



**Missouri Department of Natural Resources
Water Pollution Control Program**

UPDATE

for the

James River TMDL

**Webster, Greene, Christian and Stone
Counties, Missouri**

December 2004

James River Total Maximum Daily Load (TMDL)
UPDATE: December 2004
Pollutant: Nutrients and Unknown

Name: James River

Location: Webster, Greene, Christian and Stone Counties

Hydrologic Unit Code (HUC): 11010002

Water Body Identification (WBID): 2347, 2362, 2365

Missouri Stream Class: The impaired segments of James River are Class P streams.¹



Beneficial Uses (all three segments):

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health associated with Fish Consumption
- Whole Body Contact Recreation (swimming)
- Boating and Canoeing
- Cool Water Fishery

In addition: Segments 2347 and 2362 have the beneficial use of Irrigation
Segment 2365 is used as a Drinking Water Supply

Size of Impaired Segments:

- 2347 – 28 miles
- 2362 – 26 miles
- 2365 – 4 miles

Location of Impaired Segments:

- 2347 – From Section 10, T24N, R24W to Section 8, T26N, R22W
(Approximately from Table Rock Lake to the confluence with Finley Creek)
- 2362 – From Section 8, T26N, R22W to Lake Springfield Dam
(Approximately from Finley Creek to Springfield)
- 2365 – From Highway 65 to Section 24, T29N, R17W
(Approximately from Springfield to headwaters in Webster County)

Pollutant: Nutrients

Pollutant Source: Urban Point and Nonpoint Sources, Agricultural Nonpoint Sources

¹ Class P streams maintain flow even during drought conditions. See 10 CSR 20-7.031(1)(F)

1. Introduction and Statement of Purpose

The U.S. Environmental Protection Agency approved the James River Phased TMDL on May 7, 2001. This document will review Phase I of the TMDL, highlight the many efforts being made in the watershed to address the nonpoint sources of nutrients and, using the data collected during Phase I, suggest areas in which to concentrate future remediation efforts.

All background information, specifics on the watershed and the rationale and calculations used in deriving the TMDL target may be found in the James River TMDL. This document is posted on the Missouri Department of Natural Resources' website at:

<http://www.dnr.mo.gov/wpscd/wpcp/tmdl/wpc-tmdl-EPA-Appr.htm> Alternatively, a paper copy may be obtained by phoning 573-751-6623.

2. TMDL Target and Applicable Water Quality Standards

The goal of the TMDL is to bring the James River back in line with Missouri's Water Quality Standards (WQS), which are described below. This will be accomplished by reducing the frequency of large algal blooms through target in-stream nutrient limits of 0.075 mg/L (milligrams per liter) total phosphorus and 1.5 mg/L total nitrogen.

Water Quality Standards:

The impairment of the James River is based on exceedence of the general criteria contained in the WQS at 10 CSR 20-7.031 (3)(A) and (C). These general criteria state:

- Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses.
- Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses.

The occurrence of excessive benthic algae and green colored water caused by suspended algae constitute a violation of these standards.

Also, Missouri Effluent Regulations at 10 CSR 20-7.015(3)(G) set out a specific compliance schedule for point sources that discharge to the Table Rock Lake watershed. The schedule requires them to reduce the phosphorus in their discharge to 0.5 mg/L.

3. Implementation Progress for the Phase I of the James River TMDL

3.A. Historic efforts (prior to TMDL approval in May 2001) that help address the nutrient impairment of the James River:

- November 1999: Rule-making regarding phosphorus limit of 0.5 mg/L for all wastewater plants in the Table Rock basin with discharges $\geq 22,500$ gallons/day.
- On August 21, 1995, the Springfield City Council approved a Phosphorus Ban Ordinance.² This amendment banned household laundry detergents which contain more than 0.5 percent of phosphorus and dishwashing detergents containing more than 8.7 percent phosphorus from

² Watershed Committee of the Ozarks, *Water Resources of Greene County*, 1997, page 88.

being sold to the public. The ordinance banned high phosphorus detergents to be used, sold, manufactured, distributed or discharged into the City of Springfield's sewer system. This ordinance limits the amount of phosphorus entering Springfield treatment plants and subsequently being discharged to receiving streams. The ordinance did not, however, address phosphorus detergents being used by the private sector, such as restaurants and hotel chains.

