

APPENDIX T

CARES WATERSHED EVALUATION AND COMPARISON PROFILES FOR VARIOUS WATERSHEDS



Watershed Profile

Report Prepared on 5/6/2013

[General Information »](#)

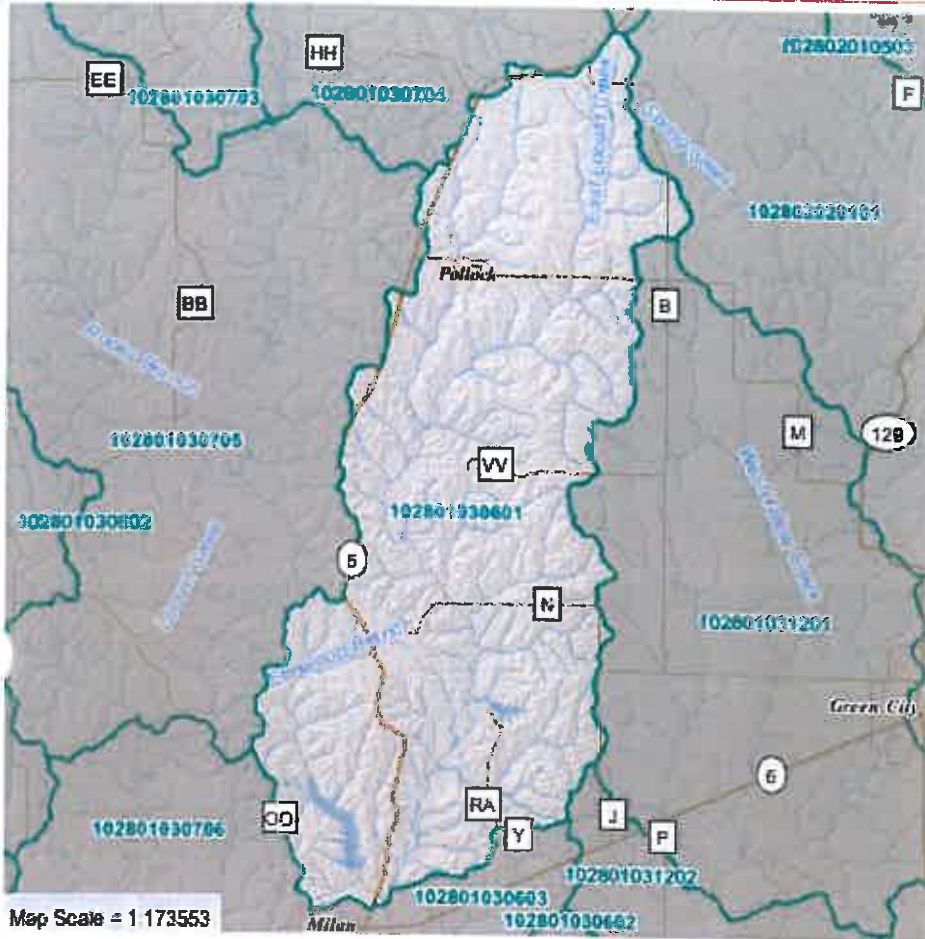
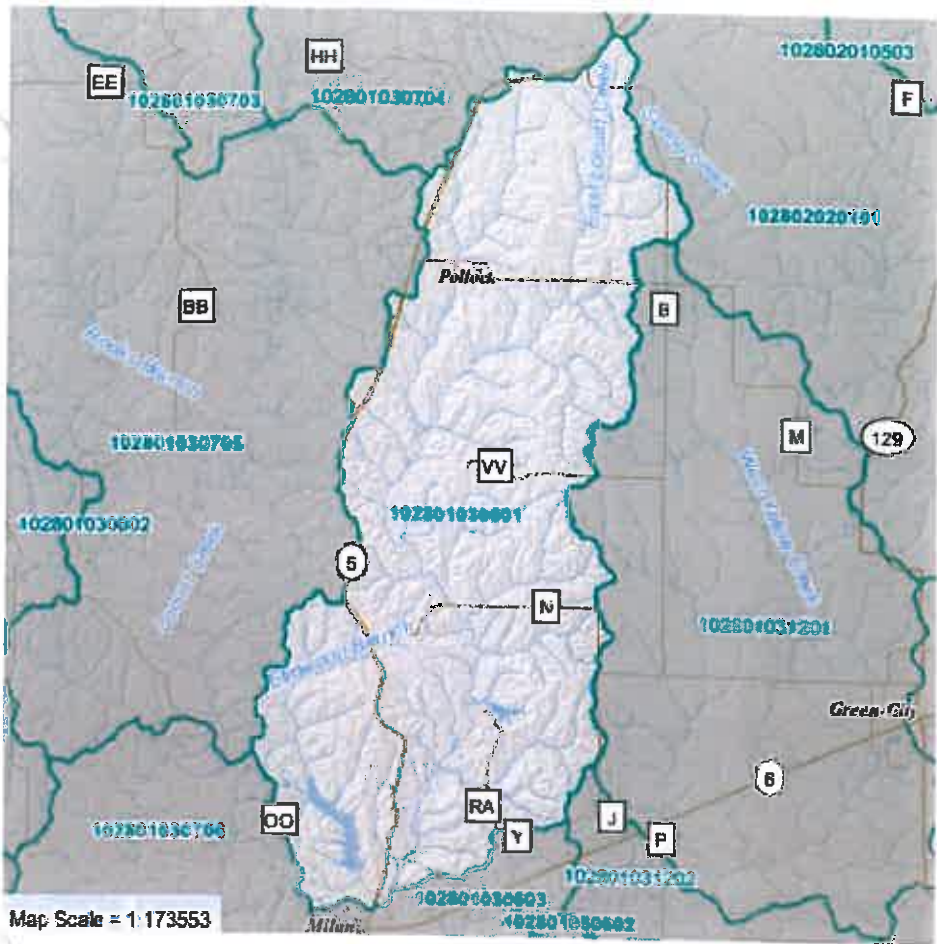


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Watershed Selection

Headwaters East Locust Creek (102801030601)

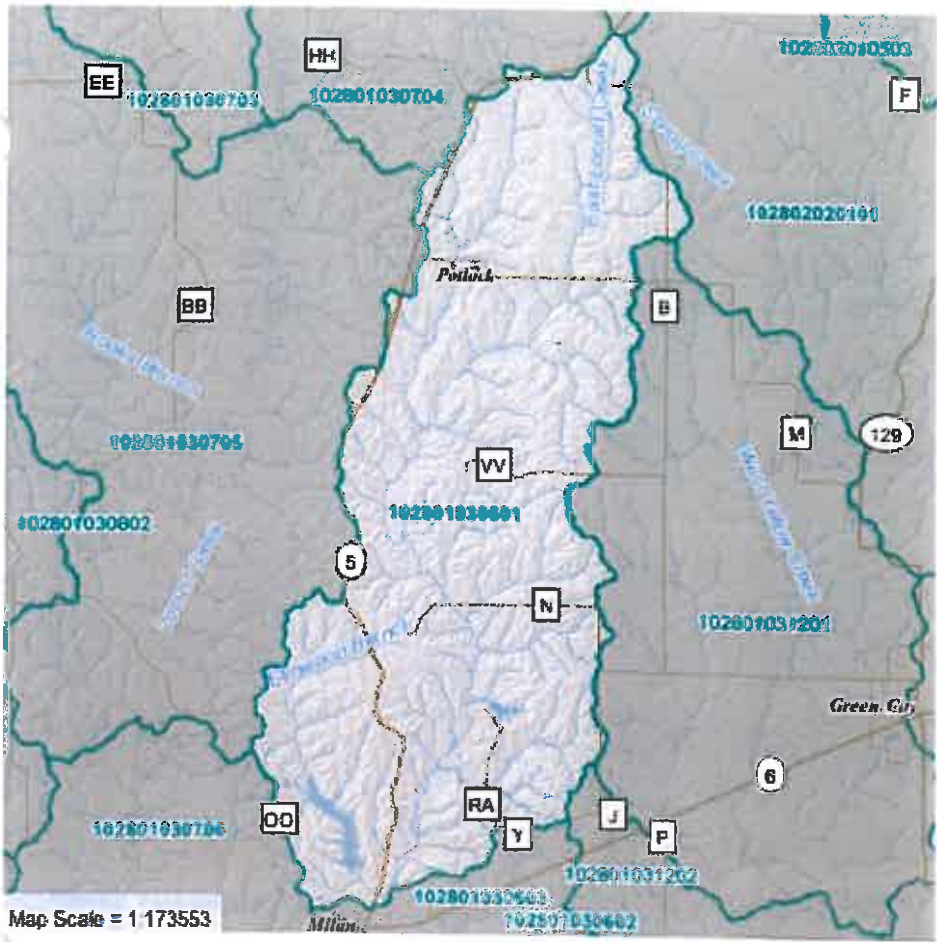


General Information

- 12-Digit HU Boundaries
- HU Boundaries

Headwaters East Locust Creek (102801030601)

Acres	Population, 2010	Density, 2010
31,585	486 persons	9.86 persons/sq mile



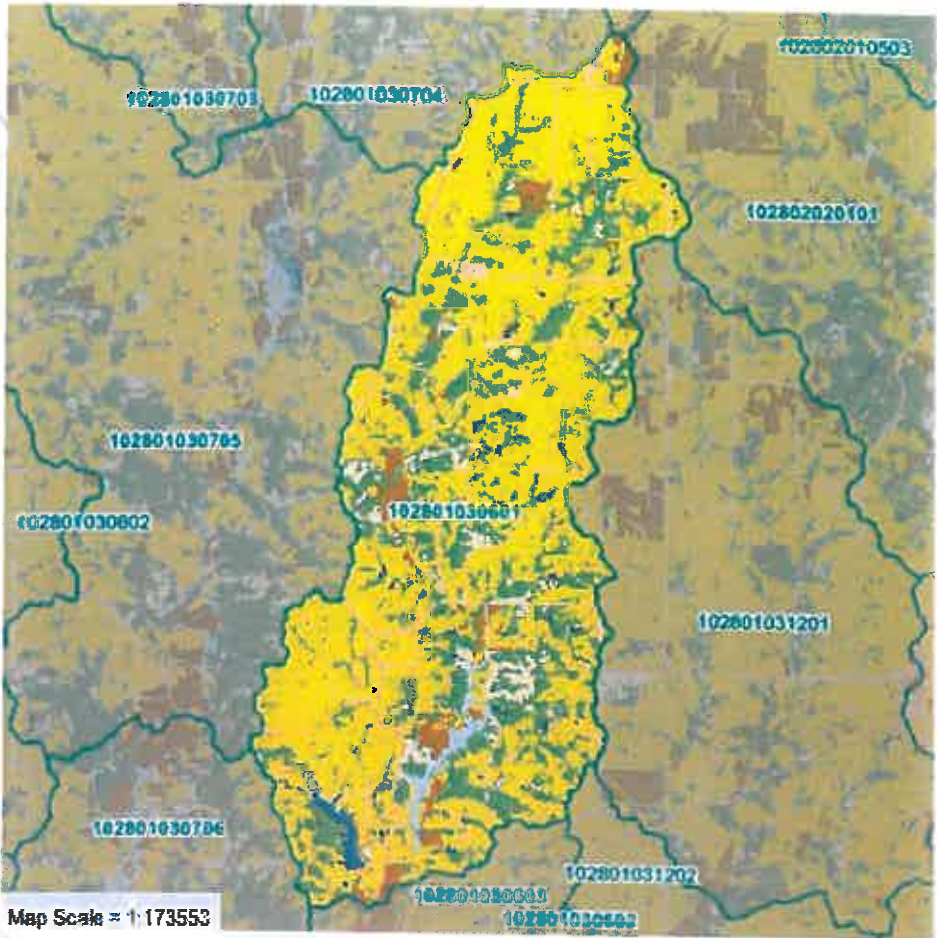
Streams

- ▬ Major Streams
- ▬ Streams and Creeks

Headwaters East Locust Creek (102801030601)

Stream Type	Perennial	Intermittent	Canal/Ditch	Other	Total
Miles	120.6	0.0	0.0	4.6	125.2
Percent	96.33%	0.00%	0.00%	3.67%	100.00%

Top Streams (Miles): East Locust Creek (19.59), Elmwood Branch (7.92). » [list all streams](#)



Land Use/Land Cover

- Developed, High Intensity
- Developed, Medium Intensity
- Developed, Low Intensity
- Developed, Open Space
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Herbaceous Wetlands
- Open Water

Headwaters East Locust Creek (102801030601)

	Cropland	Grassland	Forest	Wetland	Developed	Water
Acres	1,109	20,018	8,165	896	1,346	483
Percent	3.51%	63.37%	25.85%	2.84%	4.26%	1.53%

Source: U.S. Geological Survey National Land Cover Database, 2006.

Note: This table shows grouped land cover types. For a detailed listing, [click here](#).

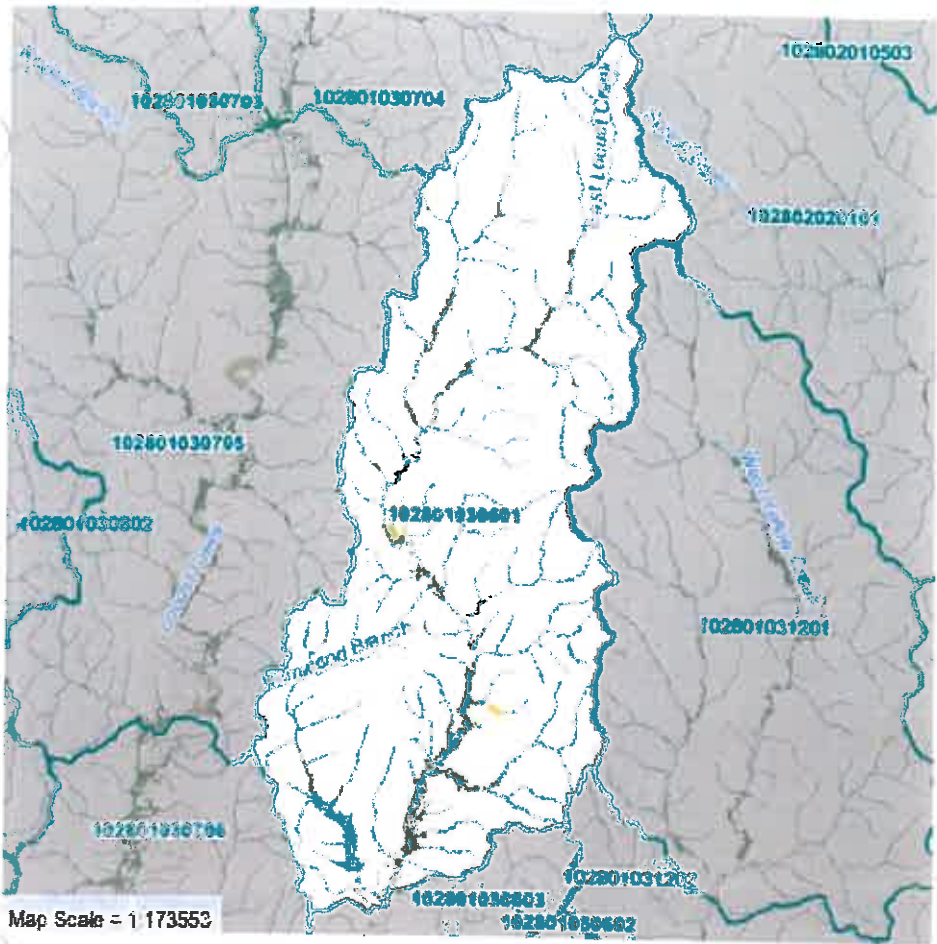


Public Lands

- Missouri Department of Natural Resources
- Missouri Department of Conservation
- U.S. Army Corps of Engineers
- U.S. Forest Service
- U.S. Fish & Wildlife Service
- National Park Service

Headwaters East Locust Creek (102801030601)

Public Lands (largest 5) List all	Acres	% of HU
Total	86.64	0.27%
SEARS COMMUNITY LAKE	86.64	0.27%
MILAN (ELMWOOD LAKE)	0.00	0.00%



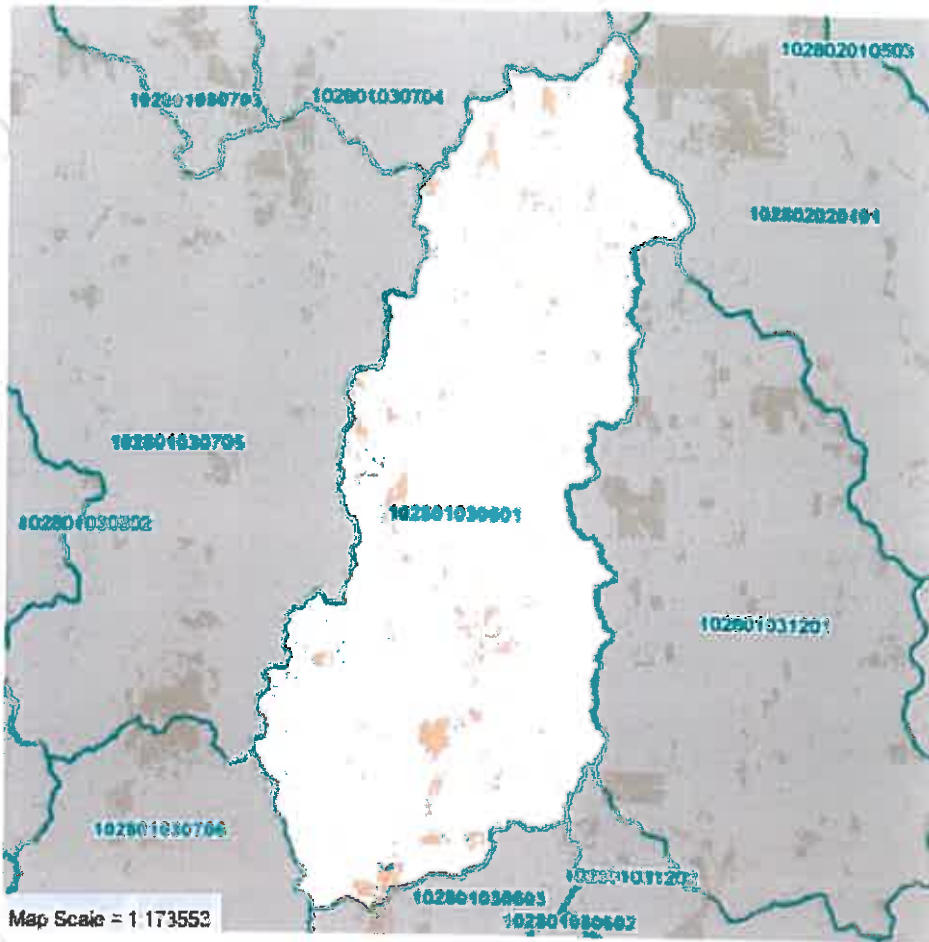
Wetlands

Wetlands shown at 1:900,000 or closer

- Inland Aquatic Bed
- Inland Forested Wetland
- Inland Herbaceous Wetland
- Inland Shrub Swamp
- Lower Perennial River
- Upper Perennial River
- Intermittent River
- Lake (Shallow)
- Lake (Deep)
- Pond
- Pond (Drawdown)
- Other Vegetated Wetland

Headwaters East Locust Creek (102801030601)

	Lacustrine	Palustrine	Riverine	Total
Acres	183	1,009	1	1,193
Percent	15.35%	84.60%	0.05%	100.00%

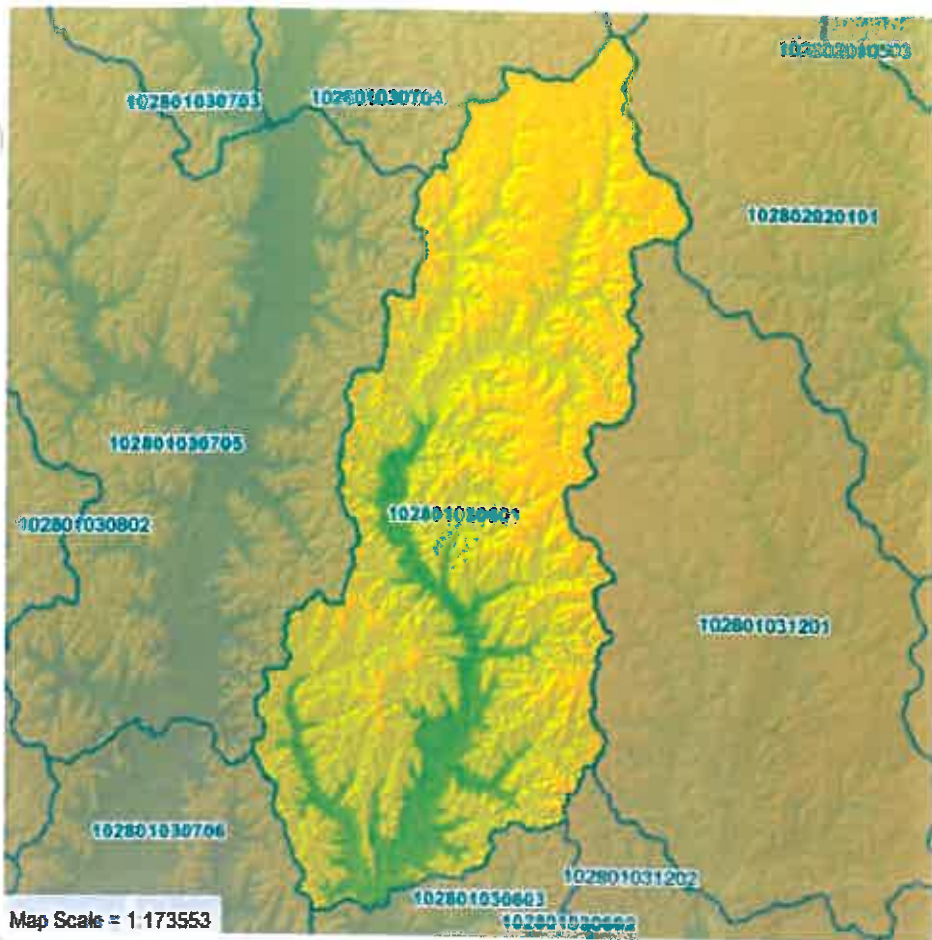


Crop Acres by Crop Type

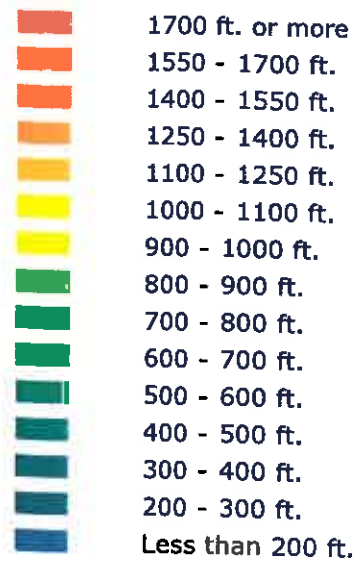
 Crop Land Areas

Note: Crop acre figures are averaged for the period 2000-2004 and may have been grown in any of the areas depicted on the map.

Headwaters East Locust Creek (102801030601)

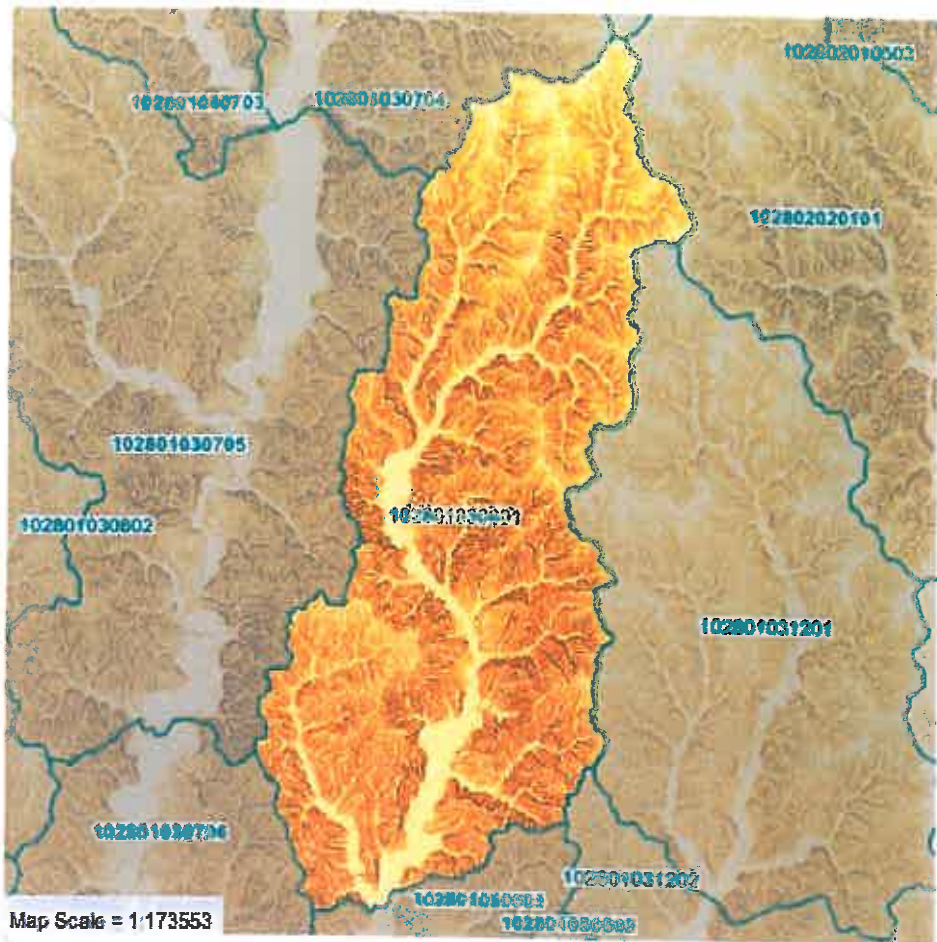


Elevation



Headwaters East Locust Creek (102801030601)

Minimum Elevation	Maximum Elevation	Mean Elevation	Elevation Difference
830 ft.	1,080 ft.	970 ft.	250 ft.

