Missouri Natural Resources Conservation Service

Rapid Watershed Assessment

Upper Black River Sub-basin

HUC # 11010007

USDA-NRCS

Missouri Natural Resources Conservation

601 Business Loop 70 West
Parkade Center, Suite 250
Columbia, MO 65203

Phone: 573/876-0901
Fax: 573/876-0913

Rapid Watershed Assessment Content

1.0 Introduction

The Upper Black River sub-basin, located in the southeastern region of Missouri, conveys drainage from its headwaters in the Ozark Highlands southward to its outlet in the Mississippi Embayment region in Arkansas. This sub-basin encompasses 1,756 square miles and covers portions of 8 Missouri counties as well as 3 Arkansas counties. Black River is the largest receiving stream in this sub-basin. The headwaters originate in Reynolds and Iron counties in Missouri where the East, Middle, and West Forks of Black River converge. Gravel comprises stream bed loads in the headwaters and stream flows are regulated by dams, the largest of which forms Clearwater Lake near Piedmont, Missouri. As Black River flows south into the Mississippi Embayment, bed loads transition into finer sediments, a function of the physiographic and associated land use change.

This sub-basin has diverse land uses that include grasslands to support livestock production, woodlands for forestry products, cropland for food and fiber, and mining. The majority of the upper sub-basins have experienced geologic uplift and subsequent erosion has left a landscape of hills, plateaus and deep valleys. Weathering of limestone and dolomite parent material has produced a network of underground solutional cavities characteristic of karst geology. Highest summits are located in the St. Francois Knobs where relief can be as great as 1,000 feet. Forestry land uses are common while grassland and cropland production are limited to depositional areas along narrow floodplains in the Ozark Highlands. As the sub-basin descends from the Ozark escarpment to the Mississippi embayment, relief averages less than 50 feet. Historical wetland drainage, timber clearing, and flood control projects have converted the lower sub-basins into a vast row crop agricultural area. Abundant, shallow groundwater has made irrigation feasible to the area, and when coupled with drainage, farmers are capable of producing excellent yields of rice, cotton, soybeans, corn, and wheat.

1.1 Scope and Purpose

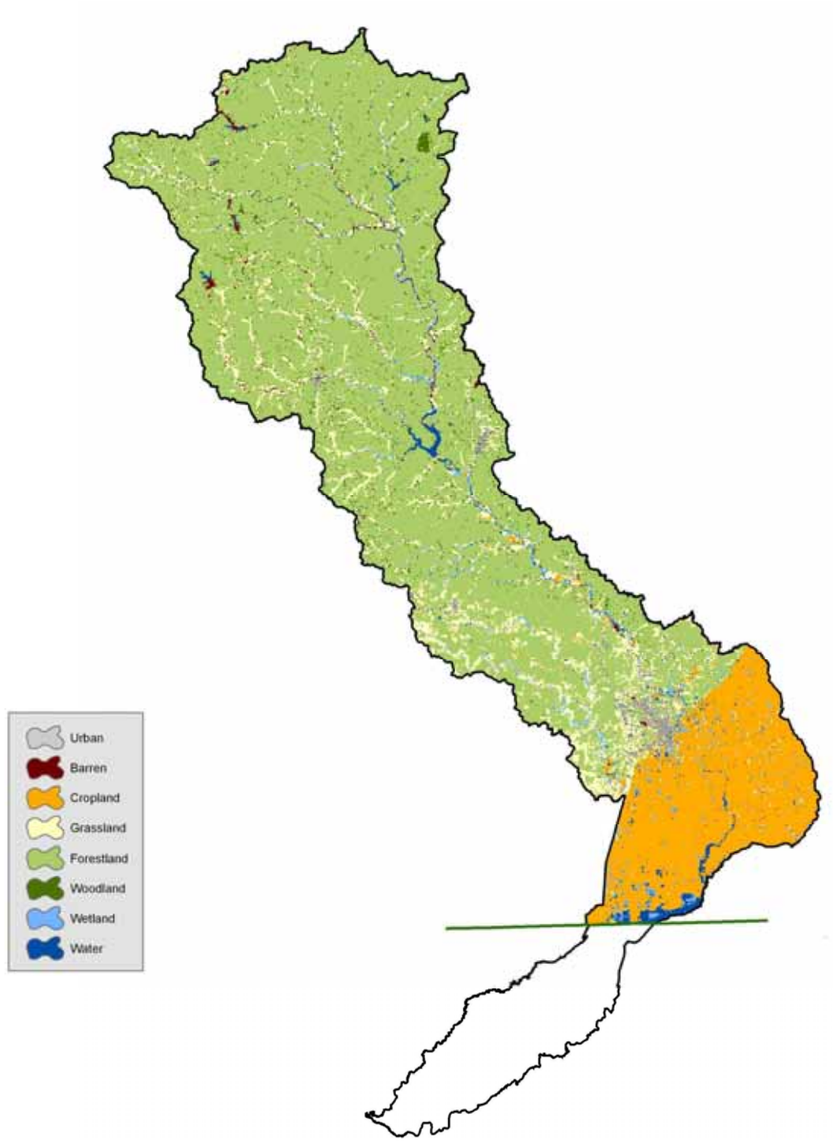
Rapid watershed assessments (RWA) provide initial estimates of where conservation investments would best address the concerns of landowners, conservation districts, and other community organizations and stakeholders. These assessments help landowners and local leaders set priorities and determine the best actions to achieve their goals. The information contained in this RWA summarizes readily available data and provide a snapshot of natural resources, concerns, and conservation opportunities.

1.2 Major Realizations

The Upper Black River sub-basin faces unique management challenges including sensitive karst geologic features (e.g. caves, sinkholes, fens and springs) that offer little opportunity for pollution attenuation in the uplands, areas within the watershed that possess significant population below poverty levels, urban water quality issues from population concentration in the southern section, and shallow groundwater protection concerns in the row crop production areas of the Mississippi embayment. Dam safety is another concern. A sinkhole found in 2003 in the dam embankment of Clearwater Lake has led the U.S. Army Corps of Engineers to classify the structure as ‘High Risk’ and initiate a major Rehabilitation Project. Additionally, in December, 2005 a hydroelectric storage structure failed near Lesterville, MO releasing a significant sediment load into the headwaters of the Black River. Reclamation projects have been initiated, but the long term effects on water quality have yet to be determined by scientists.

2.0 Physical Description

2.1 Land Use/Land Cover



Land Use/ Land Cover MoRAP /2	Urban	Cropland	Grassland	Barren	Open Woodland	Forest Land	Wetland	Water
2000 Acres	15,877	175,400.4	121,015.1	5,737.1	32,088.2	727,834.1	22,108.7	15,459.1
%	1%	16%	11%	1%	3%	65%	2%	1%

Land Use/ Land Cover NRI /1	Developed Land	Cultivated Cropland	Conservation Reserve Program	Non-cultivated Cropland	Pasture-land	Forest Land	Minor land cover/uses	Water	Federal land cover/use not recorded
1982 Acres	33,700	201,800	0	13,900	84,100	507,400	6,700	9,800	234,500
%	3%	18%	-	1%	8%	46%	1%	1%	21%
1987 Acres	35,900	200,100	900	12,300	83,700	509,500	6,800	10,000	233,700
%	3%	18%	0%	1%	8%	47%	1%	1%	21%
1992 Acres	36,500	190,000	900	17,600	82,200	510,900	9,700	11,000	234,100
%	3%	17%	0%	2%	8%	47%	1%	1%	21%
1997 Acres	39,200	180,100	0	39,200	69,200	507,200	12,100	11,800	234,100
%	3%	16%	-	4%	6%	46%	1%	1%	21%
Total Gain or Loss from 1982 to 1997	5,500	(21,700)	0	25,300	(14,900)	(200)	5,400	2,000	(400)
%	0%	-2%	-	3%	-2%	0%	0%	0%	0%

2.1.1 Crop History /1

	Close Grown Crops (acres)			Row Crops (acres)				General (acres)	
Year	**Oats**	**Rice**	**Wheat**	**Corn**	**Sorghum**	**Soybeans**	**Double Cropped**	**Cultivated**	**Non-Cultivated**
1982	1,400	49,600	14,200	6,600	32,100	91,400	36,700	200,800	13,900
1987	900	40,600	23,200	2,500	38,400	59,700	0	200,100	12,300
1992	0	34,700	20,600	8,000	25,500	80,100	1,200	190,000	17,600
1997	0	53,100	7,900	9,600	13,800	81,400	4,000	180,100	39,200

2.1.2 Grassland /1

	Grassland (acres)						
	Hayland			**Pastureland**			**Other Farmland**
Year	Grass	Legume	Legume-Grass	Grass	Legume	Grass-Forbes-Legume Mix	CRP
1997	255,000	1,400	13,700	47,600	0	21,600	0

2.2 Public Land [/3]

Public lands in the Upper Black River sub-basin account for approximately 38% of the total watershed. The Forest Service which holds the largest amount of publicly owned land originally acquired these areas for pine reforestation but currently manages for timber production and recreational opportunities. The Department of Conservation owns and manages conservation areas for wildlife management and hunting and fishing activities. However, they also manage a large number of privately held lands as arranged through lease programs such as Lower Taum Sauk Lake. The Missouri Department of Natural Resources owns state park land in this sub-basin, specifically Johnson's Shut-Ins and Tom Sauk Mountain State Parks. The U.S. Army Corps of Engineers owns and operates land in and around Clearwater Lake for many purposes including flood control.

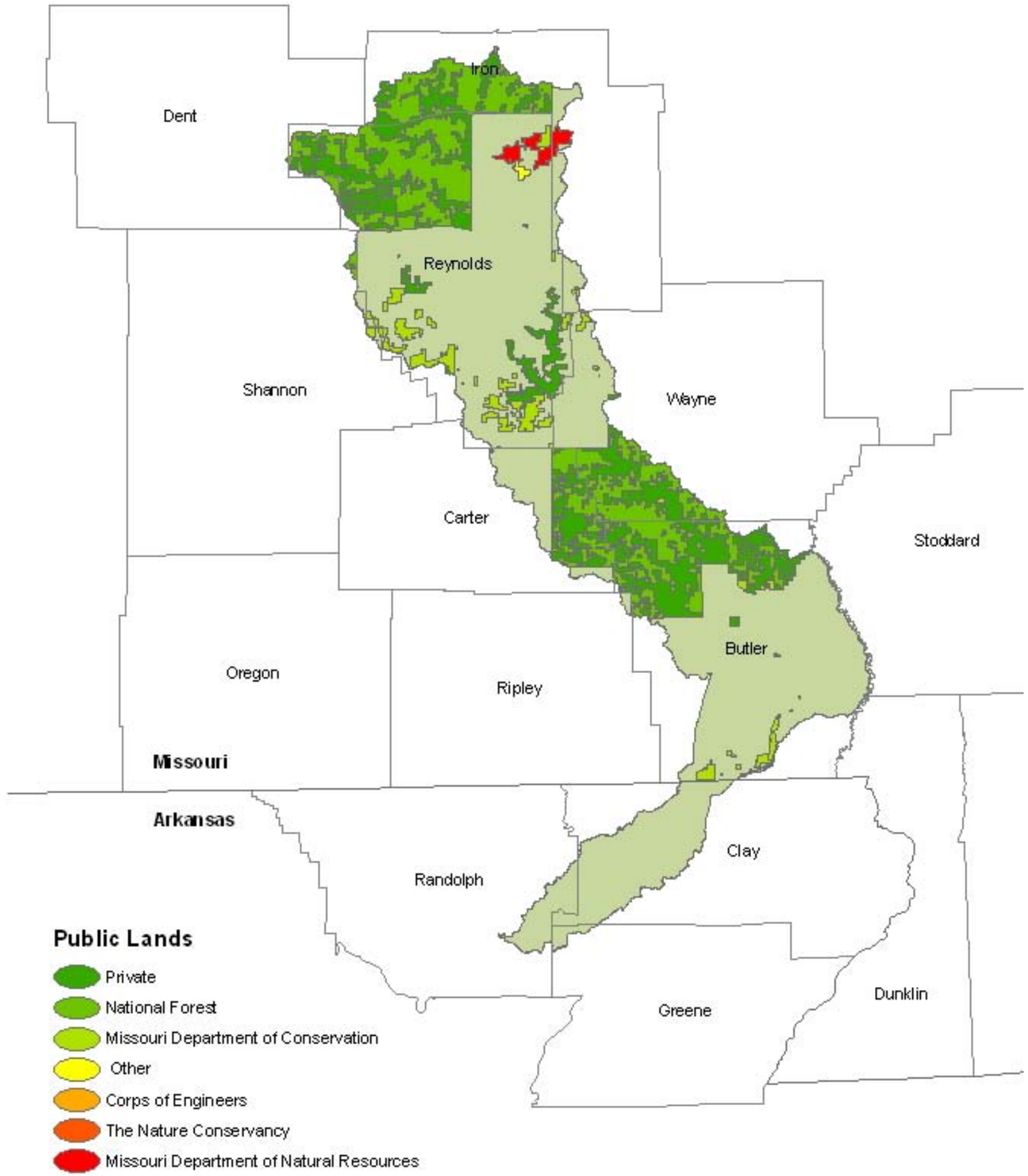
Though a large number of acres are privately owned, these landowners lease their land to public agencies through cooperative agreements. This private-public relationship is important in protecting and sustaining the economic, environmental and social resources of the Upper Black River sub-basin.

Public Land Ownership (acres)

Owner	**Total Acres**	**% of Public Lands**	**% of Watershed**
Missouri Department of Conservation	45,505	9.4	3.7
Missouri Department of Natural Resources	9,382	1.9	0.8
U.S. Forest Service (National Forest)	217,247	45	17.6
Nature Conservancy	20	< 0.1	< 0.1
Other *	1,345	0.3	0.1
Private **	189,630	39.3	15.4
U.S. Army Corps of Engineers	19,318	4.0	1.6
TOTAL	482,447		

* Municipal facilities (parks, accesses and easements)

** Private/public land lease agreements

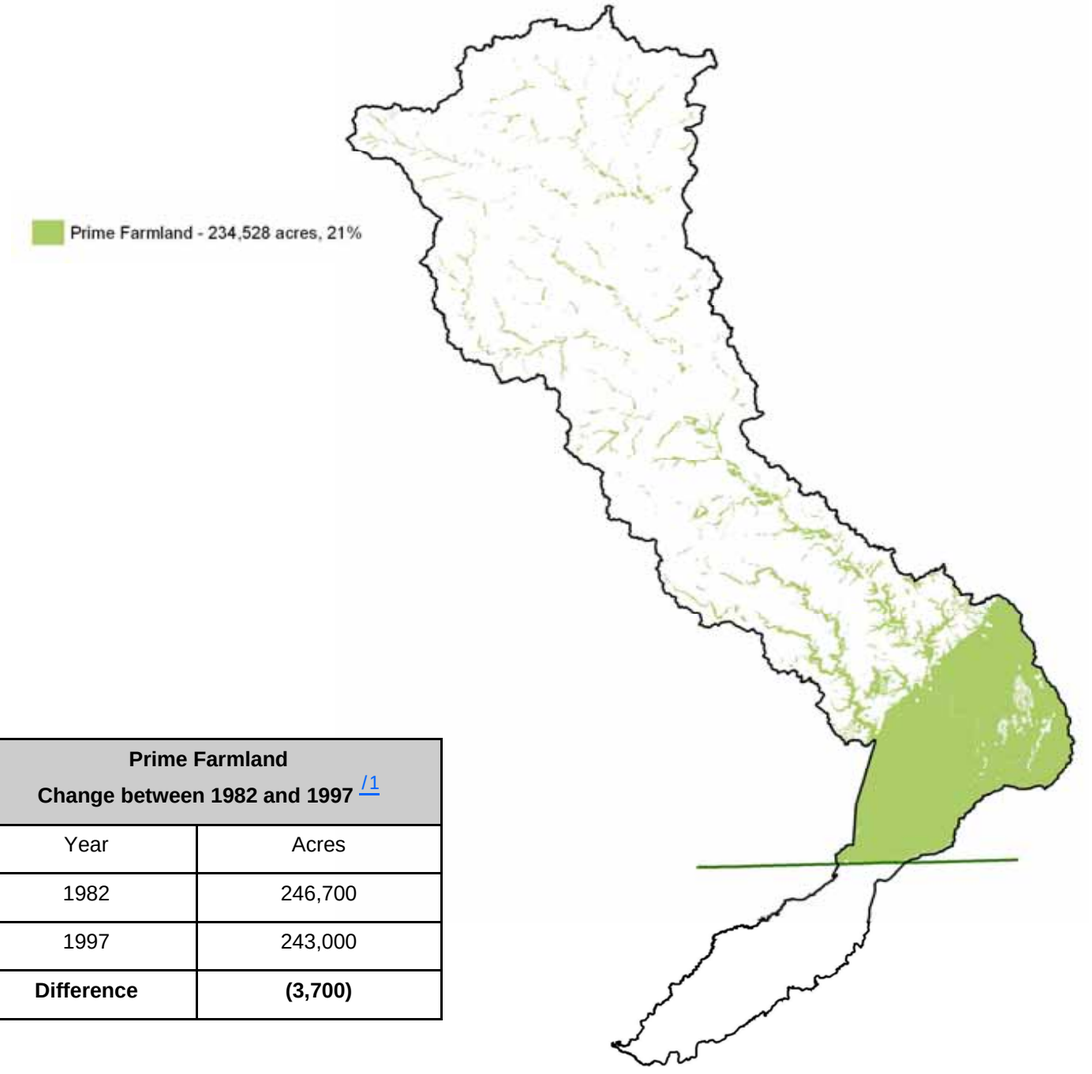


2.3 Soil Capacity

2.3.1 Prime Farmland [/28]

Prime Farmland is 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. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding.

