Watershed Management Plan in the Lower Meramec Watershed

Water Resources Committee

December 8, 2016

East-West Gateway Council of Governments

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Watershed Plan Update

- Water Quality plan with focus on non-point source runoff, aquatic habitat, and healthy streams
- Includes and references other plans in the focus area
- Update of 2012 Watershed Plan

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Steps in Watershed Planning

1. Build Partnerships
2. Characterize the Watershed to ID Problems
3. Set Goals & ID Solutions
4. Design an Implementation Program
5. Implement the Watershed Plan
6. Measure Progress & Make Adjustments

EPA Handbook, p. 2-5

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Partnerships

- Meet needs of local Communities
- Coordinate with other plans including
  - St. Louis County Parks Plan
  - Great Rivers Greenway Plan
  - Joint Feasibility Study (USACE & Mo DNR)
  - The Nature Conservancy Conservation Action Plan
  - USGS Flood Mapping
  - MSD & other Sewer District Plans
  - Regional Hazard Mitigation Plan

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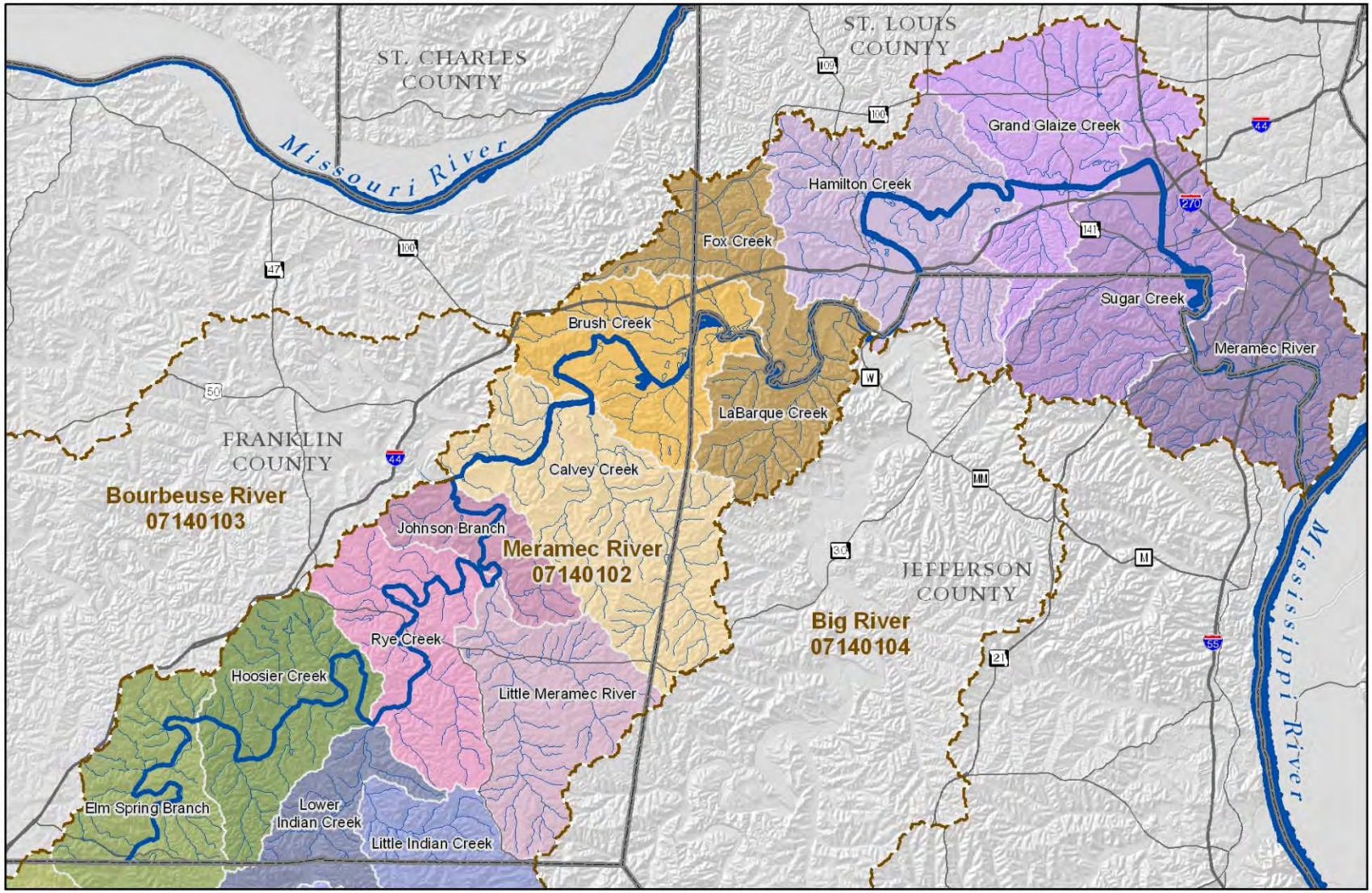
Lower Meramec River Watershed



