Identifying high infiltration and ground water recharge areas in Dane County, WI

Kathleen Arrington, Cindy Stiles*, Steve Ventura, and John Norman

Soil Science Department
University of Wisconsin
Why evaluate infiltration rates?

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- High infiltration/recharge areas provide valuable ecosystem services in landscapes
- Infiltration databases are relatively data-poor and inconsistent, but this information is a valuable resource for community planners
Suitability of soil series for septic leach fields, eastern Dane County (derived from Web Soil Survey)
Questions driving the Dane County infiltration/recharge area project

Can GIS-based model derived from SSURGO/NASIS info find potential high infiltration/recharge areas?
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- Can maps of these sensitive areas become part of community/regional urban development planning?
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- Can GIS-based model derived from SSURGO/NASIS info find potential high infiltration/recharge areas?
- Can maps of these sensitive areas become part of community/regional urban development planning?
- Will developers actually utilize the information and what format do they prefer?
Objectives

Map high infiltration/groundwater recharge areas at scales useful to land-use planners, managers, and engineers
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- Assess the impact of development on the infiltration rates of soils
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- Assess the impact of development on the infiltration rates of soils
- Develop tools to make this information readily accessible to the public
Model development

- Weighting and rating model combined with GIS layers to identify specific areas of interest
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- Three land-use categories: agricultural, residential, recreation/open/vacant/woodland
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- Sampling sites identified within combined land-use area and estimated surface horizon infiltration potential
Model development

- Weighting and rating model combining relevant GIS layers to identify specific areas of interest
- Three land-use categories: agricultural, residential, recreation/open/vacant/woodland
- Sampling sites identified within combined land-use area and estimated surface horizon infiltration potential
- Information for land-use from Dane County Regional Planning Commission (2005)
Activities – Stage 1

- Utilize pre-existing GIS layers to constrain categories of estimated soil infiltration and land-use
  - Geology, topography, land cover and land use history
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- Develop infiltration rate model suitable for field measurement methods
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- Develop infiltration rate model suitable for field measurement methods

- Field measurement of Ksat using confined ring infiltrometer, lab data obtained from cores with falling head permeameter
Field sampling strategy

- Number of sample points for each combination land use and estimated infiltration class is approximately proportional to land area coverage for that class.
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- Starting survey area will be Dane County SoLIM Sampling Project Watershed 58 because class proportion within this watershed is similar to Dane County proper.
Field sampling strategy

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- Stratified random sampling from SoLIM data points dependent upon relevant classes.
Setting – Dane County, WI
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Field measurements

- Surficially confined portable infiltrometer
- 1m x 0.5m rectangular steel frame surrounding a portable instrument
- Two replicates per landscape sample point
- Constant head maintained by ponded water on the surface within the confines of the ring
- Cores recovered and returned to lab for falling head permeameter measurements of separate horizons
Expected Products

- Dane County interactive (DCi) map
data layer = general public access
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- Extension publication = specific land use management
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- Modeling information publication through USGS/WNHGS for knowledgeable land-use managers