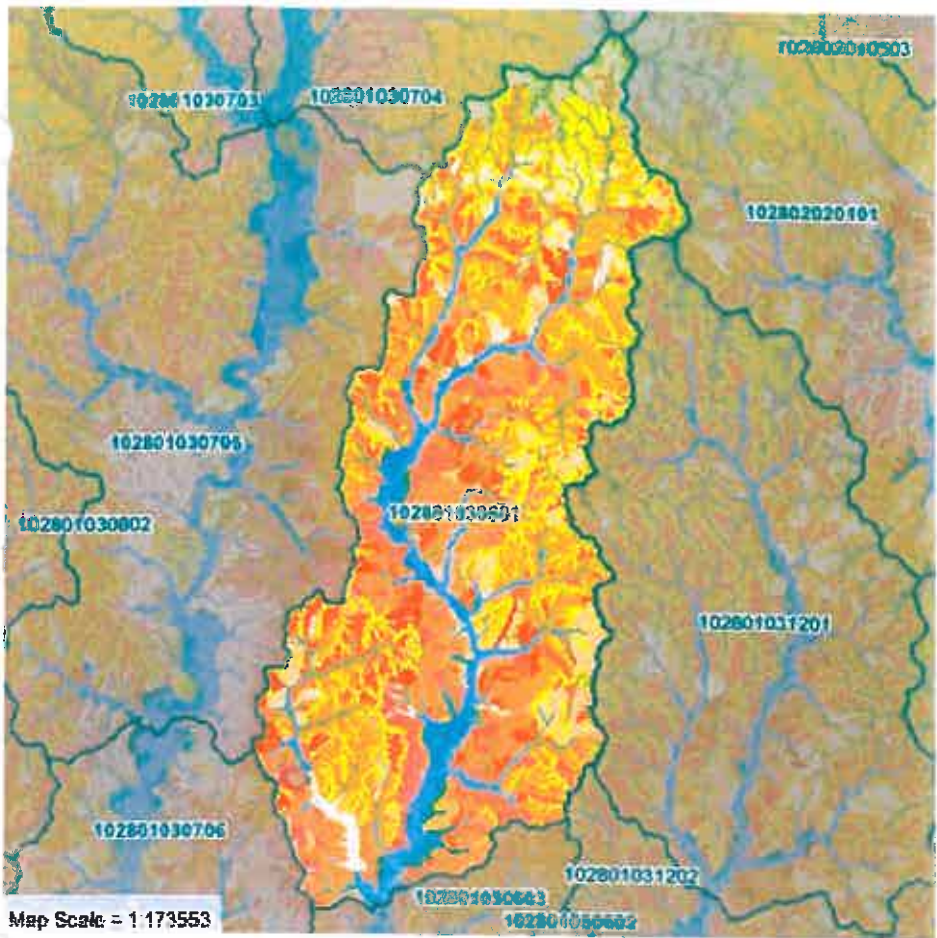


Land Slope

- 0 to 3 Percent
- 3 to 6 Percent
- 6 to 10 Percent
- 10 to 15 Percent
- 15 Percent or Greater

Headwaters East Locust Creek (102801030601)

Slope Range:	0-3%	3-6%	6-10%	10-15%	> 15%	Total
Acres	4,013	6,309	10,538	8,501	2,197	31,558
Percent	12.72%	19.99%	33.39%	26.94%	6.96%	



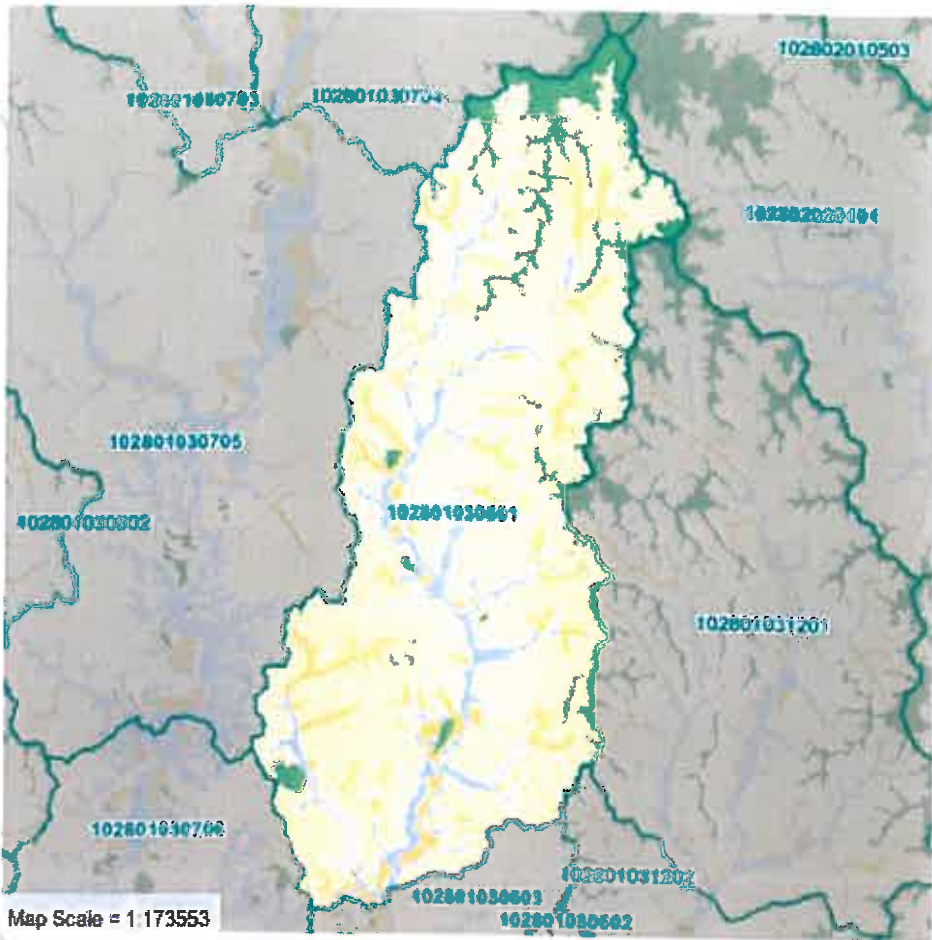
Soils

- Armstrong clay loam, 5 to 9 percent slopes, eroded
- Lagonda silty clay loam, 5 to 9 percent slopes, eroded
- Gara clay loam, 9 to 14 percent slopes, eroded
- Pershing silty clay loam, 2 to 5 percent slopes, eroded
- Armstrong loam, 2 to 5 percent slopes
- Armstrong loam, 2 to 5 percent slopes, eroded
- Vesser silt loam, 0 to 2 percent slopes, occasionally flooded
- Tice silt loam, 0 to 2 percent slopes, frequently flooded
- Lagonda silty clay loam, 2 to 5 percent slopes, eroded
- Purdin loam, 9 to 14 percent slopes, eroded

Headwaters East Locust Creek (102801030601)

Map Unit Name (top 5)	Acres	Percent
Armstrong clay loam, 5 to 9 percent slopes, eroded	4,647	14.71%
Gara clay loam, 14 to 20 percent slopes, eroded	4,588	14.53%
Winnegan loam, 14 to 20 percent slopes, eroded	3,264	10.33%
Gara clay loam, 9 to 14 percent slopes, eroded	2,644	8.37%
Landes loam, 0 to 2 percent slopes, frequently flooded	2,077	6.58%

For a complete listing of soils and map keys, [click here](#).

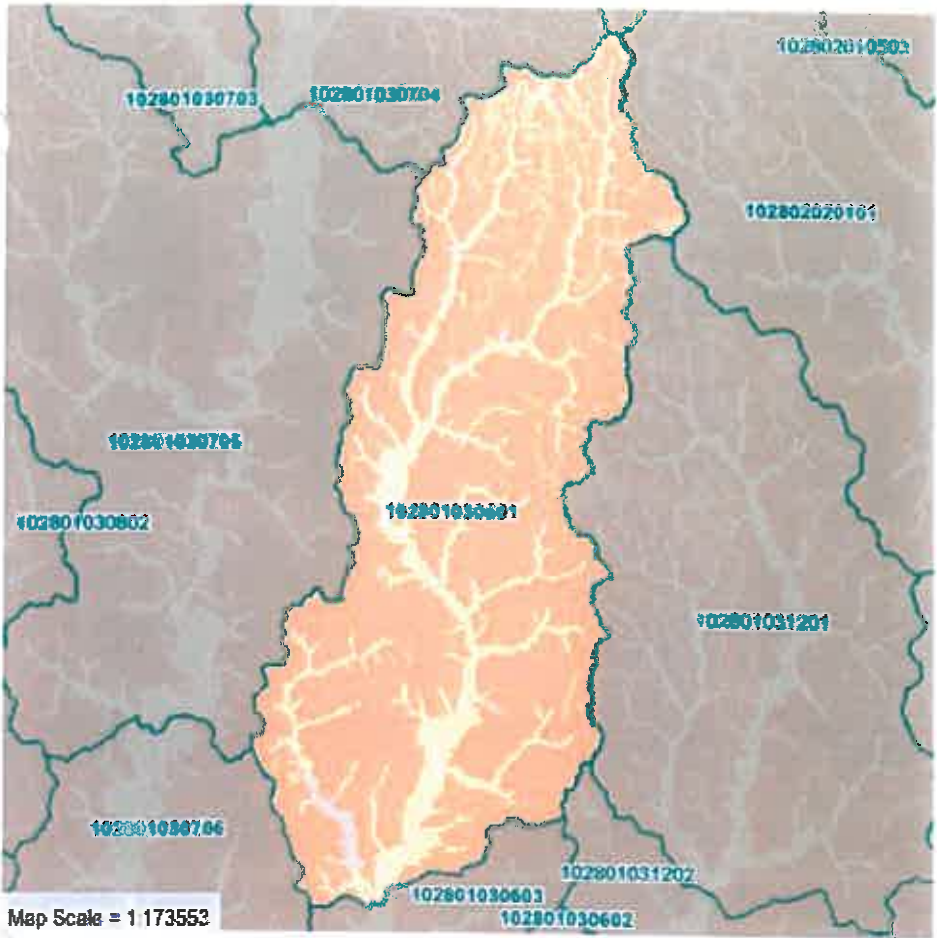


Hydrologic Soil Groups

- A: High Infiltration Rate
- B: Moderate Infiltration Rate
- B/D: Combination of Group B and D
- C: Slow Infiltration Rate
- C/D: Combination of Group C and D
- D: Very Slow Infiltration Rate
- Not Rated

Headwaters East Locust Creek (102801030601)

Group Type	A	B	B/D	C	C/D	D	Not Rated
Acres	0	2,494	0	24,514	1,965	2,313	274
Percent	0.00%	7.90%	0.00%	77.67%	6.23%	7.33%	0.87%

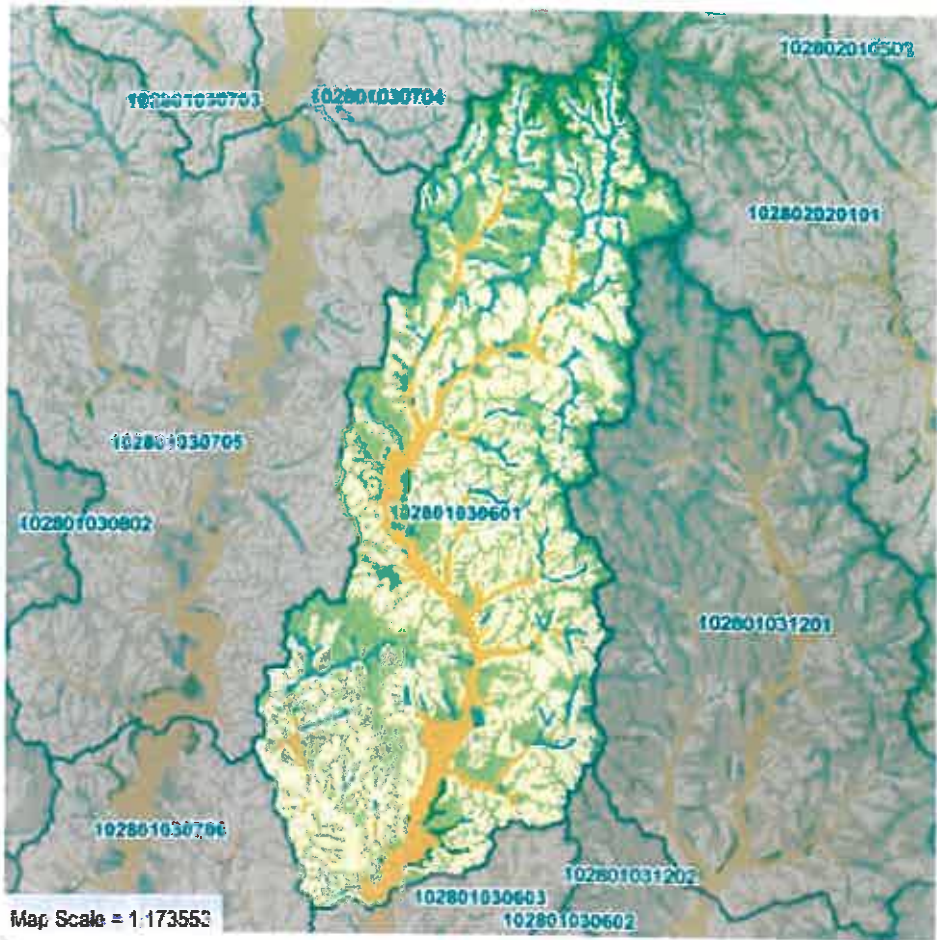


Highly Erodible Lands

- Highly Erodible Land
- Potentially Highly Erodible Land
- Not Highly Erodible Land
- Not Rated

Headwaters East Locust Creek (102801030601)

	Highly Erodible	Potentially Highly Erodible	Not Highly Erodible	Not Rated
Acres	0	0	0	31,560
Percent	0.00%	0.00%	0.00%	100.00%



Prime Farmland

- Prime Farmland
- Prime Farmland if Drained
- Prime Farmland with Limitations
- Farmland of Statewide Importance
- Not Prime Farmland

Headwaters East Locust Creek (102801030601)

	Prime Farmland	Prime Farmland if Drained	Prime Farmland with Limitations	Farmland of Statewide Importance	Not Prime Farmland
Acres	587	2,855	2,804	11,435	13,879
Percent	1.82%	8.87%	8.71%	35.53%	43.13%

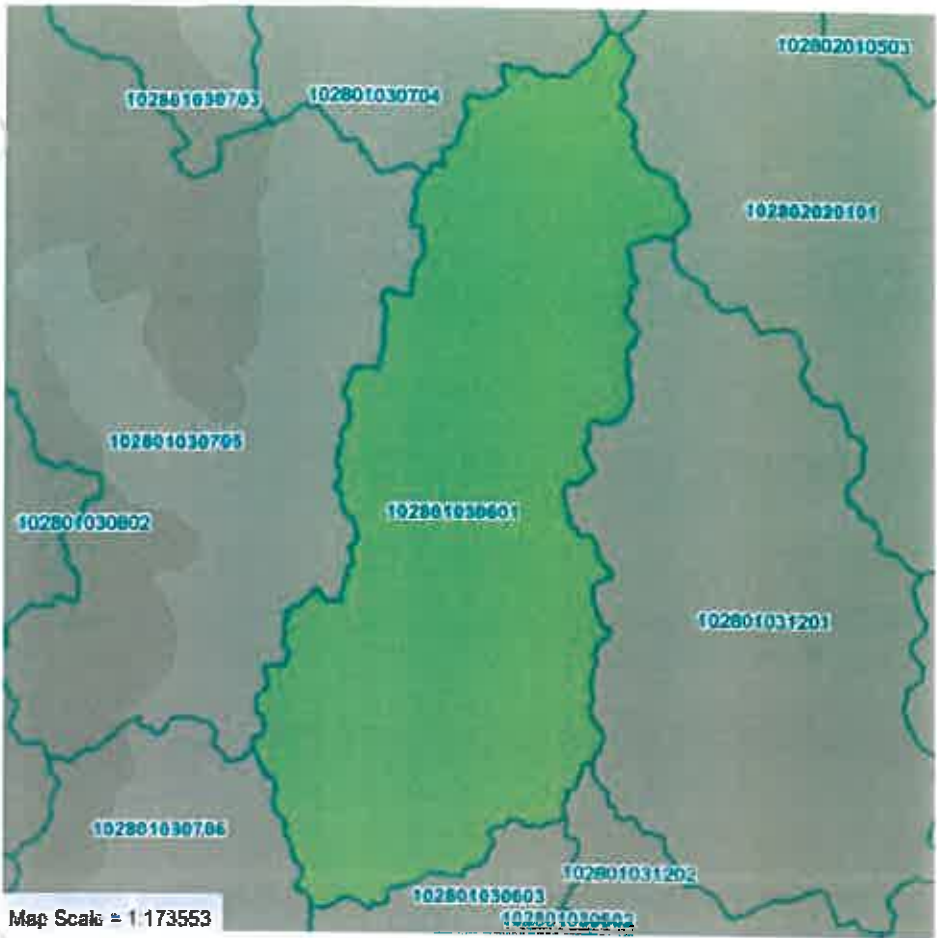


Major Land Resource Areas

109: Iowa and Missouri Heavy Till Plain

Headwaters East Locust Creek (102801030601)

Major Land Resource Area	Acres	Percent
<u>109</u>	31,560	99.92%

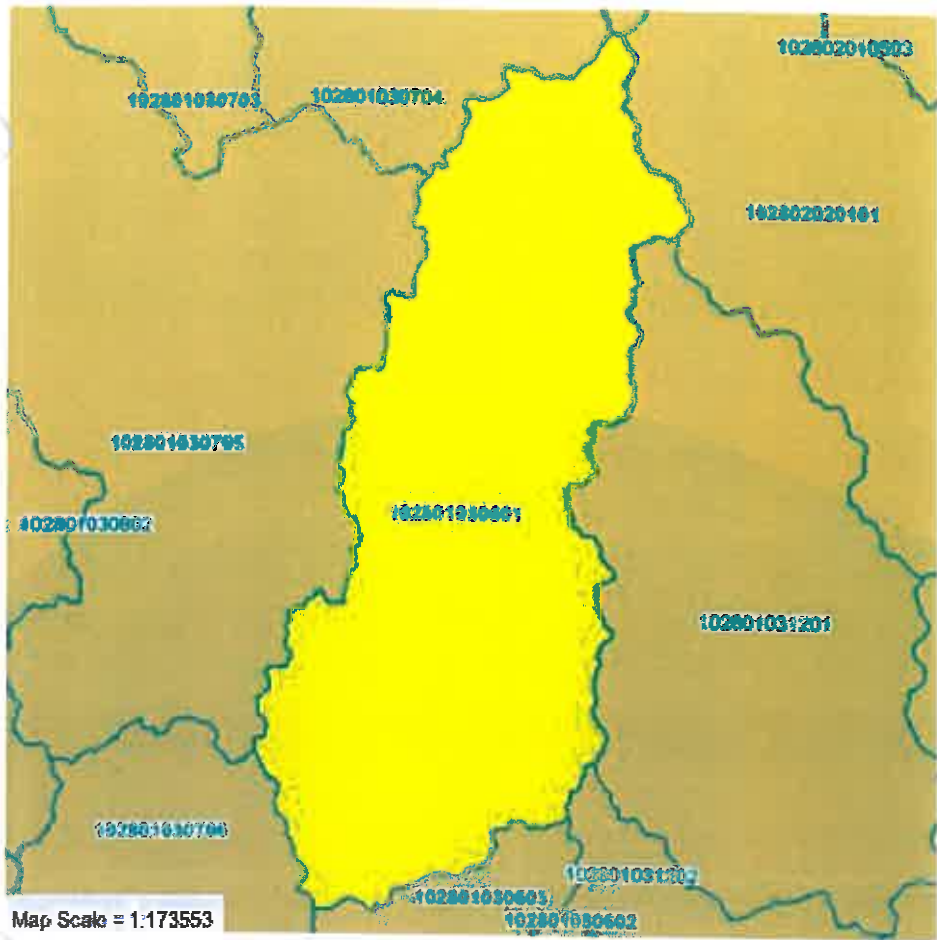


Common Resource Areas

109.2: Chariton River Hills

Headwaters East Locust Creek (102801030601)

Common Resource Area	Acres	Percent
<u>109.2</u>	31,560	99.92%

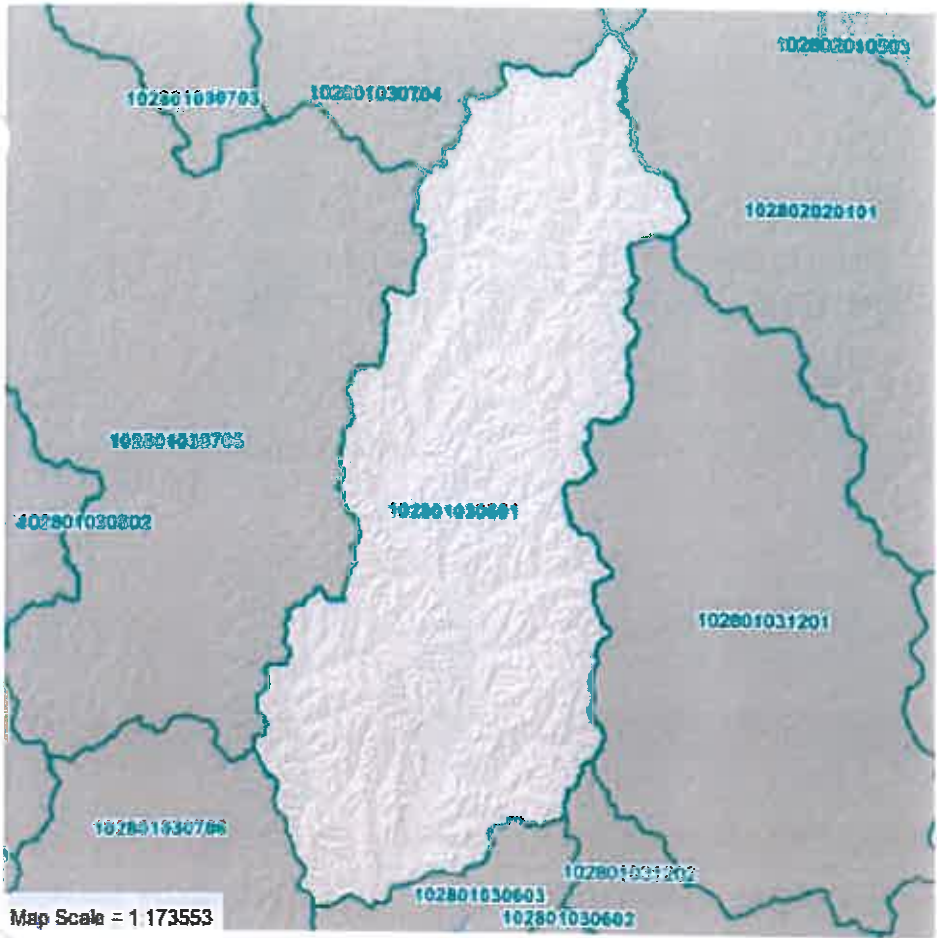


Precipitation (1971-2000)

- 37-38 inches
- 38-39 inches

Headwaters East Locust Creek (102801030601)

Minimum Annual (in.)	Maximum Annual (in.)	Average Annual (in.)
37.68	38.59	38.18

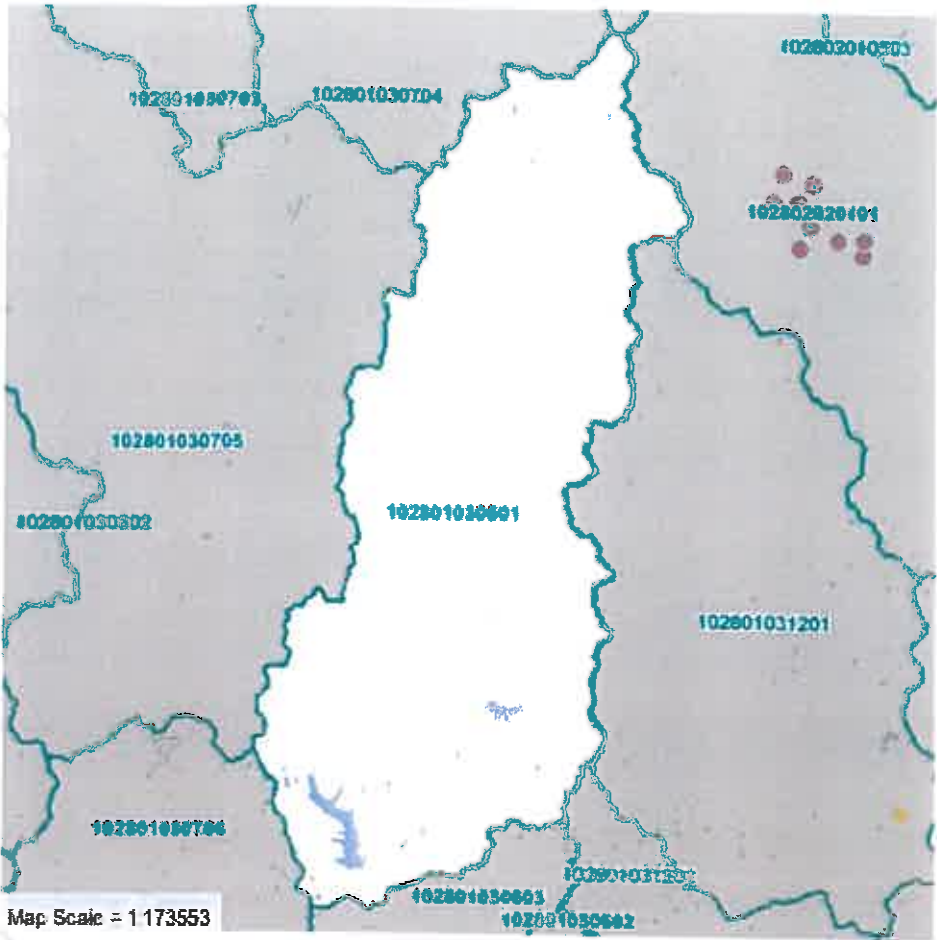


Karst Features

- Springs
- Sinkholes
- Sink Areas
- Gaining Stream
- Losing Stream

Headwaters East Locust Creek (102801030601)

	<u>Gaining Streams</u>	<u>Losing Streams</u>	Sinks	Springs
Number	0	0	0	0
Miles	0.00	0.00		



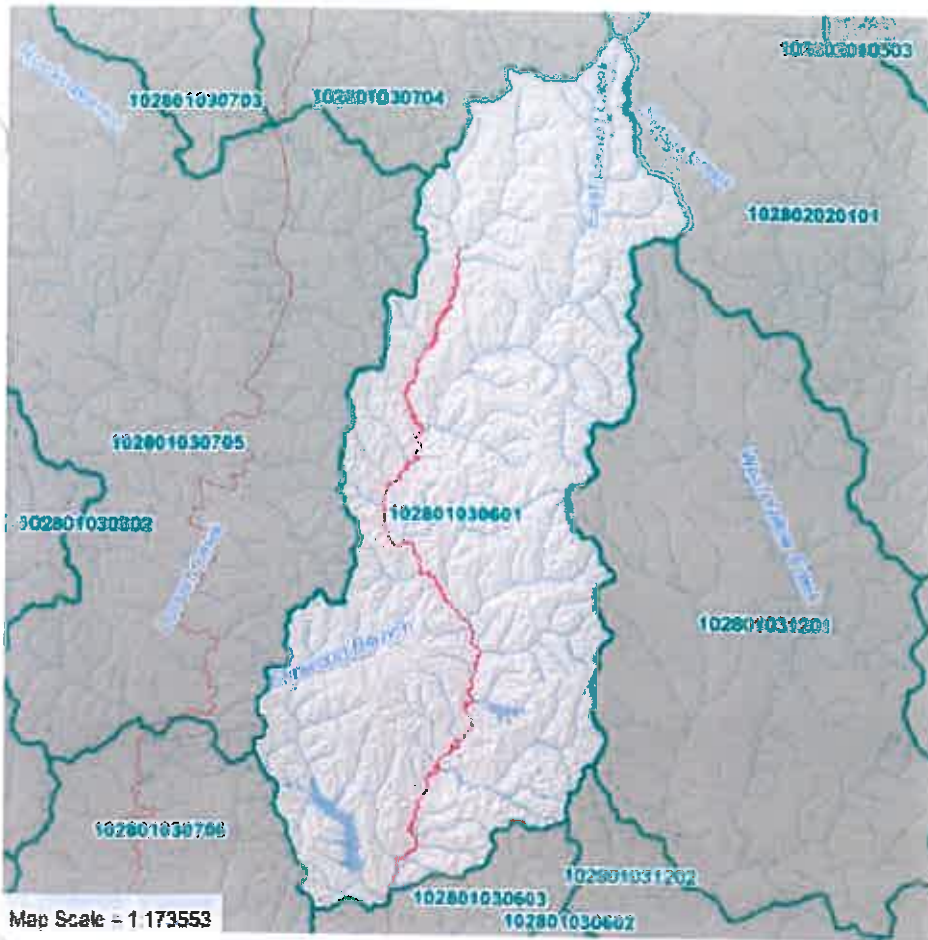
CAFOs

- IA - More than 7,000 Animal Units
- IB - 3,000 to 6,999 Animal Units
- IC - 1,000 to 2,999 Animal Units
- II - 300 to 999 Animal Units
- NP - AFO Non-Point Source

Note: Includes only MoDNR permitted Concentrated Animal Feeding Operations (CAFOs) and Animal Feeding Operations (AFOs).