Legend

- Lower Meramec Subwatersheds (12-digit HUC)
- Selected Watersheds (8-digit HUC)
- River or Stream
- County Boundary
- Interstate Highway
- Major Road

0 2.5 5 10 Miles

Sources: USDA/NRCS via MSDIS,
East-West Gateway Council of Governments
August 2009

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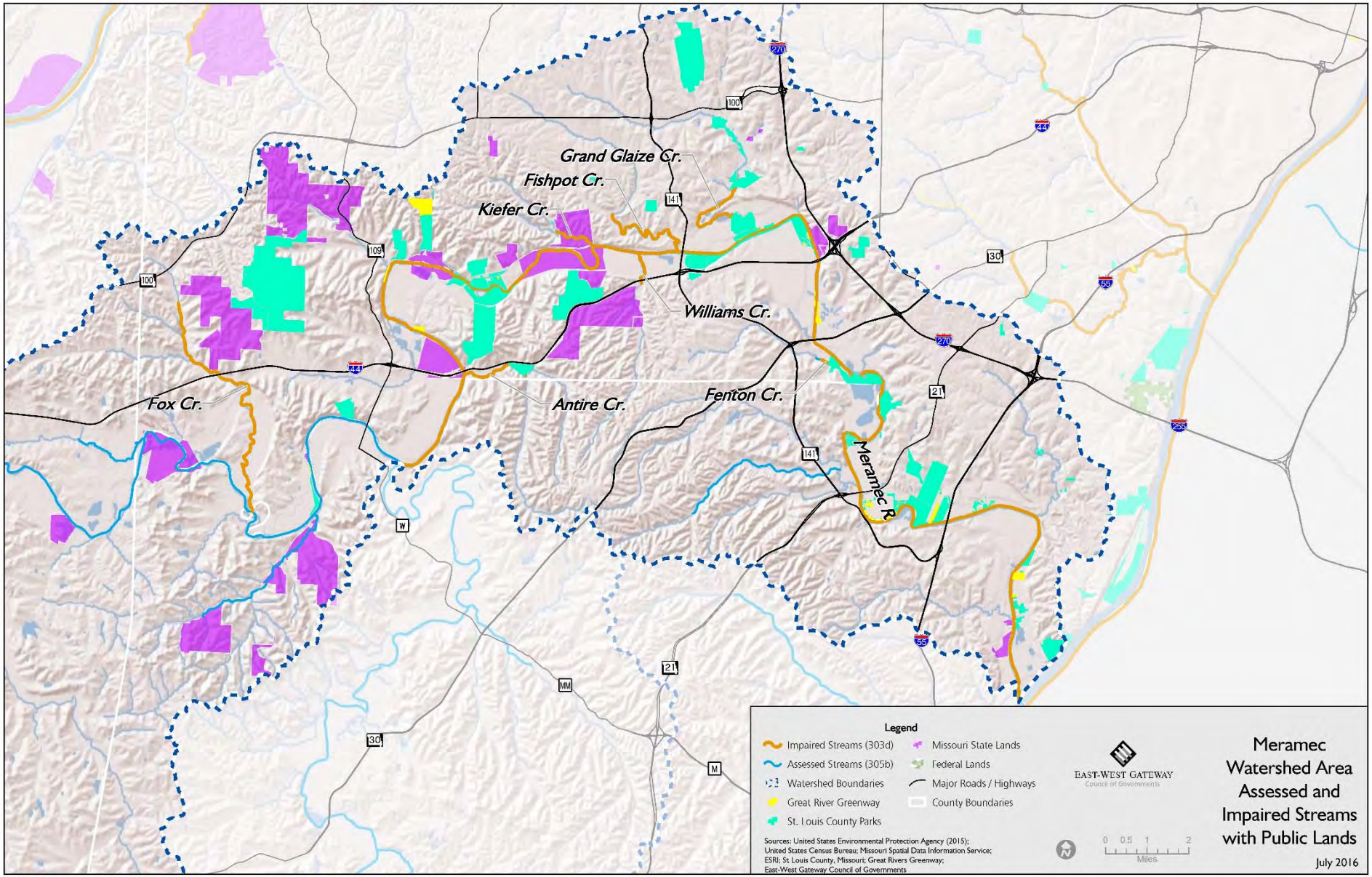
Creating Solutions Across Jurisdictional Boundaries