Image: Prime Farmland in the Upper Black sub-basin. [/9]



Prime Farmland Change between 1982 and 1997 [/1]	
Year	Acres
1982	246,700
1997	243,000
Difference	**(3,700)**

2.3.2 Land Capability [/1]

Land Capability is a classification system used to identify the erosion potential of farmland. For over forty years the USDA has used land capability classification as a planning tool in laying out conservation measures and practices to farm without serious deterioration from erosion or other causes. The current system includes eight classes of land designated by Roman numerals I thru VIII. The first four classes are arable land--suitable for cropland--in which the limitations and the need for conservation measures and management increase from I thru IV. The remaining four classes, V thru VIII, are not to be used for cropland, but may have uses for pasture, range, woodland, grazing, wildlife, recreation, and esthetic purposes.

Land Capability Class	Cultivated Cropland (acres)	Cultivated Cropland (%)	Non-cultivated Cropland (acres)	Non-cultivated Cropland (%)	Pastureland (acres)	Pastureland (%)
I - slight limitation	0	0%	2,700	7%	0	0%
II - moderate limitation	20,800	12%	16,000	41%	28,000	40%
III - severe limitations	78,300	43%	13,400	34%	26,200	38%
IV - very severe limitations	81,000	45%	4,500	11%	15,000	22%
V - no erosion hazard, but other limitations	0	0%	0	0%	0	0%
VI - severe limitations, unsuited for cultivation, limited to pasture, range, forest	0	0%	1,300	3%	0	0%
VII - very severe limitations, unsuited for cultivation, limited to grazing, forest, wildlife	0	0%	1,300	3%	0	0%
VIII - misc. areas have limitations, limited to recreation, wildlife and water supply	0	0%	0	0%	0	0%
Total	180,100		39,200		69,200	

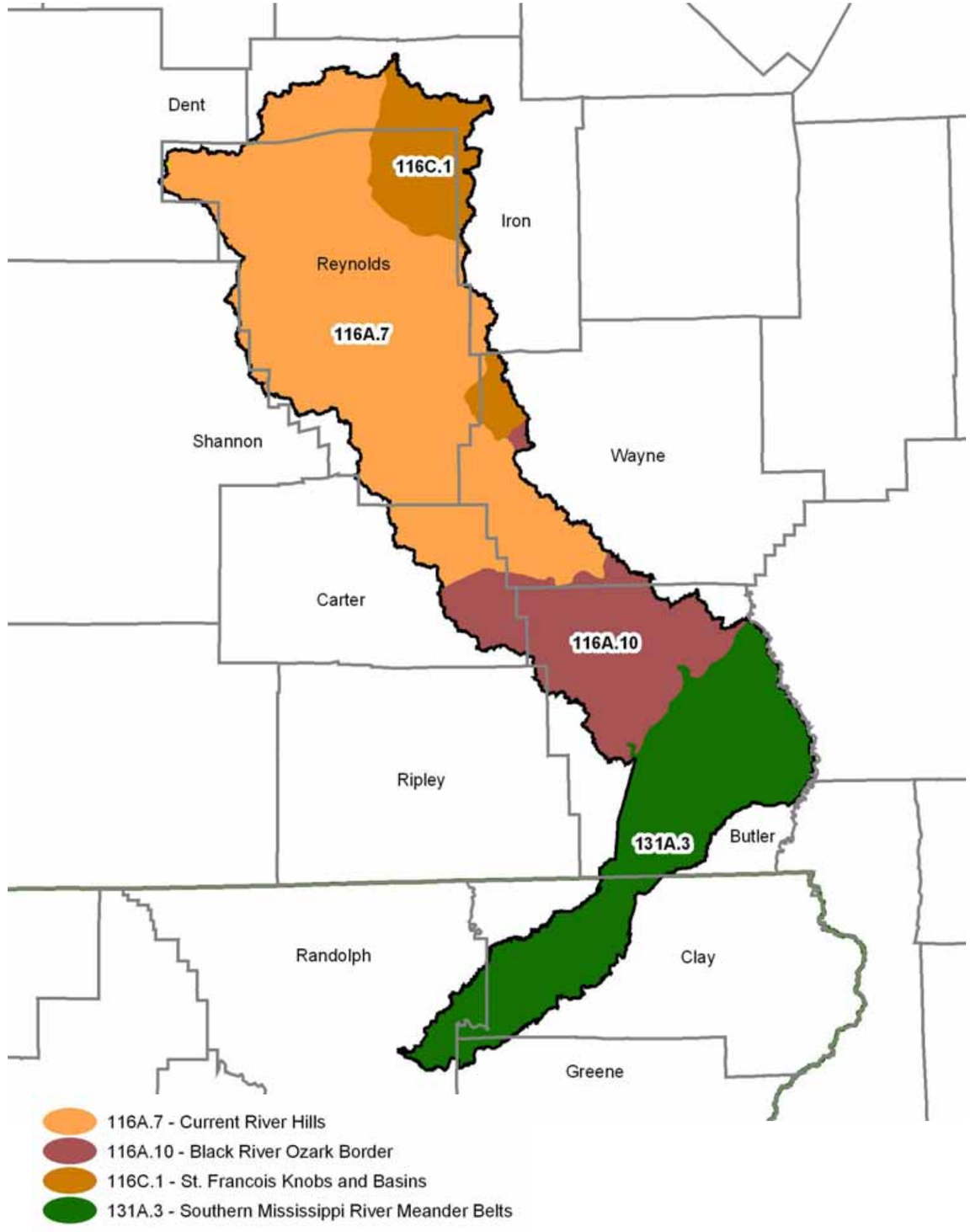
2.4 Common Resource Areas [8]

NRCS has divided the Nation into ecological type land regions called Major Land Resource Areas (MLRA). MLRAs are defined by their agricultural potential and soils capabilities and provide a spatial framework for addressing national and regional agricultural issues. A Common Resource Area is a geographic subdivision of an MLRA within which there are similar resource concerns and treatment requirements.

Missouri's CRAs are ecological subdivisions of its MLRAs. Each CRA is a grouping of Land Type Associations (LTA) taken directly from the state's ecological classification system (ECS). Missouri's LTAs are primarily differentiated on the basis of local climate, landforms and topography, geologic parent materials, soil types and potential vegetation.

The Upper Black River sub-basin occupies portions of MLRA 116A and MLRA 131A.

Common Resource Areas in the Upper Black River Sub-basin



116A.7 – Current River Hills:

The Current River Hills CRA consists of the hilly to deeply dissected landscapes. Gently rolling interfluves give way to steep slopes, narrow ridges, and narrow valley bottoms. Soils are rocky and formed mainly from carbonate and sandstone bedrock. Local karst, losing streams, and large springs are characteristic. Forests of oak and oak-pine dominate the landscape.

116A.10 – Black River Ozark Border:

The Black River Ozark Border consists of moderately dissected hills with local relief up to 300 feet, and local flatwoods of less relief. Soils on steeper slopes are deep, cherty silt loams, and elsewhere they have clay-pans formed in loess over cherty residuum. Most of the land is in oak and oak-pine forest with cleared land restricted to valley bottoms. A substantial amount of public land exists here.

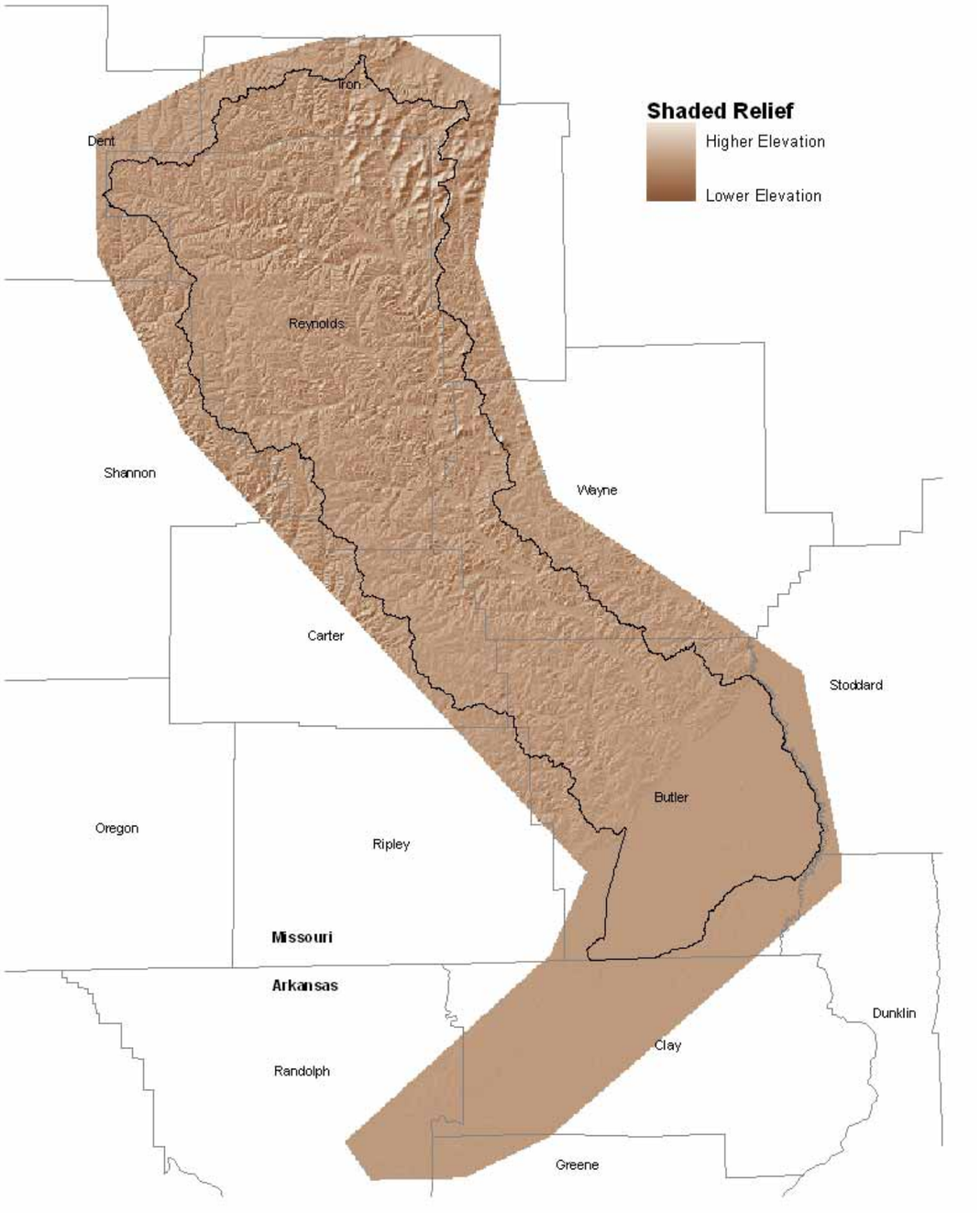
116C.1 – St. Francis Knobs and Basins:

The St. Francis Knobs and Basins CRA is distinctive for bedrock of igneous Precambrian and Cambrian age with rounded, smooth-sided igneous knobs and hills that rise conspicuously to different elevations along with basins and valleys on dolomite

131A.3 – Southern Mississippi River Meander Belts:

The Southern Mississippi River Meander Belts CRA consists of level to nearly level alluvial plains of the Black and White Rivers that includes some tracts of windblown sands and some natural wetlands. Soils are deep and most are well suited to crop production. Most of the area has been cleared of forest and is used for growing rice, soybeans, and wheat Some areas of dunes and swales support rare plant species.

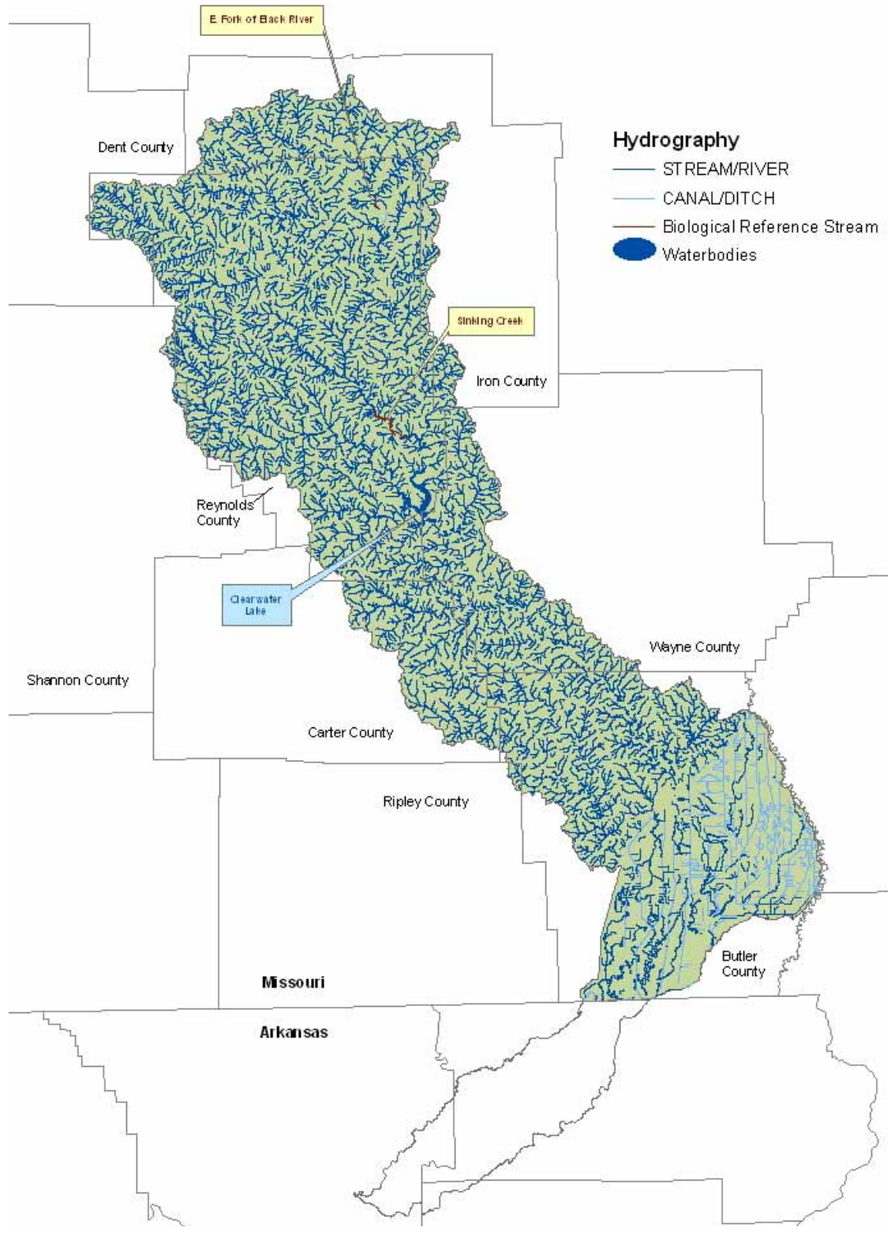
2.5 Relief Map [/27]



