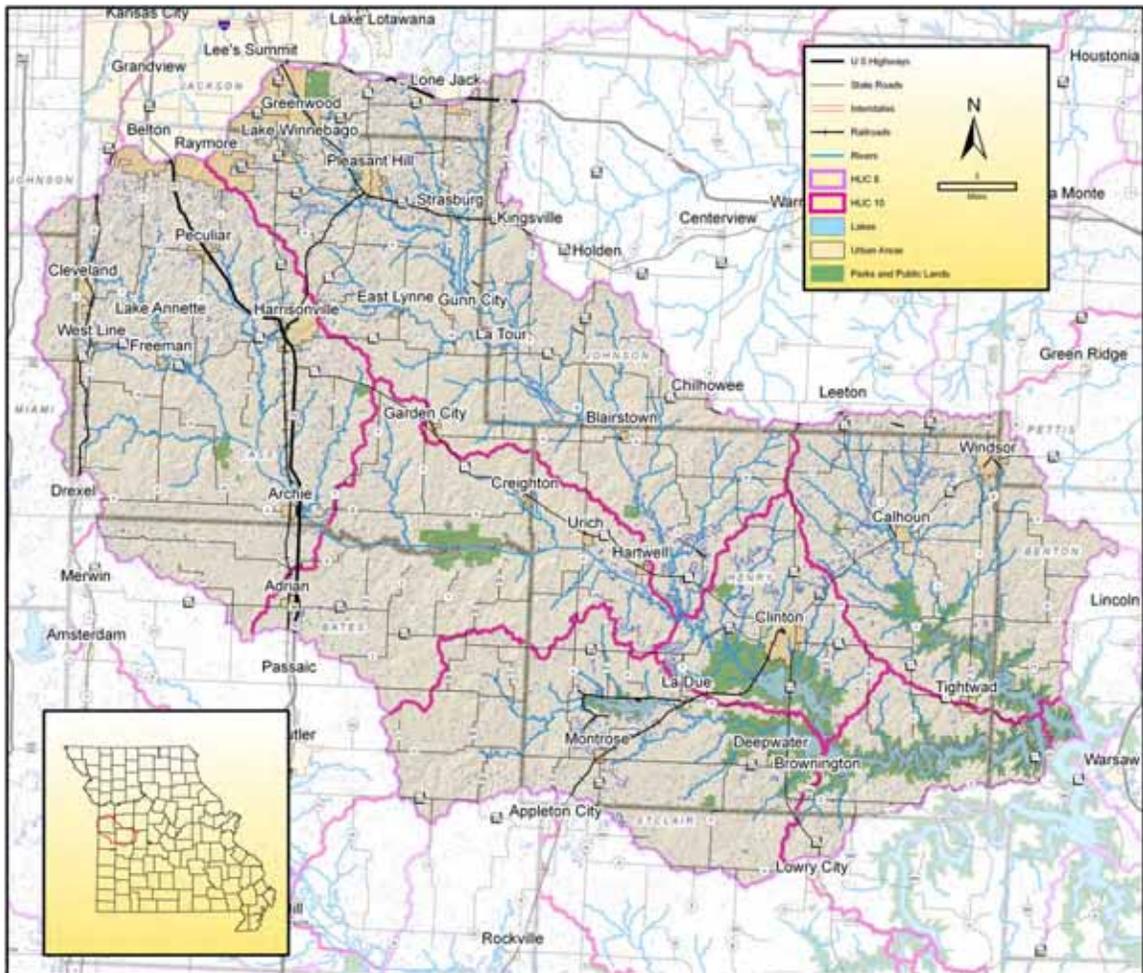


South Grand River – 10290108

8 – Digit Hydrologic Unit Profile and Resource Assessment Matrix



Profile Contents

	Page
Summary	3
Introduction	4
Relief Map	5
Karst Features	7
Geologic Features	8
Common Resource Areas	10
Major Land Resource Areas	12
Average Annual Precipitation	15
Land Ownership	16
Land Slope	17
Land Use / Land Cover	18
Riparian Corridors	21
Highly Erodible Lands	23
Prime Farmlands	24
Census Data	26
CAFOs	30
Solid Waste and Wastewater Facilities	33
Drinking Water	35
Resource Concerns	36
Rapid Watershed Assessments - Matrix	46
Footnotes / Bibliography	60

This Project was supported by the United States Department of Agriculture Natural Resources Conservation Service through the Cooperative Conservation Partnership Initiative, the Missouri Agricultural Experiment Station, and the University of Missouri Extension.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Summary

The South Grand Watershed (Hydrologic Unit 10290108) is a 2,060 square mile watershed in western Missouri (1.5% of the watershed is in Kansas). While the lower part of the basin is predominately rural, the upper part is rapidly undergoing urban development as the Kansas City metropolitan area expands southward. The overall topography is somewhat rolling, although a substantial portion is level. Agricultural operations are both crop- and livestock-based with many small ownerships. The area contains the greatest concentration of horses within the state. A significant amount of wetland area is in the watershed, and it supports fishing and waterfowl hunting areas. The watershed provides a substantial amount of the drainage for Harry S Truman Reservoir which is partially located within the watershed. The watershed is predominately private land, with only 6.8 percent in public holding.

The watershed contains three Common Resource Areas (CRAs) – Scarped Ozark Plains, Cherokee Plains, and Osage River Hills. The Scarped Ozark Plains and the Cherokee Plains are the major CRAs in the watershed. Cropland comprises only 29.4 percent of the land cover, while grassland is 41.6 percent, and deciduous forest is 13.3 percent. Highly erodible land is some 32.4 percent of the watershed, followed by 42.4 percent of potentially highly erodible land; 48.7 percent is identified as prime farmland. Only 8 Confined Animal Feeding Operations are permitted in the watershed 4 are swine operations and 4 are poultry operations. These are located across the central part of the watershed. There are a total of 9 separate streams and rivers listed as 303(d) waters. The largest is a 49 mile stretch of Big Creek running northwest from the South Grand River to a confluence just south of the town of Pleasant Hill and the Harry S Truman Reservoir.

Local stakeholder meetings held at Clinton and Harrisonville in March and May of 2007, respectively, identified corn, wheat and soybeans as the primary crops. Fescue is the predominate grass grown for pasture and grazing. Some warm season grasses have been established on Conservation Reserve Program (CRP) lands. Cow-calf management is the primary livestock operation. Most grazing is continuous, although some rotational grazing takes place. Various conservation practices were mentioned, with some relating to crop production and some relating to livestock management. A number of natural resource issues were identified; the majority of the specific issues were related to urban encroachment.

The Resource Assessment is summarized in the following table, by Conservation System - Treatment Level for cropland, forest land, grassland and urban uses.

Summary – Continued
Summary of Resource Assessment – acreages and costs, by Conservation System – Treatment Level, for Cropland, Forestland, Grassland and Urban uses.

Conservation System – Treatment Level	Current Conditions (acres)	Future Conditions (acres)	USDA Investment (\$ - PV)	Private Investment (\$ - PV)
Cropland				
Baseline	57,747	46,197		
Progressive	269,484	264,672	549,215	320,962
Resource Mgmt.	57,747	74,108	40,862,371	22,202,676
Total		25,024	41,411,585	22,523,637
Forestland				
Baseline	193,614	183,934		
Progressive	19,361	23,234	3,710,265	3,287,015
Resource Mgmt.	2,151	6,024	1,282,667	1,157,579
Total		11,617	4,992,932	4,444,594
Grassland				
Baseline	190,659	162,060		
Progressive	217,896	215,173	1,799,776	1,824,282
Resource Mgmt.	136,185	156,613	7,266,559	5,890,368
Total		39,494	9,066,335	7,714,651
Urban				
Baseline	16,993	15,294		
Progressive	1,699	2,889	2,011,068	2,025,772
Resource Mgmt.	189	563	586,923	565,750
Total		1,733	2,597,991	2,591,522

PV – Present Value of costs.

Introduction

Watershed management planning is a process which, if successfully applied, will result in a sustainable supply of water of adequate quantity and quality to support residential, agricultural, commercial and industrial needs. The process consists of several phases:

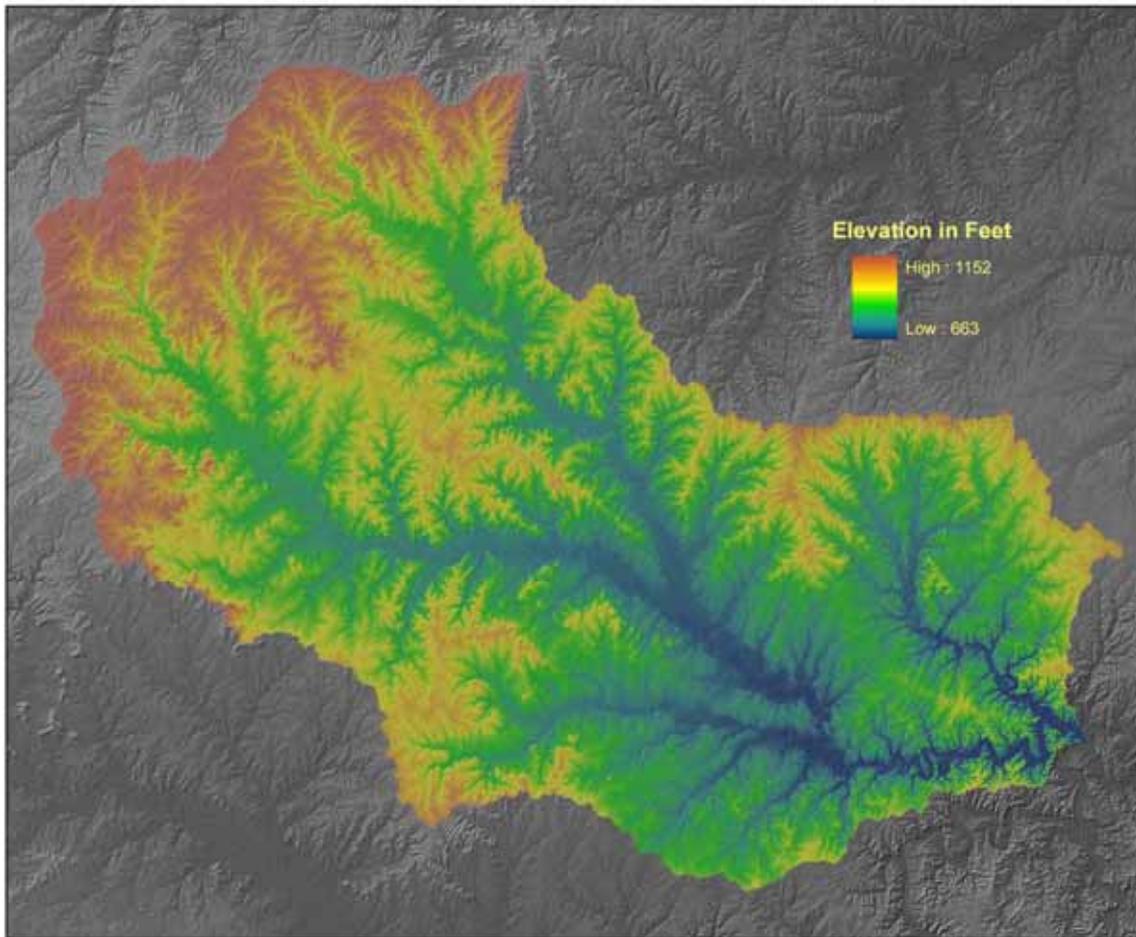
- Identifying the various factors which impede the watershed from providing a safe and reliable supply of water and related products to the users.
- Stating a set of measurable objectives for removing or resolving the impediments to water quality.
- Identifying a set of strategies and practices and strategies that will enable attainment of the objectives.
- Acquiring needed resources – technology, personnel, funding – to implement the strategies and practices.

The initial phase is the one which sets the stage for the following phases of plan development, so it must be conducted to yield the needed information in a most efficient and timely way. The initial information needed consists of an accurate and comprehensive description of the social, physical and biological characteristics of the watershed, (watershed profile), an enumeration of the natural resource concerns and issues impacting water quality and quantity in the watershed, and an assessment of the possible conservation practices that might be applied in the watershed along with their respective costs and benefits from implementation.

USDA Natural Resource Conservation Service has sponsored development of a process for generating this initial information called “Rapid Watershed Assessment.” Assessments will provide a “... rough picture of resource conditions and conservation efforts” for Missouri’s large watersheds and can be used as a focal point for locally led identification of resource concerns and priorities.”

The South Grand Watershed is 1 of 19 rapid watershed assessments completed on 8-digit hydrologic units in Missouri which were selected for inclusion in a pilot project to further develop and refine this process. Watersheds were selected based on information contained in the Missouri Unified Watershed Assessment and the Missouri Department of Natural Resources 303(d) list.

Relief Map



The South Grand Watershed (Hydrologic Unit – 10290108), a 2,060 square mile watershed in west Missouri (1.5% of the watershed is in Kansas), was selected for its mix of agricultural activities, provision of recreational and wildlife activities, and provision of public drinking water for residential development. While the lower portion of the basin remains rural, the upper portion is rapidly undergoing urban development as the Kansas City metropolitan area expands southward. The South Grand Basin is a major contributor to the Harry S Truman Reservoir, and includes nearly one-half of the lake area.

The hydrologic unit supports 13 public drinking water lakes and river intakes supplying many towns as well as a number of rural water supply districts. The watershed includes significant wetland areas, and supports fishing and waterfowl hunting areas. Agriculture operations are both crop- and livestock-based with many small-acreage ownerships. The area contains the highest concentration of horses within the state. Historically, coal strip mining was located within the watershed (a major coal burning power facility remains in operation) and 33 Minuteman missile silos were situated throughout. Concerns include eight 303(d)-listed impaired water bodies, moderate loss of wetland areas, water pollution



South Grand River - 10290108

8 – Digit Hydrologic Unit Profile and Resource Assessment Matrix

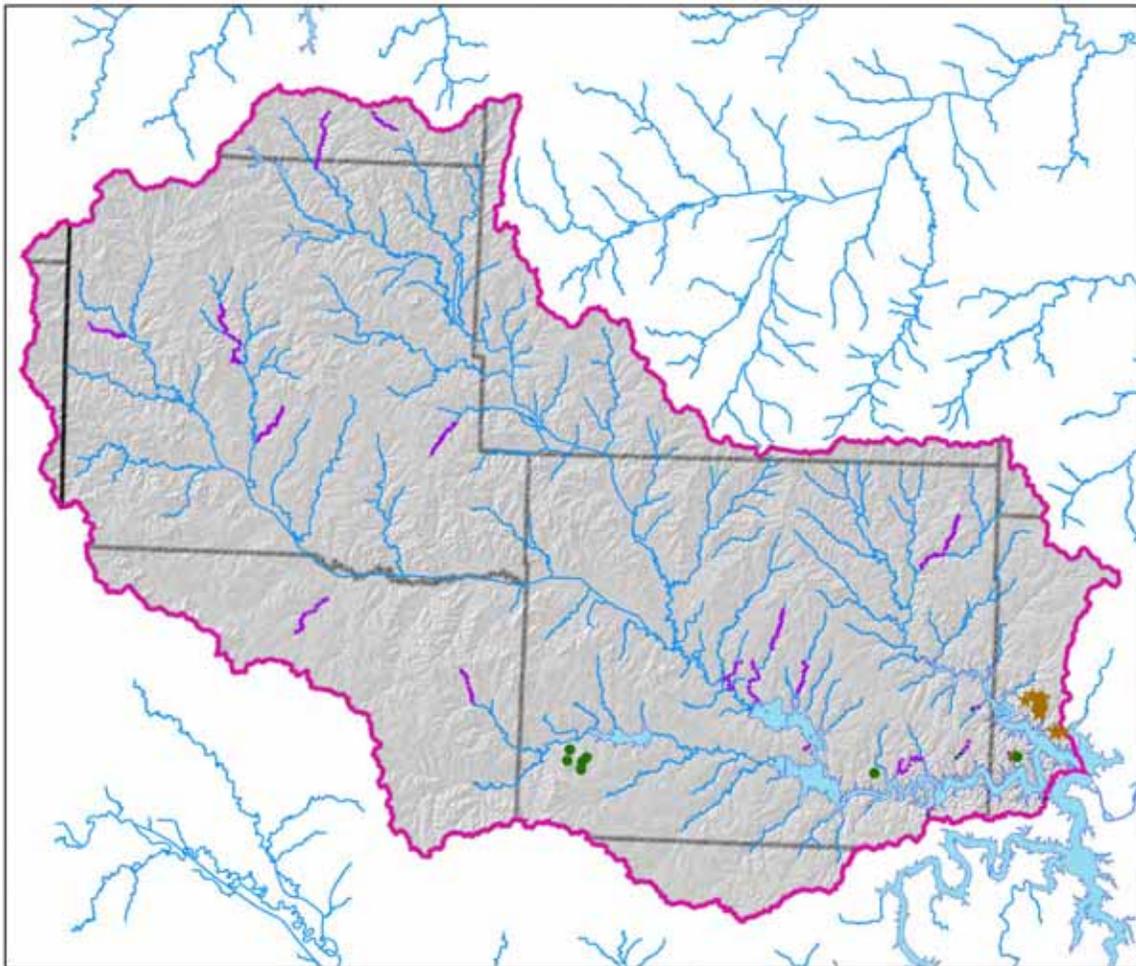


Relief Map – Continued

from sulphates and low pH levels, significant channelization and a growing human population.

The South Grand River Watershed is located in the western plains region of the state. The topography is somewhat rolling, although a substantial portion is relatively level.

Karst Features



For the South Grand River sub-basin, there are a total of 24 gaining streams and 4 losing streams. There are also 20 sinkholes and 2 sink areas. There are 7 total springs, with none having been either named or measured.

Karst Features

- Springs
- ★ Sinkholes
- Sink Areas
- Rivers / Streams / Lakes
- ▭ County Boundaries
- ▭ State Boundaries

Losing / Gaining Streams

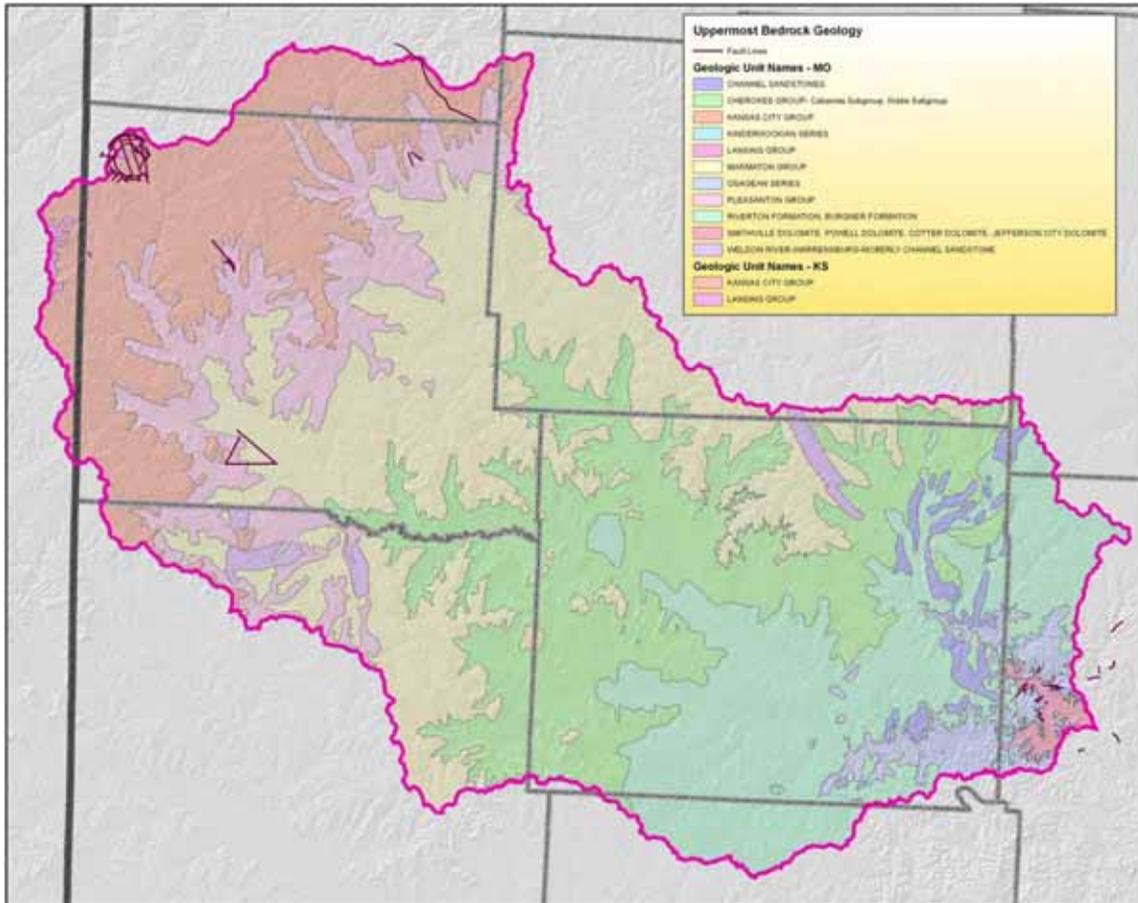
- Gaining
- Losing

A gaining stream is one in which the channel bottom is lower than the level of the surrounding groundwater table. Water moves from the ground into the channel, gaining water flow from the subsurface.