Impaired Streams

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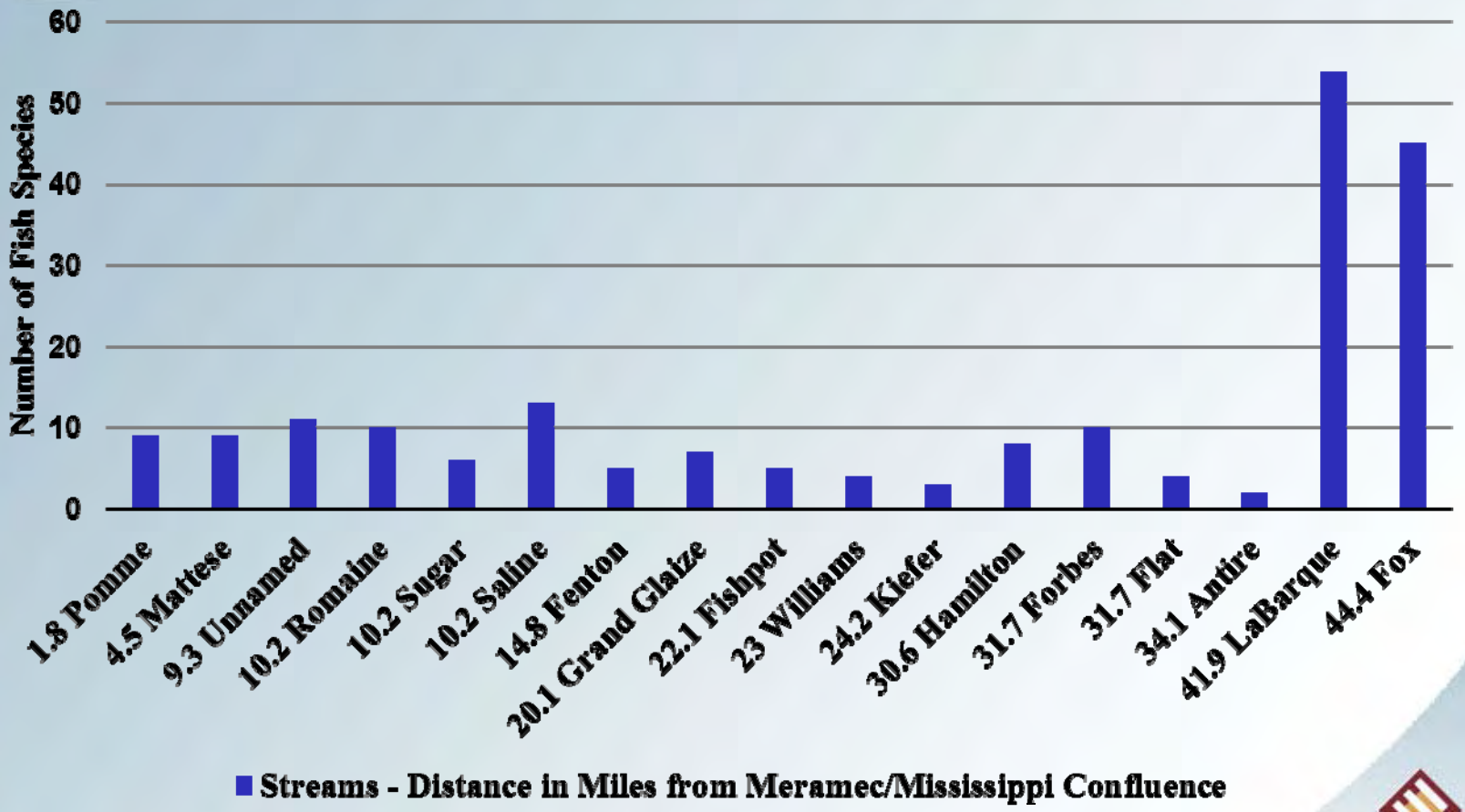
Fish Species in Meramec River Tributary Streams