3.B. Implementation Plan for Phase I of the TMDL:

These are the implementation efforts suggested for Phase I. See Section 4 for details on how these plans are succeeding.

- 1999 Phosphorus rule. Re-issuance of the wastewater facility permits through the established permit process for those plants that are required to have phosphorus limits. The compliance schedule established in the WQS is set out under Phase II below (4.A.).
- Issuance of the Springfield Storm water Permit (See 4.B.).
- The issue of increased amounts of nutrient enriched sludge due to phosphorus removal at treatment plants will be addressed in permit issuance. The concern regarding nutrients entering the James River due to inappropriate handling of sludge needs to be addressed. Application rates for the sludge are specified in a facility's permit and are based on agronomic application rates. Other options for sludge management include landfilling or incinerating the sludge. The City of Nixa currently composts its sludge and it gets reused in the community as a fertilizer. Although no option for disposal is fool-proof in preventing the nutrient load from re-entering the James River, if managed appropriately, innovative sludge management approaches should minimize the problem.
- Three years of data collection by Southwest Missouri State and U.S. Geological Survey. Since the goal of this TMDL is to reduce the frequency of large algal blooms, measurement of factors responsible for the gain and loss of algae were collected (See Section 5).
- Continued progress on the James River Watershed 319 Project, sponsored by the James River Basin Partnership, a not-for-profit 501(c)(3) organization (See 4.C.).
- The funding of a storm water education position under the Watershed Committee of the Ozarks, a local watershed partnership, working in conjunction with city and county governments (See 4.F.).
- The Phase II Storm water Permit program. This program went into effect in December 2002. Galena Township (in Stone County) and Greene and Christian counties are required to develop storm water management plans for their more densely populated areas. TMDL and storm water permitting staff will work jointly on nutrient issues that can be addressed through the storm water permitting process.
- Explore possibilities for voluntary watershed projects with existing organizations that have a working relationship with the agriculture community. Existing watershed organizations have secured more 319 grants and AgNPS SALT funds to facilitate the implementation of nutrient BMPs (See 4.D and E).

4. Update on Phase I projects

4.A. 1999 Phosphorus rule

The rule regarding the removal of phosphorus from discharges to Table Rock Lake can be found in the Missouri Water Quality Standards at 10 CSR 20.7.015(3)(G). The compliance schedule contained in this rule is as follows:

- Facilities with a design flow of 1,000,000 gallons/day or greater must comply with the rule no later than four years from the date of the rule-making (November 1999).
- Facilities with a design flow of 100,000 – 999,999 gallons/day must meet an interim phosphorus limit of 1.0 mg/L no later than four years from the effective date of the rule and must attain full compliance with the 0.5 mg/L requirement no later than eight years from the date of the rule.
- Facilities with a discharge of 22,500 – 99,999 gallons/day have no interim limits and must attain full compliance with the 0.5 mg/L monthly average for phosphorus no later than eight years after the date of the rule-making.

Table 1. Facilities Required to Implement Phosphorus Removal to a Monthly Average of 0.5 mg/L

FACILITY NAME	DESIGN FLOW GALLONS/DAY	COMPLIANCE DATE
Springfield Southwest Wastewater Treatment Plant	42,500,000	November 2003
Nixa Wastewater Treatment Facility	1,846,500	November 2003
Ozark Wastewater Treatment Plant	750,000*	November 2007
Crane Municipal Wastewater Treatment Plant	300,000*	November 2007
Seymour Municipal Wastewater Treatment Plant	252,000*	November 2007
Rogersville Wastewater Treatment Plant	112,000*	November 2007
Fordland Municipal Wastewater Treatment Facility	100,000*	November 2007
Sparta Wastewater Treatment Facility	94,500	November 2007
MDOC, Ozark Correctional Facility	92,000	November 2007
Fremont Hills Wastewater Treatment Facility	90,000	November 2007
English Village Mobile Home Park	80,250	November 2007
Clever Municipal Wastewater Treatment Facility	70,000	November 2007
Galena Wastewater Treatment Plant	60,000	November 2007

* Plants that must meet an interim limit of 1.0 mg/L by November 2003.