A losing stream is one which is above the groundwater table. Water moves from the channel into the surrounding ground, losing water flow to the subsurface.

Karst topography is a landscape shaped by the dissolution of a soluble layer or layers of bedrock. These landscapes display distinctive surface features and underground drainages.

Geologic Features



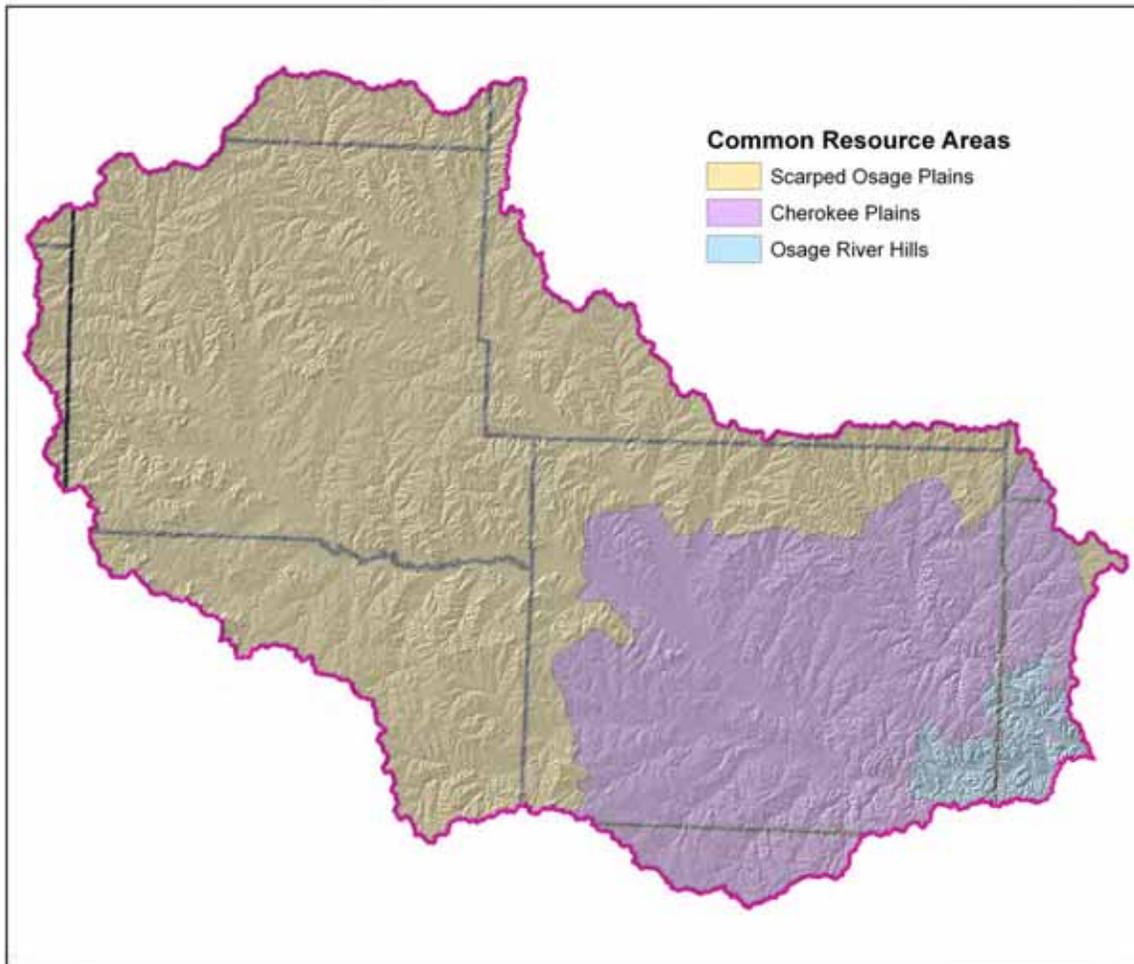
The geology of a watershed shows bedrock formations (or parent materials) which will produce soils that will in turn influence water quality, biological activity, and aquatic life in a stream. Different types of bedrock also control how channels develop.

For this sub-basin, bedrock types run from Smithville Dolomite, Powell Dolomite, Cotter Dolomite, and Jefferson City Dolomite in the bed of Harry S Truman Reservoir, to Marmaton Group, Pleasanton Group, and Kansas City Group in the upper reaches of the Lower Grand River Watershed. There is some minor impact from surface fault lines near Harry S Truman Reservoir, and more substantial impact near Belton in Cass County.

Geologic Features - Continued

Bedrock Descriptions	
Unit Name	Unit Description rock type 1; rock type 2; rock type 3
Smithville Dolomite, Powell Dolomite, Cotter Dolomite, Jefferson City Dolomite	dolostone (dolomite); sandstone; shale, conglomerate, chert
Channel Sandstones	sandstone;
Cherokee Group	shale; sandstone; siltstone, clay, limestone, coal
Kansas City Group	limestone; shale; sandstone, coal
Landsing Group	shale; limestone; sandstone
Osagean Series	limestone; chert; dolostone (dolomite), shale
Marmaton Group	limestone; shale; sandstone, clay, coal
Kinderhookian Series	limestone; siltstone; shale, sandstone
Pleasanton Group	shale; sandstone; coal
Weldon River - Warrensburg - Moberly Channel Sandstone	sandstone
Riverton Formation, Burgner formation	shale; siltstone; limestone, clay, coal

Common Resource Areas



Common Resource Area (CRA) map delineation 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

Common Resource Areas – Continued**General Descriptions of Common Resource Areas**

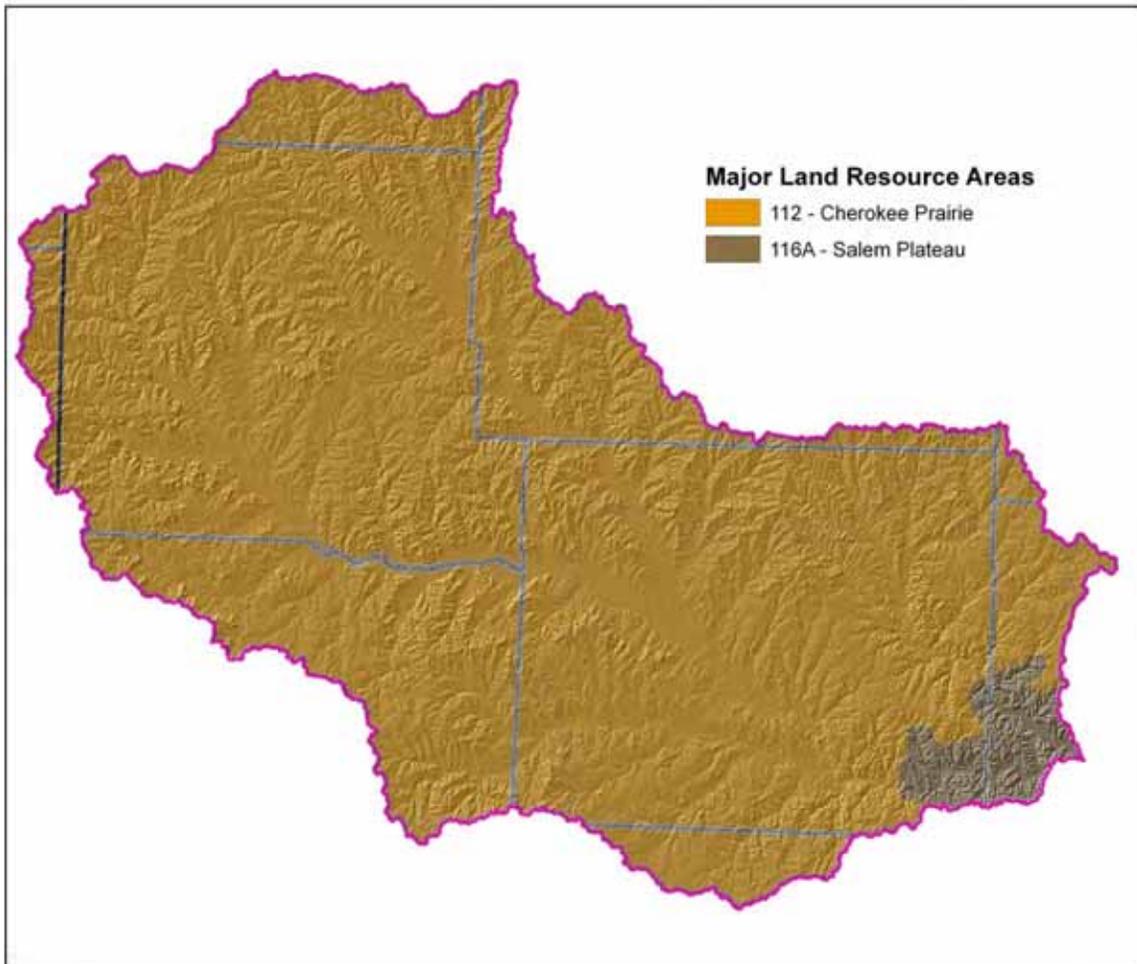
The South Grand River Watershed is comprised of three Common Resource Areas (CRAs), described as:

Scarped Osage Plains – A smooth plain interrupted by low, ragged escarpments trending southwest-northeast in which thin-bedded Pennsylvanian limestone bedrock is regularly exposed. Local relief reaches 150 feet in the escarpment zones but elsewhere averages less than 100 feet. Valley bottoms are exceptionally broad for the size of the streams. Most of the land is in pasture and cropland.

Cherokee Plains – A continuous plain of very low relief (usually less than 80 feet) on Pennsylvanian sandstones and shales. Streams have hardly dissected the surface, and valleys are topographically subdued. Wetlands are present on the wide, flat alluvial plains. Claypan soils add further distinction to the CRA. Most of the land is in pasture and cropland, with local areas of extensive strip mines.

Osage River Hills – Composed of the hilly to rugged lands. Lithology varies from Jefferson City-Cotter-dominated areas in the west to areas underlain by Roubidoux, Gasconade, and Eminence-Potosi Formations in the east. Small areas of Mississippian and Pennsylvanian parent materials occur on the western fringe. Rural lands are a nearly even mix of pasture and oak forests.

Major Land Resource Areas (MLRA)



Major land resource areas (MLRAs) are geographically associated land resource units (LRUs). Identification of these large areas is important in statewide agricultural planning and has value in interstate, regional, and national planning. Dominant physical characteristics, such as physiography, geology, climate, water, soils, biological resources, and land use are used to describe MLRAs.

Major Land Resource Area (MLRA) Descriptions

The South Grand River Watershed is located in two MLRAs as described below:

112 – Cherokee Prairies

Land use: Nearly all this area is in farms, and about one-half is cropland. Winter wheat, soybeans, corn, grain sorghum, other feed grains, and hay are the major crops. Some cotton is grown in a few counties in Oklahoma. Approximately one-third of the area is in pasture grasses and legumes; native grasses grow on the more sloping parts. Approximately one-tenth of the area, the steeper valley slopes and some of the wet bottom land, is woodland. The acreage of woodland in Kansas is considerably less than that in Missouri and in Oklahoma.

Major Land Resource Area – Continued

Elevation and topography: Elevation ranges from 100 to 400m. The gently sloping to rolling dissected plains is underlain by sandstone, shale, and limestone. The northern part has a thin mantle of loess. Even though the area is thoroughly dissected, local relief is in meters, and large valleys are about 25m below the adjacent uplands.

Climate: Average annual precipitation ranges from 900 to 1,050 mm. Maximum precipitation is from late in spring through autumn. Annual snowfall ranges from about 12 cm in the south to 45 cm in the north. Average annual temperature ranges from 13 to 17°C, with an average freeze-free period of 190 to 235 days.

Water: In many years, the moderate precipitation is adequate for crops and pasture, but in some years summer droughts reduce crop yields. In much of the area, shallow wells are the principal source of water for domestic use and for livestock, but small ponds and reservoirs on individual farms are increasingly important sources of water for livestock. Deep wells, especially in limestone areas, also provide water.

Soils: Most of the soils are Aqualfs and Udolls. They are shallow to deep and medium textured and moderately fine textured. These soils have a thermic temperature regime, an aquic or udic moisture regime, and mixed mineralogy. Somewhat poorly drained nearly level and gently sloping Albaqualfs (Parsons and Taloka series), Argiaquolls (Woodson series), and Argialbolls (Hartwell series) are on clay-mantled uplands. Moderately well drained and well drained, gently sloping and sloping Paleudolls (Dennis and Okemah series), Hapludalfs (Barden and Liberal series), and Argiudolls (Bates and Eram series) are on uplands underlain by silty and sandy shale and sandstone. Well drained, gently sloping Argiudolls (Lula and Catoosa series) are underlain by limestone and are on uplands; shallower and more stony Argiudolls (Clareson series), Haplustolls (Shidler series), and Hapludolls (Coweta and Collinsville series) are on steeper slopes of limestone, sandstone, and loamy shale. Gently sloping to moderately sloping clayey Argiudolls (Summit series) are underlain by clayey shale and clay beds and are on foot slopes. Haplaquolls (Osage series), Hapludolls (Verdigris and Wynona series), and Ochraqualfs (Hepler series) are on the flood plains of most streams.

Potential natural vegetation: The western part of this area supports tall grass prairie vegetation. Big bluestem, little bluestem, Indiangrass, and switchgrass are the dominant species. The eastern part and the valleys in the western part support natural vegetation characterized by trees. Red oak, white oak, and shagbark hickory are major species. Islands of tall grass prairie vegetation are common.

116A – Ozark Highland

Land use: Approximately 70 percent of this area is forests or woodland, most of which is in large holdings, national forests, or farm woodlots. Some 20 percent is pasture, mainly of introduced grasses and legumes. Approximately 10 percent is cropland. Corn, feed grains, and hay for dairy cattle and other livestock are the principal crops. Orchards, vineyards, and truck crops are important on some of the more friable deep soils. Summer droughts and steep slopes are major land use problems.

Major Land Resource Area – Continued

Elevation and topography: Elevation ranges from 200 to 500m. These sharply dissected limestone plateaus have narrow rolling ridge tops that break sharply to steep side slopes. Valleys are narrow and have steep gradients, especially in the upper reaches. Local relief is in meters to tens of meters.

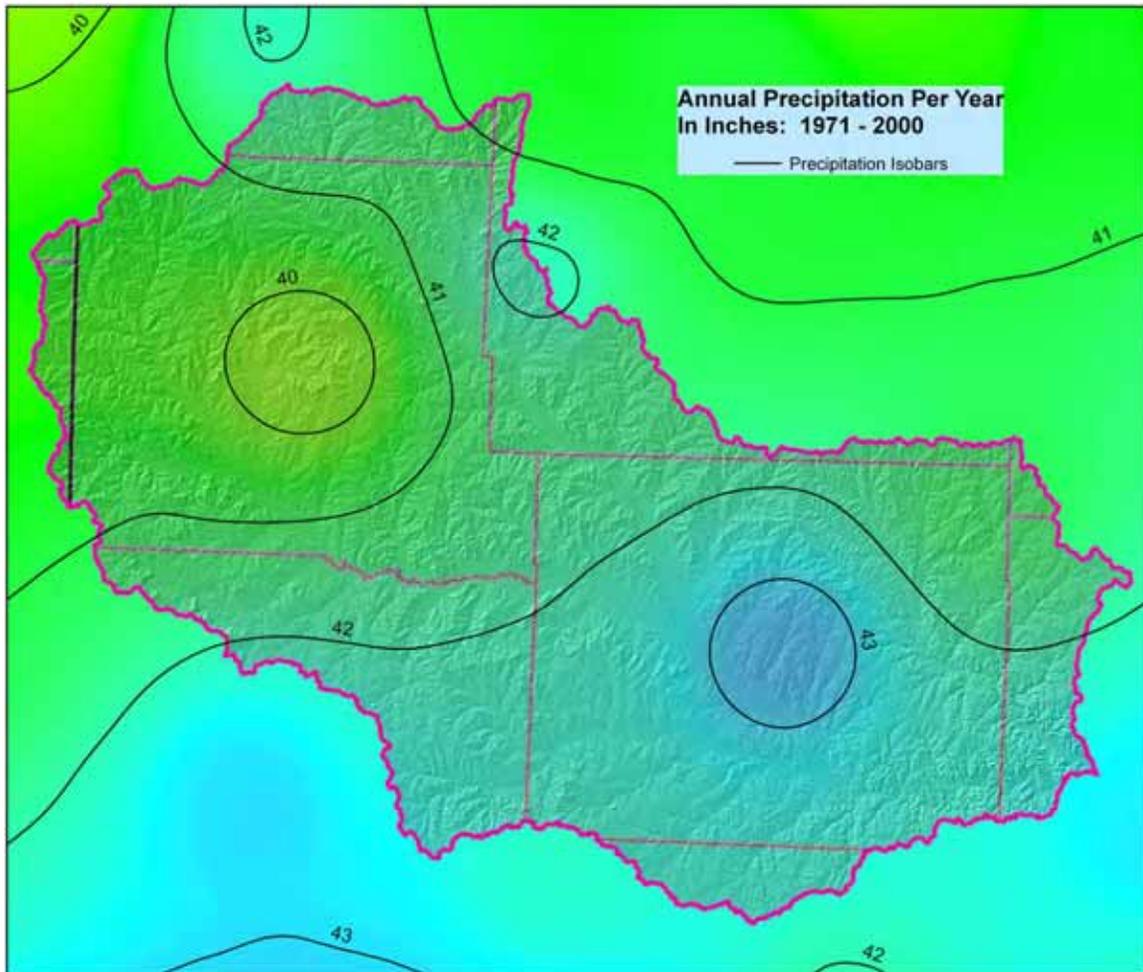
Climate: Average annual precipitation ranges from 1,025 to 1,225 mm. Maximum precipitation is in spring and early in summer, and the minimum is in midsummer. Average annual temperature ranges from 13° to 16°C with an average freeze-free period of 180 to 200 days.

Water: The moderate precipitation is adequate for crops and pasture. On most farms shallow wells or springs supply water for domestic needs and for livestock, but deep wells are required for large quantities. Water from deep wells is of good quality but is hard. Small ponds on many individual farms provide some water for livestock, and a few large reservoirs are used for flood control and for recreation.