2.6 Streams

2.6.1 NHD with Biological Reference Streams [/24]

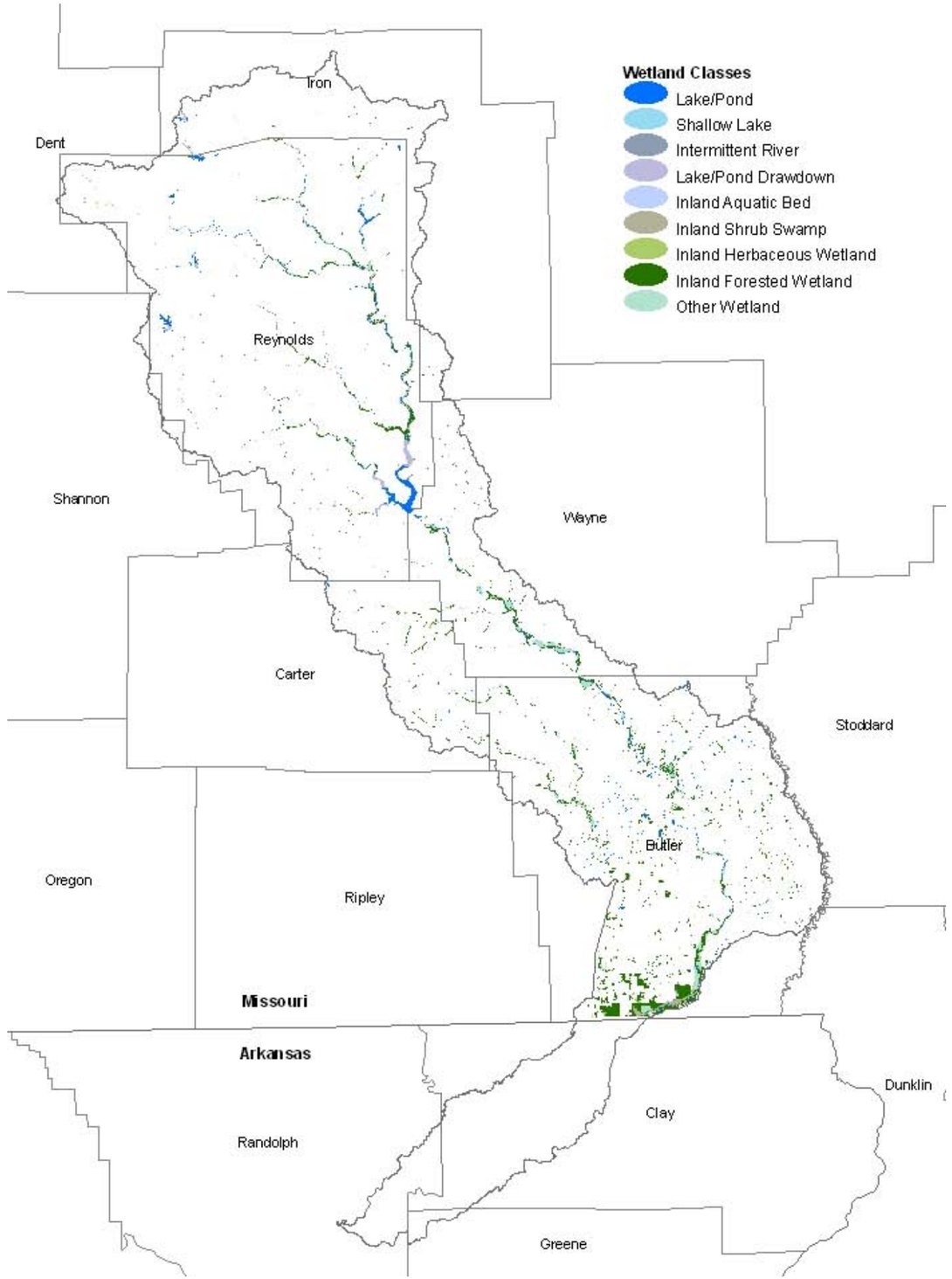
The Upper Black River sub-basin has 5,004 miles of delineated streams. Two major waterbodies are located in this sub-basin as well, Taum Sauk Reservoir and Clearwater Lake. Both of these waterbodies are used for flood control and power generation. Certain stream reaches within this sub-basin are designated as *Biological Reference Streams* by the Missouri Department of Natural Resources. This designation indicates that these sections are of optimal quality to support aquatic life in a given area. There are two such segments designated in the Upper Black River sub-basin.



2.7 Wetlands [/19]

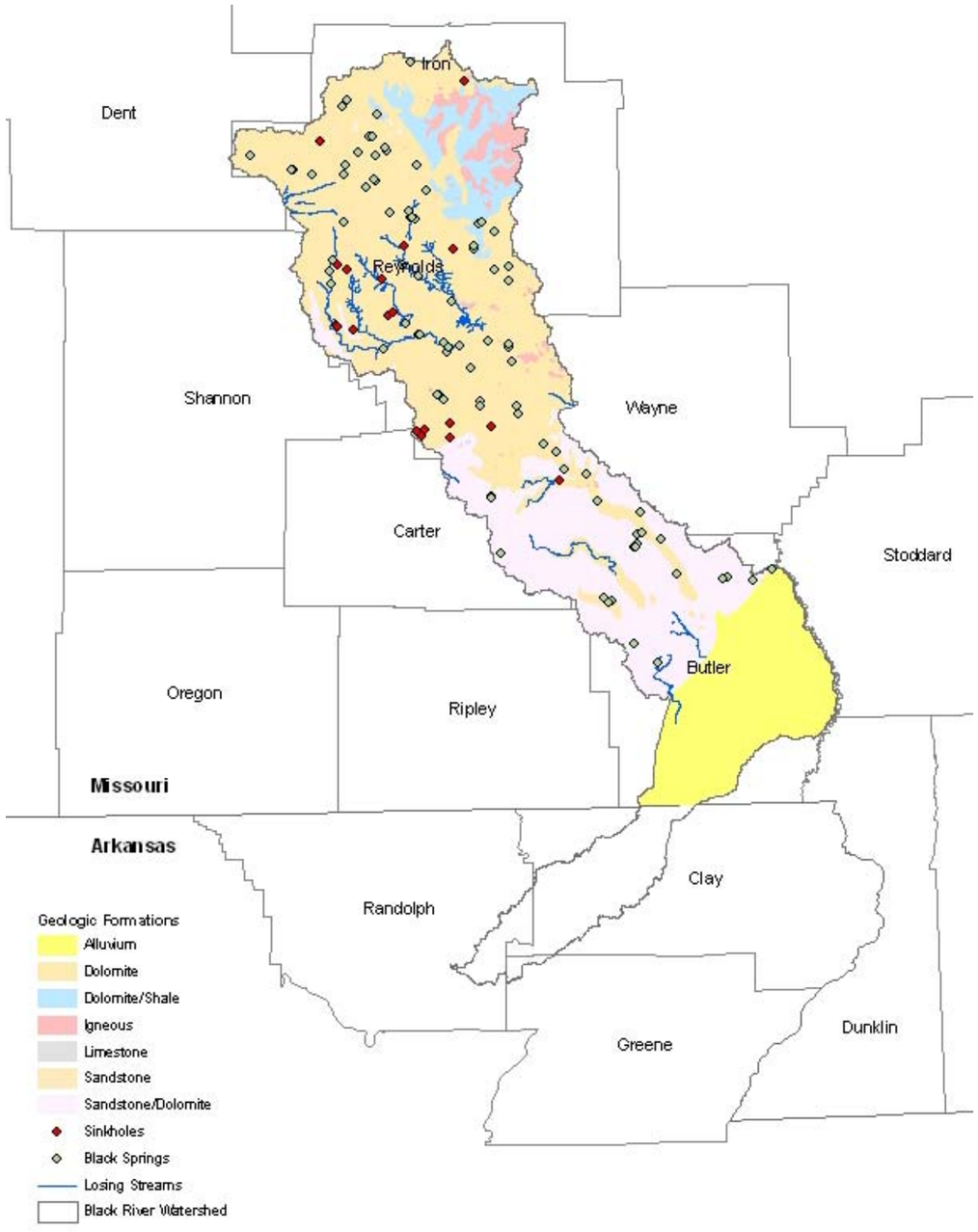
The National Wetland Inventory delineates and records wetland information through the U.S. Fish and Wildlife Service. The largest number of wetlands in the Upper Black River sub-basin are ponds used for agricultural purposes. The largest percentage of wetland acres is for inland forested wetlands which are found mainly on the tributaries and main stem of the Black River located in the public lands managed by the U.S. Forest Service.

Wetland Class	Number	Acres
Lake/Pond	3,749	8,479
Shallow Lake	1	36
Intermittent River	67	339
Lake/Pond Drawdown	906	3,186
Inland Aquatic Bed	67	86
Inland Shrub Swamp	532	2,500
Inland Herbaceous Wetland	1,039	1,439
Inland Forested Wetlands	2,743	21,698
Other Wetlands	436	6,929
Total	9,540	44,692



2.8 Geologic and Karst features [/17]

The Upper Black River sub-basin has a karst landscape indicative of caves, sinkholes, springs and losing streams. These features are found in limestone and dolomitic formations which dominate the Ozark geologic regime. Since limestone and dolomite formations are soluble, the interaction between surface and groundwater resources is great.



3.0 Resource Concerns

Resource concerns are issues related to the natural environment. Natural resources include soil, water, air, plants and humans. Missouri Natural Resources Conservation Service identified major resource issues that affect the state of Missouri.

Natural Resource	Concern 1	Concern 2	Concern3
Air	Objectionable Odors		
Animals (Domestic)	Stress & Mortality		
Plants	Threatened & Endangered Species	Noxious & Invasive Plants	Plant Damage (from wind erosion)
Soil (Quality)	Sheet & Rill Erosion to "T"		
Water (Quality)	Harmful Levels of Pathogens (livestock source)	Excessive Nutrients and Organics in Surface Water	
Water (Quantity)	Inefficient water use on irrigated lands		

3.1 Soil Quality and Quantity

3.1.1 Soils

The parent material for the soils of the Upper Black River sub-basin range from sedimentary rocks of dolomite in the upland landscapes to alluvial deposits in the lowlands to the south. The Roubidoux, Eminence, and Gasconade dolomite formations are comprised of mainly soluble calcium and magnesium carbonate material. A small portion of the headwaters in the St. Francois Mountains contain volcanic bedrock influence. In southeastern Ripley and Butler Counties, alluvial silt and clay deposits have influenced soil formation.

The soil order classification accounts for differences among soil-forming processes identified in the field, especially concerning major soil horizons within the profile. In the uplands, the majority of the soils present are classified as either ***alfisols*** or ***ultisols*** soil orders. Alfisols and ultisols are characteristic of forested mineral soils with a characteristic horizon of clays or sodium that has translocated from the soil surface. Alfisols have greater base saturation and are generally more fertile than the more highly weathered ultisols. In the alluvial plain, the majority of the soils are classified as either ***entisols*** or ***inceptisols*** soil orders. Because of relatively recent soil formation, each group is noted for the lack of profile or horizon development. Little if any profile development is present for entisols while the inceptisols have slightly greater profile advancement.

Most of the general soil map units in the uplands include soil associations of Clarksville, Doniphan, Goss, Wilderness, Hildebrecht, Weingarten, and Captina soil series. Clarksville and Weingarten soils can be present on steeper slopes with thin deposits of loess over cherty dolomite or limestone. Doniphan, Goss, Wilderness, and Hildebrecht soils are typically found on less steep land with thin layers of loess over cherty limestone or dolomite. They are moderately to well drained and many contain a fragipan layer. In the alluvial plain, relief is nearly level. Crowley and Tuckerman soils, for example, have profiles that are deeper and contain much more silt and clay compositions. Drainage is somewhat to poorly drained because of slower permeability except for those soils like Bosket that are present on natural levees. In Jackport soils, the presence of certain clays, coupled with varying moisture content, can cause tremendous shrinking and swelling.

3.1.2 Soil Erosion

Cropland Erosion Rates in USLE Tons/Acre/Year /1		
CROPLAND CATEGORY	**CULTIVATED CROPLAND**	**NON-CULTIVATED CROPLAND**
HEL		
Highly Erodible Land Eroding at or below "T"	0.67	0.71
Highly Erodible Land Eroding above "T"	19.58	0.71
All Highly Erodible Land	15.86	0.71
NON-HEL		
Non-Highly Erodible Land Eroding at or below "T"	2.61	0.13
Non-Highly Erodible Land Eroding above "T"	7.08	0.13
All Non-Highly Erodible Land	2.67	0.13
All Land Eroding at or below "T"	2.59	0.25
All Land Eroding above "T"	15.47	0
All Land	3.11	0.25

CROPLAND EROSION RATES IN USLE TONS/ACRE/YEAR /1

USLE - This table reports estimated soil loss rates from the 1997 NRI based on the Universal Soil Loss Equation (USLE). USLE estimates average annual sheet and rill soil movement down a uniform slope using rainfall energy as the erosive force acting on the soil. Soil characteristics and slope for the fields in which the NRI sample points fall or those portions of the fields surrounding the points that would be considered in conservation planning are used in the NRI USLE calculations.

"T" FACTOR – This is the maximum rate of annual soil erosion that will still permit crop productivity to be sustained economically and indefinitely.

HEL – Highly erodible land (HEL) is land that has an erodiblity index (EI) value of 8 or more. The EI index provides a numerical expression of the potential for a soil to erode, considering the physical and chemical properties of the soil and climatic conditions where it occurs. The higher the index value, the greater the investment needed to maintain the sustainability of the soil if intensively cropped.

Cropland Erosion in Relationship to "T" /1												
CROPLAND CATEGORY	CULTIVATED CROPLAND				NON-CULTIVATED CROPLAND				ALL CROPLAND			
	Total	% of Cropland Category	% of all Cropland	% of Sub-basin	Total	% of Cropland Category	% of all Cropland	% of Sub-basin	Total	% of Cropland Category	% of all Cropland	% of Sub-basin
HEL												
Highly Erodible Cropland at or below "T"	1,200	20%	1%		0	-	-	-	1,200	8%	1%	
Highly Erodible Cropland above "T"	4,900	80%	2%		8,500	100%	4%	1%	13,400	92%	6%	2%
TOTALS FOR HIGHLY ERODIBLE CROPLAND	**6,100**	**100%**	**3%**	**1%**	**8,500**	**100%**	**4%**	**1%**	**14,600**	**100%**	**7%**	**2%**
NON-HEL												
Non-Highly Erodible Cropland at or below "T"	171,600	99%	78%	16%	30,700	**100%**	14%	3%	202,300	99%	92%	19%
Non-Highly Erodible Cropland above "T"	2,400	1%	1%		0	-	-	-	2,400	1%	1%	
TOTALS FOR NON-HIGHLY ERODIBLE CROPLAND	**174,000**	**100%**	**79%**	**16%**	**30,700**	**100%**	**14%**	**3%**	**204,700**	**100%**	**93%**	**19%**
GRAND TOTALS	**180,100**	**100%**	**82%**	**17%**	**39,200**	**100%**	**18%**	**4%**	**219,300**	**100%**	**100%**	**21%**

CROPLAND EROSION IN RELATIONSHIP TO "T" /1

This table reports acres and percentages of cultivated cropland, non-cultivated cropland and all cropland by HEL and "T" categories for the sub-basin.

CORN EROSION PROFILE [/1]

This table reports USLE rates and acres by HEL, “T” and conservation practices for corn.