Status of the above facilities as of November 2004:

1.) Plants with a compliance date of November 2003:

Springfield SW WWTP – went on-line with chemical phosphorus (P) removal Feb. 2001. They are achieving well under 0.5 mg/L. The Lakes of Missouri Volunteer Program (See 4.G.) published a poster with data from 1997 – 2002 showing dramatic decreases in P in the James River and Table Rock Lake. These were correlated with the decrease in P being discharged from Springfield SW WWTP. A print-out of the poster is attached.

Nixa WWTP – started chemical P removal on or before November 2003 because the biological P removal had not been very successful.

2.) Plants with an interim schedule for November 2003 and final compliance date of November 2007:

Ozark WWTP – started chemical P removal 10/28/03. Final inspection Feb. 2004; doing well.

Crane WWTP – working with the department

Seymour WWTP – started chemical P removal. Final inspection May 27, 2004; doing well.

Rogersville WWTP – started chemical P removal 9/26/03. Final inspection Feb. 2004; doing well.

Fordland WWTP – started on or before 2/23/04. Final inspection Feb. 2004; doing well.

3.) Plants with a compliance date of November 2007

Sparta WWTP – applied for State Revolving Funds (SRF) for upgrade in Oct. 2003. At present, the department does not have funds to lend.

Ozark Correctional Facility – Permit renewed June 2, 2004 with 0.5 mg/L phosphorus limit to go into effect December 1, 2007 (as per rule).

Fremont Hills WWTP – applied for SRF for the November 15, 2004, deadline.

English Village Mobile Home Park – Hooked into the Springfield sewage system. Completed by 6/9/04.

Clever WWTP – no application yet

Galena WWTP – applied for SRF Oct. 2003. November 2004; application still on file; still no department funds available.

4.B City of Springfield Storm water Permit

This permit was issued to Springfield Public Works on July 26, 2002, and the first annual report was submitted in December 2003³. Of particular interest to this TMDL is the storm water monitoring that the city is conducting because it might reveal as yet unknown sources of nutrient input to the James River. From the permit:

Monitoring to be completed by the City of Springfield covers several parameters including:

- Total Dissolved Solids
- Total Suspended Solids
- Total Kjeldahl Nitrogen
- Nitrate + Nitrite
- Dissolved Phosphorus as P
- Total Phosphorus as P
- Estimates of Stream Flow

Grab samples collected from six identified locations provide information on the effectiveness of the storm water management program being implemented by the city. These locations are near city limits and evaluate the cumulative effects of storm water runoff from sub-watersheds.

Ambient sampling includes sample collection at all locations during the second week of March, the second week of May and the second week of November each year. A fourth sample is collected between March 1 and May 31 and is a wet weather sample. It is collected not later than 48 hours after a storm event of at least 0.2 inch and less than 3.0 inches during a 24-hour period. Another part of the monitoring program involves field screening for illicit discharges. Additionally, each year, 25 random points are selected for monitoring to evaluate industrial discharges to the storm water system during wet weather periods. Best Management Practices (BMPs) to be implemented by the city were identified during the permit process. The city was

³ http://www.ci.springfield.mo.us/egov/publicworks/storm_water/stormwater_docs.html

encouraged to use the recommended practices for urban storm water management that are identified in Missouri's approved Nonpoint Source Management Plan⁴.

Any efforts to prevent untreated storm water from entering the river will help improve its water quality. Most noteworthy and applaudable, in many cases the city has gone above and beyond the requirements and recommendations of the permit. Some of the many programs and BMPs that are being implemented in Springfield are listed below.