Soils: Most of the soils are Udults and Udalfs. They are deep, medium textured to fine textured, cherty soils that weathered from limestone. They have a mesic temperature regime, an udic moisture regime, and siliceous or mixed mineralogy. Somewhat excessively drained to well drained Paleudults (Clarksville, Coulstone, Macedonia, Noark, and Poynor series) and Paleudalfs (Peridge and Goss series) are on ridges and side slopes. Moderately well drained, nearly level to moderately steep Fragiudults (Captina and Nixa series) are on slopes. Somewhat excessively drained, shallow Hapludolls (Gasconade series) and areas of rock outcrop are on steep, dissected landscapes. Udifluvents (Midco and Elsay series) on flood plains and Hapludalfs (Razort and Secesh series) on terraces are in stream valleys. Fine textured Hapludults (Agnos and Gassville series), Paleudalfs (Gepp series), and Paleudults (Doniphan series) also occur.

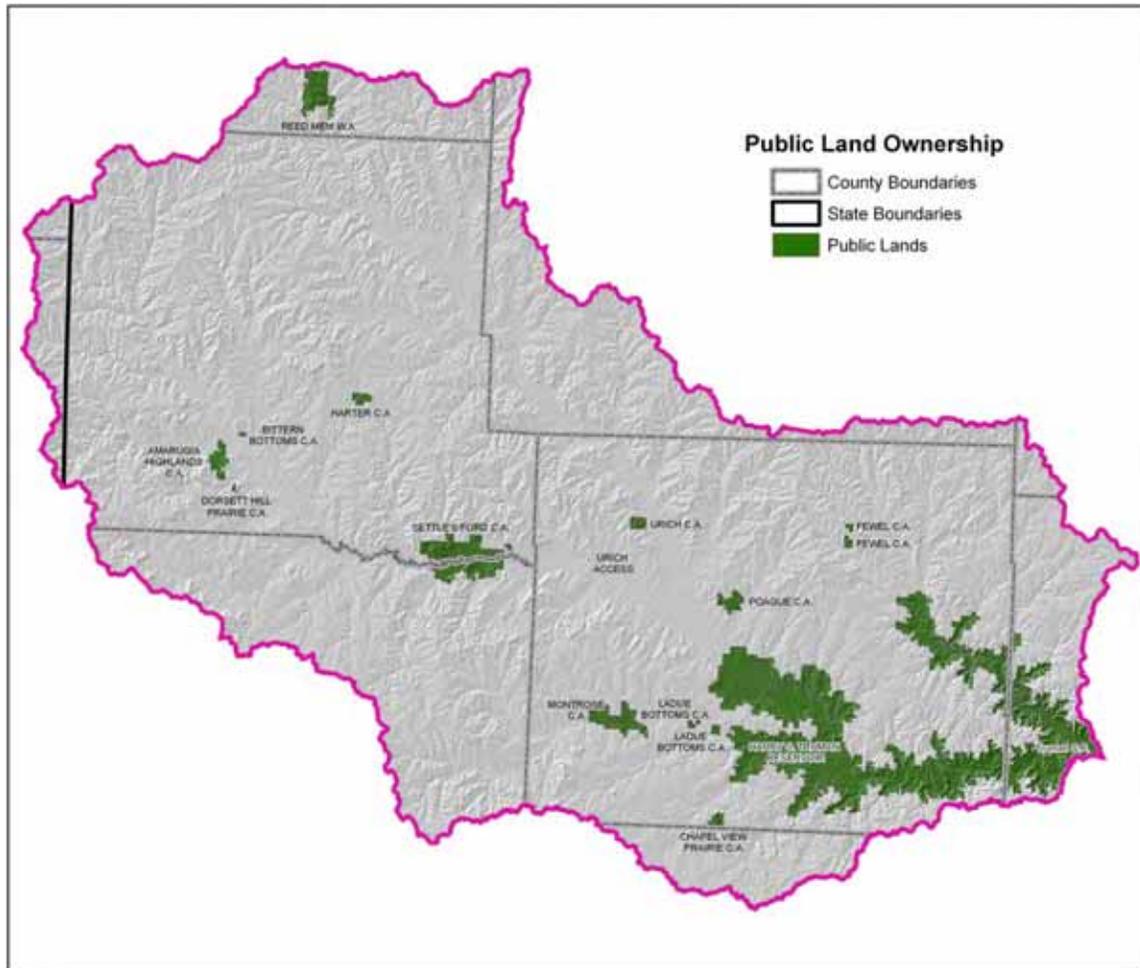
Potential natural vegetation: This area supports oak-hickory and oak-hickory-pine forests. Oak-hickory-pine forests are more dominant in the east. Glades, openings having bedrock outcrops or that are shallow to bedrock, support a more herbaceous vegetation consisting primarily of Indiangrass, little bluestem, and dropseeds. Glades are more common in the southwest.

Average Annual Precipitation



Data collected from 1971 to 2000 shows that the precipitation range for the South Grand area is from less than 40 inches per year near the center of Cass County to more than 43 inches per year near the center of St. Clair County.

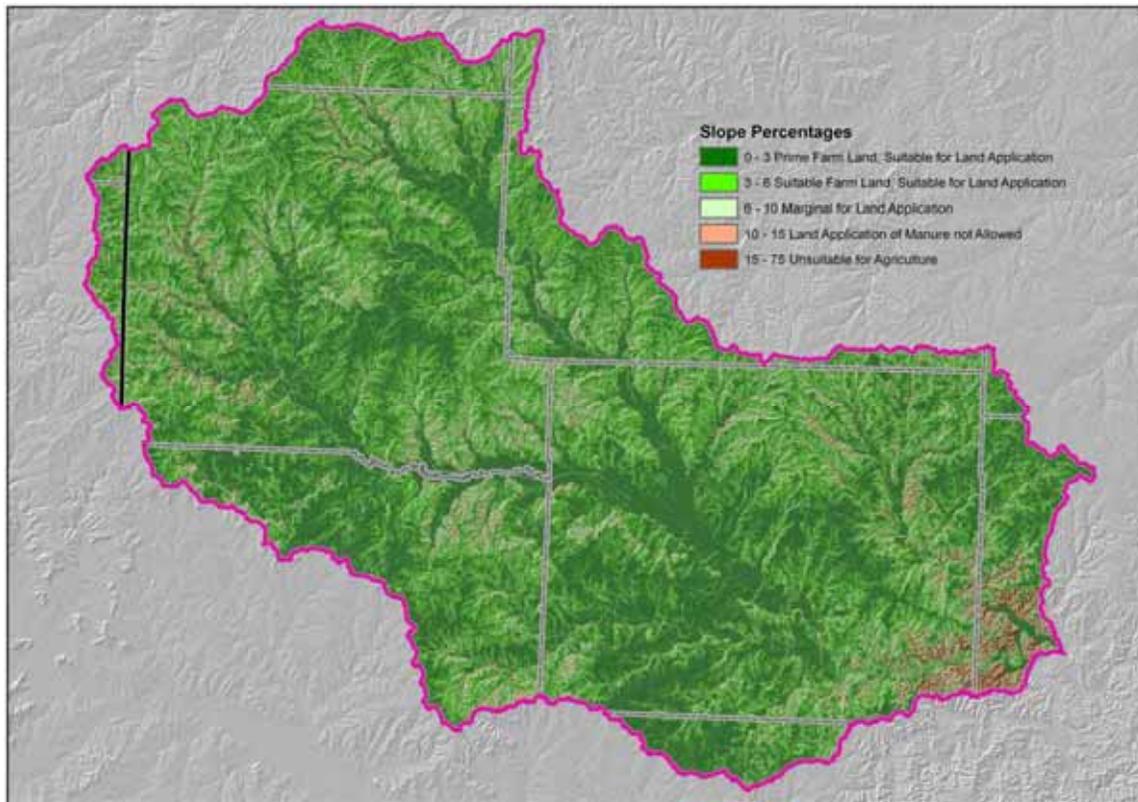
Land Ownership



Of the 1,309,266 acres that comprise the South Grand River sub-basin, only 89,020 acres (or 6.8%) are public holdings. The remaining 1,220,246 acres (or 93.2%) are owned by private landowners.

The largest public land areas in this watershed are: Harry S Truman Reservoir – 71,465 acres; Settle’s Ford Conservation Area – 6,546 acres; Reed Memorial Wildlife Area – 2,621 acres; Montrose Conservation Area – 2,443 acres; Truman State Park – 1,310 acres; and Amarugia Highlands Conservation Area – 1,039 acres.

Land Slope

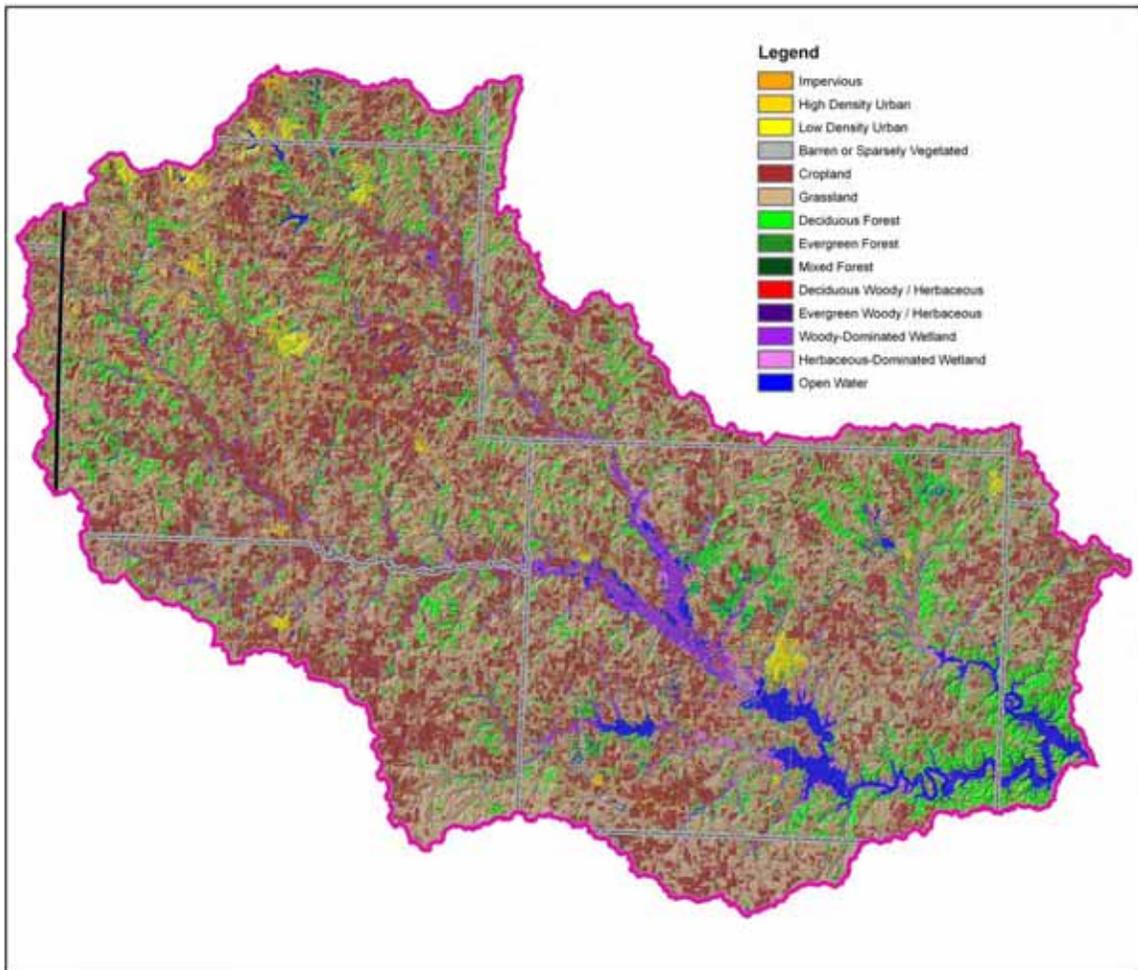


The majority of this sub-basin consists of large continuous plains that do not offer a lot of dramatic slopes, and is ideally suited for agriculture. The only large areas unsuitable for farming occur in the steeper slopes located near the town of Tightwad and Harry S Truman Reservoir. There are other local areas occurring on the steep gullies that surround rivers and streams.

Slope classification is an important factor in determining the potential for runoff of soil and chemicals into surface water. It is not the only determinant. Soil cover, in the form of growing plants and crop residue, aids in reducing runoff. The slope categories describe a site's suitability for crop production and for receiving manure applications. Soil with over 10% slope is unsuitable for manure application according to current environmental regulations.

Several opportunities exist to manage steep land to reduce the likelihood of soil erosion or chemical runoff. The University of Missouri Extension has educational materials on installing terraces, planting buffers and other management activities to stabilize land.

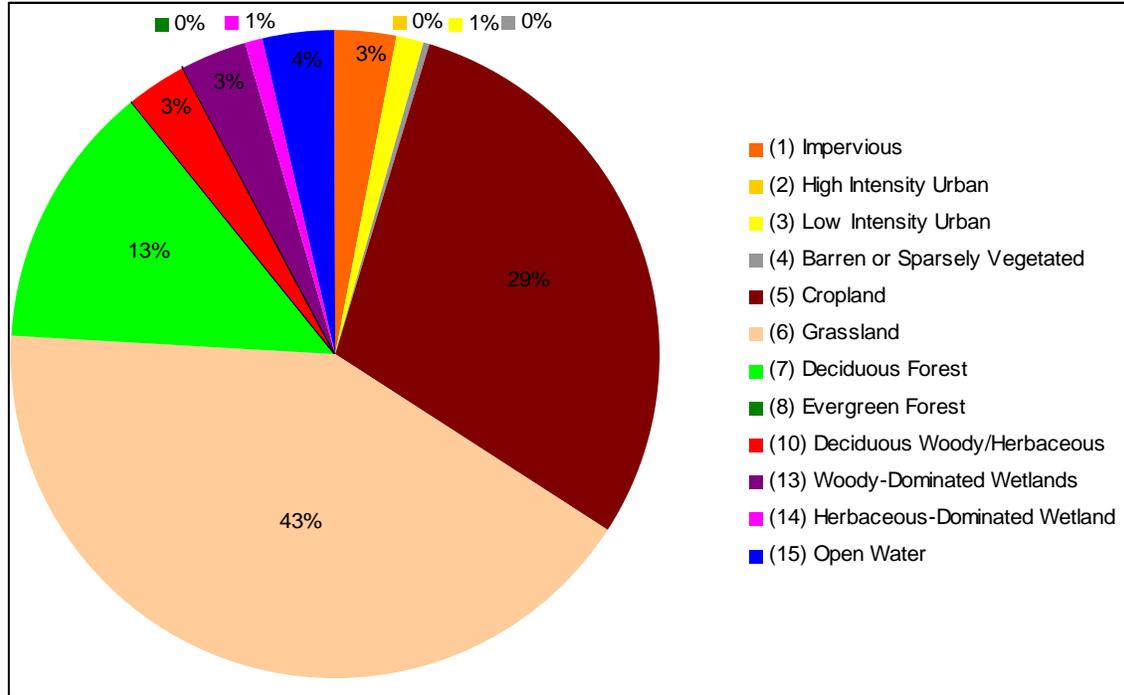
Land Use / Land Cover



Land Use and Land Cover (LULC) describe the vegetation, water, natural surface, and cultural features on the land surface.

Land Use / Land Cover – Continued

Graph of Total Land Cover / Land Use



LAND COVER/LAND USE	PUBLIC		PRIVATE		TRIBAL		TOTALS	
	Acres	%	Acres	%	Acres	%	Acres	%
(1) Impervious	874.3	0.98%	39747.3	3.26%	0	0.00%	40621.6	3.10%
(2) High Intensity Urban	2.3	0.00%	879.1	0.07%	0	0.00%	881.4	0.07%
(3) Low Intensity Urban	143.3	0.16%	17856	1.46%	0	0.00%	17999.3	1.37%
(4) Barren or Sparsely Vegetated	645.2	0.72%	1724.2	0.14%	0	0.00%	2369.4	0.18%
(5) Cropland	5954.5	6.69%	379202.6	31.07%	0	0.00%	385157.1	29.41%
(6) Grassland	18139.8	20.38%	526598.6	43.15%	0	0.00%	544738.4	41.60%
(7) Deciduous Forest	20732.1	23.29%	153948.8	12.61%	0	0.00%	174680.9	13.34%
(8) Evergreen Forest	1126.3	1.27%	931.5	0.08%	0	0.00%	2057.8	0.16%
(9) Mixed Forest	0.7	0.00%	0	0.00%	0	0.00%	0.7	0.00%
(10) Deciduous Woody/Herbaceous	3620.6	4.07%	34749.9	2.85%	0	0.00%	38370.5	2.93%
(11) Evergreen Woody/Herbaceous	0	0.00%	15.8	0.00%	0	0.00%	15.8	0.00%
(12) Mixed Woody/Herbaceous	0	0.00%	0	0.00%	0	0.00%	0	0.00%
(13) Woody-Dominated Wetlands	6410.4	7.20%	38507.7	3.16%	0	0.00%	44918.1	3.43%
(14) Herbaceous-Dominated Wetland	5807.2	6.52%	5774.2	0.47%	0	0.00%	11581.4	0.88%
(15) Open Water	25554.6	28.71%	20483.7	1.68%	0	0.00%	46038.3	3.52%
TOTALS	89011.3	6.80%	1220419.4	93.20%	0	0.00%	1309430.7	100.00%
% OF TOTAL								

Nearly 30 percent of the watershed is in cropland; another 41 percent is in grassland; and 13 percent is in deciduous forest.

Land Cover / Land Use – Continued

LAND CAPABILITY CLASS		Acres	Percent
~Based on Cropland and Pastureland only ~Uses Non-Public Lands only	I	57.5	0.01%
	II	463272.7	51.73%
	III	316733	35.37%
	IV	64244.9	7.17%
	V	3877.6	0.43%
	VI	38301.7	4.28%
	VII	9034.1	1.01%
	VIII	65.7	0.01%
Total Acres Croplands and Pasturelands		895587.2	

Capability class is the broadest category in the land capability classification system. Class codes 1, 2, 3, 4, 5, 6, 7, and 8 are used to represent both irrigated and non-irrigated land capability classes.

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Class IV soils have very severe limitations that restrict the choice of plants or require very careful management, or both.

Class V soils have little or no hazard of erosion but have other limitations, impractical to remove, that limit their use mainly to pasture, range, forestland, or wildlife food and cover.

Class VI soils have severe limitations that make them generally unsuited to cultivation and that limit their use mainly to pasture, range, forestland, or wildlife food and cover.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forestland, or wildlife.

Class VIII soils and miscellaneous areas have limitations that preclude their use for commercial plant production and limit their use to recreation, wildlife, or water supply or for esthetic purposes.

Riparian Corridors



A Riparian Corridor is a unique plant community that grows near a river, stream, lake, or other natural body of water. This vegetation serves a variety of functions that helps maintain the quality of water which it envelopes, including: filtering sediment from runoff before it enters rivers and streams, helping protect stream banks from erosion, providing storage area for flood waters, and providing habitat and food for fish and wildlife. A Riparian Corridor also maintains green spaces and other aesthetics associated with stream banks and lake shores.

These corridors have been built by buffering the National Hydrology Dataset (NHD) by 50 feet, and using the created buffered lines to clip out data from the Common Land Unit (CLU) dataset.

