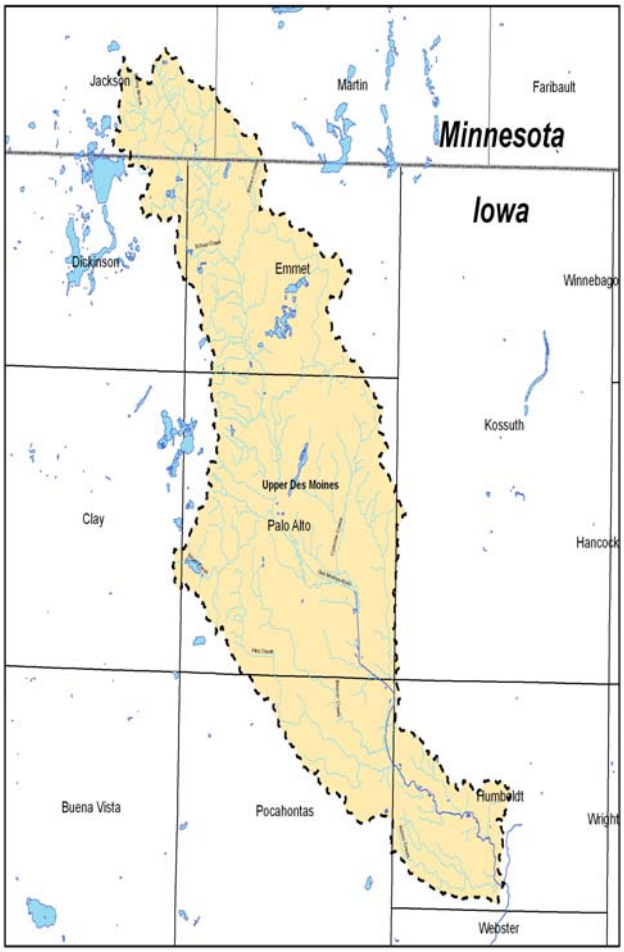
United States Department of Agriculture
Natural Resources Conservation Service
Iowa

Upper Des Moines River – 07100002
8-Digit Hydrologic Unit Profile

November 2008



The Upper Des Moines 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 Upper Des Moines River 8-Digit Hydrologic Unit Code (HUC) watershed contains 688,165 acres. Eight percent of the watershed is in the counties of Jackson and Martin in Minnesota, and the following counties in Iowa: 22 percent in Emmet County, 45 percent in Palo Alto County, 11 percent in Pocahontas County, 11 percent in Humboldt County, and the remaining 3 percent is split between Clay, Dickinson, and Kossuth counties (*1*). Two and one half percent of the watershed is publicly owned, 97.3 percent is privately owned, and 0.1 percent is tribally owned by the Sac and Fox Tribe of the Mississippi in Iowa (*2*).

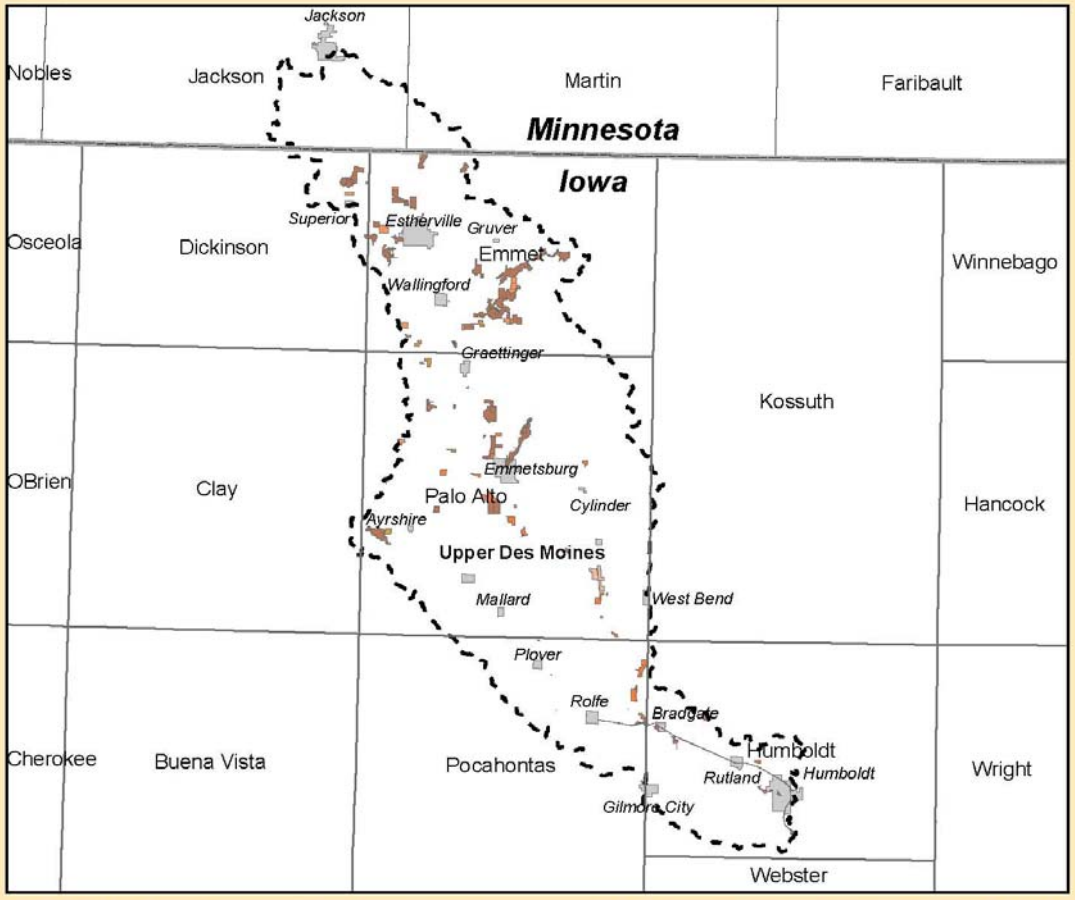
Eighty-two percent of the watershed is in row crop, 7.6 percent is pasture or hayland, 3.3 percent in woodland, natural area, or wetland, 1.0 percent is water, and 5.7 percent is developed or urban areas (*3*).

Elevations range from 1562 feet to 1024 feet (*4*). The primary Land Capability Class in the watershed is class 2. The Land Capability Class (LCC) breakdown for the watershed is: 18.7 percent in class 1; 58.2 percent in class 2; 18.1 percent in class 3; 1.1 percent in class 4; 1.4 percent in class 5; and the remaining 1.4 percent is split between classes 6, 7, and 8 (*5*). Rainfall ranges from 29 to 33 inches per year (6). The HUC includes five state highways (3, 4, 9, 10, and 15) and three US highways (18, 71, and 169) (*7*).

Conservation assistance is provided by 9 Soil and Water Conservation Districts (SWCD) and 9 Natural Resources Conservation Field Offices (NRCS), which are mutually located in the towns of Lakefield and Fairmont in Minnesota, and in Iowa are located in Spirit Lake, Estherville, Spencer, Emmetsburg, Algona, Pocahontas, and Humboldt. Four Resource Conservation and Development offices (RC&D) cover the watershed. In Minnesota they are Coteau Des Prairies RC&D (applicant status) located in Marshall and Three Rivers RC&D located in St. Peter. Counties in Iowa are covered by Iowa Lakes RC&D in Spencer and Prairie Partners RC&D in Humboldt. An office locator is found at http://offices.sc.egov.usda.gov/locator/app

The Upper Des Moines HUC includes 72 NRCS conservation easements totaling 8581.2 acres. The easements include the Wetlands Reserve Program (WRP), Emergency Watershed Program (EWP), and Emergency Wetland Reserve Program (EWRP) programs. Eight and one-half percent of the easements are in Dickinson County, 22.4 percent in Emmet County, 66.5 percent in Palo Alto County, and 2.6 percent in Pocahontas County (*8*).

Iowa Rapid Watershed Assessment
Upper Des Moines River - Ownership/Stewardship



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

Owner	No. Of Areas	Acres
County Conservation Board	59	3,519
FWS	18	1,660
Iowa DNR	65	12,514
Privately Managed Conservations Area	11	869
Tribal	1	726
Private Agricultural Land	0	654,295
Municipal Areas	22	14,783

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

Total Acres in Upper Des Moines Watershed - 688,365
Municipal City Boundary Acres - 14,520 (2.1% of basin)
GAP Stewardship Acres - 19,287(2.8% of basin)
Private Agricultural Land Acres- 654,558 (95.1%)

Miles
0 10 20

Legend

State Boundary
County Boundary - IA
Upper Des Moines River Basin
Cities-Towns U. DSM

Stewardship - U. DSM
OWNGROUP
Co. Cons. Board
FWS
Iowa DNR
Private
Tribal

NRCS Natural Resources Conservation Service
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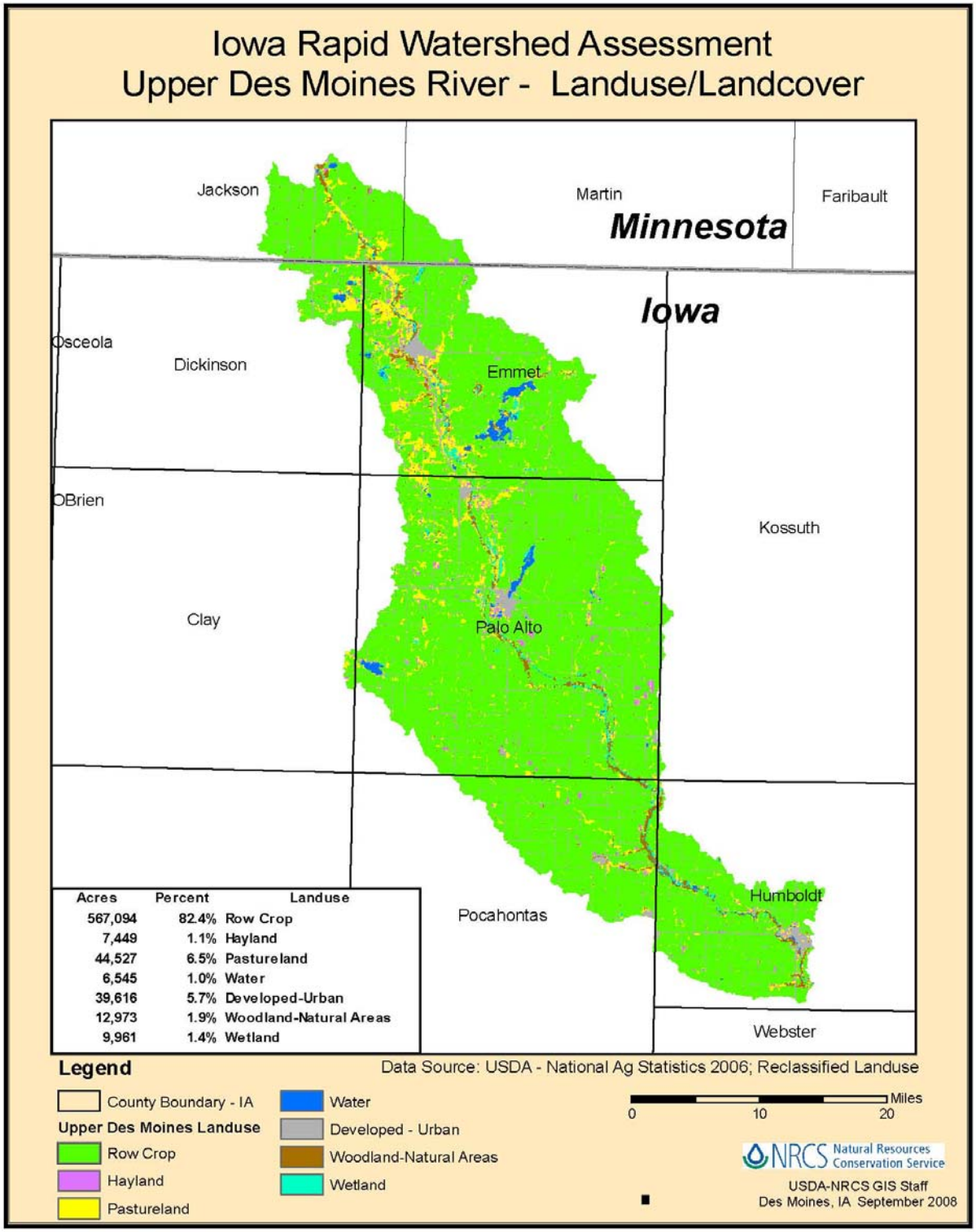
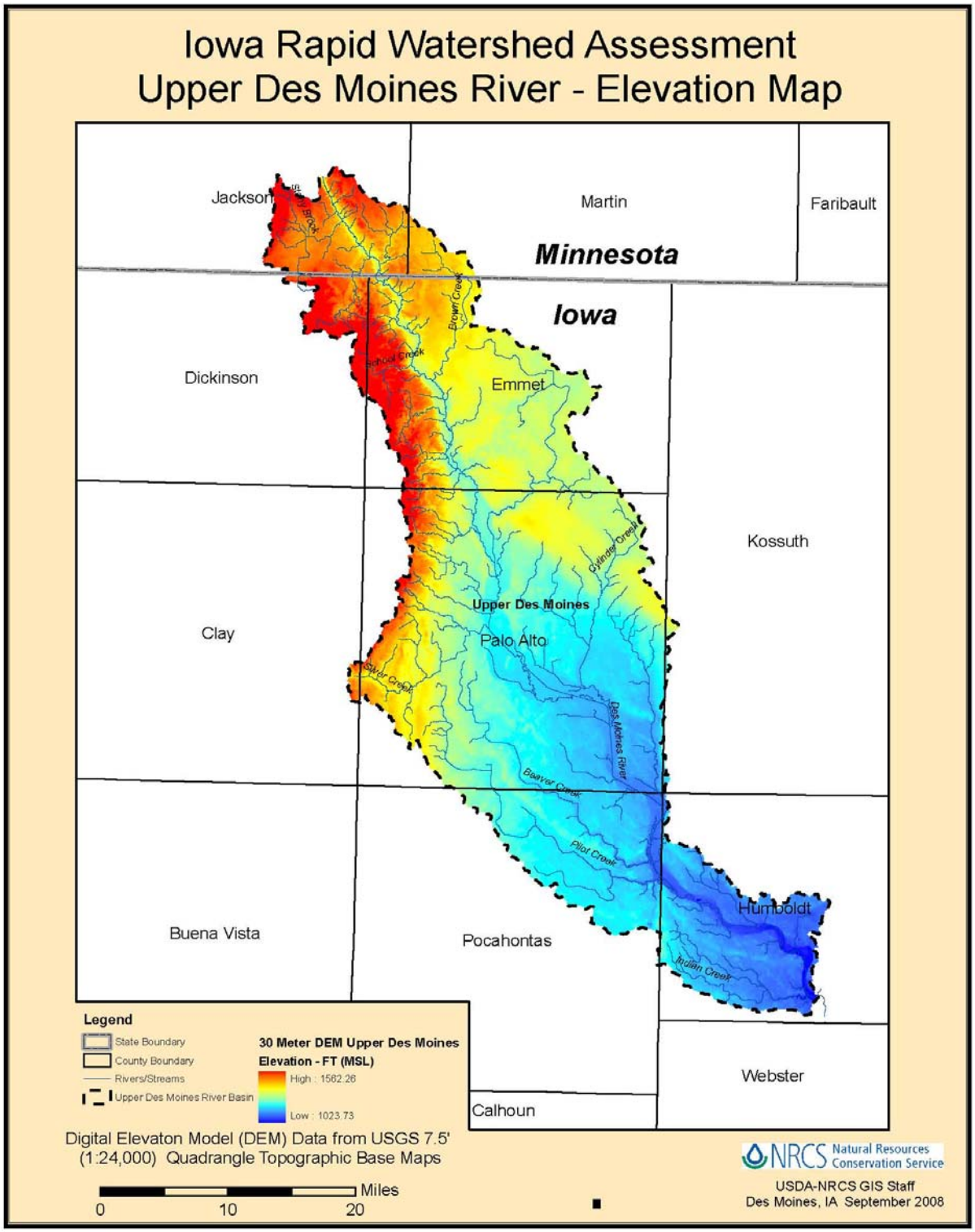
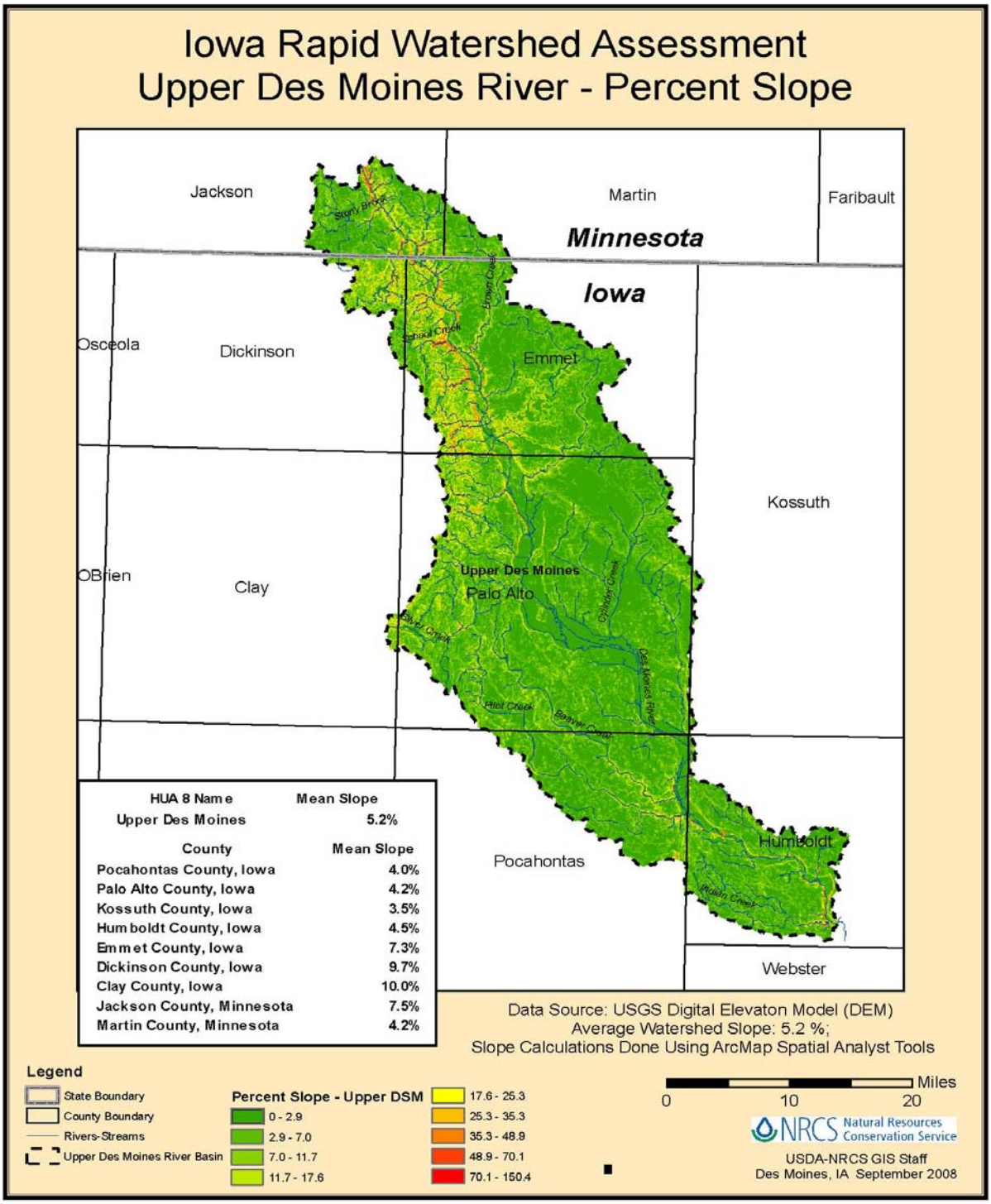
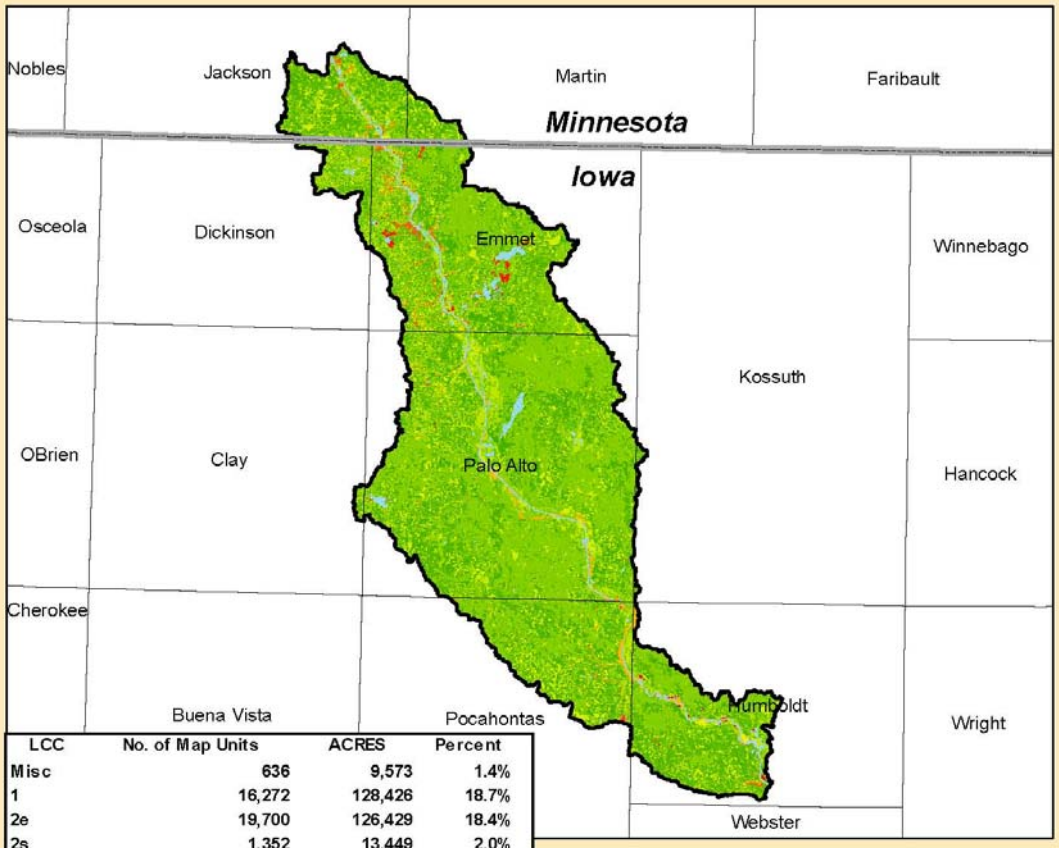