Corn Erosion Profile - USLE (tons/acre/year)		
ALL CORN ACRES	All corn acres	9,600
	USLE all corn acres	3.32
	All contoured corn acres	0
	USLE all contoured corn acres	0
	All contoured and terraced corn acres	0
	USLE all contoured and terraced corn acres	0
	All contoured corn acres not terraced	0
	USLE contoured corn acres not terraced	0
	All non-contoured corn acres	9,600
	USLE all non-contoured corn acres	3.32
	All non-contoured and terraced corn acres	0
	USLE all non-contoured and terraced corn acres	0
	All non-contoured corn acres not terraced	9,600
	USLE non-contoured corn acres not terraced	3.32
HEL CORN ACRES	All HEL corn acres	0
	USLE all HEL corn acres	0
	All contoured HEL corn acres	0
	USLE all contoured HEL corn acres	0
	All contoured and terraced HEL corn acres	0
	USLE all contoured and terraced HEL corn acres	0
	All contoured HEL corn acres not terraced	0
	USLE contoured HEL corn acres not terraced	0
	All non-contoured HEL corn acres	0
	USLE non-contoured HEL corn acres	0
	All non-contoured and terraced HEL corn acres	0
	USLE non-contoured and terraced HEL corn acres	0
	All non-contoured HEL corn acres not terraced	0
	USLE non-contoured HEL corn acres not terraced	0

SOYBEAN EROSION PROFILE [/1]

This table reports USLE rates and acres by HEL, “T” and conservation practices for soybeans.

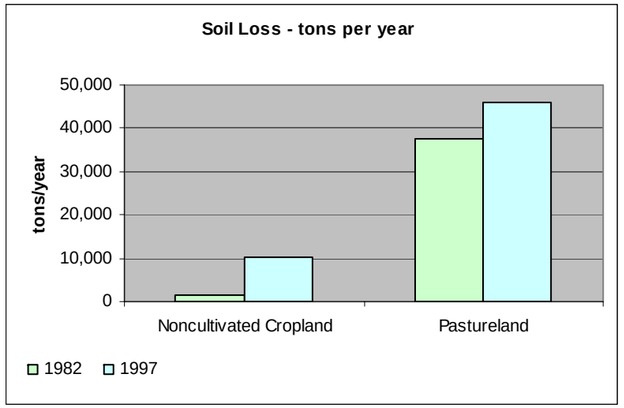
Soybean Erosion Profile - USLE (tons/acre/year)		
ALL SOYBEAN ACRES	All soybean acres	81,400
	USLE all soybean acres	3.09
	All contoured soybean acres	0
	USLE all contoured soybean acres	0
	All contoured and terraced soybean acres	0
	USLE all contoured and terraced soybean acres	0
	All contoured soybean acres not terraced	0
	USLE contoured soybean acres not terraced	0
	All non-contoured soybean acres	81,400
	USLE all non-contoured soybean acres	3.09
	All non-contoured and terraced soybean acres	0
	USLE all non-contoured and terraced soybean acres	0
	All non-contoured soybean acres not terraced	81,400
	USLE non-contoured soybean acres not terraced	3.09
HEL SOYBEAN ACRES	All HEL soybean acres	1,200
	USLE all HEL soybean acres	15.35
	All contoured HEL soybean acres	0
	USLE all contoured HEL soybean acres	0
	All contoured and terraced HEL soybean acres	0
	USLE all contoured and terraced HEL soybean acres	0
	All contoured HEL soybean acres not terraced	0
	USLE contoured HEL soybean acres not terraced	0
	All non-contoured HEL soybean acres	1,200
	USLE non-contoured HEL soybean acres	15.35
	All non-contoured and terraced HEL soybean acres	0
	USLE non-contoured and terraced HEL soybean acres	0
	All non-contoured HEL soybean acres not terraced	1,200
	USLE non-contoured HEL soybean acres not terraced	15.35

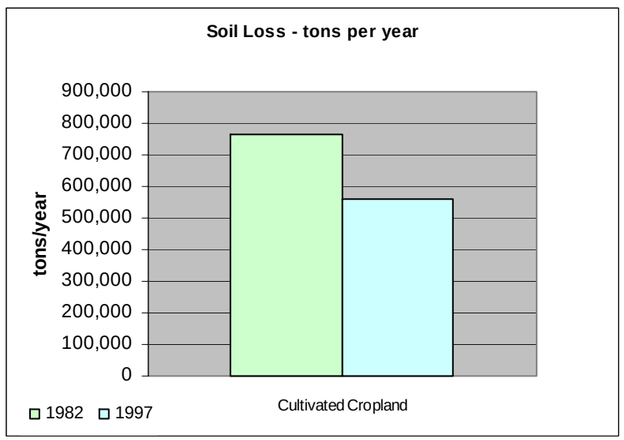
PASTURELAND EROSION [/1]

This table reports USLE rates and acres in relationship to “T” for pastureland.

Pastureland in Relation to "T" Pastureland Erosion Rates tons/acre/year		
	Acres of Pastureland	USLE Rate
Pastureland Eroding At or Below "T"	96,300	1.32
Pastureland Eroding Above "T"	24,200	5.94
All Pastureland	120,500	2.24

USLE SOIL LOSS RATES (tons/year) [/1]





3.2 Water Quality and Quantity

3.2.1 303(d) Listed Water Bodies [10]

Section 303(d) of the federal Clean Water 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. Water quality standards protect such beneficial uses of water as whole body contact (such as swimming), maintaining fish and other aquatic life, and providing drinking water for people, livestock and wildlife. The 303(d) list helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs.

Waterbody	Waterbody ID	TMDL Approved	Size	Unit	Pollutant	Source	Beneficial Use(s) *	Counties	Priority
Clearwater Reservoir	7326	No	1650	Acres	Mercury	Atmospheric Deposition		Reynolds	Medium
McKenzie Creek	2786	No	2.5	Miles	BOD	Piedmont WWTP	1, 2, 3	Wayne	High
McKenzie Creek	2787	Yes	0.5	Miles	pH	Natural	1, 2, 3	Wayne	Medium
Main Ditch	2814	Yes	5	Miles	BOD, VSS, Low DO	Poplar Bluff WWTP	1, 2, 3, 5, 7	Butler	High
West Fork Black River	1998	Yes	0.2	Miles	Nutrients	Doe Run W. Fork Mine	1, 3, 5, 10	Reynolds	Low
Black River	2769	No	45	Miles	Mercury	Atmospheric Deposition	1, 2, 3, 5, 6, 7, 8, 10	Butler	Medium

* Beneficial Uses:

1 Livestock and Wildlife Watering

2 Protection of Warm Water Aquatic Life

3 Human Health associated with Fish Consumption

4 Boating and Canoeing

5 Whole Body Contact (swimming)

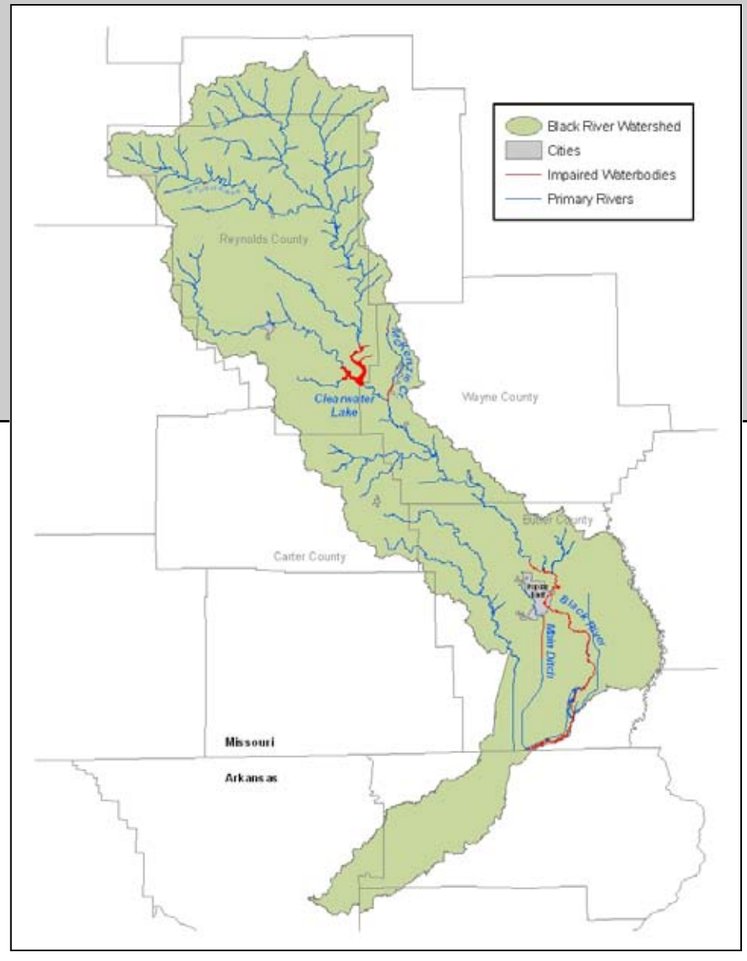
6 Secondary Contact Reaction

7 Irrigation

8 Drinking Water Supply

9 Industrial

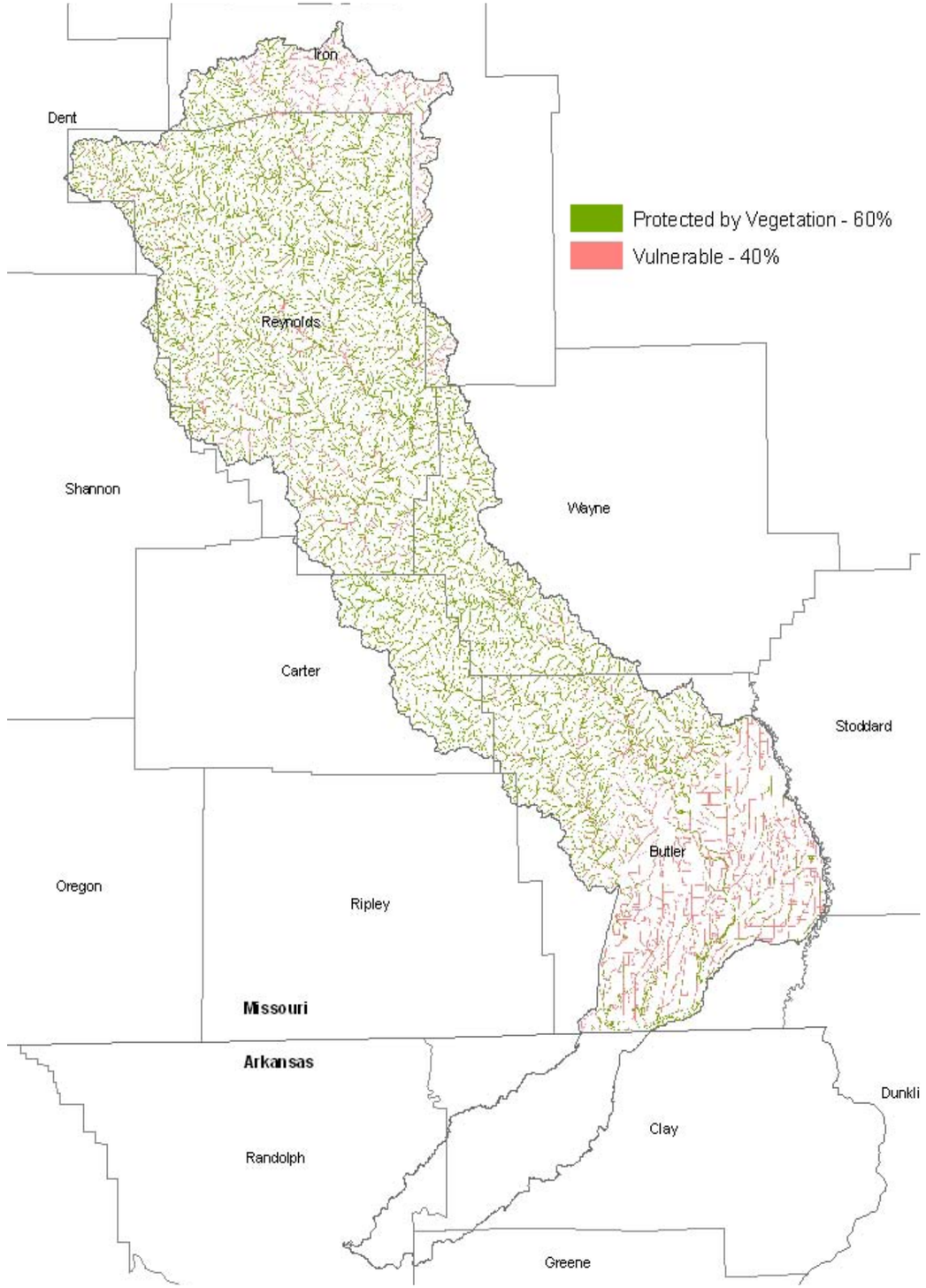
10 Cool Water Fishery



3.2.2 Riparian Corridor [/24 & /25]

The condition of the riparian zone adjacent to streams has a critical impact on water quality. Permanent and deeply-rooted stream bank vegetation slows run-off of nutrients and pollutants, and reduces sedimentation and solar heating. NRCS riparian practice standards specify 50-feet buffers along first and second order streams and 100-feet for third order and higher streams.

The 1:24,000 National Hydrologic Dataset (NHD) stream network is the highest resolution stream representation available consistently for the State. Stream order is not an attribute of these data; therefore, the streams were all buffered by 50-feet to give the most conservative representation of riparian condition. Buffered streams were used to subset the common land unit (CLU) data, land parcel data developed and maintained by the Farm Service Agency. The land cover attribute in the CLU data was used to characterize the vegetative condition of the buffers. Cropland (which includes pasture and hayland), urban, mined and barren cover types were considered “unprotected” or “vulnerable” riparian conditions, while forestland, rangeland and water were considered “protected”.



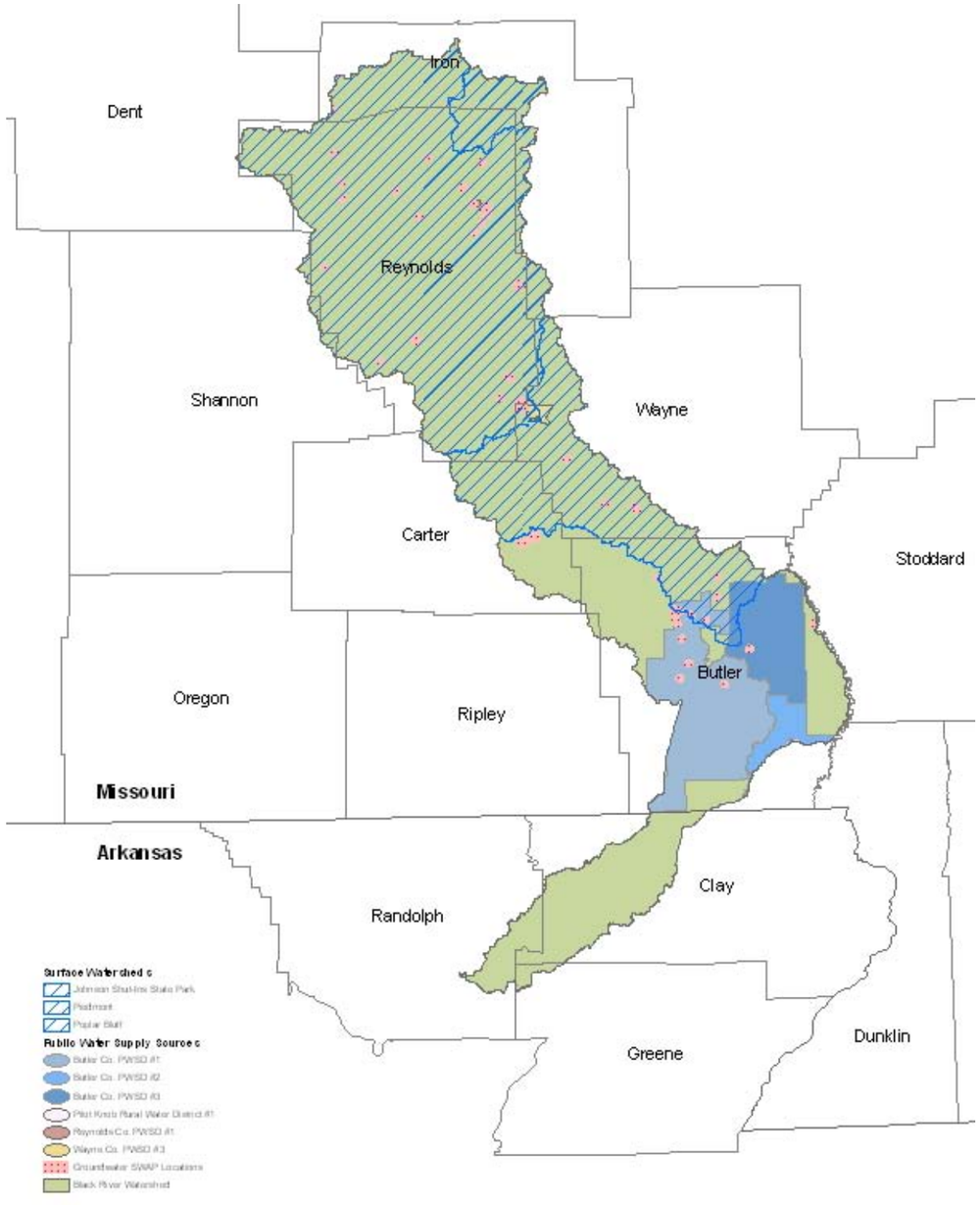
3.2.3 Drinking Water Resources [/16]

Drinking water resources are important factor in watershed management. In the Upper Black River sub-basin, drinking water resources are attained from groundwater and surface water resources. There are 78 public wells in the Upper Black River sub-basin servicing various public water districts, municipalities and other public and private facilities. Three surface water intakes draw out of the Black River.