- Creating and upgrading detention basins
- Stream channel stabilization
- Algae management measures
- Floodplain Acquisition Program
- Flood hazard mapping
- Improved de-icing practices
- Street cleaning
- Environmental controls on usage of pesticides
- Mapping of the whole Springfield area to help with the illicit discharge investigation

Best management practices may be changed if data show a specific management practice is not effective in reducing the loading of the pollutants of concern. Of note, all sample results from the first year of monitoring were below the water quality standards for the designated uses or were below current detection limits. However, the results from the following sampling events exceeded the TMDL target for total phosphorus (currently there are no WQS for nutrients): South Creek on 4/7/03 and 5/13/03, Jordan Creek on 5/13/03 and Jones Spring on 4/7/03. The remaining results were below the TMDL targets for both total phosphorus and total nitrogen.

4.C. The James River Watershed 319 Project

The James River Watershed 319 Project is one of the primary vehicles for getting best management practices (BMP) initiated in the James River Watershed. It is managed and executed by the James River Basin Partnership, a not-for-profit 501(c)(3) organization. The five-year (2001-2006), \$1,043,917 project will focus to improve and sustain water quality in three subwatersheds of the James River: Lower Finley/Elk Valley, Upper Flat Creek and an Urban Target area directly below Springfield Lake. A variety of BMPs were implemented to address not only agricultural pollutants, but urban pollutants as well. Practices include riparian corridor restoration, well and cistern plugging and sinkhole protection. Septic tank clean-out and rebates on the cost of urban soil testing apply to the Urban Target area. Agricultural soil testing and effluent testing apply to the Lower Finley/Elk Valley and Flat Creek areas. Also, the project stipulates that fifteen agricultural operations be selected to receive total nutrient management plans targeting nitrogen and phosphorus management. This is to ensure land application procedures that will be protective of water quality. Educational outreach efforts in the project include the James River Rescue, presentations to civic groups, Clean Water Kids water quality education program, a toll-free water quality information resource line and news releases about the James River Basin Partnership and water quality information for publication in local media. The project is 75 percent completed as of November 2004. The Partnership has applied for another 319 grant focused on storm water management to continue their beneficial efforts.

⁴ Available from the Missouri Department of Natural Resources or on the department web site: <http://www.dnr.state.mo.us/deq/wpcp/wpcnpsmp.htm>

4.D. Watershed Committee of the Ozarks 319 Projects

The WCO has been in existence for 20 years now. It conceives of and leads many projects to help improve water quality and quality of life in Springfield. It is currently directing five 319 grants, three of which impact the James River watershed.

- 1) *Show-Me Yards and Neighborhoods*. This is the second grant for this project. It educates homeowners and lawn care companies about better practices in people's yards.
- 2) *The Boy Scout Storm water Education and Demonstration Project*. The plan is to retrofit an existing detention basin into a storm water filtering and retention system to educate the citizens of Springfield about storm water management. This system will be used to treat water before it enters Pearson Creek, protecting water quality. An education facility and nature trails will be built on-site to inform the public of the value of wetlands and multiple use benefits from urban storm water facilities. The project was to run from July 2002 to Dec. 2004. It has been extended a year.
- 3) *Onsite Stormwater & Wastewater Demonstration Project*. This grant through the Missouri Department of Natural Resources will help fund an onsite storm water and wastewater demonstration site. This demonstration will showcase innovative solutions to storm water and on-site wastewater controls.

4.E. Ag NPS SALT Projects

The proposal for an Agriculture Nonpoint Source (AgNPS) Special Area Land Treatment (SALT) project for the Spring Creek watershed was discussed in Phase I of the TMDL. Spring Creek is a tributary of Crane Creek and Crane Creek flows into the James above Galena. This plan was approved in May 2001. Regrettably, it was terminated in March 2004 due to inadequate progress.

Other AgNPS SALT projects in the watershed now include the two below. The term for each is from July 1, 2001 to June 30, 2009. The budget for each is \$750,000:

- Crane Creek, under the Stone County Soil and Water Conservation District (SWCD), to treat 53,060 acres. A brief summary of the objectives and present achievements is:
 - Decrease sediment and nutrients loading by implementing total resource management on 16,000 acres. Promote proper waste management to reduce the amount of pesticides, nutrients, and bacteria.
 - Establish and improve riparian corridors
 - Education/outreach-workshops, tours and grazing schools
- James River Headwaters, under the Webster County SWCD, to treat 75,356 acres.
 - Improve/maintain grassland health
 - Improve/maintain woodland health
 - Education/outreach – conservation practices, dealing with noxious weeds and better management practices.

