



ILLINOIS STATE
WATER SURVEY
PRAIRIE RESEARCH INSTITUTE

Topographic Wetness Index:

A GIS Approach to Identifying Areas At Risk of Urban Flooding

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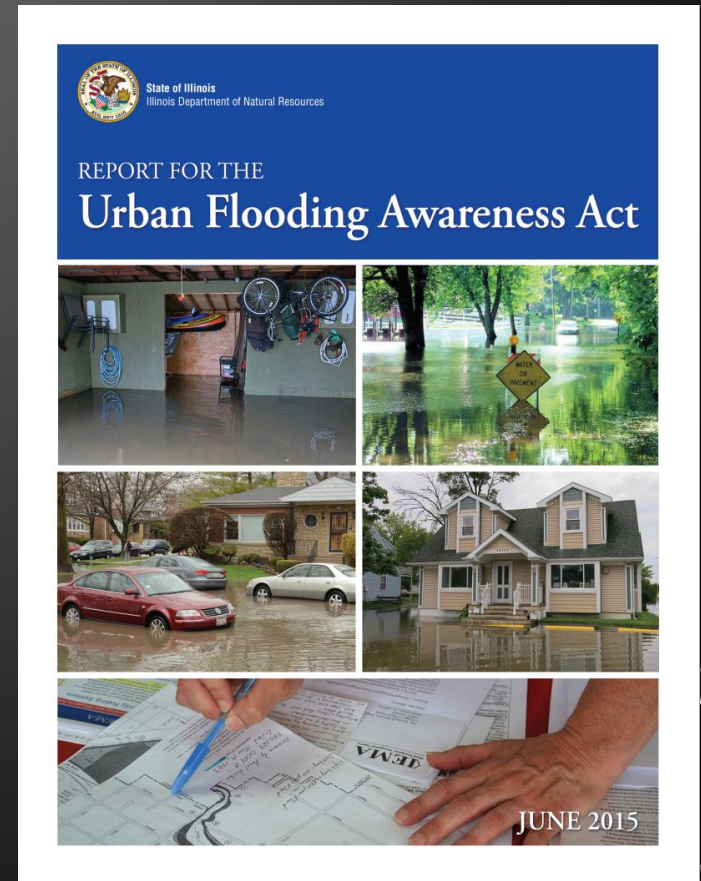
University of Illinois at Urbana-Champaign

Overview

- Background
- What's a Topographic Wetness Index?
- Brief History of Topographic Wetness Index
- Methodology
- Demo
- Processing Limitations
- Ground Truthing
- Road Ahead

Background

- Urban Flood Awareness Act released in June of 2015
 - Prevalence and cost
 - Climate trends and climate change
 - Effectiveness of projects, programs, and policies
 - Strategies for reducing urban flood damages
 - Technology and data for the identification of areas susceptible to urban flooding



What Is A Topographic Wetness Index

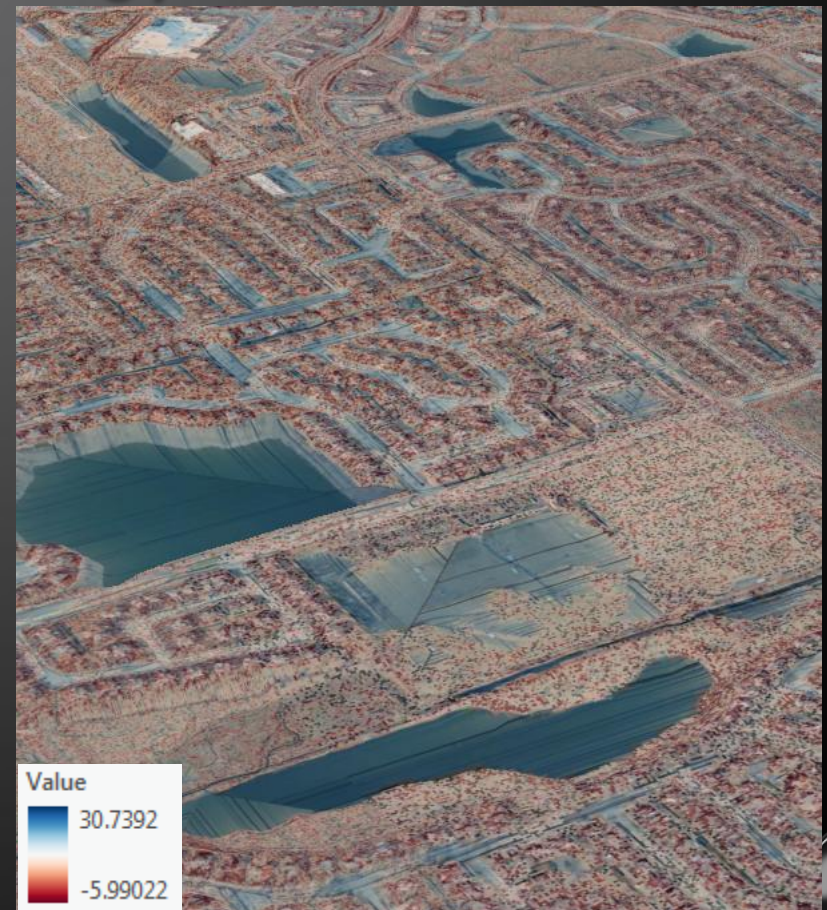
- Steady state index that's capable of predicting areas susceptible to saturated land surfaces and areas that carry the potential to produce overland flow.