Iowa Rapid Watershed Assessment
Upper Des Moines River - Landuse/Landcover
Jackson
Martin
Faribault
Minnesota
Iowa
Osceola
Dickinson
Emmet
OBrien
Kossuth
Clay
Palo Alto
Pocahontas
Humboldt
Webster
Acres Percent Landuse
567,094 82.4% Row Crop
7,449 1.1% Hayland
44,527 6.5% Pastureland
6,545 1.0% Water
39,616 5.7% Developed-Urban
12,973 1.9% Woodland-Natural Areas
9,961 1.4% Wetland
Legend
County Boundary - IA
Upper Des Moines Landuse
Row Crop
Hayland
Pastureland
Water
Developed - Urban
Woodland-Natural Areas
Wetland
Data Source: USDA - National Ag Statistics 2006; Reclassified Landuse
0
10
20
Miles
NRCS Natural Resources Conservation Service
USDA-NRCS GIS Staff
Des Moines, IA September 2008


Iowa Rapid Watershed Assessment
Upper Des Moines River - Elevation Map
Jackson
Martin
Faribault
Minnesota
Iowa
Dickinson
Emmet
Kossuth
Clay
Palo Alto
Upper Des Moines
Buena Vista
Pocahontas
Humboldt
Webster
Calhoun
Brown Creek
School Creek
Cylinder Creek
Silver Creek
Des Moines River
Beaver Creek
Pilot Creek
Indian Creek
Legend
State Boundary
County Boundary
Rivers/Streams
Upper Des Moines River Basin
30 Meter DEM Upper Des Moines
Elevation - FT (MSL)
High : 1562.26
Low : 1023.73
Digital Elevaton Model (DEM) Data from USGS 7.5'
(1:24,000) Quadrangle Topographic Base Maps
Miles
0
10
20
NRCS Natural Resources Conservation Service
USDA-NRCS GIS Staff
Des Moines, IA September 2008

The average slope is 5.2 percent (*11*).



Iowa Rapid Watershed Assessment
Upper Des Moines - Land Capability Class



LCC	No. of Map Units	ACRES	Percent
Misc	636	9,573	1.4%
1	16,272	128,426	18.7%
2e	19,700	126,429	18.4%
2s	1,352	13,449	2.0%
2w	13,358	260,111	37.8%
3e	14,302	64,967	9.4%
3s	1,280	14,200	2.1%
3w	10,145	45,090	6.6%
4e	1,555	6,252	0.9%
4s	241	1,300	0.2%
4w	20	261	0.0%
5w	253	9,508	1.4%
6e	449	2,526	0.4%
6s	71	176	0.0%
7e	336	3,126	0.5%
7s	20	392	0.1%
7w	128	2,055	0.3%
8s	25	523	0.1%

*Misc - Includes Water, Pits, Lagoons, Quarries and Orthents, Loamy type soil

Miles
0 10 20 40

Legend

State Boundary
Watershed Basin
County Boundary
Land Capability Class

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

Data Source: Iowa USDA-NRCS Soil Survey
Des Moines, Iowa, July 2008. Summarized data
from individual County SSURGO data sets.

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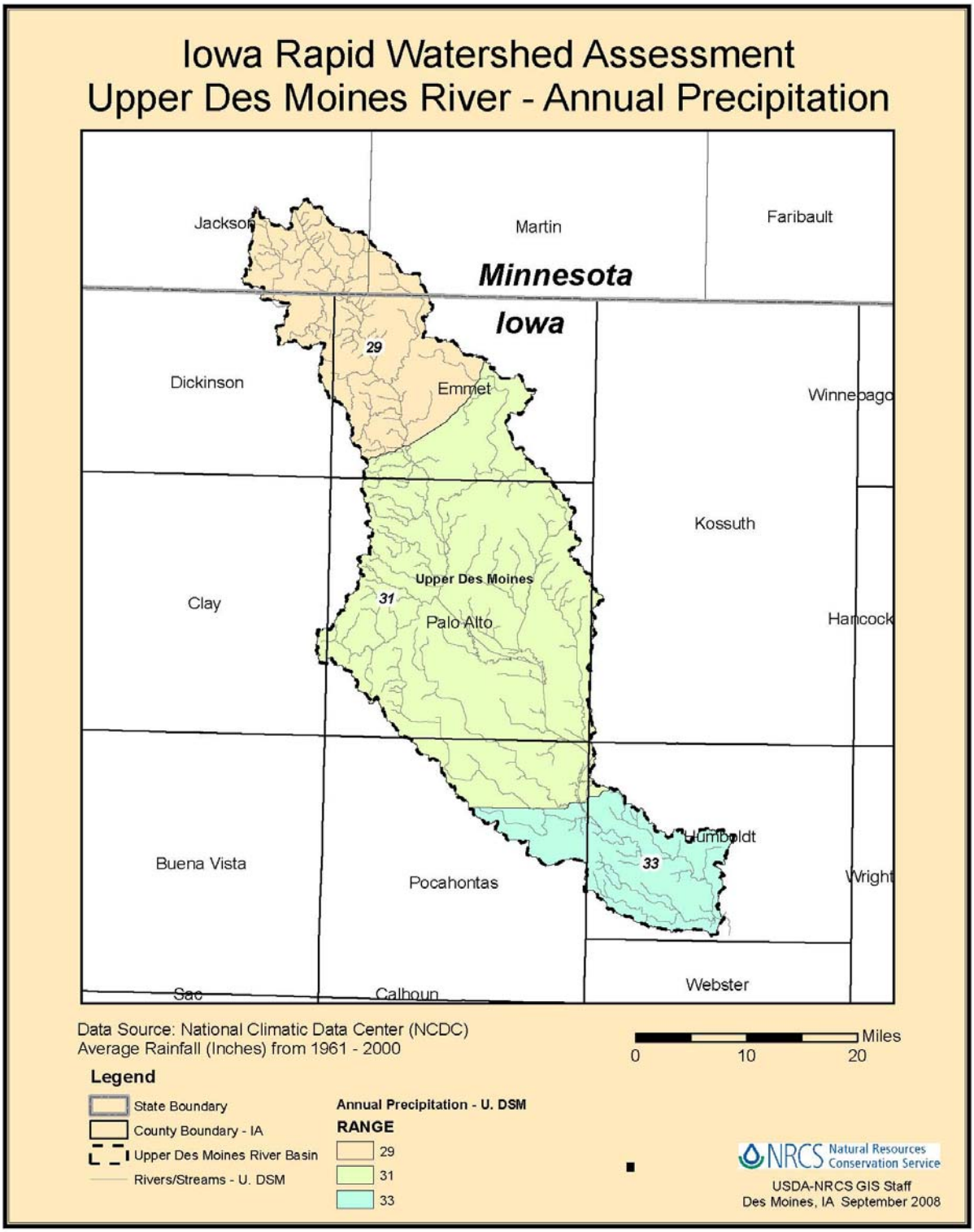
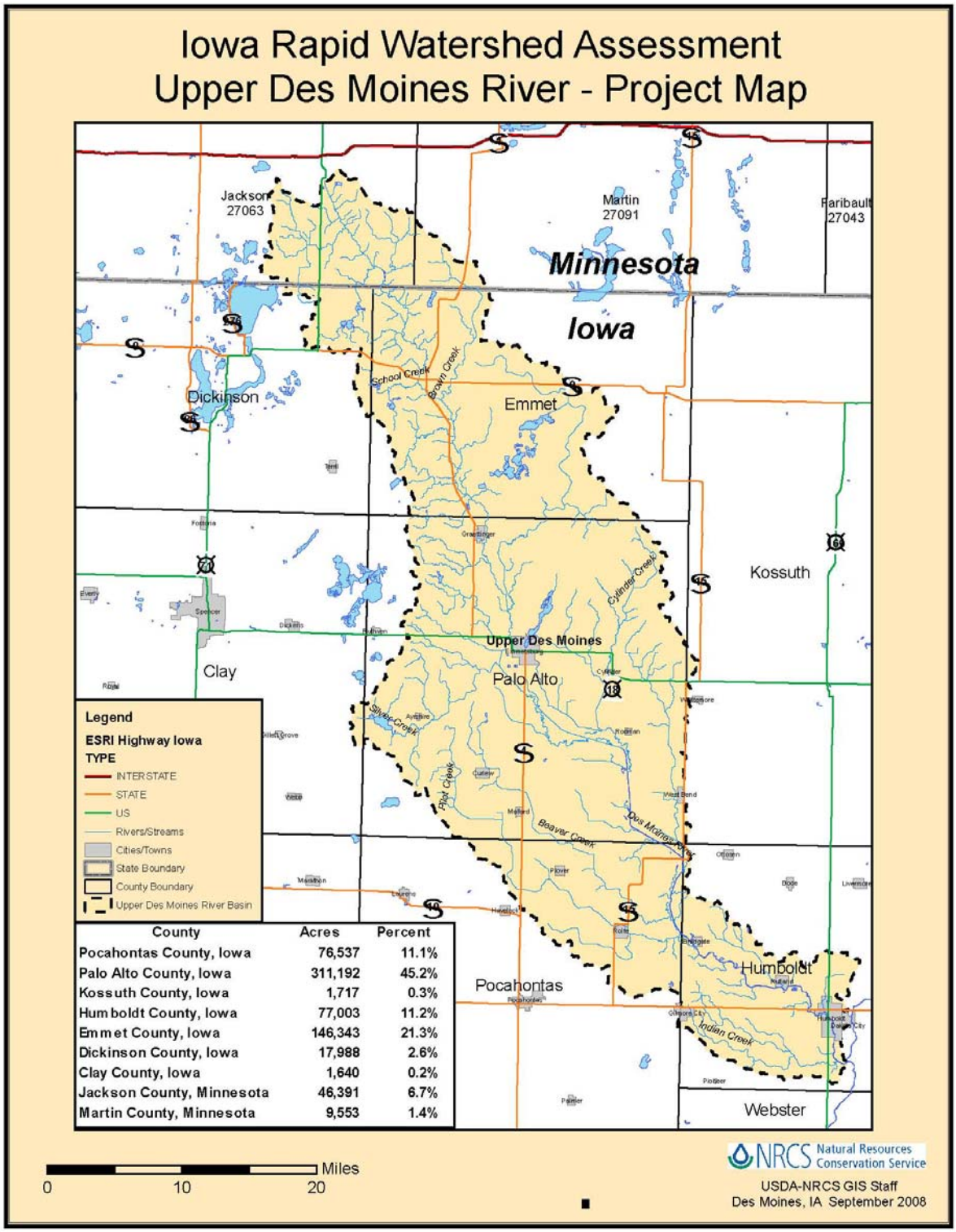
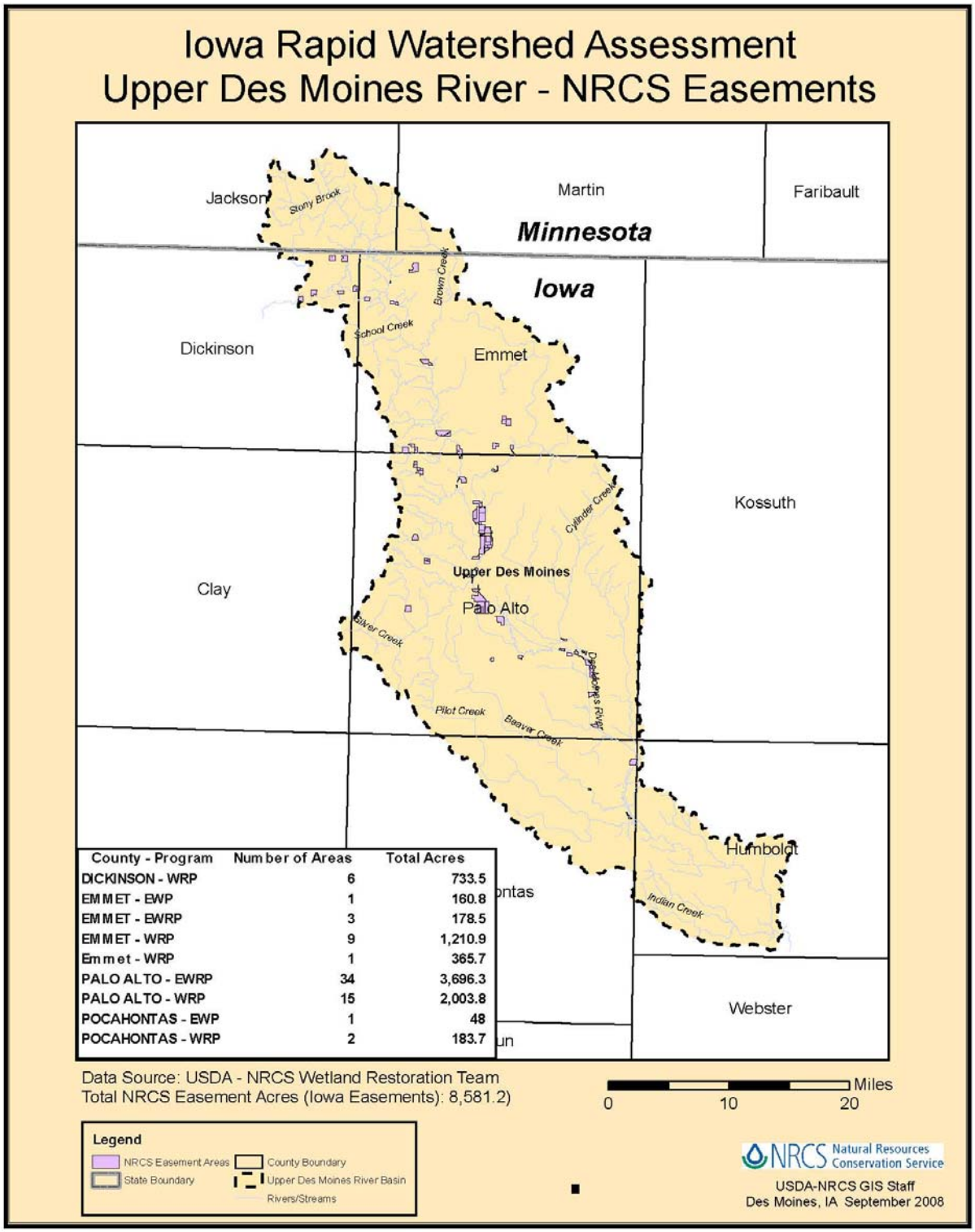
Des Moines, IA October 2008