Headwaters East Locust Creek (102801030601)

Facilities	Outfalls	Animal Units	Animal Type (Units)	Facility Class
0	0	0		



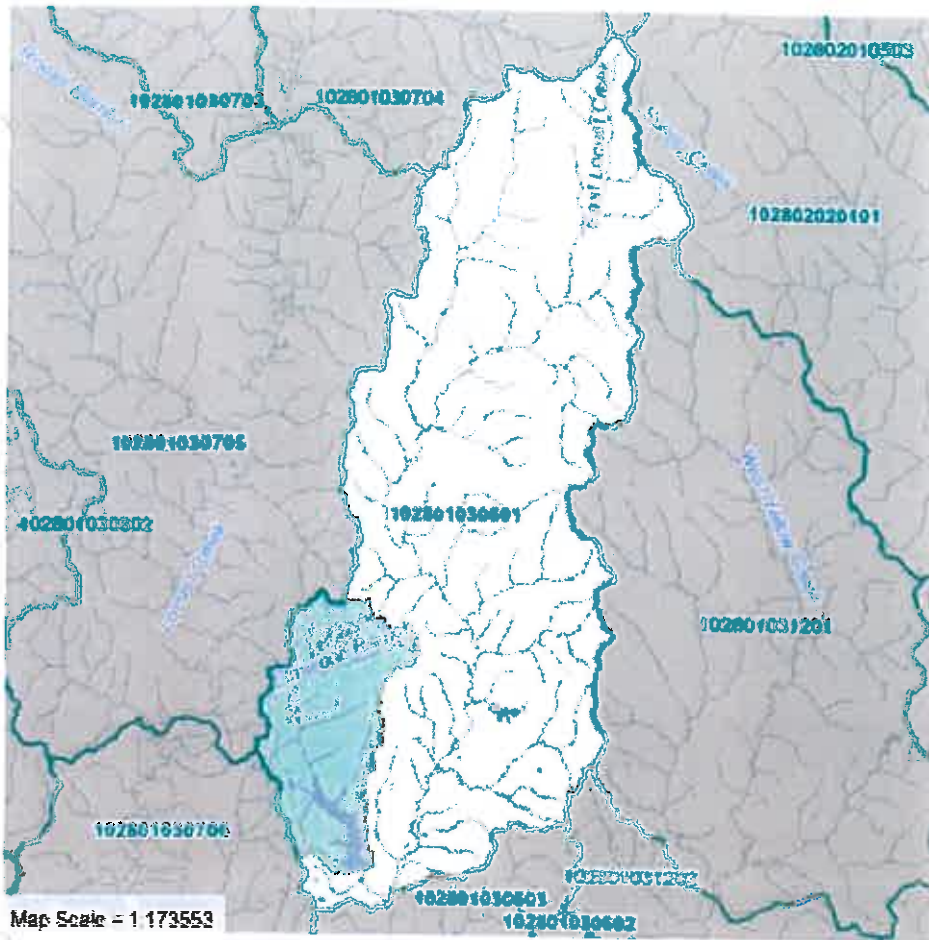
2008 303(d) Listed Lakes and Streams

— 303(d) List Lakes and
Streams

Headwaters East Locust Creek (102801030601)

Name	Size	Pollutants	Source	Uses Impaired	TMDL Date
East Fork Locust Creek	15.053 Mi	Bacteria	Rural NPS	Whole body contact recreation (swimming)	
East Fork Locust Creek	15.053 Mi	Bacteria	Point & NPS	Whole body contact recreation (swimming)	
East Fork Locust Creek	15.053 Mi	Low D.O.	Rural NPS	Whole body contact recreation (swimming)	

A total of 1 water bodies listed, with 2 unique pollutants. Click the TMDL date to access the TMDL Report. Notations next to pollutant in parenthesis indicate the medium affected: W=water, S=sediment, T=fish tissue.

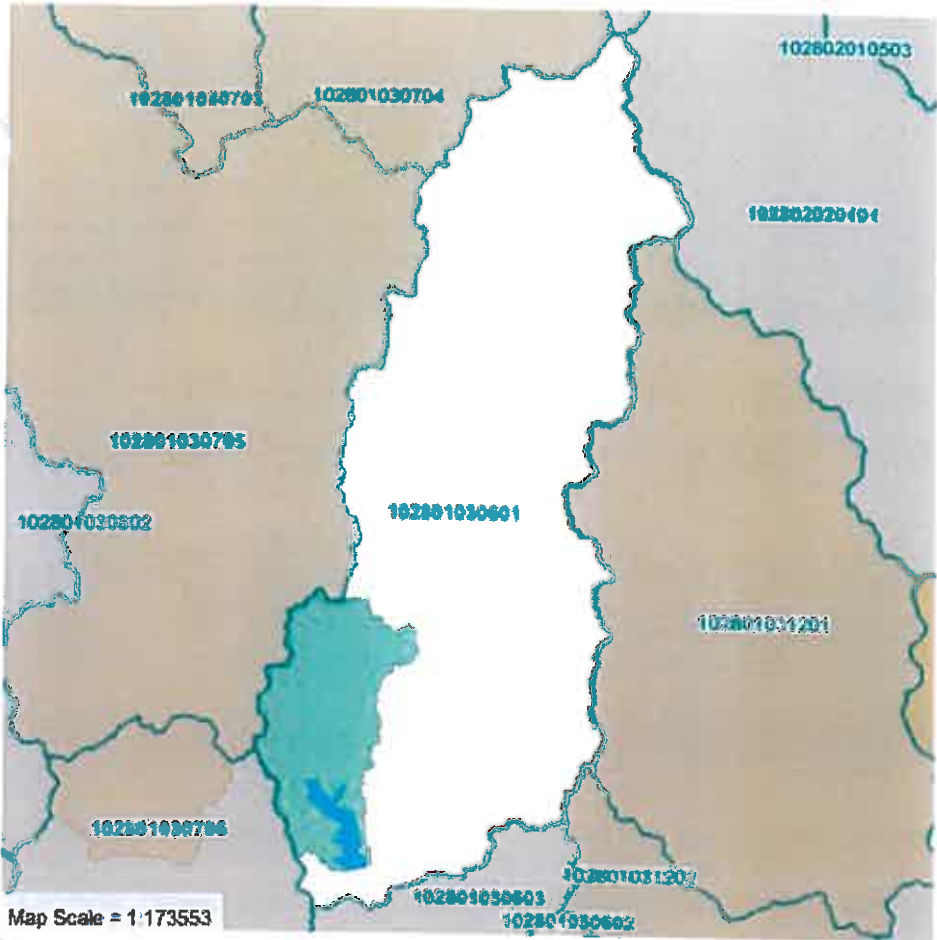


Protected Water

- Bioreference Water
- Outstanding National Resource Water Watershed
- Outstanding State Resource Water Watershed
- Public Drinking Water Watershed
- Source Water Protection Area (SWPA)

Headwaters East Locust Creek (102801030601)

Outstanding National Resource Waters	Outstanding State Resource Waters	Biological Reference Waters	Source Water Protection Areas	% of Watershed in SWPA
0	0	0	0	0.00%



Drinking Water Intakes

- River Drainage Basins
 - Lake Drainage Basin
 - Public Water Supply Lakes
- Public water intake locations not shown for security reasons.*

Headwaters East Locust Creek (102801030601)

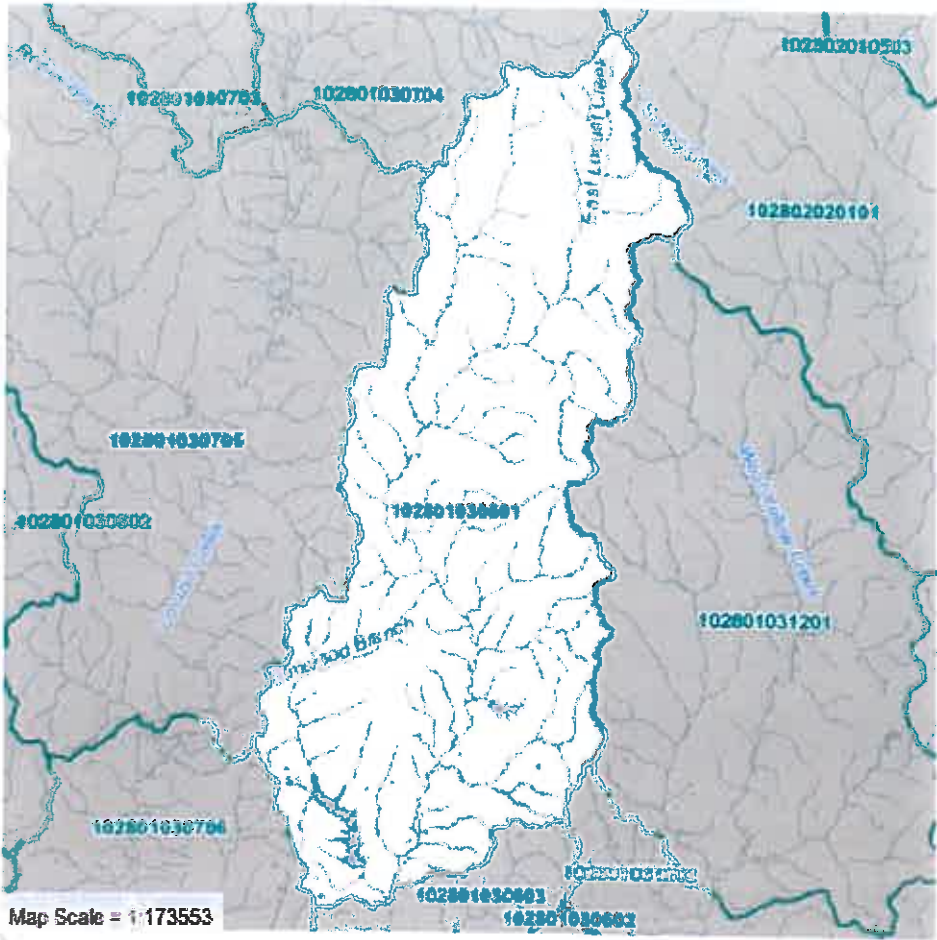


Drinking Water Wells

- Private Wells
- Public well locations not shown for security reasons.*

Headwaters East Locust Creek (102801030601)

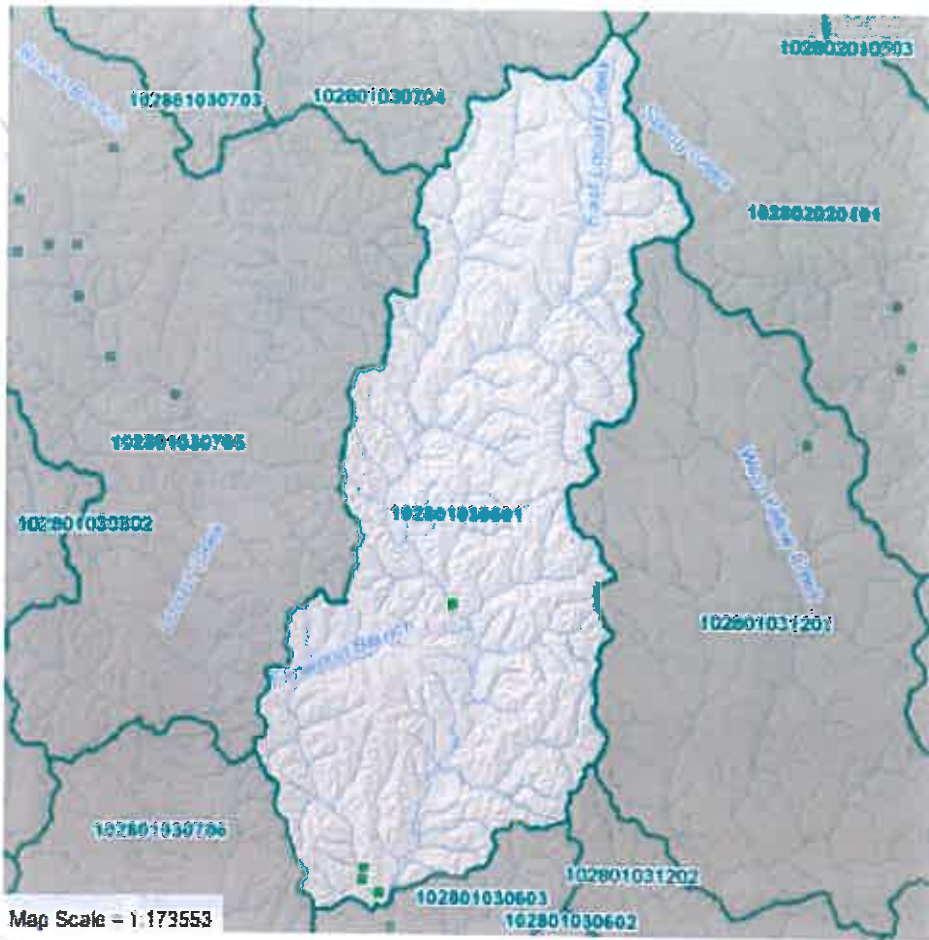
	Total	Private	Public (Active)	Community	Transient Noncommunity	Non-transient Noncommunity
Number of Wells	0	0	0	0	0	0



USGS NWIS Sites

- Stream Sites
- Groundwater Sites
- Other Sites

Headwaters East Locust Creek (102801030601)



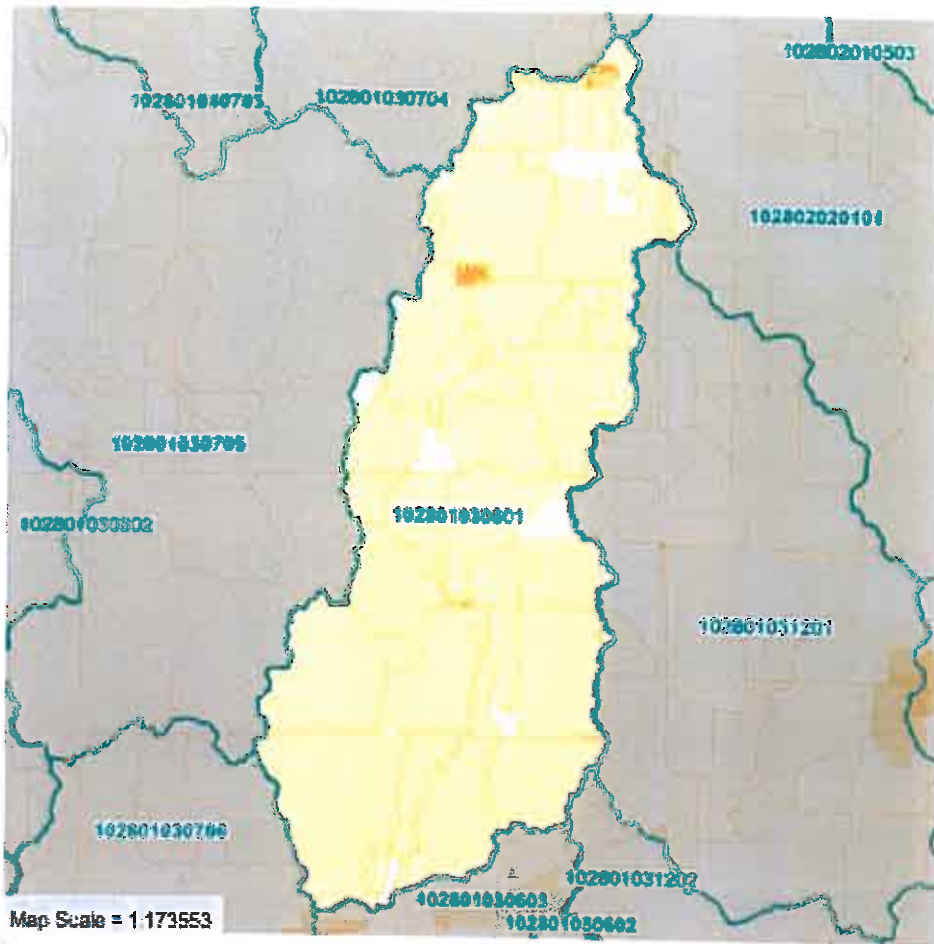
Local Initiatives

- Stream Team Monitoring Sites (not verified)
- Stream Team Monitoring Sites (verified)

Headwaters East Locust Creek (102801030601)

Stream Team Volunteer Water Quality Monitoring Sites (number verified):

6 (4)



Census Data

- 2,500 or More Persons Per Sq Mile
- 250 - 2,499.99 Persons Per Sq Mile
- 50 - 249.99 Persons Per Sq Mile
- Less than 50 Persons Per Sq Mile
- No population

Headwaters East Locust Creek (102801030601)

Total Population (2010):	486	
Persons/Sq Mile:	9.86	
Total Population (2000):	469	
Population Change, 2000 - 2010:	17	
Age 0-4:	36	7.41%
Age 5-17:	77	15.84%
Age 18-64:	285	58.64%
Age 65 and up:	88	18.11%

Data Sources

- 8, 10, and 12 Digit Hydrologic Units:** USDA Natural Resources Conservation Service Watershed Boundary Dataset, 2009.
- 303(d) Listed Lakes and Streams:** 2008 303(d) Listed Waters, Missouri Department of Natural Resources, 2009.
- Average Annual Precipitation:** PRISM (Parameter-elevation Regressions on Independent Slopes Model) dataset for 1971-2000, Oregon State University, 2006.
- Census Data:** 2010 Census Block Summary Data, U.S. Census Bureau, 2012.
- Cities and Towns:** 2008 U.S. Census Bureau Tiger Boundary File, 2009.
- Common Resource Areas:** USDA Natural Resources Conservation Service (NRCS), 2009.
- Confined Animal Feeding Operations (CAFOs):** Missouri Department of Natural Resources, NPDES, 2009.
- County Boundaries:** 2008 U.S. Census Bureau Tiger Boundary File, 2009.
- Crop Acres by Crop Type:** NASS County crop estimates, average acres 2000-2004.
- Highly Erodible Lands:** USDA Natural Resources Conservation Service, SSURGO data (NASIS attributes), 2006.
- Highways and Roads:** Missouri Department of Transportation (MoDOT), 2009.
- Hydrologic Soil Groups:** USDA Natural Resources Conservation Service, SSURGO data (NASIS attributes), 2009.
- Land Slope:** 30-Meter National Elevation Dataset, USGS, 2009.
- Land Use/Land Cover:** National Land Cover Database 2006, USGS, Multi-Resolution Land Characteristics Consortium, 2011.
- Losing/Gaining Streams:** Missouri Department of Natural Resources, DGLS, 2006.
- Major Land Resource Areas:** USDA Natural Resources Conservation Service (NRCS), 2009.
- National Wetland Inventory:** U.S. Fish and Wildlife Service, 2009.
- Outstanding National Resource Waters:** Missouri Department of Natural Resources, 2005 Outstanding National Resource Waters, 2007.
- Outstanding State Resource Waters:** Missouri Department of Natural Resources, 2005 Outstanding State Resource Waters, 2007.
- Prime Farmland:** USDA Natural Resources Conservation Service, SSURGO data (NASIS attributes), 2009.
- Private Wells:** Missouri Department of Natural Resources, Certified Wells (private only) and Well Logs (drinking water only), 2006.
- Public Drinking Water Watersheds:** Missouri Department of Natural Resources, 2003 (CARES update 2007).
- Public Drinking Water Wells:** Missouri Department of Natural Resources, 2009. MoDNR 2007 Census of Missouri Public Water Systems.
- Public Lands:** Missouri Department of Natural Resources, 2009, Missouri Department of Conservation, 2008, U.S. Forest Service, 2005, U.S. Fish and Wildlife Service, 2009, MoRAP (for NPS & USACOE lands), 2000.
- Relief Map:** 30-Meter National Elevation Dataset, USGS, 2009.

Sinkholes: Missouri Department of Natural Resources, 2006.

Source Water Areas: Missouri Department of Natural Resources, 2009.

Springs: Missouri Department of Natural Resources, 2006.

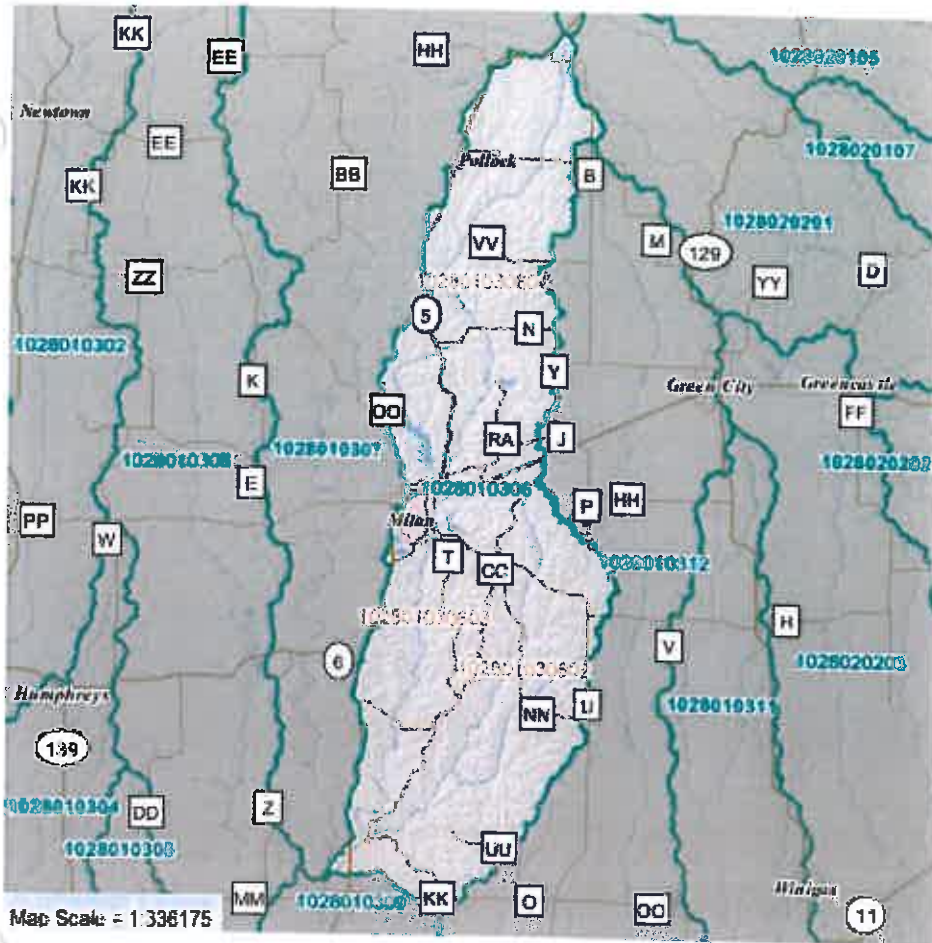
Streams and Lakes: U.S. Geological Survey National Hydrologic Dataset, High Resolution, 2009.

Stream Teams: Missouri Department Natural Resources, 2009.

USGS NWIS Sites: USGS National Water Information System (NWIS), 2007.



This project was partially funded by the US EPA, Region 7, through the Missouri Department of Natural Resources (subgrant #G06-NPS-11), under Section 319 of the Clean Water Act.

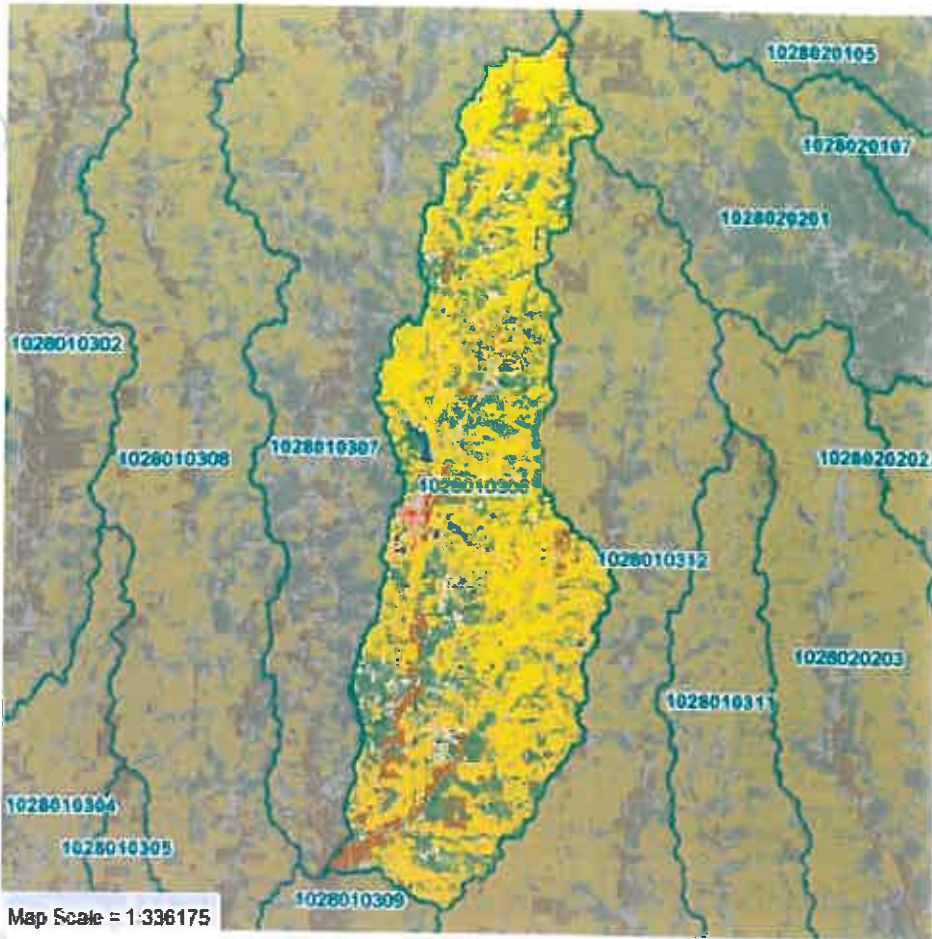


General Information

- 10-Digit HU Boundaries
- 12-Digit HU Boundaries

East Locust Creek (1028010306)

Acres	Population, 2010	Density, 2010	12-Digit HUs
79,554	3,040 persons	24.48 persons/sq mile	East Locust Creek (102801030603) Headwaters East Locust Creek (102801030601) Little East Locust Creek (102801030602)



Land Use/Land Cover

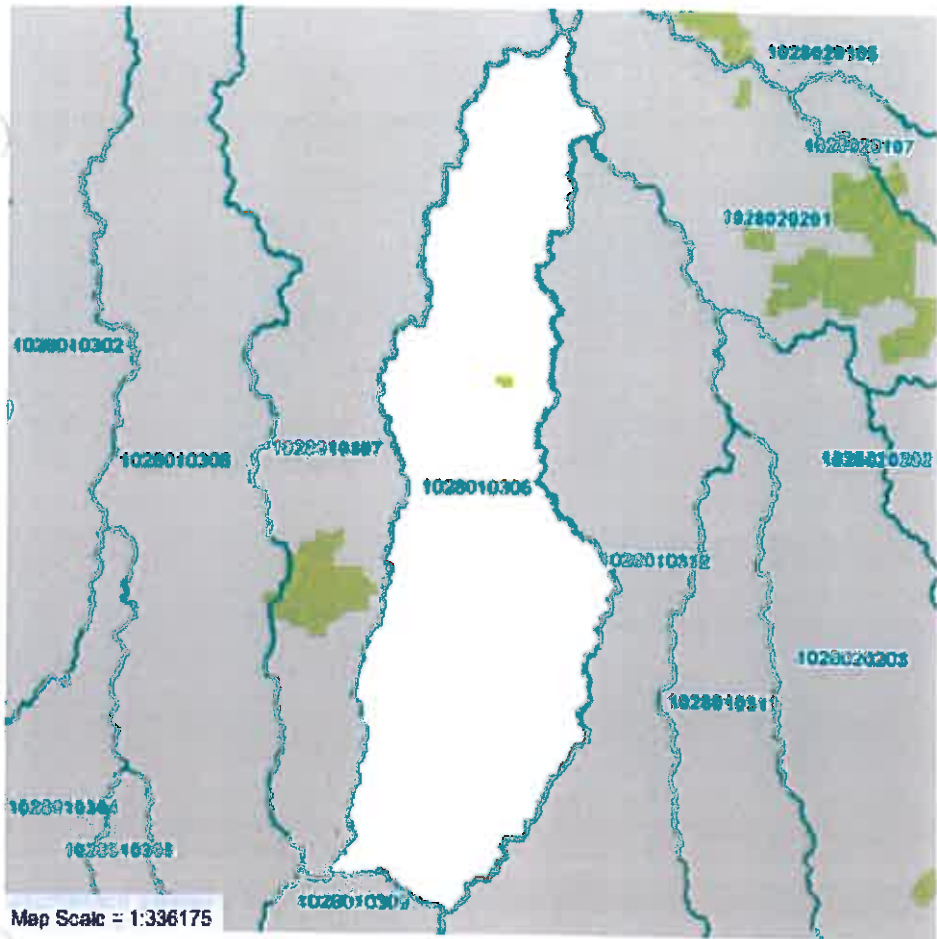
- Developed, High Intensity
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- Developed, Open Space
- Barren Land
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- Mixed Forest
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- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Herbaceous Wetlands
- Open Water

East Locust Creek (1028010306)

	Cropland	Grassland	Forest	Wetland	Developed	Water
Acres	4,493	48,302	20,847	1,057	3,871	987
Percent	5.65%	60.71%	26.20%	1.33%	4.87%	1.24%

Source: U.S. Geological Survey National Land Cover Database, 2006.

Note: This table shows grouped land cover types. For a detailed listing, [click here](#).

