



A Summary of Missouri Stream Team Invertebrate Data: 1993-2010

National Water Quality Monitoring Conference

Portland, OR

May 4, 2012

MSTWC History

- Formed in 1998-established 501c3 status
- Received MoDNR mini-grant 2009
- Received MDC funding for staff support in 2010.
- Hired first staff in spring of 2010



Mission

- The Coalition promotes and supports watershed based Stream Team Associations, by serving as a resource for information, education, stewardship and advocacy; by facilitating communication among Associations; and by serving as a united voice for healthy watersheds in Missouri.

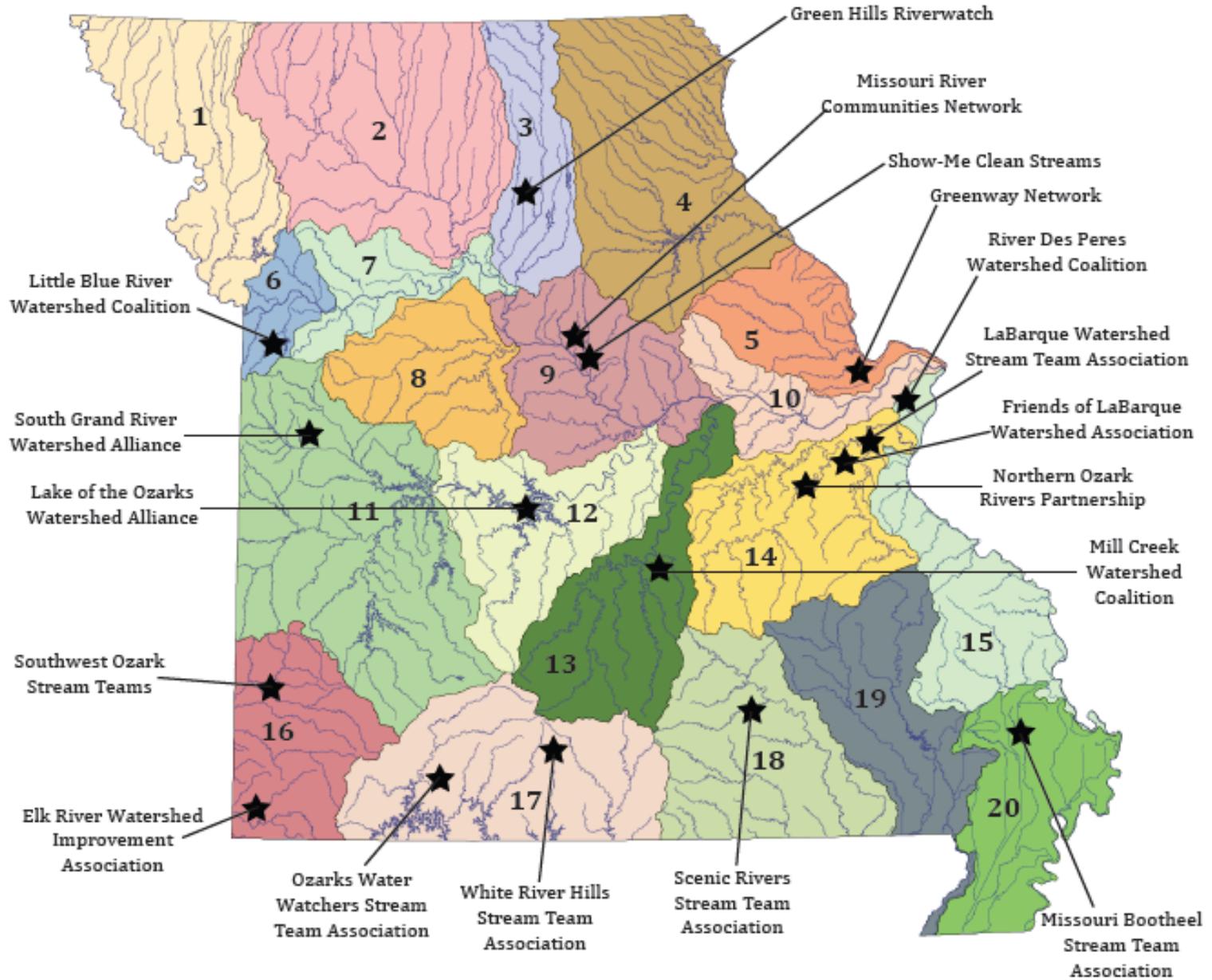


Stream Team Associations

- **Association Function-** Multiple Stream Teams that work together to meet common goals
- **Strength** in experiences, numbers, and diversity
- **16 Associations-** Located across the state