History of Topographic Wetness Index

- First developed by Keith Beven & Mike Kirkby In 1979
 - TOPMODEL- model simulate the hydrologic fluxes of water throughout watershed
- Wetland identification, vegetation ecology, and tracking malaria.

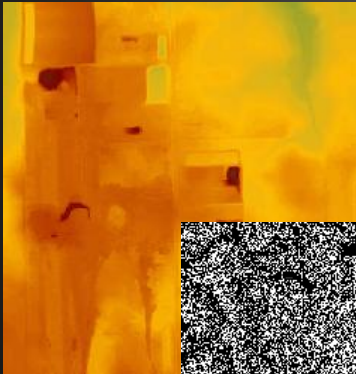
Methodology

- Formula: $TWI = \ln(a/\tan\beta)$
 - a is the upslope contributing area
 - β is the topographic gradient (slope)

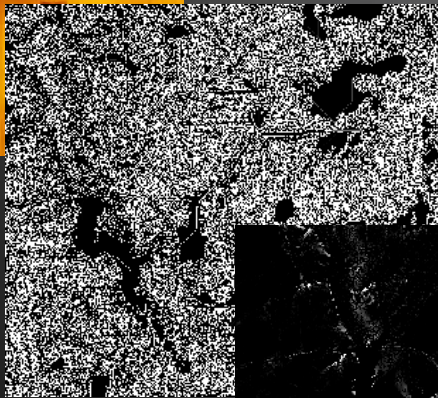


GIS Methodology

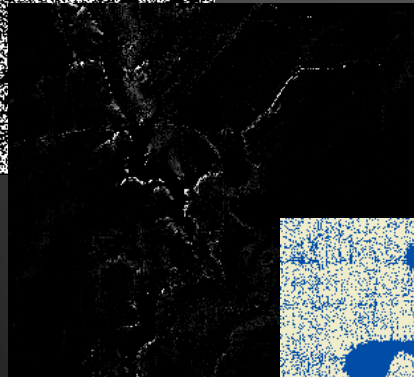
DEM



a

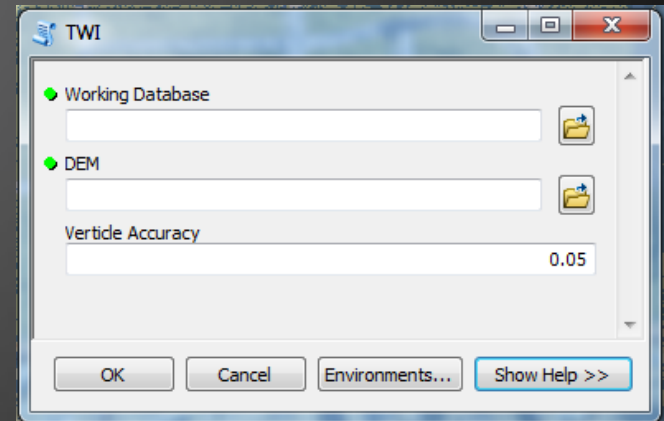
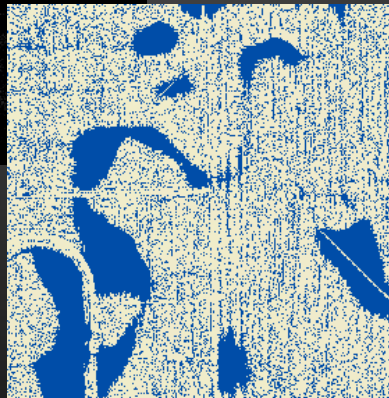