Iowa Rapid Watershed Assessment
Upper Des Moines River - Annual Precipitation
Jackson
Martin
Faribault
Minnesota
Iowa
29
Dickinson
Emmet
Winnebago
Kossuth
Upper Des Moines
31
Clay
Palo Alto
Hancock
Humboldt
33
Buena Vista
Pocahontas
Wright
Sac
Calhoun
Webster
Data Source: National Climatic Data Center (NCDC)
Average Rainfall (Inches) from 1961 - 2000
Miles
0
10
20
Legend
State Boundary
County Boundary - IA
Upper Des Moines River Basin
Rivers/Streams - U. DSM
Annual Precipitation - U. DSM
RANGE
29
31
33
NRCS Natural Resources Conservation Service
USDA-NRCS GIS Staff
Des Moines, IA September 2008



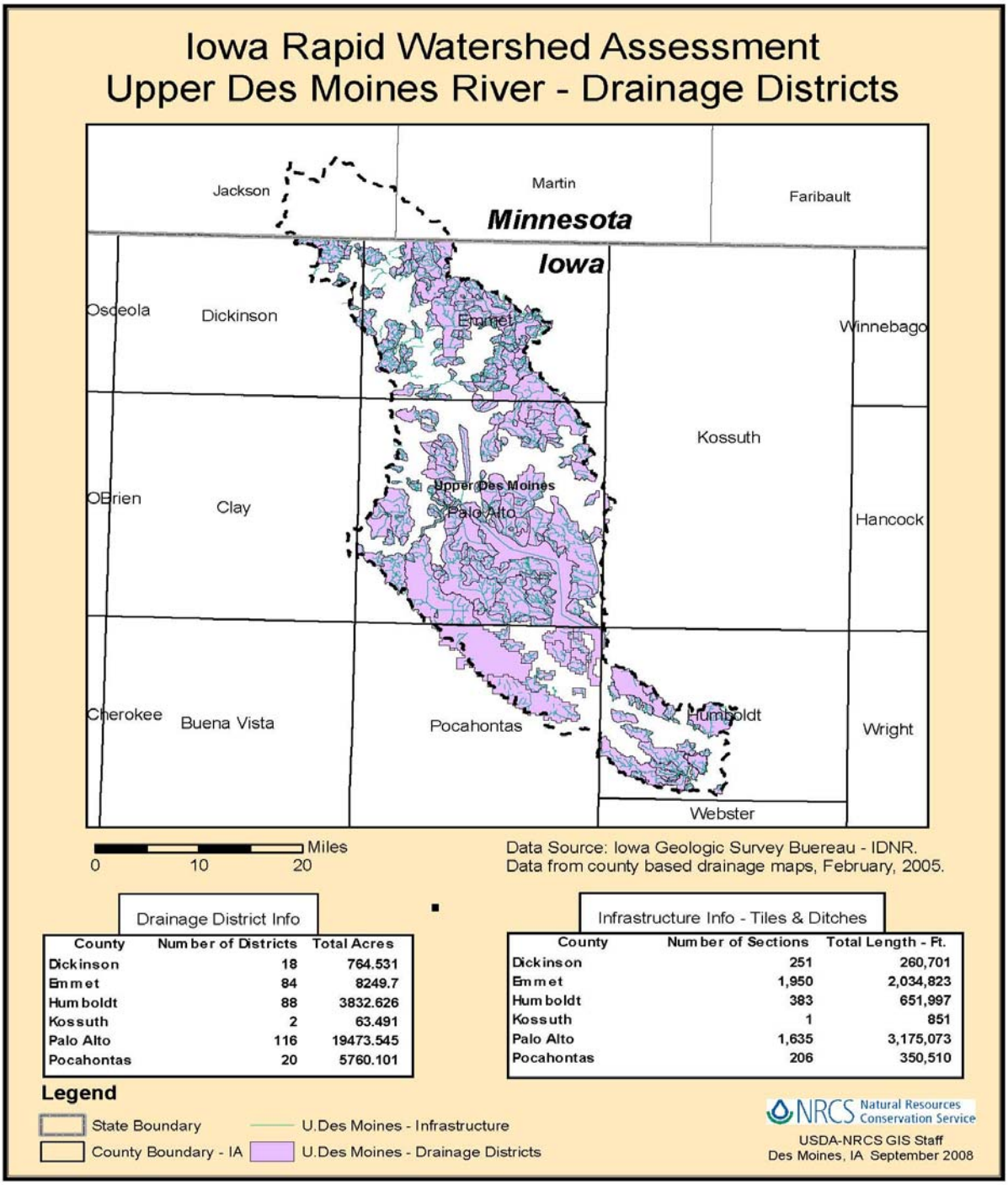
County	Acres	Percent
Pocahontas County, Iowa	76,537	11.1%
Palo Alto County, Iowa	311,192	45.2%
Kossuth County, Iowa	1,717	0.3%
Humboldt County, Iowa	77,003	11.2%
Emmet County, Iowa	146,343	21.3%
Dickinson County, Iowa	17,988	2.6%
Clay County, Iowa	1,640	0.2%
Jackson County, Minnesota	46,391	6.7%
Martin County, Minnesota	9,553	1.4%



County - Program	Number of Areas	Total Acres
DICKINSON - WRP	6	733.5
EMMET - EWP	1	160.8
EMMET - EWRP	3	178.5
EMMET - WRP	9	1,210.9
Emmet - WRP	1	365.7
PALO ALTO - EWRP	34	3,696.3
PALO ALTO - WRP	15	2,003.8
POCAHONTAS - EWP	1	48
POCAHONTAS - WRP	2	183.7

Physical Description

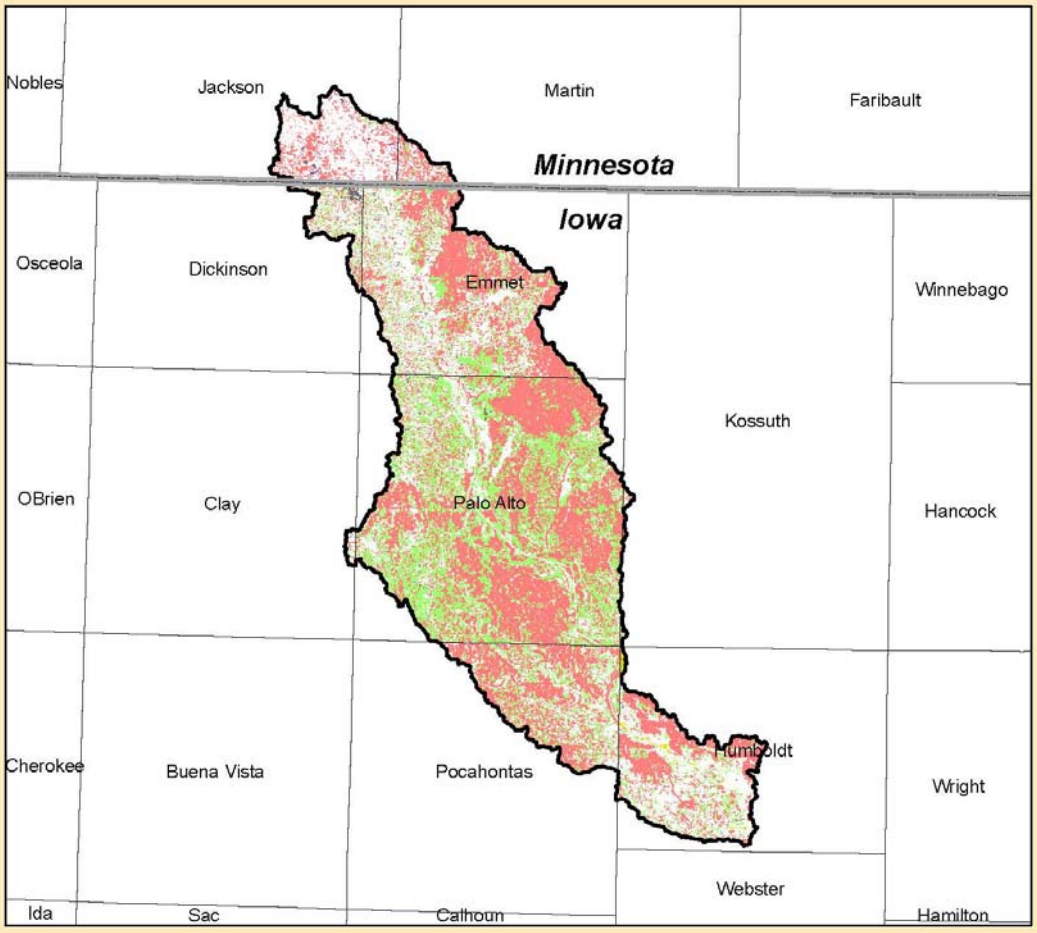
There are 328 drainage districts in the HUC. Two percent of the districts are located in Dickinson County, 21.6 percent in Emmet County, 10 percent in Humboldt County, 0.2 percent in Kossuth County, 51.1 percent in Palo Alto County, and 15.1 percent in Pocahontas County (*9*).



County	Number of Districts	Total Acres
Dickinson	18	764.531
Emmet	84	8249.7
Humboldt	88	3832.626
Kossuth	2	63.491
Palo Alto	116	19473.545
Pocahontas	20	5760.101

County	Number of Sections	Total Length - Ft.
Dickinson	251	260,701
Emmet	1,950	2,034,823
Humboldt	383	651,997
Kossuth	1	851
Palo Alto	1,635	3,175,073
Pocahontas	206	350,510

Iowa Rapid Watershed Assessment
Upper Des Moines - Percent Hydric Soil Components



% Hydric Componets	Acres	% of Watershed
0%	186,932	27.2%
1 - 25%	193,126	28.1%
26 - 50%	1,600	0.2%
51 - 75%	6,658	1.0%
76 - 100%	300,045	43.6%

Legend

State Boundary
Watershed Basin
County Boundary

Hydric Soils Percentage

0
1 - 25
26 - 50
51 - 75
76 - 100

Data Source: Iowa USDA-NRCS Soil Survey Des Moines, Iowa, July 2008. Summarized data from individual County SSURGO data sets.

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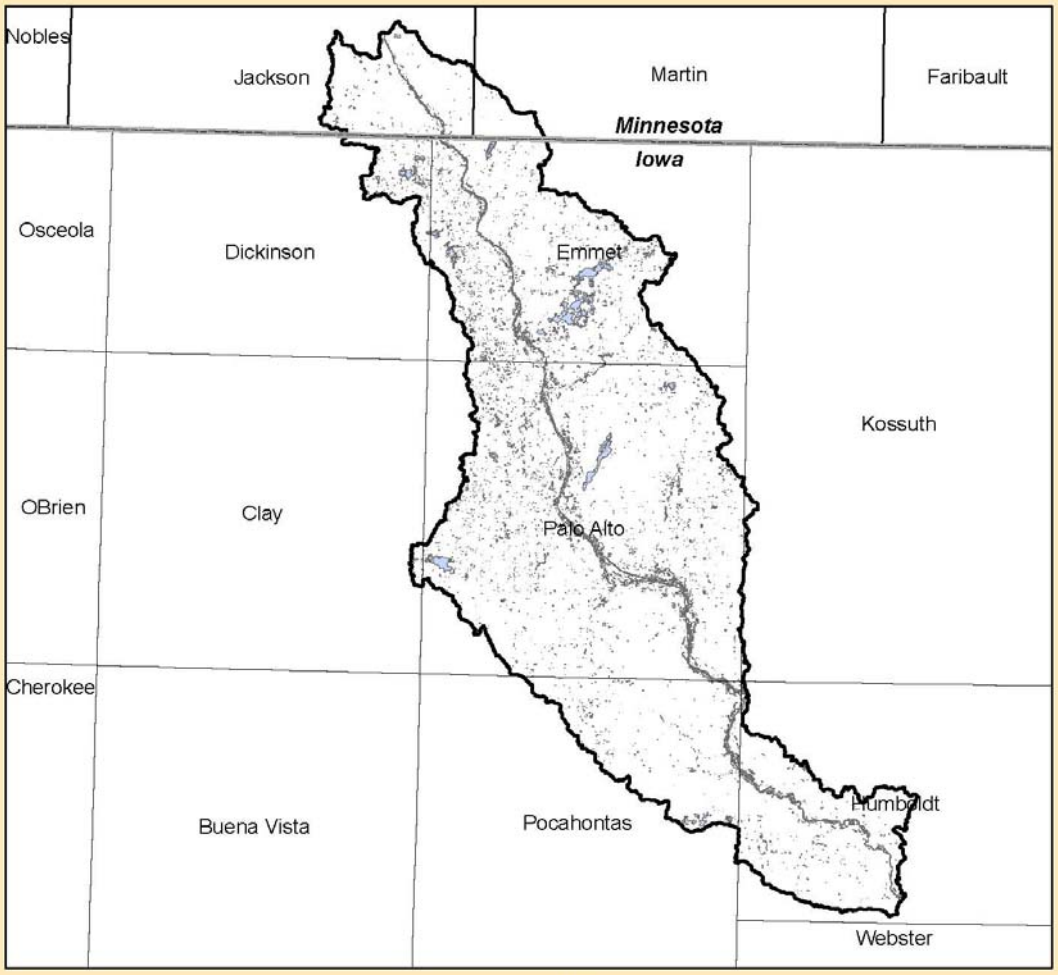
Iowa Rapid Watershed Assessment
Upper Des Moines - National Wetland Inventory



Wetand Type	No. of Areas	Total Acres
Freshwater Emergent Wetland	7,091	9,634
Freshwater Forested/Shrub Wetland	776	3,854
Freshwater Pond	670	1,120
Lake	25	4,410
Other	1	0
Riverine	65	3,221

Legend
- State Boundary
- County Boundary
- Watershed Basin
- Wetland Areas - UDSM

N W E S

NRCS

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..