Both of these projects are making good progress toward their goals.

4.F. Storm water educator

A 319 grant, administered by the Watershed Committee of the Ozarks, was started in June of 2004 that includes storm water education. A part-time person will be used until Dec. 31, when a full-time coordinator will be hired. This educator will deal with on-site wastewater training and groundwater education as well as storm water demonstrations and education.

4.G. Lakes of Missouri Volunteer Program (LMVP)

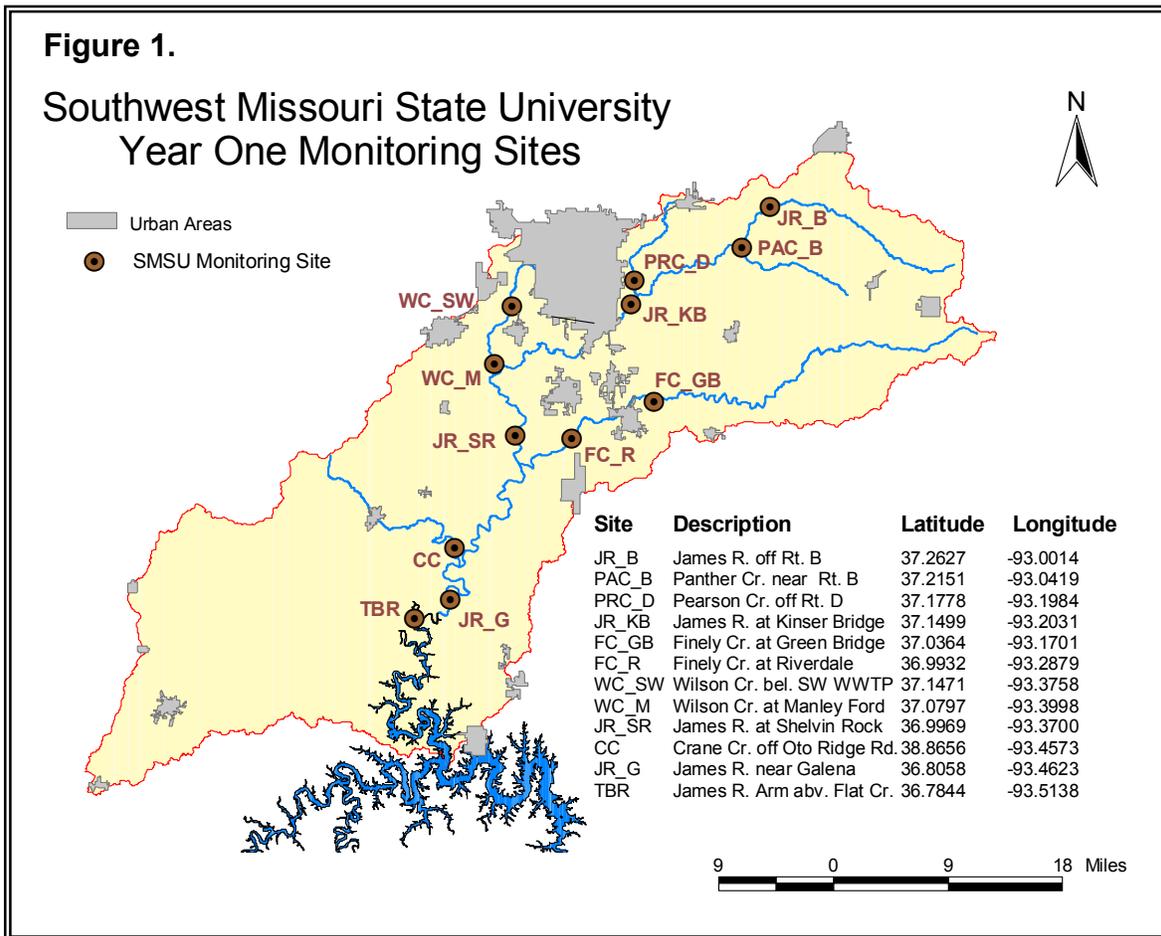
The Lakes of Missouri Volunteer Program was created in 1992 to determine the current water quality of Missouri's lakes, to monitor for changes in water quality over time, and to educate the public about lake ecology and water quality issues. Since then, about 200 volunteers have participated and water samples have been collected on over 50 different lakes around the state. The program is funded in part with 319 funds.