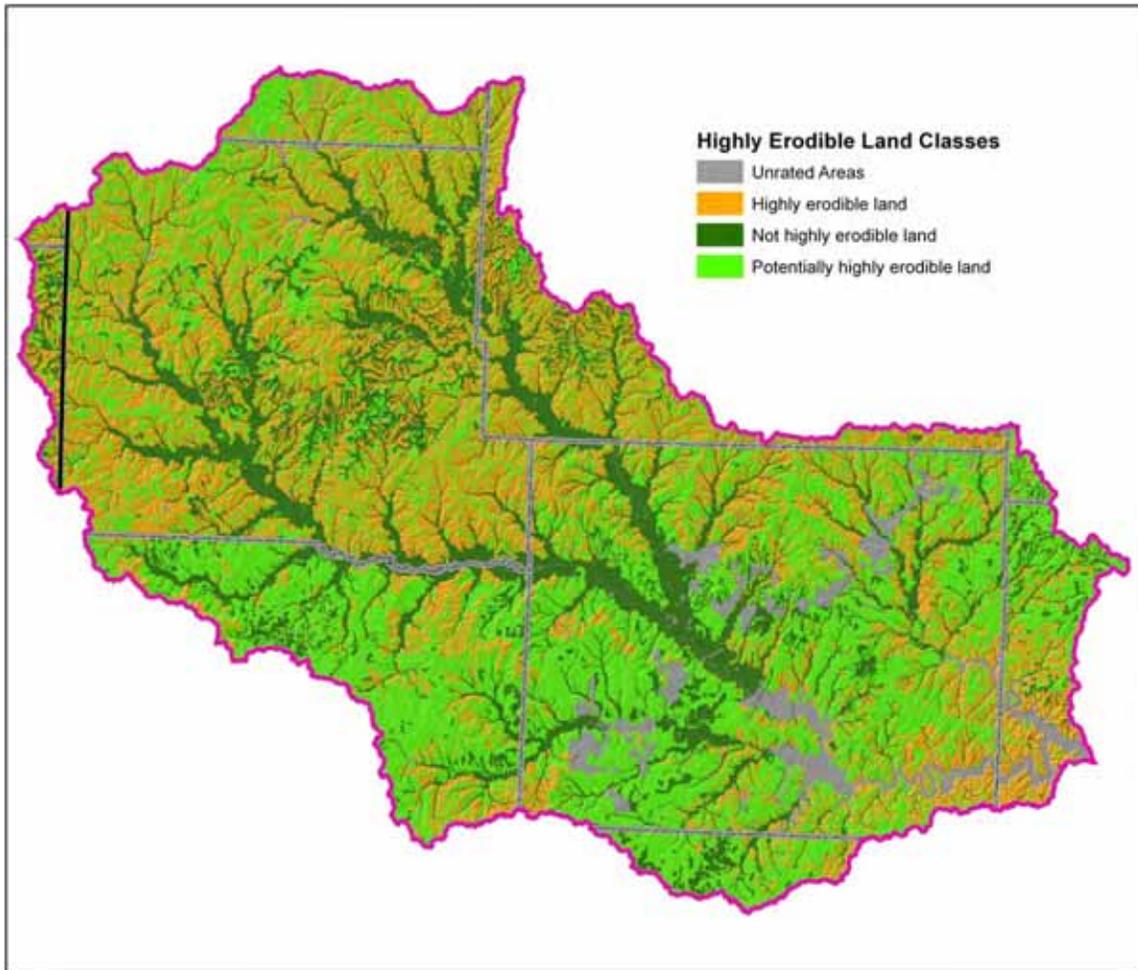
Riparian Corridor – Continued

Riparian Corridor Lands		TOTALS	
		Acres	%
	*Crop OR unclassified OR Public Land	11467	17.65%
	Urban	1122	1.73%
	Cropland	10399	16.01%
	Rangeland	166	0.26%
	Forestland	30851	47.50%
	Water	4181	6.44%
	Mined Land	154	0.24%
	Barren Land	2	0.00%
	Other Agriculture Lands	6612	10.18%
TOTALS		64954	

* These figures have been developed from attributes usually limited to areas that are not USDA program fields. Sometimes if there are program fields included, it is added as “crop”, however it can also just mean that it is public land, has yet to be evaluated, or is undetermined as to what is there.

The bulk of riparian corridors are found on agricultural land (cropland or forestland) within the watershed.

Highly Erodible Lands

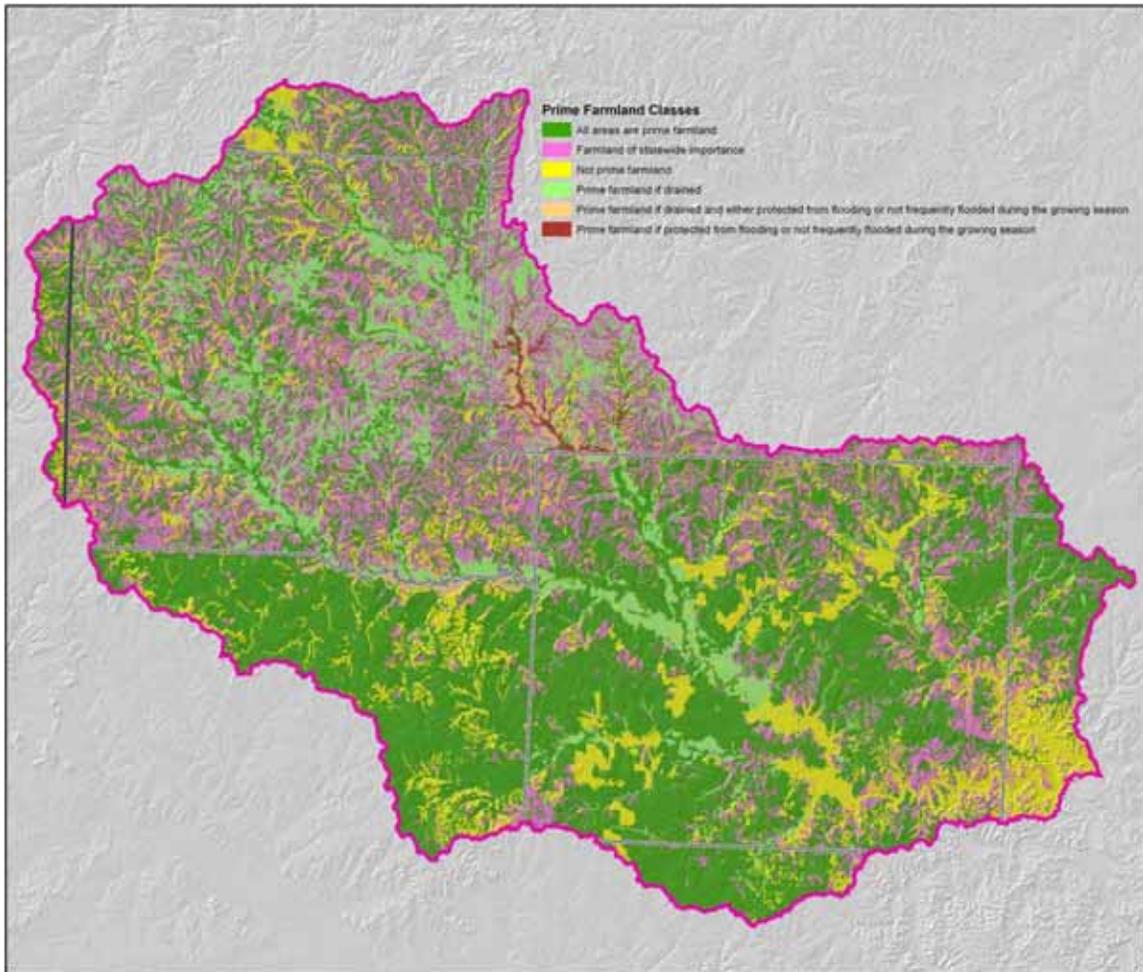


Erosion is defined as the wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Roughly 75% of the lands in the South Grand River sub-basin are defined as either Highly Erodible or Potentially Highly Erodible.

HIGHLY ERODIBLE LANDS		
	Acres	Percent of Total
Unrated Areas	55200	4.22%
Highly Erodible Land	424732	32.44%
Not Highly Erodible Land	273765	20.91%
Potentially Highly Erodible Land	555569	42.43%
TOTAL	1309266	

Prime Farmland



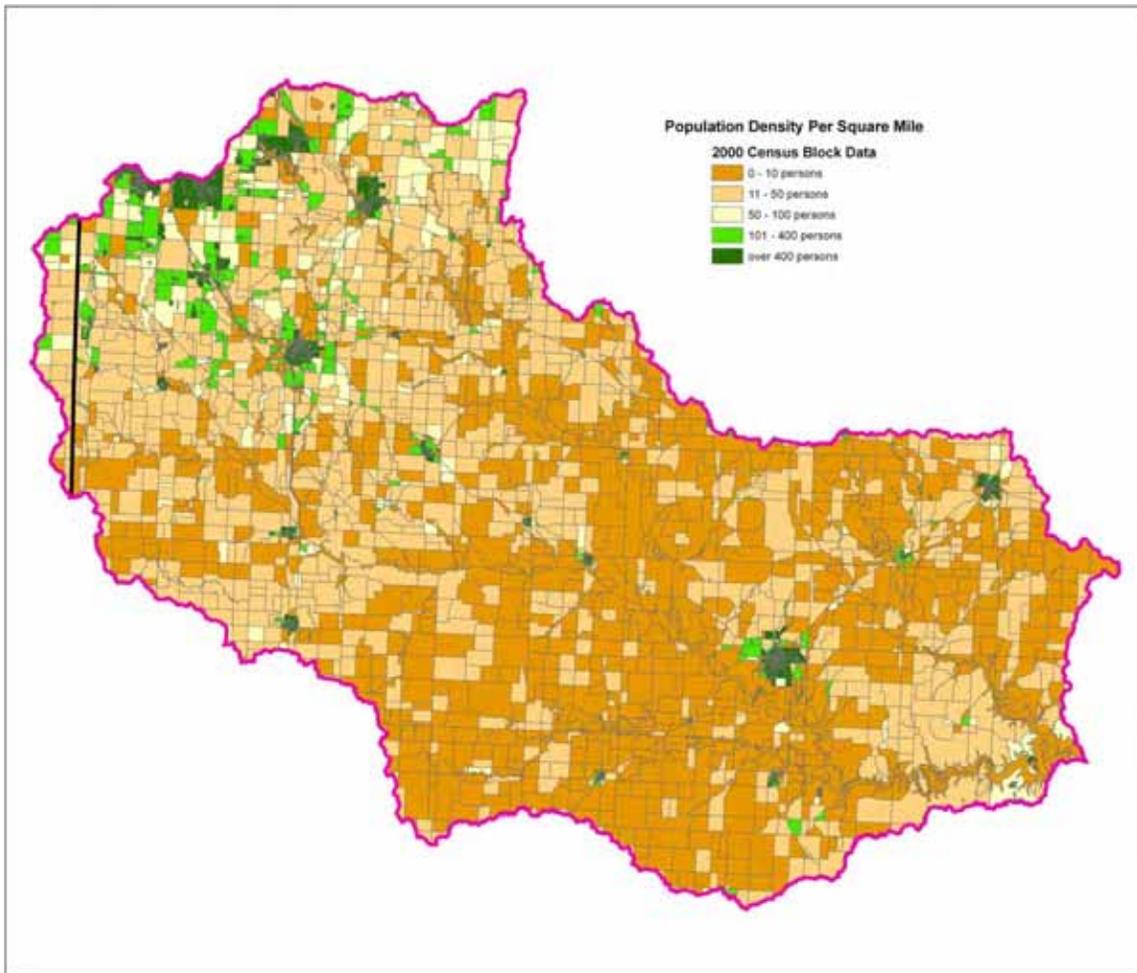
Prime Farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses.

Prime Farmland – Continued

PRIME FARMLANDS		Acres	Percent of Total
All Areas are Prime Farmland		637206	48.67%
Farmland of Statewide Importance		327639	25.02%
Not Prime Farmland		180133	13.76%
Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season		8638	0.66%
Prime Farmland if Drained		151238	11.55%
Prime Farmland if Protected from flooding, or not frequently flooded during the growing season		4411	0.34%
TOTAL		1309265	

Approximately three-fourths of the farmland in the watershed is classified as Prime Farmland or Farmland of Statewide Importance; almost 14% is classified as Not Prime Farmland. Another 12 percent would be considered prime if it were drained or otherwise protected.

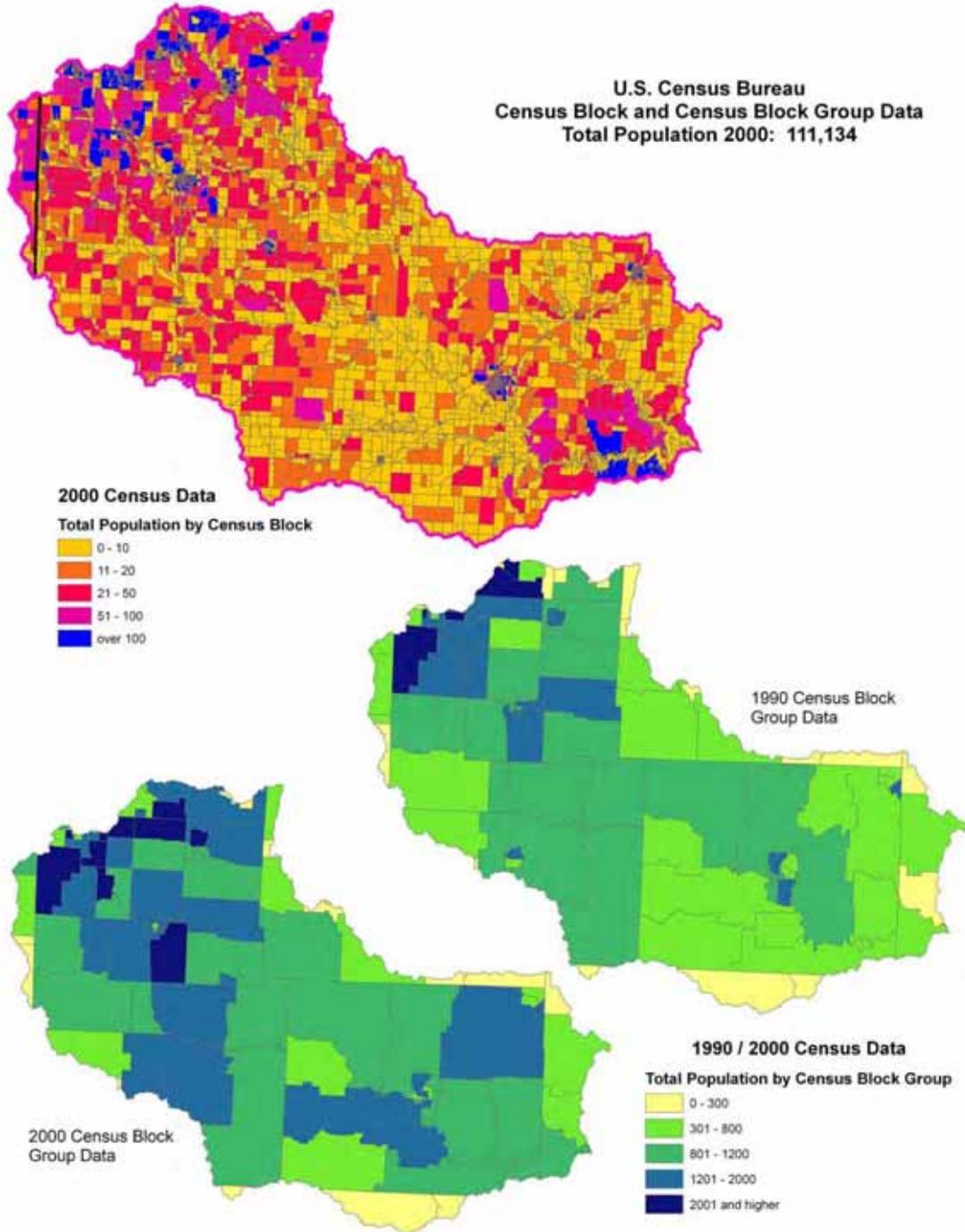
Census Data



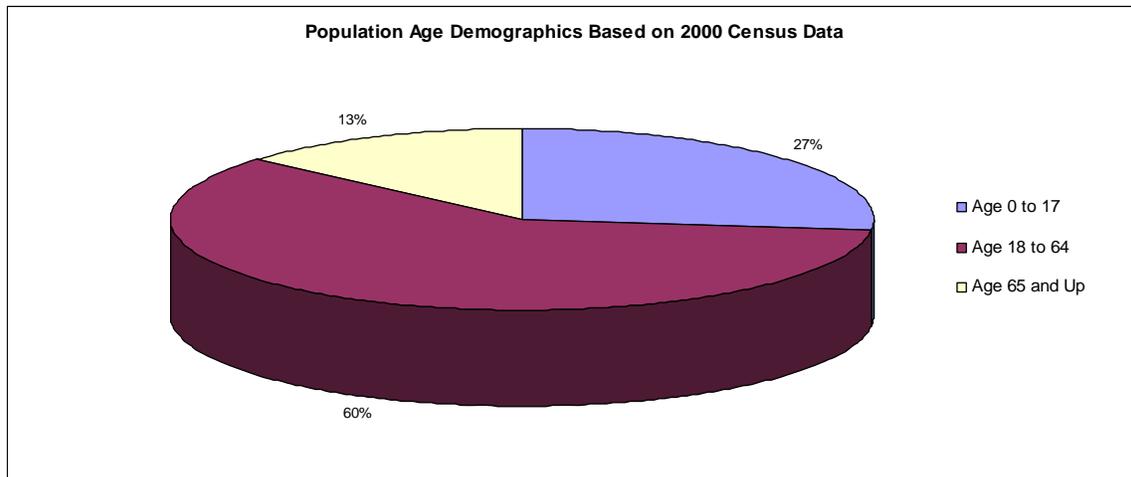
This map is based on 2000 U.S. Census Block data. It distributes the population evenly over the entire area of a block.

As expected, the higher density areas appear where urban areas are located. In this case, the highest population per square mile occurs in two separate areas. The first is located where the town of Clinton sits. The second is near the northwest corner of the sub-section where Kansas City has a very heavy influence on population. The least dense areas are on the southern and north eastern edges of the watershed in Bates, St. Clair, Benton, and Johnson Counties in Missouri, and southern Miami County in Kansas.

