Watershed Assessment, a Critical Component of Stream Restoration

Greg Phillips
GBM[c] & Associates
219 Brown Lane
Bryant, Arkansas
Email: <gphillips@gbmcassoc.com>

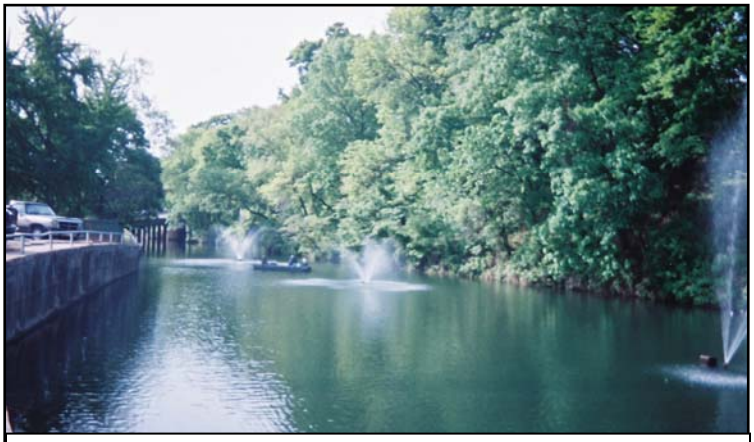
Stream restoration is quickly becoming a mainstream science in the United States. Multiple federal and state agencies have been in the process of developing, guidance for stream and wetland restoration activites occuring in their realm of influence. With the increase in such activities, which typically alters the aquatic environment (physically as well as biologically), it is critical that restoration plans be well thought through to ensure the intended goals are met (and unintended consequences are avoided).

The first step in any stream restoration project should be a thorough watershed assessment. An appropriate level of watershed assesssment would include all aspects of the physical, chemical and biological nature of the stream corridor. It is ***integral*** that these aspects of the watershed be reviewed and analyzed to ensure that any restorative actions in the stream will have the desired effect.

- The hydrology of the system must be understood to ensure that peak flows will not destroy bank protection efforts or undo channel improvements.
- The landuses in the watershed should be examined (future as well as current) to allow restoration design to be in concert with exisiting landuses and any potential future changes in the watershed.
- The ecology of the stream system should be analyzed including fish, macroinvertebrate and algae communities as well as their associated habitat. Some restoration activites can be potentially harmful to sensitive aquatic communities, at least for the short term. Care and attention needs to be given to the exisiting biota to protect it from adverse impacts.
- Water quality of the stream system should be reviewed to assess potential concerns that may need to be corrected along with other restoration activites if positive results are to be achieved.
- In addition, the economic importance of the stream and its watershed should be understood to ensure that restorative activities are not in opposition with public wishes.

(For Further Reading: Success and Benefits of Stream Restoration, *Watershed Update*, Vol.1 (6), http://www.awra.org/committees/techcom/watershed/pdfs/0106WU.pdf)

An example of such a watershed assessment, with the appropriate level of detail, can be found in that completed for Sager Creek.



Sager Creek in downtown Siloam Springs.

Sager Creek is a small stream in Northwest Arkansas with a watershed of approximately 17 square miles. It runs directly through the historic town of Siloam Springs which has built up around the creek over the past 120 years. Sager Creek is the focal point of the downtown area of Siloam Springs and its health and beauty are a high priority to the citizens of the area. Over the past 20 years a decline in the aesthetic character of the creek has been observed. Nuisance algae mats have become prominent during the summer season and concerns over potentially elevated nutrient levels have arisen. With the assignment of a restrictive phosphorus criteria (0.037 mg/L) to the scenic Illinois River (of which Sager Creek is a tributary) the concern over nutrient levels in the creek were heightened. These concerns led the City of Siloam Springs to pursue a watershed assessment of Sager Creek to determine what could be done to protect the stream, enhance it and restore it to a previous level of aesthetic character.

The Sager Creek watershed assessment was completed over the course of approximately 14 months. A vast amount of historical data was reviewed on stream water quality, biological communities and public forum comments and concerns. Data gaps were identified and field activites conducted to fill in the gaps. A variation of the Unified Stream Assessment (Kitchell and Schueler, 2004) was completed on the main stem of the creek where a trained field crew walked the stream assessing its physical characteristics and noting observations pertaining to water quality and biological integrity. Baseline and storm water quality were characterized at important outlets in the watershed. A geomorphic assessment was

Dye tracer study to determine time of travel in Sager Creek.

completed to characterize the streams stability and identify reference morphology. Various other activities were completed including flow monitoring, time of travel studies, GIS landuse assessment and rapid bioassessments. After the physical, chemical and biological nature of the stream and its watershed were appropriately characterized, several critical areas of concern were identified. These included insufficient riparian buffers to protect the stream banks and filter storm water runoff, three run-of-the-river dams that were negatively impacting hydrology, elevated sediment and nutrient levels in runoff from construction sites and grazed pastures in the watershed and elevated peak flows instream associated with impervious areas in the cites urbanized zone. Each of these concerns resulted in recommendations for protection, enhancement and restoration alternatives for Sager Creek. The basic issue became how to reduce sediment and sediment born phosphorus in the basin and in turn allow the resulting load of these pollutants to transport downstream naturally without building up or being detained in the downstream pools created by the dams. Recommendations included establishment of new vegetated riparian buffers along the creek and enhancement of the existing buffers, dam removal, channel improvements between existng dam locations and the addition of instream morphology and habitat, implementation of a suite of agricultural best management practices (BMPs), installation of storm water treatment features and use of low impact development techniques in critical areas of the watershed. All of these recommendations were designed to meet the goals of decreased nutrient levels and an improvement in the aesthetics of the stream in the downtown area.

Without the detailed watershed assessment a wholistic approach to attaining the stated goals for the stream would have been impossible. Recommendations lacking the overall watershed assessment might have been simply to implement BMPs in the agricultural areas and improve riparian vegetated buffers along the creek. Though implementation of these factors would likely improve the situation (particularly in reference to decreasing phosphorus levels), as long as the dams are in place the algal issues will remain an aesthetic problem during the hot summer season. If the dams were recommended for removal without consideration of the upstream storm water quality and the downstream post dam channel, than the full aesthetic potential of the stream might

not be achieved and overall water quality would not improve dramatically. In order to ensure restoration activities meet the intended goals of a project, generally to improve water quality, enhance aesthetics and enhance biological communities, it is necessary to take a wholistic approach to the watershed by getting to know its characteristics beforehand.

Reference

Kitchell, A. and Schueler T. (2004). Unified Stream Assessment: A Users Manual. Center for Watershed Protection. Ellicott City, MD.