams
-  Rivers/Streams
-  Iowa River, Lower, Basin

NRCS Conservation Easement Programs

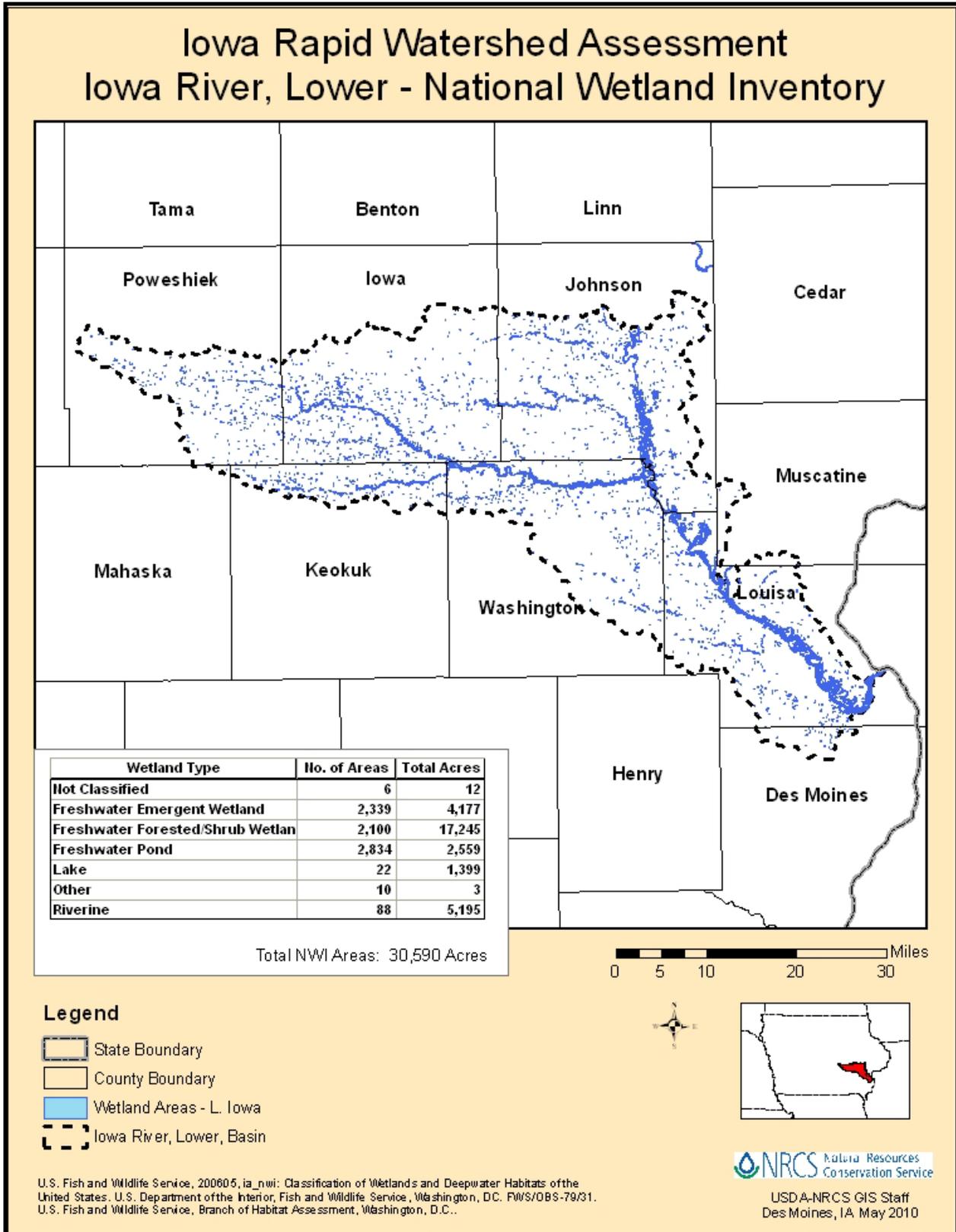
- EWP** - Emergency Watershed Protection Program - Floodplain Easements
- EWRP** - Emergency Wetlands Reserve Program
- FRPP** - Farm and Ranch Lands Protection Program
- GRP** - Grassland Reserve Program
- WRP** - Wetlands Reserve Program



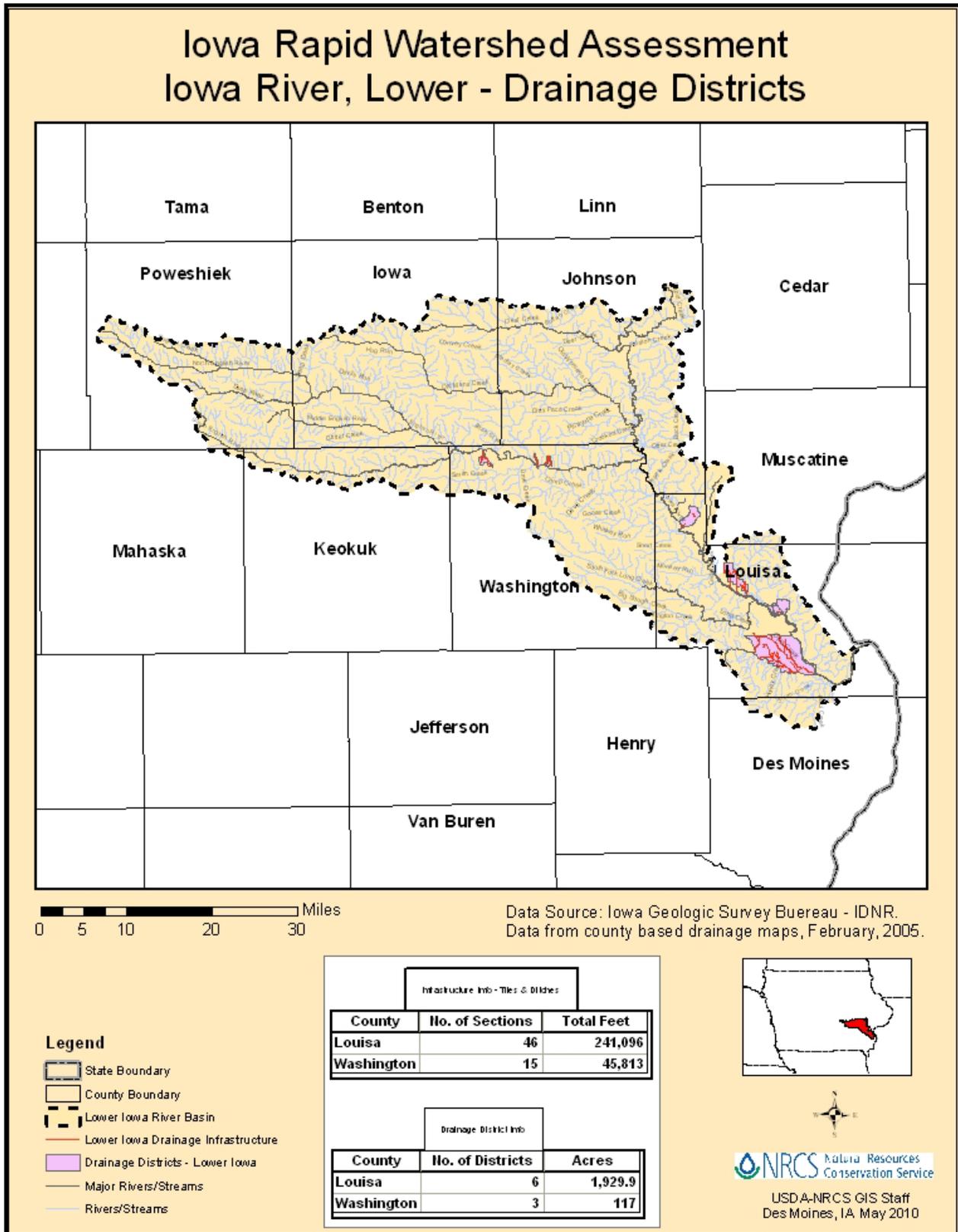
Physical Description (continued)