Source – MDC 2015

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Goals of 2012 Plan

1. Provide a framework for planning
   (in subwatersheds, e.g., Kiefer Creek)
2. Protect and improve water quality
3. Reduce extreme fluctuations in stream flow
4. Reduce flooding and erosion problems
5. Demonstrate strategies for water quality protection
6. Educate citizens re-
   - Non-point source pollution
   - Strategies to reduce stormwater runoff

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Priorities for 2016-2017 Update

I. Protect/Expand size of riparian corridor buffer zone on main stem and tributaries
II. Expand use of Green Infrastructure
III. Eliminate / Control Waste Water System Discharge
IV. Engage Public in Positive Action
V. Encourage agriculture best practices

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I. Protect and the increase size of riparian corridor buffer zone

A. Stabilize stream banks and stream channels (TNC, USACE)

B. Buy out flood prone properties (MSD, Local Governments, FEMA)

C. Look for political solutions: Establish standard setbacks among counties and cities

Benefits: *Improve aquatic habitat, reduce overland flow, alleviate in-stream pollution, reduce flood damage, reduce costs of protection, improve recreation*

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II. Expand use of Green Infrastructure

A. Implement demonstration Rainscaping projects on public lands (State, County, GRG, Municipal Land)

B. Implement a private lands Rainscaping cost share program (e.g., Missouri Botanical Garden/MSD)

Benefits: *Capture rainfall where it lands; reduce erosion, engage the public*

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III. Control Waste Water System Discharge

A. Connect homes with on site treatment to sewers (MSD & other Sewer Districts)

B. Hook up small (package) treatment facilities to larger systems (MSD & other Sewer Districts)

C. Upgrade, repair, maintain on-site treatment systems though resident education & cost share assistance (potential project)

Benefits: *Reduce sources of waste into the streams*

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IV. Engage Public in Positive Action

A. Support River Bank Clean up and planting activities (Open Space Council)

B. Increase public awareness of how behavior affects water quality

C. Increase opportunities for the public to enjoy river and environs

Benefits: *Public will have greater responsibility for water quality*

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V. Encourage Agriculture Best Practices

A. Reduce runoff from agricultural property
(Soil and Water Conservation Districts)

B. Contain & manage animal waste

Benefits: Reduced erosion, sedimentation and improved aquatic habitat

Project Planning Process

- Identify Priority Areas
- Identify Partners and Resources
- Identify Projects

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Missouri Department of Natural Resources

Missouri Conservation Department

MSD

The Nature Conservancy

The Open Space Council for the St. Louis Region

Great Rivers Greenway

The U.S. Environmental Protection Agency Region 7, through the Missouri Department of Natural Resources, has provided partial funding for this project under section 319 of the Clean Water Act.

Core Partners

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The Simple Method to Calculate Urban Stormwater Pollutant Loads

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Why Model?