All public drinking water sources are regulated by the Missouri Department of Natural Resources-Public Drinking Water Program through the federal Safe Drinking Water Act. These facilities are responsible for providing a Source Water Assessment Plan that includes an inventory of potential contamination sites located within a delineated one-mile wellhead zone for groundwater wells or for watersheds above a surface intake. This plan also entails measures utilized to deter potential contamination problems as well as an annual consumer confidence report sent to facility consumers detailing water quality conditions.

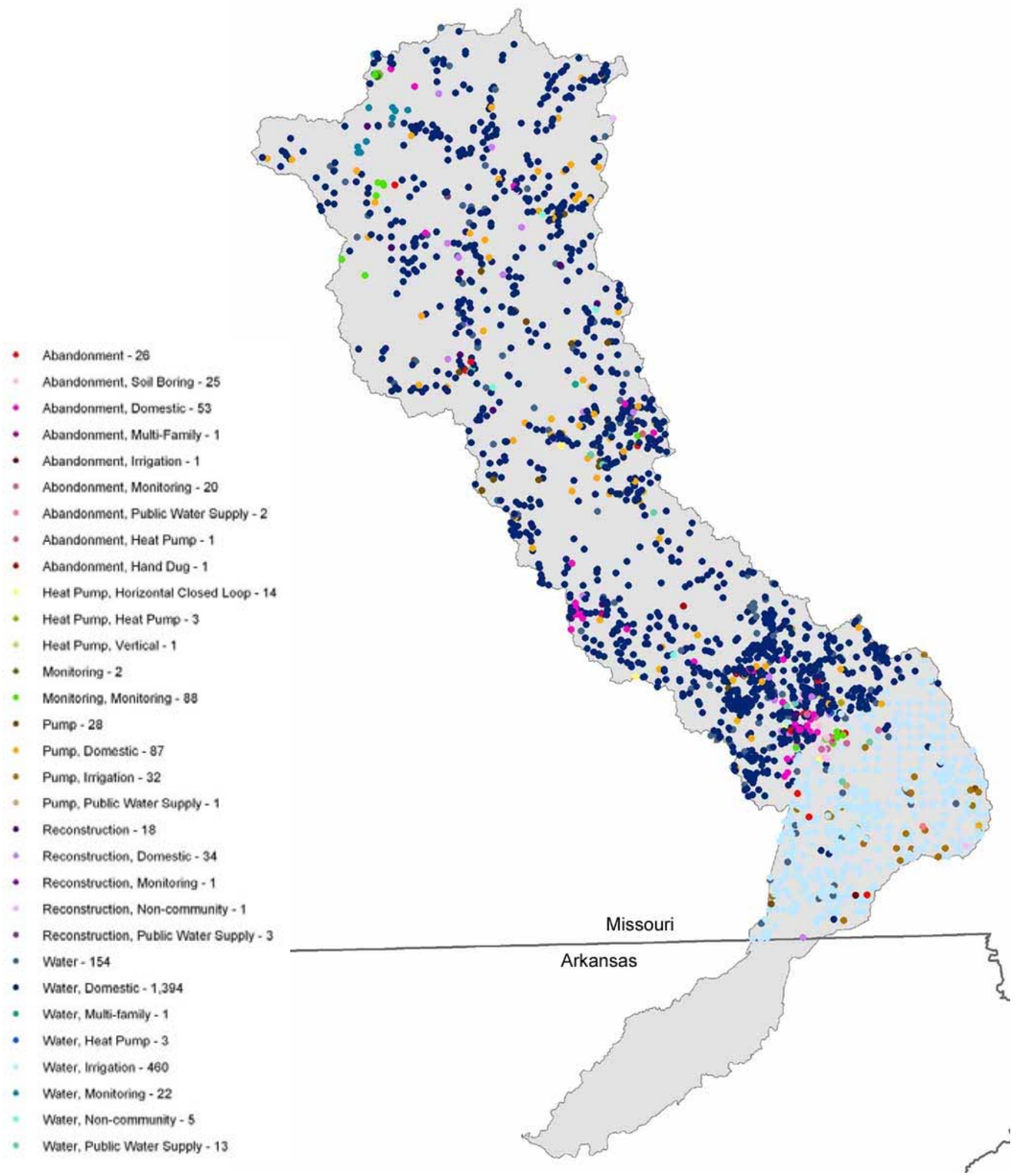
Facility Type	Number of Wells
Public Water Districts	17
U.S Corps of Engineers	15
Municipalities	12
Industrial/Business Facilities	10
Hotels/Resorts	8
Private Campgrounds	3
Federal Facilities*	3
Restaurants	3
Youth Institution	2
Residential Subdivisions	2
Service Station	1
State Park	1
State Highway Trooper Facility	1
*Includes National Forest Service Facilities.	

Service Drinking Water Sources		
Serviced Community	**Waterbody Source**	**Drainage Area (square miles)**
Johnson Shut-Ins State Park	East Fork of Black River	56
City of Piedmont	Black River	914
City of Poplar Bluff	Black River	1,248



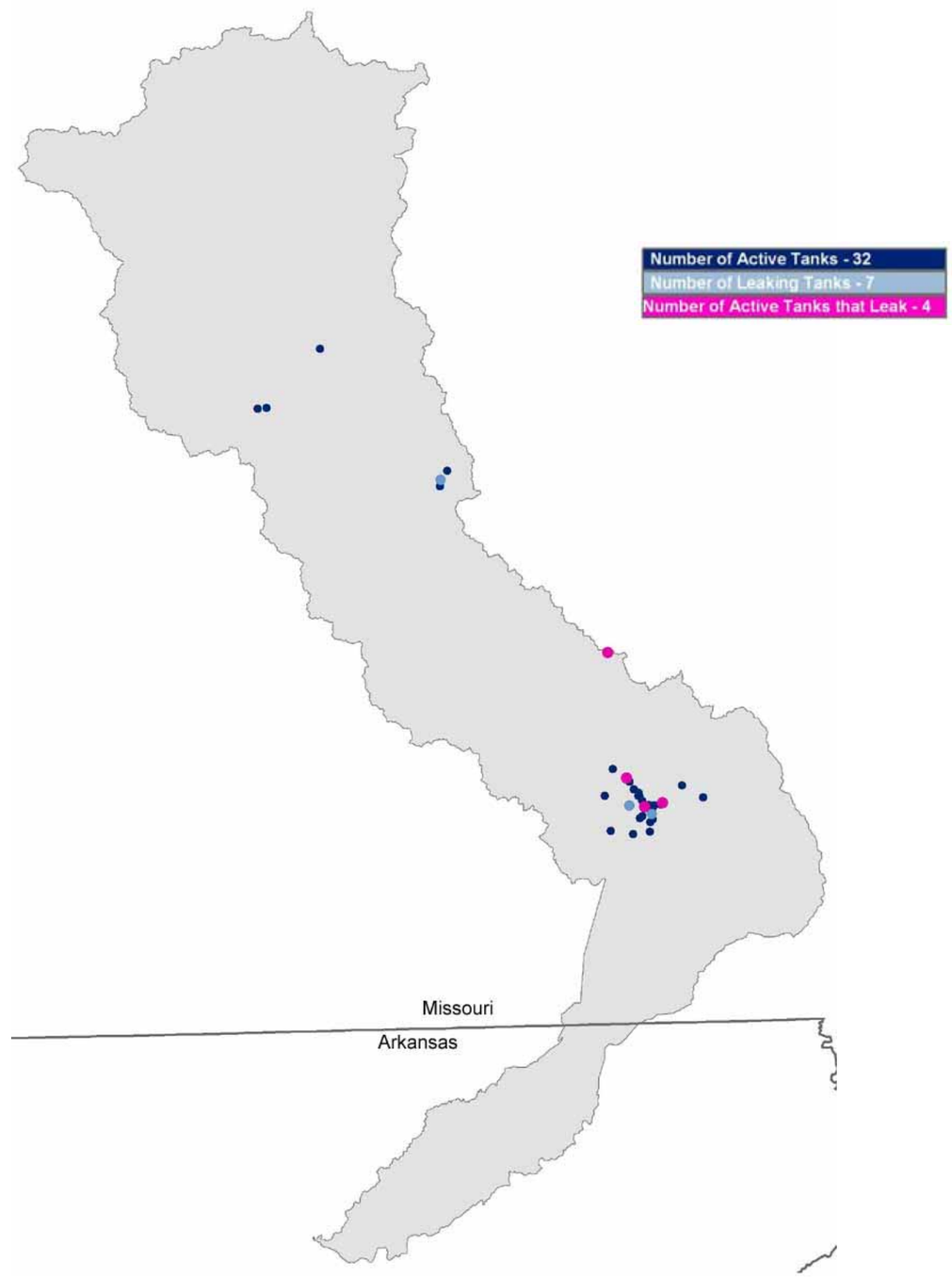
3.2.4 Wells [/12]

The Missouri Well Driller's Law (Section 256.600-256.640 RSMo.) established minimum construction standards and state certification requirements of wells constructed after October, 1987. The law was created to protect Missouri groundwater from contamination due to improperly constructed wells. Contaminated groundwater exposes Missourians of all ages to serious health risks that can result from water borne diseases such as typhoid fever, dysentery, cholera, hepatitis and giardiasis. The law is administered through the Department of Natural Resources.



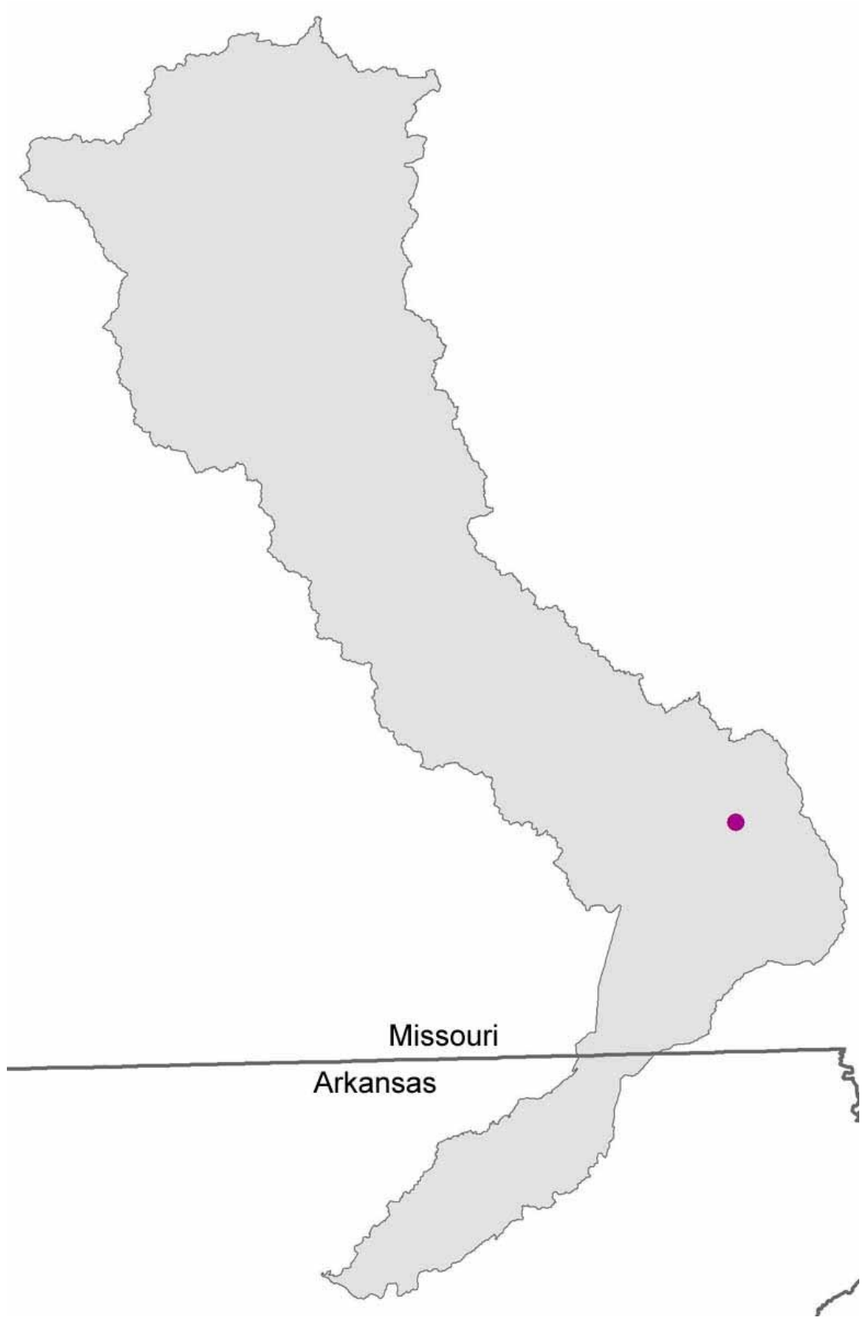
3.2.5 Underground Tanks [/13 & /14]

Registered active underground tanks and locations of leaking underground tanks where clean-up activities are on-going.



3.2.6 Sites with Hazardous Waste Permits [/15]

Sites with hazardous waste permits are permitted to treat, store or dispose of hazardous waste or are facilities that are certified for resource recovery. There is 1 site in the Upper Black River sub-basin.