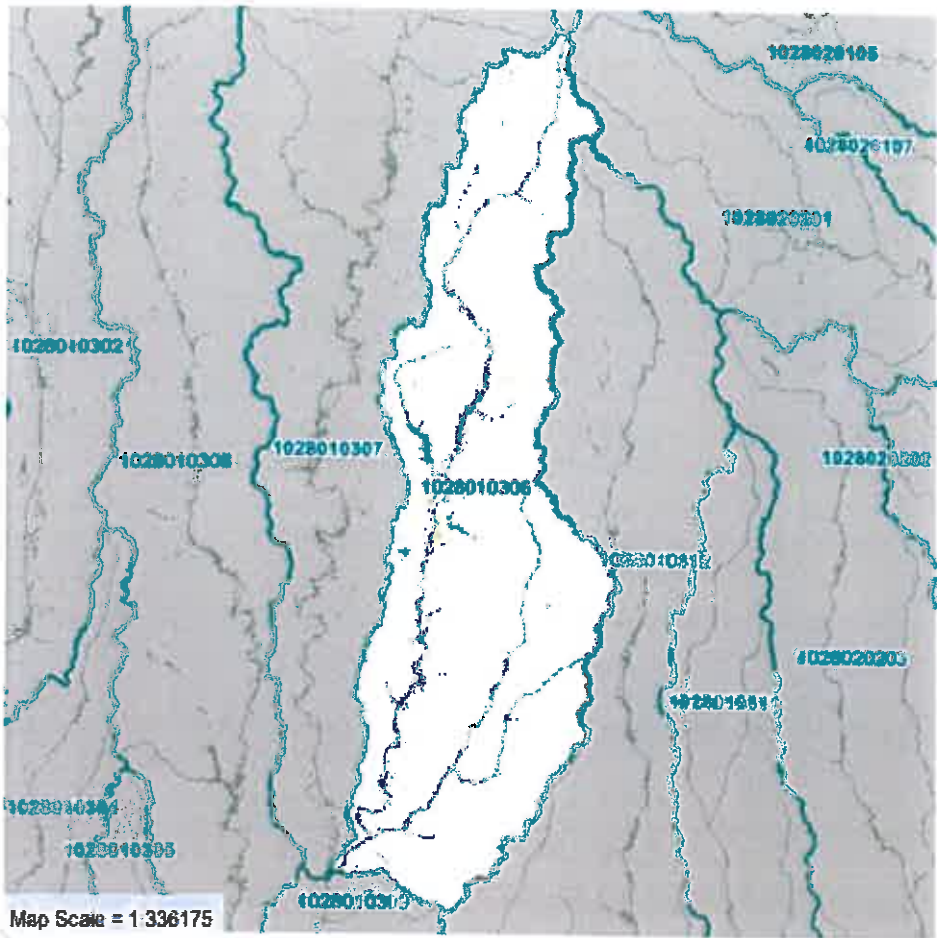


Public Lands

- Missouri Department of Natural Resources
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- U.S. Fish & Wildlife Service
- National Park Service

East Locust Creek (1028010306)

Public Lands (largest 5) > list all	Acres	% of HU
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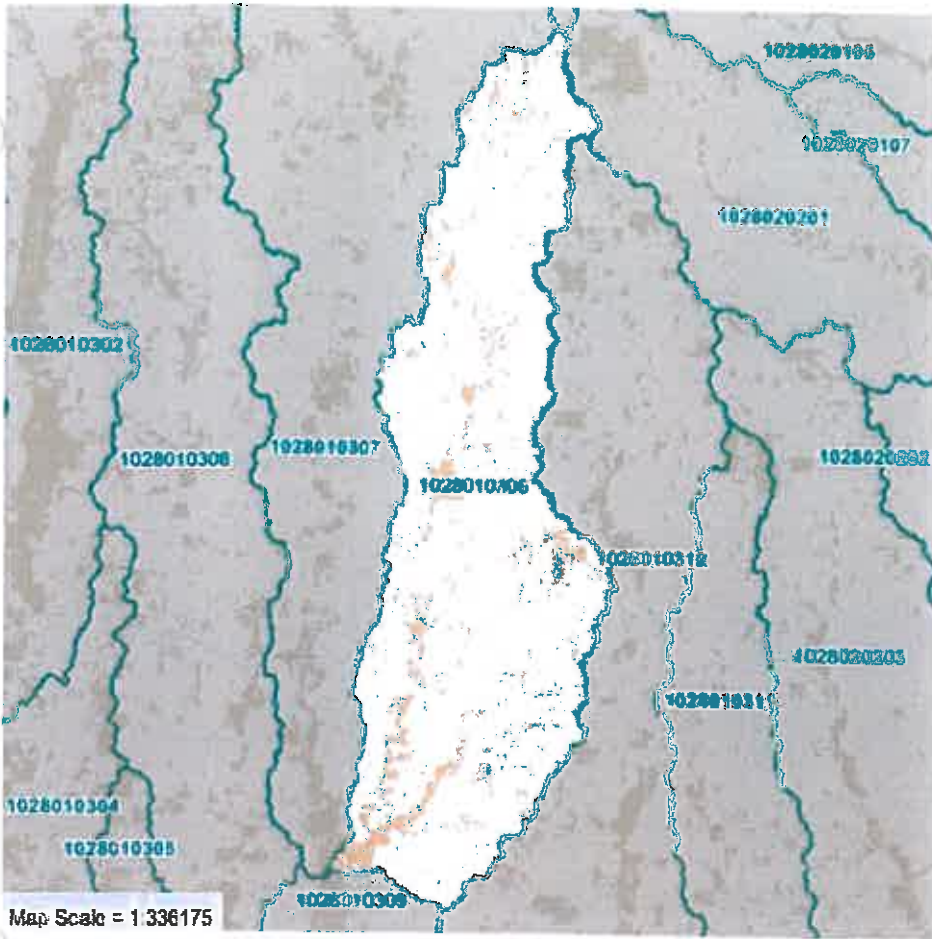
Wetlands

Wetlands shown at
1:900,000 or closer

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- Inland Forested Wetland
- Inland Herbaceous Wetland
- Inland Shrub Swamp
- Lower Perennial River
- Upper Perennial River
- Intermittent River
- Lake (Shallow)
- Lake (Deep)
- Pond
- Pond (Drawdown)
- Other Vegetated Wetland

East Locust Creek (1028010306)

	Lacustrine	Palustrine	Riverine	Total
Acres	277	2,546	44	2,868
Percent	9.66%	88.79%	1.55%	100.00%

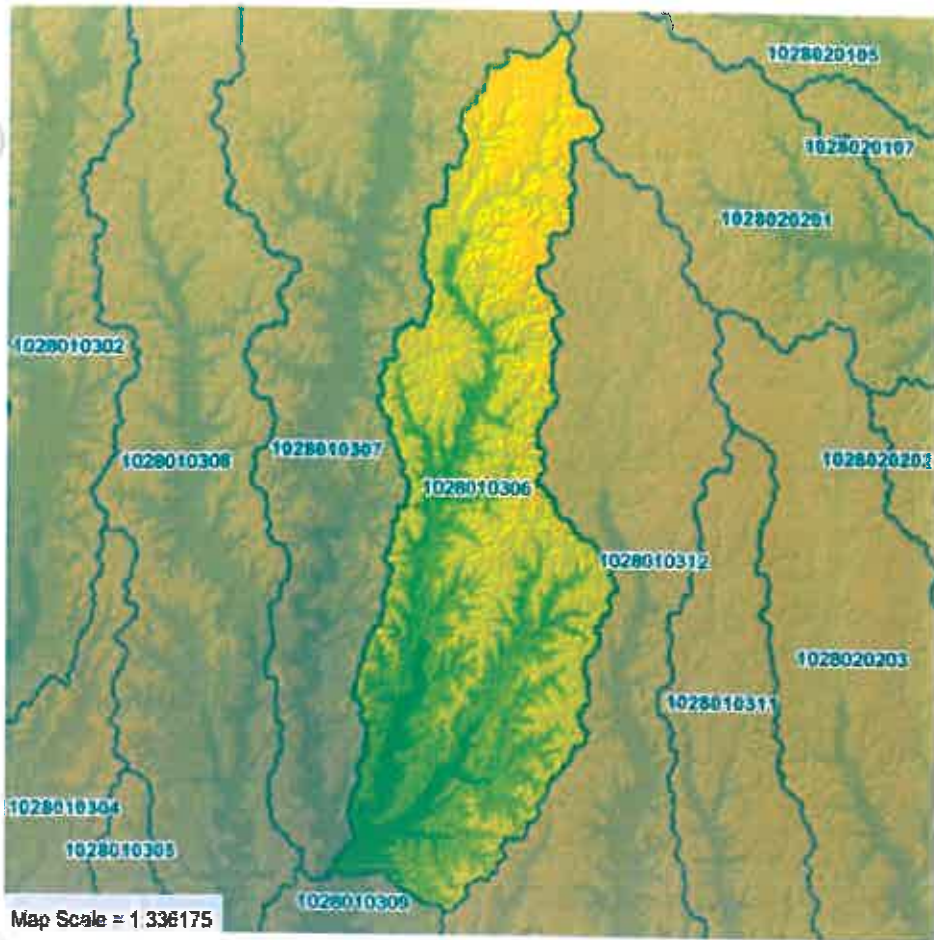


Crop Acres by Crop Type

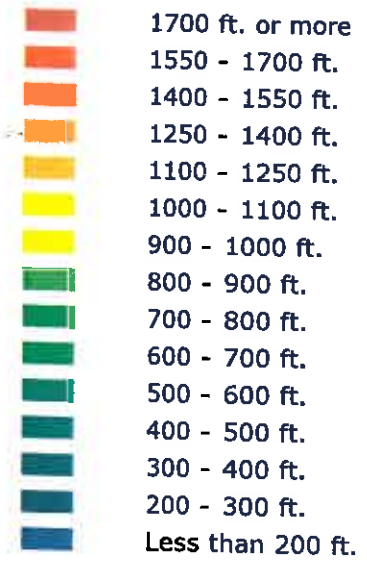
 Crop Land Areas

Note: Crop acre figures are averaged for the period 2000-2004 and may have been grown in any of the areas depicted on the map.

East Locust Creek (1028010306)

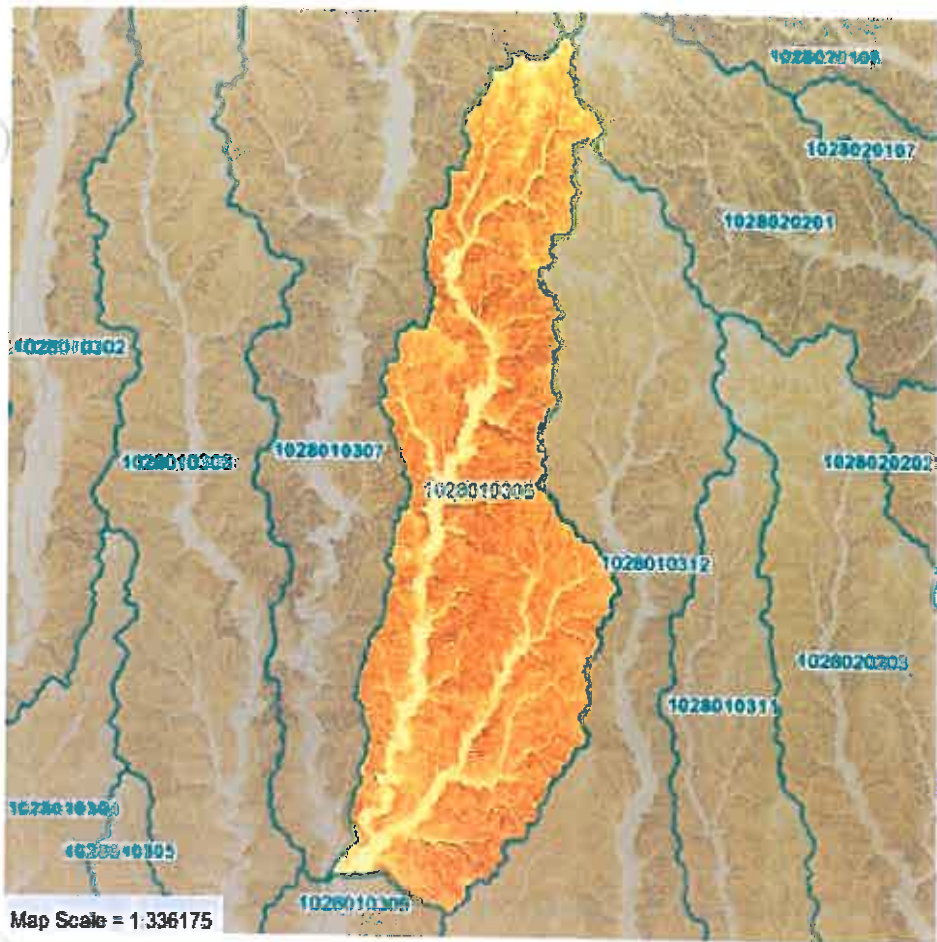


Elevation

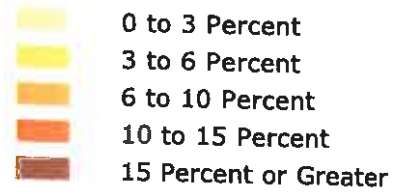


East Locust Creek (1028010306)

Minimum Elevation	Maximum Elevation	Mean Elevation	Elevation Difference
730 ft.	1,080 ft.	917 ft.	350 ft.

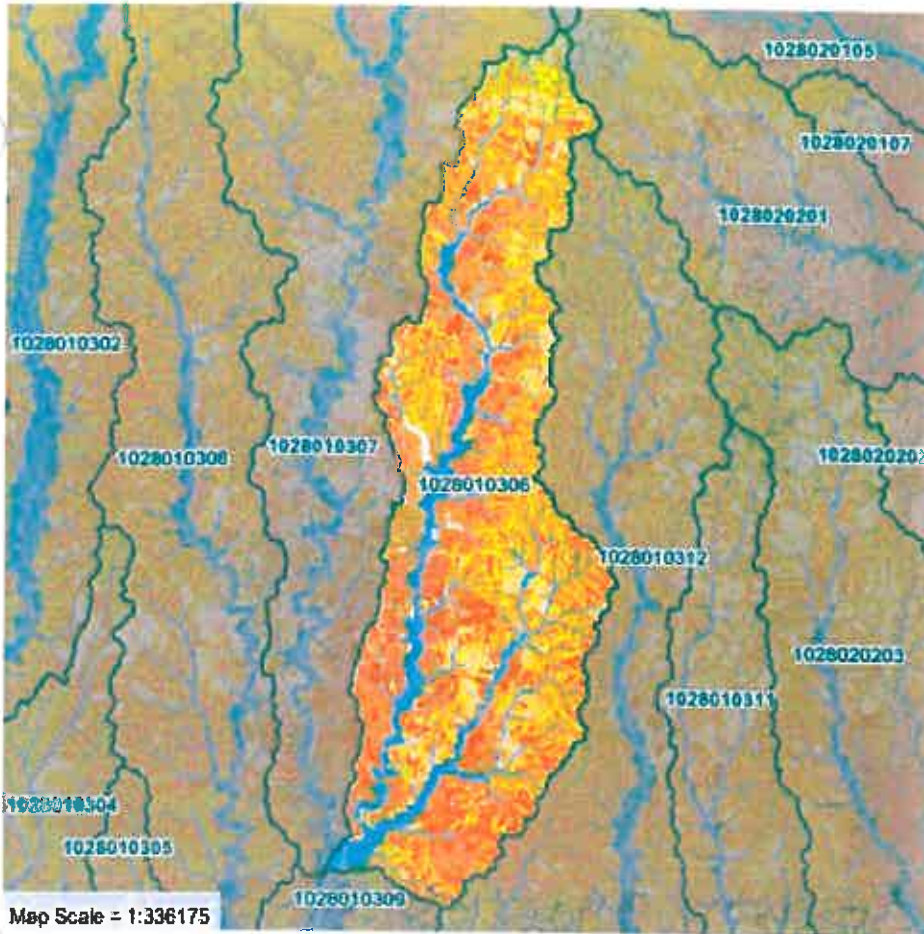


Land Slope



East Locust Creek (1028010306)

Slope Range:	0-3%	3-6%	6-10%	10-15%	> 15%	Total
Acres	10,260	15,616	27,953	21,296	4,364	79,489
Percent	12.91%	19.65%	35.17%	26.79%	5.49%	



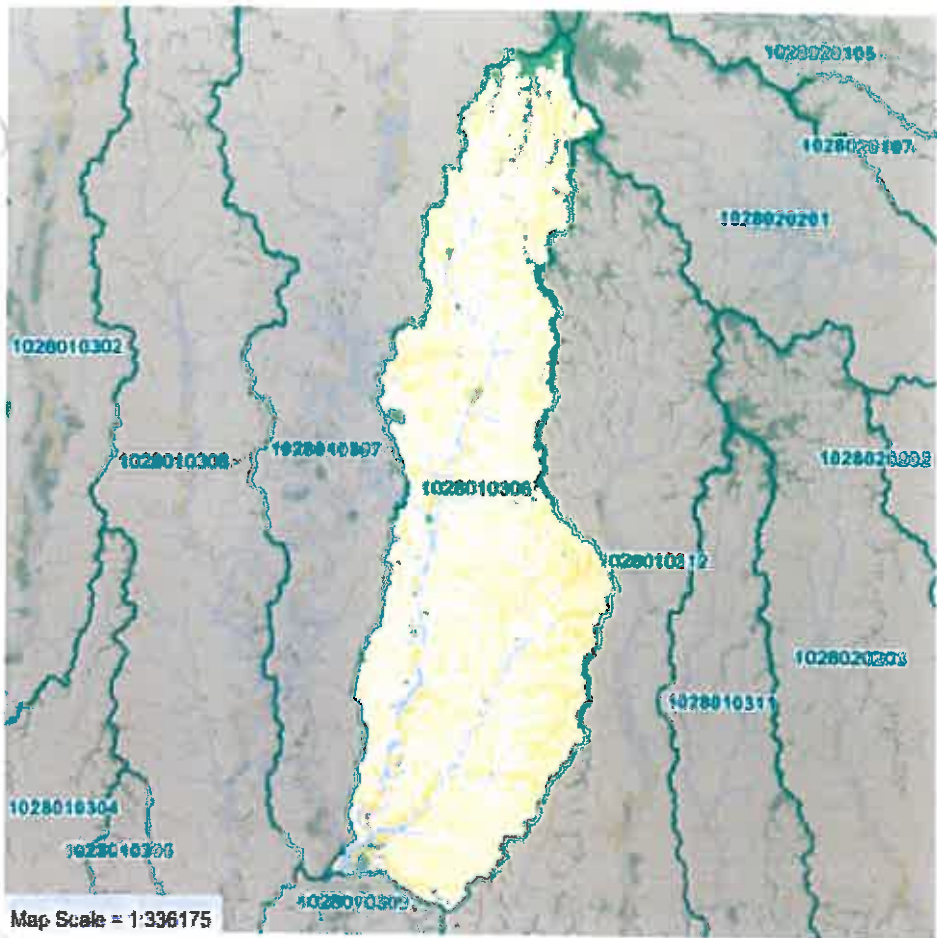
Soils

- Armstrong clay loam, 5 to 9 percent slopes, eroded
- Lagonda silty clay loam, 5 to 9 percent slopes, eroded
- Carlow silty clay, 0 to 2 percent slopes, frequently flooded
- Lagonda silty clay loam, 2 to 5 percent slopes, eroded
- Gara clay loam, 9 to 14 percent slopes, eroded
- Vesser silt loam, 0 to 2 percent slopes, occasionally flooded
- Dockery silt loam, 0 to 2 percent slopes, frequently flooded
- Pershing silty clay loam, 2 to 5 percent slopes, eroded
- Armstrong loam, 2 to 5 percent slopes
- Armstrong loam, 2 to 5 percent slopes, eroded

East Locust Creek (1028010306)

Map Unit Name (top 5)	Acres	Percent
Armstrong clay loam, 5 to 9 percent slopes, eroded	11,980	15.07%
Gara clay loam, 14 to 20 percent slopes, eroded	11,234	14.13%
Gara clay loam, 9 to 14 percent slopes, eroded	8,249	10.38%
Winnegan loam, 14 to 20 percent slopes, eroded	7,048	8.87%
Landes loam, 0 to 2 percent slopes, frequently flooded	6,429	8.09%

For a complete listing of soils and map keys, [click here](#).

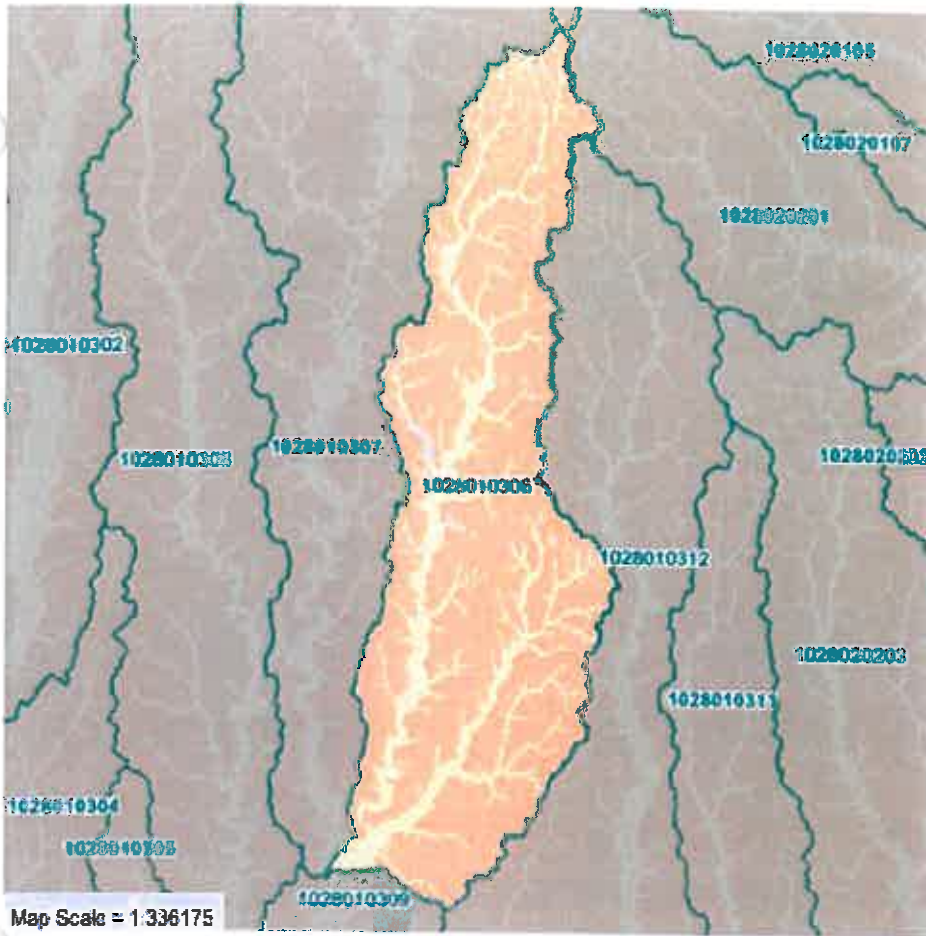


Hydrologic Soil Groups

- A: High Infiltration Rate
- B: Moderate Infiltration Rate
- B/D: Combination of Group B and D
- C: Slow Infiltration Rate
- C/D: Combination of Group C and D
- D: Very Slow Infiltration Rate
- Not Rated

East Locust Creek (1028010306)

Group Type	A	B	B/D	C	C/D	D	Not Rated
Acres	0	7,300	34	63,280	5,528	2,856	494
Percent	0.00%	9.18%	0.04%	79.61%	6.95%	3.59%	0.62%

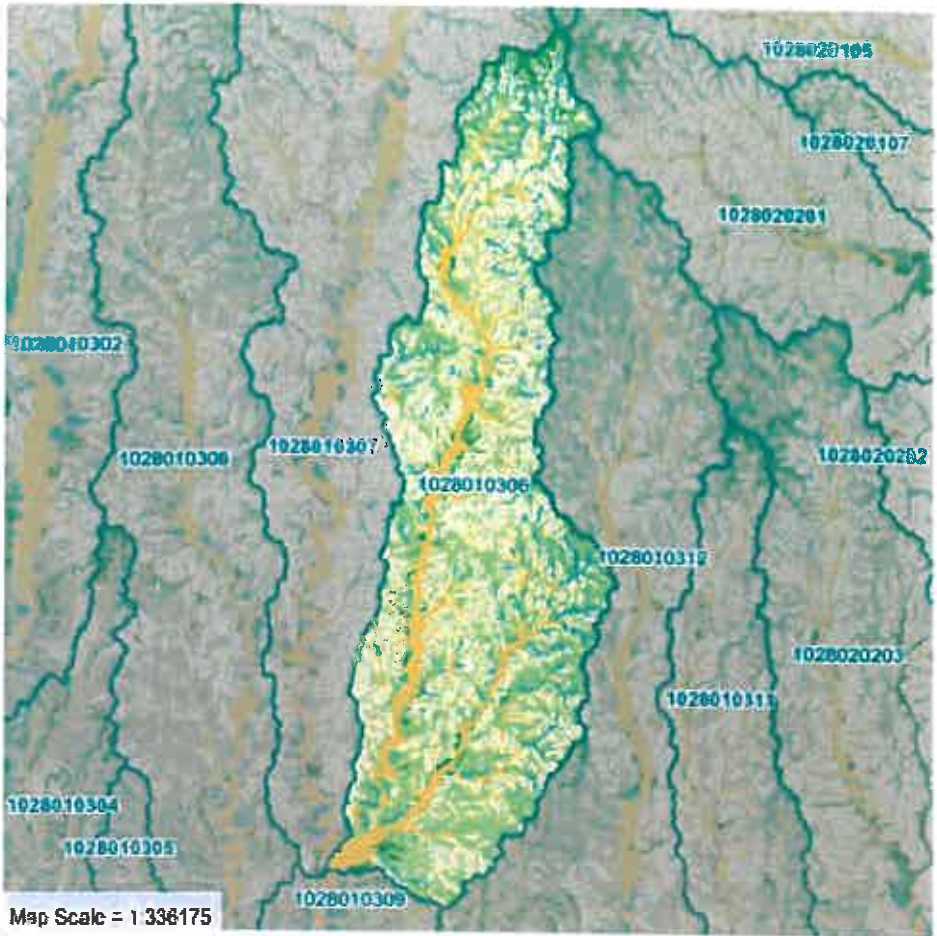


Highly Erodible Lands

- Highly Erodible Land
- Potentially Highly Erodible Land
- Not Highly Erodible Land
- Not Rated

East Locust Creek (1028010306)

	Highly Erodible	Potentially Highly Erodible	Not Highly Erodible	Not Rated
Acres	0	0	0	79,492
Percent	0.00%	0.00%	0.00%	100.00%



Prime Farmland

- Prime Farmland
- Prime Farmland if Drained
- Prime Farmland with Limitations
- Farmland of Statewide Importance
- Not Prime Farmland

East Locust Creek (1028010306)

	Prime Farmland	Prime Farmland if Drained	Prime Farmland with Limitations	Farmland of Statewide Importance	Not Prime Farmland
Acres	1,095	5,490	9,002	32,053	31,853
Percent	1.34%	6.73%	11.03%	39.28%	39.04%

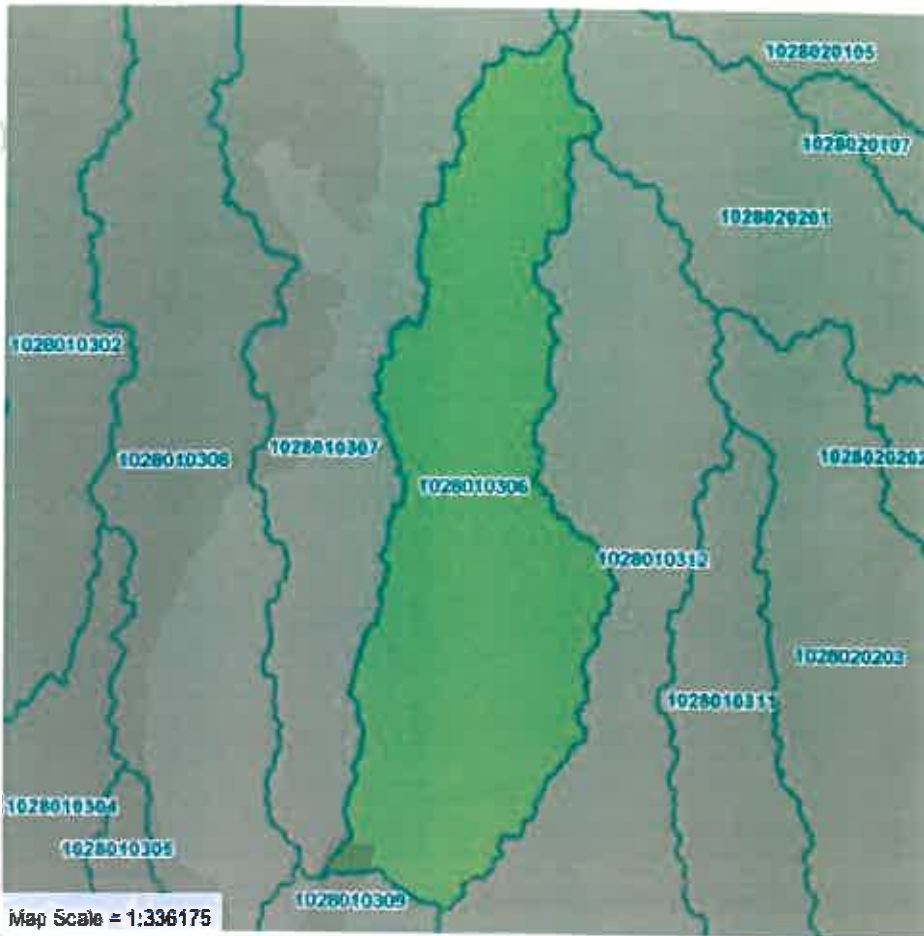


Major Land Resource Areas

109: Iowa and Missouri Heavy Till Plain

East Locust Creek (1028010306)