Physical Description (continued)



Physical Description (continued)

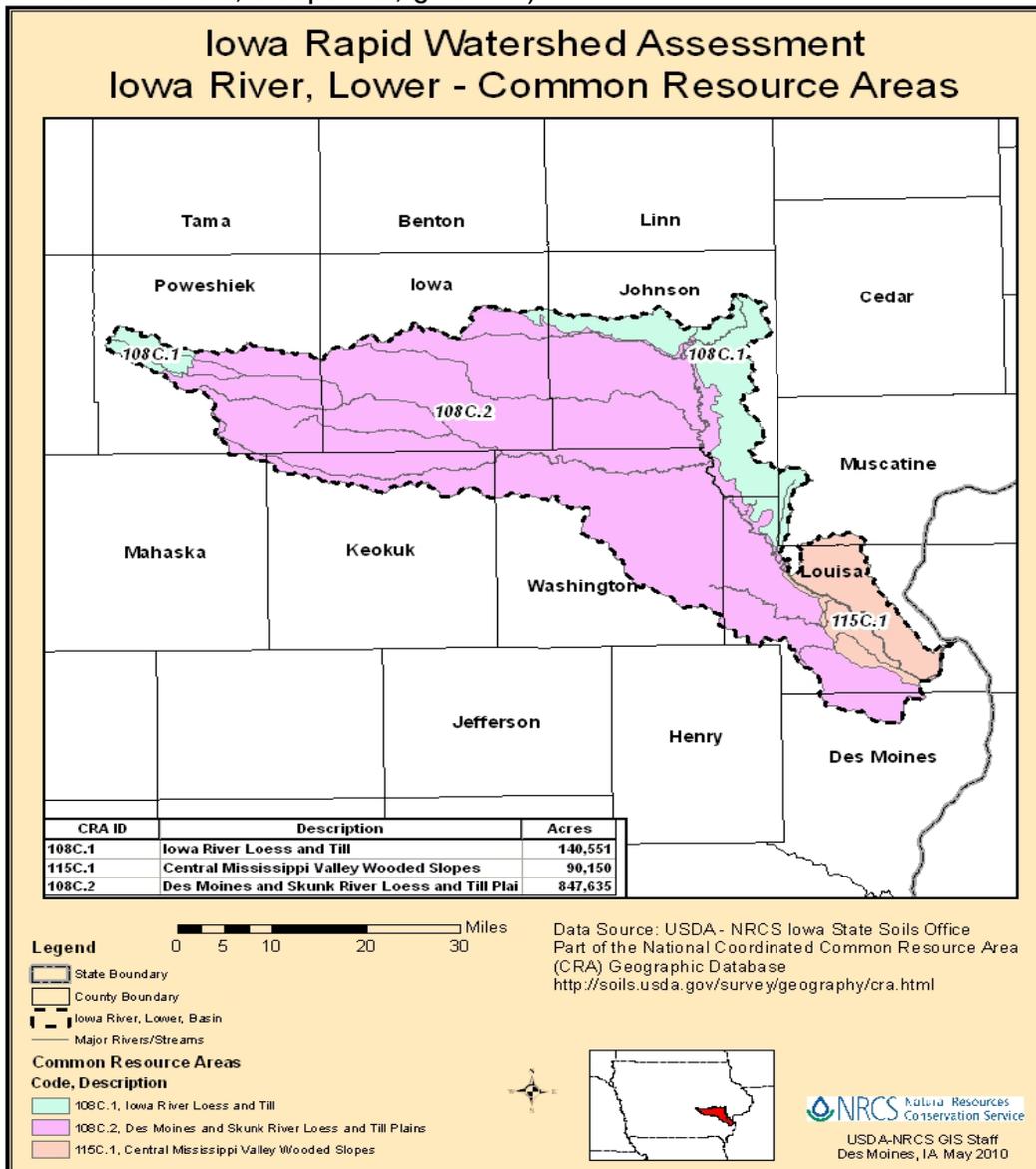


Physical Description (continued)

Common Resource Areas

The Iowa River - Lower HUC includes portions of three National Common Resource Areas (CRA): 108C.2, 108C.1, and 115C.1. Seventy nine percent of the watershed is in CRA 108C.2, 13.0 percent in 108C.1, and 8.0 percent in 115C.1 (12).

The CRAs delineated below for the Iowa River - Lower HUC are described on the next page (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 (12) (General Manual Title 450, Subpart C, §401.21).



Physical Description (continued)

Common Resource Area Descriptions (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.

108C.2 - Iowa River Loess and Till

This area consists of silty soils on ridge tops and highly dissected side slopes with drainage ways and streams. Glacial till soils dominate the steeper side slopes. Native vegetation was prairie on the ridge tops with thin bands of timber in the valleys and ravines. Common crops are corn and soybeans with some hay. Swine and poultry operations are numerous. Resource concerns are soil erosion, soil quality, nutrient management, water quality, and wildlife habitat.

108C.1 – Iowa River Loess and Till

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115C.1 – Central Mississippi Valley Wooded Slopes

Mississippi and lower Iowa River valleys and adjacent slopes. Low areas consist of the nearly level flood plains and terraces. The Corps of Engineers maintains a levee along the Mississippi River. Adjacent uplands consist of loess hills with moderately steep to very steep side slopes and narrow to moderately wide gently sloping to moderately sloping ridgetops. Low areas are composed of poorly drained to well drained silty, clayey and loamy alluvial and outwash deposits. Corn and soybeans are the major crops. Upland areas consist of well drained to somewhat poorly drained light colored soils. Hardwood forest dominates the upland side slopes. Livestock and grain farming are dominant in the less sloping upland areas. Urban growth is evident in the area around the Quad Cities.

Physical Description (continued)

Geology, Geomorphology & Soils

This drainage area consists of the southern (lower) portion of the Iowa River watershed. The English River is a major tributary, draining roughly one third of the RWA area from the west. Other large tributaries, also from the west and southwest, include Old Mans Creek, Clear Creek, and Long Creek. Soils and landforms of the watershed formed in deposits laid down by ice and water over the last two million years during the Pleistocene and Holocene Epochs. The thickness of these unconsolidated deposits above the Paleozoic bedrock ranges from less than 25 feet in southeastern portions of the watershed to more than 300 feet in the northwest. Surface elevations from the head to the mouth of the watershed range from about 1,010 to 530 feet above sea level.

The bedrock consists predominantly of Late Devonian shale, siltstone, and dolomite. Areas of older Devonian dolomite and limestone occur along the eastern edge of the watershed area. Younger dolomite and limestone of Mississippian age, and small outliers of Pennsylvanian shale and sandstone, occur along the southern edge of the watershed area. Several sinkholes are known to exist in the carbonate rocks in Louisa County. Bedrock exposures in the watershed are uncommon, however, and quarries are limited to a few in Johnson and Louisa counties.

The landscape of the Iowa River – Lower RWA area falls into two of Iowa's seven physiographic provinces (landform regions). Most of the watershed, including the entire western half, is in the Southern Iowa Drift Plain. Here, windblown silty loess several feet thick blankets an old glacial surface composed of thick, dense Pre-Illinoian till deposited beneath a few thousand feet of ice at least a half million years ago. The landscape is steeply rolling and highly dissected by a well-established, dendritic drainage network. Channels carved deeply into the land surface have since been partially filled by Holocene alluvial sediments of the DeForest Formation. Between valleys, tabular upland divides represent the highest and oldest areas of land, remnants that have experienced little erosion since the till was deposited.