Using data collected under their program, the LMVP has created a poster showing improved phosphorus levels in Table Rock Lake (TRL), of which the James River is a major tributary. The poster correlates the levels of P being discharged from Springfield Southwest Wastewater Treatment Plant (WWTP) and with levels of P in TRL. There is a striking improvement in the lake since the WWTP went online with P removal from their effluent in February 2001. A copy of the poster is attached.

5. Review of the collected data

The data collected under the continuous monitoring plan found in the James River TMDL may be reviewed in an accompanying document: Data for the James River Basin 2001-2003. The Phase I modeling activities for the James River focused on the use of mass balance spreadsheets to calculate a flow duration curve. Increases in data quantity and data appropriate for modeling purposes has made possible the use of a more detailed model, in this case the Soil and Water Assessment Tool (SWAT). With the workload in TMDLs needed for this year, 2004, there has not been opportunity to go over the data that thoroughly. Review of the data, however, has provided some information on the effectiveness of Phase I.

The James River TMDL Evaluation (April 2004) may be found in Appendix A. This contains two load duration curves, one each of data collected at Galena and at Boaz. These curves show that total phosphorus (TP) loads at Galena diminished substantially in the last three years. There is a load reduction of about 77 percent at low flow (indicating point source reductions) and about 55 percent at higher flow (nonpoint sources). In the James River near Boaz, TP load decreased by about 78 percent at low flow and about 62 percent at higher flows. However, also at high flows, the total nitrogen load overall has increased in the last three years. The site locations are shown in Figure 1, below.



More work (modeling) with the data is needed to determine where to focus additional BMPs for controlling nutrients from nonpoint sources and also to determine whether the present TMDL targets need to be adjusted or not. The Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri has been awarded a 319 grant called the Upper White River Watershed Management Project. This project involves a detailed assessment of alternative management practices in the James River watershed. In particular, one objective is to “assess the effectiveness of the phosphorus restrictions defined in the Phase I of the TMDL implementation plan for the James River by simulating James River water quality impacts for 10 to 50 years into the future”. At present, in the absence of this modeling, the department is confident the TMDL goals are generally appropriate. This is because the work that has been done on nutrient standards in the last three years indicates that these goals are “in the ball park”. Also, the targets that were selected for the Elk River TMDL (0.06 mg/L TP and 1.0 mg/L TN) are similar to those for the James River.

6. Comments and Conclusions

As briefly discussed in this document, tremendous positive steps have been made in the James River Basin with excellent results in Phase I. The department recommends that all point and nonpoint source efforts continue on their present courses. The only adjustment that can be suggested at this time is to look at the nitrogen issue. As mentioned above, the data indicate that nitrogen has increased at Boaz in the last three years. This should be investigated and is an opportunity for targeted BMPs. Phase II will be necessary if the modeling work indicates that a different end point (target) is appropriate for the James River. In that case, an official Phase II TMDL document will be written and go through public review and participation.

7. Public Participation

A public meeting was held April 20, 2004, in Springfield to update the public on the status of the TMDL and to provide a venue for participation from affected or involved stakeholders. Springfield Public Works, the James River Basin Partnership (reporting for other watershed groups and NPS efforts) and the department all delivered presentations.

The two watershed organizations that operate in the upper James River watershed have excellent public participation. They are running “on their own”, without leadership from the department, to reduce the amount of nutrients reaching the James River. This is exactly the goal for implementing a TMDL: that a group(s) of local citizens voluntarily and effectively organize and execute implementation plans they themselves construct.

