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Storm Water Program Technical Quarterly

excellence in conservation

Issue: TQ 10.4

Inside This Issue

Soil pH	2
Bulk Density and Vegetative Success	2
Soil Rehabilitation	3
Proper Disposal	3
Organic Mediums	4

Renewing Urban Areas with Brownfield Green-ups

Water quality improvements with proper plant and soil selection

Water Quality Improvements Through Public Works

Underground sand filter at the Cleveland Hopkins International Airport

Web Links

- Filtrexx International BMP Applications
- NOACA Updates for MS4 Communites Construction/Post Construction
- Early Successional Habitat Development/ Management
- Migratory Bird Habitat Initiative
- Lake Erie Algal Toxin Advisories Continue
- If you have additional information, click here to let us know.

Bulk Density and Vegetative Success

Bulk density of soil is the mass of dry solids (organic and mineral materials) per unit of volume, including air space. For instance, soils with more pore space (higher porosity) have a lower bulk density (lower compaction).

This physical attribute is an indicator of soil quality and is important to the establishment and long-term success of vegetative treatments and landscaping.

Plants penetrate the soil by *growing* roots into pore spaces. Where pore spaces are not large enough for the root, soil solids must be pushed aside to make way for the root. Compacted soils with higher bulk densities have less pore space available for plant roots to extend. In addition to this, less pore space limits plant available water capacity, nutrient efficiency, aeration porosity, and gas exchange (roots need air too).

In keeping with the science of soil quality, good conservation calls for lowering bulk density (compaction) wherever and whenever possible; particularly, where successful vegetative treatments and landscaping are desired to restore urban ecosystem function.

Cleveland's Pursuit of the Beneficial Use

Making useful products from the Cuyahoga River dredged materials

Soil pH: A Key to Planting Soil-Based Water Quality BMPs

Bio-retention cells, pocket wetlands and other soil-based water quality Best Management Practices (BMPs) function well when landscaped with plants adapted to planned (natural and manufactured) soil conditions. A key consideration for vegetative establishment and growth is soil pH. Soil pH is an expression of the degree of soil acidity and alkalinity. The pH scale is 0 to 14. Soils with lower pH (<7) are more acid, higher pH (>7) are more alkaline, and pH 7 are neutral.

At lower pH, Aluminum (Al), Iron (Fe) and Manganese (Mn) are more soluble and can be concentrated enough to be toxic to plants. To neutralize soil acidity, liming materials can be applied.

With higher pH, elements such as Al, Fe and Mn become less soluble and less toxic. However, as pH rises above neutral, Fe, Mn and other micronutrients can become less plant available and can lead to micronutrient deficiencies.

Micronutrient deficiencies in alkaline soils can be a problem for some plants, but plant selection and acid-forming amendments, such as sulphur, can be easily applied to meet ones needs.

So, to ensure that soil-based water quality BMPs are thriving, well-vegetated, aesthetically pleasing features with minimal maintenance applications of fertilizer and lime, be sure to adequately consider the soil pH during plant selection and maintenance.

Urban Soil Rehabilitation: Rediscovering the Rhizosphere

Rehabilitation of urban soils has become a widespread topic of conversation in metropolitan areas. Of particular interest is the renewed focus on plant and soil interactions. Plants and soils individually provide unique and valuable functions and can be aesthetically pleasing components of the urban environment. The zone where plant roots and soils interface is of significant importance to rehabilitating not only soil quality, but water and air quality as well (*see Soil Structure TQ 9.3*).

The zone where plants roots and soil interface is known as the rhizosphere. The rhizosphere typically extends a few millimeters from a root surface and is teaming with an abundance and diversity of microbial critters. Here, chemical and physical properties are influenced by the interaction of plants and soil. Plant roots take in nutrients and exude organic compounds (e.g. sugars, organic acids,

amino acids, etc.) that provide an excellent growth medium for microbes. Nutrient uptake, organic matter additions, and microbial decomposition processes are all targeted functions of storm water treatment facilities like bio-retention cells, pocket wetlands, and other soil-based water quality Best Management Practices (BMPs). While bio-retention cells and pocket wetlands are each compatible with different soil drainage classes (*see Drainage Class and Soil Color TQ 10.1 and 10.3*), they both require plantings to function optimally. So, during your next consideration of urban soil rehabilitation or design of a water quality feature, be sure to consider the benefits of plant and soil interactions and rediscover the rhizosphere!

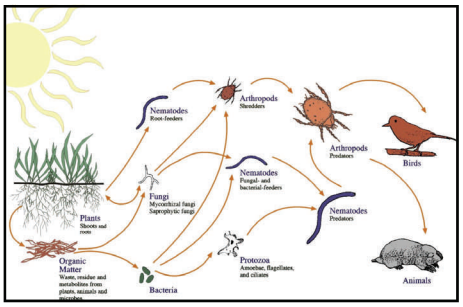

Image courtesy of NRCS

Proper Disposal: Important Reminder

A reminder to properly dispose of chemical wastes. Don't let this happen on your site!

Please dispose of any chemical wastes correctly.

STORM WATER PROGRAM'S PRINCIPAL OBJECTIVE

Help guide planning, design, construction and maintenance of water quality Best Management Practices (BMPs) and soil quality improvements based on Clean Water Act responsibilities and Federal Farm Bill programs.

Sediment and Nutrient Filtration Using Organic Mediums

Organic materials, such as hardwood mulches and yard-waste compost, are well known for their beneficial influence on water-holding capacity, flocculating and stabilizing soil structure (see *Soil Structure*, TQ 9.3 & *Flocculants*, TQ 10.3), as well as increasing nutrient and chemical retention (see *Soil Organic Matter*, TQ 9.4). In addition, the microbial critters often found in abundance in mulch/compost blends, work to break down pollutants and other substances. In keeping with these and other benefits, mulch/compost blends are increasingly sought out for use as water quality filter mediums.

Filter socks and berms are two common applications of mulch/compost blends that can be used for water quality treatment purposes where sheet flow occurs. When used properly, filter socks and berms have been demonstrated to retain sediment, thereby decreasing turbidity, and trap other pollutants, such as hydrocarbons, pesticides, and metals. In fact, qualitative studies have consistently shown that filter socks and berms are at least as effective as most traditional sediment control practices, and in some cases more effective.

In addition to filtration, where non-sediment pollutant loading is negligible, mulch/compost blends may be incorporated as part of the landscaping when construction is complete. Filter socks and berms can even aid in the long-term function of bio-retention cells and other soil based water quality BMPs.

So, given the diversity of potential application of filter socks and berms, one should consider the benefits of putting these water quality filter mediums to work. Just be sure that the specific mulch/compost blend *selected* meets one's needs. In other words, composition is key when it comes to water quality and filter mediums.

Cuyahoga SWCD

NOTICE

Take advantage of the Technical Quarterly hyperlinks, visit:
http://www.cuyahogaswcd.org/services-stormwater-publications.html

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2010 Schedule of Training Opportunities

Find details on our website's **Calendar of Events** for the most up-to-date information.

Date	Event
October-December	Healthy Soils, Healthy Crops - CPESC On-line Training
November 4	Stormwater System Design, Performance, & Economics
November 17-18	39th Annual Water Management Association of Ohio Conference
December 10	Exams only for Certified Professional Erosion and Sediment Control Inspector (CPESC) , Certified Erosion, Sediment and Storm Water Inspector (CESSWI), Certified Professional in Storm Water Quality (CPSWQ), and Certified Municipal Separate Storm Sewer System Specialist (CMS4S)