3.3 Threatened and Endangered Species [/18]

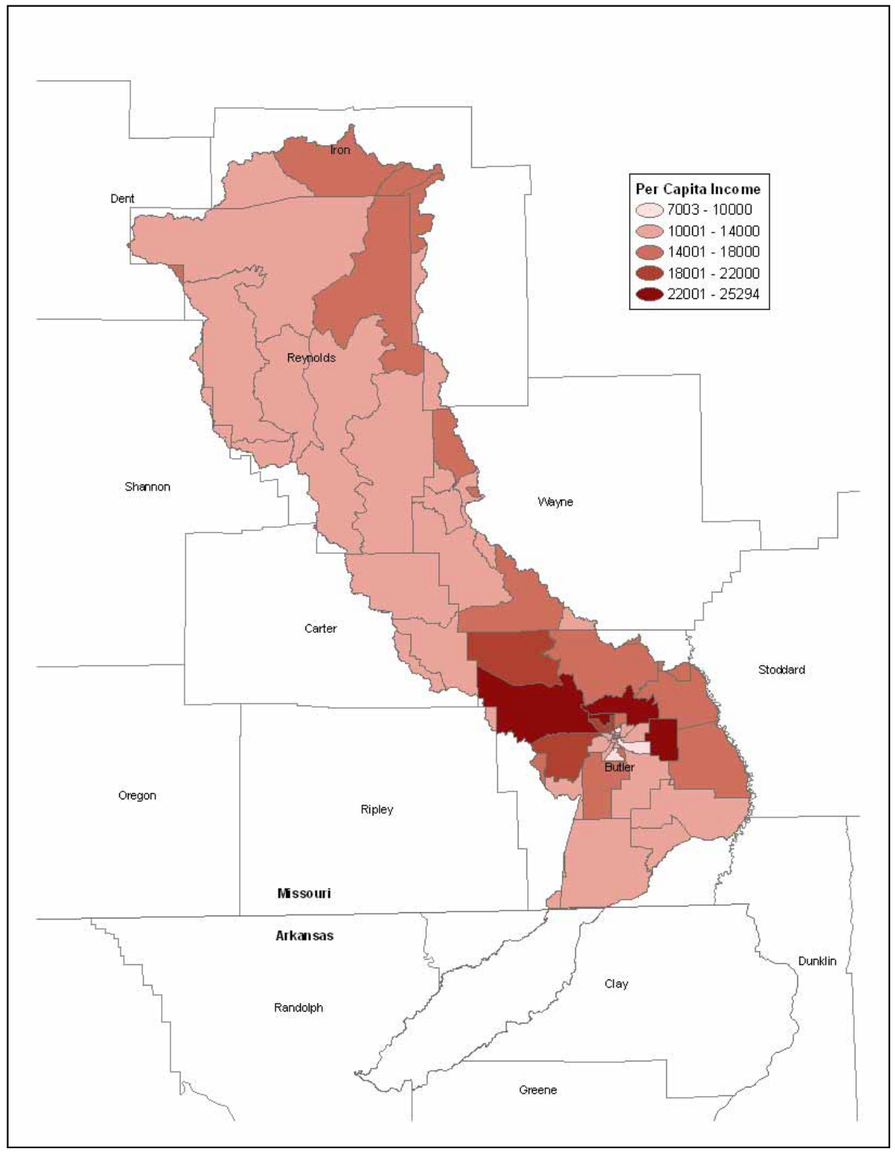
Species Common Name	Scientific Name	Threatened (T), Endangered (E), Candidate (C)	Listing: Federal (F), State (S)
Bats			
Gray Bat	Myotis grisescens	E/E	F/S
Indiana Bat	Myotis sodalis	E/E	F/S
Birds			
Bald Eagle	Haliaeetus leucocephalus	T/E	F/S
Barn Owl	Tyto alba	E	S
Swainson's Warbler	Limnothlypis swainsonii	E	S
Fish			
Crystal Darter	Crystallaria asprella	E	S
Goldstripe Darter	Etheostoma parvipinne	E	S
Harlequin Darter	Etheostoma histrio	E	S
Longnose Darter	Percina nasuta	E	S
Mountain Madtom	Noturus eleutherus	E	S
Sabine Shiner	Notropis sabinae	E	S
Swamp Darter	Etheostoma fusiforme	E	S
Taillight Shiner	Notropis maculatus	E	S
Insects			
Hine's Emerald	Somatochlora hineana	E/E	F/S
Mollusks			
Curtis Pearlymussel	Epilblasma florentina curtisii	E/E	F/S
Elephantear	Elliptio crassidens	E	S
Pink Mucket	Lampsilis abrupta	E/E	F/S
Plants			
Mead's Milkweed	Asclepias meadi	E	S
Running Buffalo Clover	Trifolium stoloniferum	E/E	F/S
Reptiles			
Western Chicken Turtle	Deirochelys reticularia miaria	E	S

4.0 Census and Social Data

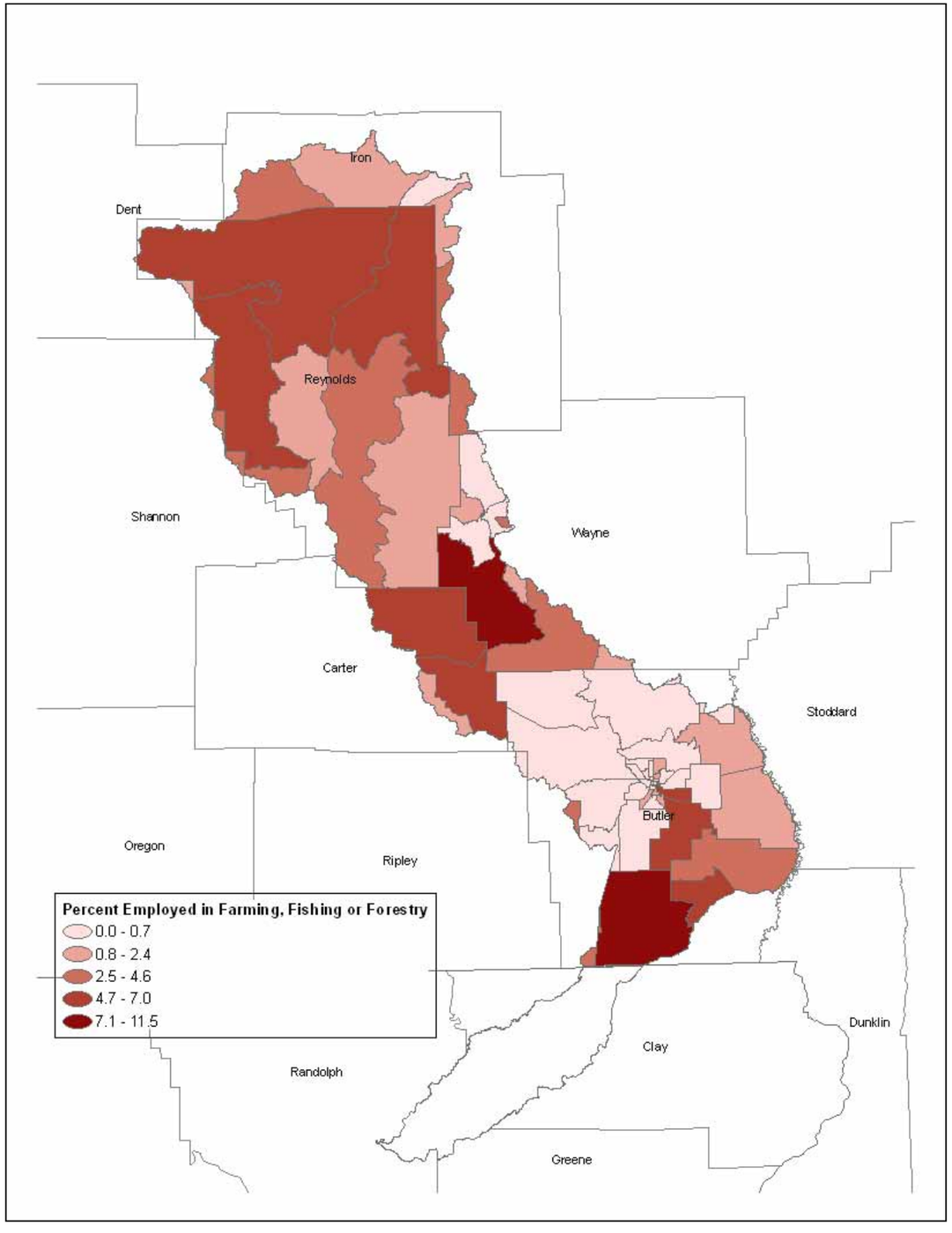
4.1 Census Bureau [/20]

Block group-level GIS data files from the 2000 Census, including Summary Form 3 (SF3) attributes, were used to illustrate population, population change, income and the agricultural cohort for the sub-basin. County block group spatial files were merged and clipped by the sub-basin boundary. The per cent of the block group falling in the sub-basin was calculated, and population figures were prorated by this value. Although this technique erroneously assumes even distribution of the population within block groups, it is a more accurate population count for the sub-basin than including the entire block group population.

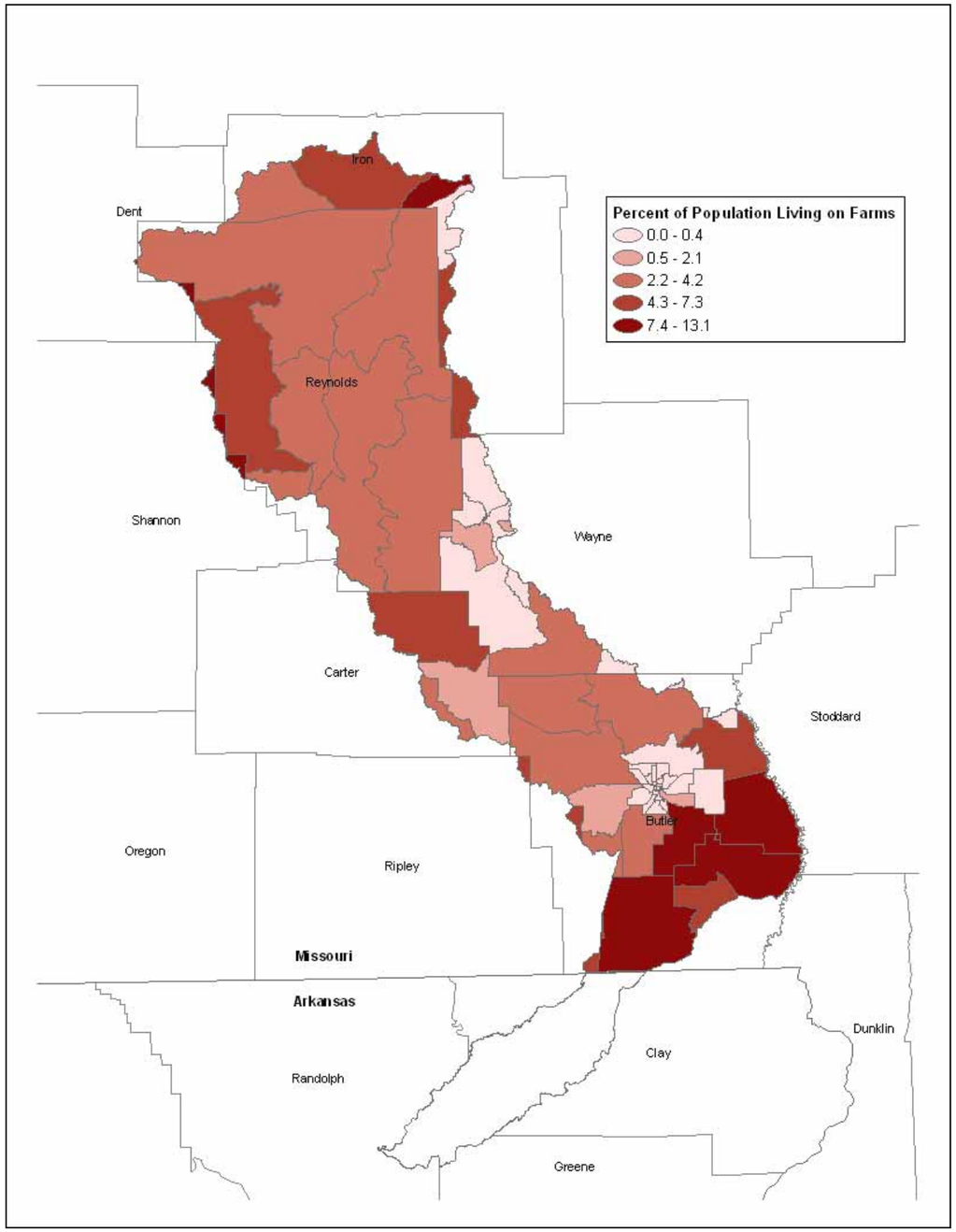
4.1.1 Income



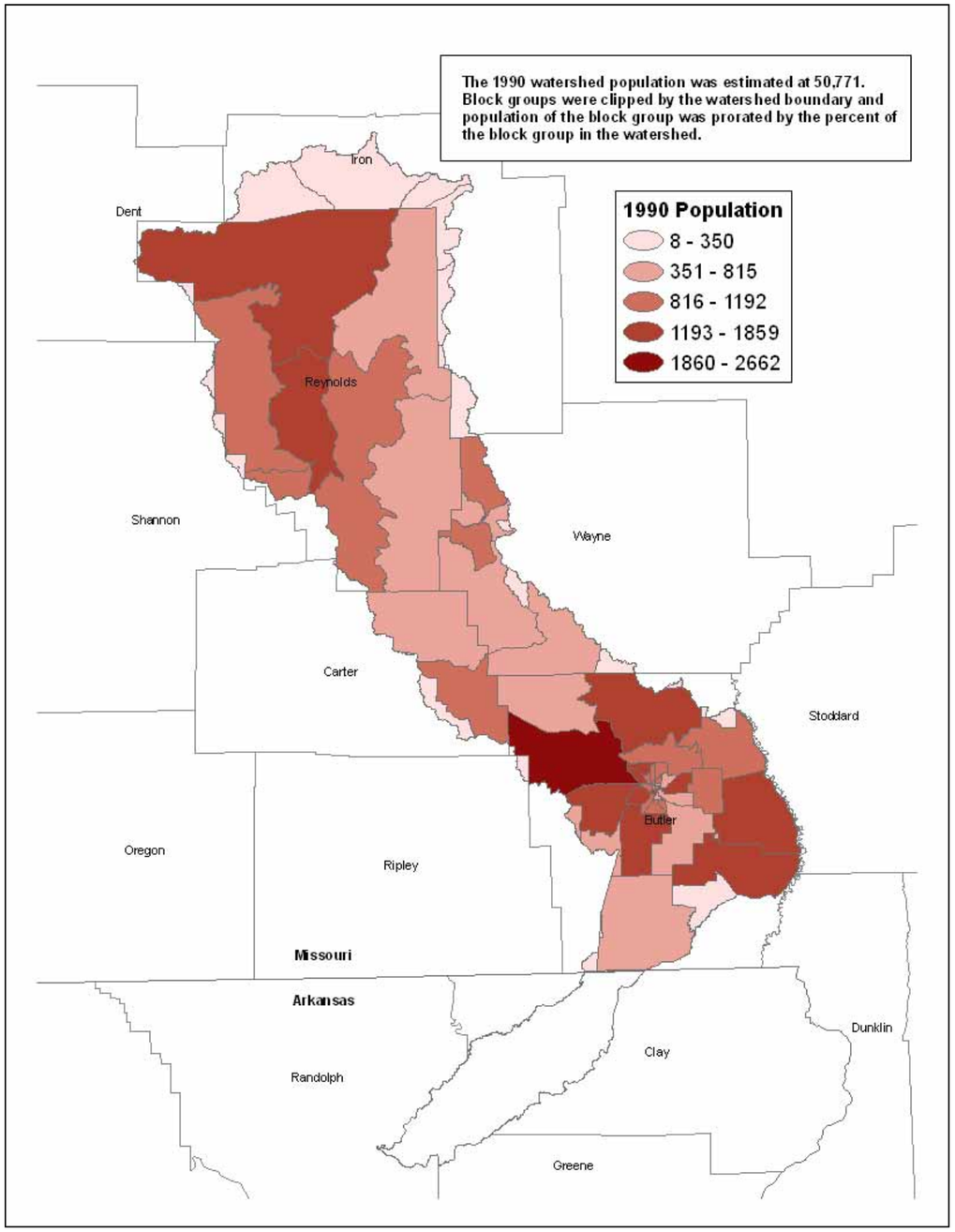
4.1.2 Employment in Agriculture, Forestry and Fishing