Major Land Resource Area	Acres	Percent
109	79,492	99.92%

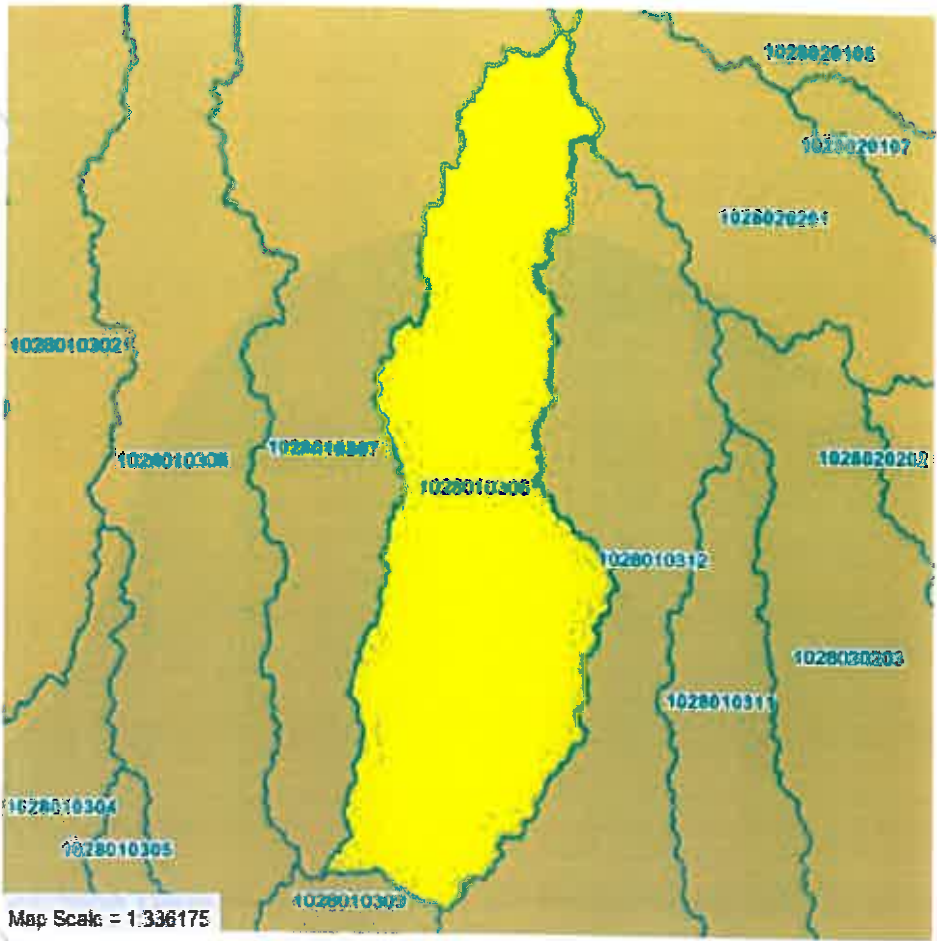


Common Resource Areas

- 109.1: Grand River Hills
- 109.2: Chariton River Hills

East Locust Creek (1028010306)

Common Resource Area	Acres	Percent
<u>109.1</u>	633	0.80%
<u>109.2</u>	78,859	99.13%

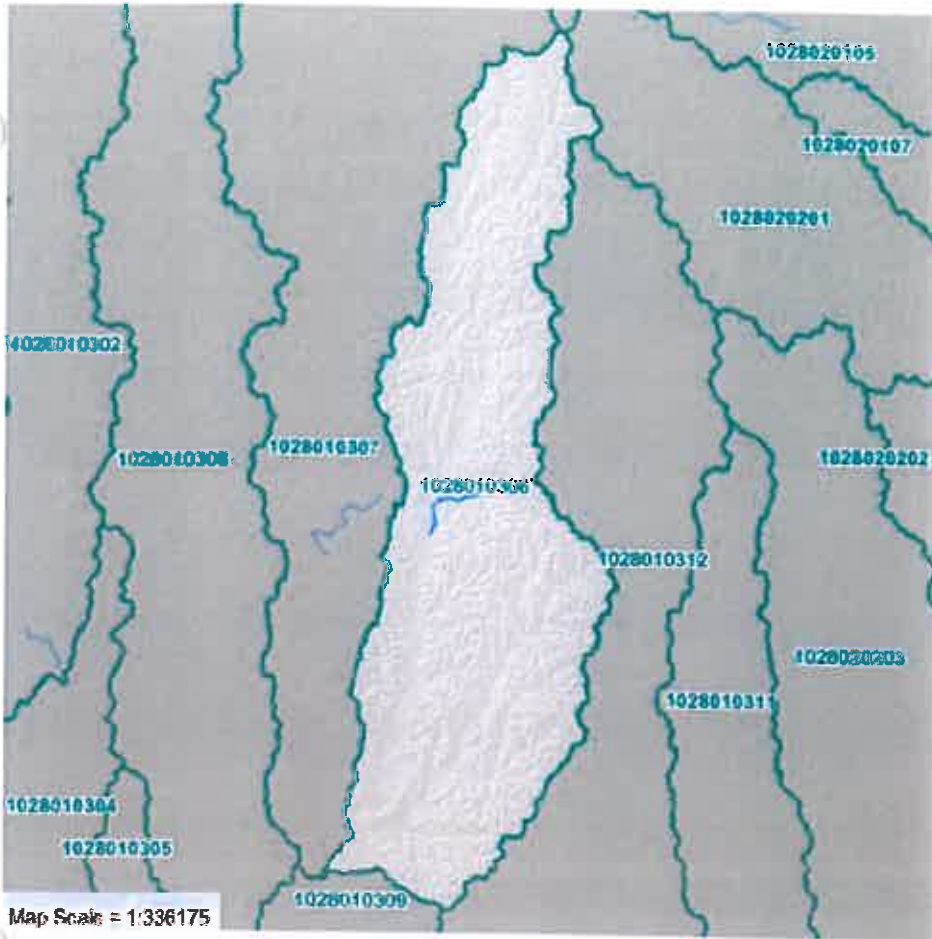


Precipitation (1971-2000)

- 37-38 inches
- 38-39 inches

East Locust Creek (1028010306)

Minimum Annual (in.)	Maximum Annual (in.)	Average Annual (in.)
37.68	38.61	38.34

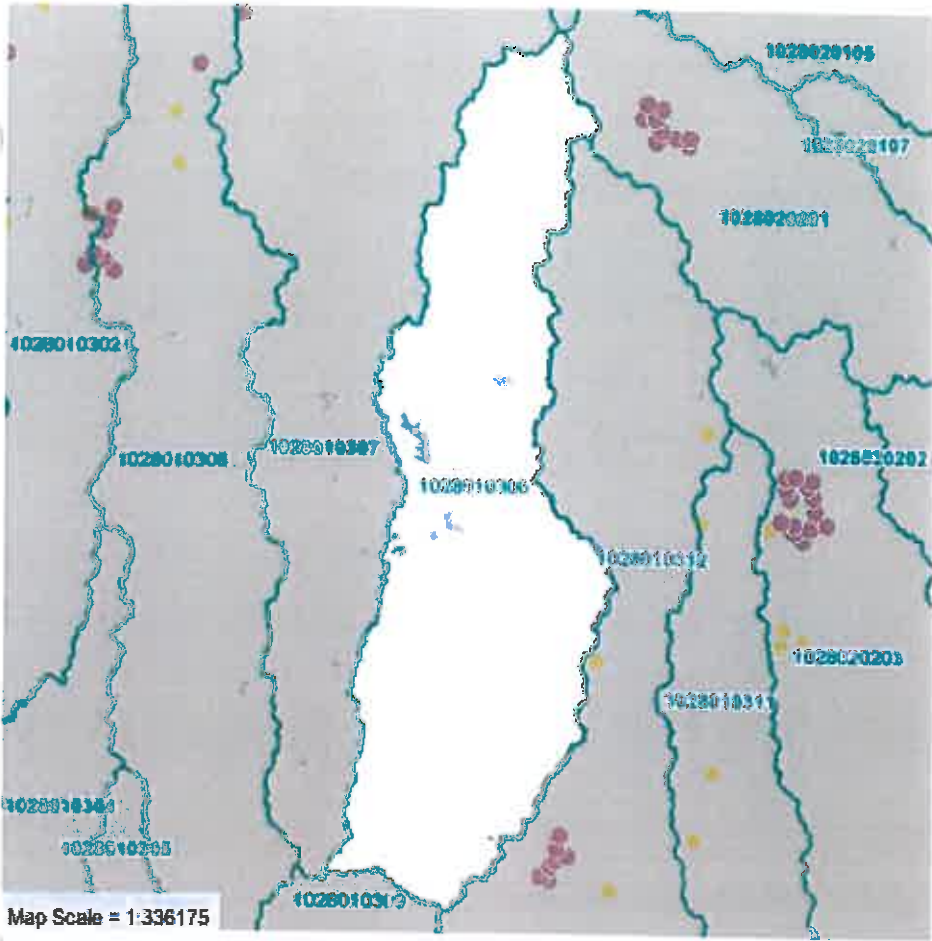


Karst Features

- Springs
- Sinkholes
- Sink Areas
- Gaining Stream
- Losing Stream

East Locust Creek (1028010306)

	<u>Gaining Streams</u>	<u>Losing Streams</u>	Sinks	Springs
Number	1	0	0	0
Miles	3.12	0.00		



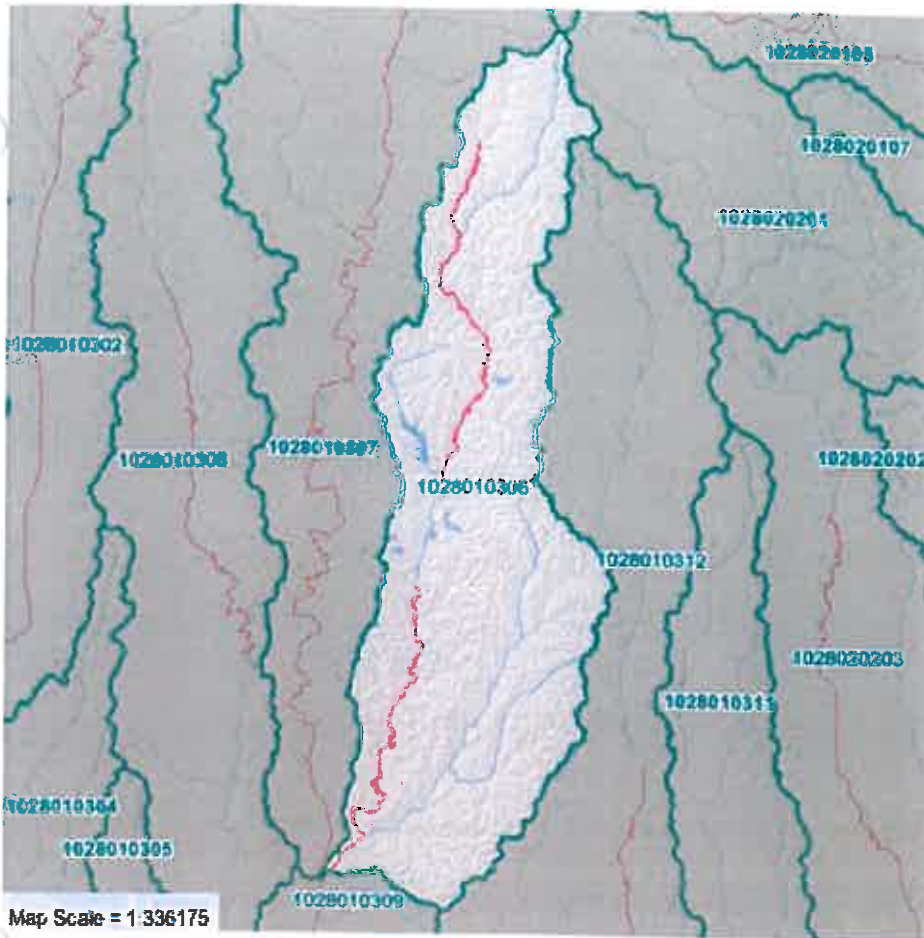
CAFOs

- IA - More than 7,000 Animal Units
- IB - 3,000 to 6,999 Animal Units
- IC - 1,000 to 2,999 Animal Units
- II - 300 to 999 Animal Units
- NP - AFO Non-Point Source

Note: Includes only MoDNR permitted Concentrated Animal Feeding Operations (CAFOs) and Animal Feeding Operations (AFOs).

East Locust Creek (1028010306)

Facilities	Outfalls	Animal Units	Animal Type (Units)	Facility Class
0	0	0		



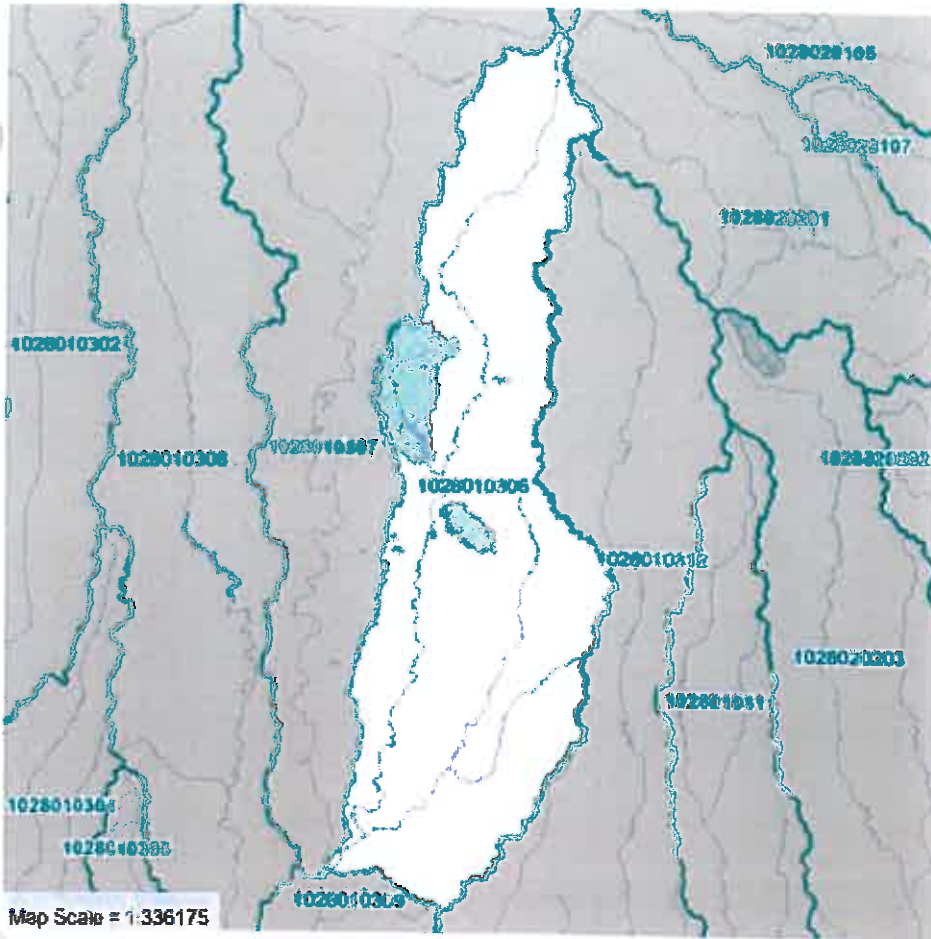
2008 303(d) Listed Lakes and Streams

— 303(d) List Lakes and Streams

East Fork Locust Creek (1028010306)

Name	Size	Pollutants	Source	Uses Impaired	TMDL Date
East Fork Locust Creek	12.923 Mi	Bacteria	Multiple Point & NPS	Whole body contact recreation (swimming)	
East Fork Locust Creek	15.42 Mi	Bacteria	Rural NPS	Whole body contact recreation (swimming)	
East Fork Locust Creek	15.42 Mi	Bacteria	Point & NPS	Whole body contact recreation (swimming)	
East Fork Locust Creek	15.42 Mi	Low D.O.	Rural NPS	Whole body contact recreation (swimming)	

A total of 2 water bodies listed, with 2 unique pollutants. Click the TMDL date to access the TMDL Report. Notations next to pollutant in parenthesis indicate the medium affected: W=water, S=sediment, T=fish tissue.



Protected Water

- Bioreference Water
- Outstanding National Resource Water Watershed
- Outstanding State Resource Water Watershed
- Public Drinking Water Watershed
- Source Water Protection Area (SWPA)

East Locust Creek (1028010306)

Outstanding National Resource Waters	Outstanding State Resource Waters	Biological Reference Waters	Source Water Protection Areas	% of Watershed in SWPA
0	0	0	0	0.00%






Drinking Water Intakes

- River Drainage Basins
 - Lake Drainage Basin
 - Public Water Supply Lakes
- Public water intake locations not shown for security reasons.*

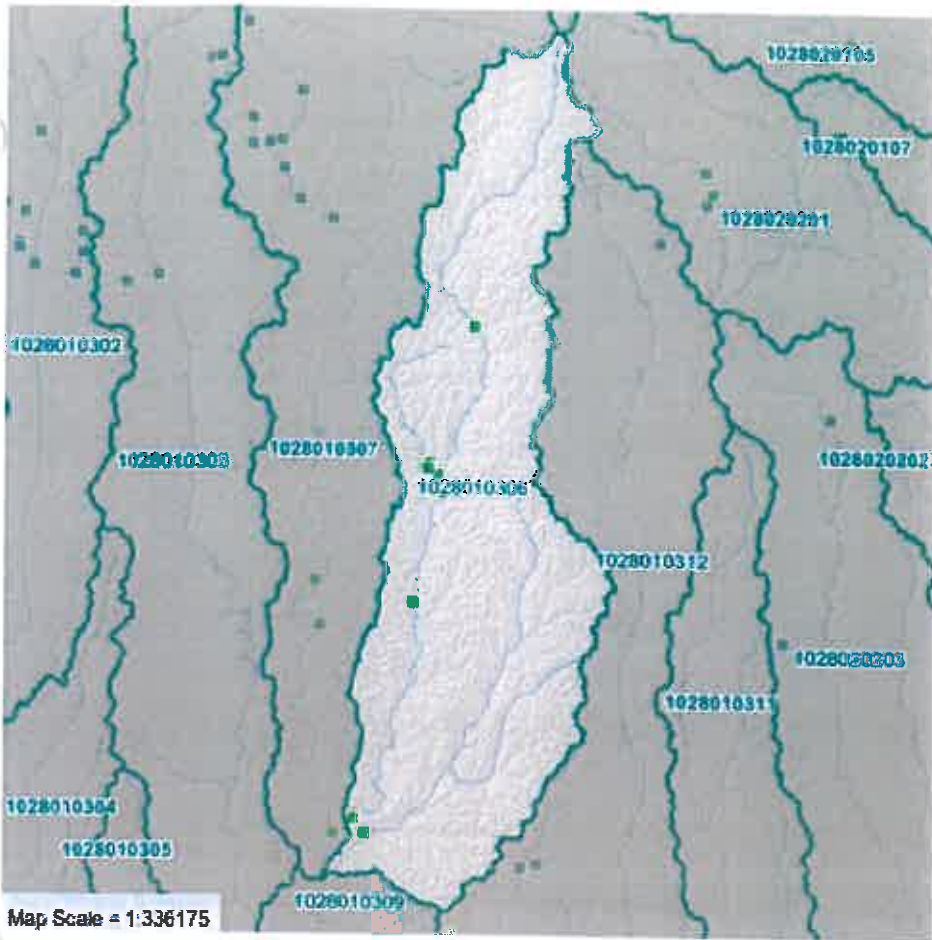
East Locust Creek (1028010306)



USGS NWIS Sites

-  Stream Sites
-  Groundwater Sites
-  Other Sites

East Locust Creek (1028010306)

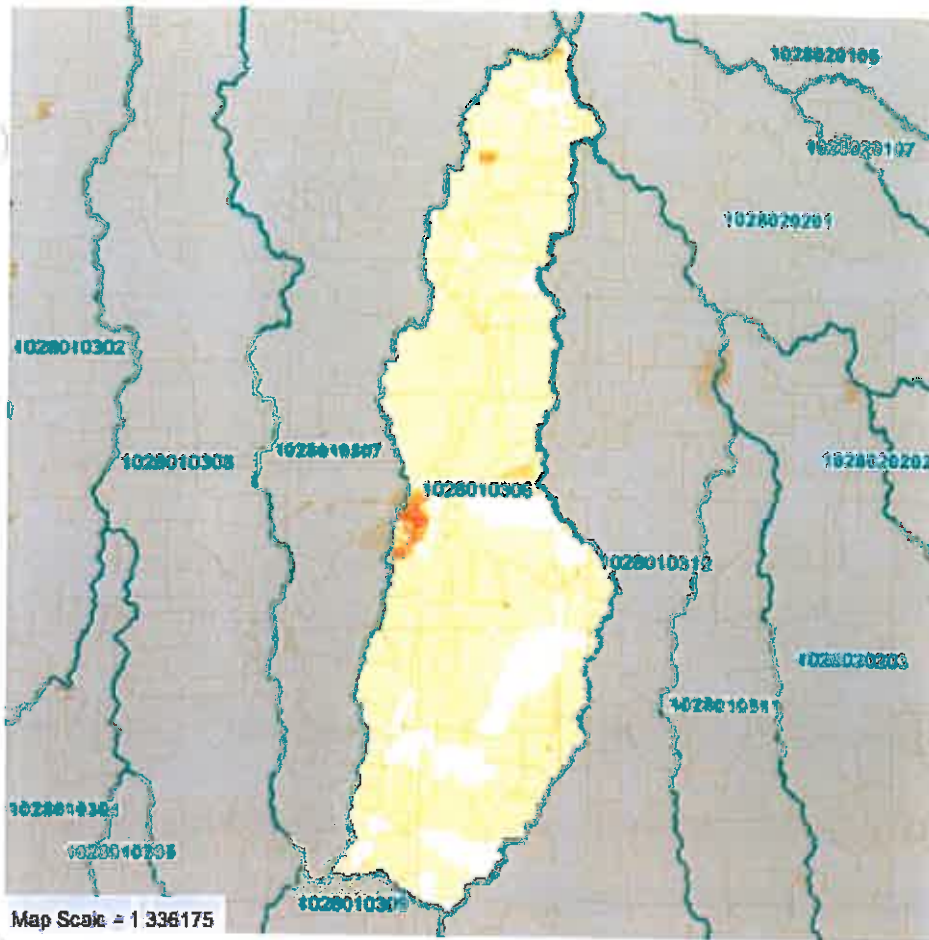


Local Initiatives

- Stream Team Monitoring Sites (not verified)
- Stream Team Monitoring Sites (verified)

East Locust Creek (1028010306)

Stream Team Volunteer Water Quality Monitoring Sites (number verified):	<u>12 (10)</u>
---	----------------



Census Data

- 2,500 or More Persons Per Sq Mile
- 250 - 2,499.99 Persons Per Sq Mile
- 50 - 249.99 Persons Per Sq Mile
- Less than 50 Persons Per Sq Mile
- No population

East Locust Creek (1028010306)

Total Population (2010):	3,040	
Persons/Sq Mile:	24.48	
Total Population (2000):	2,943	
Population Change, 2000 - 2010:	97	
Age 0-4:	240	7.89%
Age 5-17:	553	18.19%
Age 18-64:	1,772	58.29%
Age 65 and up:	475	15.63%

Data Sources

- 8, 10, and 12 Digit Hydrologic Units:** USDA Natural Resources Conservation Service Watershed Boundary Dataset, 2009.
- 303(d) Listed Lakes and Streams:** 2008 303(d) Listed Waters, Missouri Department of Natural Resources, 2009.
- Average Annual Precipitation:** PRISM (Parameter-elevation Regressions on Independent Slopes Model) dataset for 1971-2000, Oregon State University, 2006.
- Census Data:** 2010 Census Block Summary Data, U.S. Census Bureau, 2012.
- Cities and Towns:** 2008 U.S. Census Bureau Tiger Boundary File, 2009.
- Common Resource Areas:** USDA Natural Resources Conservation Service (NRCS), 2009.
- Confined Animal Feeding Operations (CAFOs):** Missouri Department of Natural Resources, NPDES, 2009.
- County Boundaries:** 2008 U.S. Census Bureau Tiger Boundary File, 2009.
- Crop Acres by Crop Type:** NASS County crop estimates, average acres 2000-2004.
- Highly Erodible Lands:** USDA Natural Resources Conservation Service, SSURGO data (NASIS attributes), 2006.
- Highways and Roads:** Missouri Department of Transportation (MoDOT), 2009.
- Hydrologic Soil Groups:** USDA Natural Resources Conservation Service, SSURGO data (NASIS attributes), 2009.
- Land Slope:** 30-Meter National Elevation Dataset, USGS, 2009.
- Land Use/Land Cover:** National Land Cover Database 2006, USGS, Multi-Resolution Land Characteristics Consortium, 2011.
- Losing/Gaining Streams:** Missouri Department of Natural Resources, DGLS, 2006.
- Major Land Resource Areas:** USDA Natural Resources Conservation Service (NRCS), 2009.
- National Wetland Inventory:** U.S. Fish and Wildlife Service, 2009.
- Outstanding National Resource Waters:** Missouri Department of Natural Resources, 2005 Outstanding National Resource Waters, 2007.
- Outstanding State Resource Waters:** Missouri Department of Natural Resources, 2005 Outstanding State Resource Waters, 2007.
- Prime Farmland:** USDA Natural Resources Conservation Service, SSURGO data (NASIS attributes), 2009.
- Private Wells:** Missouri Department of Natural Resources, Certified Wells (private only) and Well Logs (drinking water only), 2006.
- Public Drinking Water Watersheds:** Missouri Department of Natural Resources, 2003 (CARES update 2007).
- Public Drinking Water Wells:** Missouri Department of Natural Resources, 2009. MoDNR 2007 Census of Missouri Public Water Systems.
- Public Lands:** Missouri Department of Natural Resources, 2009, Missouri Department of Conservation, 2008, U.S. Forest Service, 2005, U.S. Fish and Wildlife Service, 2009, MoRAP (for NPS & USACOE lands), 2000.
- Relief Map:** 30-Meter National Elevation Dataset, USGS, 2009.

Sinkholes: Missouri Department of Natural Resources, 2006.

Source Water Areas: Missouri Department of Natural Resources, 2009.

Springs: Missouri Department of Natural Resources, 2006.

Streams and Lakes: U.S. Geological Survey National Hydrologic Dataset, High Resolution, 2009.

Stream Teams: Missouri Department Natural Resources, 2009.

USGS NWIS Sites: USGS National Water Information System (NWIS), 2007.



This project was partially funded by the US EPA, Region 7, through the Missouri Department of Natural Resources (subgrant #G06-NPS-11), under Section 319 of the Clean Water Act.