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Des Moines, IA October 2008

Special Considerations

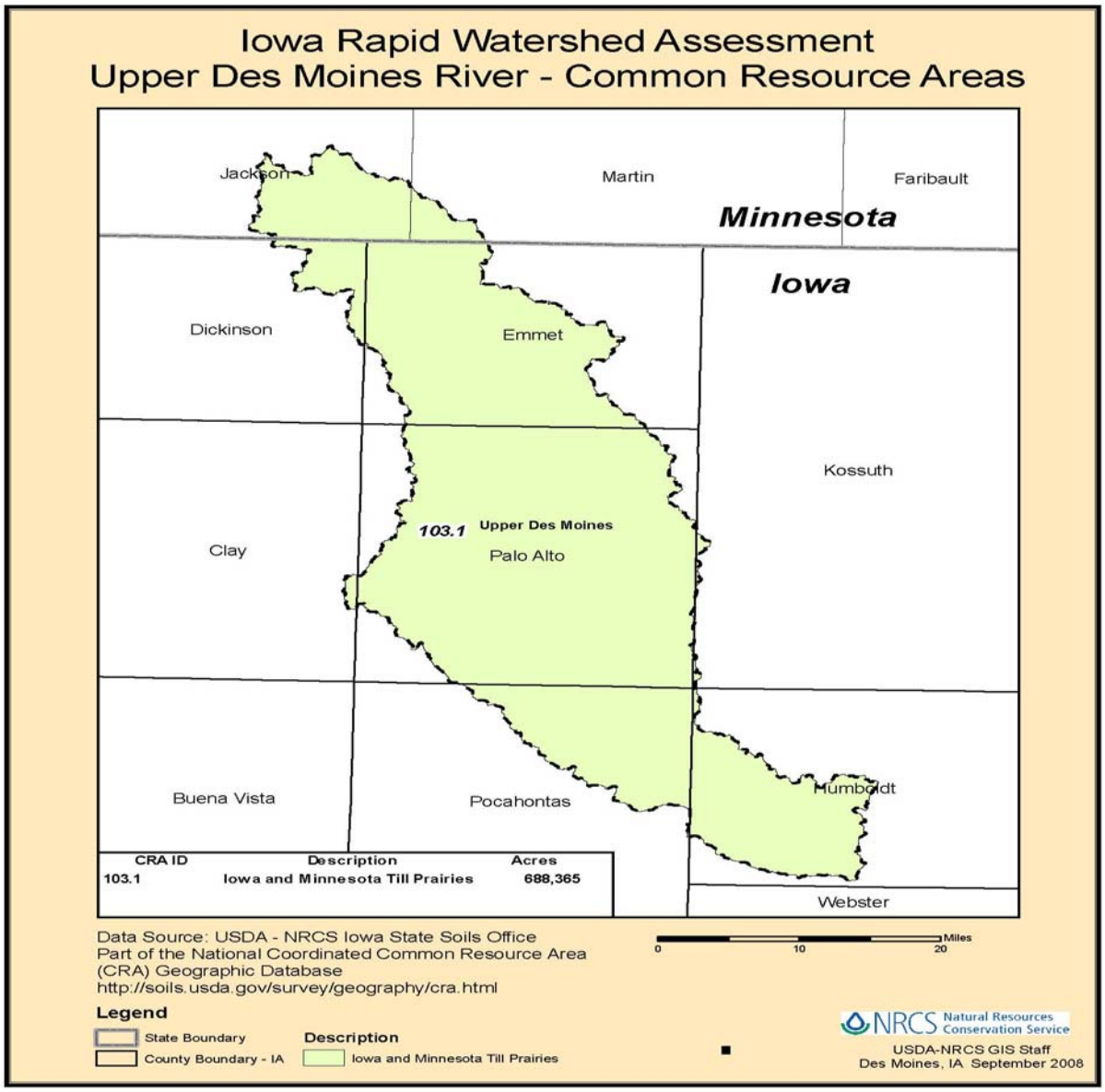
Drainage laws in Iowa are contained in the *Code of Iowa*. Chapter 465 applies to individual drainage rights, including tile drainage. Chapter 455 applies to levee and drainage districts, and Chapter 455B applies to the Department of Natural Resources (*30*).

Legal 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 drainage districts. Two or more landowners can petition for the formation of a drainage district, and single individuals can petition for sub-districts. Once established, installation and maintenance is under the direct control of County Board of Supervisors or Drainage District Trustees (30).

Minnesota Drainage Law is contained in Minnesota Statute Chapter 103.

Common Resource Area Map

The Common Resource Area (CRA) delineated below for the Upper Des Moines River HUC is 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 Common Resource Area (General Manual Title 450, Subpart C, §401.21) (*10*).



Common Resource Area Descriptions (*10*)

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.

103.1 Iowa and Minnesota Till – Prairies

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

Deciduous forest on side slopes. Primary resource concerns are cropland erosion, surface water quality, grazing land and woodland productivity, and soil erosion during timber harvest.

Geology

This watershed is drained by the West Fork of the Des Moines River. Soils and landforms of the watershed developed in deposits laid down by ice and water during the Pleistocene and Holocene Epochs. In most of the watershed, the unconsolidated deposits rest on bedrock of the Dakota Formation, which consists of Cretaceous shale and mudstone with minor sandstone. The lower part of the watershed, in Humboldt County, is underlain by Mississippian limestones and dolomites. The bedrock is buried beneath 100 feet or more of glacial deposits.

The entire RWA area occurs within the boundaries of the Des Moines Lobe landform region of Iowa. Its landscape is the result of separate advances of the surging ice lobe between 12,300 and 13,500 years ago. These advances are marked by the Altamont end moraine complex along the western one-third of the watershed and the Algona end moraine complex in northeast Palo Alto County and western Emmet County. The moraines are wide bands of prominent ridges and high relief hummocky landforms with scattered kames, eskers, and ice-walled lake deposits. Between the moraines, the landscape consists of level till plain, or ground moraine, pocked by kettles (prairie potholes), and areas of glacial lake plain. Elevations in the watershed range from about 1,100 feet to about 1,500 feet.

The surficial deposits in the watershed include 10-30 feet of variable supraglacial till, dense basal till, and a complex suite of sorted sediments — silty lake deposits, sands interstratified with loamy till, and outwash sands and gravels — all late-Wisconsinan in age. Younger deposits of the DeForest Formation occur in stream bottoms and floodplains and were deposited by streams in the last 8,000 years. The Peoria Loess that blankets most of the rest of the state pre-dated the Des Moines Ice Lobe and so has only been found here buried below the younger glacial materials.

Soils are predominantly loams, silt loams and sandy loams formed in glacial till, glacial lacustrine sediments, and outwash. Soils on bottomlands and benches of the Des Moines River valley are mainly sandy loams. Till soils are predominantly poorly drained and somewhat poorly drained, while outwash and alluvial soils are typically well-drained.

Resource Concerns

Resource Concerns by Land Use

Pasture (*12*)

Location is typically along semi wooded riparian areas. Predominant species introduce cool season forages, such as Kentucky Bluegrass and Smooth Bromegrass, with lesser amounts of Tall Fescue and Orchardgrass. Some introduced legumes are present, with White (Ladino) Clover being the most predominant. Some Red Clover, Birdsfoot Trefoil, and Alfalfa are included in lesser amounts. Continuous overgrazing is common.

Typically soil erosion as a result of sheet and rill will be less than1 ton/acre/year. There is some small gully erosion. Stream bank erosion may be significant because grazing animals typically have unlimited access to streams. In time, undesirable woody species may invade older pastures and decrease the productivity of the forage. Soil compaction on cattle paths and around watering sources can increase soil erosion and create a niche for undesirable plant species. Availability of a reliable watering source can be a hindrance to developing rotational grazing.

Hayland (*12*)

Hayland has been seeded to introduce species, predominantly Smooth Bromegrass and Alfalfa. There will also be Orchardgrass and Red Clover to a lesser extent. Erosion is not typically a problem on hayland. Nutrient and Pest Management are often under utilized. Typically, 3 cuttings of hay are taken from May through early September.

Cropland (*13, 14, 15*)

Crops are primarily corn and soybeans, 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.

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. Application of nutrients and pesticides typically does not meet Iowa NRCS standards. Although in recent years, no-till systems on soybean acres have increased, no-till on corn acres has decreased.

Natural Areas/Woodland (*16*)

Natural areas in the Upper Des Moines River Watershed consist of poor quality woodland and degraded meadow found mostly in odd areas along property corners, fence lines, or abandoned pastures. Typically these areas are too steep or wet to be included into cropland or pasture. Vegetation includes a mixture of native trees, shrubs, and/or prairie with a growing undesirable population of introduced and often noxious species of woody and non-woody plants. Predominant resource concerns include invasive species, classic gully erosion, habitat fragmentation, increasing homogeneity, and land use conversion to crop or urban land.

SWAPA+H stands for soils, water, air, plants, animals, and humans. SWAPA+H is used in watershed and ecosystem planning to identify natural systems and how they relate to social and economic conditions. The table below lists the resource concern priorities of stakeholders and landowners in the watershed.

SWAPA + H Concerns Table (*21, 22, 23*)

Resource Concerns/Issues by Land Use					
SWAPA*	Specific Resource Concerns/Issues	Cropland	Pasture	Natural Areas	Farmstead
Soil Erosion	Sheet and Rill	X			
	Ephemeral Gully	X			
	Classic Gully		X	X	
	Streambank		X		
	Wind	X			
Water Quality, Surface	Suspended Sediment & Turbidity	X			
	Pesticides	X			
	Excessive Nutrients & Organics		X		
Water Quality, Ground	Excessive Nutrients & Organics	X			X
Soil Condition	Animal Waste & Other Organics (N,P,K)	X			
Plant Condition	Productivity, Health, and Vigor		X		
	Palatability		X		
Domestic Animals	Inadequate Quantity & Quality Feed & Forage		X		
	Inadequate Stock Water		X		
Air Quality	Particulates, Ammonia, CO2				X
Wildlife	Inadequate cover & shelter			X	
	T & E Species			X	

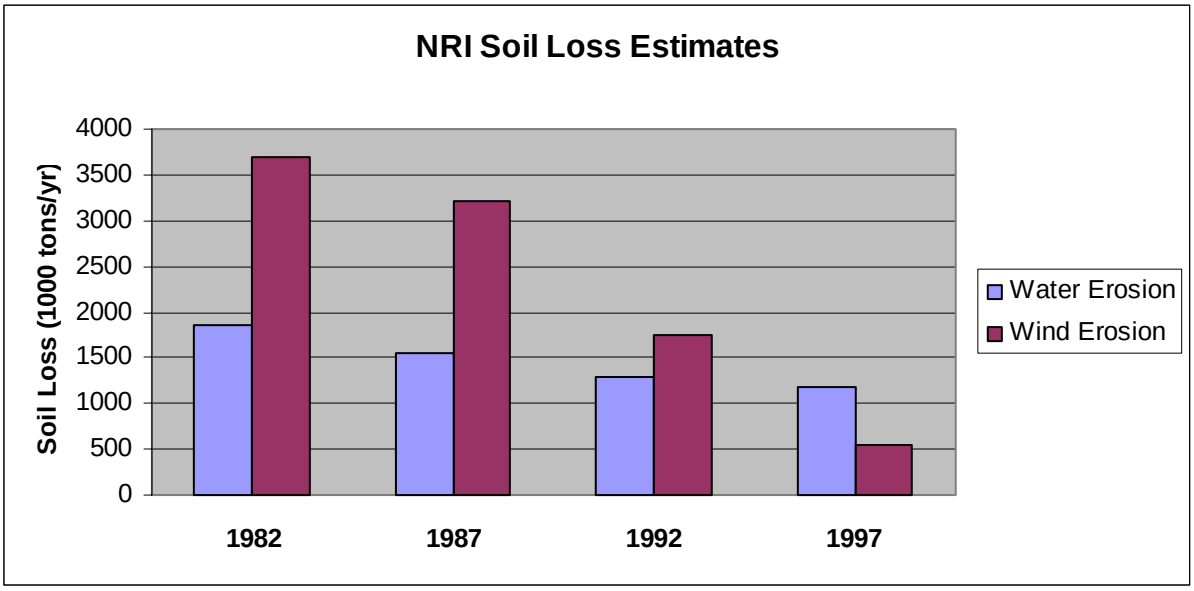
*** SWAPA: - Soil, Water, Air, Plants, and Animals**

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 converted to other uses, such as wildlife habitat. Long term benefits of implemented conservation practices should include increased soil health, improved water quality, increased domestic livestock carrying capacity, better air quality, and diversified wildlife habitat. Other considerations by humans in the watershed should include recreational opportunities, rural and urban land needs, commodity market prices and its relationship to conservation practice costs, farm profitability, and land values.

Soil Loss

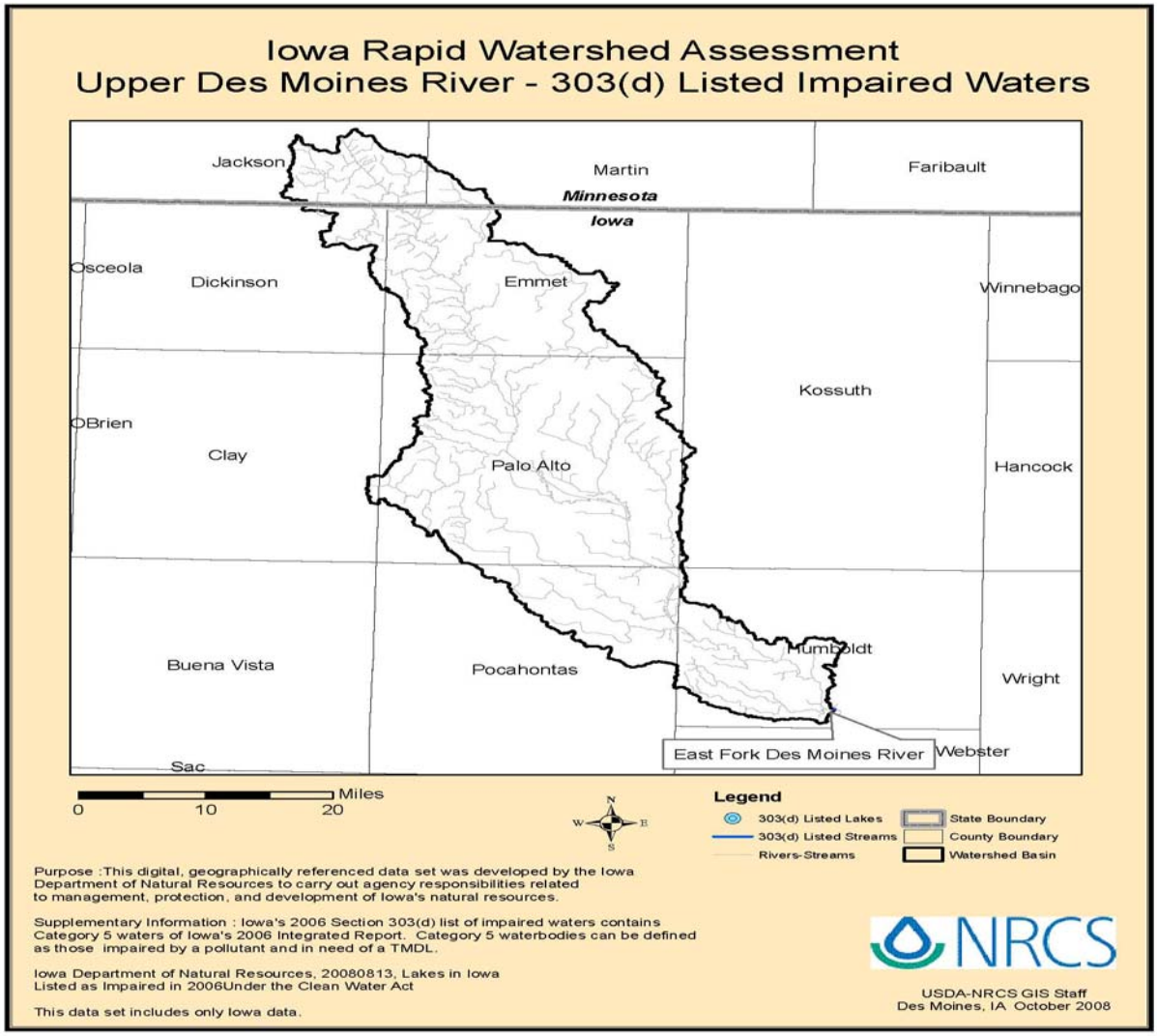
Water erosion (sheet and rill) from cropland accounts for nearly 90 percent of Iowa's soil erosion. In Iowa, there has been a steady decline in sheet and rill erosion from 1982 to 1997, but on average soil erosion remains above the sustainable levels. In order to maintain sustainable levels of soil stability, soil erosion should not exceed 5 tons/acre/year (*18*).