In the lower half of the drainage area, the alluvial valley of the Iowa River is the dominant physiographic feature. The bottomland ranges from two to four miles in width and is nearly level. In Louisa County, the river valley is bordered on both sides by gently undulating upland plains. The western plain is underlain by loess over Pre-Illinoian till. The eastern plain is partially covered by sand dunes and terminates in high steep bluffs that border the wide alluvial valley of the Mississippi River.

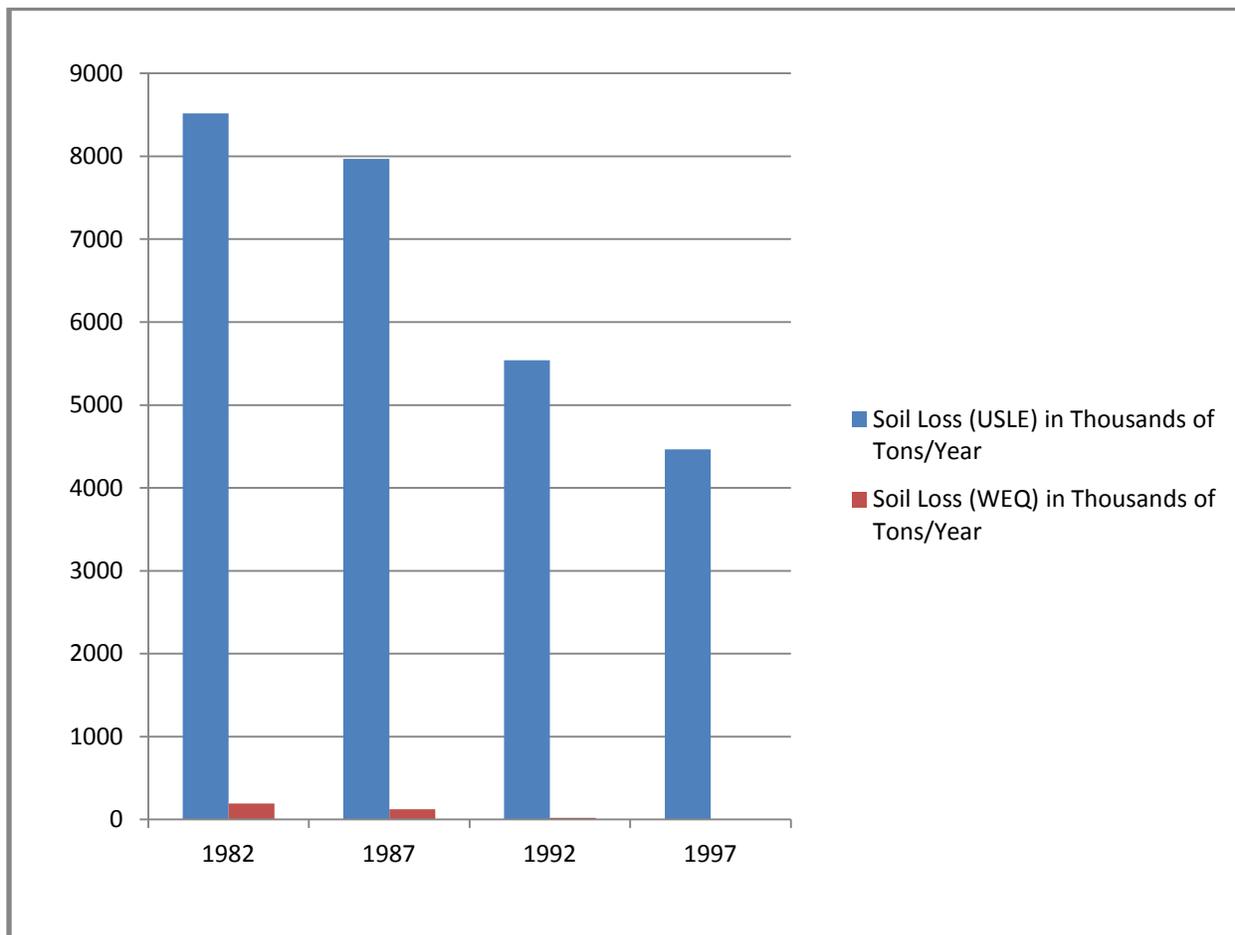
Soils on the uplands are moderately drained to well-drained and consist mainly of silt loam and silty clay loam soils formed in loess (Tama, Downs, Ladoga, etc.) or thin loess over till (Dinsdale, Kenyon). Loam and clay loam soils that developed in glacial till are found on strongly sloping hillsides (Shelby, Gara). Loess-derived silt loam and silty clay loam soils (Colo, Nodaway, Lawson, etc.) dominate in the Iowa River valley, and range from poorly drained to well-drained. Very well-drained Sparta and Chelsea soils occur on stream terraces and wind-deposited sands on uplands in the eastern part of the watershed area. (30)

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 (USLE) on cropland and pastureland decreased by approximately 4,050,700 tons (48 percent) of soil loss between 1982 and 1997. NRCS estimates indicate wind erosion rates (WEQ) decreased by 188,900 tons (98.9 percent) between 1982 and 1997. The standard error for the USLE estimate is 367,945 tons for 1997(USLE) and 654,996 tons for 1982 (USLE). The standard error for the WEQ estimate is 1,229 tons for 1997(WEQ) and 47,315 tons for 1982 (WEQ). 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 Iowa River – Lower 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.

For more information on water quality and the Iowa Department of Natural Resources (IDNR) Water Quality Index, go to the following website (20):
<http://www.igsb.uiowa.edu/wqm/Data/WQI/WQI.htm>

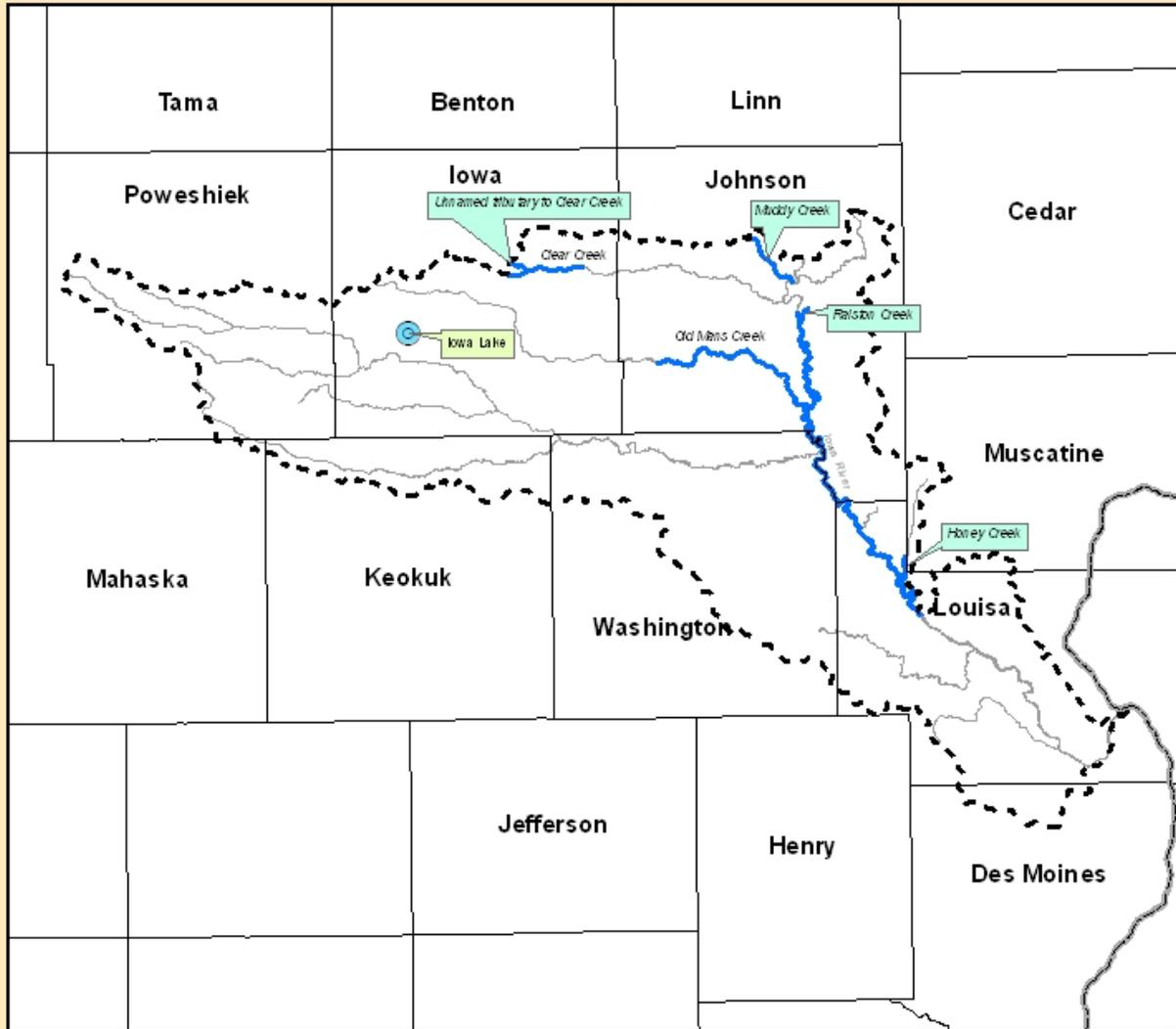
For more information on water quality and IDNR's Regional Watershed Assessment Tool go to the following website: <http://programs.iowadnr.gov/iowawaterweb/rwa.aspx>

