



# The Pioneer Grant Program

The 2016 Pioneer Grant Program aims to reduce nutrient and/or sediment contaminant loads to the Maryland portion of the Chesapeake Bay and Maryland Coastal Bays from any nonpoint source: agriculture, urban or suburban stormwater, air, and septic by seeking proposals that focus on new techniques, information, or programs that increase the rate at which load reductions can occur.



## Center for Urban Environmental Research and Education, UMBC

### **Suburban Subsoiling**

*2010-2012*

**Project Track:** New Information

**Research Question:** Does “suburban soiling” work as an effective way to restore hydrological functions to compacted urban soils?

**Research Results:** 21 demonstration plots of 3 different blends of structural soil were installed in the vehicle drive lane at the Paint Branch Turf Grass Research Facility. These plots continue to be monitored and evaluated. Due to construction delays these practices were not implemented at the Cabrerra property mitigation project, but this project is still considered a success.

**Notable Information:** The Technical Advisory Committee website and other important information can be found at:  
<https://sites.google.com/a/umbc.edu/subsoiling-tac>  
<https://sites.google.com/a/umbc.edu/subsoiling-tac/>  
[http://www.youtube.com/watch?v=C\\_V3AQehl5w](http://www.youtube.com/watch?v=C_V3AQehl5w)  
<https://sites.google.com/a/umbc.edu/umbc-pbtrf-soil-compaction/home>

PROJECT PARTNERS



**US Army Corps  
of Engineers.**

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## Final Report Narrative

Center for Urban Environmental Research and Education, UMBC

### **Suburban Subsoiling**

*2010-2012*

#### **Summary of Project**

This project sought to advance the practice of “suburban subsoiling” (soil decompaction and amendment) as a standard tool to restore hydrologic services to the disturbed and highly compacted soils of the urban suburban environment. Our original work plan relied heavily on our partnership with the Montgomery County DEP Rainscapes Program. As detailed in our Status Report of December 2012, we revised our planning and implementation to install demonstration pots of structural soil and alternate tillage practices for establishment of turf grass lawns. Turf plots were completed in the fall of 2012 and we continue to conduct systematic performance evaluations, with first year performance completed in 2013 and monitoring, education and outreach continuing at the Pain Branch Turf Grass Research Facility beyond the life of this grant. WE also installed twenty-one demonstration plots of three different blends of structural soil in the vehicle drive lane at the Pain Branch Turf Grass Research facility. These plots provide ongoing testing and performance evaluation of our structural soil blends on a well trafficked pervious drive-lane for working farm equipment. Construction delays in the US Army Corps of Engineers stream restoration project on Paint Branch was not completed before the end of this grant, but our partnership with Montgomery Parks and the Corps led to our suburban subsoiling practice being included in the post-construction site stabilization for the Cabrera property ICC mitigation project. WE consider our partners’ contractual commitment to implement this suburban subsoiling project in fall 2014, despite the end of this Pioneer grant, one of the notable successes of this project.

Over the project performance period:

1. We established a project web site for our partnership with Montgomery County DEP including a common shared project calendar and timeline, resource documents and reference pages and links to our Technical Advisory Committee’s website.
2. WE convened a highly qualified Technical Advisory Committee (TAC) to advise and oversee technical direction and specifications for this project. WE have been fortunate to be able to draw on expertise both within and beyond the Bay region, y developing a “virtual” TAC, of experts willing to contribute their time and expertise, organized through a TAC website.
3. Working with the TAC and our former partners at Montgomery County we have reviewed and revised four different variations of a suburban subsoiling technical specification for use in standard grading contracts. Versions, reference materials and comments and revisions are all memorialized on the TAC website.
4. We established a demonstration site showcasing and comparing seven different site-preparation tillage practices for landscaping and stabilizing graded construction sites that will remain in place at the premier education and outreach center for the MD Turf industry.
5. Outreach and educational activities continue to reach the practitioner communities from turf grass, landscaping, and nurserymen, to landscape architects and engineers.

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6. Our TAC website will be maintained and expanded as an information resource for practitioner communities. We have started to expand the technology transfer tools to include short narrated PowerPoint presentations on YouTube and will continue to add similar presentations to the project web site as results, papers and additional analysis continue.