- **MSTWC Board-** Every Association has representation on the board



Missouri Watershed Coalition Associations and Units



Supporting our Stream Team Associations and Stream Team Program Statewide

Strategic Planning

MSTWC in 2010 focused on developing strategies and implementing tools that would assist Stream Teams and Stream Team Associations in their effort to protect and improve our water resources. MSTWC developed a strategic plan that focuses in four areas:

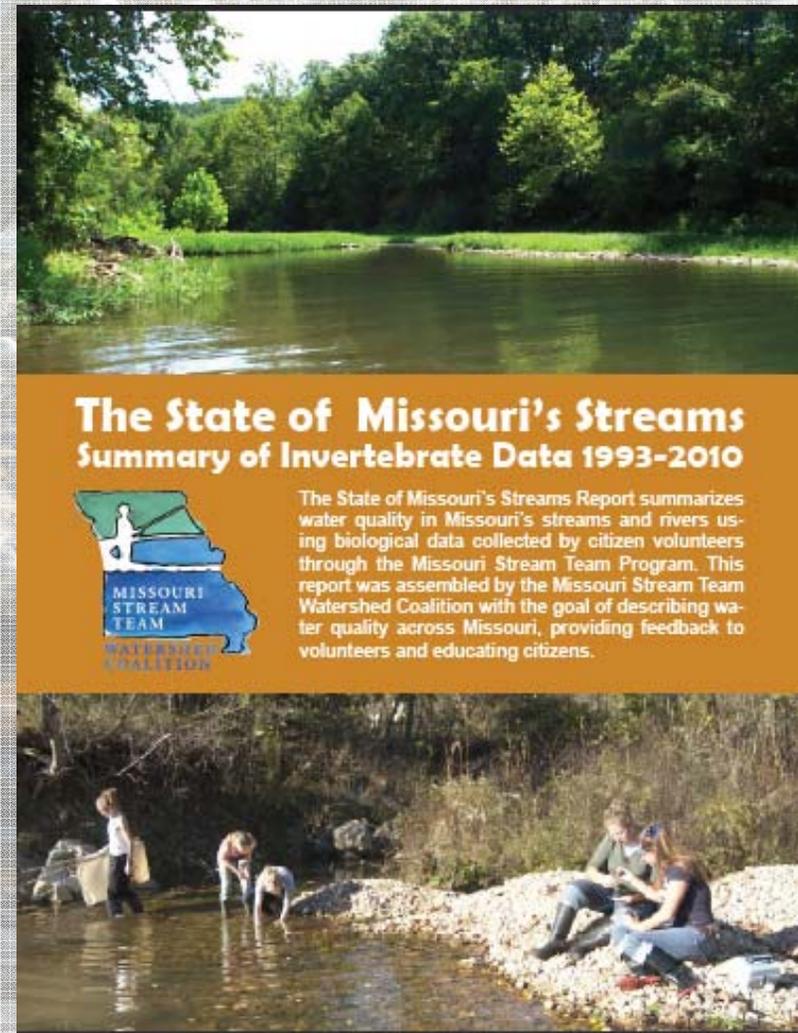
Education/Outreach, Advocacy, Sustainable Funding, Technical



Strategic Planning

Technical-Action

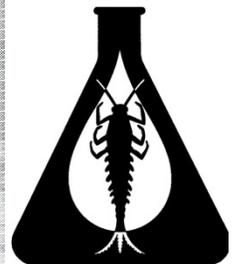
- **Showcase Stream Team Volunteer Data-** encourage and inspire Teams to monitor consistently and submit data
- **Audience-** general public, state agencies, community leaders, and decision makers across the state.