Watershed Profile

Report Prepared on 5/6/2013

[General Information »](#)

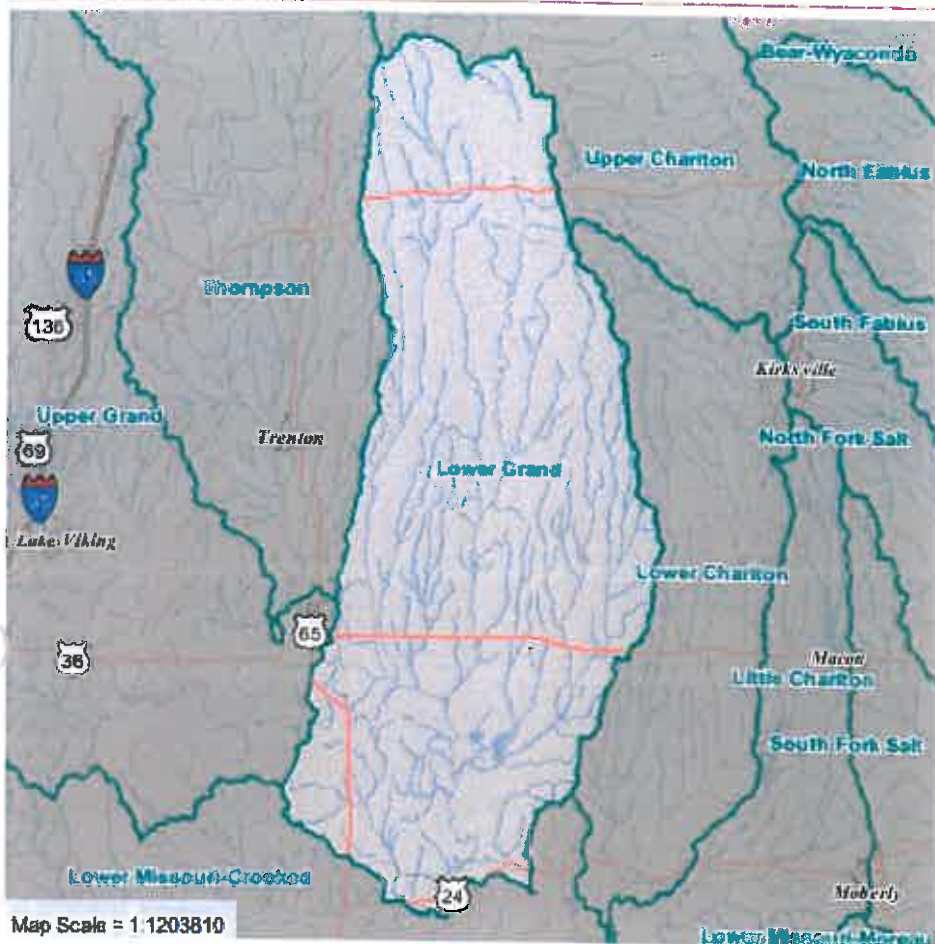
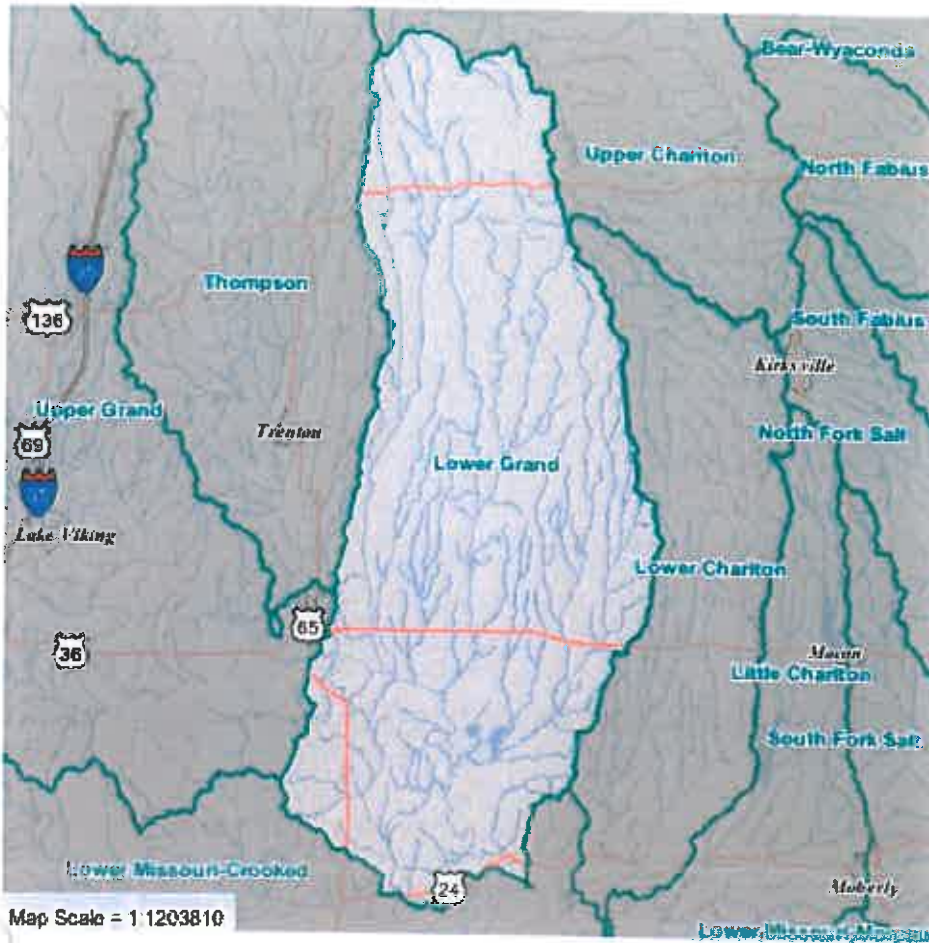


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Watershed Selection

Lower Grand (10280103)

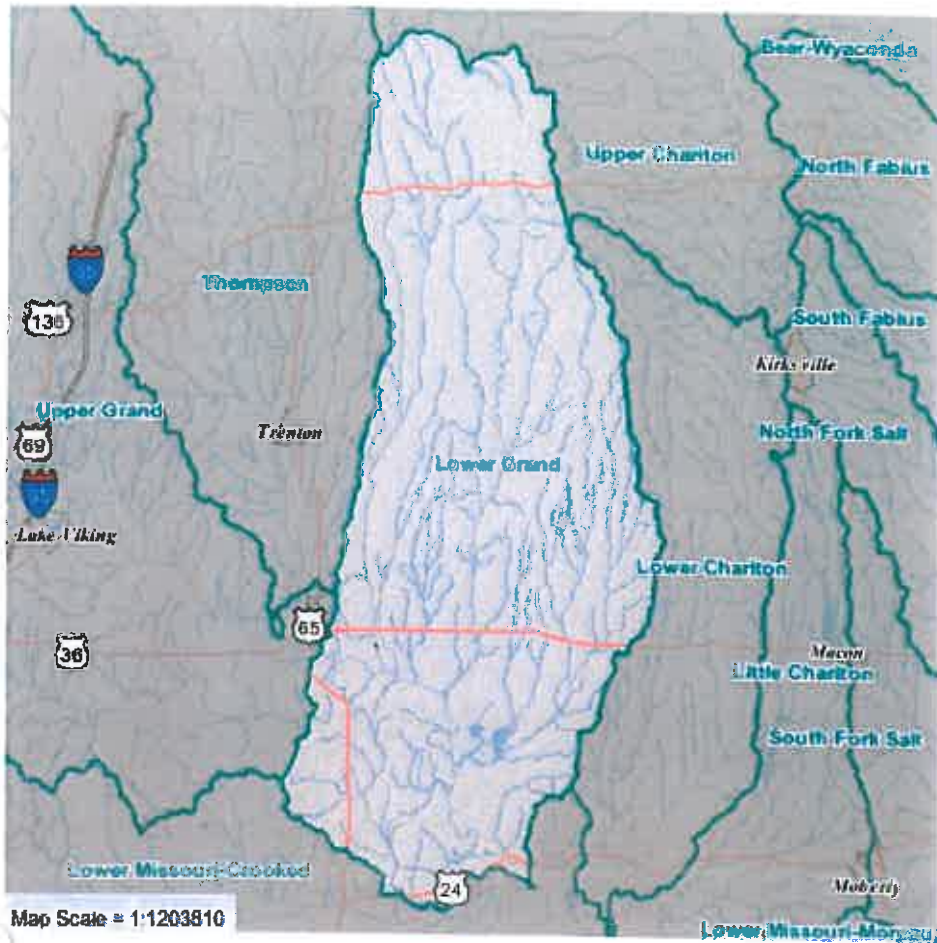


General Information

- 8-Digit HU Boundaries
- 10-Digit HU Boundaries

Lower Grand (10280103)

Acres	Population, 2010	Density, 2010	10-Digit HUs
1,510,882	26,515 persons	11.24 persons/sq mile	Big Creek (1028010315) East Locust Creek (1028010306) East Yellow Creek (1028010311) Elk Creek (1028010313) Headwaters Medicine Creek (1028010302) Hurricane Creek-Grand River (1028010316) Johnson Creek-Grand River (1028010310) Little Medicine Creek (1028010301) Locust Creek (1028010309) Medicine Creek (1028010303) Muddy Creek (1028010304) Parson Creek (1028010305) Salt Creek-Grand River (1028010317) Watkins Creek-Locust Creek (1028010307) West Locust Creek (1028010308) West Yellow Creek (1028010312) Yellow Creek (1028010314)



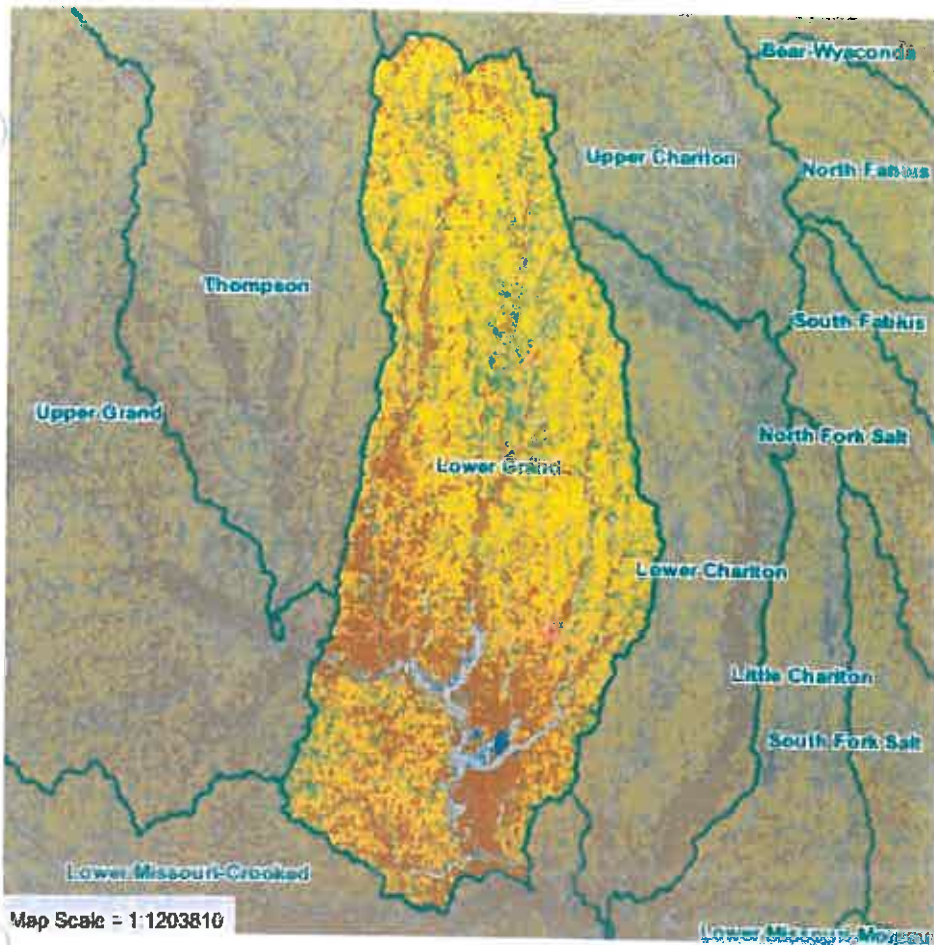
Streams

- Major Streams
- Streams and Creeks

Lower Grand (10280103)

Stream Type	Perennial	Intermittent	Canal/Ditch	Other	Total
Miles	5,912.9	568.5	9.1	393.8	6,884.3
Percent	85.89%	8.26%	0.13%	5.72%	100.00%

Top Streams (Miles): Medicine Creek (77.15), Locust Creek (75.78), West Yellow Creek (71.82), Grand River (55.97), East Yellow Creek (53.90). » [list all streams](#)

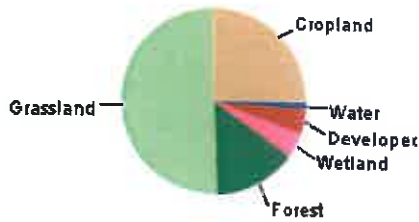


Land Use/Land Cover

- Developed, High Intensity
- Developed, Medium Intensity
- Developed, Low Intensity
- Developed, Open Space
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Herbaceous Wetlands
- Open Water

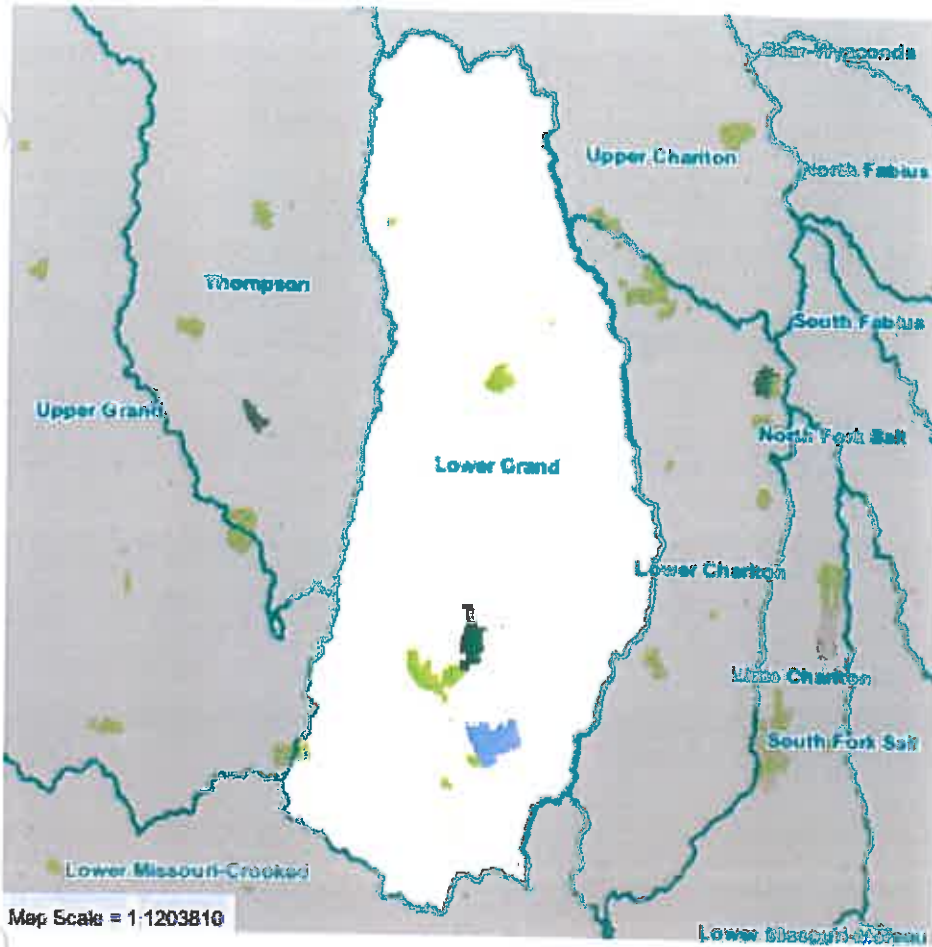
Lower Grand (10280103)

	Cropland	Grassland	Forest	Wetland	Developed	Water
Acres	381,710	758,027	221,346	64,785	68,482	16,571
Percent	25.26%	50.17%	14.65%	4.29%	4.53%	1.10%



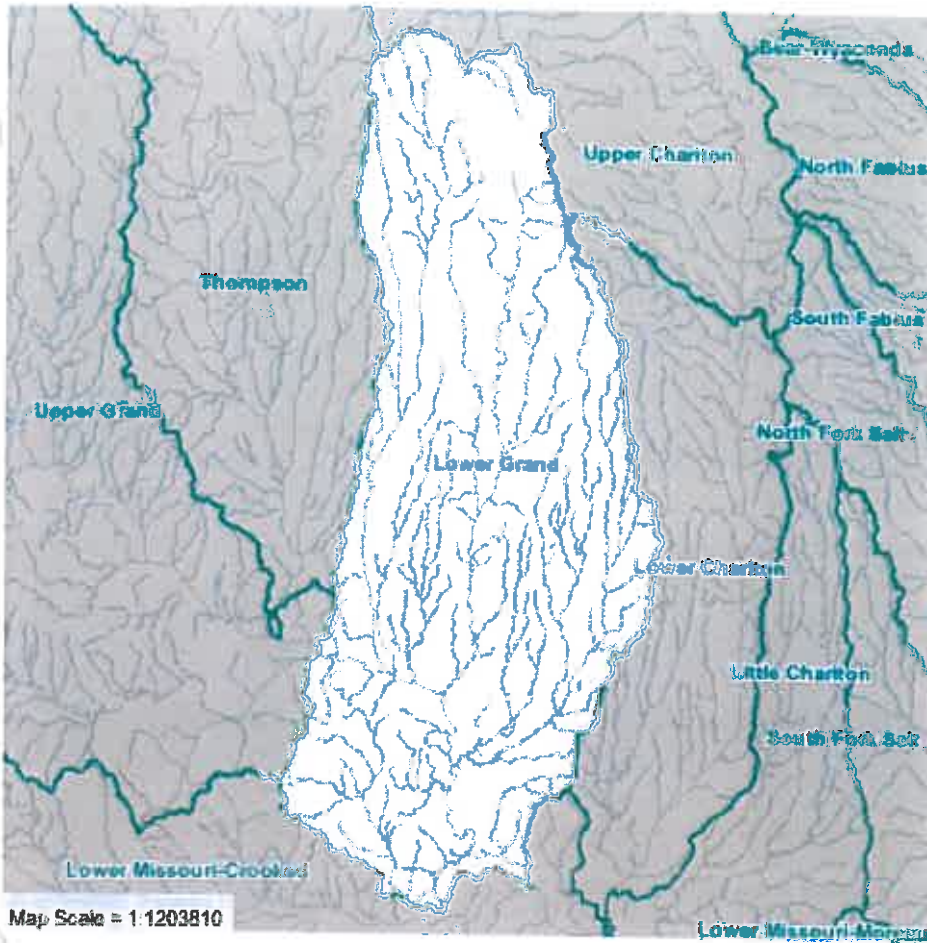
Source: U.S. Geological Survey National Land Cover Database, 2006.

Note: This table shows grouped land cover types. For a detailed listing, [click here](#).



Lower Grand (10280103)

Public Lands (largest 5) * list all	Acres	% of HU
Total	29,786.99	1.97%
SWAN LAKE NATIONAL WILDLIFE REFUGE	11,024.89	0.73%
FOUNTAIN GROVE CONSERVATION AREA	7,486.46	0.50%
Pershing State Park	5,389.04	0.36%
LOCUST CREEK CONSERVATION AREA	3,466.69	0.23%
BUNCH HOLLOW CONSERVATION AREA	988.89	0.07%



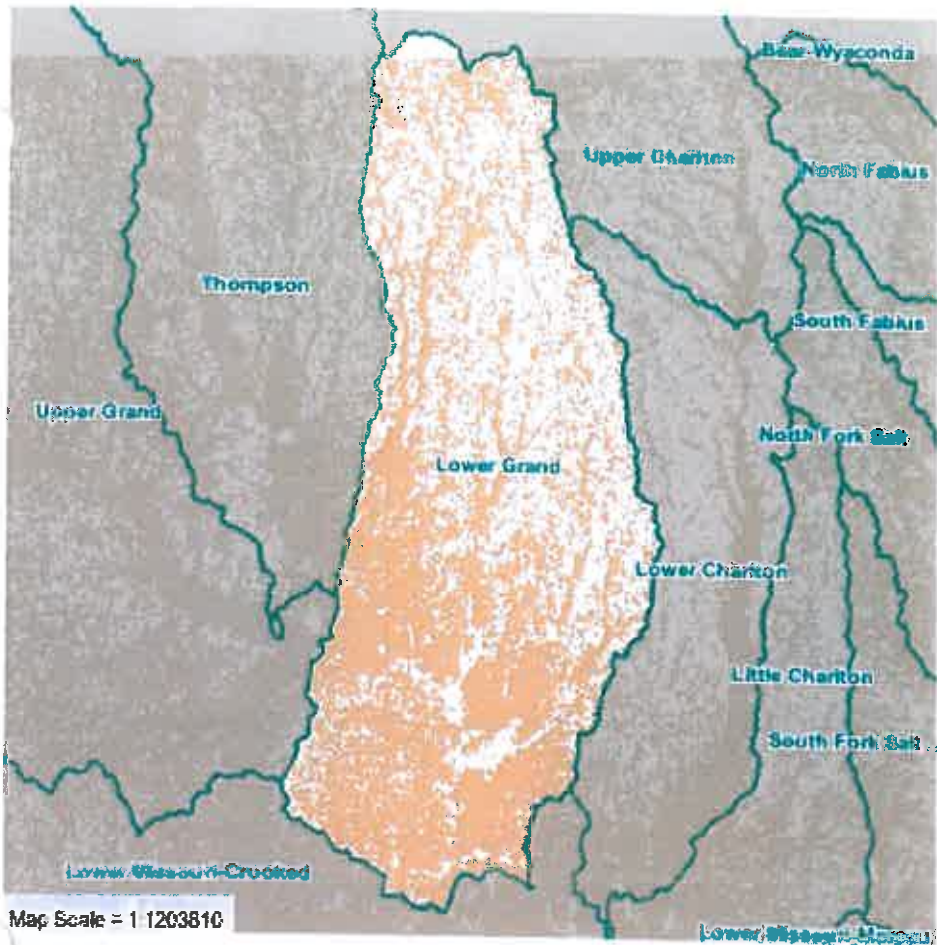
Wetlands

Wetlands shown at
1:900,000 or closer

- Inland Aquatic Bed
- Inland Forested Wetland
- Inland Herbaceous Wetland
- Inland Shrub Swamp
- Lower Perennial River
- Upper Perennial River
- Intermittent River
- Lake (Shallow)
- Lake (Deep)
- Pond
- Pond (Drawdown)
- Other Vegetated Wetland

Lower Grand (10280103)

	Lacustrine	Palustrine	Riverine	Total
Acres	4,310	86,079	4,112	94,501
Percent	4.56%	91.09%	4.35%	100.00%

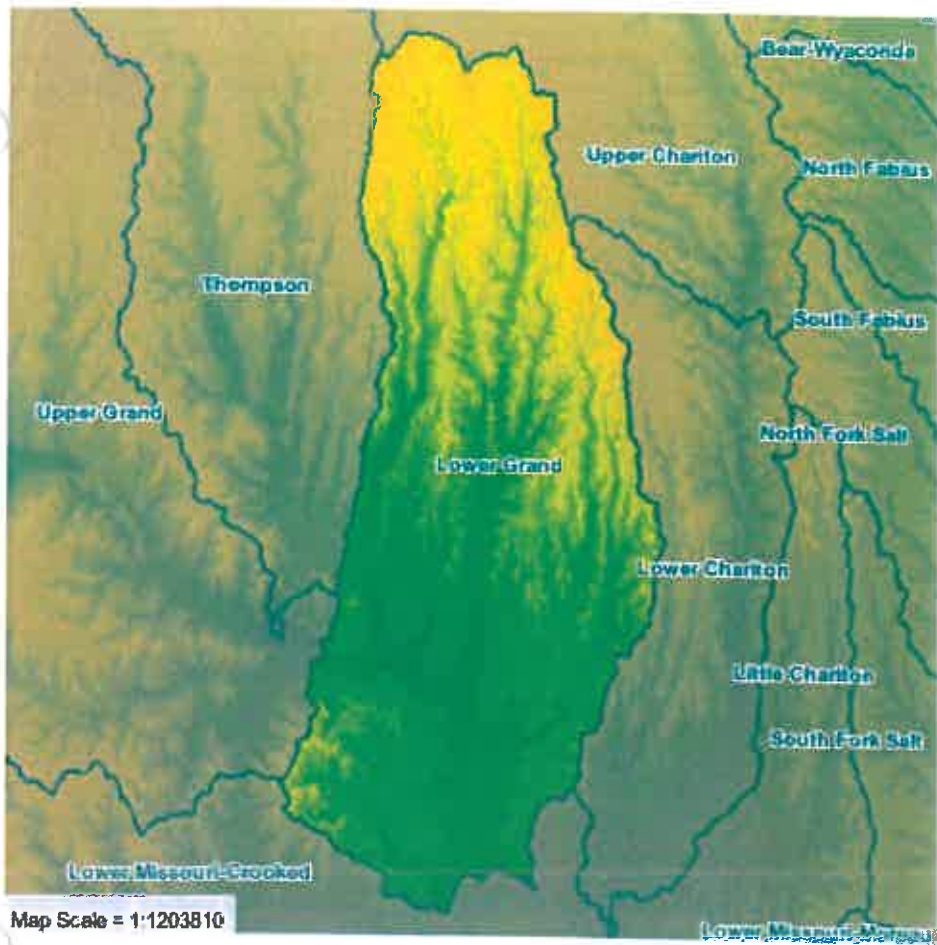


Crop Acres by Crop Type

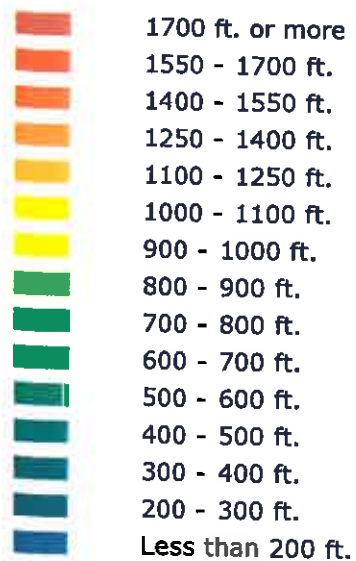
Crop Land Areas
Note: Crop acre figures are averaged for the period 2000-2004 and may have been grown in any of the areas depicted on the map.

Lower Grand (10280103)

	Corn	Corn (Silage)	Soybeans	Sorghum	Wheat	Oats	Rice	Cotton	Tobacco
Acres	90,153	1,816	222,625	14,924	25,177	2,645	0	0	158
Percent	6.0%	0.1%	14.7%	1.0%	1.7%	0.2%	0.0%	0.0%	0.0%

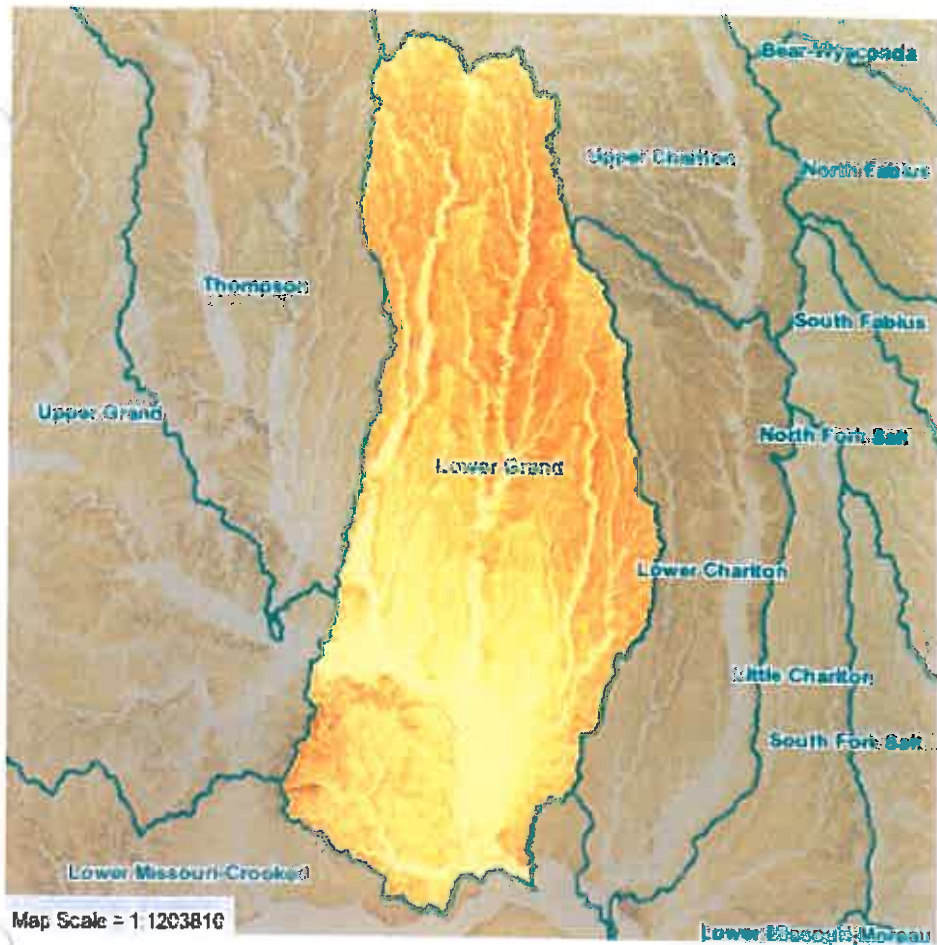


Elevation

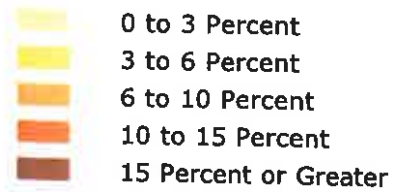


Lower Grand (10280103)

Minimum Elevation	Maximum Elevation	Mean Elevation	Elevation Difference
611 ft.	1,120 ft.	846 ft.	509 ft.