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.

Water Quality (continued)

Iowa Rapid Watershed Assessment
 Iowa River, Lower - 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
- Iowa River, Lower, Basin
- Major Rivers/Streams
- Impaired Lakes
- Impaired Streams

Water Quality (continued)

Water Quality Concerns Data Graph/Table (19)

Impaired Water Bodies	Fish Kill	pH	Biological	Bacteria	Nutrients	Turbidity	Sewage	Priority Organics
Clear Creek (IA 02-IOW-0161_0)							X	
English River (IA 02-IOW-0100_1)				X				
Honey Creek (IA 02-IOW-0093_0)			X					
Iowa Lake (IA 02-IOW-01150-L_0)		X						
Muddy Creek (IA 02-IOW-0162_0)							X	
Iowa River (IA 02-IOW-0030_1)			X					
Iowa River (IA 02-IOW-0020_1)			X	X				
Iowa River (IA 02-IOW-0020_2)			X					
Iowa River (IA 02-IOW-0010_3)			X	X				

Impaired Water Bodies	Fish Kill	pH	Biological	Bacteria	Nutrients	Turbidity	Sewage	Priority Organics
Kent Park Lake (IA 02-IOW-01630-L_0)		X						
Old Mans Creek (IA 02-IOW-0150_1)			X					
Old Mans Creek (IA 02-IOW-0150_2)			X	X				
Otter Creek (IA 02-IOW-0086_0)	X							
Ralston Creek (IA 02-IOW-0155_1)								X
Short Creek (IA 02-IOW-0450_0)	X							
Unnamed tributary to Clear Creek (IA 02-IOW-01615_0)							X	
Unnamed Tributary to Short Creek (IA 02-IOW-0451_0)	X							

The schedule for TMDL development can be found at:

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

Water Quality (continued)

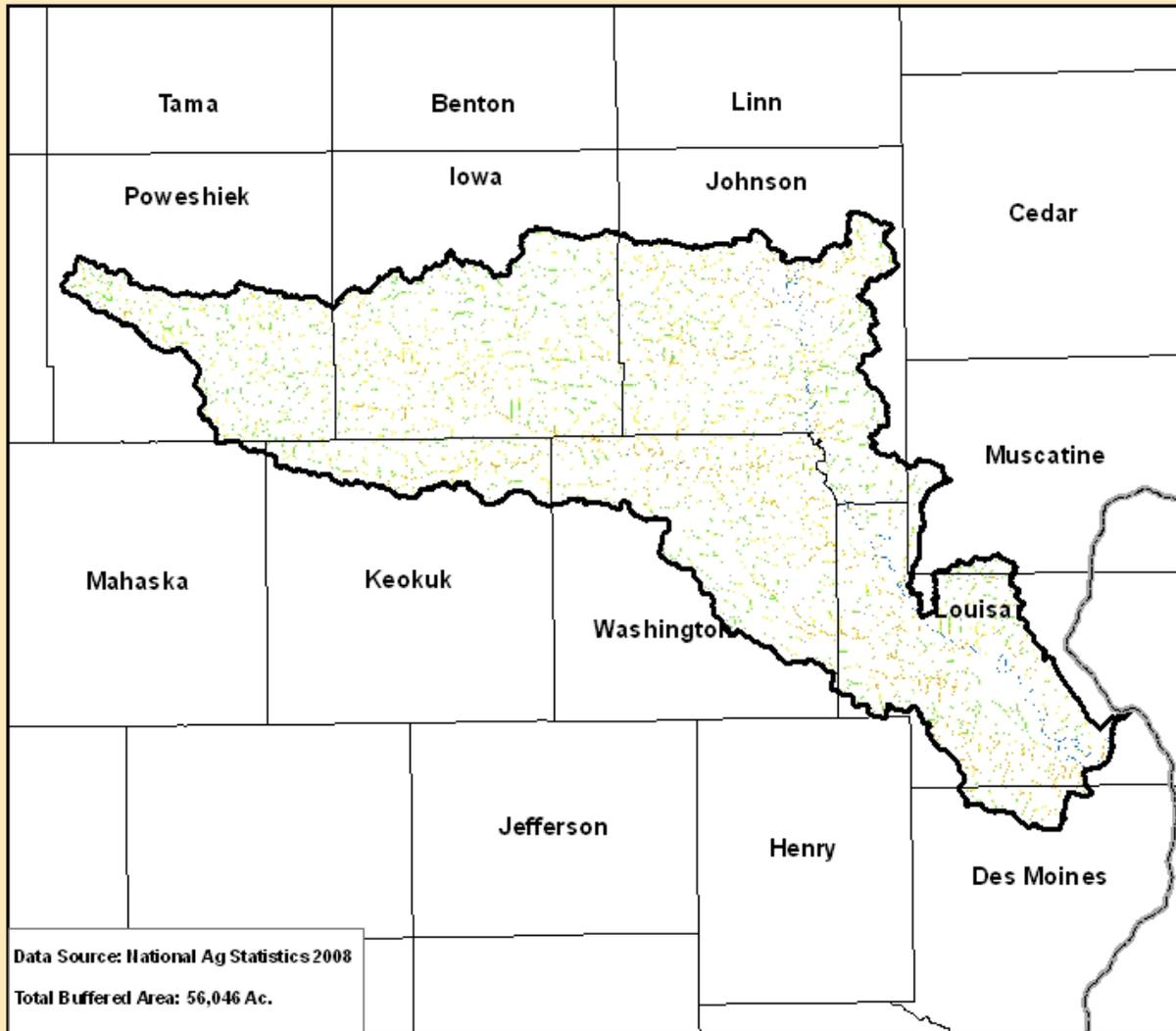
Watershed Projects, Plans, Studies, and Assessments	
Iowa Watershed Improvement Review Board (WIRB) Projects (31)	
None	
Water Quality Improvement Projects* (33)	IDNR TMDLs (23)
Chinkapin Bluffs Water Quality Improvement and Flood Reduction Louisa County(Active) Bonus for Trees Project Des Moines County (Completed) Johnson County Urban Water Quality Project Johnson County (Completed) Johnson County Urban Conservationist Project Johnson County(Active) Iowa Lake Water Quality Project Iowa County (Completed) Kent Park Lake Renovation & Water Quality Project Johnson County (Completed) Deer Creek and North Branch Sub-sheds of Clear Creek Johnson County (Active)	Scheduled 2012 Muddy Creek Ralston Creek