Stream Team Volunteer Data

- Collected since 1993
- Biological, Chemical, Physical
- Data management = Mo Department of Natural Resources
- Early plans for summary reports never became a reality
 - * volume of data/staff time
 - * inconsistency of data
- Volunteers and other data users strongly desire feedback



Water Quality
Volunteer



Data Uses

(Locate Problems)



- ST #346 Francis Howell H. S. Env't Studies discovered a sewer line break
- ST #2893 The Clark Family Farm discovered the local pool draining
- ST #1012 discovered several barrels dumped in the stream
 - Several volunteers have discovered and reported fish kills





Data Uses

(Locate Problems)



- Kansas City requested all volunteer data w/in city limits
- Planning by local agencies, such as zoning regulations



Dot Anderson & Karen Meyer ST #2108



Intro WKS Field Portion 03/06



Data Uses

(Supplement Other Agency Data)



- Army Corps of Engineers
 - Biological data
 - Environmental statement
- MODOT
 - Biological data
 - Env't. Impact Stmt.
- US Forest Service
 - All data
- 319 and SALT projects
 - As monitoring component

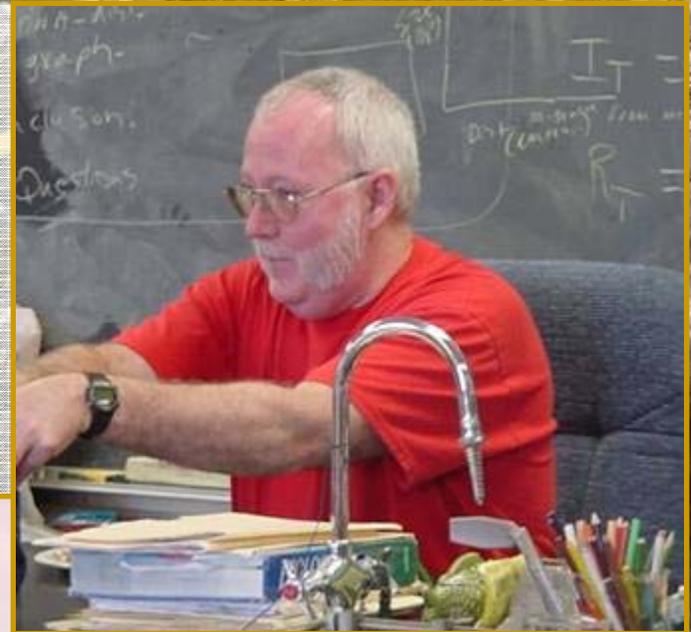




Data Uses (MDC)



- Aquatic education
- Related projects
- Sensitive watersheds?
- Aquatic Conservation Opportunity Areas





Data Uses (DNR)



- Intro and Level 1 – screening data
- Level 2 & 3, and CSI data – treated as agency collected data
- Evaluate Best Management Land Use Practices (BMPs)



Caddisfly (Limnephilidae sp.)



Delwin Johnson ST #1549



Data Uses (DNR)



- 303(d) list of impaired waters
 - Listing and delisting
 - Discharge data used for TMDL modeling
- 305(b) report to EPA
 - Stream classification and designated use



Fenton Stream Cleaners ST #1857



State of Missouri's Streams

Summary of Mo Stream Team Invertebrate Data: 1993-2010

- **MSTWC** contracted with Tony Thorpe and Dan Obrecht, University of Missouri
- **2 publications**- brochure and long report
- **Funding**- private donation from Mrs. Pat Jones



The State of
Missouri's Streams
Summary of Missouri Stream Team
Invertebrate Data: 1993-2010



This is a summary document, view the full report at www.mstwc.org



Stream Team Volunteer Data

- Invertebrate Data Collected since 1993
- Invertebrates utilized as indicators
- Water Quality Index- Rates Poor, Fair, Good, Excellent
- Index Based on Isaac Walton League: biological methodology for wadeable streams; modification through recommendation from MoDNR
- 3 kick sets
- A minimum of twice a year sampling is recommended
- ID to Order level