β



$$TWI = \ln(a/\tan\beta)$$

TWI

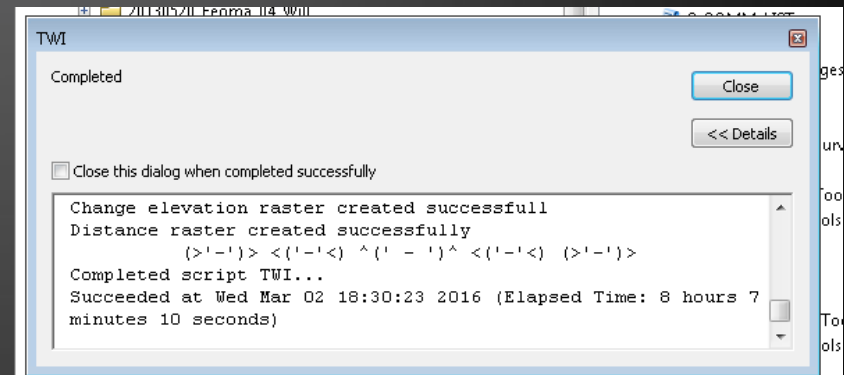


Demo



Processing Limitations

- The best results come for high resolution digital elevations models (DEM)
 - Hard drive Space
 - Computing time

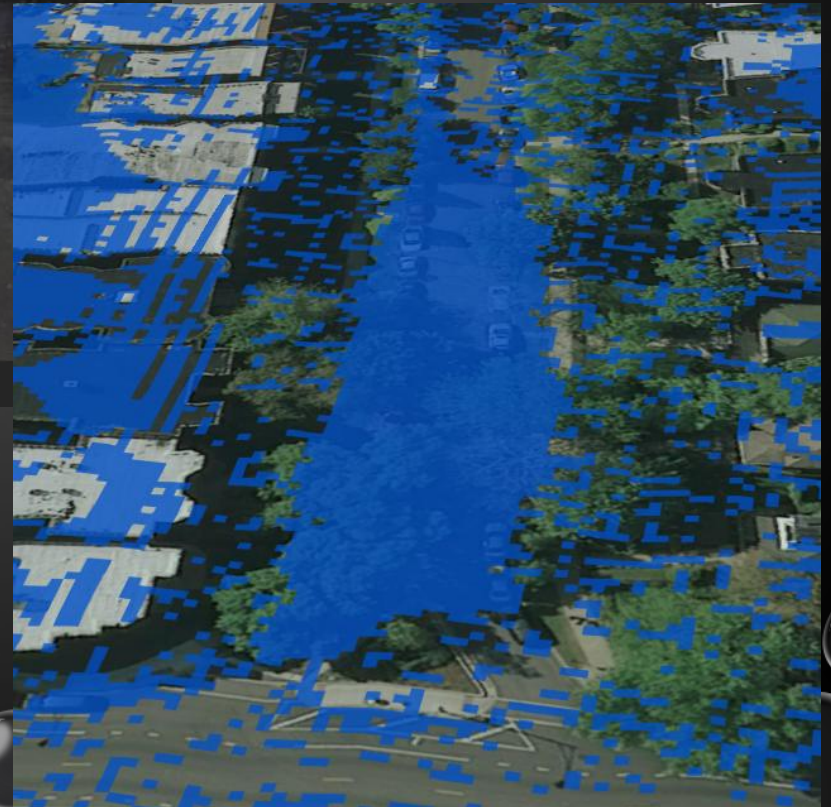


Ground Truthing



Flooding at Beacon Street and Lawrence Avenue.

Photo by: Sean Madden



Mitigation Planning With TWI



The Wet Road Ahead

- Journal article
- Developing a TWI for Will County
- Super computing
 - develop standardized index
 - Online TWI interface



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Questions?

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