Ecosystem Development of a Riparian Restoration Site in West Tennessee

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Introduction

As part of the requirements for an Aquatic Resources Alteration Permit in the state of Tennessee a mitigation site is monitored for five years after establishment. The monitoring includes an annual assessment of stream macroinvertebrates and riparian vegetation along the restored reaches. The purpose of this program is to ensure that the water resources of Tennessee can be used and enjoyed to their fullest extent while maintaining water quality T.C.A. §69-3-102(b). Here we present the results from five years of riparian vegetation and aquatic macroinvertebrate surveys along with wetland assessments at a mitigation site located in northwest Tennessee.

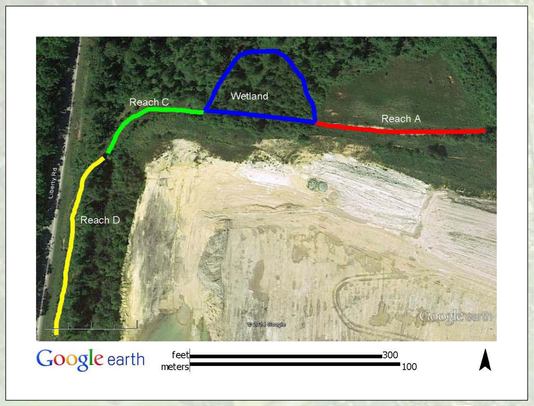

Figure 1 – Map of mitigation site showing locations of sampling during the monitoring period.

Methodology

The restoration site includes a relocated intermittent channel and small wetlands area in Weakley County Tennessee. The site was annually visited in late spring during the five years of monitoring. The sampling dates were: June 3, 2010; May 25, 2011; May 9, 2012; May 21, 2013 and May 23, 2014. The restoration site included three riparian reaches and a wetland area (figure 1). Percent ground cover along the riparian reaches was evaluated using a line-intercept technique. Two transects were walked for each reach and soil samples were collected about every 8 meters along the transects. The wetland assessment included identification of the plant community and wetland indicator status along with evaluations of hydrology and soils. The aquatic macroinvertebrate survey involved the establishment of a 25 meter transect and four kick/jab samples were taken using a D-frame dipnet (500 micron mesh) in proportion to the available productive habitat. A composite of all four samples from each reach was preserved in 80% ethyl alcohol.

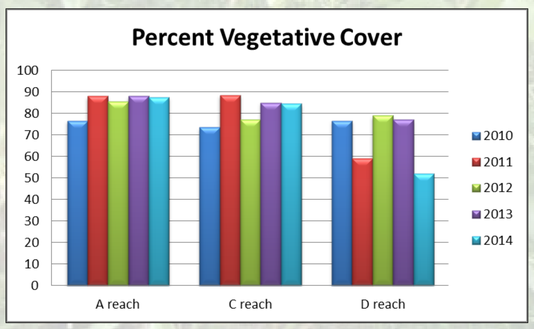

Figure 2 – Changes in the percent vegetative cover along the riparian reaches during the monitoring period.

Along the riparian reaches the vegetative communities have developed and the percent cover (for the most part) has increased since the restoration was established (figures 2-6). Species richness ranged from 7.5 along the A reach to 22 along the C and D reaches. The lower value for species richness along the A reach is reflective of a predominance of tall fescue, *Schedonorus arundinaceus* (Schreb.), and sericea lespedeza, *Lespedeza cuneata* (Dum. Cours.). These species are providing excellent cover as can be seen in figure 3. Vegetation along the D reach has reestablished itself after a devestating flood in 2011. However, the use of herbicide along the Liberty road right-of-way is negatively impacting the reach. During the 2014 sampling soil erosion was observed along the areas where the vegetation is being killed, figure 6.

Results

Figure 3 – Photos of reach A taken in 2010 (left) and 2013 (right). The development of the vegetative community along with an increase in overall plant cover is evident.

Figure 4 – Photos of the wetland area taken in 2010 (left) and 2014(right). The canopy vegetation has been restored.

Figure 5 – Photos of reach C taken in 2010 (left) and 2014 (right). Trees along this reach are becoming well established.

Figure 6 – Photos of reach D taken in 2010 (left) and 2014 (right). Herbicide use along the Liberty road right-of-way is limiting the riparian vegetation along this reach.

Discussion

The wetland area at the reclamation site is well-established and functional. There are strong indicators for hydrology, soils and plants. The calculated Prevalence Index for the wetland vegetation has decreased from 2.42 at establishment in 2010 to 1.25 in 2014. The entire system is beginning to store carbon as indicated in table 1.

Table 1 – SOM measured in surface soil samples, 0-5 cm.

Soil Organic Matter, Percent LOI		
	2012	2014
Reach A	2.34	4.25
Wetland	2.60	4.79
Reach C	1.83	3.33
Reach D	2.63	3.82

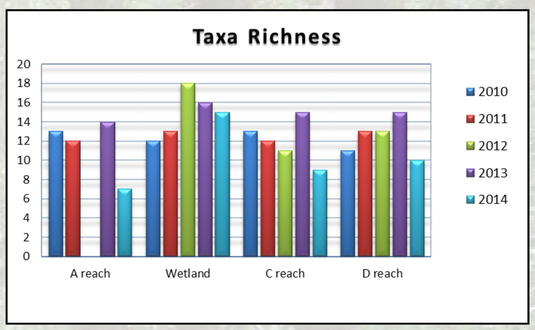

Figure 7 – Changes in macroinvertebrate populations along each of the reaches during the monitoring period.

Although taxa richness of aquatic macroinvertebrates was relatively low (figure 7), this was likely a reflection of the limited available habitats. During the summer months, reach A was dry in some years, and the other reaches experienced very low water levels. The presence of somewhat sensitive taxa like mayflies and caddisflies suggested that water quality was good when water levels were high enough to provide appropriate habitat. The wetland habitat consistently supported the most diverse community of aquatic macroinvertebrates. We believe this to be a result of a more consistent availability of adequate aquatic habitat. The aquatic macroinvertebrate community in this system was judged to be normal given the physical features of the stream and the ephemeral nature of specific reaches.

Conclusions

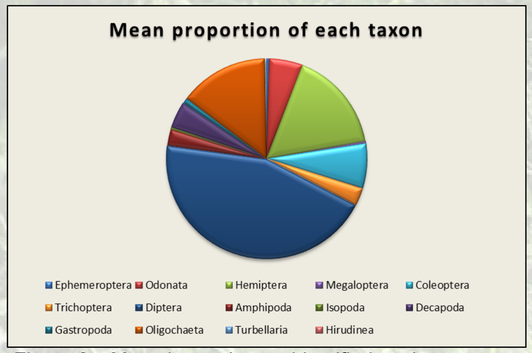

Figure 8 – Macroinvertebrates identified at site.

The macroinvertebrate community was consistently dominated by midge larvae (Diptera), aquatic worms (Oligochaeta), true bugs (Hemiptera), and beetles (Coleoptera), figure 8. A few sensitive taxa in the orders Ephemeroptera (mayflies) and Trichoptera (caddisflies) were collected periodically during this study. Although taxa richness was relatively low, the stream appears to be functioning normally given the physical nature of the stream. The riparian vegetation has become well established and the appearance of native species such as may apple, *Podophyllum peltatum* L. is indicative of a functional restoration.