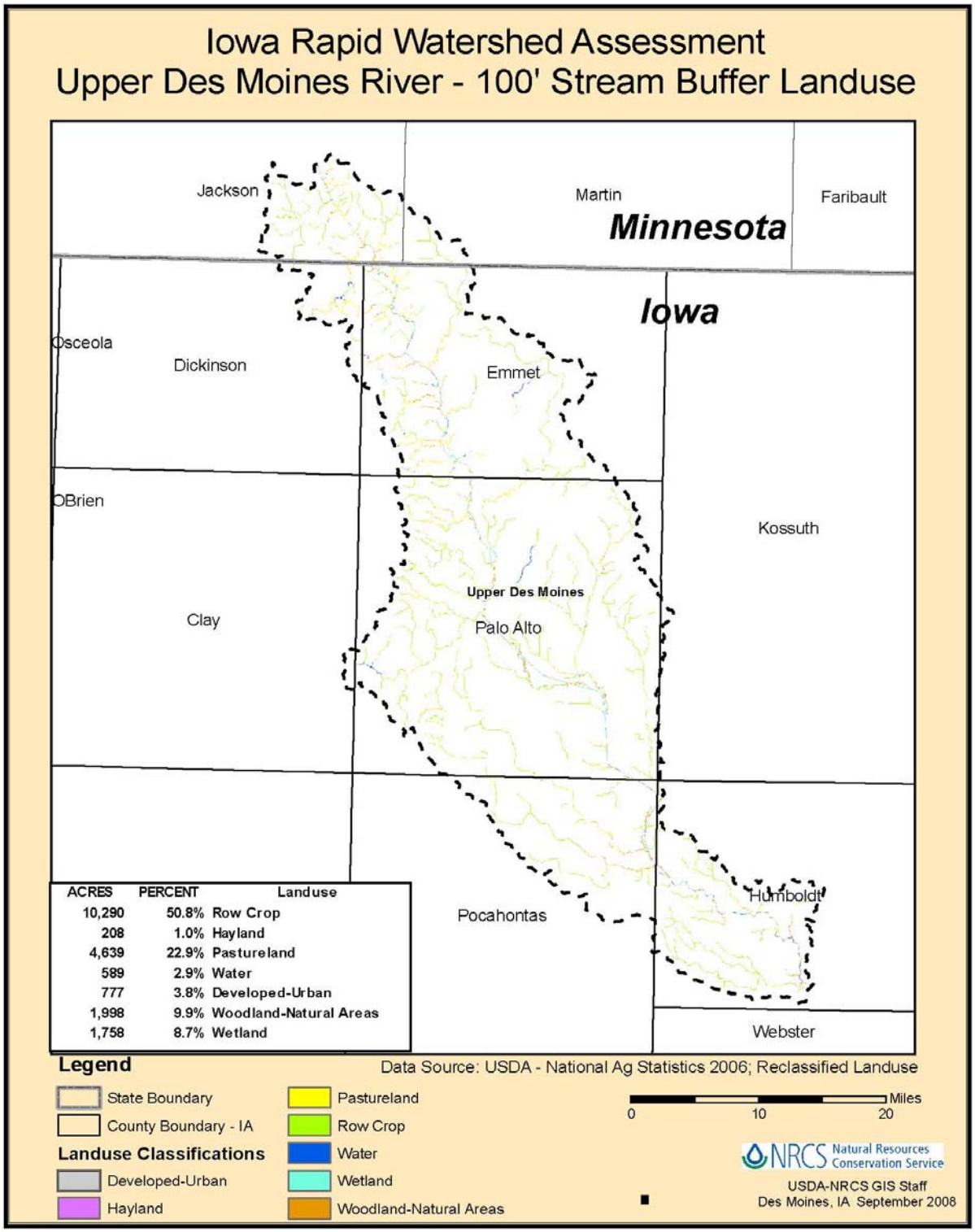
The National Resources Inventory (NRI) estimates for sheet and rill erosion by water on the cropland and pastureland decreased by approximately 684.7 tons (37 percent) of soil loss between 1982 and 1997. NRCS estimates indicate wind erosion rates decreased by 3,130.7 tons (85 percent) between 1982 and 1997 (*18*).



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 waterbodies" and states are required to calculate total maximum daily loads (TMDLs) for pollutants causing impairments *(33)*.




Iowa Rapid Watershed Assessment
Upper Des Moines River - 100' Stream Buffer Landuse
Jackson
Martin
Faribault
Minnesota
Iowa
Osceola
Dickinson
Emmet
OBrien
Kossuth
Upper Des Moines
Clay
Palo Alto
Pocahontas
Humboldt
Webster
ACRES PERCENT Landuse
10,290 50.8% Row Crop
208 1.0% Hayland
4,639 22.9% Pastureland
589 2.9% Water
777 3.8% Developed-Urban
1,998 9.9% Woodland-Natural Areas
1,758 8.7% Wetland
Legend
State Boundary
County Boundary - IA
Landuse Classifications
Developed-Urban
Hayland
Pastureland
Row Crop
Water
Wetland
Woodland-Natural Areas
Data Source: USDA - National Ag Statistics 2006; Reclassified Landuse
Miles
0
10
20
NRCS Natural Resources Conservation Service
USDA-NRCS GIS Staff
Des Moines, IA September 2008

Water Quality Concerns Data Graph/Table (*19*)

Impaired Water Bodies	Stream Miles	Sediment & Siltation	Nutrients	Ammonia	Bacteria & Pathogens	Turbidity	Low Dissolved Oxygen	Flow Alteration	Organic Enrichment	Other Impairments
Brown Creek (UDM-0400_0)	8.0			■			■		■	
Des Moines River (UDM-0100_4)	6.3			■			■		■	
Des Moines River (UDM-0100_3)	17.0			■			■		■	
Five Island Lake (UDM-03850-L_0)			■			■				■
Ingham Lake (UDM-03985-L_0)						■				■
Silver Lake (UDM-1020-L_0)			■			■	■		■	■

Impaired and TMDL Needed

Other Impairments, TMDL not needed

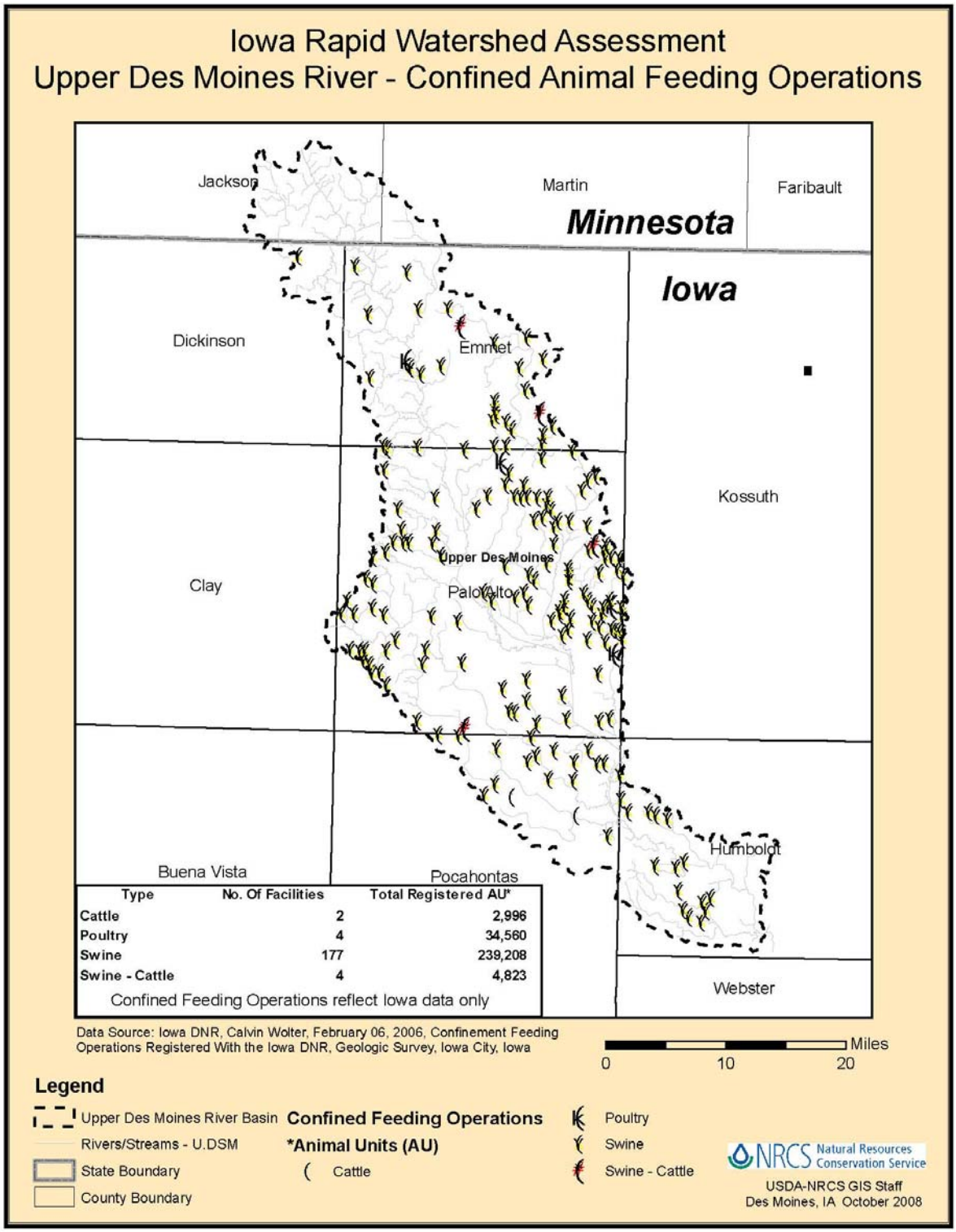
Impaired, TMDL Complete & Approved

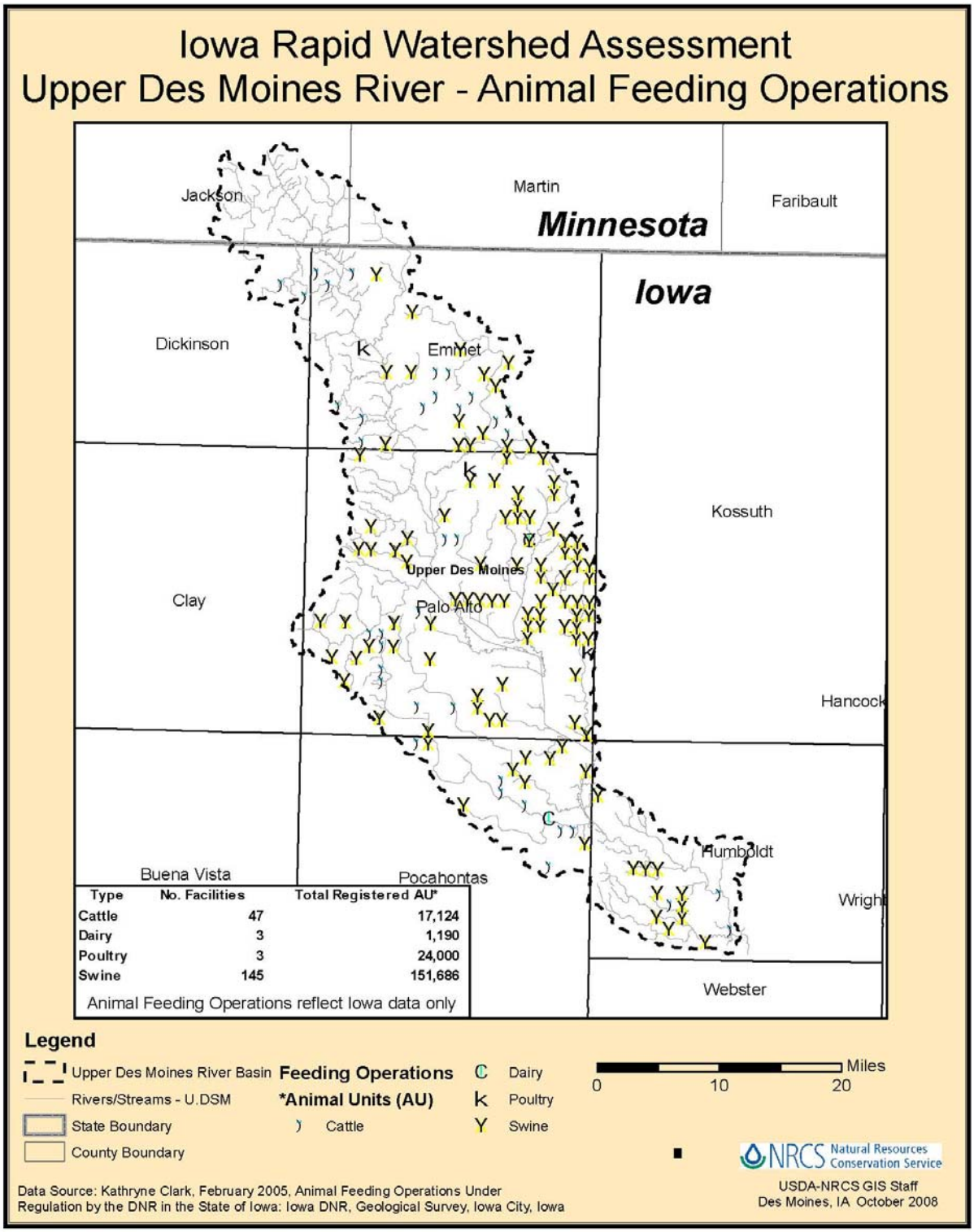
Watershed Projects, Plans, Studies, and Assessments**		
Federal:	***State:***	***Local:***
NRCS Watershed Plans/Studies/Assessments	**IDNR TMDLs**	
West Fork Des Moines Low Head Dam Reconnaissance Study (ACOE and RC&D)	Five Island Lake (PA)	Silver Creek (PA)*
	Ingham Lake (E)	Jack Creek (PA)*
	Silver Lake (PA)	West Fork Des Moines (PA)*
	IDNR 319 Projects	Silver Lake Tributary (PA)*
	Silver Lake (PA)	West For Des Moines (Em)*
		* Water Monitoring

**Listing includes past efforts in the watershed, and ongoing studies and assessments.

Sediment, Nutrients, Pathogens, and their affects are the major pollutants impacting surface waters of the Upper Des Moines River Watershed. Surface waters, especially natural glacial lakes and constructed 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 run off, 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 ground cover has resulted in flashy stream flows, thus contributing to stream down cutting and increased streambank 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*)


Iowa Rapid Watershed Assessment
Upper Des Moines River - Confined Animal Feeding Operations
Jackson
Martin
Faribault
Minnesota
Iowa
Dickinson
Emmet
Kossuth
Upper Des Moines
Clay
Palo Alto
Humboldt
Buena Vista
Pocahontas
Webster
Type | No. Of Facilities | Total Registered AU*
Cattle | 2 | 2,996
Poultry | 4 | 34,560
Swine | 177 | 239,208
Swine - Cattle | 4 | 4,823
Confined Feeding Operations reflect Iowa data only
Data Source: Iowa DNR, Calvin Wolter, February 06, 2006, Confinement Feeding Operations Registered With the Iowa DNR, Geologic Survey, Iowa City, Iowa
Miles
0
10
20
Legend
Upper Des Moines River Basin
Rivers/Streams - U.DSM
State Boundary
County Boundary
Confined Feeding Operations
*Animal Units (AU)
Cattle
Poultry
Swine
Swine - Cattle
NRCS Natural Resources Conservation Service
USDA-NRCS GIS Staff
Des Moines, IA October 2008


