Minnesota Ground Water Association

Spring 2006 Conference – April 12, 2006

Better Ground Water by Design -

A Review of Practices and Systems That Impact Ground Water

John M. Barten, Water Resources Manager, Three Rivers Park District

Presentation

Alternative Landscape Management to Protect Water Resources

Abstract

Soil compaction during urban development is a significant problem affecting both surface and groundwater resources in the Twin Cities Metropolitan Area (TCMA). Cone penetrometer readings obtained from lawns in the west TCMA suburbs show significant compaction of the upper soil layers , and impaired plant root growth. Turf establishment and maintenance on these compacted soils requires the use of large amounts of fertilizers and pesticides, requires excessive amounts of groundwater during summer months, increases the volume of rainfall runoff, and because of the greater pollutant availability, increases the rate of pollutant export. Recent research has demonstrated that turf areas export significant quantities of nutrients, particularly phosphorus to lakes and streams in urban area.

Reducing soil compaction, therefore, needs to be a mandatory component of stormwater management in urban areas. This presentation will address numerous strategies to reduce soil compaction during and after the land development process, and discuss strategies to replace turf with deep-rooted plant species that will improve rainfall infiltration. These strategies have the long term goal of reducing storm water runoff, reducing pollutant export from urban areas, and reducing the use of groundwater.

Biography

John M. Barten received a B.A. in Biology and Chemistry, and an M.A. in Aquatic Biology from St. Cloud State University.

From 1979 to 1987, Mr. Barten worked as a Limnologist in Waseca, Minnesota, where he developed and implemented restoration programs for two lakes in the City. A major feature of the restoration program was the management of a 52-acre wetland treatment system designed to remove nutrients from stormwater runoff.

From 1987 to 1989 he worked as a Limnologist for the Dakota County Soil and Water Conservation District. The position involved working with municipalities to mitigate the impacts of development on aquatic resources, and assisting municipalities and watershed management organizations with water quality management planning. Mr. Barten developed and wrote much of the City of Eagan Water Quality Management Plan.

Since 1989, Mr. Barten has worked as the Water Quality Manager for Three Rivers Park District, where he works with municipalities and WMO's to mitigate the impacts of development on the quality of lakes in the Park system. At Three Rivers Park District, he is responsible for the management of 20 lakes, 9 swimming beaches, and 56 water supply wells. While in this position, Mr. Barten has done extensive research on the quality of runoff water from lawns and golf courses.

Mr. Barten is a member of the North American Lake Management Society, the Minnesota Wetland Delineators Association, the LMCD Exotic Species Task Force, the Society of Wetland Scientists, and the ILCC.

His publications include: "Nutrient Removal from Urban Stormwater by Wetland Filtration", pages 23-30 in Lake Restoration and Management, 1983. Lake and Watershed Management in a Small Rural Community", Lake and Reservoir Management, 1985, Vol. 1. "Quantity and Quality of Runoff from Four

Golf Courses in theTwin Cities Metropolitan Area", Report to the LCMR, 1995., "Studies on the Incidence, Control, and Affect of Eurasian Watermilfoil in Lakes Adjacent to Hennepin Parks", Report to the Metropolitan Council, 1995. Suburban Lawn Runoff Water Quality in the Twin Cities Metropolitan Area, 1996 and 1997", Hennepin Parks, 1997.

Dr. Jim Anderson, University of Minnesota, Dept. of Soil, Water, and Climate

Presentation

Water Movement and Soil Treatment

Abstract

Predicting the behavior of water in the soil formations is critical for the proper design of onsite sewage treatment systems. Understanding the impacts of the soil on the movement of water will allow for better designs and better operation of systems. The identification of the two flow patterns in soil is also critical to understanding how wastewater is treated in the soil system.

This discussion is designed to develop the key points in soil/water movement in relationship to onsite wastewater treatment and dispersal systems. This will allow the participants to assess the key components and the relationships between biomat formation and system hydraulic and treatment performance. There is a clear discussion of the differences between saturated and unsaturated flow and their applications in the operation of onsite wastewater systems.

The Water Movement and Treatment in Soils Module addresses 1) the basics of water movement in the vadose zone and upper saturated zone of soil, 2) the measurement, calculation and interpretation of saturated hydraulic conductivity (Ksat), 3) the use of Darcy's Law and simple models to assess and simulate water movement in soils and the upper portion of the ground water system and 4) wastewater treatment in soils. For this discussion emphasis is placed on gravity distribution and effect of unsaturated flow effects on soil treatment.

