

Syllabus November 2008

The course has two types of modules. Core modules are given in all sessions noted as C1, C2, C3, etc. Treatment modules noted as T9, T10, etc, focus on specific pollutants: TPH, metals, phosphorus, nitrogen, bacteria, temperature, and gross solids (litter). There is insufficient time in the two days to present all seven modules. *We focus on the pollutants attendees identify as their priorities for their community and region. For each treatment system a summary table is provided on known performance based on effluent concentrations observed in field studies.*

DAY 1

#	TOPIC	CONTENT
C1	Management approach	<i>Stormwater, why the concern:</i> Impact on the hydrologic cycle and in turn streams, lakes, wetlands, and estuaries; pollutants of concern and why. <i>Control strategy:</i> integrated control of runoff rate and volume, and pollutant reduction. <i>General summaries:</i> Performance and pros/cons of each type of treatment system.
C2	Stormwater quality	<i>What in stormwater matters to treatment and performance:</i> sources of pollutants, types of pollutants, and typical concentrations; variability in concentrations and why.
C3	Source control	<i>Importance of source control</i> to the ability of treatment systems to meet numeric limits, and to reduce cost of maintenance; source control BMPs of particular benefit.
C4	UOPs	<i>Unit processes and operations:</i> a better way to frame and understand stormwater treatment systems.
C5	Treatment systems	<i>Overview of what we have:</i> basins, swales, filters, infiltrators, gross solids removers, active treatment. Manufactured vaults and filters.
C6	Some Basics	<i>Unit process of sedimentation:</i> How sediment (TSS) settles, hydraulic loading rate versus residence time, Stokes Law. <i>Unit processes of sorption:</i> adsorption, absorption, ion exchange; operating capacity and relationship to media replacement. <i>Unit processes of wet basins:</i> chemical and biological processes; what is really going on; myths about wet basins. <i>Unit processes of infiltration systems:</i> chemical and biological processes, causes of failure, mounding, groundwater and soil contamination.
C7	TSS	<i>TSS:</i> What it is, common concentrations, and particle size distributions; current performance goals and benchmarks; origin of the common performance goal. <i>Basins:</i> wet ponds and wetlands, a more cost-effective design procedure making them much smaller than currently; extended detention, how to make as effective as wet basins. <i>Swales and strips:</i> Origin of residence time and Manning's criteria, design changes to improve performance. <i>Filters:</i> filter media, performance and sizing; manufactured filters. <i>Summation:</i> likely lowest effluent concentrations for both public-domain and manufactured systems.

DAY 2

The morning of Day 2 we focus on specific pollutants. Which sessions are presented depends upon the priorities established by the attendees through the completion of the Questionnaire that comes with the Registration Form. Final core sessions occur in the afternoon of Day 2.