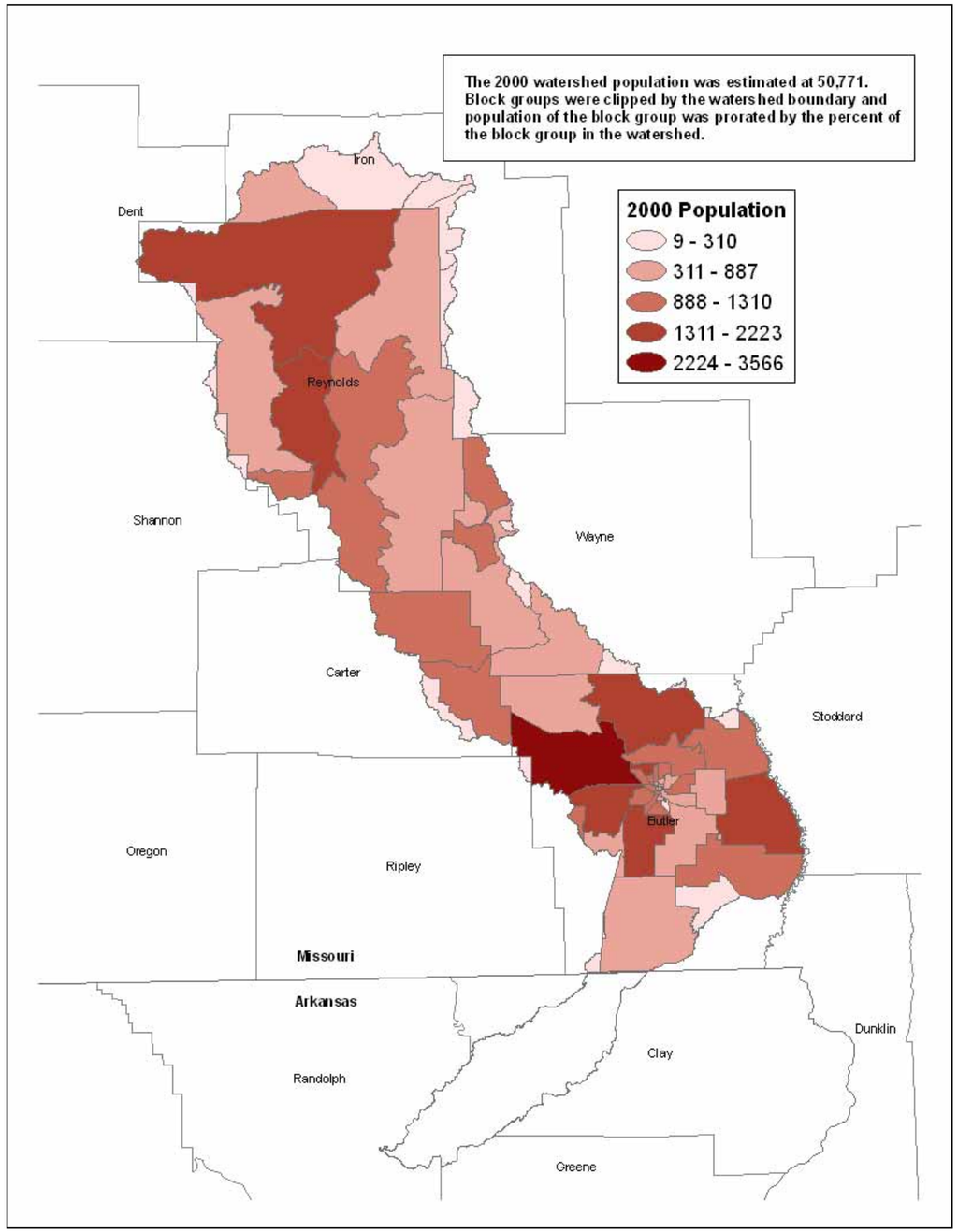
4.1.3 Farm Population



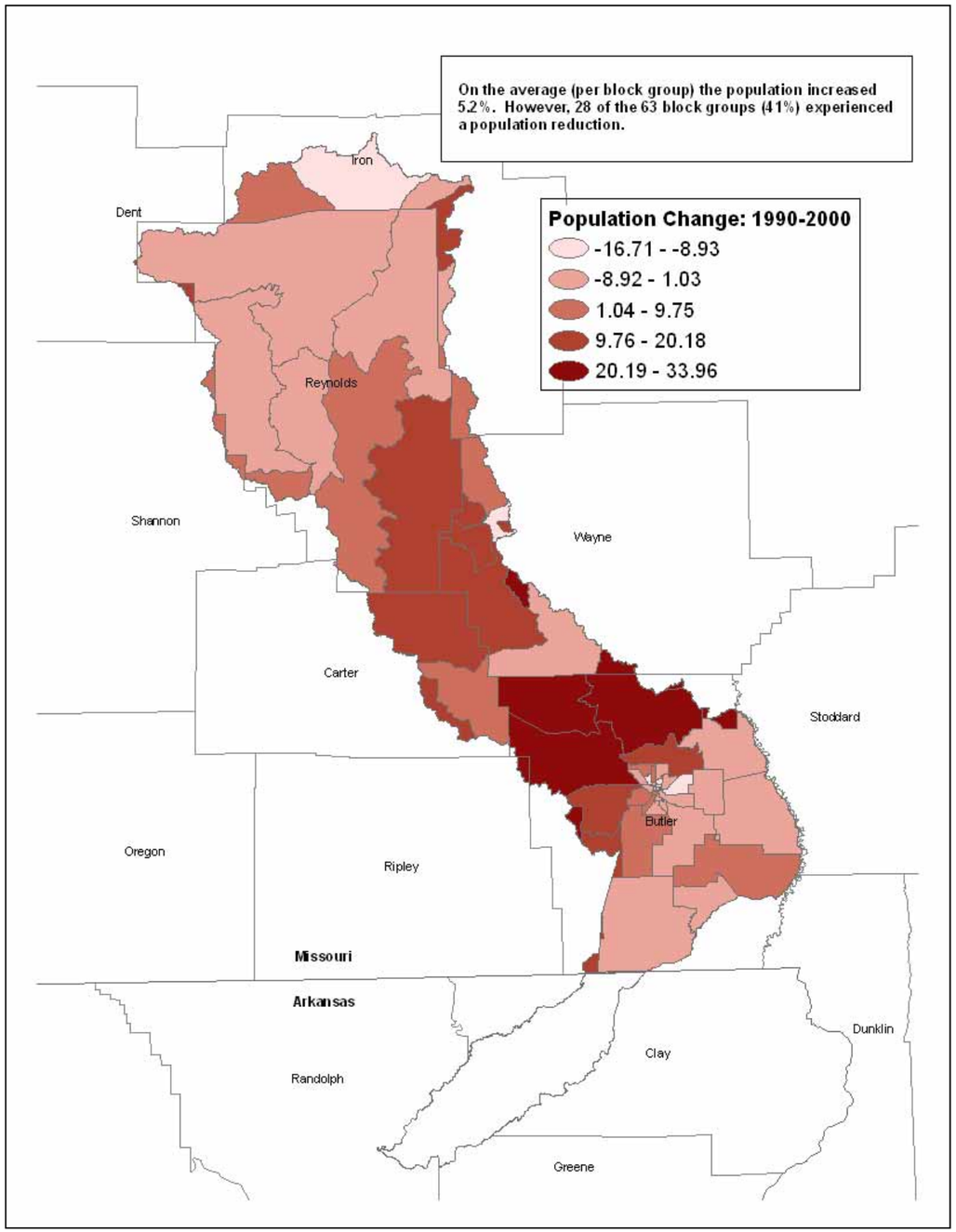
4.1.4 1990 Population



4.1.5 2000 Population



4.1.6 Change in Population



4.2 Agricultural Census

4.2.1 County Statistics [4]

COUNTY SUMMARY HIGHLIGHTS, 2002							
Item		**Missouri**	**Butler**	**Carter**	**Iron**	**Reynolds**	**Wayne**
Farms	number	106,797	673	228	299	379	445
Land in farms	acres	29,946,035	247,820	92,560	70,520	117,793	113,740
Cattle	number	4,460,495	7,769	11,147	10,674	12,605	14,388
Sheep	number	76,015	(D)	-	54	28	87
Horses & Ponies	number	141,362	872	332	491	834	807
Goats	number	48,654	288	163	185	328	655
Cropland used only for pasture or grazing	acres	4,178,574	10,152	11,348	12,518	22,661	15,569
Woodland pastured	acres	2,281,064	7,612	15,880	10,000	11,164	11,297
Permanent Pastureland and rangeland	acres	4,854,438	10,357	15,533	11,938	13,770	14,259
Pastureland, all types	acres	11,314,076	28,121	42,761	34,456	47,595	41,125
Percent Pastureland to All Land in Farms	percent	37.8	11.3	46.2	48.9	40.4	36.2
Sum of All Grazing Livestock	number	4,726,526	8,929	11,642	11,404	13,795	15,937
Acres of Pastureland per Animal	number	2.4	3.1	3.7	3	3.5	2.6

4.2.2 General Statistics

- 244 Operators with farming as primary occupation
- Majority of farms size: 50-179 acres
- More than 9,000 cattle and calves
- Only 144 hogs and pigs
- More than 3700 acres of corn harvested for grain
- 4300 acres of wheat harvested for grain
- 10,600 acres of forage

4.2.3 Forestry Statistics /6

AREA OF FOREST LAND BY FOREST TYPE AND STAND SIZE CLASS																					
Land Class	Total Forest Type	Shortleaf-Pine	Eastern Red Cedar	Shortleaf Pine Oak	Post Oak Blackjack Oak	White & Red Oak, Hickory	White Oak	Northern Red Oak	Sassafras Persimmon	Sweetgum Yellow Poplar	Scarlet Oak	Chestnut, Black & Scarlet Oak	Mixed Upland hardwoods	Sweetgum Nuttall Oak Willow Oak	Overcup Oak, Water Hickory	Sweetbay, Swamp Tupelo, Red Maple	River Birch, Sycamore	Sycamore, Pecan, American Elm	Sugarberry Hackberry Elm Green Ash	Sugar Maple, Beech, Yellow Birch	Black Cherry	Hard Maple Bass-wood
Large diameter	448,533.8	23,110.3	-	61,190.7	10,693.6	218.760.1	40,780.1	7,118.8	-	-	28,466.5	28,501.5	4,378.5	10,18.2	36,42.2	-	11,757.9	54,73.2	3,642.2	-	-	-
Medium diameter	265,125.9	6,092	4,378.5	15,264.3	7,127.3	148,643.7	37,473.5	3,642.2	-	3,283.9	4,072.8	14,475.4	3,535.4	-	-	4,072.8	4,072.8	-	896.5	6,941.6	-	1,153.2
Small diameter	82,834.4	-	1,094.6	3,807.5	4,072.8	58,603.7	-	-	2,284.5	-	-	4,834.3	4,072.8	-	-	-	-	-	1,018.2	2,284.5	761.5	-
Chaparral																						
Nonstocked																						
Not collected																						
Other																						
Sub-basin Total	796,494	29,202.3	5,473.2	80,262.5	21,893.7	426,007.5	78,253.6	10,761	2,284.5	3,283.9	32,539.2	47,811.1	11,986.7	1,018.2	3,642.2	4,072.8	15,830.7	5,473.2	5,556.9	9,226.1	761.5	1,153.2

NET VOLUME OF SAWTIMBER TREES BY SPECIES GROUP AND DIAMETER CLASS (BOARD FEET)														
Land Class	Total Current diameter	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	not measured
Loblolly and shortleaf pine	670,567,560	-	-	-	-	157,038,024	178,447,559	142,502,604	98,011,149	59,266,002	35,302,221	-	-	-
Other eastern softwoods	7,361,770	-	-	-	-	3,239,010	1,364,879	-	2,757,881	-	-	-	-	-
Select white oaks	610,277,230	-	-	-	-	-	173,799,565	156,079,650	125,857,427	47,549,924	36,215,247	55,289,085	15,486,333	-
Select red oaks	139,454,067	-	-	-	-	-	26,775,990	29,069,904	22,777,304	14,632,494	15,346,604	30,851,772	-	-
Other white oaks	105,692,579	-	-	-	-	-	39,603,893	28,200,334	15,255,670	3,169,901	11,031,243	8,431,537	-	-
Other red oaks	1,174,089,452	-	-	-	-	-	298,839,919	304,043,475	228,988,560	151,947,881	99,150,082	91,119,534	-	-
Hickory	166,229,919	-	-	-	-	-	95,960,762	36,493,217	23,743,783	10,032,157	-	-	-	-
Hard maple	14,804,776	-	-	-	-	-	11,370,066	3,434,710	-	-	-	-	-	-
Soft maple	26,776,070	-	-	-	-	-	3,261,973	4,810,072	-	5,635,467	5,743,832	7,324,726	-	-
Beech	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sweetgum	25,544,003	-	-	-	-	-	5,236,547	2,760,987	-	9,737,669	7,808,799	-	-	-
Tupelo and blackgum	42,906,536	-	-	-	-	-	5,426,023	12,455,427	3,036,031	4,009,086	5,010,041	12,969,929	-	-
Ash	21,275,211	-	-	-	-	-	4,804,774	2,277,282	14,193,155	-	-	-	-	-
Cottonwood and aspen	3,707,724	-	-	-	-	-	-	3,707,724	-	-	-	-	-	-
Black walnut	23,929,520	-	-	-	-	-	4,256,522	4,036,739	8,284,830	-	-	7,351,429	-	-
Other eastern soft hardwoods	70,977,375	-	-	-	-	-	14,527,533	10,470,159	19,046,530	17,420,067	-	9,513,086	-	-
Total Species group	3,103,593,787	-	-	-	-	160,277,034	863,676,003	740,342,283	561,952,319	323,400,648	215,608,069	222,851,097	15,486,333	-

AREA OF FOREST LAND BY OWNERSHIP											
Land Class	Total Ownership class	National Forest	National Park Service	Bureau of Land Mgmt	Fish and Wildlife Service	Dept of Defense	Other federal	State	County and Municipal	Other local government	Private
Sub-basin Total	796,493.9	232,922.8	0	0	0	0	12,327.9	67,336.8	7,284.5	0	476,621.9

4.2.3 Forestry—continued [/6]

General Statistics				
Land Class		Total Tree species	Softwoods	Hardwoods
Net Volume of Growing-Stock	Cubic Feet	950,565,394.1	165,779,672.4	784,785,721.8
Net Volume of Live Trees	Cubic Feet	950,565,394.1	165,779,672.4	784,785,721.8
Average Net Annual Growth of Growing-Stock Trees	Cubic Feet	950,565,394.1	165,779,672.4	784,785,721.8
Average Net Annual Growth of Sawtimber	Board Feet	100,433,464.8	17,418,851	83,014,613.9
Average Annual Mortality Rate of Growing-Stock	Cubic Feet	8,880,949.5	678,770.2	8,202,179.3
Average Annual Mortality Rate of Sawtimber	Board Feet	22,740,498.4	2,907,921.4	19,832,577
Average Annual Removals of Growing-Stock	Cubic Feet	5,799,117	0	5,799,117
Average Annual Removals of Sawtimber	Board Feet	27,835,997.3	0	27,835,997.3

Area of Forest Land by Site Productivity Class								
Land Class	Total Site productivity class	225+	165-224	120-164	85-119	50-84	20-49	0-19
Sub-basin Total	796,493.9	0	7,662.4	20,660.5	303,907.9	388,591.3	75,671.7	0

Area of Forest Land by Stocking Class						
Land Class	Total Growing-stock stocking	Overstocked	Fully stocked	Medium stocked	Poorly stocked	Non-stocked
Sub-basin Total	796,493.9	19,539.8	277,863.4	391,864.4	106,131.7	1,094.6

4.3 Resource Producer Factor [/5]

Missouri's average county has a limited resource producer factor of 13, with a low of 2 for St. Louis County to a high of 45 for Greene county.

Factor = number of farms in the county multiplied by the percentage of the county's population below the poverty level and then divided by 1,000.

County	Limited Resource Producer Factor
Adair	20
Andrew	7
Atchison	5
Audrain	16
Barry	28
Barton	12
Bates	19
Benton	13
Bollinger	13
Boone	20
Buchanan	10
Butler	13
Caldwell	11
Callaway	13
Camden	7
Cape Girardeau	13
Carroll	15
Carter	6
Cass	9
Cedar	17
Chariton	13
Christian	12
Clark	10
Clay	4
Clinton	8
Cole	10
Cooper	10
Crawford	12
Dade	12
Dallas	22
Daviess	16
DeKalb	9
Dent	12
Douglas	20
Dunklin	11
Franklin	13
Gasconade	8
Gentry	10

County	Limited Resource Producer Factor
Greene	45
Grundy	12
Harrison	15
Henry	14
Hickory	11
Holt	6
Howard	9
Howell	33
Iron	6
Jackson	10
Jasper	20
Jefferson	5
Johnson	27
Knox	12
Laclede	20
Lafayette	11
Lawrence	30
Lewis	13
Lincoln	9
Linn	14
Livingston	11
McDonald	23
Macon	17
Madison	8
Maries	12
Marion	9
Mercer	8
Miller	16
Mississippi	6
Moniteau	11
Monroe	11
Montgomery	9
Morgan	15
New Madrid	8
Newton	20
Nodaway	23
Oregon	19
Osage	10

County	Limited Resource Producer Factor
Ozark	18
Pemiscot	8
Perry	8
Pettis	16
Phelps	14
Pike	16
Platte	4
Polk	29
Pulaski	6
Putnam	12
Ralls	6
Randolph	12
Ray	8
Reynolds	8
Ripley	11
St. Charles	3
St. Clair	15
Ste. Genevieve	6
St. Francois	11
St. Louis	2
Saline	12
Schuyler	8
Scotland	11
Scott	8
Shannon	14
Shelby	11
Stoddard	16
Stone	8
Sullivan	14
Taney	6
Texas	34
Vernon	21
Warren	6
Washington	12
Wayne	10
Webster	29
Worth	5
Wright	29

Counties in Orange fall within the Upper Back River Sub-basin

5.0 Status of Resources

5.1 Performance Results System [/11]

The Performance Results System (PRS) is a web-based measurement and accountability system utilized by the USDA-Natural Resources Conservation Service since 1998 to formalize annual performance measures on the landscape from field personnel and to enhance conservation data quality and accountability.