- To characterize a watershed
- To estimate load reductions from potential management measures
- Required component of an EPA Section 319 watershed plan (9 element plan)

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Simple Method to Calculate Urban Stormwater Loads

- Stormwater Manager's Resource Center
- Spreadsheet approach to estimate annual storm event runoff pollutant loads or bacteria by developed land uses and roads for a specific drainage area
  - Baseline conditions
  - What if scenarios

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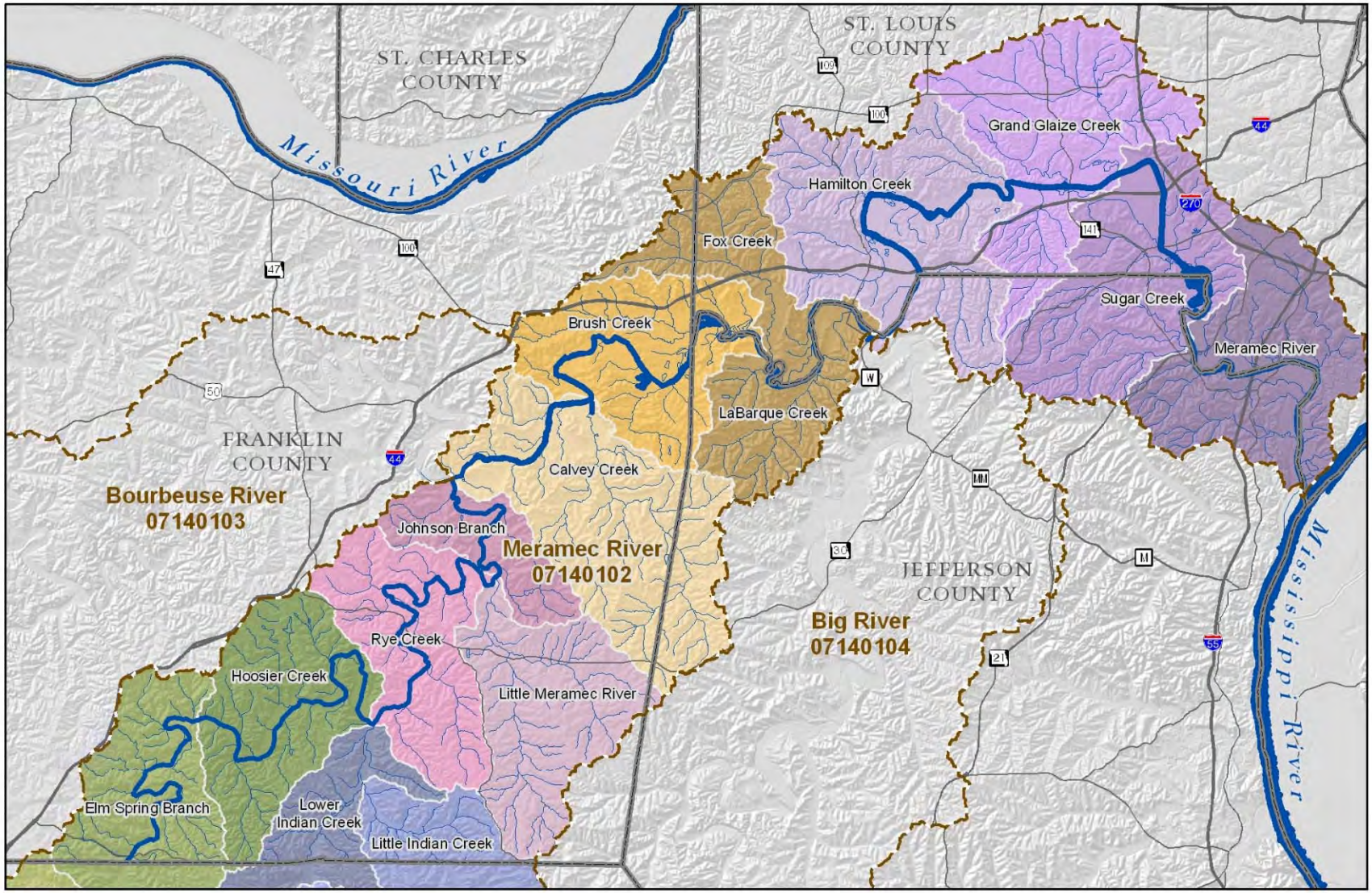
Lower Meramec River Watershed