Iowa Rapid Watershed Assessment
Upper Des Moines River - Animal Feeding Operations
Jackson
Martin
Faribault
Minnesota
Iowa
Dickinson
Emmet
Kossuth
Upper Des Moines
Clay
Palo Alto
Hancock
Humboldt
Buena Vista
Pocahontas
Wright
Webster
Type | No. Facilities | Total Registered AU*
Cattle | 47 | 17,124
Dairy | 3 | 1,190
Poultry | 3 | 24,000
Swine | 145 | 151,686
Animal Feeding Operations reflect Iowa data only
Legend
Upper Des Moines River Basin
Rivers/Streams - U.DSM
State Boundary
County Boundary
Feeding Operations
*Animal Units (AU)
Cattle
Dairy
Poultry
Swine
Miles
0
10
20
NRCS Natural Resources Conservation Service
Data Source: Kathryne Clark, February 2005, Animal Feeding Operations Under Regulation by the DNR in the State of Iowa: Iowa DNR, Geological Survey, Iowa City, Iowa
USDA-NRCS GIS Staff
Des Moines, IA October 2008

Federally Threatened and Endangered Species (17, 25)

	SPECIES	Status			County								
		IA State Level	MN State Level	Federal Level	Jackson (MN)	Martin (MN)	Dickinson	Emmet	Clay	Palo Alto	Kossuth	Pocahontas	Humboldt
Birds	Bald Eagle (Haliaeetus leucocephalus)	E					■		■	■	■		■
	Burrowing Owl (Speotyto cunicularia)		E			■							
	Common Moorhen (Gallinula chloropus)		C		■								
	Forster's Tern (Sterna forsteri)	C	C		■		■		■	■			
	Franklin's Gull (Larus pipixcan)		C		■								
	Henslow's Sparrow (Ammodramus henslowii)	T					■					■	
	King Rail (Rallus elegans)	E	E		■	■			■				
	Long-Eared Owl (Asio otus)	T						■					
	Northern Harrier (Circus cyaneus)	E					■				■	■	
	Short-Eared Owl (Asio flammeus)	E						■			■		
	Trumpeter Swan (Cygnus buccinator)		T		■								
	Wilson's Phalarope (Phalaropus tricolor)		T		■								

Federally Threatened and Endangered Species (17, 25)														
	SPECIES	Status			County									
		IA State Level	MN State Level	Federal Level	Jackson (MN)	Martin (MN)	Dickinson	Emmet	Clay	Palo Alto	Kossuth	Pocahontas	Humboldt
Mammals	Spotted Skunk (Spilogale putorius)	E											
Reptile	Blandings Turtle (Emydoidea blandingii)	T											
Reptile	Smooth Green Snake (Liochlorophis vernalis)	C											
Fish	Blacknose Shiner (Notropis heterolepis)	T											
Fish	Pugnose Shiner (Notropis anogenus)	E											
Fish	Topeka Shiner (Notropis topeka)	T		E									
Fish	Weed Shiner (Notropis texanus)	E											
Mussel	Creeper (Strophitus undulatus)	T											
Mussel	Monkeyface (Quadrula metanevra)		T										
Mussel	Round Pigtoe (Pleurobema coccineum)		T										
Mussel	Mucket (Actinonaias ligamentina)		T										
Mussel	Yellow Sandshell (Lampsilis teres)	E											

Federally Threatened and Endangered Species (17, 25)														
	SPECIES	Status			County									
		IA State Level	MN State Level	Federal Level	Jackson (MN)	Martin (MN)	Dickinson	Emmet	Clay	Palo Alto	Kossuth	Pocahontas	Humboldt
Insects	Arogos Skipper (Atrytone arogos)	C	C		■		■	■	■	■	■		
	Broad-Winged Skipper (Poanes viator)	C					■		■	■	■		
	Byssus Skipper (Problema byssus)	T					■						
	Dakota Skipper (Hesperia dacotae)	E		C			■						
	Dion Skipper (Euphyes dion)	C					■					■	
	Dusted Skipper (Atrytonopsis hianna)	C					■			■			
	Eared False Foxglove (Agalinis auriculata)		E		■								
	Edwards' Hairstreak (Satyrium edwardsii)	C					■						
	Mulberry Wing (Poanes massasoit)	T					■		■	■	■		
	Olympia Marble (Euchloe olympia)	C										■	
	Ottoe Skipper (Hesperia ottoe)		T		■								
	Powesheik Skipperling (Oarisma powesheik)	T	C		■		■	■			■		
	Regal Fritillary (Speyeria idalia)	C	C		■	■	■	■	■	■	■	■	
	Silvery Blue (Glaucopsyche lygdamus)	T					■	■				■	
	Two-Spotted Skipper (Euphys bimacula)	C										■	
	Wild Indigo Dusky Wing (Erynnis baptisiae)	C					■						
	American Ginseng (Panax quinquefolius)		C		■								

Federally Threatened and Endangered Species (17, 25)

	SPECIES	Status			County								
		IA State Level	MN State Level	Federal Level	Jackson (MN)	Martin (MN)	Dickinson	Emmet	Clay	Palo Alto	Kossuth	Pocahontas	Humboldt
Plants (Dicots)	Bicknell Northern Crane's-Bill (Geranium bicknelli)	C						■					
	Blue Giant Hyssop (Agastache foeniculum)	E					■	■					
	Bog Willow (Salix pedicellaris)	T						■					
	Broadleaf Water-milfoil (Myriophyllum heterophyllum)	C							■				
	Brook Lobelia (Lobelia kalmii)	C					■	■	■	■			
	Buckbean (Menyanthes trifoliata)	T					■	■	■	■			
	Clustered Poppy-mallow (Callirhoe alcaeoides)	T					■						
	Coast-Blite Goosefoot (Chenopodium rubrum)	C					■						
	Common Mare's-tail (Hippuris vulgaris)	C					■		■				
	Earleaf Foxglove (Tomanthera auriculata)	C	E			■	■	■	■	■	■	■	
	Flat Top White Aster (Aster pubentior)	C					■	■	■	■			
	Flatleaf Bladderwort (Utricularia intermedia)	C						■	■				
	Fragrant False Indigo (Amorpha nana)	T					■	■	■	■	■	■	
	Golden Corydalis (Corydalis aurea)	T					■						

Federally Threatened and Endangered Species (17, 25)														
	SPECIES	Status			County									
		IA State Level	MN State Level	Federal Level	Jackson (MN)	Martin (MN)	Dickinson	Emmet	Clay	Palo Alto	Kossuth	Pocahontas	Humboldt
Plants (Dicots)	Kitten Tails (Besseya bullii)	T					■	■					
	Lesser Bladderwort (Utricularia minor)	C					■	■	■				
	Limestone Rockcress (Arabis divaricarpa)	C						■					
	Nodding Thistle (Cirsium undulaturm)	C					■						
	One-sided Pyrola (Pyrola secunda)	T						■					
	Pink Milkwort (Polygala incarnata)	T						■		■			
	Prairie Bush Clover (Lespedeza leptostachya)	T	T	T	■	■	■	■	■	■	■	■	■
	Rattle Milk-vetch (Astragalus adsurgens)	C					■						
	Rush Aster (Aster junciformis)	T					■	■					
	Sage Willow (Salix candida)	C						■					
	Sand Cherry (Prunus pumila)	C					■						
	Shadbush (Amelanchier sanguinea)	C							■				
	Shining Willow (Salix lucida)	T					■		■				
	Showy Milkweed (Asclepias speciosa)	T					■	■	■	■			

Federally Threatened and Endangered Species (17, 25)

	SPECIES	Status			County								
		IA State Level	MN State Level	Federal Level	Jackson (MN)	Martin (MN)	Dickinson	Emmet	Clay	Palo Alto	Kossuth	Pocahontas	Humboldt
Plants (Dicots)	Silver Buffalo-berry Spepherdia argentea)	T						■					
	Silverweed (Potentilla answerina)	T					■						
	Small Fringed Gentian (Gentianopsis procera)	C					■	■	■	■			
	Sullivant's Milkweed (Asclepias sullivantii)		T		■	■							
	Tuberous Indian-plantain (Arnoglossum plantagineum)		T			■							
	Water Marigold (Megalodonta beckii)	E					■						
	Water Milfoil (Myriophyllum verticillatum)	C						■					
	Water Parsnip (Berula erecta)	T					■	■	■	■			
	Water Starwort (Callitriche heterophylla)	C					■						
	Waterwort (Elatine triandra)	C					■						
	Western Parsley (Lomatium orientale)	T						■	■				
	White Prairie Aster (Aster falcatus)	C							■	■			
	Wooly Milkweed (Asclepia lanuginosa)	T					■	■	■	■			
	Yellow Monkey Flower (Mimulus glabratus)	T					■	■					

Federally Threatened and Endangered Species (17, 25)

	SPECIES	Status			County								
		IA State Level	MN State Level	Federal Level	Jackson (MN)	Martin (MN)	Dickinson	Emmet	Clay	Palo Alto	Kossuth	Pocahontas	Humboldt
Plants (Monocots)	Alkali Muhly (Muhlenbergia asperifolia)	S					■		■				
	Alpine Rush (Juncus alpinus)	C					■						
	Arrow Grass (Triglochin maritimum)	T					■	■	■	■			
	Back's Sedge (Carex backii)	C						■					
	Beakrush (Rhynchospora capillacea)	T					■	■	■	■			
	Crawe Sedge (Carex crawei)	C						■	■	■			
	Creeping Sedge (Carex chordorrhiza)	E						■					
	Ditch-grass (Ruppia maritima)	C					■						
	Fescue Sedge (Carex festucacea)		T		■								
	Fewflower Spikerush (Eleocharis pauciflora)	C					■	■					
	Glomerate Sedge (Carex aggregata)	C									■		
	Hair-like Beak-Rush (Rhynchospora capillacea)		T		■								
	Hooded Ladies'-Tresses (Spiranthes romanzoffiana)	T					■	■					
	Interrupted Wildrye (Elymus diversiglumis)	C					■	■					

Federally Threatened and Endangered Species (17, 25)														
	SPECIES	Status			County									
		IA State Level	MN State Level	Federal Level	Jackson (MN)	Martin (MN)	Dickinson	Emmet	Clay	Palo Alto	Kossuth	Pocahontas	Humboldt
Plants (Monocots)	Large-Leaf Pondweed (Potamogeton amplifolius)	C					■						
	Leafy Northern Green Orchid (Platanthera hyperborea)	T					■	■	■				
	Lesser Panicled Sedge (Cares diandra)	C						■					
	Low Nut Rush (Scleria verticillata)	T						■	■				
	Meadow Bluegrass (Poa wolfii)	C						■					
	Philadelphia Panic Grass (Panicum philadelphicum)	T					■		■				
	Prairie Bulrush (Scirpus maritimus)	C					■						
	Pod Grass (Scheuchzeria palustris)	C						■					
	Rattlesnake Master (Eryngium yuccifolium)		C		■	■							
	Richardson Sedge (Carex richardsonii)	C						■	■	■	■		
	Shore Sedge (Carex limosa)	C						■					
	Showy Lady's Slipper (Cypripedium reginae)	T						■					
	Slender Arrow Grass (Triglochin palustris)	T					■	■	■	■			
	Slender Cotton Grass (Eriophorum gracile)	T					■	■					

Federally Threatened and Endangered Species (17, 25)														
	SPECIES	Status			County									
		IA State Level	MN State Level	Federal Level	Jackson (MN)	Martin (MN)	Dickinson	Emmet	Clay	Palo Alto	Kossuth	Pocahontas	Humboldt
Plants (Monocots)	Slender Sedge (Carex tenera)	C											
	Slim-leaved Panic Grass (Dichanthelium linearifolium)	T											
	Small White Lady's Slipper (Cypripedium candidum)	C	C										
	Snow Trillium (Trillium nivale)		C										
	Spear Needlegrass (Stipa comata)	C											
	Straight-Leaf Pondweed (Potamogeton strictifolius)	C											
	Tall Cotton Grass (Eriophorum angustifolium)	C											
	Toad Rush (Juncus bufonius)	C											
	Western Prairie Fringed Orchid (Platanthera praeclara)	T		T									
	White-Stem Pondweed (Potamogeton praelongus)	C											
	Wolf Spike-Rush (Eleocharis wolfii)	C											
	Whorled Nut-Rush (Scleria verticillata)		T										

Federally Threatened and Endangered Species (17, 25)													
		Status			County								
	SPECIES	IA State Level	MN State Level	Federal Level	Jackson (MN)	Martin (MN)	Dickinson	Emmet	Clay	Palo Alto	Kossuth	Pocahontas	Humboldt
Pteriodophytes	Prairie Moonwort (Botrychium campestre)	C											

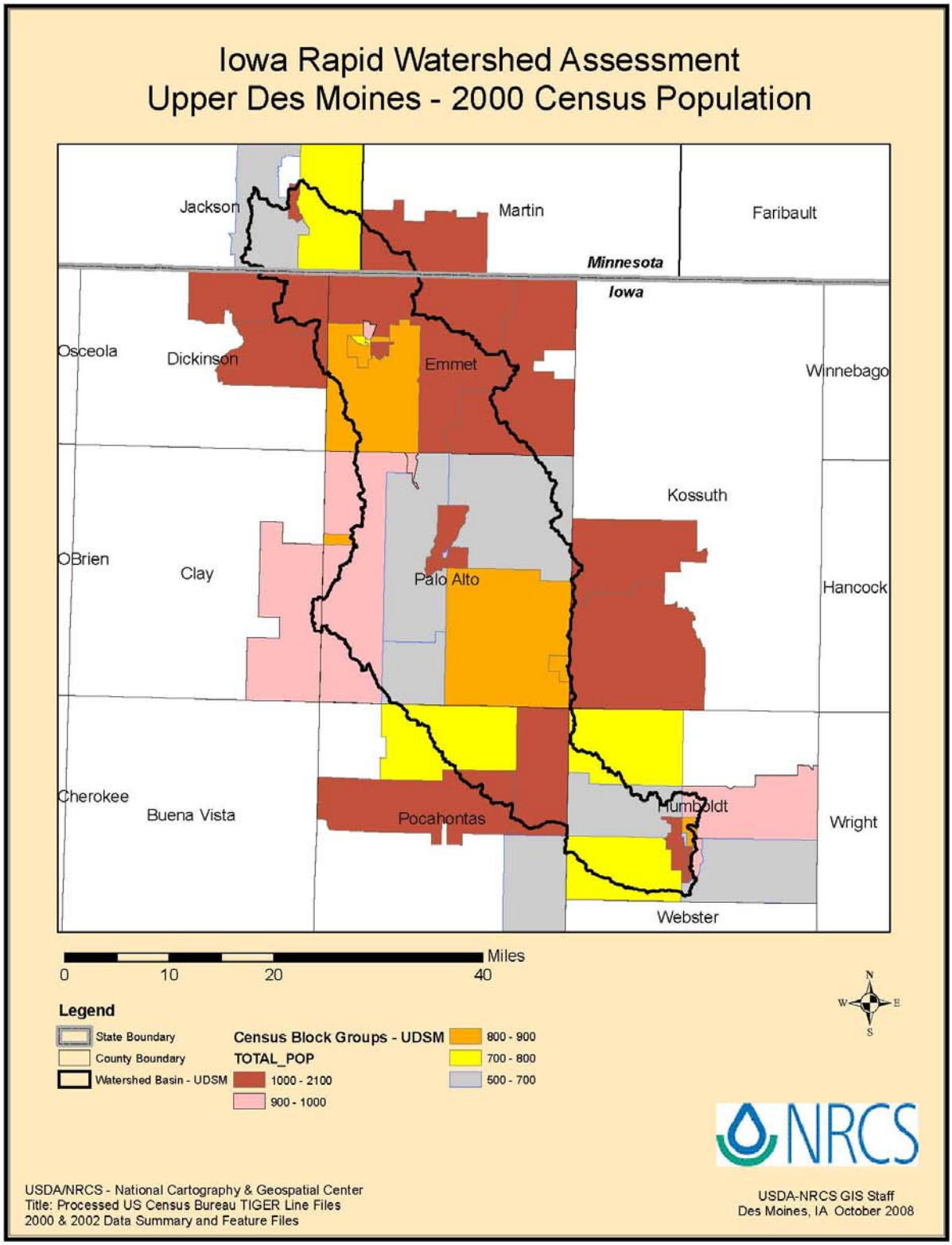
E = Endangered Specie
T = Threatened Specie
C = Candidate/Species of Concern
http://www.fws.gov/midwest/endangered/lists/iowa_cty.html
Minnesota NRCS GIS Database

Census and Social Data

There are 1,438 total farm operators in the watershed. Of these, 1,325 are male and 113 are female. There are 715 principal operators, including 58 percent working full time on the farm (*24*).