8. Appendices

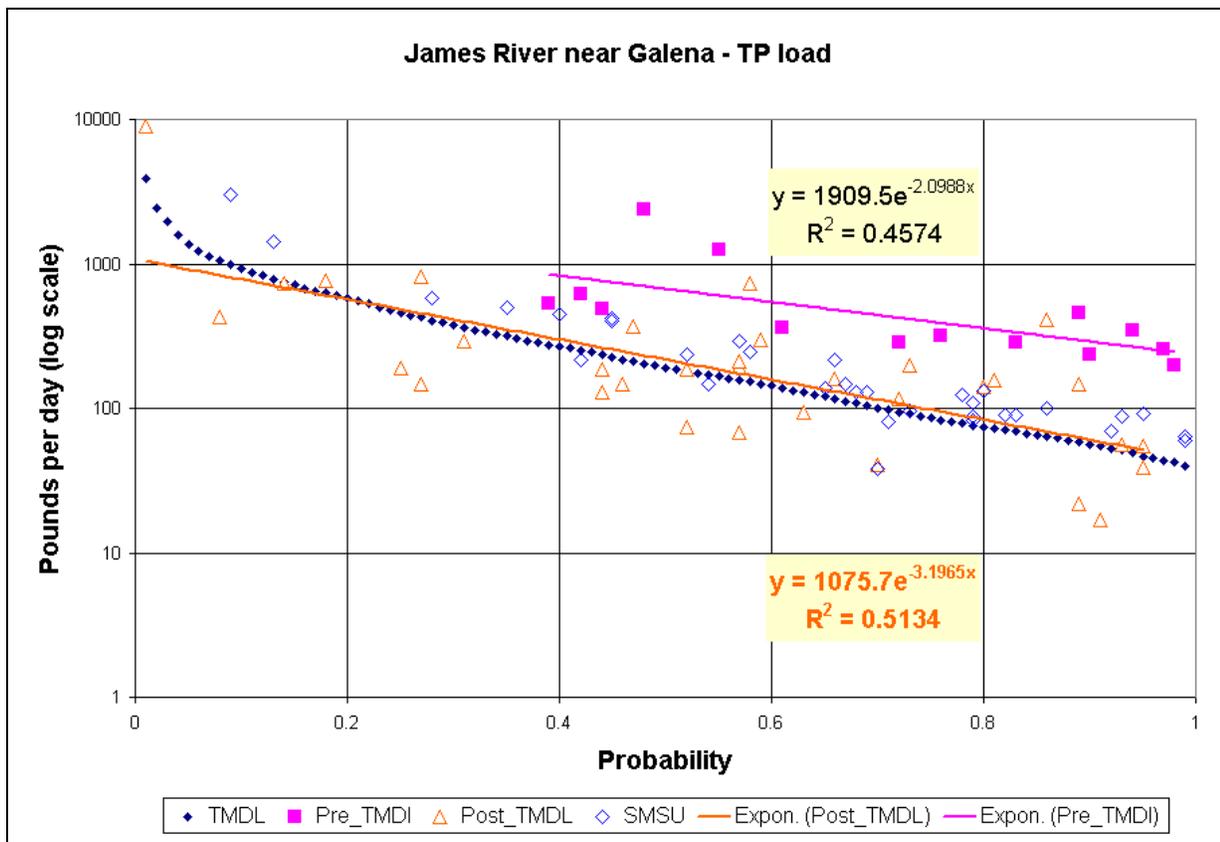
- Appendix A – James River TMDL Evaluation (April 2004)
- Attachment – [Data from the James River Basin 2001-2003](#)
- Attachment – [Lakes of Missouri Volunteer Program poster](#)