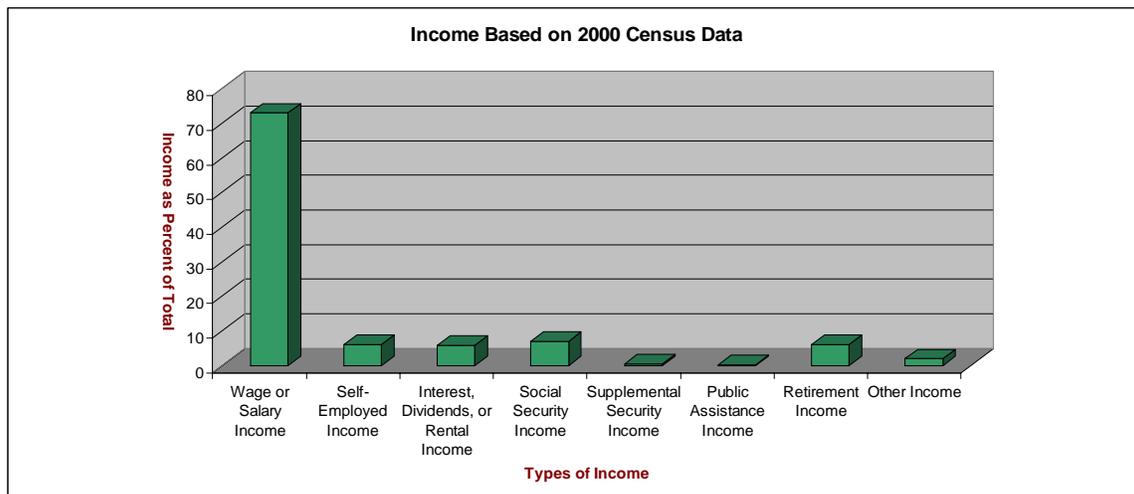
Census Data – Continued



Census Data – Continued

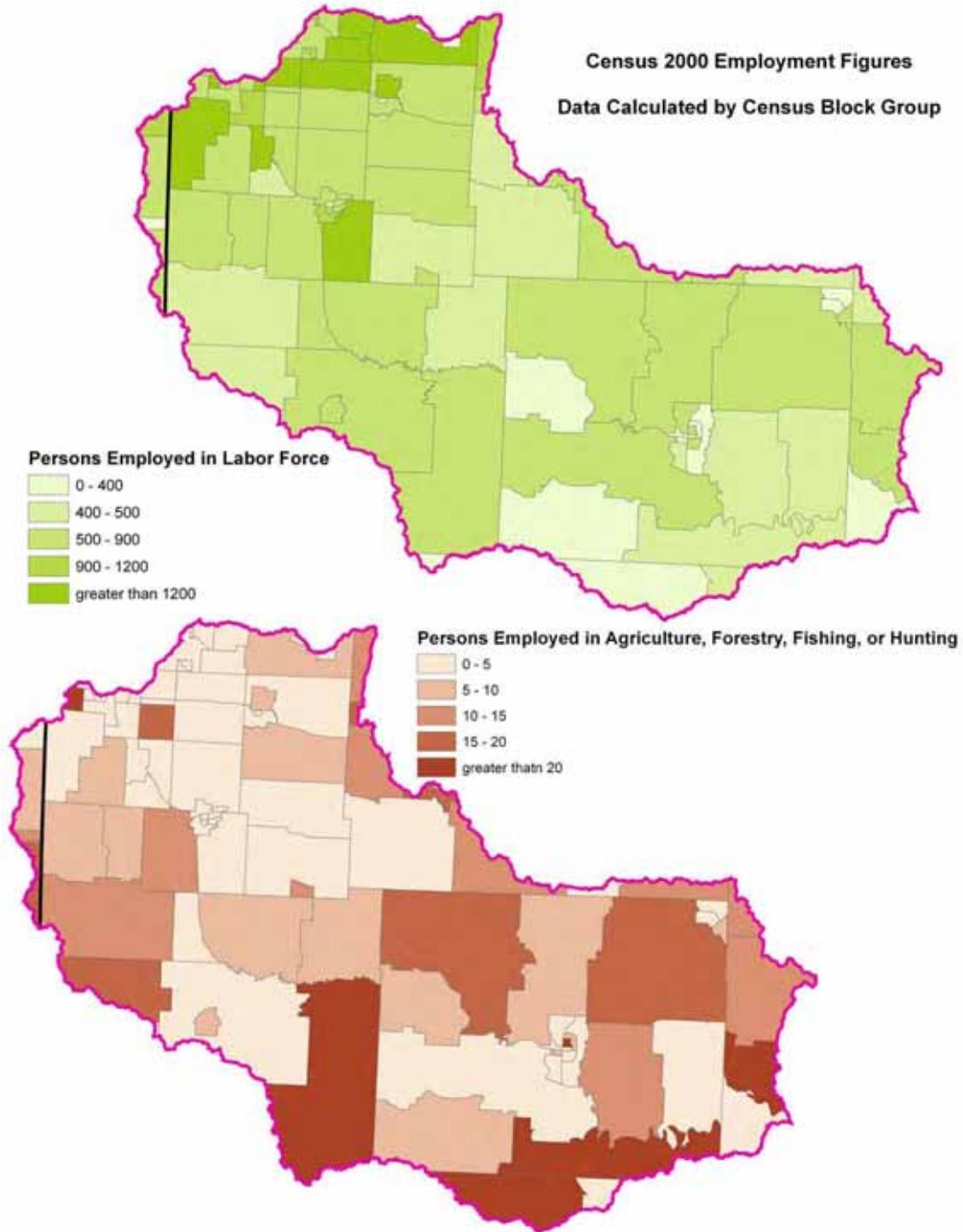


According to the Census Bureau, well over half of the population in the watershed falls between the ages of 18 and 65. Additionally, most of the income earned in this watershed comes from wages or salaries.

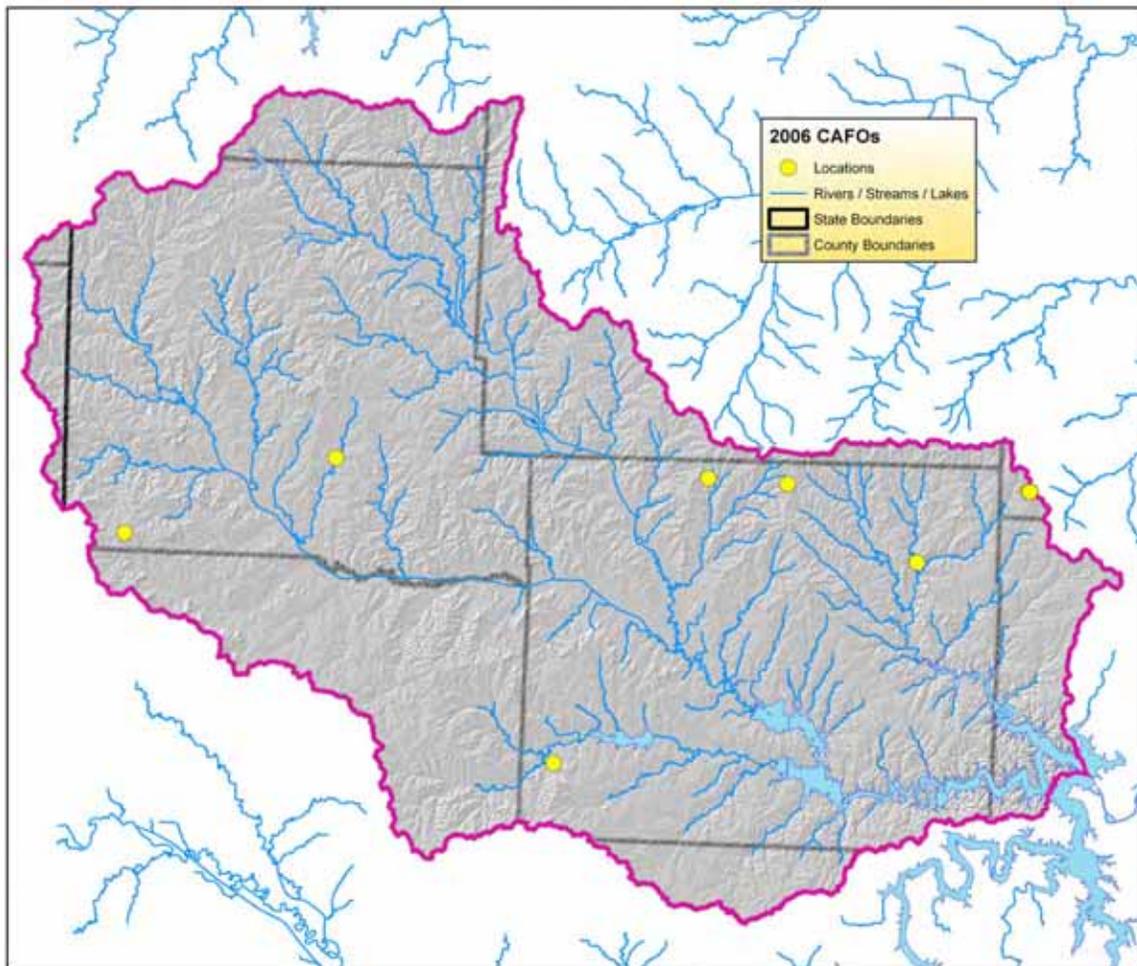


Agriculture income is not separated from other types of income in this graph. Farmers who own and work their own farms or ranches are included as Self-Employed. Farm hands and others who do not work their own land, and are paid employees are included as Wage and Salary Income.

Census Data – Continued



Confined Animal Feeding Operations



Confined Animal Feeding Operations (CAFOs) are special agriculture facilities that consist of large numbers of animals that are housed and fed in a confined space for a limited period of time. The official definition of a CAFO is as follows:

An operating location where animals have been, are, or will be stabled or confined and fed or maintained for a total of forty-five (45) days or more in any twelve (12)-month period, and a ground cover of vegetation is not sustained over at least fifty percent (50%) of the animal confinement area and meets one (1) of the following criteria: A.) Class I operation; or B.) Class II operation that discharges through a man-made conveyance or where pollutants are discharged directly into waters of the state which originate outside of and pass over, across or through the operation or otherwise come into direct contact with the animals confined in the operation.

There are eight permitted CAFOs in the watershed. While they are distributed throughout the watershed, most are located relatively near streams.

Confined Animal Feeding Operations - Continued

Definition of Animal Units:

1 Animal Unit =					
1	Beef feeder or slaughter animal	2.5	Swine weighing over 55 lbs.	30	Chicken laying hens
0.5	Horse	15	Swine weighing less than 55 lbs.	60	Chicken layer pullets
0.7	Dairy cow	10	Sheep	55	Turkeys
				100	Broiler chickens

CONFINED ANIMAL FEEDING OPERATIONS - MISSOURI CAFO PERMIT - 2006

Animal Type	No. of Permitted Farms	No. of Permitted Animals
Dairy		
Feedlot		
Poultry	4	4,171
Swine	4	8,974
Other		

State Regulations restrict where CAFOs can be located, based on setbacks from dwellings and wells. These setbacks are also based on the total number of animal units housed at each facility.

Facility Setback:			
Feature	Facility Size	Requirement	Regulating Authority
Dwelling (Non-Owned)	1000 to 2999 AU 3000 to 6999 AU 7000 AU or more	1000 feet 2000 feet 3000 feet	State of Missouri
Well	All	100 feet (poultry litter) 300 feet (other)	State of Missouri

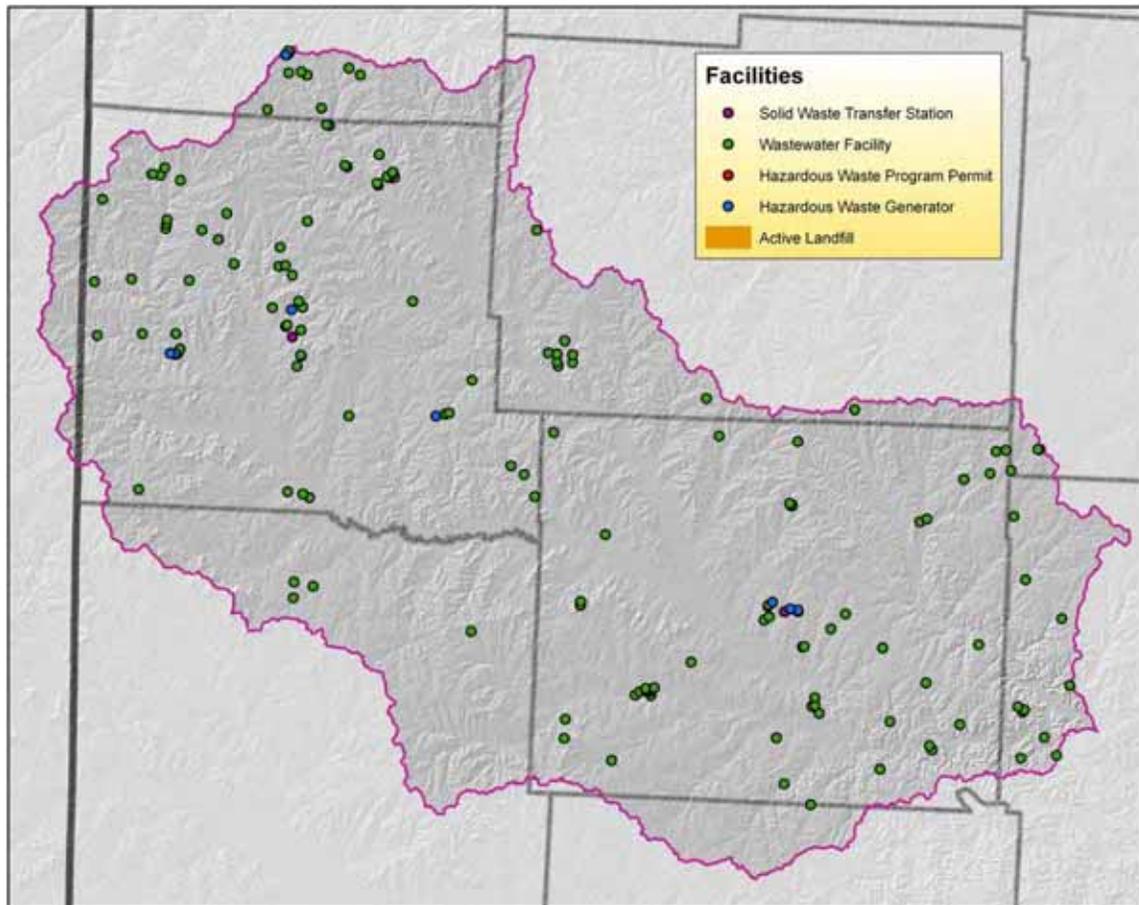
Confined Animal Feeding Operations - Continued

Additional Setbacks:

Of the ten counties that contribute area to the Lower Osage River sub-basin, only Henry and Pettis Counties have additional restrictions as imposed by County Health Ordinances.

Facility Setback:			
Feature	Facility Size	Requirement	Regulating Authority
Dwelling (Non-Owned)	1000 AU or more	3000 feet	Henry County
Well	All	100 feet (poultry litter) 300 feet (other)	State of Missouri
WARNING: No lagoons shall be located on an elevation less than 742 feet. The entire evaluation area is above 742 feet elevation.			Henry County
Feature	Facility Size	Requirement	Regulating Authority
Dwelling (Non-Owned) ¹	300 to 1100 AU	1000 feet	Pettis County
	1101 to 1650 AU	1320 feet	
	1651 to 2000 AU	2640 feet	
	2001 AU or more	3960 feet	
Other CAFOs ²	All	1320 to 5280 feet	Pettis County
Populated Area ³	2001 AU or more	10560 feet	Pettis County
Well	All	100 feet (poultry litter) 300 feet (other)	State of Missouri
¹ Increases 1320 feet per 500 AU in excess above 2000 AU. ² County restrictions have different classifications for CAFOs than state standards. You will need to read the county legislation for specifications and size classifications. ³ Increases 1320 feet per 500 AU in excess above 2000 AU. Populated Area defined as an area having at least 10 occupied dwellings within one square mile.			

Solid Waste and Wastewater Facilities



Solid waste management permitting, monitoring and enforcement efforts can prevent illegal dumping and other factors that may cause long-term social, economic and environmental problems.

Solid Waste Transfer Station: active solid waste transfer stations in Missouri.

Wastewater Facility: outfall locations of wastewater facilities with Missouri National Pollutant Discharge System (NPDES) Operating Permits.

Hazardous Waste Program Permits: sites permitted to treat, store or dispose of hazardous waste and facilities that are certified for resource recovery. Some of the permitted sites have known or suspected hazardous contamination.

Hazardous Waste Generator: large quantity hazardous waste generators registered in Missouri.

Active Landfills: permitted active landfills in Missouri.

Solid Waste and Wastewater Facilities – Continued

Permitted Facilities		
	Facility Type	Total
	Hazardous Waste Generators	8
	Hazardous Waste Program Permits	1
	Wastewater Facilities	162
	Solid Waste Transfer Stations	2
	Active Landfills	2

Drinking Water

Ground Water (Public Wells)	
<i>*Missouri Data Only</i>	
Total population served by public wells	5108
Community population served by wells	4361
Non-community, non-transient population (schools, factories)	75
Non-community, transient population (campgrounds, state parks)	672
Total wells	1280
Public wells	27
Community wells	9
Non-community, non-transient population	1
Non-community, transient	13
Private wells	1253

Of the total population served by public wells, over 85% are using community wells.

Surface Water (Reservoir Used for Public Drinking)	
<i>*Missouri Data Only</i>	
Total population served by surface water	43172
Community population served by surface water	43172
Non-community, non-transient population (schools, factories)	0
Non-community, transient population (campgrounds, state parks)	0
Total number of intakes	11

All of the population served by surface water is in communities.

Resource Concerns

Endangered and Threatened Species

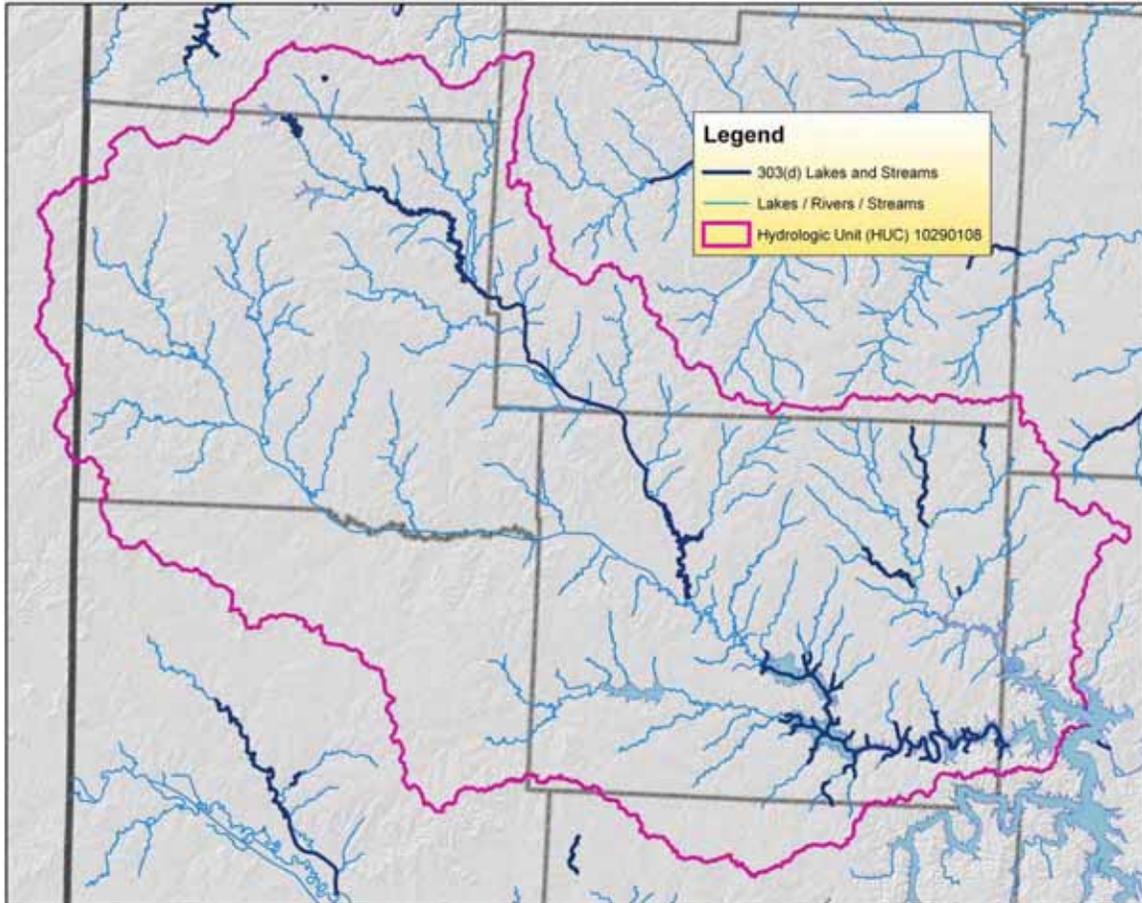
THREATENED AND ENDANGERED SPECIES LISTED FEDERALLY AND BY STATE		
State or Federally listed	Species	Endangered Status
State	Redbelly Snake - <i>reptile</i>	Threatened
State	Smooth Earth Snake - <i>reptile</i>	Threatened
State	Broadhead Skink - <i>reptile</i>	Threatened
State / Federal	Mead's Milkweed - <i>plant</i>	State - Endangered / Federal - Threatened
State / Federal	Gray Bat - <i>Mammal</i>	State - Endangered / Federal - Endangered
State	Barn Owl - <i>bird</i>	Endangered
State	Northern Harrier - <i>bird</i>	Endangered
State	Greater Prairie Chicken - <i>Bird</i>	Endangered
State / Federal	Bald Eagle - <i>bird</i>	State - Endangered / Federal - Threatened
State	Black-tailed Jackrabbit - <i>mammal</i>	Endangered
State / Federal	Geocarpon - <i>plant</i>	State - Endangered / Federal - Threatened
<p style="text-align: center;"> <i>Listed by U.S. Fish and Wildlife</i> <i>Listed by Missouri Department of Conservation</i> <i>Listed by Kansas Department of Wildlife and Parks</i> </p>		

Stream Flow Data

STREAM FLOW DATA	USGS 06921760 South Grand River near Clinton, MO as recorded 1992-2006	Total Avg. Yield	1,139 CFS
		May - Sept. Yield	1,280 CFS

Resource Concerns – Continued

303(d) Listed Lakes and Streams



The South Grand River sub-basin has a total of nine separate streams and rivers, and three separate lakes listed as 303(d) waters. The largest of these are a 49 mile stretch of Big Creek running northwest from the South Grand River to a confluence just south of the town of Pleasant Hill, and the Harry S Truman Reservoir.