* 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)

Iowa Rapid Watershed Assessment

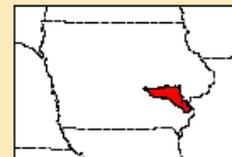
Iowa River, Lower - 100' Stream Buffer Landuse



Data Source: National Ag Statistics 2008

 Total Buffered Area: 56,046 Ac.

rwa_desc	Acres	Percent
Developed - Urban	3,793	6.8%
Hayland	147	0.3%
Pastureland	18,252	32.6%
Row Crop	18,702	33.4%
Water	1,989	3.5%
Wetland	342	0.6%
Woodland - Natural Areas	12,821	22.9%



Legend

-  State Boundary
-  County Boundary
-  Iowa River, Lower, Basin
-  100' Buffer Landuse: Developed - Urban
-  Hayland
-  Pastureland
-  Row Crop
-  Water
-  Wetland
-  Woodland - Natural Areas

Threatened and Endangered Species (17,34)

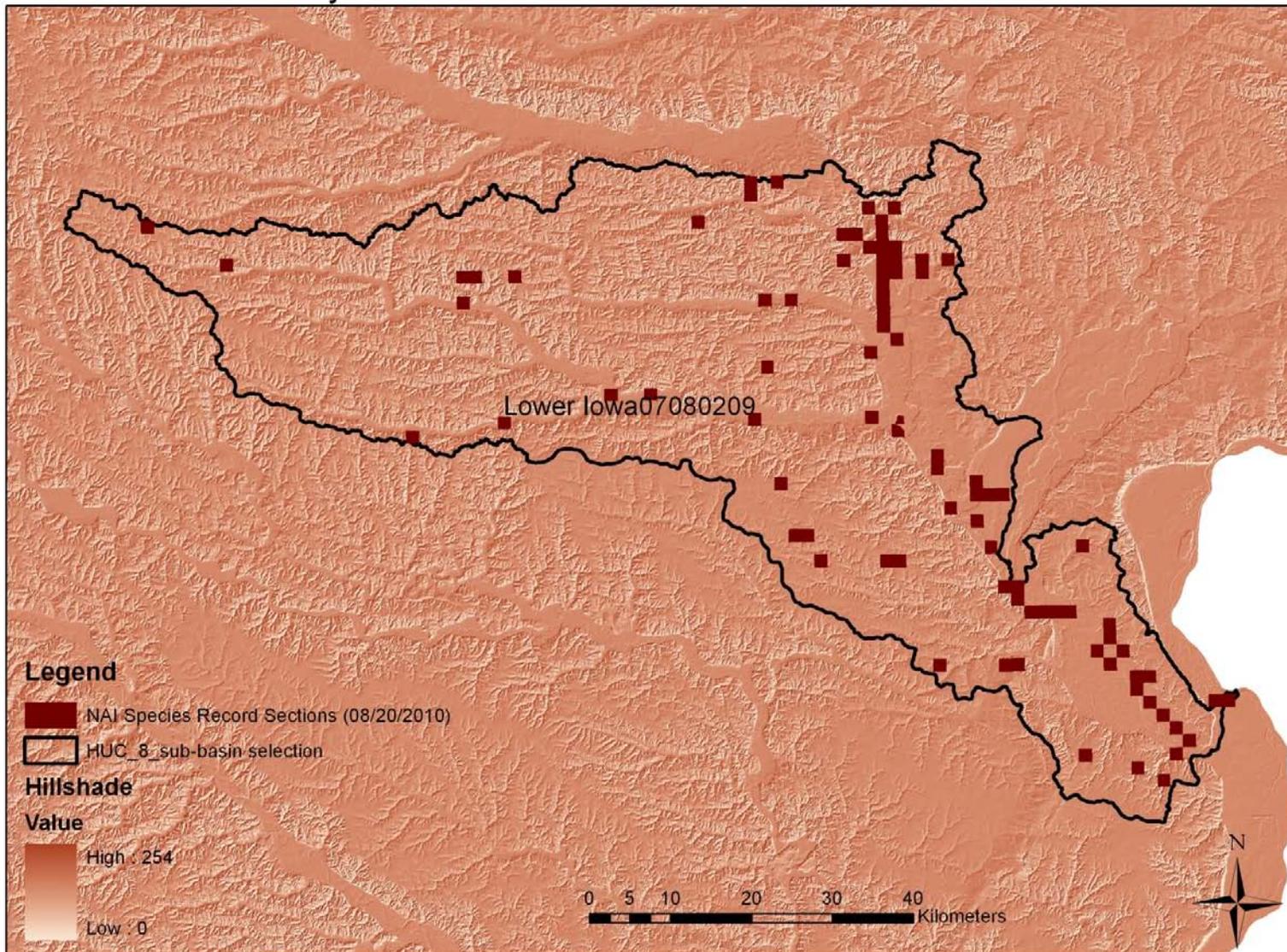
	SPECIES	Status	
		State	Federal
Animals	Henslow's Sparrow (<i>Ammodramus henslowii</i>)	T	
	Arogos Skipper (<i>Atrytone arogos</i>)	S	
	Wood Turtle (<i>Clemmys insculpta</i>)	E	
	Blanding's Turtle (<i>Emydoidea blandingii</i>)	T	
	Grass Pickerel (<i>Esox americanus</i>)	T	
	Orangethroat Darter (<i>Etheostoma spectabile</i>)	T	
	Baltimore Checkerspot (<i>Euphydryas phaeton</i>)	T	
	Bald Eagle (<i>Haliaeetus leucocephalus</i>)	S	
	Yellow Sandshell (<i>Lampsilis teres</i>)	E	
	Smooth Green Snake (<i>Liochlorophis vernalis</i>)	S	
	Indiana Bat (<i>Myotis sodalis</i>)	E	E
	Copperbelly Water Snake (<i>Nerodia erythrogaster neglecta</i>)	E	
	Freckled Madtom (<i>Noturus nocturnus</i>)	E	
	Sheepnose (<i>Plethobasus cyphus</i>)	E	C
	Round Pigtoe (<i>Pleurobema sintoxia</i>)	E	
	Fat Pocketbook (<i>Potamilus capax</i>)		E
	Massasauga Rattlesnake (<i>Sistrurus catenatus</i>)	E	
	Regal Fritillary (<i>Speyeria idalia</i>)	S	
	Spotted Skunk (<i>Spilogale putorius</i>)	E	
	Common Musk Turtle (<i>Sternotherus odoratus</i>)	T	
	Creeper (<i>Strophitus undulatus</i>)	T	
	Ornate Box Turtle (<i>Terrapene ornata</i>)	T	
	Pistolgrip (<i>Tritogonia verrucosa</i>)	E	
Barn Owl (<i>Tyto alba</i>)	E		

	SPECIES	Status	
		State	Federal
Plants	Pearly Everlasting (<i>Anaphalis margaritacea</i>)	S	
	Broom Sedge (<i>Andropogon virginicus</i>)	S	
	Limestone Rockcress (<i>Arabis divaricarpa</i>)	S	
	Flat Top White Aster (<i>Aster pubentior</i>)	S	
	Sweet Indian Plantain (<i>Cacalia suaveolens</i>)	T	
	Low Bindweed (<i>Calystegia spithamea</i>)	S	
	Missouri Lambsquarters (<i>Chenopodium missouriensis</i>)	S	
	Hill's Thistle (<i>Cirsium hillii</i>)	S	
	Slender Dayflower (<i>Commelina erecta</i>)	T	
	Fineberry Hawthorn (<i>Crataegus chrysocarpa</i>)	S	
	Slim-leaved Panic Grass (<i>Dichanthelium linearifolium</i>)	T	
	Tall Cotton Grass (<i>Eriophorum angustifolium</i>)	S	
	Spring Avens (<i>Geum vernum</i>)	S	
	Limestone Oak Fern (<i>Gymnocarpium robertianum</i>)	S	
	False Loosestrife (<i>Ludwigia peploides</i>)	S	
	Crowfoot Clubmoss (<i>Lycopodium digitatum</i>)	S	
	Yellow Monkey Flower (<i>Mimulus glabratus</i>)	T	
	Pinesap (<i>Monotropa hypopithys</i>)	T	
	Northern Adder's-tongue (<i>Ophioglossum pusillum</i>)	S	
	Philadelphia Panic Grass (<i>Panicum philadelphicum</i>)	T	
	Pale Green Orchid (<i>Platanthera flava</i>)	E	
	Eastern Prairie Fringed Orchid (<i>Platanthera leucophaea</i>)	E	T
	Chapman Bluegrass (<i>Poa chapmaniana</i>)	S	
	Pink Milkwort (<i>Polygala incarnata</i>)	T	
Vasey Pondweed (<i>Potamogeton vaseyi</i>)	S		