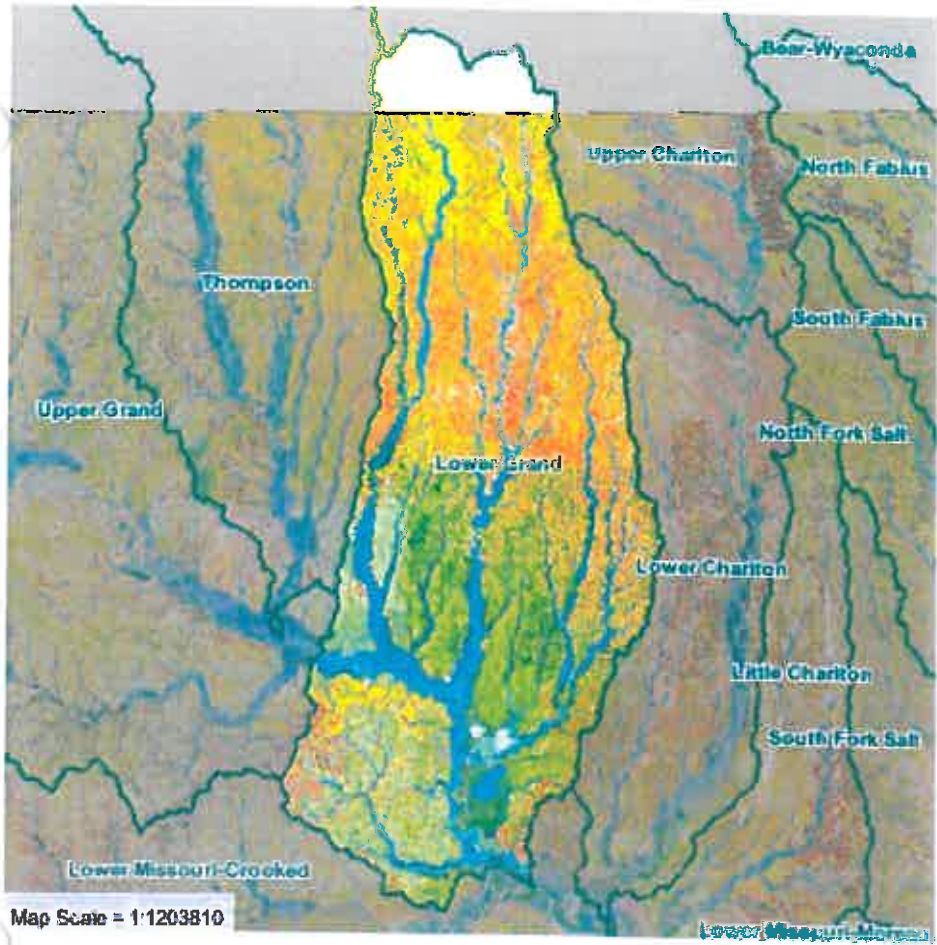


Land Slope



Lower Grand (10280103)

Slope Range:	0-3%	3-6%	6-10%	10-15%	> 15%	Total
Acres	498,140	449,538	370,956	160,743	30,335	1,509,711
Percent	33.00%	29.78%	24.57%	10.65%	2.01%	



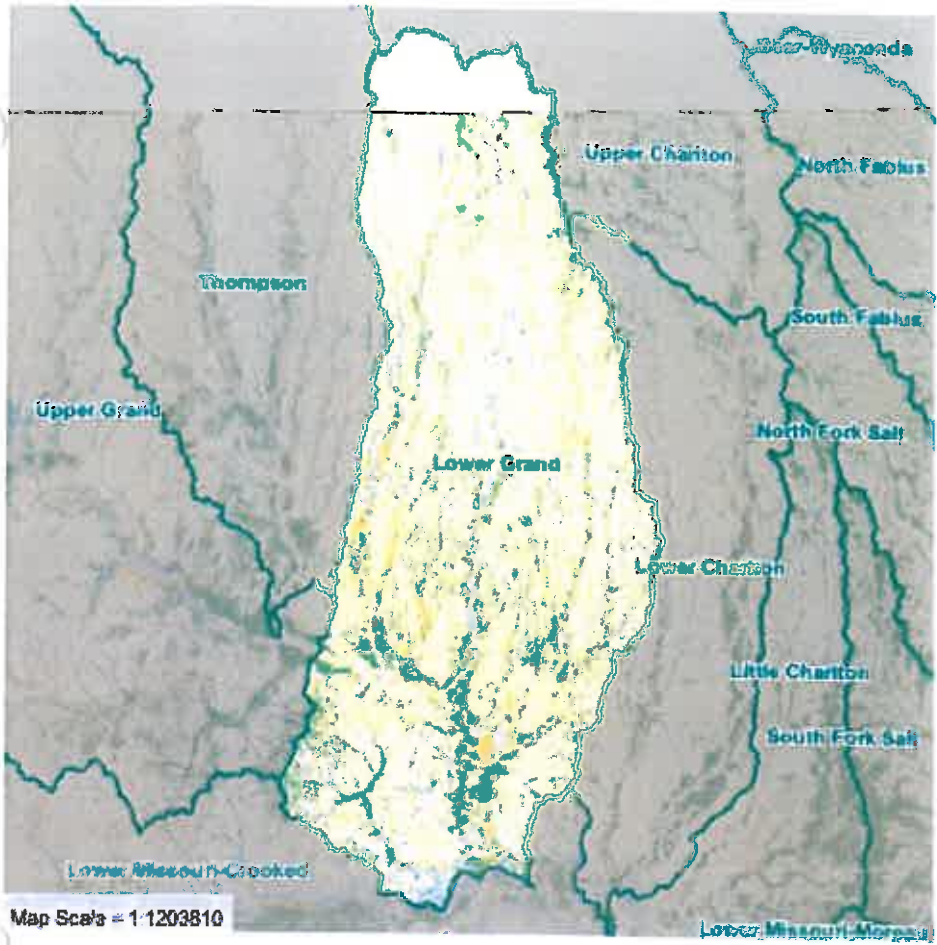
Soils

- Armstrong clay loam, 5 to 9 percent slopes, eroded
- Lagonda silty clay loam, 5 to 9 percent slopes, eroded
- Gara clay loam, 9 to 14 percent slopes, eroded
- Gara loam, 14 to 20 percent slopes, eroded
- Lagonda silt loam, 2 to 5 percent slopes, eroded
- Gara clay loam, 14 to 20 percent slopes, eroded
- Purdin loam, 9 to 14 percent slopes, eroded
- Armstrong loam, 2 to 5 percent slopes, eroded
- Grundy silt loam, 2 to 5 percent slopes
- Landes loam, 0 to 2 percent slopes, frequently flooded

Lower Grand (10280103)

Map Unit Name (top 5)	Acres	Percent
Armstrong clay loam, 5 to 9 percent slopes, eroded	191,723	12.69%
Lagonda silty clay loam, 5 to 9 percent slopes, eroded	70,922	4.69%
Gara clay loam, 9 to 14 percent slopes, eroded	61,587	4.08%
Gara loam, 14 to 20 percent slopes, eroded	49,230	3.26%
Lagonda silt loam, 2 to 5 percent slopes, eroded	48,749	3.23%

For a complete listing of soils and map keys, [click here](#).

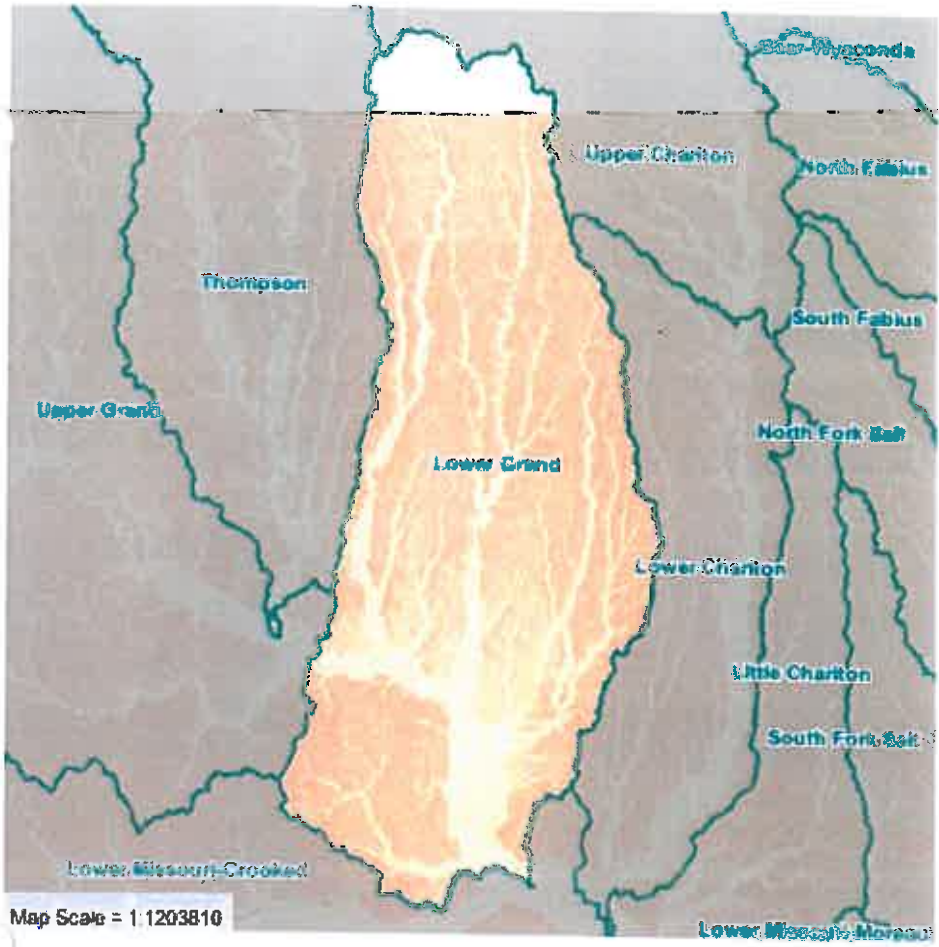


Hydrologic Soil Groups

- A: High Infiltration Rate
- B: Moderate Infiltration Rate
- B/D: Combination of Group B and D
- C: Slow Infiltration Rate
- C/D: Combination of Group C and D
- D: Very Slow Infiltration Rate
- Not Rated

Lower Grand (10280103)

Group Type	A	B	B/D	C	C/D	D	Not Rated
Acres	487	117,667	25,569	1,073,008	96,721	183,903	12,367
Percent	0.03%	7.79%	1.69%	71.07%	6.41%	12.18%	0.82%

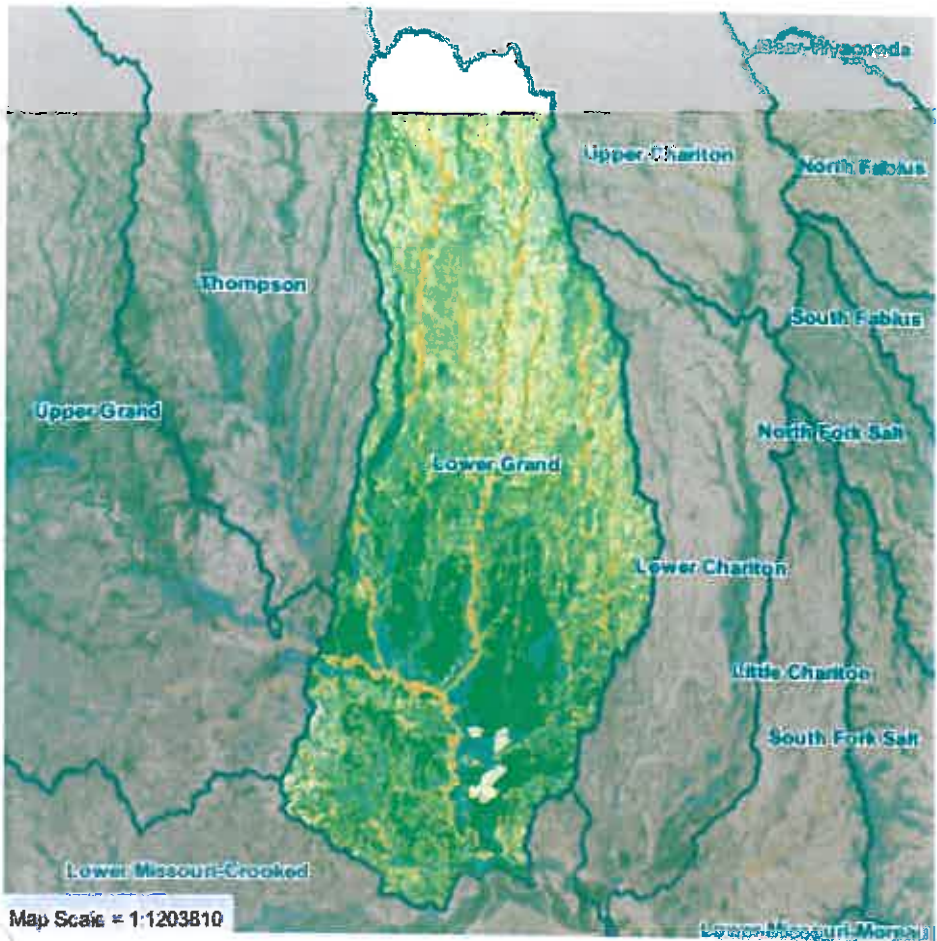


Highly Erodible Lands

- Highly Erodible Land
- Potentially Highly Erodible Land
- Not Highly Erodible Land
- Not Rated

Lower Grand (10280103)

	Highly Erodible	Potentially Highly Erodible	Not Highly Erodible	Not Rated
Acres	0	0	0	1,509,722
Percent	0.00%	0.00%	0.00%	100.00%

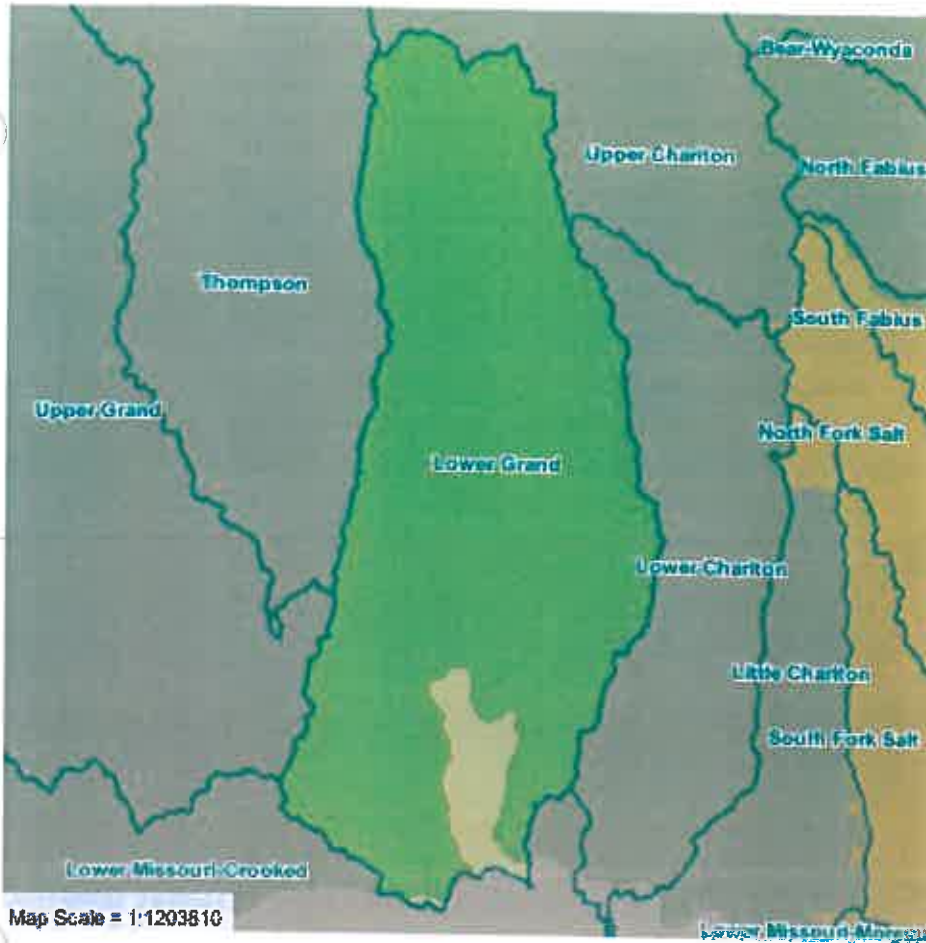


Prime Farmland

- Prime Farmland
- Prime Farmland if Drained
- Prime Farmland with Limitations
- Farmland of Statewide Importance
- Not Prime Farmland

Lower Grand (10280103)

	Prime Farmland	Prime Farmland if Drained	Prime Farmland with Limitations	Farmland of Statewide Importance	Not Prime Farmland
Acres	243,384	210,388	163,667	629,502	262,781
Percent	15.53%	13.42%	10.44%	40.17%	16.77%

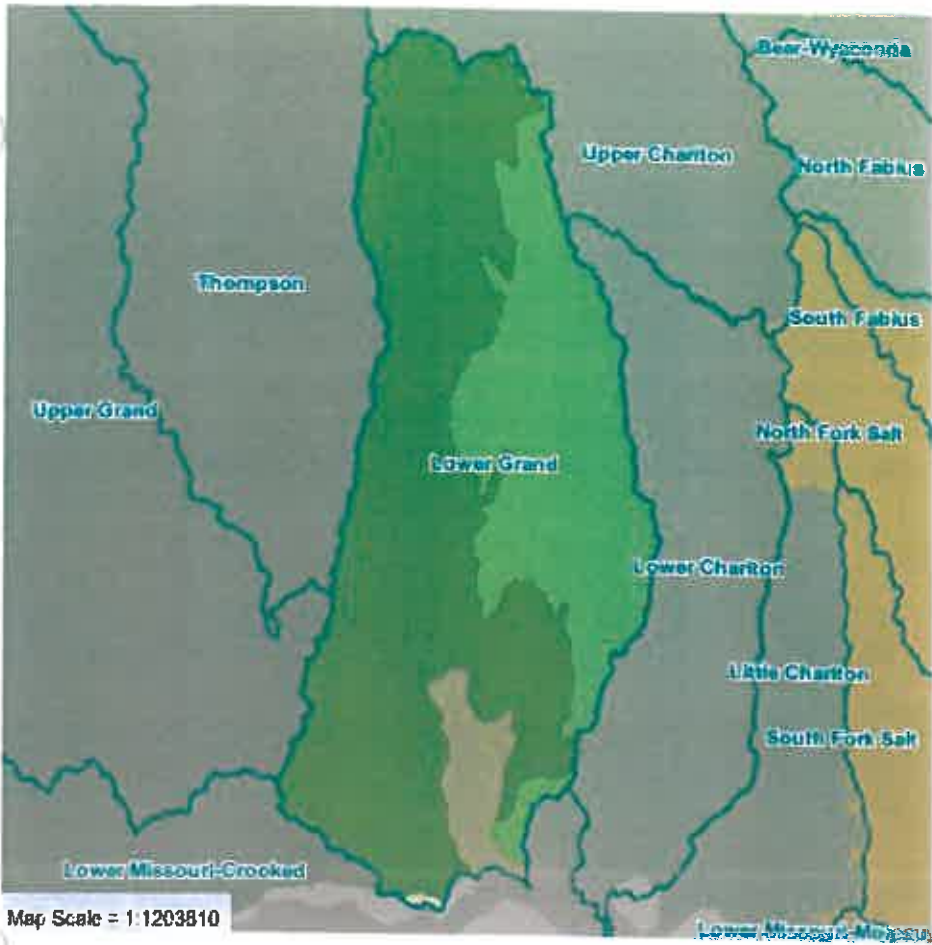


Major Land Resource Areas

- 107B: Iowa and Missouri Deep Loess Hills
- 109: Iowa and Missouri Heavy Till Plain

Lower Grand (10280103)

Major Land Resource Area	Acres	Percent
<u>107B</u>	82,041	5.43%
<u>109</u>	1,427,681	94.49%

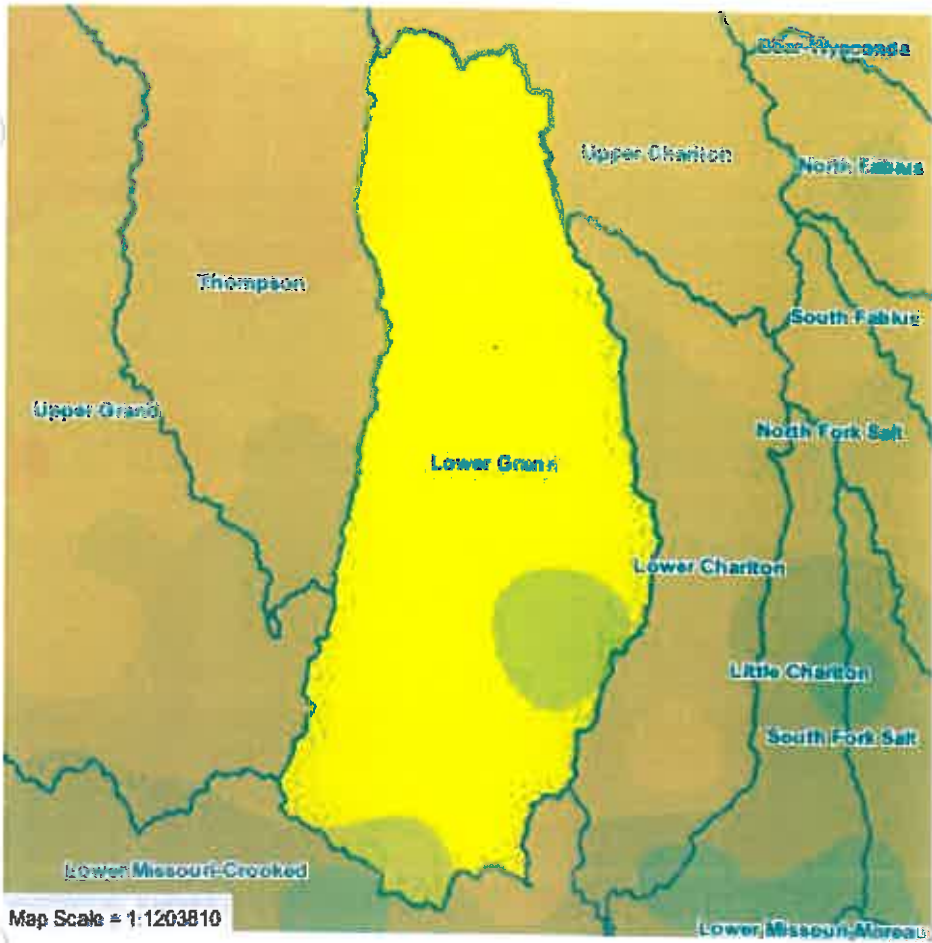


Common Resource Areas

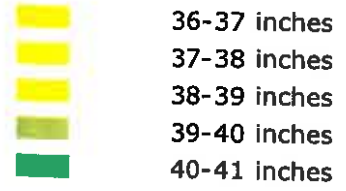
- 107B.1: Missouri River Alluvial Land
- 107B.4: Missouri Loess Hills
- 109.1: Grand River Hills
- 109.2: Chariton River Hills

Lower Grand (10280103)

Common Resource Area	Acres	Percent
<u>107B.1</u>	79,255	5.25%
<u>107B.4</u>	2,787	0.18%
<u>109.1</u>	925,833	61.28%
<u>109.2</u>	501,848	33.22%

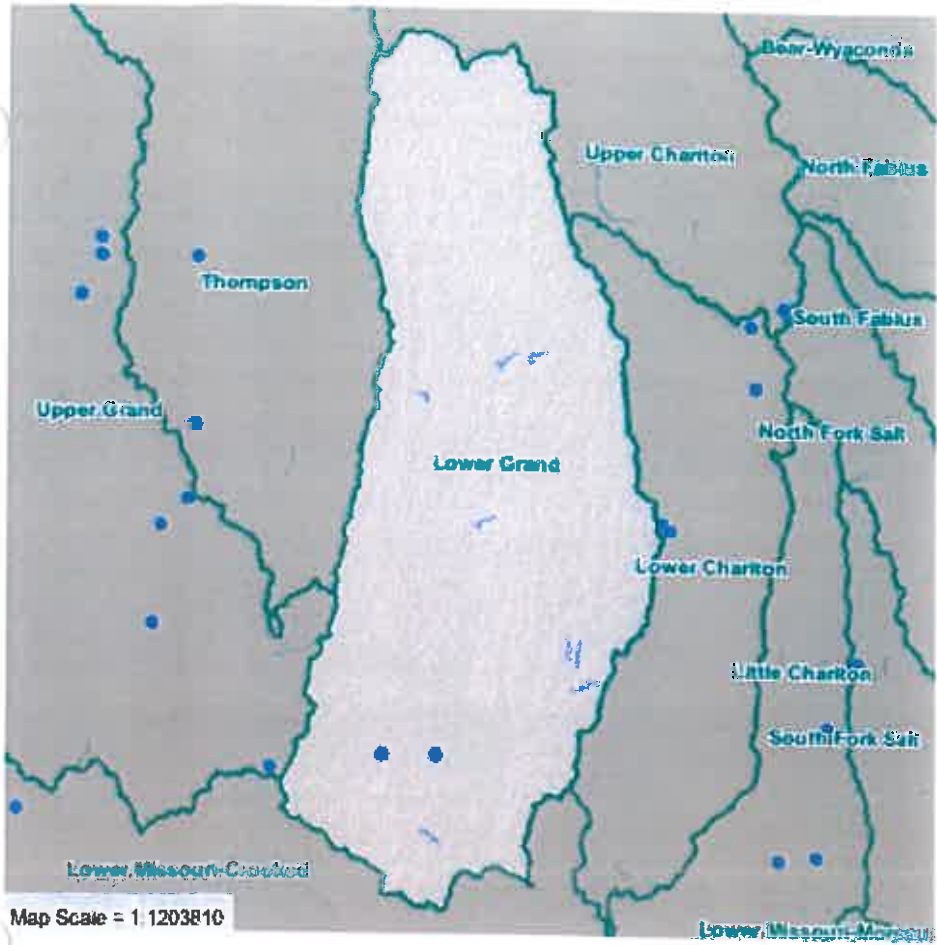


Precipitation (1971-2000)



Lower Grand (10280103)

Minimum Annual (in.)	Maximum Annual (in.)	Average Annual (in.)
36.81	40.02	38.27

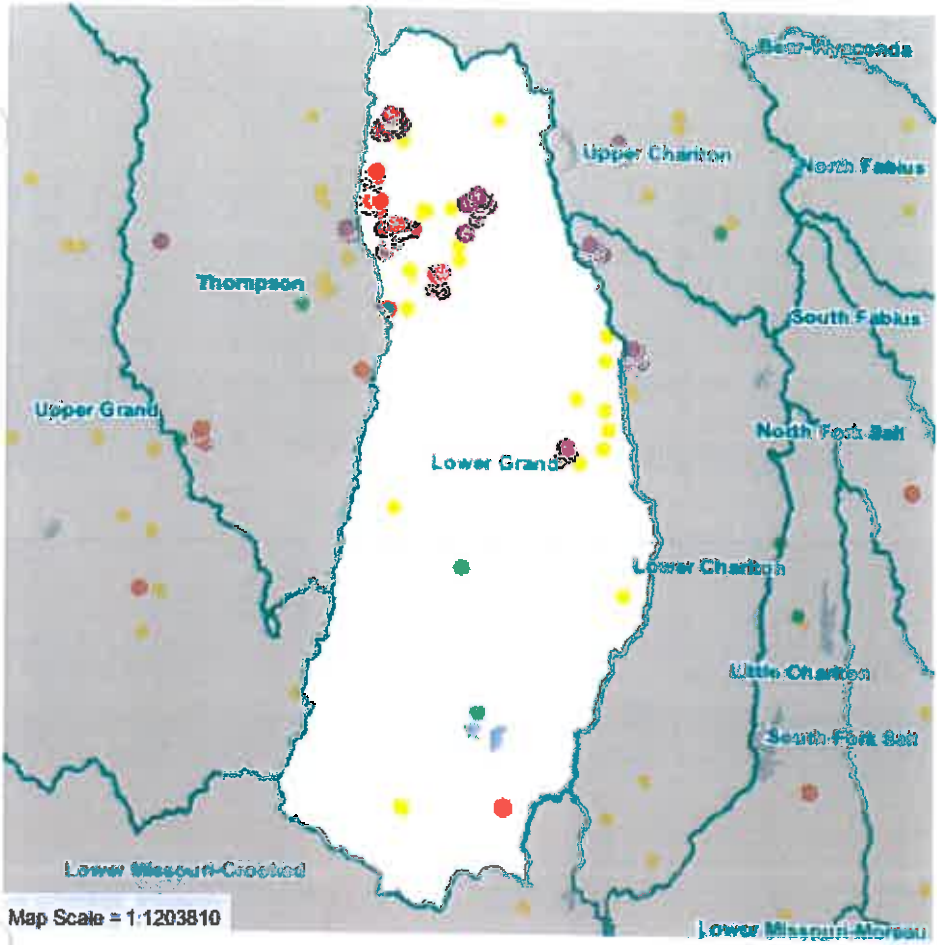


Karst Features

- Springs
- Sinkholes
- Sink Areas
- Gaining Stream
- Losing Stream

Lower Grand (10280103)