Biography

Present Position: Professor Department of Soil, Water and Climate (since 1991)
Director of Center for Agricultural Impacts on Water Quality (since 1986)
and Co-director Water Resources Center (since1997)

Contributions in Environmental Quality Area:
Major contributions have been made in environmental quality research, education and extension. Since 1971, Dr. Anderson has conducted research and education programs on soil treatment of septic tank effluent. He has been invited to present workshops in over 20 states, 3 provinces in Canada, and for the National Association Wastewater of Transporters. He writes a monthly column for the Onsite Installer magazine, which reaches approximately 27,000 industry professionals. Since 1986 he has been responsible for overseeing research and education on agricultural water quality impacts. He was a Principle Investigator on the Northern Cornbelt Sandplain Management Systems Evaluation Area Project. He was instrumental in developing with the Natural Resources Conservation Service, nutrient and pesticide standards for water quality protection. Dr. Anderson was co-developer of the nationally recognized Farmstead Assessment System, (FARM*A*SYST). Since 2000 he has participated in two USDA-CSREES panels reviewing grant proposals for the Section 406 Integrated Water Quality Program, once as panel manager. He currently is Principle Investigator on eight projects funded through USDA and USEPA.

Publications to date include:

- 25 scientific papers in peer reviewed journals
- 42 articles for national symposia and conferences
- 71 extension bulletins, folders, manuals, articles

Professional Honors and Awards:
2003. National Association of Wastewater Transporters Man of the Year.
1997. USDA Distinguished Service, Farm*A*Syst/Home*A*Syst Program
1997. USDA Group Honor Award, Farm*A*Syst/Home*A*Syst , Group Leader

1997. USDA Group Honor Award, Management Systems Evaluation Areas, Principal Investigator
1994. Special Act Award for Distinguished Service, U.S. Department of Agriculture for the development of the Farmstead Assessment System (Farm*A*Syst)
1989. Fellow, Soil and Water Conservation Society

Dr. Matt Simcik, University of Minnesota, Environmental Health Sciences

Presentation

Effects of Degraded Air Quality on Precipitation and Recharge Quality

Abstract

Many persistent organic pollutants undergo atmospheric long-range transport. Processes governing the extent of long-range transport include gas-particle partitioning, dry and wet deposition, air-water and air-terrestrial exchange and atmospheric reactions. Once deposited to a terrestrial or aquatic system these contaminants may be transported down into groundwater systems. The processes that govern the efficiency to which a persistent organic pollutant is transported into groundwater include volatilization, soil-water partitioning chemical reactions and microbial degradation. All of the above processes are governed by a compound's physical-chemical properties. Very few persistent organic pollutants possess the requisite physical-chemical properties to have the potential for both atmospheric transport and percolation into groundwater. These processes, physical-chemical properties and candidate persistent organic pollutants will be addressed.

Biography

Education: BS Chemistry from Michigan State University
MS Civil Engineering University of Minnesota (under Steve Eisenreich)
PhD Environmental Science Rutgers (under Steve Eisenreich)
Post-Doctoral Fellow Indiana University (under Ron Hites)

I am currently an Assistant Professor in the Division of Environmental Health Sciences in the School of Public Health at the University of Minnesota. I have been here for 6.5 years and I study the fate and transport of organic contaminants. In particular, I study atmospheric processes and their effect on aquatic systems.

Dr. Bill Arnold, University of Minnesota, Department. of Civil Engineering and Holly Dolliver, University of Minnesota , Department. of Soil, Water, and Climate

Presentation

Pharmaceuticals in Groundwater: Fate, Transport, and Effects

Abstract

In the past five years, pharmaceuticals have emerged as a new class of water contaminants. The chemicals have caused particular concern, for they are designed to have biological activity, and their effects in the environment are largely unknown. Pharmaceuticals enter surface waters largely via discharge of treated and untreated wastewater/sewage. Contamination of groundwater by pharmaceuticals has, overall, received less attention. It is also suspected that pharmaceuticals may enter the environment as a result of their usage in agriculture. One potential pathway pharmaceuticals may reach groundwater is via leaching from manure applied to fields or from manure pits. Of particular concern are antibiotics/antimicrobials, which may lead to environmental bacteria developing resistance. Regionally-based research is currently being conducted to evaluate the transport of agricultural antibiotics from terrestrial to aquatic systems