#	TOPIC	CONTENT
T8*	TSS/Enhanced Removal	<i>Laminar settlers:</i> Use in small vaults, why and the benefits <i>Active treatment:</i> Liquid and solid coagulants at construction sites.
T9*	TPH	<i>Oil/water separators:</i> current performance goals and benchmarks; sizing a true separator, API and CPI; distinction from oil/grit separators; limited use is recommended; data on how well other treatment systems such as ponds and swales remove TPH.
T10*	Metals	<i>Which metals are important:</i> which tend to be dissolved, what is removed with the TSS, focus on dissolved; performance goals and benchmarks. <i>Wet ponds, and wetlands:</i> how metals are removed; role of plants versus soils; data on the relationship of basin size and removal; cost-effective sizing; inherent limits of biological systems; performance over the long-term, and relevance of vegetation harvesting. <i>Filters:</i> media types, capacity vs performance; amended sand filters, bioretention cells and swales (dry swales); performance of manufactured filters; media for metals removal. <i>Infiltration:</i> performance based on what is found in groundwater beneath infiltration and porous pavement systems. <i>Summation:</i> likely lowest effluent concentrations for both public-domain and manufactured systems.
T11*	Phosphorus	<i>Importance of dissolved phosphorus:</i> What is removed with the TSS; focus on dissolved; what is BAP; performance goals and benchmarks. <i>Wet ponds, and wetlands:</i> how phosphorus is removed; role of plants versus soils; data on the relationship of basin size and performance; cost-effective sizing; inherent limits of biological systems; performance over the long-term, and relevance of vegetation harvesting. Active treatment with chemicals. <i>Filters:</i> media types, capacity vs performance; amended sand filters, bioretention cells and swales (dry swales), infiltration; performance of manufactured filters; media for phosphorus removal. <i>Infiltration:</i> performance as determined by what is found in groundwater beneath infiltration and porous pavement systems. <i>Summation:</i> likely lowest effluent concentrations for both public-domain and manufactured systems.
T12*	Nitrogen	<i>Forms of nitrogen:</i> organic, ammonia, nitrate; what is removed with the TSS; focus on dissolved; performance goals and benchmarks. <i>Wet ponds, and wetlands:</i> how nitrogen is removed; role of plants versus soils; data on the relationship of basin size and performance; cost-effective sizing; inherent limits of biological systems; performance over the long-term, and relevance of vegetation harvesting. <i>Filters:</i> media types, capacity vs performance; amended sand filters, bioretention cells and swales (dry swales), infiltration; performance of manufactured filter; media for nitrogen removal. <i>Infiltration:</i> performance as determined by what is found in groundwater beneath infiltration and porous pavement systems. <i>Summation:</i> likely lowest effluent concentrations for both public-domain and manufactured systems.

#	TOPIC	CONTENT
T13*	Bacteria	<i>Disease organisms in stormwater:</i> sources; health risks; performance goals and benchmarks. <i>Treatment:</i> removal mechanisms, which systems are ineffective; which are most effective. <i>Public-domain systems:</i> ponds, wetlands, swales, bioretention, design modifications to enhance performance. <i>Manufactured systems:</i> new developments on positive kill systems; active disinfection; media for nitrogen removal. <i>Summation:</i> likely lowest effluent concentrations for both public-domain and manufactured systems.
T14*	Temperature	<i>Thermal effects:</i> of pavement and treatment systems, <i>Design elements to minimize thermal effects:</i> Ponds and wetlands; bioretention.
T15*	Gross solids (Litter)	<i>Composition:</i> what are gross solids, why control is important; current performance goals and benchmarks; current performance goals and benchmarks. <i>Control:</i> in common treatment systems; with screens and sweeping.
T21*	Cold climate	<i>Special considerations and design elements for Cold Climate regions</i>
T22*	Retrofit	<i>Focuses on issues, special considerations, and technical approaches to retrofitting treatment into the built environment</i>

CORE SESSIONS COVERED IN THE AFTERNOON OF DAY 2

C16	Pretreatment	<i>Why pretreatment:</i> reasonable performance target. <i>Unit operations for pretreatment, sizing:</i> strips, forebays in ponds and sand filters. <i>Manufactured vaults for pretreatment:</i> swirl concentrators (aka vortex), standard configured vaults; performance data; use of HLR for model selection.
C17	Treatment Trains	<i>Being effective and cost-effective:</i> objectives; inconsistent application of the terminology; example systems; pitfalls; performance data; rules on sticking “boxes” in series; is a second or third “box” worth it?
C18	Maintenance	<i>Effect on performance:</i> data on the effect of maintenance on performance. <i>Facility inspection program:</i> its elements and costs; cost experience.
C19	Certification	<i>Certification programs:</i> requirements and status of approved manufactured systems; lab versus field testing; manufactured systems not currently certified that will likely meet performance goals. <i>International BMP Data Base.</i> How to use it; questions to ask; its benefits and limitations; cautions in its use.
C20	Wrap up	Systems used by application; summary of performance; lowest possible effluent concentrations by pollutant and which systems can give those concentrations; possible ways to improve each type of treatment system; final observations.

* Which of these is presented depends on the priorities set by the attendees who complete a brief questionnaire with the registration form.