	<u>Gaining Streams</u>	<u>Losing Streams</u>	Sinks	Springs
Number	14	0	0	2
Miles	36.14	0.00		



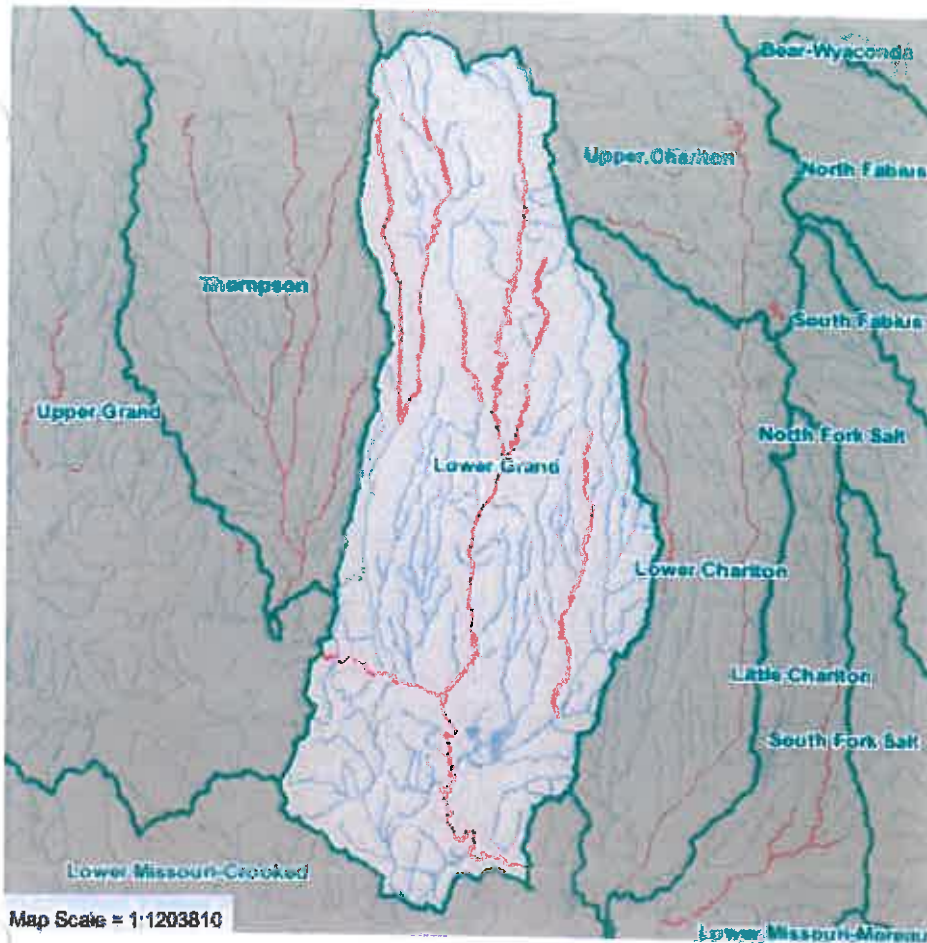
CAFOs

- IA - More than 7,000 Animal Units
- IB - 3,000 to 6,999 Animal Units
- IC - 1,000 to 2,999 Animal Units
- II - 300 to 999 Animal Units
- NP - AFO Non-Point Source

Note: Includes only MoDNR permitted Concentrated Animal Feeding Operations (CAFOs) and Animal Feeding Operations (AFOs).

Lower Grand (10280103)

Facilities	Outfalls	Animal Units	Animal Type (Units)	Facility Class
30	116	218,930	Beef (5,490) Dairy (86) Swine (213,354)	IA (5), IB (5), IC (18), II (2)



2008 303(d) Listed Lakes and Streams

— 303(d) List Lakes and
Streams

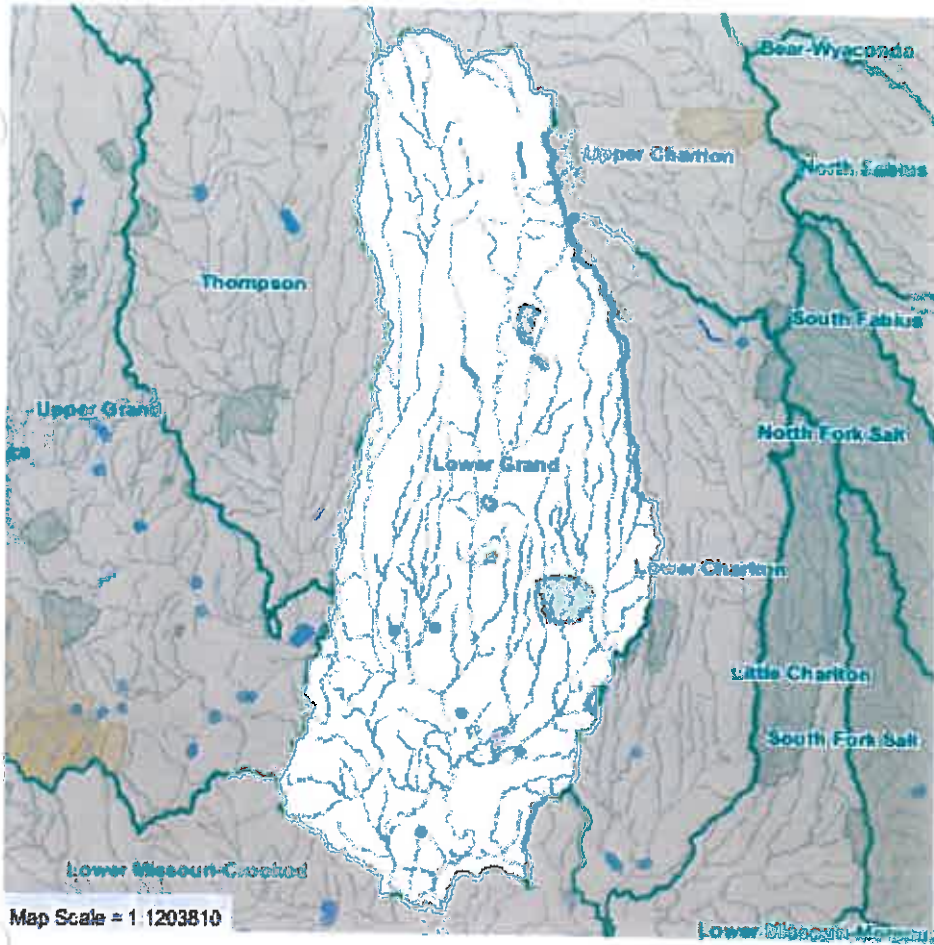
Lower Grand (10280103)

Name	Size	Pollutants	Source	Uses Impaired	TMDL Date
East Fork Locust Creek	15.42 Mi	Bacteria	Rural NPS	Whole body contact recreation (swimming)	
East Fork Locust Creek	15.42 Mi	Bacteria	Point & NPS	Whole body contact recreation (swimming)	
East Fork Locust Creek	15.42 Mi	Low D.O.	Rural NPS	Whole body contact recreation (swimming)	
East Fork Locust Creek	12.929 Mi	Bacteria	Multiple Point & NPS	Whole body contact recreation (swimming)	
East Fork Medicine Creek	43.788 Mi	Bacteria	Rural NPS	Whole body contact recreation (swimming)	<u>2006/11/22</u>
Grand River	55.96 Mi	Bacteria	Rural NPS	Whole body contact recreation (swimming)	
Locust Creek	91.684 Mi	Bacteria	Rural NPS	Whole body contact recreation (swimming)	
West Fork Locust Creek	17.593 Mi	Unknown		General criteria pertaining to protection of aquatic life	
West Fork Medicine Creek	39.794 Mi	Bacteria	Rural NPS	Whole body contact recreation (swimming)	<u>2006/10/13</u>
West Fork Medicine Creek	39.794 Mi	Unknown	Unknown	General criteria pertaining to protection of aquatic life	<u>2006/10/13</u>
West Yellow Creek	43.141 Mi	Low D.O.		No designated use	

Walt Disney 16.4 Ac Chloride
Lake

Protection of aquatic life, (includes human
health protection for fish consumption)

A total of 9 water bodies listed, with 4 unique pollutants. Click the TMDL date to access the TMDL Report.
Notations next to pollutant in parenthesis indicate the medium affected: W=water, S=sediment, T=fish tissue.

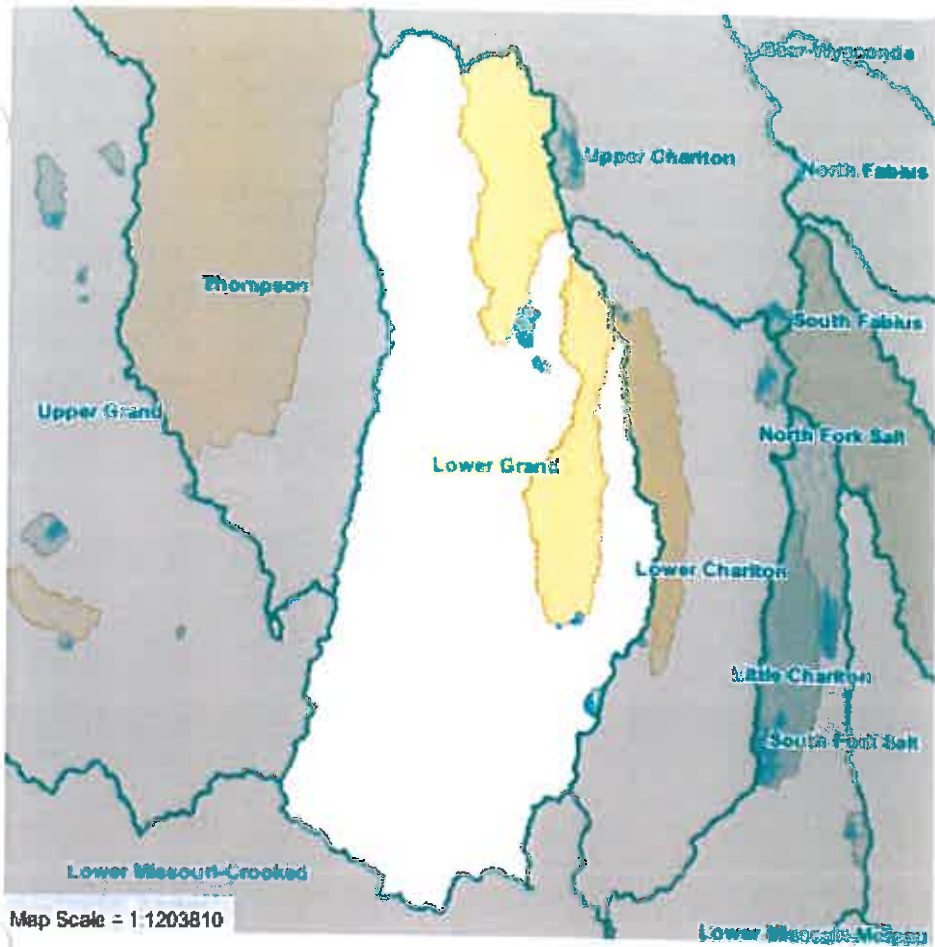


Protected Water

- Bioreference Water
- Outstanding National Resource Water Watershed
- Outstanding State Resource Water Watershed
- Public Drinking Water Watershed
- Source Water Protection Area (SWPA)

Lower Grand (10280103)

Outstanding National Resource Waters	Outstanding State Resource Waters	Biological Reference Waters	Source Water Protection Areas	% of Watershed in SWPA
0	0	2 » list	23	0.28%

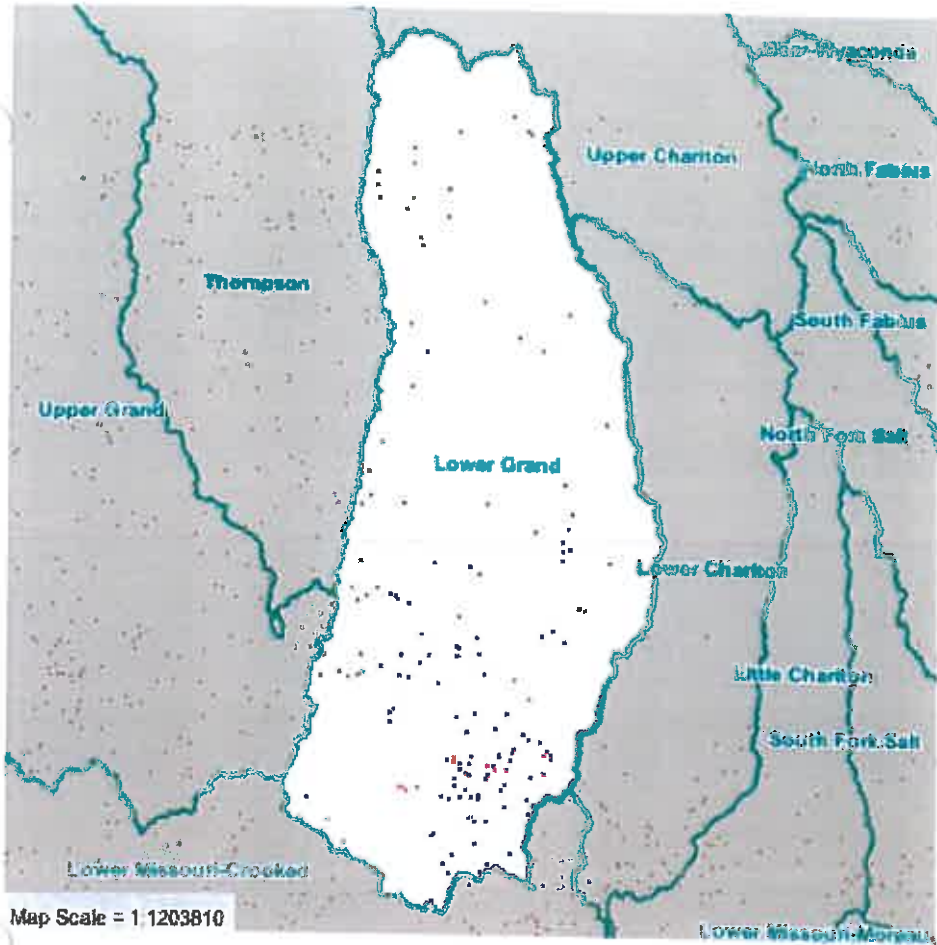


Drinking Water Intakes

- River Drainage Basins
 - Lake Drainage Basin
 - Public Water Supply Lakes
- Public water intake locations not shown for security reasons.*

Lower Grand (10280103)

Total Intakes	Persons Served	Community	Transient Noncommunity	Non-transient Noncommunity
9	45,259	42,059	0	3,200

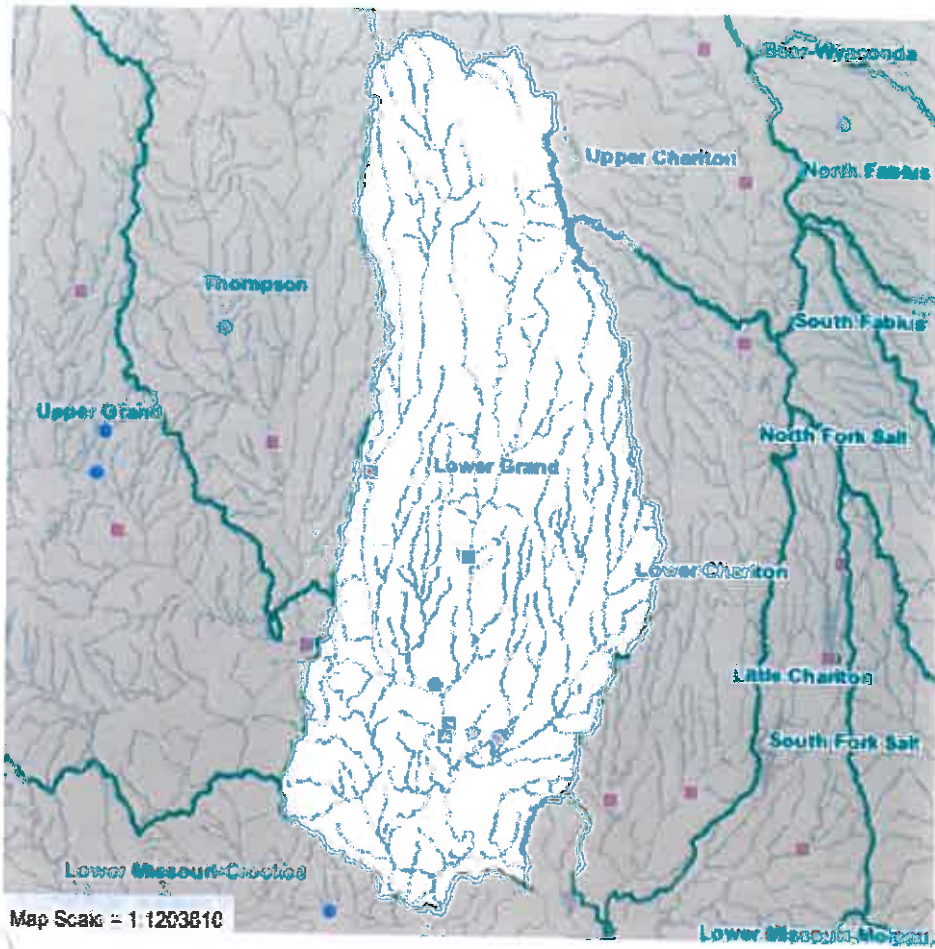


Drinking Water Wells

- Private Wells
- Public well locations not shown for security reasons.*

Lower Grand (10280103)

	Total	Private	Public (Active)	Community	Transient Noncommunity	Non-transient Noncommunity
Number of Wells	187	173	14	14	0	0

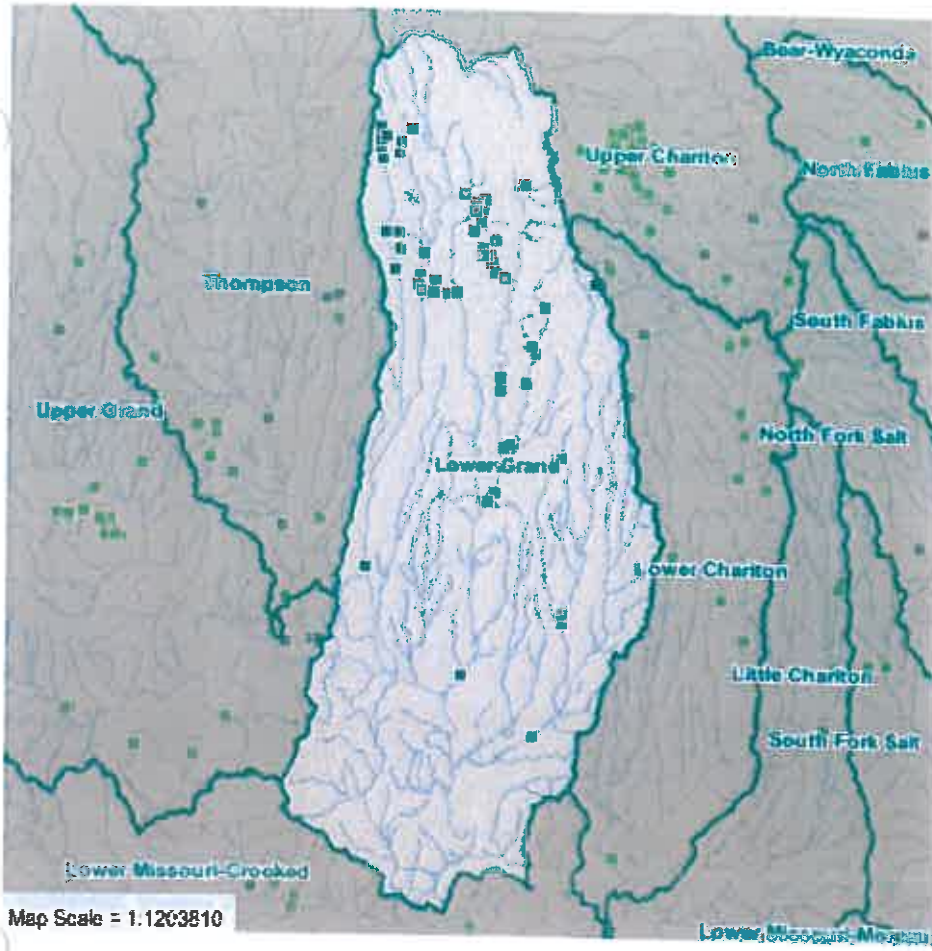


USGS NWIS Sites

- Stream Sites
- Groundwater Sites
- Other Sites

Lower Grand (10280103)

Total Sites	Stream Sites	Groundwater Sites	Other Sites
5	4	1	0

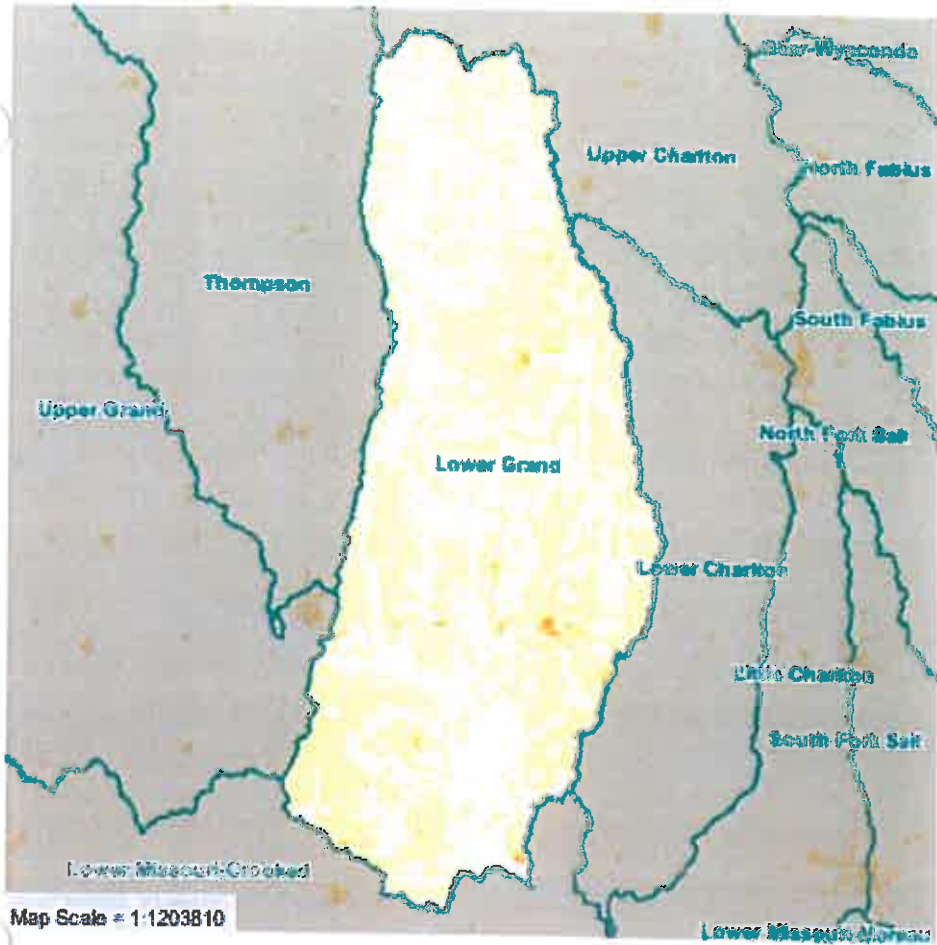


Local Initiatives

- Stream Team Monitoring Sites (not verified)
- Stream Team Monitoring Sites (verified)

Lower Grand (10280103)

Stream Team Volunteer Water Quality Monitoring Sites (number verified):	70 (18)
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Census Data

- 2,500 or More Persons Per Sq Mile
- 250 - 2,499.99 Persons Per Sq Mile
- 50 - 249.99 Persons Per Sq Mile
- Less than 50 Persons Per Sq Mile
- No population

Lower Grand (10280103)

Total Population (2010):	26,515	
Persons/Sq Mile:	11.24	
Total Population (2000):	28,506	
Population Change, 2000 - 2010:	-1991	
Age 0-4:	1,729	6.52%
Age 5-17:	4,868	18.36%
Age 18-64:	15,012	56.62%
Age 65 and up:	4,906	18.50%

Data Sources

- 8, 10, and 12 Digit Hydrologic Units:** USDA Natural Resources Conservation Service Watershed Boundary Dataset, 2009.
- 303(d) Listed Lakes and Streams:** 2008 303(d) Listed Waters, Missouri Department of Natural Resources, 2009.
- Average Annual Precipitation:** PRISM (Parameter-elevation Regressions on Independent Slopes Model) dataset for 1971-2000, Oregon State University, 2006.
- Census Data:** 2010 Census Block Summary Data, U.S. Census Bureau, 2012.
- Cities and Towns:** 2008 U.S. Census Bureau Tiger Boundary File, 2009.
- Common Resource Areas:** USDA Natural Resources Conservation Service (NRCS), 2009.
- Confined Animal Feeding Operations (CAFOs):** Missouri Department of Natural Resources, NPDES, 2009.
- County Boundaries:** 2008 U.S. Census Bureau Tiger Boundary File, 2009.
- Crop Acres by Crop Type:** NASS County crop estimates, average acres 2000-2004.
- Highly Erodible Lands:** USDA Natural Resources Conservation Service, SSURGO data (NASIS attributes), 2006.
- Highways and Roads:** Missouri Department of Transportation (MoDOT), 2009.
- Hydrologic Soil Groups:** USDA Natural Resources Conservation Service, SSURGO data (NASIS attributes), 2009.
- Land Slope:** 30-Meter National Elevation Dataset, USGS, 2009.
- Land Use/Land Cover:** National Land Cover Database 2006, USGS, Multi-Resolution Land Characteristics Consortium, 2011.
- Lossing/Gaining Streams:** Missouri Department of Natural Resources, DGLS, 2006.
- Major Land Resource Areas:** USDA Natural Resources Conservation Service (NRCS), 2009.
- National Wetland Inventory:** U.S. Fish and Wildlife Service, 2009.
- Outstanding National Resource Waters:** Missouri Department of Natural Resources, 2005 Outstanding National Resource Waters, 2007.
- Outstanding State Resource Waters:** Missouri Department of Natural Resources, 2005 Outstanding State Resource Waters, 2007.
- Prime Farmland:** USDA Natural Resources Conservation Service, SSURGO data (NASIS attributes), 2009.
- Private Wells:** Missouri Department of Natural Resources, Certified Wells (private only) and Well Logs (drinking water only), 2006.
- Public Drinking Water Watersheds:** Missouri Department of Natural Resources, 2003 (CARES update 2007).
- Public Drinking Water Wells:** Missouri Department of Natural Resources, 2009. MoDNR 2007 Census of Missouri Public Water Systems.
- Public Lands:** Missouri Department of Natural Resources, 2009, Missouri Department of Conservation, 2008, U.S. Forest Service, 2005, U.S. Fish and Wildlife Service, 2009, MoRAP (for NPS & USACOE lands), 2000.
- Relief Map:** 30-Meter National Elevation Dataset, USGS, 2009.

Sinkholes: Missouri Department of Natural Resources, 2006.

Source Water Areas: Missouri Department of Natural Resources, 2009.

Springs: Missouri Department of Natural Resources, 2006.

Streams and Lakes: U.S. Geological Survey National Hydrologic Dataset, High Resolution, 2009.

Stream Teams: Missouri Department Natural Resources, 2009.

USGS NWIS Sites: USGS National Water Information System (NWIS), 2007.



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