Appendix A

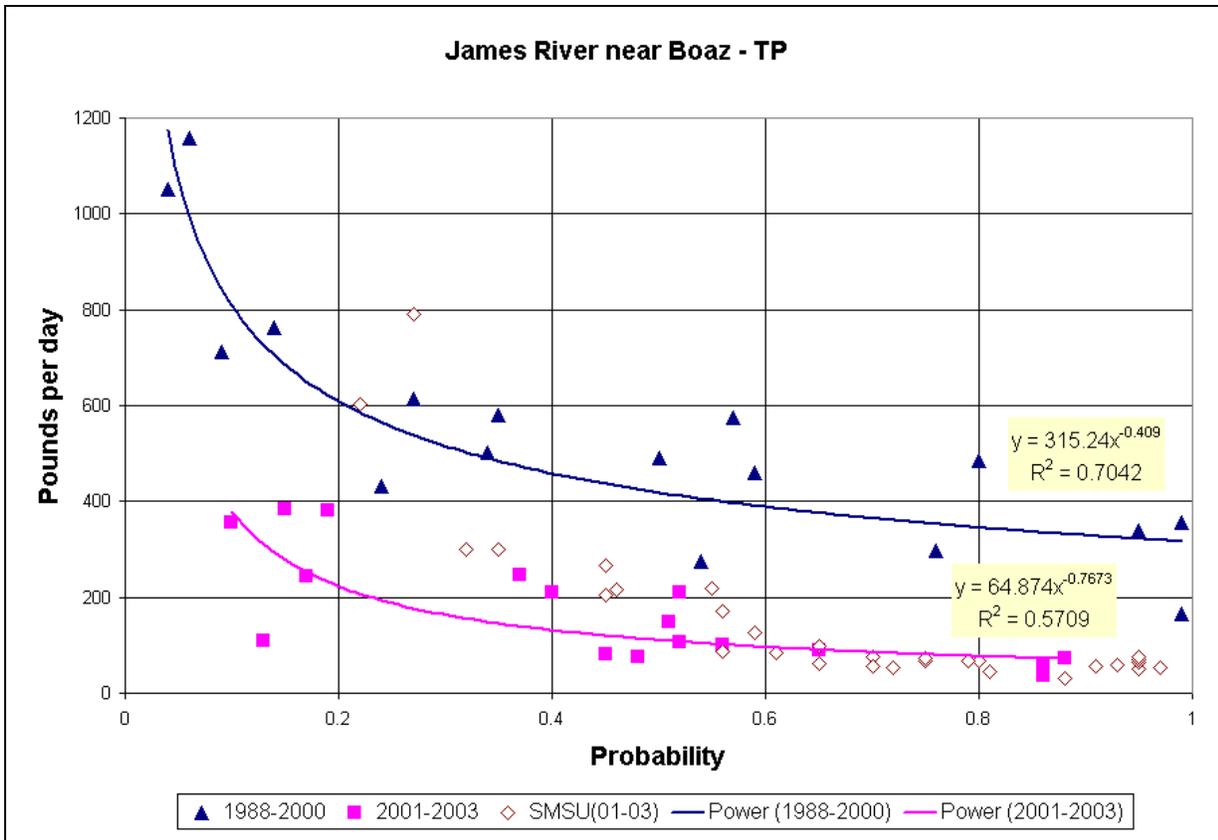
James River TMDL Evaluation (April 2004)

Background: James River TMDL calculation calls for an in stream total phosphorus concentration of 0.075 mg/L and a total nitrogen concentration of 1.5 mg/L. By rule, TP effluent limit was set to 0.5 mg/L for major discharges. Total Nitrogen limits have not been implemented. Watershed groups with the assistance of federal, state, and local government are actively reducing nutrient loading through best management practices.

Phosphorus: Total phosphorus load at Galena diminished substantially in the last three years. There is a load reduction of about 77 percent at low flow (0.8) and about 55 percent at higher flow (0.4). All observed TP loads converged toward the TMDL line (exponential trend line in the figure below). USGS and SMSU data collected near Galena have similar magnitude and trend.



In James River near Boaz, TP load decreased by about 78 percent at low flow (0.8 probability) and about 62 percent at higher flow regime (0.2) [Fig below]. At high flows (probability range of 0 – 0.4), SMSU TP loads are higher than USGS loads. At the same high flows, overall total nitrogen load has increased in the last three years.



Watershed evaluation should be based on adjusted parameters instead of concentration or load. For instance, you may have a relatively high load due to a high flow that only happens rarely (low frequency of occurrence). To weight these parameters, the concentration value is matched with the frequency of occurrence of its corresponding flow. Five out of the 12 sites SMSU monitored are located near a USGS gauging station.

Nitrogen: Total nitrogen concentration in the ambient water on James River near Boaz has increased significantly in the last three years.