There are 710 farms in the Upper Des Moines Watershed with farm size ranging from one acre to over 1,000 acres. Size of farms: 5 percent are 1-9 acres; 16 percent are 10-49 acres; 20 percent are 50-179 acres; 27 percent are 180-499 acres; 20 percent are 500-999 acres; and 12 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*).

Limiting factors to conservation practice application include such human issues as lack of knowledge, prohibitive costs, lack of management knowledge and skills, resistance to changes in crop yield and profitability (*21*).


Iowa Rapid Watershed Assessment
Upper Des Moines - 2000 Census Population
Jackson
Martin
Faribault
Minnesota
Iowa
Osceola
Dickinson
Emmet
Winnebago
Kossuth
OBrien
Clay
Palo Alto
Hancock
Cherokee
Buena Vista
Pocahontas
Humboldt
Wright
Webster
Miles
0
10
20
40
N
W
E
S
Legend
State Boundary
County Boundary
Watershed Basin - UDSM
Census Block Groups - UDSM
TOTAL_POP
1000 - 2100
900 - 1000
800 - 900
700 - 800
500 - 700
NRCS
USDA/NRCS - National Cartography & Geospatial Center
Title: Processed US Census Bureau TIGER Line Files
2000 & 2002 Data Summary and Feature Files
USDA-NRCS GIS Staff
Des Moines, IA October 2008

Total Farms By Size Per County
Upper Des Moines Watershed

COUNTY	Acres	Percentt of Co.	1 - 9 Acres	10 - 49 Acres	50 - 179 Acres	180 - 499 Acres	500 - 999 Acres	> 1000 Acres	Total Farms
Pocahontas	76,537	11.12%	4	10	14	22	20	11	81
Palo Alto	311,192	45.21%	17	67	72	90	65	43	354
Kossuth	1,717	0.25%	0	0	1	1	1	0	3
Humboldt	77,003	11.19%	5	8	13	21	12	9	68
Emmet	146,343	21.26%	6	16	19	28	25	15	109
Dickinson	17,988	2.61%	0	2	3	3	3	1	12
Clay	1,640	0.24%	0	0	0	1	1	0	2
Jackson	46,391	6.74%	5	10	14	20	12	7	68
Martin	9,553	1.39%	1	2	3	3	2	2	13
	688,365	100%	38	115	139	189	141	88	710

Data Source: 2002 National Ag Statistics
County numbers obtained by correlating the percent county which lies within the watershed to determine an estimated number (shown in table).

NASS Farm Operators
Upper Des Moines Watershed

COUNTY	STATE	Ac. Co. In Wtshd	% Co. In Wtshd	All Operators	Female Op	Male Op	Principal Operators	Full Time Op	Part Time Op
Jackson	Minnesota	46,391	6.74%	99	4	95	55	35	20
Martin	Minnesota	9,553	1.39%	20	1	19	10	6	4
Pocahontas	Iowa	76,537	11.12%	151	5	146	76	39	37
Palo Alto	Iowa	311,192	45.21%	669	77	592	299	178	121
Kossuth	Iowa	1,717	0.25%	4	0	4	2	1	1
Humboldt	Iowa	77,003	11.19%	168	9	159	91	51	40
Emmet	Iowa	146,343	21.26%	290	15	275	161	94	67
Dickinson	Iowa	17,988	2.61%	34	2	32	20	13	7
Clay	Iowa	1,640	0.24%	3	0	3	1	1	0
		688,365	100%	1,438	113	1,325	715	418	297

Data Source: 2002 National Ag Statistics
County numbers obtained by correlating the percent county which lies within the watershed to determine an estimated number (shown in table).

Principal Operators - Person considered to be primarily responsible for managing operations on a farm.
Full Time - Works > 200 Days per year conducting farming activities
Part Time - Works < 200 Days per year conducting farming activities

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 CRP and contract extensions to protect sensitive lands, applying comprehensive nutrient management plans, pest management plans, constructing soil retaining structures, and water monitoring through IOWATER (Iowa's volunteer water monitoring program).

Resource Concerns that Require Ongoing Attention

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 (*26*). Additional water quality concerns include cattle feedlots and pastures, especially with livestock grazing along streams. Grazing along streams also creates problems with stream bank stability and creates erosion, which is reduced when management restricts cattle access (*27*).

Underground storage tanks create resource issues due to storage of substances, primarily petroleum products (*28*).

In the state of Iowa, as of November 2008, there were approximately 60 operating or proposed biofuel plants. At this time, there are 2 ethanol plants in operation in the Upper Des Moines River Watershed. It is reported that 2 – 4 gallons of water is required for every gallon of biofuel produced, creating a concern about water quantity (*29*). Future biofuel plants that may use corn stover for ethanol production will result in less crop residue protecting the soil surface, which poses a risk to soil detachment and erosion.

Soil erosion by water is an ongoing concern, especially on cropland. Ongoing efforts are needed to increase acres utilizing conservation tillage and no-till. Educational activities are needed to promote extension of expiring CRP contracts.

Wildlife habitat and recreational area resource protection and improvement are ongoing concerns. Implementation of programs, such as Conservation Reserve Program (CRP) and Resource Enhancement and Protection (REAP) would increase wildlife habitat (*21*).

The primary natural resource concerns with animal feeding operations are water and air pollution. Concerns include over applying manure and associated spills, odor, particulates, and ammonia. Potential air quality issues include effects on human and animal health, impacts on property values, increased risk of nuisance litigation, and NO and NO^2 pollution (*27*). There are 187 Confined Animal Feeding Operations (CAFOs) in the watershed with a total of 281,587 animal units. Of which, 85 percent are swine, 12 percent are poultry, and 3 percent are cattle. There are 198 Animal Feeding Operations (AFOs) in the watershed totaling 194,000 animal units. Of which, 78 percent are swine, 12 percent are poultry, 9 percent are cattle, and 1 percent is dairy (*31, 32*).

Other resource concerns include potential for flood damage to land due to infrastructure and buildings along major rivers and streams, lack of adequate wastewater facilities and safe drinking water in small and unicorporated towns, and lack of infrastructure for renewable energy efforts. There is a need for development of alternative and renewable energy resources such as wind, geothermal, biomass, or methane from livestock facilities.

There is a lack of alternative crop production and agricultural diversity, thus decreasing opportunities for positive affects on water quality.

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WATERSHED NAME & CODE	UPPER DES MOINES RIVER -						LANDUSE ACRES			567,094
LANDUSE TYPE	ROW CROP						TYPICAL UNIT SIZE ACRES			151
POSSIBLE SOURCES OF FUNDING							ESTIMATED PARTICIPATION			8%
	FUTURE	USDA INVESTMENT						OTHERS			
CONSERVATION SYSTEMS BY TREATMENT LEVELS	New Treatment Units	CTA	EQIP	WRP	WHIP	CSP	CRP/ CREP	Fed	State	Local	NOTES/COMMENTS
Progressive System Acres Treated	**29,262**										
Conservation Crop Rotation (ac.) 328	2,926	X	X			X					
Critical Area Planting (ac.) 342	293	X	X						X		IFIP, REAP
Filter Strip (ac.) 393	293	X	X				X		X		REAP
Grassed Waterway (ac.) 412	293	X	X				X		X		IFIP
Nutrient Management (ac.) 590	21,947	X	X			X					
Pest Management (ac.) 595	17,265	X	X			X					
Residue and Tillage Management, Mulch Till (ac.) 345	18,728	X	X			X					
Resource Management System (RMS) Acres Treated	**12,476**										
Conservation Cover (ac.) 327	125	X		X	X		X		X		REAP
Conservation Crop Rotation (ac.) 328	390	X	X			X					
Critical Area Planting (ac.) 342	98	X	X						X		IFIP, REAP
Filter Strip (ac.) 393	472	X	X				X		X		REAP
Grassed Waterway (ac.) 412	98	X	X				X		X		IFIP
Nutrient Management (ac.) 590	9,436	X	X			X					
Pest Management (ac.) 595	9,872	X	X			X					
Residue and Tillage Management, Mulch Till (ac.) 345	0	X	X			X					
Residue Management, No-Till/Strip Till/Direct Seed (ac.) 329	7,361	X	X			X				X	IFIP
Wetland Restoration (ac.) 657	250	X	X	X	X		X			X	REAP, Private Wetland Mitigation

WATERSHED NAME & CODE	UPPER DES MOINES RIVER -				LANDUSE ACRES			567,094
LANDUSE TYPE	ROW CROP				TYPICAL UNIT SIZE ACRES			151
ASSESSMENT INFORMATION					ESTIMATED PARTICIPATION			8%
CONSERVATION SYSTEMS BY TREATMENT LEVELS	CURRENT CONDITIONS	FUTURE CONDITIONS			RESOURCE CONCERNS			
	Total Units	Existing Unchanged Units	New Treatment Units	Total Units	Soil Erosion – Sheet and Rill	Soil Erosion – Ephemeral Gully	Soil Condition – Contaminants: Animal Waste and Other Organics – P	Water Quality – Excessive Nutrients and Organics in Surface Water
Baseline System			**System Rating ->**		**2**	**1**	**2**	**1**
Total Acreage at Baseline Level	**487,701**	**448,685**	**0**	**448,685**				
Conservation Crop Rotation (ac.) 328	429,177	394,843	0	394,843	4	2	4	2
Residue and Tillage Management, Mulch Till (ac.) 345	165,818	152,553	0	152,553	1	0	0	0
Progressive System			**System Rating ->**		**4**	**4**	**3**	**4**
Total Acreage at Progressive Level	**68,051**	**65,329**	**29,262**	**94,591**				
Conservation Crop Rotation (ac.) 328	66,690	89,773	2,926	92,699	4	2	4	2
Critical Area Planting (ac.) 342	681	653	293	946	5	5	0	2
Filter Strip (ac.) 393	681	653	293	946	0	0	2	4
Grassed Waterway (ac.) 412	681	653	293	946	0	5	1	2
Nutrient Management (ac.) 590	51,038	48,997	21,947	70,943	0	0	4	5
Pest Management (ac.) 595	40,150	38,544	17,265	55,809	0	0	0	0
Residue and Tillage Management, Mulch Till (ac.) 345	66,690	73,972	18,728	92,699	1	0	0	0
Resource Management System (RMS)			**System Rating ->**		**5**	**5**	**4**	**5**
Total Acreage at RMS Level	**11,342**	**11,342**	**12,476**	**23,818**				
Conservation Cover (ac.) 327	113	113	125	238	5	2	4	2
Conservation Crop Rotation (ac.) 328	10,435	21,522	390	21,913	4	2	4	2
Critical Area Planting (ac.) 342	113	141	98	238	5	5	0	2
Filter Strip (ac.) 393	454	481	472	953	0	0	2	4
Grassed Waterway (ac.) 412	113	141	98	238	0	5	1	2
Nutrient Management (ac.) 590	10,435	12,476	9,436	21,913	0	0	4	5
Pest Management (ac.) 595	10,435	12,041	9,872	21,913	0	0	0	0
Residue and Tillage Management, Mulch Till (ac.) 345	3,743	7,860	0	7,860	1	0	0	0
Residue Management, No-Till/Strip Till/Direct Seed (ac.) 329	6,692	6,692	7,361	14,053	4	2	0	2
Wetland Restoration (ac.) 657	227	227	250	476	0	0	1	3

CONSERVATION INVESTMENT INFORMATION

CONSERVATION SYSTEMS BY TREATMENT LEVELS	FUTURE	USDA INVESTMENT				PRIVATE INVESTMENT		
	New Treatment Units	Installation Cost 50%	Management Cost - 3 yrs 100%	Technical Assistance 20%	Total Present Value Cost	Installation Cost 50%	Annual O & M + Mgt Costs 100%	Total Present Value Cost
Progressive System Acres Treated	**29262.0504**							
Conservation Crop Rotation (ac.) 328	2,926	$0	$553,053	$110,611	$603,383	$0	$184,351	$283,781
Critical Area Planting (ac.) 342	293	$51,648	$0	$10,330	$61,977	$51,648	$5,165	$73,403
Filter Strip (ac.) 393	293	$585,241	$0	$117,048	$702,289	$585,241	$23,410	$683,851
Grassed Waterway (ac.) 412	293	$175,572	$0	$35,114	$210,687	$175,572	$7,023	$205,155
Nutrient Management (ac.) 590	21,947	$0	$855,915	$171,183	$933,807	$0	$285,305	$439,185
Pest Management (ac.) 595	17,265	$0	$207,175	$41,435	$226,029	$0	$69,058	$106,305
Residue and Tillage Management, Mulch Till (ac.) 345	18,728	$0	$1,123,663	$224,733	$1,225,921	$0	$374,554	$576,571
	Subtotal	**$812,461**	**$2,739,806**	**$710,453**	**$3,964,092**	**$812,461**	**$948,866**	**$2,368,251**
Resource Management System (RMS) Acres Treated	**12476.068**							
Conservation Cover (ac.) 327	125	$10,168	$0	$2,034	$12,202	$10,168	$610	$12,738
Conservation Crop Rotation (ac.) 328	390	$0	$73,740	$14,748	$80,451	$0	$24,580	$37,837
Critical Area Planting (ac.) 342	98	$17,216	$0	$3,443	$20,659	$17,216	$1,722	$24,468
Filter Strip (ac.) 393	472	$943,644	$0	$188,729	$1,132,373	$943,644	$37,746	$1,102,643
Grassed Waterway (ac.) 412	98	$58,524	$0	$11,705	$70,229	$58,524	$2,341	$68,385
Nutrient Management (ac.) 590	9,436	$0	$368,021	$73,604	$401,513	$0	$122,674	$188,838
Pest Management (ac.) 595	9,872	$0	$118,464	$23,693	$129,244	$0	$39,488	$60,786
Residue and Tillage Management, Mulch Till (ac.) 345	0	$0	$0	$0	$0	$0	$0	$0
Residue Management, No-Till/Strip Till/Direct Seed (ac.) 329	7,361	$0	$220,826	$44,165	$240,922	$0	$73,609	$113,310
Wetland Restoration (ac.) 657	250	$168,427	$0	$33,685	$202,112	$168,427	$3,369	$182,616
0	0	$0	$0	$0	$0	$0	$0	$0
	Subtotal	**$1,197,979**	**$781,052**	**$395,806**	**$2,289,706**	**$1,197,979**	**$306,138**	**$1,791,622**
TOTAL ACRES TREATED / ESTIMATED TREATMENT COSTS	**41738.1184**	**$2,010,440**	**$3,520,858**	**$1,106,260**	**$6,253,798**	**$2,010,440**	**$1,255,003**	**$4,159,873**

WATERSHED NAME & CODE	UPPER DES MOINES RIVER -							LANDUSE ACRES			5,314
LANDUSE TYPE	FARMSTEAD							TYPICAL UNIT SIZE ACRES			5
POSSIBLE SOURCES OF FUNDING								ESTIMATED PARTICIPATION			8%
	FUTURE	USDA INVESTMENT						OTHERS			
CONSERVATION SYSTEMS BY TREATMENT LEVELS	New Treatment Units	CTA	EQIP	WRP	WHIP	CSP	CRP/ CREP	Fed	State	Local	NOTES/COMMENTS
Progressive System Acres Treated	**274**										
Windbreak/Shelterbreak Establishment (ft.) 380	27,928	X	X		X		X		X		REAP
Resource Management System (RMS) Acres Treated	**117**										
Waste Storage Facility (no.) 313	22	X	X								
Windbreak/Shelterbreak Establishment (ft.) 380	16,454	X	X		X		X		X		REAP