	SPECIES	Status	
		State	Federal
Plants	Hortulan Plum (<i>Prunus hortulana</i>)	S	
	Sand Cherry (<i>Prunus pumila</i>)	S	
	Toothcup (<i>Rotala ramosior</i>)	S	
	Sage Willow (<i>Salix candida</i>)	S	
	Slender Ladies'-tresses (<i>Spiranthes lacera</i>)	T	
	Great Plains Ladies'-tresses (<i>Spiranthes magnicamporum</i>)	S	
	Hedge Nettle (<i>Stachys aspera</i>)	S	
	Earleaf Foxglove (<i>Tomanthera auriculata</i>)	S	
	Virginia Spiderwort (<i>Tradescantia virginiana</i>)	S	
	False Hellebore (<i>Veratrum woodii</i>)	T	
	Cream Violet (<i>Viola striata</i>)	S	
	Frost Grape (<i>Vitis vulpina</i>)	S	
E = Endangered Species T = Threatened Species C = Candidate Species S = Special Concern Species			

Threatened and Endangered Species

Iowa Natural Areas Inventory Threatened, Endangered, and Special Concern Species
Records by PLSS Section for Lower Iowa HUC 8 07080209

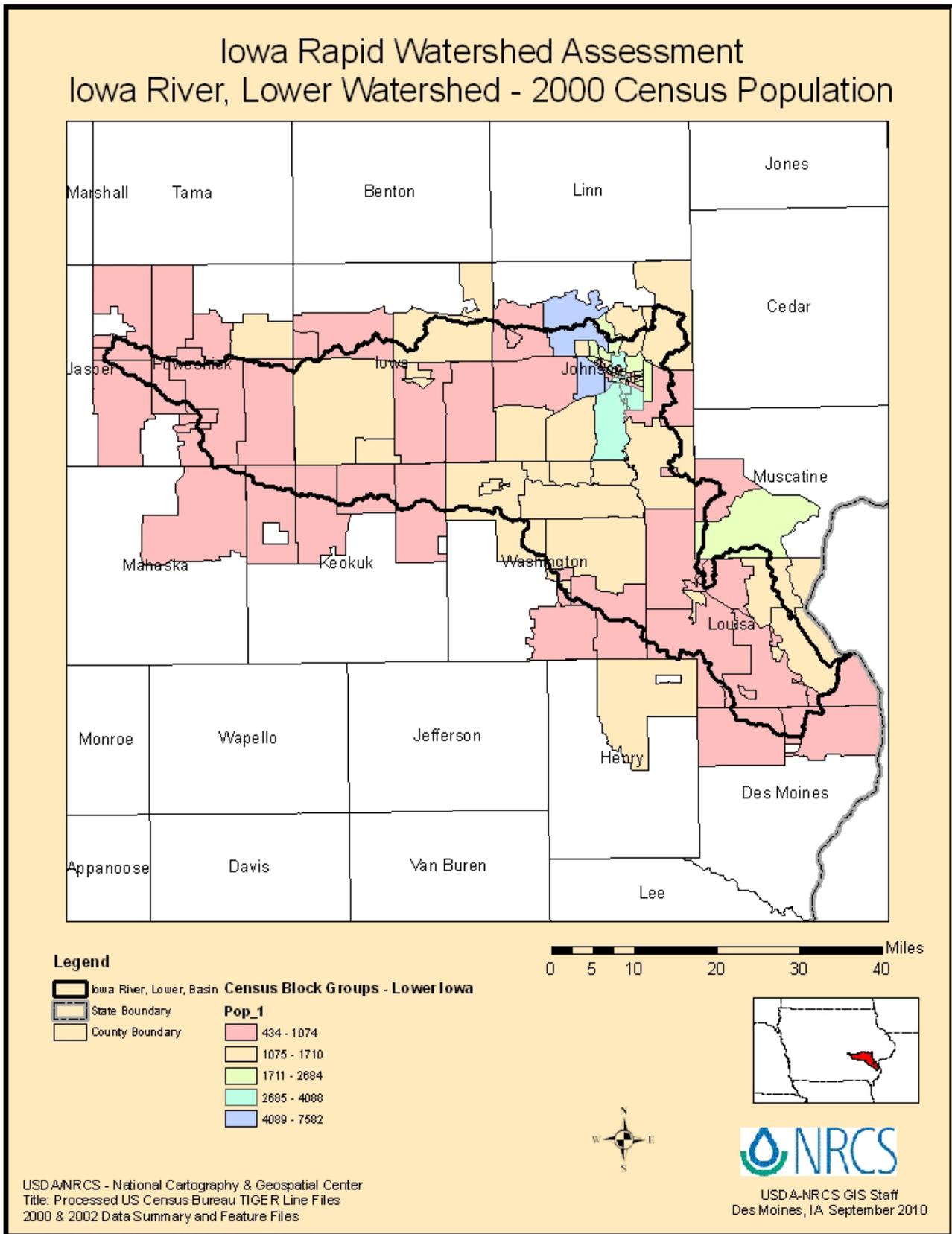


Census and Social Data

There are 4,786 total farm operators in the watershed. Of these, 3,558 are male and 1,228 are female. Eighty-one percent of the farm operators in the watershed are full time farmers (24).

There are 3,251 farms in the Iowa River - Lower Watershed with farm size ranging from one acre to over 1,000 acres. Size of farms: eight percent are 1-10 acres; 20 percent are 10-50 acres; 31 percent are 50-179 acres; 24 percent are 180-499 acres; 11 percent are 500-999 acres; and 6 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 (24).

Census and Social Data (continued)



Census and Social Data (continued)

Total Farms By Size Per County Iowa River, Lower Watershed

COUNTY	Acres	% of Watershed	1 - 10 Ac	10 - 50 Ac	50 - 179 Ac	180 - 499 Ac	500 - 999 Ac	> 1000 Ac
DES MOINES	15,131	1.4%	3	8	10	8	4	3
HENRY	19	0.0%	0	0	0	0	0	0
IOWA	232,580	21.6%	59	127	212	201	68	40
JOHNSON	249,040	23.1%	41	198	295	158	78	39
KEOKUK	61,440	5.7%	12	33	68	46	24	9
LOUISA	200,271	18.6%	51	101	156	124	63	31
MAHASKA	1,138	0.1%	0	1	1	1	0	0
MUSCATINE	13,470	1.2%	3	9	12	9	4	2
POWESHIEK	118,991	11.0%	29	61	78	68	36	26
WASHINGTON	186,254	17.3%	58	118	183	172	85	25
Total	1,078,334	100.0%	256	656	1,015	787	362	175

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

G:\geodata\project_data\nrcs\Rapid_Watershed_Assessment\LIowa\tables\NASS_fm.sz_LI07_PivTable

Census and Social Data (continued)