State of Missouri's Streams Report

Methodology

- **Compiled data from 1993-2010**
- **Excluded data that had less than 3 kick sets**
- **Excluded data that was missing information**
- **5,216 sampling events**



State of Missouri's Streams Report

Methodology

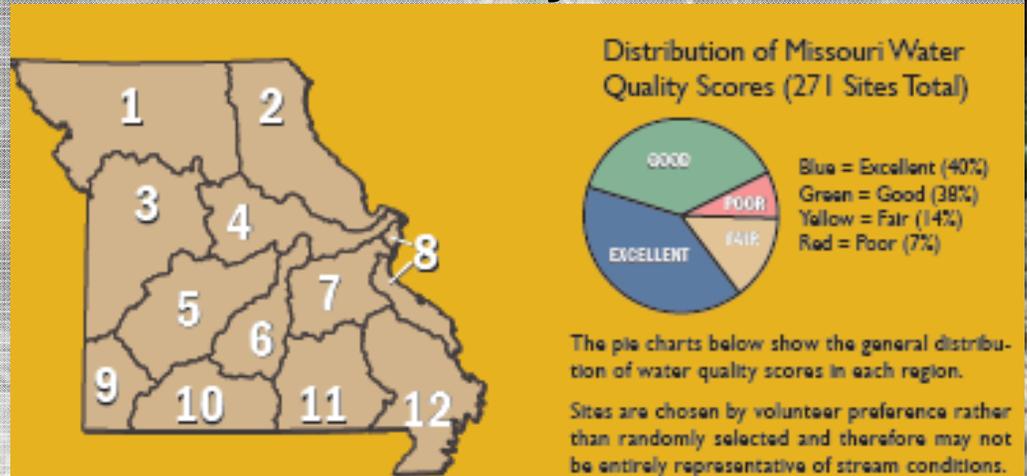
- Excluded sites that has less than 4 years of sampling (2,429)
- 2787 sampling events
- Sites sampled multiple times in a year, the Maximum score was used to reach one value per site per year
- The arithmetic mean (average) of each site was calculated to give an overall score for each site



State of Missouri's Streams Report

Interpreting the Data

- Report assesses 271 sites across state (between 8-39 sites per region)
- Data only represents Macro Invertebrates
- Excellent Scores were on the low end of the Excellent range (23-49, average was 27)
- Sites are chosen by volunteers, not randomly selected
- Data is compiled collectively over 17 years
- State is divided into 12 Ecological Drainage Units (HUC 8)

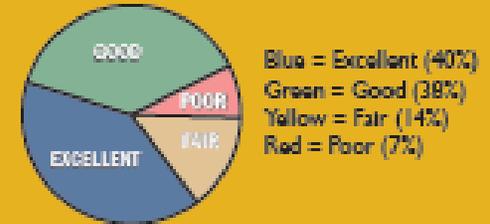


Based on these data and Stream Team Protocol

- 40% of all sites are in the Excellent Range
- 38% are in Good Condition
- 14% are in Fair Condition
- 7% are in Poor Condition