### **Project Evaluation**

In addition to institutional lessons learned-and documented in our December 2012 status report-the adaptive management of the project has allowed us to establish a reference site where practitioners can evaluate *in the field* both stand familiar practices, and more innovative site preparation technologies to restore pervious infiltration on disturbed soils. Locating out demonstration plots at the Pain Branch Turf Grass facility leverages the impact of the sites which have already been- and will continue to be- included in the turf industry's semi-annual Field Day held at this facility each year. The establishment of long-term demonstration sites provides a unique replicated demonstration of the long-term performance of the alternative tillage practices used. Our ongoing performance monitoring will provide the long-term information sought by practitioners who are considering the commercial viability and life-cycle costs of changing "standard" practices. Perhaps most significantly, establishing these demonstration sites at the industry's premier turf grass facility in Maryland enables us to transfer the knowledge, performance information, and technology changes directly to industry practitioners. In contrast to our original "user-pull" model of trying to jumpstart these technologies using motivated (but technically inexperienced) county partners, our adaptive change to a "supplier-push" model, moves upstream, targeting industry practitioners by building their capacity to offer these innovative technologies as superior sustainable landscaping services.

### **Transferability and Sustainability**

The no-cost extension through 2013 enabled the completion of demonstration projects and monitoring of a full year of performance. Establishing demonstration plots at the Paint Branch Turf Grass Research Facility ensures that our results will continue to be part of the Turf Grass practitioners community's ongoing education and training activities at that site. Our partners' implementation of this work as part of an ICC environmental mitigation project at the Cabrera property will be completed by the project partners, in Fall 2014, after the end of this grant. We consider this fledgling example of the institutionalization of this practice by our partners as one of the significant successes of our adaptive management of the project.

### **Monitoring and Maintenance**

Composite samples from the Paint Branch demonstration sites were submitted for Whole Food Web, nutrient, and trace elements testing from all eight tillage practices being compared. We completed full site assessments for all 32 plots after one full year (i.e. four seasons) of growth and settlement, and will continue this monitoring. In addition to infiltration and soil testing, four of the sites- representing four significantly different tillage practices- were initially labeled with 6-mm biodegradable bb's as a tracer for surface incorporation. Using a calibrated fertilizer spreader, 50kg of biodegradable bb's were spread at a surface density of 1,000 bb's per square foot over a 144 square foot area in each of the four plots prior to tillage. In the spring of 2013 five Shelby tubes (7.5cm diameter cores driven approximately 40cm deep) were taken from each of the tracer sites. Cores were extruded and sampled at 2cm interval to recover any incorporated bb's. In this way the depth of incorporation for surface applied amendments- including our compost amendments- can be unambiguously documented. Results show dramatic differences

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between plots prepared with a Rotodairon (industry standard landscaping rotary tiller) compared to a soil spader. The analysis dramatically confirmed the superior depth and uniformity of spading for deep uniform soil amendment, without the destruction of soil structure that accompanies traditional rotary tillage. Routine monitoring consists of infiltration measurements with a modified Dunne permeameter and both 6” and 12” single ring falling head infiltration tests. Each set of infiltration tests is accompanied by at least two 10cm bulk density cores which are also analyzed for particle size and organic matter. We also take composite samples that are analyzed for nutrients and trace elements at the University of Delaware soils lab, and whole soil food web analysis at the Rodale Institute. Data and monitoring results are being posted to the website for this project and will be updated as additional data and analysis becomes available.

### **Community Involvement and Outreach Activities**

Public outreach and education targeted practitioner communities, including presentations at the Maryland Turf Council’s fall field day and both turf and athletic field professionals through invited presentations at the 2011 and 2013 Maryland Turf Council’s Annual Turf Conference, and the Maryland Nurseryman and Landscapers Association’s 2011 and 2014 Chesapeake Green Conference. A short article describing the general project goals appeared in UMBC Magazine. The ASLA blog “The Dirt,” also posted a detailed article on our work. We also presented this work at the USGBC’s Annual Greenbuild national conference in 2012. Invited presentations on this work have been made at the annual meeting of the Chesapeake Stormwater Partners, including a scheduled presentation this spring. This invitational meeting brings together the leaders in innovative stormwater technology implementation and regulation from each of the Chesapeake Bay States, providing a rich forum to inoculate this technology into practice for the Chesapeake Bay. Through this forum we provided technical review and modification based on our work, that were adopted by the State of Delaware. A strong interest in growing among the Chesapeake Bay stormwater partners to convene an expert panel that would define and approved suburban subsoiling practice, with approved nutrient and sediment reductions, to be credited within the Chesapeake Bay watershed model.

### **Partnerships**

Montgomery Parks, Paint Branch Turf Grass Research Facility, Trent Hill Nursery, Laytonsville Turf, Carolina Stalite Company, US Army Corps of Engineers, and Montgomery County DEP.

### **Accounting of Expenditures**

CBT Funds: \$50,000

**Total Funds: \$50,000**