303(d) listed waters are named from Section 303(d) of the federal Clean Water Act. This Act requires that each state identify waters that are not meeting water quality standards, and for which adequate water pollution controls have not been required. Additional information on 303(d) listed waters, Impaired Waters, and Total Maximum Daily Loads (TMDL) can be found on the Missouri Department of Natural Resources website at:

<http://www.dnr.mo.gov/env/wpp/tmdl/index.html>

Resource Concerns – Continued

STREAM DATA		Miles	Percent
	Total Miles - Major Streams	871	100%
	303(d) Listed Streams	69.3	7.96%
303(d) Listed Streams and Lakes			
	Barkers Creek Tributary	0.3	miles
	Big Creek	49	miles
	Big Otter Creek	1	miles
	Big Otter Creek Tributary	1	miles
	East Fork Tebo Creek	1	miles
	Honey Creek	3	miles
	Middle Fork Tebo Creek	5.5	miles
	Middle Fork Tebo Creek Tributary	1.5	miles
	West Fork Tebo Creek	7	miles
	Bluestem Lake	15	acres
	Harry S Truman Lake	10000	acres
	Winnebago Lake	350	acres

Resource Concerns – Continued

Local Stakeholder Meetings

Meetings with local stakeholders were held at two locations – Clinton and Harrisonville – within the South Grand Watershed (see following table). These locations were chosen to obtain as widest as possible set of venues that would be convenient for local stakeholders to meet and provide the information needed from them. The information obtained consisted of crops grown in the area, cropping practices, conservation practices and natural resource issues. Two meetings have been held and a third is scheduled (See following table). These meetings are described below.

Attendance at Rapid Watershed Assessment Meetings – South Grand Watershed

Initial Meeting			Invitees*	Second Meeting		
Date	Location	Attendees		Date	Location	Attendees
1 - 24	Clinton	13	44	3 – 27	Clinton	14
1 - 25	Harrisonville	12	46	5 – 1	Harrisonville	23

* Invitees with verified addresses

Initial meeting – A small group (8 – 12) of key landowners were identified by SWCD and NRCS personnel and invited to attend these meetings. SWCD and agency staff also was invited. At this initial meeting, following a presentation describing the project, we asked attendees to identify other key landowners in the larger watershed so we might invite them to another meeting within a month or so to obtain the information described above.

Following this meeting, mailing addresses were obtained from several sources on the World Wide Web. Letters of invitation were mailed approximately two weeks prior to the actual meeting.

Second meeting - At this second meetings, University of Missouri Extension Water Quality Program personnel facilitated a discussion with the group to elicit crops grown, crop yields, cropping/grazing practices, conservation practices applied, resource concerns and resource issues within the watershed.

Final meeting – A final series of meetings was scheduled for April of 2008 within the watershed. Findings were to be reported back to the groups as a check for accuracy and their opinions regarding the overall utility of the information gathered. However, due to an unusually wet spring, these meetings were subsequently cancelled.

Resource Concerns – Continued**Cropping Practices**Clinton –

- A. Main crops: Corn, Wheat, Soybeans
 - Wheat is grown the least; double cropping - lespedeza or clover
 - Recent years - continuous corn; economics is the driving force – ethanol production
- B. Fertilizer
 - Mostly commercial and some manure
 - Forages – landowner applied; other crops are fertilized by the supplier
 - Soil testing – has been done for less than 20 years
 - Lime broadcast at the rate of 2-3 tons every 4-5 years
- C. Herbicides
 1. Soybeans: RoundUp is contact applied
 2. Corn-grass: soil applied herbicide
 - Because of resistance to weeds - going to split applications of herbicides
 3. Wheat: not worried in past; now, winter annuals and onions are a problem
 4. Soybeans followed by corn: generally not inoculated; fungicides are used when necessary
 5. Plant some Bt corn
- D. Tillage
 1. Soybeans: not a high percentage
 2. Wheat: not a high percentage
 3. Corn: less than 10% no-till; most is conservation tilled (minimum till)
 4. Minor crops: sunflowers/milo/alfalfa
 5. New farm practices: irrigation-pivots
- E. Conservation Reserve Program (CRP)
 1. CP33-buffer acres: amount is increasing
 2. Lot of CRP was on highly erosive and/or on lower productive soils
 3. New signups require warm season grasses while earlier signups permitted cool season grasses
 4. CRP land that is coming out of the program is going to crops
 5. Higher grain prices may bring back some land in production

Resource Concerns – ContinuedHarrisonville –

- A. Main crops: Wheat, corn, and soybeans
- B. Rotations
 - 1. Corn, soybeans
 - 2. Corn, soybeans, soybeans
 - 3. Corn price dictates: corn, corn, soybeans, wheat 4th year (soybeans are double-cropped)
 - 4. Very little other grains grown in this part of the watershed
 - 5. Milo is replacing popcorn
 - 6. Double-crop soybeans after wheat
- C. Yields
 - 1. Corn: county average - 125bu/acre; range - 90-150 bu/ac
 - 2. Soybeans: county average - 35 bu/acre; range 20-60 bu/ac 25 bu/ac - double crop, 40+ bu/ac - single crop
 - 3. Wheat: county average 50 bu/acre; range 30-70 bu/ac
 - 4. Popcorn: 1000 acres (entire county)
 - 5. Milo: 1000 acres (entire county); county average 70-80 bu/ac range 50-90 bu/ac
- D. Tillage Practices
 - 1. Conventional till: 0
 - 2. Conservation till: 70-75%
 - 3. No-till: 25-30%
- E. Fertilization – Irrigation – 2,000 acres (manure is applied on crops)
 - 1. Corn: preplanting anhydrous – 150-75-75; at planting – P-K
 - Applied mostly single pass with side dressing
 - 2. Soybeans: use carryover from corn
 - 3. Wheat: Spring application of N (100-0-0) – top dress, sometimes split application - P-K in the fall, 0-50-70
- F. Lime
 - 3-5 year intervals
 - 2-4 tons per acre
- G. Soil test
 - 1. Every four years
 - 2. Some farmers test every other year
 - Rental land, price of fertilizer dictate application
- H. Herbicides – used by everyone
 - 1. Corn: lots of choices; atrazine – 1.5 – 2.0 lbs/ac
 - 2. Soybeans: 90% RoundUp ready
 - 3. Wheat: little herbicides used on wheat; sometimes spray for broadleaf
- I. Seed treatment
 - 1. Corn: Poncho
 - 2. Beans: very low percent are inoculated
 - 3. Fungicides: are applied to bean seeds

Resource Concerns – Continued**Pastures/Hay**Clinton –

A. Forages

1. Fescue: predominant
2. Lespedeza and red clover are inter-seeded
3. Seed production: fertilized for seed production

B Fertilizer

1. Rotational grazing: fertilizer and lime are required
2. Fescue: hayed once/year; yield is 1.5-2.0 tons /acre; fall graze

Harrisonville –

A. Species

1. Fescue: 90%
2. Brome hay only
3. Orchard grass hay only
4. Red clover inter-seeded
5. Lespedeza inter-seeded
6. Alfalfa
7. Sudan
8. Warm season grasses, primarily on CRP lands

B. Fertilization: P-K in fall; N in spring

1. Fescue: 55-20-30 lbs. per acre
2. Brome: 60-20-30 lbs. per acre
3. Orchard grass: 55-20-30 lbs per acre
4. Alfalfa: 0-70-140 lbs. per acre is applied after the first cutting
5. Hog manure: some is applied; sometimes it is tested for nutrient content – Less than 1,000 acres

C. Yields

1. Fescue: 3 tons/acre; county average - 2 tons per acre
2. Orchard grass: slightly less than for fescue
3. Brome: 3 tons/acre on better ground and is fertilized more heavily
4. Alfalfa: 5 tons/acre, four cuttings

D. Lime

1. Applied by soil test every 4-5 years

Resource Concerns – Continued**Grazing**Clinton –

- A. Management: primarily cow-calf
 - 1. 3+/- acres per cow or year round grazing - cow-calf
 - Supplement hay from December through March
 - 2. Protein licks/tub licks
 - 3. Paddock grazing-non-existent
 - 4. Warm season grass grazing: less than 5%
 - Most warm season grass is in CRP or seed production

Harrisonville –

- A. Management: Primarily cattle - lots of small horse lots (number 1 horse county) - more goats are coming in
- B. Forages
 - 1. Fescue: continuous 80%, 3 acre/cow on good pasture
 - 2. Timber: quite a lot less 10 acres/cow
 - 3. Feed hay in the winter
 - 4. Intensive rotation grazing: high intensity, short duration
 - Less than 5,000 acres
- C. Rotation: 20-25%
 - 1. Move every few weeks, among several pastures
 - 2. Feed late November early December through March or mid April
- D. Water
 - 1. Few improved ponds
 - 2. Rural water
 - 3. Creeks, wells
 - 4. Few springs
- E. Nutrient management planning
 - 1. Crops
 - Hay - pasture
 - Livestock pasture
- F. Confinement operations
 - 1. Hogs: 4
 - 2. Dairies: 6

Conservation PracticesClinton –

- Terraces with grass waterways
- Contour grass strips
- Highly erodible lands require conservation plan; crop rotation and tillage to leave residue
- Field borders
- CP33 buffers
- Food plots (small landowners, sports clubs and MDC)

Resource Concerns – Continued**Harrisonville** –

- Terraces
- No-till
- Waterways
- Conservation Reserve Program
- Tile drains
- Buffers/field borders
- Filter strips
- Conservation tillage
- Crop rotation
- Residue management
- Wildlife food plots
- Cover strips
- Edge feathering
- Grazing systems
- Grade stabilization structures
- Crop land being converted to pasture and hay land
- Fence cattle out of ponds and waterways
- Alternative watering sources
- Inter-seed legumes in fescue pasture
- Well decommissioning 1-2 per year
- Elimination of noxious weed and woody invaders in pastures
- Nutrient management/ waste utilization
- Pest management

Natural Resource Issues**Clinton** –

- Parcels of land converted to recreational/ private gun clubs
- Second bottom lands
- Small parcels
 - Urban development/sprawl
- Increased runoff
- On-site household waste management
- Ground water quality/quantity
- Abandoned wells?
- Stream bank erosion
- Channelization - down cutting
- Increased wildlife damage for landowners
- Trespassing problems/ adjacent to Corps of Engineers and MDC
- 4-wheeler/ORV issues
- Resident geese population - water quality issue
- Lake water quality-fecal bacteria/sediment/nutrients/solid waste
- Old car tires

Resource Concerns – Continued**Harrisonville –**

- Sercia lespedeza is invading the area
- Soil erosion – number 1 problem
- Water quality
- Water quantity – is better now
- Flooding from urban development - floods ruin drainages in bottom lands
- Competition for water between agriculture and urban development
- Urban derived flooding has had detrimental effects on bottom land
- Stream channel augmentation
- Lack of wildlife habitat
- Overabundance of deer and turkey
- Too few quail and rabbits
- On site waste systems are failing
- Invasive wildlife – feral hogs and armadillos
- Storm water management by urban cities
- Urban sprawl into rural areas, primarily in the North
- Stream buffering
- Liability concerns (burning fields) less tolerance
- Rural fire departments are less effective, due to lack of adequate water
- Lack of infrastructure with urban sprawl
- Illegal dumping/ trash/ littering
- Trespass and erosion from ATVs
- Trespassers tear down fences, liability issues if cattle get out
- Lack of acknowledgment of headwaters of the watershed
- County road department does not practice conservation
- County and MoDOT need to do a better job of right-of-way maintenance
- Loose dogs and cats – deplete quail and rabbits
- Overgrazing from too many horses
- Fields are tilled to the road ditch - no buffers
- Contamination from closed mines - acid mine leaching
- When log jam on HWY 18 was removed the Grand River started head cutting several miles up the channel

Rapid Watershed Assessments – Matrix Data

Rapid watershed assessments provide initial estimates of where conservation investments would best address the concerns of landowners, conservation districts, and other community organizations and stakeholders. These assessments help land-owners and local leaders set priorities and determine the best actions to achieve their goals.

The rapid assessment matrix summarizes, in tabular form, current and future resource conditions and their qualitative effect on primary resource concerns. The matrix also summarizes future resource conditions by cost, including: installation, annual operations, initial and annual management, and technical assistance.

The following matrix model was developed from Oregon NRCS, but has been customized to represent Missouri conditions and related economic figures. Input for the model was solicited from district conservationists from each watershed, who identified the resource concerns and typical conservation practice systems installed. As with any modeling effort, it is necessary to make assumptions and generalizations. However, these reports contain estimates from local and experienced field conservationists.

For the South Grand River Watershed, the assessment is comprised of four separate land uses – in the following table, the pages in parenthesis show where the respective assessment summary matrices are located.

Land use characteristics used in Assessment Matrix development.

Land Use	Watershed Total (acres)	Typical Unit Size (acres)	Estimated Participation* (%)
Cropland (p. 47-49)	384,977	40	8
Forestland (p. 50-52)	215,127	10	5
Grassland (p. 53-55)	544,741	55	10
Urban (p. 56-58)	18,881	5	9

* Calculated Participation Rate = Future Treated Acres / (Current Base Acres + Current Progressive Acres)

The assessment matrix for each land use identified is presented as two tables.

Assessment Information – summarizes the practices at each treatment level, the quantities of practices for current benchmark conditions and projected future conditions. It also displays the four major resource concerns along with practice effects and adds a “systems rating” indicating the overall effectiveness of the conservation system used at each level.

Rapid Watershed Assessments Matrix – Continued

Conservation Systems are identified by different conservation practices within **Treatment Levels**, as described below.

Baseline System – represents those landowners who typically are not participating in conservation programs.

Progressive System – is a level of conservation adoption that is leading to a full Resource Management System (RMS).

Resource Management System – is a system of conservation practices that address all the SWPA resource concerns typically seen for this land use in the watershed.

Each table includes the four highest priority **Resource Concerns** that typically must be dealt with for that particular land use in the watershed. Other resource concerns might be identified in the profile, but they will not be identified in the matrix. For each resource concern, a numerical **Practice Effect** rating is identified which is the default rating from the statewide Conservation Practice Physical Effects (CPPE) for both the selected resource concerns and conservation practices. The **System Rating** shown for each conservation system indicates the overall effectiveness of the conservation system used at each treatment level.

Current Conditions and Future Conditions, in terms of units of practices within the respective conservation systems, are shown for current benchmark conditions as well as for projected future conditions for each particular conservation practice that is identified within the resource concerns.

Conservation Investment Information – summarizes the installation, management, operation and maintenance costs, by practice and treatment level, for the projected future conditions by federal and private share of the costs. This table also includes the current benchmark and projected future conditions conservation status bars for the Progressive System and the Resource Management System.

USDA Investment costs are shown for each practice included within the different conservation systems.

Installation Costs are shown at a 50% cost-share rate.

Management Costs are shown for a 3-year period, at a 100% rate.

Technical Assistance Costs are shown at a 20% cost-share rate.

Total Present Value of Costs is the summation of all of the preceding costs, by conservation practice.

Private Investment costs are shown for each practice included within the different conservation systems.

Installation Costs are shown at a 50% cost-share rate.

Annual Operation and Management Costs are shown at a 100% rate.

Total Present Value of Costs is the summation of all of the preceding costs, by conservation practice.



South Grand River - 10290108
 8 – Digit Hydrologic Unit Profile and
 Resource Assessment Matrix



WATERSHED NAME & CODE		SOUTH GRAND RIVER - 1029108			LANDUSE ACRES		384,977	
LANDUSE TYPE		CROPLAND			TYPICAL UNIT SIZE ACRES		40	
ASSESSMENT INFORMATION PART 1					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 – Classic Gully	Water Quality – Excessive Nutrients and Organics in Surface Water	Plant Condition – Productivity, Health and Vigor
Baseline System	System Rating ->				2	2	2	4
Total Acreage at Baseline Level	57,747	46,197	0	46,197				
Conservation Crop Rotation (ac.) 328	57,747	46,197	0	46,197	4	1	2	4
Grassed Waterway (ac.) 412	2,887	2,310	0	2,310	0	4	2	5
Residue Management, Seasonal (ac.) 344	57,747	46,197	0	46,197	2	1	1	2
Progressive System	System Rating ->				4	3	4	5
Total Acreage at Progressive Level	269,484	256,010	8,662	264,672				
Conservation Crop Rotation (ac.) 328	269,484	264,672	0	264,672	4	1	2	4
Contour Farming (ac.) 330	269,484	256,010	8,662	264,672	3	1	3	1
Diversion (ft.) 362	3,368,549	3,200,121	108,275	3,308,396	1	3	0	2
Field Border (ft.) 386	8,892,969	8,448,320	285,845	8,734,166	4	2	2	4
Filter Strip (ac.) 393	2,695	2,560	87	2,647	3	0	5	4
Grassed Waterway (ac.) 412	13,474	13,234	0	13,234	0	4	2	5
Residue and Tillage Management, Mulch Till (ac.) 345	269,484	256,010	8,662	264,672	0	0	0	0
Residue Management, Seasonal (ac.) 344	269,484	264,672	0	264,672	2	1	1	2



South Grand River - 10290108

8 – Digit Hydrologic Unit Profile and Resource Assessment Matrix



WATERSHED NAME & CODE	SOUTH GRAND RIVER - 1029108				LANDUSE ACRES	384,977			
LANDUSE TYPE	CROPLAND				TYPICAL UNIT SIZE ACRES	40			
ASSESSMENT INFORMATION PART 2					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 – Classic Gully	Water Quality – Excessive Nutrients and Organics in Surface Water	Plant Condition – Productivity, Health and Vigor	
Resource Management System (RMS)	System Rating ->				5	5	5	5	
Total Acreage at RMS Level	57,747	57,747	16,362	74,108					
Conservation Crop Rotation (ac.) 328	57,747	74,108	0	74,108	4	1	2	4	
Contour Buffer Strips (ac.) 332	2,310	2,310	654	2,964	4	1	3	3	
Contour Farming (ac.) 330	57,747	71,221	2,887	74,108	3	1	3	1	
Cover Crop (ac.) 340	57,747	57,747	16,362	74,108	4	1	2	2	
Diversion (ft.) 362	721,832	890,259	36,092	926,351	1	3	0	2	
Field Border (ft.) 386	1,905,636	2,350,285	95,282	2,445,566	4	2	2	4	
Filter Strip (ac.) 393	577	712	29	741	3	0	5	4	
Grade Stabilization Structure (no.) 410	1,444	1,444	409	1,853	0	5	0	0	
Grassed Waterway (ac.) 412	2,887	3,705	0	3,705	0	4	2	5	
Manure Transfer (no.) 634	1,444	1,444	409	1,853	0	0	3	1	
Nutrient Management (ac.) 590	57,747	57,747	16,362	74,108	0	0	5	3	
Pest Management (ac.) 595	57,747	57,747	16,362	74,108	0	0	0	5	
Residue and Tillage Management, Mulch Till (ac.) 345	57,747	71,221	2,887	74,108	0	0	0	0	
Residue and Tillage Management, No-Till/Strip Till/Direct Seed (ac.) 329	57,747	57,747	16,362	74,108	5	1	1	2	
Terrace (ft.) 600	8,661,983	8,661,983	2,454,228	11,116,211	5	2	2	2	
Upland Wildlife Habitat Management (ac.) 645	6,930	6,930	1,963	8,893	3	2	0	4	