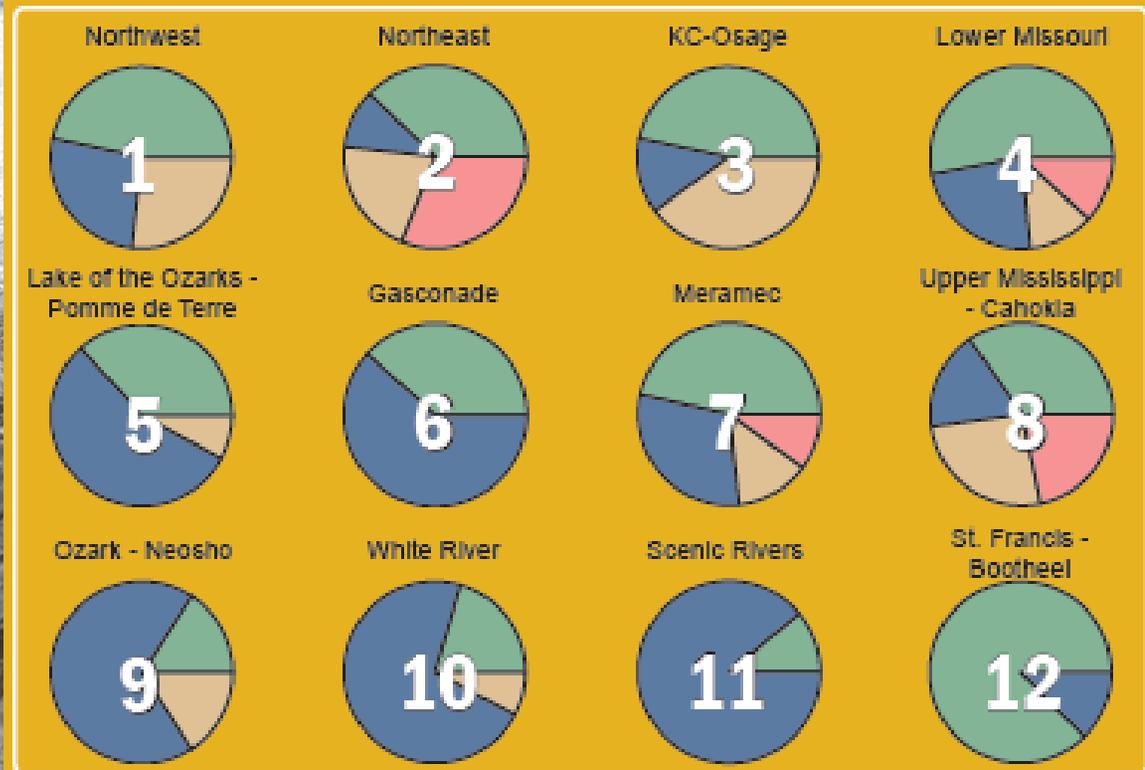


Distribution of Missouri Water Quality Scores (271 Sites Total)



The pie charts below show the general distribution of water quality scores in each region.

Sites are chosen by volunteer preference rather than randomly selected and therefore may not be entirely representative of stream conditions.



To view the full report, visit www.mstwc.org



The State of Missouri's Streams Summary of Invertebrate Data 1993-2010



The State of Missouri's Streams Report summarizes water quality in Missouri's streams and rivers using biological data collected by citizen volunteers through the Missouri Stream Team Program. This report was assembled by the Missouri Stream Team Watershed Coalition with the goal of describing water quality across Missouri, providing feedback to volunteers and educating citizens.



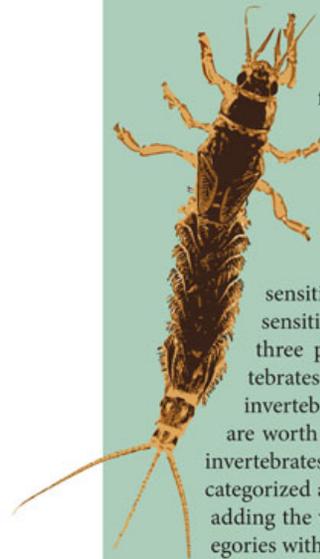
Invertebrates as Indicators of Water Quality

One of the challenges in monitoring water quality in streams and rivers is that conditions within the waterways change quickly. Short-term pollution events can occur and have a negative effect on aquatic life, but not be accounted for in water sampling unless the sample collection is timed perfectly. Chronic pollution may remain at fairly low concentrations which might not gain notice, yet negatively affect aquatic life. There are also changes in habitat (ex. sedimentation, channelization) that are more difficult to measure. Monitoring invertebrates allows us to gauge water quality not only at the time of the sample collection, but also evaluate water quality prior to the sample collection. What makes this possible is the fact

that many invertebrates have life cycles that last a year or more. If a pollution event eliminates sensitive invertebrates from a stream, we would expect a delay before the lost species return to the stream. If a stream or river is affected by a long-term pollution issue, we would expect the aquatic community to always be disturbed.