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Creating Solutions Across Jurisdictional Boundaries

Analysis for Lower Meramec Watershed Plan Update

- HUC 12 Watersheds
  - Sugar/Fenton Creeks
  - Pomme/Mattese Creeks

- Impaired Streams
  - Kiefer Creek
  - Fishpot Creek
  - Grand Glaize Creek
  - Williams Creek
  - Fenton Creek
  - Mattese Creek

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Simple Method Inputs

- For each land use category in analysis area
  - Impervious acreage*
  - Annual runoff*
  - Pollutant concentration or bacteria mean event concentration

*User to calculate, process identified in Simple Method methodology

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Pollutant Simple Method Formula

Impervious Acreage x
Annual Runoff x
Pollutant Concentration (milligrams/liter) x
Conversion Factor (0.226) =
Annual Pollutant Load (pounds)

Calculated for each pollutant for each land use category in the analysis area

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Bacteria Simple Method Formula

Impervious Acreage x
Annual Runoff x
Bacteria Event Mean Concentration (colony forming units/100 milliliters) x
Conversion Factor (0.00103) =
Annual Loading (billion colonies)

Calculated for each bacteria for each land use category in analysis area

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Kiefer Creek
Developed & Impervious Acreage

Developed Land	Total Acres	Mean Impervious Cover % *	Impervious Acres
Commercial	162.8	72	117.2
Industrial	25.5	53	13.5
Institutional	58.1	34	19.8
Multi-Family Residential	276.5	43	118.9
Single-Family Residential	2,034.6	24	488.3
Developed Subtotal	**2,557.5**	**NA**	**757.7**
Watershed Total	4,256.7		
Roads	**183.3**	**100**	**183.3**

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* Upper Delaware Watershed Management Study

Kiefer Creek – Pollutant Annual Storm Event Loading

Land Use	Pollutant (pounds/year)			
	Phosphorus	Nitrogen	Total Suspended Solids	Biological Oxygen Demand
Commercial	138.8	1,387.9	52,047.3	6,453.9
Industrial	18.1	151.0	7,249.2	308.1
Institutional	12.1	108.7	4,047.5	471.2
Multi-Family Residential	177.4	975.4	44,337.8	2,261.2
Single-Family Residential	445.8	2,452.1	86,633.4	5,684.4
Roads	737.4	4,424.3	221,213.8	13,715.3
Total	**1,529.6**	**9,499.5**	**417,528.9**	**28,894.1**

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Kiefer Creek – Bacteria Annual Storm Event Loading

Land Use	Bacteria (billion colonies)	
	Fecal Coliform	*E. coli*
Commercial	14,232.4	12,518.2
Industrial	688.3	584.5
Institutional	844.9	726.6
Multi- Family Residential	15,660.5	14,231.8
Single-Family Residential	29,368.3	35,776.9
Roads	11,426.1	9,477.0
Total	**82,220.5**	**73,315.0**

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What If Scenarios

- Baseline load estimates are a starting point to evaluate pollutant/bacteria loadings for different stormwater BMPs over 20 year period
- Assumptions
  - Total impervious acreage would remain the same
  - In 20 years, 60% of impervious acreage in a land use category would be affected by BMP
  - In 20 years, 20% of impervious acreage in the road category would be affected by BMP

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What If Inputs

- BMPs included – bioretention, swales, rain gardens, pervious pavement
- BMP pollutant/bacteria removal efficiencies came from national and regional sources/tools
- For each land use category, pollutant loads recalculated for impervious acres with BMP and without

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What If – Kiefer Creek Storm Event Loading

Pollutant/ Bacteria	Baseline Total	Year 20 with BMPS Total	Percent Change
Pollutant (pounds per year)			
Phosphorous	1,529.6	1,241.8	- 18.8
Nitrogen	9,499.5	7,771.1	- 18.2
Total Suspended Solids	417,528.9	313,410.0	- 24.9
Biological Oxygen Demand	28,894.1	Not calculated	NA
Bacteria (billion colonies)			
Fecal Coliform	82,229.1	45,778.9	- 44.0
E. coli	73,322.4	40,602.0	- 45.0

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Questions

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