South Grand River - 10290108
 8 – Digit Hydrologic Unit Profile and
 Resource Assessment Matrix



WATERSHED NAME & CODE		SOUTH GRAND RIVER - 1029108				LANDUSE ACRES		384,977	
LANDUSE TYPE		CROPLAND				TYPICAL UNIT SIZE ACRES		40	
CONSERVATION INVESTMENT INFORMATION						ESTIMATED PARTICIPATION		8%	
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	8661.9825								
Conservation Crop Rotation (ac.) 328	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Contour Farming (ac.) 330	8,662	\$0	\$129,930	\$25,986	\$141,754	\$0	\$43,310	\$66,669	
Diversion (ft.) 362	108,275	\$93,116	\$0	\$18,623	\$111,740	\$93,116	\$3,725	\$108,806	
Field Border (ft.) 386	285,845	\$7,146	\$0	\$1,429	\$8,575	\$7,146	\$286	\$8,350	
Filter Strip (ac.) 393	87	\$3,032	\$0	\$606	\$3,638	\$3,032	\$182	\$3,798	
Grassed Waterway (ac.) 412	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Residue and Tillage Management, Mulch Till (ac.) 345	8,662	\$0	\$259,859	\$51,972	\$283,508	\$0	\$86,620	\$133,338	
Residue Management, Seasonal (ac.) 344	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Subtotal		\$103,294	\$389,789	\$98,617	\$549,215	\$103,294	\$134,122	\$320,962	
Resource Management System (RMS) Acres Treated	16361.5225								
Conservation Crop Rotation (ac.) 328	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Contour Buffer Strips (ac.) 332	654	\$17,690	\$0	\$3,538	\$21,228	\$17,690	\$708	\$20,671	
Contour Farming (ac.) 330	2,887	\$0	\$43,310	\$8,662	\$47,251	\$0	\$14,437	\$22,223	
Cover Crop (ac.) 340	16,362	\$0	\$2,343,788	\$468,758	\$2,557,082	\$0	\$781,263	\$1,202,638	
Diversion (ft.) 362	36,092	\$31,039	\$0	\$6,208	\$37,247	\$31,039	\$1,242	\$36,269	
Field Border (ft.) 386	95,282	\$2,382	\$0	\$476	\$2,858	\$2,382	\$95	\$2,783	
Filter Strip (ac.) 393	29	\$1,011	\$0	\$202	\$1,213	\$1,011	\$61	\$1,266	
Grade Stabilization Structure (no.) 410	409	\$2,081,973	\$0	\$416,395	\$2,498,368	\$2,081,973	\$124,918	\$2,608,175	
Grassed Waterway (ac.) 412	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Manure Transfer (no.) 634	409	\$0	\$27,218,374	\$5,443,675	\$29,695,355	\$0	\$9,072,791	\$13,966,218	
Nutrient Management (ac.) 590	16,362	\$0	\$621,901	\$124,380	\$678,497	\$0	\$207,300	\$319,108	
Pest Management (ac.) 595	16,362	\$0	\$1,047,465	\$209,493	\$1,142,788	\$0	\$349,155	\$537,472	
Residue and Tillage Management, Mulch Till (ac.) 345	2,887	\$0	\$86,620	\$17,324	\$94,503	\$0	\$28,873	\$44,446	
Residue and Tillage Management, No-Till/Strip Till/Direct Seed (ac.) 329	16,362	\$0	\$889,903	\$177,981	\$970,888	\$0	\$296,634	\$456,625	
Terrace (ft.) 600	2,454,228	\$2,515,584	\$0	\$503,117	\$3,018,701	\$2,515,584	\$100,623	\$2,939,446	
Upland Wildlife Habitat Management (ac.) 645	1,963	\$0	\$88,352	\$17,670	\$96,393	\$0	\$29,451	\$45,335	
Subtotal		\$4,649,679	\$32,339,714	\$7,397,878	\$40,862,371	\$4,649,679	\$11,007,551	\$22,202,676	
TOTAL ACRES TREATED / ESTIMATED TREATMENT COSTS	25023.505	\$4,752,973	\$32,729,503	\$7,496,495	\$41,411,585	\$4,752,973	\$11,141,674	\$22,523,637	



South Grand River - 10290108
 8 – Digit Hydrologic Unit Profile and
 Resource Assessment Matrix



WATERSHED NAME & CODE		SOUTH GRAND RIVER - 10290108			LANDUSE ACRES		215,127	
LANDUSE TYPE		FORESTLAND			TYPICAL UNIT SIZE ACRES		10	
ASSESSMENT INFORMATION PART 1					ESTIMATED PARTICIPATION		5%	
CONSERVATION SYSTEMS BY TREATMENT LEVELS	CURRENT CONDITIONS	FUTURE CONDITIONS			RESOURCE CONCERNS			
	Total Units	Existing Unchanged Units	New Treatment Units	Total Units	Soil Erosion – Streambank	Water Quantity – Insufficient Flows in Watercourses	Plant Condition – Productivity, Health and Vigor	Fish and Wildlife – Inadequate Food
Baseline System	System Rating ->				0	2	5	4
Total Acreage at Baseline Level	193,614	183,934	0	183,934				
Forest Stand Improvement (ac.) 666	19,361	18,393	0	18,393	0	3	5	3
Tree/Shrub Establishment (ac.) 612	19,361	18,393	0	18,393	0	2	5	3
Tree/Shrub Site Preparation (ac.) 490	19,361	18,393	0	18,393	0	0	5	0
Upland Wildlife Habitat Management (ac.) 645	193,614	183,934	0	183,934	1	1	4	5
Progressive System	System Rating ->				4	4	5	5
Total Acreage at Progressive Level	19,361	15,489	7,745	23,234				
Brush Management (ac.) 314	968	774	387	1,162	1	3	3	3
Critical Area Planting (ac.) 342	968	774	387	1,162	4	0	5	2
Forest Stand Improvement (ac.) 666	9,681	8,519	3,098	11,617	0	3	5	3
Pest Management (ac.) 595	19,361	15,489	7,745	23,234	0	0	5	3
Prescribed Forestry (ac.) 409	19,361	15,489	7,745	23,234	5	5	5	3
Streambank and Shoreline Protection (ft.) 580	968,072	774,457	387,229	1,161,686	4	0	4	2
Tree/Shrub Establishment (ac.) 612	1,936	2,323	0	2,323	0	2	5	3
Tree/Shrub Pruning (ac.) 660	1,936	1,549	774	2,323	0	0	5	1
Tree/Shrub Site Preparation (ac.) 490	1,936	2,323	0	2,323	0	0	5	0
Upland Wildlife Habitat Management (ac.) 645	19,361	23,234	0	23,234	1	1	4	5



South Grand River - 10290108

8 – Digit Hydrologic Unit Profile and Resource Assessment Matrix



WATERSHED NAME & CODE	SOUTH GRAND RIVER - 10290108				LANDUSE ACRES	215,127			
LANDUSE TYPE	FORESTLAND				TYPICAL UNIT SIZE ACRES	10			
ASSESSMENT INFORMATION PART 2					ESTIMATED PARTICIPATION	5%			
CONSERVATION SYSTEMS BY TREATMENT LEVELS	CURRENT CONDITIONS	FUTURE CONDITIONS			RESOURCE CONCERNS				
	Total Units	Existing Unchanged Units	New Treatment Units	Total Units	Soil Erosion – Streambank	Water Quantity – Insufficient Flows in Watercourses	Plant Condition – Productivity, Health and Vigor	Fish and Wildlife – Inadequate Food	
Resource Management System (RMS)	System Rating ->				4	3	5	5	
Total Acreage at RMS Level	2,151	2,151	3,872	6,024					
Brush Management (ac.) 314	108	204	97	301	1	3	3	3	
Critical Area Planting (ac.) 342	108	204	97	301	4	0	5	2	
Forest Stand Improvement (ac.) 666	1,936	3,098	2,323	5,421	0	3	5	3	
Forest Trails and Landings (ac.) 655	108	108	194	301	0	0	2	1	
Pest Management (ac.) 595	2,151	4,087	1,936	6,024	0	0	5	3	
Prescribed Forestry (ac.) 409	2,151	4,087	1,936	6,024	5	5	5	3	
Shallow Water Management for Wildlife (ac.) 646	11	11	19	30	0	0	3	4	
Streambank and Shoreline Protection (ft.) 580	107,564	204,371	96,807	301,178	4	0	4	2	
Tree/Shrub Establishment (ac.) 612	215	602	0	602	0	2	5	3	
Tree/Shrub Pruning (ac.) 660	215	409	194	602	0	0	5	1	
Tree/Shrub Site Preparation (ac.) 490	215	602	0	602	0	0	5	0	
Upland Wildlife Habitat Management (ac.) 645	2,151	6,024	0	6,024	1	1	4	5	
Use Exclusion (ac.) 472	2,108	2,108	3,795	5,903	2	2	4	3	
Wetland Restoration (ac.) 657	215	215	387	602	0	0	4	5	
Windbreak/Shelterbelt Establishment (ft.) 380	107,564	107,564	193,614	301,178	0	-2	5	4	



South Grand River - 10290108

8 – Digit Hydrologic Unit Profile and Resource Assessment Matrix



WATERSHED NAME & CODE	SOUTH GRAND RIVER - 10290108				LANDUSE ACRES	215,127		
LANDUSE TYPE	FORESTLAND				TYPICAL UNIT SIZE ACRES	10		
CONSERVATION INVESTMENT INFORMATION					ESTIMATED PARTICIPATION	5%		
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	7744.572							
Brush Management (ac.) 314	387	\$17,172	\$0	\$3,434	\$20,606	\$17,172	\$343	\$18,618
Critical Area Planting (ac.) 342	387	\$92,195	\$0	\$18,439	\$110,634	\$92,195	\$1,844	\$99,962
Forest Stand Improvement (ac.) 666	3,098	\$138,674	\$0	\$27,735	\$166,409	\$138,674	\$2,773	\$150,357
Pest Management (ac.) 595	7,745	\$0	\$495,807	\$99,161	\$540,928	\$0	\$165,269	\$254,407
Prescribed Forestry (ac.) 409	7,745	\$193,614	\$0	\$38,723	\$232,337	\$193,614	\$0	\$193,614
Streambank and Shoreline Protection (ft.) 580	387,229	\$2,112,332	\$0	\$422,466	\$2,534,798	\$2,112,332	\$84,493	\$2,468,248
Tree/Shrub Establishment (ac.) 612	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Tree/Shrub Pruning (ac.) 660	774	\$87,126	\$0	\$17,425	\$104,552	\$87,126	\$3,485	\$101,807
Tree/Shrub Site Preparation (ac.) 490	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Upland Wildlife Habitat Management (ac.) 645	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Subtotal	\$2,641,114	\$495,807	\$627,384	\$3,710,265	\$2,641,114	\$258,208	\$3,287,015
Resource Management System (RMS) Acres Treated	3872.286							
Brush Management (ac.) 314	97	\$4,293	\$0	\$859	\$5,151	\$4,293	\$86	\$4,655
Critical Area Planting (ac.) 342	97	\$23,049	\$0	\$4,610	\$27,659	\$23,049	\$461	\$24,991
Forest Stand Improvement (ac.) 666	2,323	\$104,006	\$0	\$20,801	\$124,807	\$104,006	\$2,080	\$112,768
Forest Trails and Landings (ac.) 655	194	\$115,349	\$0	\$23,070	\$138,418	\$115,349	\$4,614	\$134,784
Pest Management (ac.) 595	1,936	\$0	\$123,952	\$24,790	\$135,232	\$0	\$41,317	\$63,602
Prescribed Forestry (ac.) 409	1,936	\$48,404	\$0	\$9,681	\$58,084	\$48,404	\$0	\$48,404
Shallow Water Management for Wildlife (ac.) 646	19	\$97	\$0	\$19	\$116	\$97	\$0	\$97
Streambank and Shoreline Protection (ft.) 580	96,807	\$528,083	\$0	\$105,617	\$633,700	\$528,083	\$21,123	\$617,062
Tree/Shrub Establishment (ac.) 612	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Tree/Shrub Pruning (ac.) 660	194	\$21,782	\$0	\$4,356	\$26,138	\$21,782	\$871	\$25,452
Tree/Shrub Site Preparation (ac.) 490	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Upland Wildlife Habitat Management (ac.) 645	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Use Exclusion (ac.) 472	3,795	\$9,487	\$0	\$1,897	\$11,385	\$9,487	\$569	\$11,885
Wetland Restoration (ac.) 657	387	\$58,084	\$0	\$11,617	\$69,701	\$58,084	\$1,162	\$62,978
Windbreak/Shelterbelt Establishment (ft.) 380	193,614	\$43,563	\$0	\$8,713	\$52,276	\$43,563	\$1,743	\$50,903
	Subtotal	\$956,196	\$123,952	\$216,030	\$1,282,667	\$956,196	\$74,026	\$1,157,579
TOTAL ACRES TREATED / ESTIMATED TREATMENT COSTS	11616.858	\$3,597,310	\$619,759	\$843,414	\$4,992,932	\$3,597,310	\$332,235	\$4,444,594



South Grand River - 10290108

8 – Digit Hydrologic Unit Profile and Resource Assessment Matrix



WATERSHED NAME & CODE		SOUTH GRAND RIVER - 10290108			LANDUSE ACRES		544,741	
LANDUSE TYPE		GRASSLAND			TYPICAL UNIT SIZE ACRES		55	
ASSESSMENT INFORMATION PART 1					ESTIMATED PARTICIPATION		10%	
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	Soil Erosion – Streambank	Plant Condition – Productivity, Health and Vigor	Domestic Animals – Inadequate Quantities and Quality of Feed and Forage
Baseline System		System Rating ->			2	0	4	4
Total Acreage at Baseline Level		190,659	162,060	0	162,060			
Fence (ft.) 382	20,799,202	17,679,322	0	17,679,322	0	0	0	0
Forage Harvest Management (ac.) 511	190,659	162,060	0	162,060	0	0	4	4
Pasture and Hay Planting (ac.) 512	190,659	162,060	0	162,060	1	0	5	5
Pipeline (ft.) 516	3,466,534	2,946,554	0	2,946,554	0	0	2	0
Pond (no.) 378	3,467	2,947	0	2,947	4	1	2	0
Progressive System		System Rating ->			3	3	5	5
Total Acreage at Progressive Level		217,896	196,107	19,066	215,173			
Brush Management (ac.) 314	32,684	29,416	2,860	32,276	3	1	3	4
Fence (ft.) 382	35,655,775	34,170,117	1,039,960	35,210,077	0	0	0	0
Forage Harvest Management (ac.) 511	217,896	215,173	0	215,173	0	0	4	4
Pasture and Hay Planting (ac.) 512	217,896	215,173	0	215,173	1	0	5	5
Pipeline (ft.) 516	7,923,505	7,477,808	346,653	7,824,462	0	0	2	0
Pond (no.) 378	3,962	3,912	0	3,912	4	1	2	0
Upland Wildlife Habitat Management (ac.) 645	21,790	19,611	1,907	21,517	2	1	4	2
Use Exclusion (ac.) 472	26,148	23,533	2,288	25,821	2	2	4	4
Watering Facility (no.) 614	3,962	3,566	347	3,912	1	4	2	3



South Grand River - 10290108
 8 – Digit Hydrologic Unit Profile and
 Resource Assessment Matrix



WATERSHED NAME & CODE		SOUTH GRAND RIVER - 10290108			LANDUSE ACRES		544,741	
LANDUSE TYPE		GRASSLAND			TYPICAL UNIT SIZE ACRES		55	
ASSESSMENT INFORMATION PART 2					ESTIMATED PARTICIPATION		10%	
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	Soil Erosion – Streambank	Plant Condition – Productivity, Health and Vigor	Domestic Animals – Inadequate Quantities and Quality of Feed and Forage
Resource Management System (RMS)	System Rating ->				3	4	5	5
Total Acreage at RMS Level	136,185	136,185	20,428	156,613				
Brush Management (ac.) 314	13,619	14,708	953	15,661	3	1	3	4
Fence (ft.) 382	28,475,098	31,297,847	1,448,516	32,746,362	0	0	0	0
Forage Harvest Management (ac.) 511	122,567	140,952	0	140,952	0	0	4	4
Nutrient Management (ac.) 590	122,567	122,567	18,385	140,952	0	0	3	4
Pasture and Hay Planting (ac.) 512	122,567	140,952	0	140,952	1	0	5	5
Pest Management (ac.) 595	136,185	136,185	20,428	156,613	0	0	5	4
Pipeline (ft.) 516	6,561,653	7,131,155	414,746	7,545,901	0	0	2	0
Pond (no.) 378	2,476	2,848	0	2,848	4	1	2	0
Prescribed Grazing (ac.) 528	122,567	122,567	18,385	140,952	2	3	5	5
Riparian Forest Buffer (ac.) 391	13,619	13,619	2,043	15,661	3	4	4	0
Streambank and Shoreline Protection (ft.) 580	1,238,048	1,238,048	185,707	1,423,755	0	4	4	1
Tree/Shrub Establishment (ac.) 612	13,619	13,619	2,043	15,661	2	0	5	2
Tree/Shrub Site Preparation (ac.) 490	13,619	13,619	2,043	15,661	-2	0	5	0
Upland Wildlife Habitat Management (ac.) 645	13,619	14,708	953	15,661	2	1	4	2
Use Exclusion (ac.) 472	16,342	17,650	1,144	18,794	2	2	4	4
Water Well (no.) 642	2,476	2,476	371	2,848	0	0	1	2
Watering Facility (no.) 614	2,476	2,674	173	2,848	1	4	2	3