Another benefit of monitoring invertebrates is they have differing tolerances to pollution. Some types of invertebrates are capable of living in streams with very low levels of water quality, while other can only survive in the cleanest of water. By looking at the numbers and types of invertebrates found during a sample, we can assess water quality.

The Data



Stream Team volunteers collect invertebrates from their streams according to program guidelines. Invertebrates are identified and placed into one of twenty-four groups. The groups are divided into three categories based on sensitivity to pollution. The most sensitive invertebrates are worth three points while tolerant invertebrates are worth one point. Those invertebrates that are semi-tolerant are worth two points. Once all of the invertebrates have been counted and categorized a point total is calculated by adding the values from each of the categories with at least one individual.

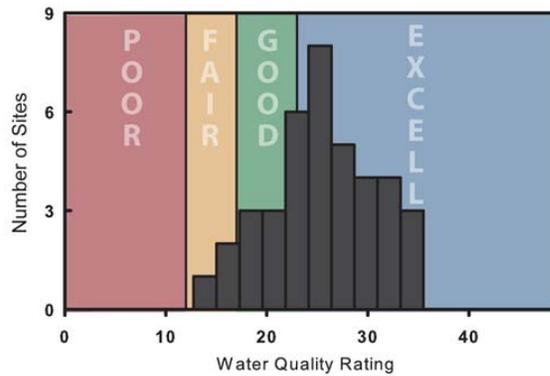
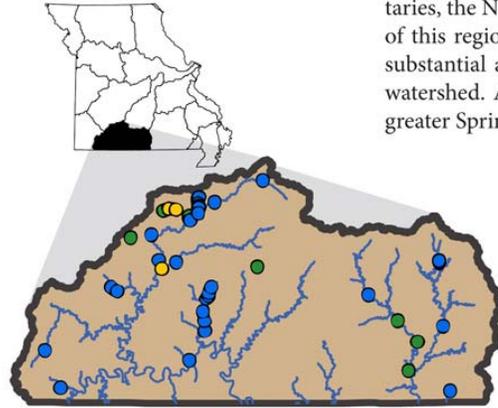
The data used in this report represent average values from sites that were monitored for at least four years. Depending on the time of year and the location sampled, seasonal differences in the invertebrate community and patchy invertebrate distribution can lead to underestimation of water quality. To avoid this, the maximum annual value was used (as opposed to the average) at sites where multiple samples were collected within a year. Use of maximum values instead of averages still allow for identifying streams with water quality issues due to chronic pollution/habitat problems.

Because sites are chosen by volunteer preference rather than random selection, sites may be skewed toward easily accessible or popular locations. Ideally, multiple sites would be monitored on each stream to provide the most accurate assessment of water quality.



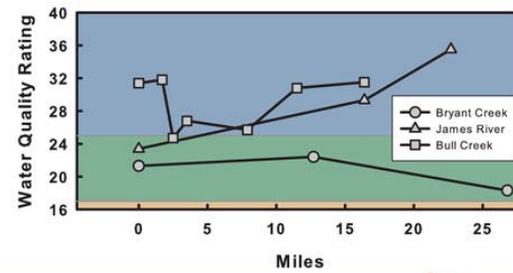
White River Region

This region includes all of the area that drains south into the White River, including Flat Creek, the James River and its tributaries, the North Fork of the White River and Bryant Creek. In most of this region forest is the dominant land cover, though there is a substantial amount of grassland/pasture in the upper James River watershed. Approximately one third of the sites are located in the greater Springfield area or directly downstream from the city.