Biography

Dr. William Arnold is an Associate Professor in the Department of Civil Engineering. He received his B.S. in Chemical Engineering from MIT in 1994, an M.S. in Chemical Engineering from Yale University in 1995, and his Ph.D. in Environmental Engineering from The Johns Hopkins University in 1999. His

research is focus on the transformation of pollutants in natural and engineered aquatic systems. Current efforts include developing reactive membrane barriers for pollutant containment, studying the photochemical fate of pharmaceutical compounds, and studying reactions that occur at mineral (natural) and zero-valent metal (engineered) surfaces. In 2003, he was named Minnesota Young Engineer of the Year.

Holly Dolliver is a Ph.D. student in the Water Resources Science program at the University of Minnesota, advised under the direction of Dr. Satish Gupta in the Department of Soil, Water, and Climate. She received her B.S. in Soil Science from North Dakota State University in 2001 and M.S. in Water Resources Science from the U of M in 2003. Her research is focused on water quality and emerging contaminants from agricultural systems.

Camilla Correll PE, and Jennifer Olson PG, Emmons and Olivier Resources, Inc.

Presentation

Stormwater Management and Ground Water: Are They Compatible?

Abstract

Stormwater infiltration is becoming a more acceptable method of managing the surface water runoff volumes associated with increased imperviousness due to development. Within the last 10 years, stormwater managers have realized the need for management and protection that goes beyond traditional ponding and have turned to stormwater infiltration as one solution to the problem. Stormwater infiltration is a means of handling excess runoff by mimicking the natural hydrology of the system: it provides for groundwater recharge, maintains stream baseflow, and protects surface water quality and stream morphology. While stormwater infiltration is typically used for small storm hydrology it can be used on a very large scale for flood protection.

One of the interesting issues associated with stormwater infiltration is the protection of the groundwater quality. While stormwater infiltration provides substantial surface water protection, it also has the potential to negatively impact the groundwater resources. To reduce this impact, stormwater has to be subject to pretreatment prior to infiltration. However, there are some pollutants that are more difficult to treat than others. Another important design consideration is groundwater mounding. Groundwater mounding can result in decreased performance of an infiltration practice and eliminate the treatment effect of aerobic soils beneath the infiltration practice.

What standards have been established to address these issues in Minnesota and nationwide? What is the appropriate level of protection to provide? Guidelines have been established by the State and local authorities to address such things as:

- Minimum separation to the water table
- Special areas of concern (karst, fractured bedrock, wellhead protection areas, etc...)
- Design standards for infiltration practices
- Construction standards for infiltration practices

The presenters will identify the standards/guidelines being used to direct the design community today and will present a number of case studies located in the Metropolitan Area.

Biography

Jennifer Olson is a hydrologist and registered Professional Geologist with 8 years of experience at Emmons and Olivier Resources, Inc. Ms. Olson has an undergraduate degree in Hydrogeology from the University of Minnesota Duluth and a Master's degree in Water Resource Science from the University of Minnesota, Twin Cities. Ms. Olson's Master's research focused on the groundwater mounding process beneath infiltration practices and included an inventory of stormwater infiltration practices in the entire Metropolitan Area. Ms. Olson has managed the collection of 8 years of infiltration monitoring data in a rapidly developing portion of the Metropolitan Area and is currently involved in applying these data to watershed management and planning projects.

Camilla Correll is a water resource engineer and registered professional engineer with 8 years of experience at Emmons and Olivier Resources, Inc. Ms. Correll has an undergraduate and Master's degree in Civil and Environmental Engineering from the University of Wisconsin, Madison. Ms. Correll's Master's research focused on the feasibility of applying stormwater infiltration to a watershed facing development pressures in a suburb of Madison, Wisconsin. A significant portion of her work was dedicated to developing a literature review on stormwater infiltration. Ms. Correll was most recently involved in the development of the Minnesota Stormwater Manual which was developed in partnership with the Center for Watershed Protection.