South Grand River - 10290108

8 – Digit Hydrologic Unit Profile and Resource Assessment Matrix



WATERSHED NAME & CODE	SOUTH GRAND RIVER - 10290108					LANDUSE ACRES	544,741		
LANDUSE TYPE	GRASSLAND					TYPICAL UNIT SIZE ACRES	55		
CONSERVATION INVESTMENT INFORMATION						ESTIMATED PARTICIPATION	10%		
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	19065.935								
Brush Management (ac.) 314	2,860	\$126,822	\$0	\$25,364	\$152,186	\$126,822	\$2,536	\$137,506	
Fence (ft.) 382	1,039,960	\$759,171	\$0	\$151,834	\$911,005	\$759,171	\$75,917	\$1,078,961	
Forage Harvest Management (ac.) 511	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Pasture and Hay Planting (ac.) 512	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Pipeline (ft.) 516	346,653	\$372,652	\$0	\$74,530	\$447,183	\$372,652	\$0	\$372,652	
Pond (no.) 378	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Upland Wildlife Habitat Management (ac.) 645	1,907	\$0	\$85,797	\$17,159	\$93,605	\$0	\$28,599	\$44,024	
Use Exclusion (ac.) 472	2,288	\$5,720	\$0	\$1,144	\$6,864	\$5,720	\$343	\$7,165	
Watering Facility (no.) 614	347	\$157,445	\$0	\$31,489	\$188,934	\$157,445	\$6,298	\$183,973	
	Subtotal	\$1,421,810	\$85,797	\$301,521	\$1,799,776	\$1,421,810	\$113,693	\$1,824,282	
Resource Management System (RMS) Acres Treated	20427.7875								
Brush Management (ac.) 314	953	\$42,274	\$0	\$8,455	\$50,729	\$42,274	\$845	\$45,835	
Fence (ft.) 382	1,448,516	\$1,057,417	\$0	\$211,483	\$1,268,900	\$1,057,417	\$105,742	\$1,502,839	
Forage Harvest Management (ac.) 511	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Nutrient Management (ac.) 590	18,385	\$0	\$698,814	\$139,763	\$762,409	\$0	\$232,938	\$358,574	
Pasture and Hay Planting (ac.) 512	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Pest Management (ac.) 595	20,428	\$0	\$1,307,787	\$261,557	\$1,426,801	\$0	\$435,929	\$671,048	
Pipeline (ft.) 516	414,746	\$445,852	\$0	\$89,170	\$535,022	\$445,852	\$0	\$445,852	
Pond (no.) 378	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Prescribed Grazing (ac.) 528	18,385	\$80,894	\$0	\$16,179	\$97,073	\$80,894	\$0	\$80,894	
Riparian Forest Buffer (ac.) 391	2,043	\$332,973	\$0	\$66,595	\$399,568	\$332,973	\$6,659	\$361,025	
Streambank and Shoreline Protection (ft.) 580	185,707	\$1,013,033	\$0	\$202,607	\$1,215,639	\$1,013,033	\$40,521	\$1,183,723	
Tree/Shrub Establishment (ac.) 612	2,043	\$332,973	\$0	\$66,595	\$399,568	\$332,973	\$0	\$332,973	
Tree/Shrub Site Preparation (ac.) 490	2,043	\$0	\$274,488	\$54,898	\$299,468	\$0	\$91,496	\$140,845	
Upland Wildlife Habitat Management (ac.) 645	953	\$0	\$42,898	\$8,580	\$46,802	\$0	\$14,299	\$22,012	
Use Exclusion (ac.) 472	1,144	\$2,860	\$0	\$572	\$3,432	\$2,860	\$172	\$3,583	
Water Well (no.) 642	371	\$555,569	\$0	\$111,114	\$666,683	\$555,569	\$22,223	\$649,179	
Watering Facility (no.) 614	173	\$78,722	\$0	\$15,744	\$94,467	\$78,722	\$3,149	\$91,987	
	Subtotal	\$3,942,566	\$2,323,988	\$1,253,311	\$7,266,559	\$3,942,566	\$953,974	\$5,890,368	
TOTAL ACRES TREATED / ESTIMATED TREATMENT COSTS	39493.7225	\$5,364,376	\$2,409,784	\$1,554,832	\$9,066,335	\$5,364,376	\$1,067,667	\$7,714,651	



South Grand River - 10290108
 8 – Digit Hydrologic Unit Profile and
 Resource Assessment Matrix



		SOUTH GRAND RIVER - 10290108			LANDUSE ACRES		18,881	
LANDUSE TYPE		HIGH AND LOW INTENSITY URBAN			TYPICAL UNIT SIZE ACRES		5	
ASSESSMENT INFORMATION PART 1					ESTIMATED PARTICIPATION		9%	
CONSERVATION SYSTEMS BY TREATMENT LEVELS	CURRENT CONDITIONS	FUTURE CONDITIONS			RESOURCE CONCERNS			
	Total Units	Existing Unchanged Units	New Treatment Units	Total Units	Soil Erosion – Mass Movement	Water Quantity – Excessive Runoff, Flooding, or Ponding	Water Quality – Excessive Nutrients and Organics in Surface Water	Water Quality – Excessive Suspended Sediment and Turbidity in Surface Water
Baseline System		System Rating ->			#N/A	0	1	3
Total Acreage at Baseline Level		16,993	15,294	0	15,294			
Critical Area Planting (ac.) 342	850	765	0	765	#N/A	0	2	4
Fence (ft.) 382	4,418,154	3,976,339	0	3,976,339	#N/A	0	0	0
Tree/Shrub Establishment (ac.) 612	850	765	0	765	#N/A	-1	2	4
Progressive System		System Rating ->			#N/A	1	2	4
Total Acreage at Progressive Level		1,699	1,529	1,359	2,889			
Critical Area Planting (ac.) 342	85	144	0	144	#N/A	0	2	4
Fence (ft.) 382	441,815	751,086	0	751,086	#N/A	0	0	0
Grade Stabilization Structure (no.) 410	340	306	272	578	#N/A	0	0	2
Mulching (ac.) 484	170	153	136	289	#N/A	2	2	2
Pipeline (ft.) 516	84,965	76,468	67,972	144,440	#N/A	0	0	0
Tree/Shrub Establishment (ac.) 612	127	183	34	217	#N/A	-1	2	4
Upland Wildlife Habitat Management (ac.) 645	680	612	544	1,156	#N/A	1	0	2
Watering Facility (no.) 614	340	306	272	578	#N/A	0	0	2
Windbreak/Shelterbelt Establishment (ft.) 380	169,929	152,936	135,943	288,879	#N/A	1	1	2



South Grand River - 10290108
 8 – Digit Hydrologic Unit Profile and
 Resource Assessment Matrix



WATERSHED NAME & CODE		SOUTH GRAND RIVER - 10290108			LANDUSE ACRES		18,881	
LANDUSE TYPE		HIGH AND LOW INTENSITY URBAN			TYPICAL UNIT SIZE ACRES		5	
ASSESSMENT INFORMATION PART 2					ESTIMATED PARTICIPATION		9%	
CONSERVATION SYSTEMS BY TREATMENT LEVELS	CURRENT CONDITIONS	FUTURE CONDITIONS			RESOURCE CONCERNS			
	Total Units	Existing Unchanged Units	New Treatment Units	Total Units	Soil Erosion – Mass Movement	Water Quantity – Excessive Runoff, Flooding, or Ponding	Water Quality – Excessive Nutrients and Organics in Surface Water	Water Quality – Excessive Suspended Sediment and Turbidity in Surface Water
Resource Management System (RMS)	System Rating ->				#N/A	1	4	4
Total Acreage at RMS Level	189	189	374	563				
Conservation Cover (ac.) 327	9	9	19	28	#N/A	2	2	3
Critical Area Planting (ac.) 342	9	28	0	28	#N/A	0	2	4
Fence (ft.) 382	60,419	157,619	22,431	180,049	#N/A	0	0	0
Grade Stabilization Structure (no.) 410	38	45	68	113	#N/A	0	0	2
Mulching (ac.) 484	28	32	53	84	#N/A	2	2	2
Nutrient Management (ac.) 590	179	179	355	535	#N/A	0	5	0
Pest Management (ac.) 595	179	179	355	535	#N/A	0	0	2
Pipeline (ft.) 516	9,441	11,140	16,993	28,133	#N/A	0	0	0
Tree/Shrub Establishment (ac.) 612	14	34	8	42	#N/A	-1	2	4
Upland Wildlife Habitat Management (ac.) 645	151	165	285	450	#N/A	1	0	2
Watering Facility (no.) 614	38	45	68	113	#N/A	0	0	2
Windbreak/Shelterbelt Establishment (ft.) 380	37,762	41,161	71,370	112,531	#N/A	1	1	2



South Grand River - 10290108
 8 – Digit Hydrologic Unit Profile and
 Resource Assessment Matrix



WATERSHED NAME & CODE		SOUTH GRAND RIVER - 10290108				LANDUSE ACRES		18,881	
LANDUSE TYPE		HIGH AND LOW INTENSITY URBAN				TYPICAL UNIT SIZE ACRES		5	
CONSERVATION INVESTMENT INFORMATION						ESTIMATED PARTICIPATION		9%	
CONSERVATION SYSTEMS BY TREATMENT LEVELS	FUTURE	USDA INVESTMENT				PRIVATE INVESTMENT			
	New Treatment Units	Installation Cost	Management Cost - 3 yrs	Technical Assistance	Total Present Value Cost	Installation Cost	Annual O & M + Mgt Costs	Total Present Value Cost	
		50%	100%	20%		50%	100%		
Progressive System Acres Treated	1359.432								
Critical Area Planting (ac.) 342	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Fence (ft.) 382	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Grade Stabilization Structure (no.) 410	272	\$1,383,881	\$0	\$276,776	\$1,660,658	\$1,383,881	\$83,033	\$1,733,646	
Mulching (ac.) 484	136	\$0	\$40,783	\$8,157	\$44,494	\$0	\$13,594	\$20,926	
Pipeline (ft.) 516	67,972	\$73,069	\$0	\$14,614	\$87,683	\$73,069	\$0	\$73,069	
Tree/Shrub Establishment (ac.) 612	34	\$5,540	\$0	\$1,108	\$6,648	\$5,540	\$0	\$5,540	
Upland Wildlife Habitat Management (ac.) 645	544	\$0	\$24,470	\$4,894	\$26,697	\$0	\$8,157	\$12,556	
Watering Facility (no.) 614	272	\$123,487	\$0	\$24,697	\$148,184	\$123,487	\$4,939	\$144,294	
Windbreak/Shelterbelt Establishment (ft.) 380	135,943	\$30,587	\$0	\$6,117	\$36,705	\$30,587	\$1,223	\$35,741	
Subtotal		\$1,616,564	\$65,253	\$336,363	\$2,011,068	\$1,616,564	\$110,947	\$2,025,772	
Resource Management System (RMS) Acres Treated	373.8438								
Conservation Cover (ac.) 327	19	\$1,183	\$0	\$237	\$1,419	\$1,183	\$24	\$1,282	
Critical Area Planting (ac.) 342	0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Fence (ft.) 382	22,431	\$16,374	\$0	\$3,275	\$19,649	\$16,374	\$1,637	\$23,272	
Grade Stabilization Structure (no.) 410	68	\$345,970	\$0	\$69,194	\$415,164	\$345,970	\$20,758	\$433,412	
Mulching (ac.) 484	53	\$0	\$15,803	\$3,161	\$17,242	\$0	\$5,268	\$8,109	
Nutrient Management (ac.) 590	355	\$0	\$13,499	\$2,700	\$14,728	\$0	\$4,500	\$6,927	
Pest Management (ac.) 595	355	\$0	\$22,737	\$4,547	\$24,806	\$0	\$7,579	\$11,667	
Pipeline (ft.) 516	16,993	\$18,267	\$0	\$3,653	\$21,921	\$18,267	\$0	\$18,267	
Tree/Shrub Establishment (ac.) 612	8	\$1,385	\$0	\$277	\$1,662	\$1,385	\$0	\$1,385	
Upland Wildlife Habitat Management (ac.) 645	285	\$0	\$12,847	\$2,569	\$14,016	\$0	\$4,282	\$6,592	
Watering Facility (no.) 614	68	\$30,872	\$0	\$6,174	\$37,046	\$30,872	\$1,235	\$36,073	
Windbreak/Shelterbelt Establishment (ft.) 380	71,370	\$16,058	\$0	\$3,212	\$19,270	\$16,058	\$642	\$18,764	
Subtotal		\$430,110	\$64,886	\$98,999	\$586,923	\$430,110	\$45,925	\$565,750	
TOTAL ACRES TREATED / ESTIMATED TREATMENT COSTS	1733.2758	\$2,046,674	\$130,139	\$435,363	\$2,597,991	\$2,046,674	\$156,872	\$2,591,522	

Footnotes / Bibliography

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

Some data that was provided was given for areas that do not match up perfectly with the watershed. For these areas, such as county wide and census data, figures were adjusted by percent of the HUC in the area.

Page 1

Base Layer Map

Digital Elevation Model of Missouri. Map Layer. Center for Applied Research and Environmental Systems (CARES), 2005.
Public Land Survey. Map Layer. CARES, 2005.
Hydrologic Unit Code (HUC). Map Layer. Natural Resources Conservation Service (NRCS), 2006.
National Hydrology Dataset (NHD). Map Layer. U.S. Geologic Survey (USGS), 2005.
Roads and Highways. Map Layer. Missouri Department of Transportation (MoDOT), 2005.
Railroads. Map Layer. Federal Railroad Administration, 2003.
Political Boundaries. Map Layer. U.S. Census Bureau, 2001.
Public Lands. Map Layer. Missouri Resource Assessment Partnership (MoRAP), 2003.

Page 5

Relief Map:

Digital Elevation Model of Missouri. Map Layer. CARES, 2005.
Hillshade Relief Map of Missouri. Map Layer. CARES, 2005.

Page 7

Karst Features Map:

Springs, Sink Areas, and Losing/Gaining Streams. Map Layer. Missouri Department of Natural Resources (MoDNR), 2006.
Data Downloaded from: <http://www.msdis.missouri.edu/datasearch/ThemeList.jsp>
Sinkholes. Map Layer. CARES from various sources, 2006.

Page 8

Geologic Features Map:

Missouri Bedrock Geology. Map Layer. MoDNR, division of Geology and Land Survey-Geological Survey Program, 2006.
Missouri Fault Geology. Map Layer. MoDNR, division of Geology and Land Survey-Geological Survey Program, 2006.
Generalized Kansas Bedrock Geology. Map Layer. Kansas Geological Survey, 1992.
Data downloaded from: <http://www.kansasgis.org>

Pages 10-11

Common Resource Area Map / Descriptions:

Common Resource Areas. Map Layer. NRCS, 2006.
Common Resource Areas. Descriptions. NRCS, 2006.
Descriptions downloaded from the NRCS online Electronic Field Guide (eFOTG) at:
http://efotg.nrcs.usda.gov/references/public/MO/CRA_descriptions.pdf

Pages 12-14

Major Land Resource Area Map / Descriptions:

Major Land Resource Areas. Map Layer. NRCS, 2006.
Major Land Resource Areas. Descriptions. NRCS, 1981.
Descriptions downloaded from: <http://www.soilsurvey.org/maps/mlra.asp>

Footnotes / Bibliography – Continued**Page 15**

Annual Precipitation Map:

Annual Precipitation. Map Layer. PRISM Group at Oregon State University, 2006.**Page 16**

Land Ownership Map:

Public Lands. Map Layer. MoRAP, 2003.**Page 17**

Land Slope Map:

Land Slope. Map layer. CARES, 2005.

Created from the CARES 10 Meter DEM.

Page 18

Land Use / Land Cover Map:

2005 Land Use Land Cover. Map Layer. MoRAP, 2005.**Page 19**

Land Use / Land Cover Pie Chart:

2005 Land Use Land Cover. Database. MoRAP, 2005.

Land Use / Land Cover Graph:

2005 Land Use Land Cover. Database. MoRAP, 2005.

Data was collected by using Public Land (MoRAP, 2003) to clip Land Use / Land Cover. This gave both public and private land areas that could be queried by type.

Page 20

Land Capability Class Graph:

Soils GIS Data. Database. NRCS.Served by Missouri Cooperative Soil Survey at: <http://www.soilsurvey.org>Missouri Land Capability Classes. Descriptions. NRCS.Descriptions downloaded from <http://soils.usda.gov/technical/handbook/contents/part622.html>Kansas Land Capability Classes. Database. NRCS.

Data queried from NRCS Soil Data Mart at:

<http://soildatamart.nrcs.usda.gov/County.aspx?State=KS>**Page 21**

Riparian Corridor Map:

Riparian Corridor. Map Layer. NRCS.**Page 23**

Highly Erodible Lands Map:

Soils GIS Data. Map Layer. NRCS.

Data queried from NRCS Soil data being served by the Missouri Cooperative Soil Survey at

<http://www.soilsurvey.org>Kansas Highly Erodible Land. Map Layer. NRCS.

Data queried from NRCS Soil Data Mart at:

<http://soildatamart.nrcs.usda.gov/County.aspx?State=KS>

Footnotes / Bibliography – Continued**Page 24**

Prime Farmlands Map:

Soils GIS Data. Map Layer. NRCS.

Data queried from NRCS Soil data being served by the Missouri Cooperative Soil Survey at:

<http://www.soilsurvey.org>Kansas Highly Erodible Land. Map Layer. NRCS.

Data queried from NRCS Soil Data Mart at:

<http://soildatamart.nrcs.usda.gov/County.aspx?State=KS>**Page 26**

Census Data by Block Map:

2000 U.S. Census Tiger Lines. Map Layer. U.S. Census Bureau, 2001.2000 U.S. Census Data. Database. U.S. Census Bureau, 2001.

Data queried from SF1-A databases.

Page 27

Census Data by Block Maps:

2000 U.S. Census Tiger Lines. Map Layer. U.S. Census Bureau, 2001.2000 U.S. Census Data. Database. U.S. Census Bureau, 2001.

Data queried from SF1-A databases

Page 28

Age Demographics Pie Chart:

2000 U.S. Census Data. Database. U.S. Census Bureau, 2001.

Data queried from SF1-B databases.

Income Sources Graph:

2000 U.S. Census Data. Database. U.S. Census Bureau, 2001.

Data queried from SF3-O databases.

Page 29

Employment Figures Map:

2000 U.S. Census Data. Map Layer and Database. U.S. Census Bureau, 2001.

Data queried from SF3-M databases.

Page 30

Confined Animal Feeding Operation Map:

Confined Animal Feeding Operations. Map Layer and Database. NRCS, 2006.**Page 31**

Animal Units Definitions:

NPDES Permitting of CAFOs in Missouri. Definitions. MoDNR, 2004.Definitions found at: http://www.dnr.mo.gov/env/wpp/cafo/npdes_permitting_cafos.pdf

Confined Animal Feeding Operations Graph:

Confined Animal Feeding Operations. Database. NRCS, 2006.

Facility Setback Graph:

Required Setbacks for Missouri. Database. MoDNR.Ordinances are based on guidelines produced by the Water Protection Program, and can be found at: <http://agebb.missouri.edu/commag/permit/setbacks.asp>

Footnotes / Bibliography – Continued**Page 32**

Facility Additional Setback Graph:

Local Restrictions. Database. MoDNR.

Ordinances produced by individual counties, and go beyond what MoDNR requires. Information can be found at: <http://agebb.missouri.edu/commag/permit/restrictions.asp>

Page 33

Solid Waste and Wastewater Facilities Map:

Landfills. Map Layer. MoDNR, 2004.

Hazardous Waste Program-Permits. Map Layer. MoDNR, 2004.

Wastewater Facilities. Map Layer. MoDNR, 2006.

Solid Waste Transfer Stations. Map Layer. MoDNR, 2004.

Hazardous Waste Generators. Map Layer. MoDNR, 2007.

All layers downloaded from: <http://www.msdis.missouri.edu/datasearch/ThemeList.jsp>

Page 35

Ground Water Graph:

Ground Water for 8 Digit HUC (GWHU8). Database. Census of Missouri Public Water Systems, 2007.

Surface Water Graph:

Surface Water for 8 Digit HUC (SWHU8). Database. Census of Missouri Public Water Systems, 2007.

Page 36

Endangered and Threatened Species Graph:

Species and Natural Communities of Conservation Concern. Database. Missouri National Heritage Program, 2007.

Online linkage can be found here: <http://mdc.mo.gov/nathis/heritage>

Threatened and Endangered Species. Database. Kansas Department of Wildlife and Parks, 2007.

Online linkage can be found here:

http://www.kdwp.state.ks.us/news/other_services/threatened_and_endangered_species/threatened_and_endangered_species/county_lists

Stream Flow Data Graph:

USGS Surface-Water Data for Missouri. Database. USGS, 2007.

Gage station information can be found here: <http://waterdata.usgs.gov/mo/nwis/sw>

Page 37

303(d) Listed Streams and Water Map:

Missouri 2002 303(d) Listed Waters. Map Layer. MoDNR, 2002.

Data downloaded from <http://www.msdis.missouri.edu/datasearch/ThemeList.jsp>

Pages 48-59

Rapid Watershed Assessment Matrix Data Tables:

Database. NRCS, 2008.