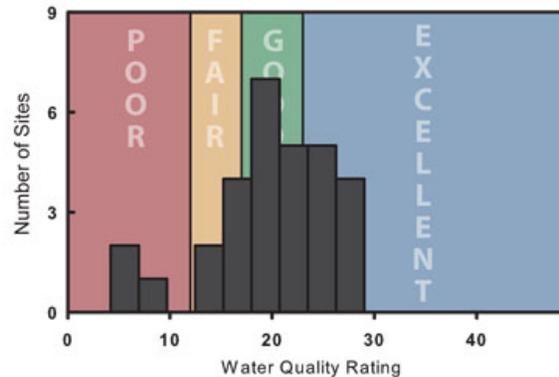
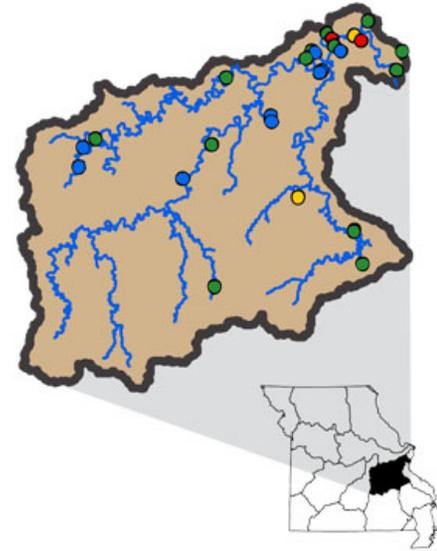
There were 39 sites in the White River Region that were sampled for 4 or more years. Scores ranged from 12.8 to 35.5, with 92% of the sites scoring higher than 17 and being classified as having either “Good” or “Excellent” water quality. Two of the 3 sites rated as “Fair” were located on the same stream within the City of Springfield.

Three streams in the region, Bryant Creek, James River above Springfield and Bull Creek had multiple sites. The graph shows how water quality scores varied along the three streams, with the most upstream sites identified as Mile 0 on the horizontal axis. Subsequent sites are identified by distance from Mile 0. The graph illustrates how water quality differs not only from stream to stream, but among sites in a single stream as well.



Meramec Region

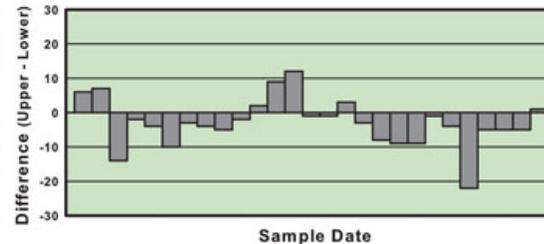
The Meramec region contains the Meramec River and its major tributaries Big River and the Bourbeuse River. A total of 30 sites within the region were assessed, half of them in rural areas. The remaining sites were split between suburban areas, urban areas and sites in the lower Meramec River. The lower Meramec River sites are notably different from the other sites in the region due to the size of the Meramec River after its confluence with the Bourbeuse River.



The overall score for sites in the Meramec region ranged from a low of 4.2 to a high of 29.0. Three sites scored below 12 and are classified as having "Poor" water quality. Of these sites, one was in the lower Meramec River, one was in a suburban area and the third was in a mostly rural area. Interestingly, of the nine sites that scored above 23 and were considered "Excellent", two were also located in the lower Meramec River.

Two sites less than a mile apart on Fox Creek were sampled on the same date, 27 times between 2001 and 2010. Overall water quality scores were 22.6 and 24.4 for the upstream and downstream sites, respectively.

The graph shows the difference between the site scores for the 27 monitoring events. Bars above the center line indicate a higher score at the upstream site, while bars below the center line represent a higher score downstream. These results highlight the inherent variability of aquatic invertebrate distribution.



Pouch Snails, also called "left-handed" snails, do not have gills, but rather have a lung "sac" which must be filled at the water surface. Pouch snails are pollution tolerant.



State of Missouri's Streams Report

Future Plans

- **Secured Funding to create a second report focusing on water chemistry data.**
- **Piloting a program with Ozark Water Watch to utilize ST volunteer monitors in creating their Status of the Watershed Report**
- **Begin conversations on how ST data can be better utilized, how can it assist with MoDNR, with over 7,000 trained volunteer water quality monitors is it time to evaluate monitoring program.**

Supporters