Dr. Gyles W. Randall, University of Minnesota, Southern Research and Outreach Center, Waseca

Presentation

Impact of Agricultural Practices on Minnesota's Ground Water

Abstract

Agricultural crop and livestock production practices do have an impact on Minnesota's ground and surface waters. The degree to which these practices affect Minnesota's water resources is greatly dependent upon (1) geologic and soil properties, (2) climate, and (3) landscape use. Geologic and soil properties and climate are uncontrollable factors, which clearly define and determine the type and degree of environmental impact. Landscape management, however, is controllable, allowing us to choose and use management practices that minimize the environmental effects. The primary "contaminants" of concern are sediment, nutrients (nitrogen and phosphorus in particular), pathogens, and excess water. This presentation will discuss how these "contaminants" and their transport to water systems are affected by agricultural management practices such as cropping systems; time, rate, placement and source of nutrients; tillage practices; livestock dietary practices; and manure handling practices.

Biography

Dr. Gyles W. Randall is Professor and Soil Scientist at the University of Minnesota Southern Research and Outreach Center.

A native of Wanamingo, Minnesota, Randall earned his B.S. and M.S. degrees from the University of Minnesota and Ph.D. degree from the University of Wisconsin.

His research interests lie in soil fertility, tillage, cropping systems, and environmental quality as they relate to crop production. Specific research has centered on improved nutrient efficiency and management of fertilizers and animal manures in the development of best management practices (BMPs) to limit losses of nutrients to subsurface, tile drainage water.

Tim Crocker and Julie Ekman, Minnesota Department of Natural Resources, Waters, Area Hydrologists

Presentation

Management of Ground Water Use and Supply

Abstract

Where does your water come from? In the state of Minnesota the total reported water use in 2003 was 1374 billion gallons. Nearly 25% of this came from ground water sources and the major use of the ground water was for municipal water supply (2003: 140 billion gallons). Additionally, unreported ground water withdrawal occurs from approximately 130,000 domestic wells throughout the state. As our population continues to increase, so will our demand for water. Can our water resources provide for future needs?

Immediate areas of concern are urban sprawl, rural residential development, and major crop irrigation (up 31 billion gallons in one year 2002-2003) as well as industrial expansion such as ethanol production. In some areas of the state, adjacent but different land uses result in competition for the same water source.

How does DNR Waters evaluate water use? The permit process is DNR Waters' vehicle for evaluating requests for water appropriation. Through this process the following information is needed: purpose of the withdrawal, site location, volume to be appropriated, water source (ground water or surface water), and the viability of the water source.

The viability of ground water sources is information that we most often lack and yet this piece of information may be the most important in assuring the sustainability of our water resources. The larger our knowledge base becomes the better equipped we will be to make decisions on ground water use. How do we expand our knowledge base? Improved monitoring and technical analysis, better planning, and refined regulations that allow for a more fair and equitable distribution of water resources can help us move forward with confidence that our ground water resources will be available for future generations.

Biography

Tim Crocker graduated from the University of Minnesota College of Agriculture with a Bachelor of Science Degree in Soil and Water Resource Management – emphasis in water resources. Tim had a brief stint as a Watershed Technician with the Stearns, Wright and Meeker County SWCD's working on conservation practices in the Clearwater River Watershed. In 1988, he started working with the MN Department of Natural Resources – Division of Waters as a Staff Hydrologist. For the past 15 years, he has been an Area Hydrologist stationed out of Little Falls, currently serving Todd, Morrison and Mille Lacs Counties.

Julie Ekman graduated from the University of Minnesota Civil Engineering Department with a Bachelor of Science degree in Geological Engineering—Water Resources. She has worked for the Department of Natural Resources Division of Waters since 1995; first as an intern assisting hydrologists and hydrogeologists with surface water and ground water studies. After graduating from the University of Minnesota she worked in the County Geologic Atlas program, developing the Otter Tail Regional Hydrogeologic Assessment. Since June of 2002 Julie has been an Area Hydrologist serving Carver and southern Hennepin Counties.

State Senator Michael J. Jungbauer, District 48

Presentation

How Legislators Receive Scientific Information to Support Decision-Making

Committees

- Commerce
- Environment and Natural Resources
- Finance - Environment, Agriculture and Economic Development Budget Division
- Finance - K-12 Education Budget Division
- Finance - Transportation Budget Division
- Transportation

Home: East Bethel
Occupation: Wastewater treatment designer
Education: Moody Bible Institute