PRS Data	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	Avg/ Year
Total Acres of Conservation Systems Planned	3,310	6,314	10,294	11,873	11,161	Not reported by HU	15,566	10,194	12,199
Total Acres of Conservation Systems Applied	1,216	6,023	5,929	16,670	15,485	Not reported by HU	12,144	11,051	13,838

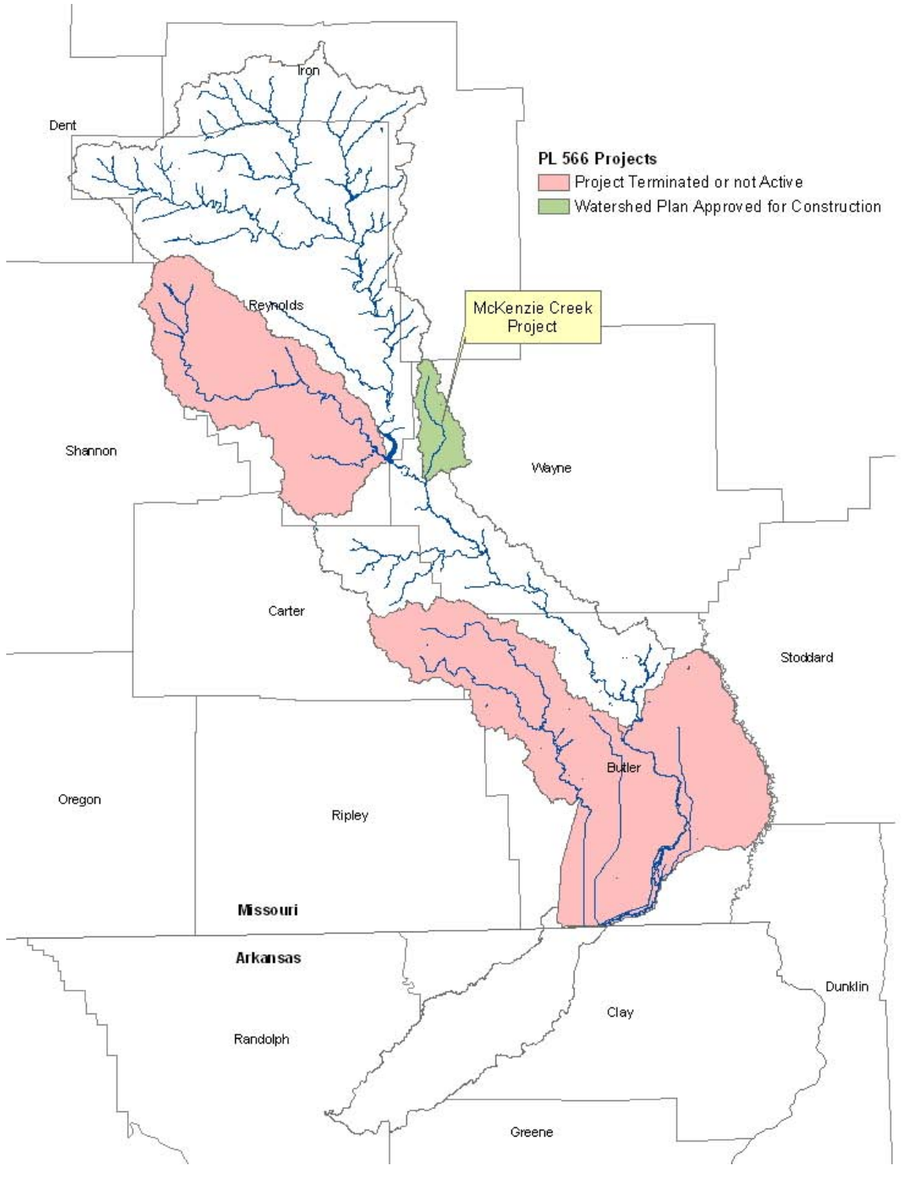
	Fiscal Year 2004		Fiscal Year 2005		Fiscal Year 2006	
Summary Conservation Practices	Planned	Applied	Planned	Applied	Planned	Applied
Conservation Cover (327) (ac)	81	59	111	96	87	241
Conservation Crop Rotation (328) (ac)	11,296	2,662	11,751	3,282	7,378	5,437
Critical Area Planting (342) (ac)	42	10	7	37	81	1
Early Successional Habitat Development/ Management (647) (ac)	10		10			5
Feed Management (592) (no)						
Fence (382) (ft)	72,530	23,712	119,264	6,646	63,294	41,268
Field Border (386) (ft)	7,920				3,960	4,650
Filter Strip (393) (ac)			85	85		
Forage Harvest Management (511) (ac)	75	75	75	26	13	13
Forest Site Preparation (490) (ac)	103	37				
Forest Stand Improvement (666) (ac)	118	23	789		156	61
Forest Trails and Landings (655) (ac)	82				277	
Grade Stabilization Structure (410) (no)	161	40	91	34	39	41
Heavy Use Area Protection (561) (ac)	1		1			0
Irrigation Land Leveling (464) (ac)	750		2,542	309	388	769
Irrigation System, Surface and Subsurface (443) (no)	31	128	1,927	170	849	1,084
Irrigation Water Conveyance, Pipeline, High-Pressure, Underground, Plastic (430DD) (ft)	525		2,970			1,360
Irrigation Water Management (449) (ac)	5,738	1,883	9,759	5,230	6,536	5,244
Mulching (484) (ac)	8	5	13	4	81	2
Nutrient Management (590) (ac)	778	256	3,251	143	490	292
Pasture and Hay Planting (512) (ac)	847	171	1,418	139	397	592
Pest Management (595) (ac)	728	132	2,166	64	553	384
Pipeline (516) (ft)	27,977	5,025	22,435	5,641	14,449	4,843
Pond (378) (no)	13	9	10	4	6	5
Prescribed Burning (338) (ac)	51		271		353	89
Prescribed Grazing (528) (ac)			25	160	785	257

	Fiscal Year 2004		Fiscal Year 2005		Fiscal Year 2006	
Summary Conservation Practices	Planned	Applied	Planned	Applied	Planned	Applied
Residue Management, Mulch Till (329B) (ac)			38			
Residue Management, No-Till/Strip Till (329A) (ac)	448		95	175		
Residue Management, Seasonal (344) (ac)	10,213	1,542	11,647	2,502	7,403	5,797
Restoration and Management of Declining Habitats (643) (ac)			88		16	
Riparian Forest Buffer (391) (ac)	15	5	16	5		16
Shallow Water Management for Wildlife (646) (ac)			465		116	
Structure for Water Control (587) (no)	1		4	1		1
TA Check-Out (913) (no)			28			
TA Design (911) (no)			28			
Tree/Shrub Establishment (612) (ac)	85	13	12	3		5
Upland Wildlife Habitat Management (645) (ac)	1,585	809	3,827	860	304	740
Use Exclusion (472) (ac)	1,325	125	1,815	1,370	279	534
Water Well (642) (no)			2	1	1	1
Watering Facility (614) (no)	38	14	41	4	25	24
Well Decommissioning (351) (no)	1		3			1
Wetland Creation (658) (ac)	410	41				
Wetland Enhancement (659) (ac)	369	284		60		
Wetland Restoration (657) (ac)	340	330			93	
Wetland Wildlife Habitat Management (644) (ac)	650	622	120	8	100	
Wildlife Watering Facility (648) (no)	5		7		3	3

5.2 Watershed Projects

PL-566 [/26]

The PL-566 program is an initiative that authorizes the NRCS to cooperate with states and local agencies to carry out works of improvement for soil conservation and other purposes including flood prevention, conservation, development, utilization and disposal of water. The NRCS also assists public sponsors to develop watershed plans to mitigate flood damages; conservation, development, utilization and disposal of water; and conservation and proper utilization of land. The focus of these plans is to identify solutions that use conservation practices, including nonstructural measures, to solve problems. In the Upper Black River sub-basin, there are two active projects: the Little Black River and the Fourche Creek watershed projects. Both of these projects are focusing on flooding and drainage issues.



The Missouri Department of Natural Resources administers two watershed protection programs that local communities can apply for in order to address water quality concerns.

SALT [/22]

The Special Area Land Treatment (SALT) program addresses agricultural non-point sources such as sedimentation, nutrients, animal waste management, irrigation, pesticide and grazing issues. *No SALT programs have been or are currently being implemented in the Upper Black River sub-basin.*

319 [/21]

NPS source grant funds are provided from the U.S. Environmental Protection Agency (EPA) through Section 319 of the Clean Water Act. Funds are used to address NPS pollution and are administered from the EPA through the Missouri Department of Natural Resources to eligible sponsors. Funds can be used to address NPS pollution through information/education, conserve, restore, or improve water quality. Eligible sponsors include state and local agencies, educational institutions, and nonprofit organizations with 501(c)(3) status. The overall goal of the grant program is to provide citizens with the knowledge and ability to improve their common land-use practices and to protect water quality. Selection for 319 funding emphasizes projects that restore the quality of waters on the state's 303(d) list of impaired waters due to NPS pollution. However, other high quality NPS projects are encouraged. *No 319 projects have been or are currently being implemented in the Upper Black River sub-basin.*

5.3 Farm Bill Program Lands

Conservation Reserve Program (CRP) [/23]

The Conservation Reserve Program (CRP) provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. CRP is administered by the Farm Service Agency, with NRCS providing technical land eligibility determinations, conservation planning and practice implementation.

The Conservation Reserve Program reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filter strips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover practices. In the Black River watershed, 469 acres of highly erodible cropland have been converted over to vegetative cover, namely in grassland areas in Butler, Carter and Wayne Counties.

County	Acres
Butler	320
Carter	78
Reynolds	11
Wayne	60

5.4 Missouri Department of Conservation 2004 Management Goals

The management goals, for the Upper Black River sub-basin were developed using information collected from the Black River Watershed Inventory and Assessment (WIA) and direction provided by the South-east Regional Management Guidelines, Missouri Department of Conservation (MDC) Strategic Plan, and the Fisheries Division Five Year Strategic Plan. All goals are of equal importance and are reasonably expected to be achieved or influenced during the next twenty-five years. Specific objectives and strategies for these goals can be found at http://mdc.mo.gov/fish/watershed/black/manprb.

GOAL I

Maintain or improve aquatic habitat conditions to meet the needs of native aquatic biota while accommodating society's demands for agricultural production and economic development.

Objective 1.1

Maintain, expand, and restore riparian corridors; enhance watershed management; improve in-stream habitat; and reduce streambank erosion throughout the basin.

Objective 1.2

In the channelized streams of the lower subbasin, reduce channel instability, sedimentation, and streambank sloughing and increase instream woody habitat.

GOAL II

Maintain or improve water quality throughout the basin so that it is sufficient to support diverse aquatic biota.

Objective 1.1

Ensure that basin streams meet state water quality standards.

Objective 1.2

Encourage the public to become advocates for high-quality water.

Objective 1.3

Work with AmerenUE and other stakeholders to determine the impacts of the Taum Sauk hydropower facility on the aquatic resources and to develop mitigation measures which benefit natural resources and recreation.

GOAL III

Maintain diversity of native aquatic organisms and improve the quality of fishing.

Objective 1.1

Monitor, assess, and protect aquatic populations and communities.

Objective 1.2

Provide diverse, high-quality angling opportunities.

Objective 1.3

Improve access to basin streams

GOAL IV

Improve the public's knowledge and appreciation of stream resources; recreational opportunities; and proper watershed, riparian corridor, and streambank management.

Objective 4.1

Educate the public on the value of healthy stream ecosystems and encourage advocacy on behalf of basin streams.

Objective 4.2

Educate the public about aquatic-related recreational opportunities in the basin.

REFERENCES

1. USDA, Natural Resources Conservation Service. National Resources Inventory Database, 1997. For more information: http://www.nrcs.usda.gov/technical/NRI/
2. Missouri Resource Assessment Partnership (MoRAP). Missouri Land Cover Mapping Project, 2005. Available for download at http://www.msdis.missouri.edu/datasearch/ThemeList.jsp For more information: http://www.cerc.usgs.gov/morap/
3. Missouri Resource Assessment Partnership (MoRAP). Missouri Public Lands, 2003.
4. Census of Agriculture Missouri: Released June 3, 2004, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, U.S. Department of Agriculture, 2002.
5. U.S. Census Bureau, Census of Population and Housing. Demographic Profile, 2000. *Factor = number of farms in the county multiplied by the percentage of the county's population below the poverty level and then divided by 1,000.*
6. USDA-Forest Service. National Forest Inventory and Analysis Database, 2005. Available at http://www.fia.fs.fed.us/tools-data/data/default.asp
7. U.S. Environmental Protection Agency (2002). National Water Quality Inventory: 2000 Report to Congress. EPA841-R-02-001. Office of Water, August.
8. USDA-Natural Resources Conservation Service. Common Resource Area (CRA) Map. For more information: http://efotg.nrcs.usda.gov/treemenuFS.aspx select Section I; D. Maps; Common Resource Areas.
9. USDA-Natural Resources Conservation Service. Soil Survey Geographic Database (SSURGO), 2007. Available for download at: http://soildatamart.nrcs.usda.gov/
10. Missouri Department of Natural Resources. Missouri 303(d) List, 2002. For more information: http://www.dnr.mo.gov/env/wpp/waterquality/303d/index.html
11. USDA-Natural Resources Conservation Service. Performance Results System (PRS), 2004—2006 reports. For more information: http:/ias.sc.egov.usda.gov , reports tab.
12. Missouri Department of Natural Resources, Division of Environmental Quality, Wellhead Protection Section. Certified Wells, 2006.
13. Missouri Department of Natural Resources, Air and Land Protection Division, Hazardous Waster Program, Tanks Section. Active Tanks, 2004.
14. Missouri Department of Natural Resources, Air and Land Protection Division, Hazardous Waste Program, Tanks Section. Remediation Sites, 2004.
15. Missouri Department of Natural Resources, Air and Land Protection Division, Hazardous Waste Program, Permits Section. Hazardous Waste Program Permits, 2004.
16. Missouri Department of Natural Resources, Water Protection Program, Public Drinking Water Branch in conjunction with the Center for Agricultural, Resource and Environmental Systems-University of Missouri, Columbia. Source Water Inventory Project, 2007. For more information: http://drinkingwater.missouri.edu/swip/
17. Missouri Department of Natural Resources, Division of Geology and Land Survey. State Known Spring Locations database 2006. State Losing Streams database 2006. State Sinkhole database 2006. State Sinkhole Database 2006. State Geologic Formations database, 2006.
18. Missouri Department of Conservation, Heritage Database, 2005.
19. U. S. Fish and Wildlife Service. National Wetland Inventory, 1994.
20. U.S. Census Bureau, Census of Population and Housing. Demographic Profile, 2000.
21. Missouri Department of Natural Resources, Division of Environmental Quality. Water Protection Program. Water Pollution Control Branch. 2007.
22. Missouri Department of Natural Resources. Soil and Water Conservation Program. 2007.
23. USDA-Natural Resources Conservation Service. Conservation Reserve Program Database. 2006.
24. U. S. Geological Survey. National Hydrography Dataset (NHD) high resolution (1:24,000-scale) geodatabase. For more information and to download: http://nhd.usgs.gov/data.html
25. U. S. Department of Agriculture, Farm Services Agency. Common Land Units (CLU), 2007. (sensitive data—not available for download).
26. USDA. Natural Resources Conservation Service. Missouri NRCS State Office. PL-566 projects. 2006. For more information: http://www.nrcs.usda.gov/programs/watershed/index.html
27. Unknown.
28. Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. For more information: http://soils.usda.gov/technical/manual/