NASS Farm Operators Per County Iowa River, Lower Watershed

COUNTY	Acres	Percent	Operators	Female Operators	Male Operators	Part-Full Time Operators	Full Time Op	Part Time Op
Washington	186,254	17.30%	953	223	730	1,043	747	296
Poweshiek	118,991	11.00%	441	120	322	482	352	129
Muscatine	13,470	1.20%	58	13	45	63	47	17
Mahaska	1,138	0.10%	4	1	3	5	4	1
Louisa	200,271	18.60%	759	202	557	853	622	231
Keokuk	61,440	5.70%	282	73	209	308	224	85
Johnson	249,040	23.10%	1,195	306	889	1,319	969	351
Iowa	232,580	21.60%	1,041	277	763	1,152	846	306
Henry	19	0.00%	0	0	0	0	0	0
Des Moines	15,131	1.40%	53	13	40	59	43	15
Total	1,078,335	100.00%	4,786	1,228	3,558	5,284	3,854	1,431

* 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

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 very small amount of oats and meadow as part of a rotation. Corn acres increased in recent years, compared to soybean acres, due to increased grain prices and ethanol plant development. The average slope is 4.6 percent. Predominant resource concerns on cropland include soil erosion (sheet and rill, gully, and wind); soil compaction; soil eutrophication; weed infestation; and decrease in soil carbon. Over-application of nutrients (commercial and manure-based) and pesticides typically does not meet Iowa NRCS standards. In recent years, no-till systems on soybean acres have increased, although no-till on corn acres has decreased.

Natural Areas/Forestland (35)

Natural areas in the Iowa River, Lower 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. Predominant resource concerns include invasive species, classic gully erosion, habitat fragmentation, increasing homogeneity, and land use conversion 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 management plans; pest management plans; and water monitoring through IOWATER (Iowa's volunteer water monitoring program).

Urban erosion has created increased natural resource concerns related to soil erosion and water quality. Focus on these issues, especially in areas of substantial development, has resulted in increased technical assistance in the urban arena.

On a statewide basis, increase in ethanol plant manufacturing utilizes crop residues which adversely affects soil quality and increases soil erosion. This creates more of a need for increased conservation efforts.

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 Iowa River - Lower 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 (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.

In addition, there is increased interest and productivity 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.

Underground storage tanks create resource issues due to storage of substances, primarily petroleum products (25).

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 (34).

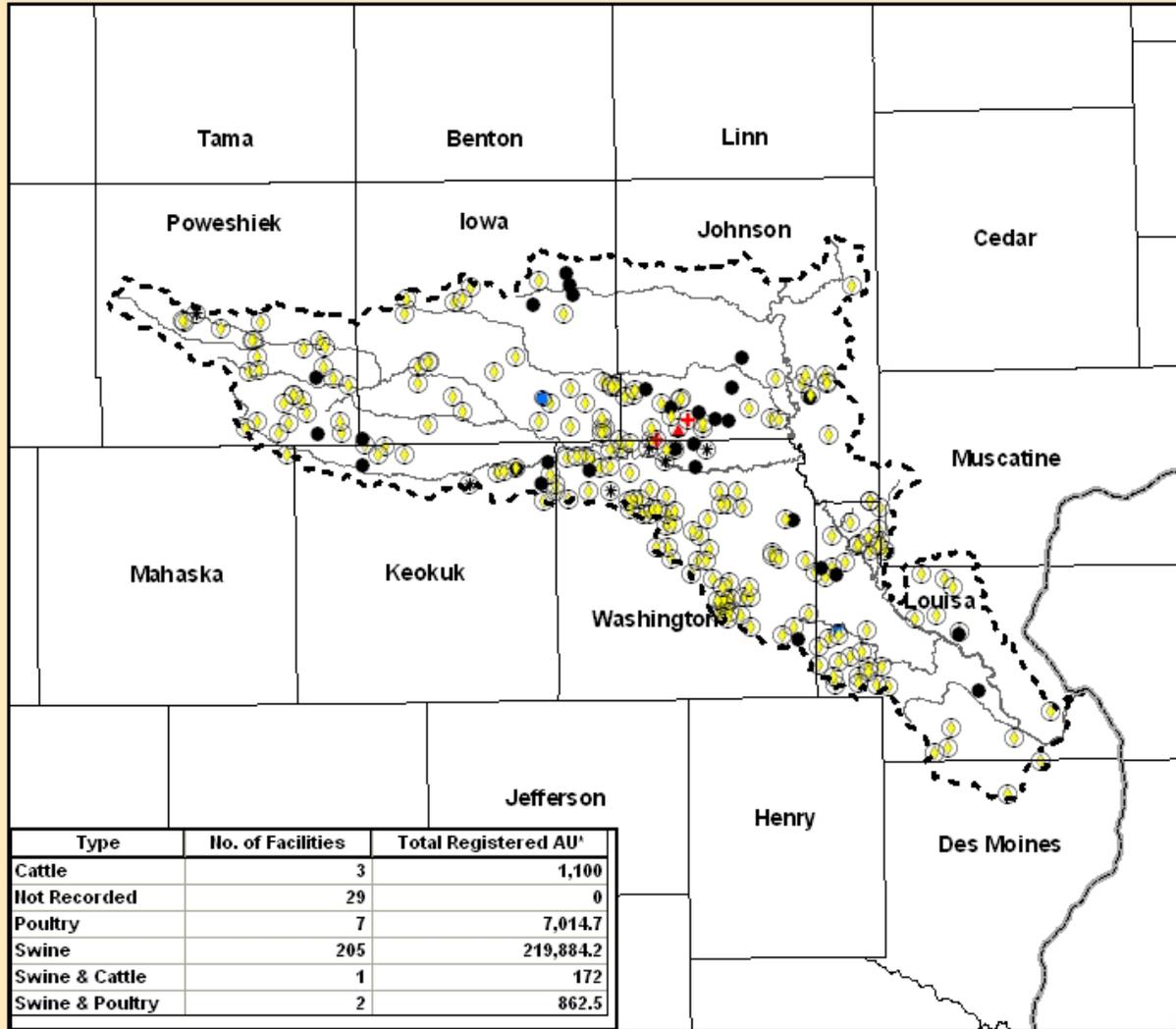
In the state of Iowa, as of October 2009, there were approximately 57 biofuel plants that are in operation or under construction. At this time, there is one bio diesel plant that is in operation in the Iowa River - Lower Watershed, located in the City of Washington, in Washington County. It is reported that 2 - 4 gallons of water is required for every gallon of biofuel produced, creating a concern about water quantity (26).

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 (27). There are 247 Confined Animal Feeding Operations (CAFO) in the watershed, with a total of 229,033 animal units. Eighty-three percent of the CAFOs are swine and the remaining 17 percent are split between swine-cattle operations, poultry, and cattle (28). There are 32 Animal Feeding Operations (AFO) in the watershed, with a total number of 5,513 animal units. Fifty-six percent of the AFOs are cattle, 13 percent swine, and 31 percent are split between a mixture of poultry, horse, swine, and cattle operations (29).

Resource Concerns (continued)

Iowa Rapid Watershed Assessment
 Iowa River, Lower - Confined Animal Feeding Operations



*Animal Units (AU): A unit of measure developed to compare differences in the amount of manure produced by a species. One animal unit is standardized as the amount of manure produced on a regular basis by a slaughter steer/heifer (1000 lb).

Data Source: Iowa Geological and Water Survey, DNR.
 February 09, 2010. This file contains locations of confinement feeding operations that are known by the Iowa DNR, Iowa City, IA.