WATERSHED NAME & CODE	UPPER DES MOINES RIVER -				LANDUSE ACRES			5,314
LANDUSE TYPE	FARMSTEAD				TYPICAL UNIT SIZE ACRES			5
ASSESSMENT INFORMATION					ESTIMATED PARTICIPATION			8%
CONSERVATION SYSTEMS BY TREATMENT LEVELS	CURRENT CONDITIONS	FUTURE CONDITIONS			RESOURCE CONCERNS			
	Total Units	Existing Unchanged Units	New Treatment Units	Total Units	Soil Condition – Contaminants: Animal Waste and Other Organics – P	Water Quality – Excessive Nutrients and Organics in Surface Water	Water Quality – Harmful Levels of Pathogens in Surface Water	Air Quality – Objectionable Odors
Baseline System				**System Rating ->**	**0**	**0**	**0**	**0**
Total Acreage at Baseline Level	**4,570**	**4,204**	**0**	**4,204**				
No Conservation Practices being applied at this level	0	0	0	0	0	0	0	0
Progressive System				**System Rating ->**	**1**	**0**	**0**	**1**
Total Acreage at Progressive Level	**638**	**612**	**274**	**886**				
Windbreak/Shelterbreak Establishment (ft.) 380	64,949	62,351	27,928	90,279	2	1	0	2
Resource Management System (RMS)				**System Rating ->**	**1**	**2**	**1**	**0**
Total Acreage at RMS Level	**106**	**106**	**117**	**223**				
Waste Storage Facility (no.) 313	20	20	22	41	2	4	2	-2
Windbreak/Shelterbreak Establishment (ft.) 380	17,320	19,918	16,454	36,371	2	1	0	2

CONSERVATION INVESTMENT INFORMATION

CONSERVATION SYSTEMS BY TREATMENT LEVELS	FUTURE	USDA INVESTMENT				PRIVATE INVESTMENT		
	New Treatment Units	Installation Cost 50%	Management Cost - 3 yrs 100%	Technical Assistance 20%	Total Present Value Cost	Installation Cost 50%	Annual O & M + Mgt Costs 100%	Total Present Value Cost
Progressive System Acres Treated	**274.2024**							
Windbreak/Shelterbreak Establishment (ft.) 380	27,928	$20,946	$0	$4,189	$25,135	$20,946	$419	$22,711
0	0	$0	$0	$0	$0	$0	$0	$0
	Subtotal	**$20,946**	**$0**	**$4,189**	**$25,135**	**$20,946**	**$419**	**$22,711**
Resource Management System (RMS) Acres Treated	**116.908**							
Waste Storage Facility (no.) 313	22	$1,677,846	$0	$335,569	$2,013,416	$1,677,846	$67,114	$1,960,554
Windbreak/Shelterbreak Establishment (ft.) 380	16,454	$12,340	$0	$2,468	$14,808	$12,340	$247	$13,380
0	0	$0	$0	$0	$0	$0	$0	$0
	Subtotal	**$1,690,187**	**$0**	**$338,037**	**$2,028,224**	**$1,690,187**	**$67,361**	**$1,973,934**
TOTAL ACRES TREATED / ESTIMATED TREATMENT COSTS	**391.1104**	**$1,711,133**	**$0**	**$342,227**	**$2,053,359**	**$1,711,133**	**$67,780**	**$1,996,645**

WATERSHED NAME & CODE	UPPER DES MOINES RIVER -							LANDUSE ACRES			52,315
LANDUSE TYPE	PASTURE/HAYLAND							TYPICAL UNIT SIZE ACRES			14
POSSIBLE SOURCES OF FUNDING								ESTIMATED PARTICIPATION			8%
	FUTURE	USDA INVESTMENT						OTHERS			
CONSERVATION SYSTEMS BY TREATMENT LEVELS	New Treatment Units	CTA	EQIP	WRP	WHIP	CSP	CRP/ CREP	Fed	State	Local	NOTES/COMMENTS
Progressive System Acres Treated	**2,699**										
Fence (ft.) 382	534,492	X	X		X		X		X		REAP
Forage Harvest Management (ac.) 511	945	X									
Nutrient Management (ac.) 590	945	X	X			X					
Pasture & Hayland Planting (ac.) 512	945	X	X						X		IFIP, REAP
Pest Management (ac.) 595	945	X	X			X					
Pipeline (ft.) 516	317,186	X	X				X				
Riparian Forest Buffer (ac.) 391	459	X			X		X		X		IFIP, REAP
Use Exclusion (ac.) 472	459	X	X		X		X		X		REAP
Resource Management System (RMS) Acres Treated	**1,151**										
Brush Management (ac.) 314	541	X	X				X				
Fence (ft.) 382	301,725	X	X		X		X		X		REAP
Forage Harvest Management (ac.) 511	603	X									
Heavy Use Area Protection (ac.) 561	0	X	X								
Nutrient Management (ac.) 590	867	X	X			X					
Pasture & Hayland Planting (ac.) 512	867	X	X						X		IFIP, REAP
Pest Management (ac.) 595	867	X	X			X					
Pipeline (ft.) 516	281,821	X	X				X				
Prescribed Grazing (ac.) 528	955	X	X			X			X		REAP
Riparian Forest Buffer (ac.) 391	153	X			X		X		X		IFIP, REAP
Stream Crossing 578	8,221	X	X				X				
Streambank & Shoreline Protection (ft.) 580	63,794	X	X		X						
Tree/Shrub Establishment (ac.) 612	196	X	X		X		X		X		REAP
Use Exclusion (ac.) 472	153	X	X				X		X		REAP
Watering Facility (no.) 614	288	X	X				X				

WATERSHED NAME & CODE	UPPER DES MOINES RIVER -				LANDUSE ACRES			52,315
LANDUSE TYPE	PASTURE/HAYLAND				TYPICAL UNIT SIZE ACRES			14
ASSESSMENT INFORMATION					ESTIMATED PARTICIPATION			8%
CONSERVATION SYSTEMS BY TREATMENT LEVELS	CURRENT CONDITIONS	FUTURE CONDITIONS			RESOURCE CONCERNS			
	Total Units	Existing Unchanged Units	New Treatment Units	Total Units	Water Quality – Excessive Nutrients and Organics in Surface Water	Plant Condition – Productivity, Health and Vigor	Domestic Animals – Inadequate Quantities and Quality of Feed and Forage	Domestic Animals – Inadequate Stock Water
Baseline System			**System Rating ->**		**0**	**0**	**0**	**0**
Total Acreage at Baseline Level	**44,991**	**41,392**	**0**	**41,392**				
No Conservation Practices being applied at this level	0	0	0	0	0	0	0	0
Progressive System			**System Rating ->**		**4**	**5**	**5**	**3**
Total Acreage at Progressive Level	**6,278**	**6,027**	**2,699**	**8,726**				
Fence (ft.) 382	1,243,004	1,193,284	534,492	1,727,776	0	2	4	0
Forage Harvest Management (ac.) 511	2,197	2,109	945	3,054	2	4	4	0
Nutrient Management (ac.) 590	2,197	2,109	945	3,054	5	3	4	0
Pasture & Hayland Planting (ac.) 512	2,197	2,109	945	3,054	2	5	5	0
Pest Management (ac.) 595	2,197	2,109	945	3,054	0	5	4	0
Pipeline (ft.) 516	737,642	708,136	317,186	1,025,322	0	2	0	5
Riparian Forest Buffer (ac.) 391	1,067	1,025	459	1,483	3	5	1	0
Use Exclusion (ac.) 472	1,067	1,025	459	1,483	2	4	3	0
Resource Management System (RMS)			**System Rating ->**		**4**	**5**	**5**	**4**
Total Acreage at RMS Level	**1,046**	**1,046**	**1,151**	**2,197**				
Brush Management (ac.) 314	492	492	541	1,033	0	3	2	0
Fence (ft.) 382	319,495	369,215	301,725	670,940	0	2	4	0
Forage Harvest Management (ac.) 511	628	716	603	1,318	2	4	4	0
Heavy Use Area Protection (ac.) 561	0	0	0	0	1	3	0	0
Nutrient Management (ac.) 590	868	956	867	1,824	5	3	4	0
Pasture & Hayland Planting (ac.) 512	868	956	867	1,824	2	5	5	0
Pest Management (ac.) 595	868	956	867	1,824	0	5	4	0
Pipeline (ft.) 516	283,024	312,530	281,821	594,351	0	2	0	5
Prescribed Grazing (ac.) 528	868	868	955	1,824	1	5	5	0
Riparian Forest Buffer (ac.) 391	178	221	153	374	3	5	1	0
Stream Crossing 578	7,474	7,474	8,221	15,695	-1	0	3	3
Streambank & Shoreline Protection (ft.) 580	57,995	57,995	63,794	121,789	1	2	1	0
Tree/Shrub Establishment (ac.) 612	178	178	196	374	2	5	0	0
Use Exclusion (ac.) 472	178	221	153	374	2	4	3	0

Watering Facility (no.) 614	262	262	288	549	0	2	4	5

CONSERVATION INVESTMENT INFORMATION

CONSERVATION SYSTEMS BY TREATMENT LEVELS	FUTURE	USDA INVESTMENT				PRIVATE INVESTMENT		
	New Treatment Units	Installation Cost 50%	Management Cost - 3 yrs 100%	Technical Assistance 20%	Total Present Value Cost	Installation Cost 50%	Annual O & M + Mgt Costs 100%	Total Present Value Cost
Progressive System Acres Treated	**2699.454**							
Fence (ft.) 382	534,492	$497,077	$0	$99,415	$596,493	$497,077	$19,883	$580,832
Forage Harvest Management (ac.) 511	945	$0	$283,443	$56,689	$309,237	$0	$94,481	$145,439
Nutrient Management (ac.) 590	945	$0	$36,848	$7,370	$40,201	$0	$12,283	$18,907
Pasture & Hayland Planting (ac.) 512	945	$63,775	$0	$12,755	$76,530	$63,775	$1,275	$69,147
Pest Management (ac.) 595	945	$0	$11,338	$2,268	$12,369	$0	$3,779	$5,818
Pipeline (ft.) 516	317,186	$253,749	$0	$50,750	$304,498	$253,749	$10,150	$296,504
Riparian Forest Buffer (ac.) 391	459	$145,474	$0	$29,095	$174,568	$145,474	$8,728	$182,241
Use Exclusion (ac.) 472	459	$9,178	$0	$1,836	$11,014	$9,178	$551	$11,498
0	0	$0	$0	$0	$0	$0	$0	$0
	Subtotal	**$969,252**	**$331,628**	**$260,176**	**$1,524,910**	**$969,252**	**$151,130**	**$1,310,386**
Resource Management System (RMS) Acres Treated	**1150.93**							
Brush Management (ac.) 314	541	$52,471	$0	$10,494	$62,965	$52,471	$1,049	$56,891
Fence (ft.) 382	301,725	$280,604	$0	$56,121	$336,725	$280,604	$11,224	$327,884
Forage Harvest Management (ac.) 511	603	$0	$180,801	$36,160	$197,254	$0	$60,267	$92,772
Heavy Use Area Protection (ac.) 561	0	$201	$0	$40	$242	$201	$20	$286
Nutrient Management (ac.) 590	867	$0	$33,828	$6,766	$36,906	$0	$11,276	$17,358
Pasture & Hayland Planting (ac.) 512	867	$58,548	$0	$11,710	$70,258	$58,548	$1,171	$63,481
Pest Management (ac.) 595	867	$0	$10,409	$2,082	$11,356	$0	$3,470	$5,341
Pipeline (ft.) 516	281,821	$225,457	$0	$45,091	$270,548	$225,457	$9,018	$263,445
Prescribed Grazing (ac.) 528	955	$27,225	$0	$5,445	$32,670	$27,225	$0	$27,225
Riparian Forest Buffer (ac.) 391	153	$48,491	$0	$9,698	$58,189	$48,491	$2,909	$60,747
Stream Crossing 578	8,221	$1,076,942	$0	$215,388	$1,292,330	$1,076,942	$21,539	$1,167,671
Streambank & Shoreline Protection (ft.) 580	63,794	$1,435,374	$0	$287,075	$1,722,449	$1,435,374	$57,415	$1,677,227
Tree/Shrub Establishment (ac.) 612	196	$55,763	$0	$11,153	$66,915	$55,763	$1,115	$60,460
Use Exclusion (ac.) 472	153	$3,059	$0	$612	$3,671	$3,059	$184	$3,833
Watering Facility (no.) 614	288	$143,866	$0	$28,773	$172,640	$143,866	$8,632	$180,227
0	0	$0	$0	$0	$0	$0	$0	$0
	Subtotal	**$3,408,002**	**$225,037**	**$726,608**	**$4,335,118**	**$3,408,002**	**$189,289**	**$4,004,848**
TOTAL ACRES TREATED / ESTIMATED TREATMENT COSTS	**3850.384**	**$4,377,254**	**$556,665**	**$986,784**	**$5,860,029**	**$4,377,254**	**$340,420**	**$5,315,235**

WATERSHED NAME & CODE	UPPER DES MOINES RIVER -	LANDUSE ACRES	29,479
LANDUSE TYPE	NATURAL AREAS	TYPICAL UNIT SIZE ACRES	8
POSSIBLE SOURCES OF FUNDING		ESTIMATED PARTICIPATION	8%

CONSERVATION SYSTEMS BY TREATMENT LEVELS	FUTURE	USDA INVESTMENT						OTHERS			NOTES/COMMENTS
	New Treatment Units	CTA	EQIP	WRP	WHIP	CSP	CRP/ CREP	Fed	State	Local	
Progressive System Acres Treated	**1,521**										
No Conservation Practices being applied at this level	0										
Resource Management System (RMS) Acres Treated	**649**										
Forest Stand Improvement (ac.) 666	350	X	X		X				X		REAP
Tree/Shrub Establishment (ac.) 612	52	X	X		X				X		REAP
Upland Wildlife Habitat Management (ac.) 645	52	X		X	X						
Use Exclusion (ac.) 472	52	X	X		X				X		REAP

WATERSHED NAME & CODE	UPPER DES MOINES RIVER -				LANDUSE ACRES			29,479
LANDUSE TYPE	NATURAL AREAS				TYPICAL UNIT SIZE ACRES			8
ASSESSMENT INFORMATION					ESTIMATED PARTICIPATION			8%
CONSERVATION SYSTEMS BY TREATMENT LEVELS	CURRENT CONDITIONS	FUTURE CONDITIONS			RESOURCE CONCERNS			
	Total Units	Existing Unchanged Units	New Treatment Units	Total Units	Soil Erosion – Classic Gully	Plant Condition – T & E Plant Species: Declining Species, Species of Concern	Fish and Wildlife – Habitat Fragmentation	Fish and Wildlife – T & E Species: Declining Species, Species of Concern
Baseline System				**System Rating ->**	**0**	**0**	**0**	**0**
Total Acreage at Baseline Level	**25,352**	**23,324**	**0**	**23,324**				
No Conservation Practices being applied at this level	0	0	0	0	0	0	0	0
Progressive System				**System Rating ->**	**0**	**0**	**0**	**0**
Total Acreage at Progressive Level	**3,537**	**3,396**	**1,521**	**4,917**				
No Conservation Practices being applied at this level	0	0	0	0	0	0	0	0
Resource Management System (RMS)				**System Rating ->**	**1**	**3**	**4**	**3**
Total Acreage at RMS Level	**590**	**590**	**649**	**1,238**				
Forest Stand Improvement (ac.) 666	318	318	350	669	0	1	2	1
Tree/Shrub Establishment (ac.) 612	47	47	52	99	2	3	4	3
Upland Wildlife Habitat Management (ac.) 645	47	47	52	99	0	4	4	4
Use Exclusion (ac.) 472	47	47	52	99	2	2	3	2

CONSERVATION INVESTMENT INFORMATION									
	FUTURE	USDA INVESTMENT				PRIVATE INVESTMENT		
CONSERVATION SYSTEMS BY TREATMENT LEVELS	New Treatment Units	Installation Cost 50%	Management Cost - 3 yrs 100%	Technical Assistance 20%	Total Present Value Cost	Installation Cost 50%	Annual O & M + Mgt Costs 100%	Total Present Value Cost
Progressive System Acres Treated	**1521.1164**							
No Conservation Practices being applied at this level	0	$0	$0	$0	$0	$0	$0	$0
	Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Resource Management System (RMS) Acres Treated	**648.538**							
Forest Stand Improvement (ac.) 666	350	$21,363	$0	$4,273	$25,635	$21,363	$1,282	$26,762
Tree/Shrub Establishment (ac.) 612	52	$14,787	$0	$2,957	$17,744	$14,787	$296	$16,032
Upland Wildlife Habitat Management (ac.) 645	52	$0	$1,556	$311	$1,698	$0	$519	$799
Use Exclusion (ac.) 472	52	$1,038	$0	$208	$1,245	$1,038	$62	$1,300
	Subtotal	**$37,187**	**$1,556**	**$7,749**	**$46,323**	**$37,187**	**$2,159**	**$44,893**
TOTAL ACRES TREATED / ESTIMATED TREATMENT COSTS	**2169.6544**	**$37,187**	**$1,556**	**$7,749**	**$46,323**	**$37,187**	**$2,159**	**$44,893**