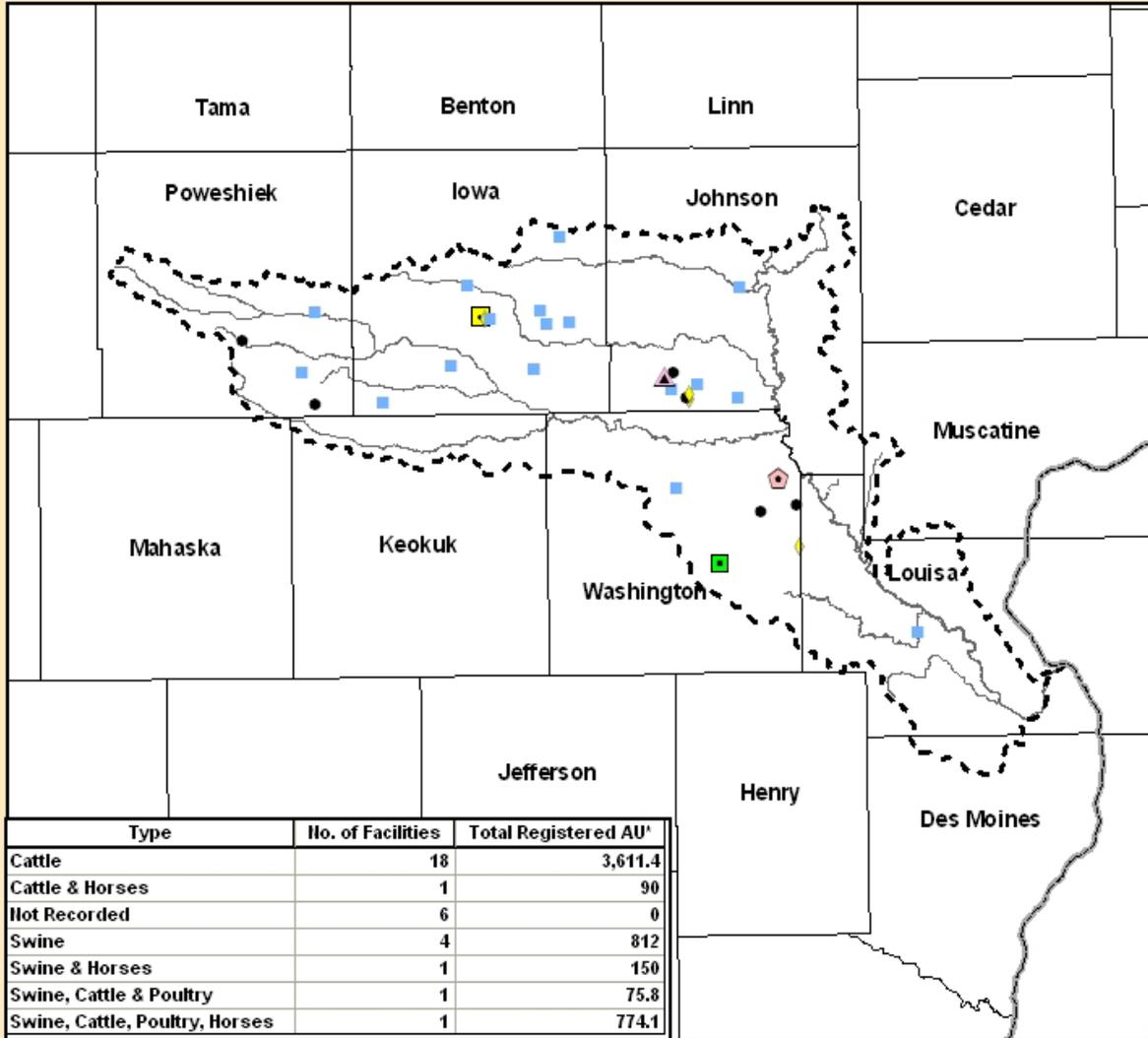
Legend

- State Boundary
 - County Boundary
 - Iowa River, Lower, Basin
 - Major Rivers/Streams
- Confined Operations Type**
- Cattle
 - Not Recorded
 - Poultry
 - Swine
 - Swine & Cattle
 - Swine & Poultry



Resource Concerns (continued)

Iowa Rapid Watershed Assessment
Iowa River, Lower - Open Lot Animal Feeding Operations



*Animal Units (AU): A unit of measure developed to compare differences in the amount of manure produced by a species. One animal unit is standardized as the amount of manure produced on a regular basis by a slaughter steer/heifer (1000 lb).

Data Source: Iowa Geological and Water Survey, DNR.
February 09, 2010. This file contains locations of open lot feeding operations that are known by the Iowa DNR, Iowa City, IA.

Legend

- State Boundary
- County Boundary
- Iowa River, Lower, Basin
- Major Rivers/Streams

Open Lot Operations

Type

- Cattle
- Cattle & Horses
- No AUs Recorded

- Swine
- Swine & Horses
- Swine, Cattle & Poultry
- Swine, Cattle, Poultry, Horses



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
	Stream Bank		X	X	
Water Quality, Surface	Excessive Nutrients & Organics	X	X		
	Excessive Suspended Sediment & Turbidity	X			X
Water Quality, Ground	Excessive Nutrients & Organics	X	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	X	
Domestic Animals	Inadequate Quantity & Quality Feed & Forage		X		
	Inadequate Stock Water		X		
Air Quality	Excessive Green House Gas (CO2)				X
Wildlife	Inadequate Cover & Shelter			X	
	T & E Species			X	
	Inadequate Food			X	

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

Special Considerations

With over nine percent of the watershed included in an urban land use, unique resource concerns exist. Resource concerns in urban and developing areas include ephemeral gully erosion, classic gully erosion, excessive suspended sediment and turbidity in surface water, excessive nutrients and organics in surface water, and excessive runoff, flooding or ponding. These concerns exist on developing, newly developed, and existing urban areas. According to the Environmental Protection Agency (EPA), non-porous urban landscapes impede runoff from slowly percolating into the ground, therefore, water remains above the surface, where it accumulates and runs off in large amounts.

Cities install storm sewer systems that quickly channel this runoff from roads and other impervious surfaces. When water leaves the storm water system and empties into a stream or river, large volumes of quickly flowing runoff erodes stream banks and damages streamside vegetation. Also, discharged storm water tends to have higher temperatures resulting from heating on impervious surfaces. Native fish and other aquatic species cannot survive in urban streams severely impacted by urban runoff (13).

Urban runoff increases the variety and amount of pollutants transported to receiving waters. Sediment from development and new construction, oil, grease, toxic chemicals from automobiles, nutrients and pesticides from turf management and gardening, viruses and bacteria from failing septic systems, road salts, and heavy metals are examples of pollutants generated in urban areas (13). Urban runoff most dramatically impacts urbanizing smaller watersheds with higher percentages of urban land compared to large watersheds (many times over 30%). These types of streams experience frequent localized flooding that is aggravated by urban runoff (13).

Some of the conservation practices implemented on urban areas include: bio-retention (rain gardens); bio-swales; soil quality restoration; permeable pavements; storm water wetlands; wet detention ponds; and native landscaping. During active development or construction of new urban areas in which land use is being converted, practice implementation includes silt fence, sediment basins, temporary seeding, mulching, polymers, rolled erosion control products (i.e. blankets), and compost blankets. (21)

Levee and drainage laws in Iowa are contained in the *Code of Iowa*. Chapter 465 applies to individual levee and drainage rights, including tile drainage. Chapter 455 applies to levee and drainage districts, and Chapter 455B applies to the Department of Natural Resources.

Legal levee and drainage districts are formed according to state laws. Chapter 455 of the *Code of Iowa* applies to formation by County Board of Supervisors of legal levee and drainage districts. Two or more landowners can petition for the formation of a drainage district, and single individuals can petition for sub-districts (10). Once established, construction, installation, and maintenance is under the direct control of the County Board of Supervisors or Drainage District Trustees.

Special Considerations (continued)

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. (11)

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"). (11)

IDNR's SWP Program has developed a list of Priority Community Water Supplies. The Iowa River - Lower Watershed has no Priority SWP communities identified. However, the watershed has about 10 communities in the watershed identified as having possible highly susceptible systems. These communities are identified by the DNR SWP Program as highly susceptible based the geologic characteristics of the aquifer and is independent of well vulnerability. (11)

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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