

# Use of green infrastructure for stormwater management

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Growing Green Infrastructure in New York  
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# Outline

- Background
  - Onondaga Lake
  - Green infrastructure in Onondaga County
- The green roof
  - Technology introduction
  - *OnCenter* green roof
    - Water mass balance
    - Water chemistry study
    - Temperature gradient
- Future work

# Background

- Combined Sewer System (CSS): the same sewer system is used for both stormwater and domestic wastewater
- Combined Sewer Overflow (CSO): overflow of combined sewage and stormwater
- CSOs can be reduced by “gray infrastructure”
  - holding tanks, regional treatment facilities, enlarged central treatment plants

# Background

- Gray infrastructure is brute force approach
- Green infrastructure (GI) technologies used for stormwater management are designed to protect or restore the natural hydrology of a site

# Onondaga Lake

- Large proportion of the source water for Onondaga Lake (up to 20%) comes directly from METRO outflows
- CSOs are a major contributor of bacteria, floating trash, organic material, solids and grit to the lake and its tributaries.



*Onondaga Lake , Onondaga Lake Partnership.*

# Onondaga County

- 8 CSO sewersheds
- Precipitation “trigger” events as small as 0.10-0.15 in/hr



*CSO point , CNY Regional Planning & Development Board.*

# GI in Onondaga County

Factors allowing for rapid adoption of green infrastructure technologies:

- Shift in local and national mindset
- Support of all regulating parties
- Support of community advocates
- Economic opportunities
- Reasonably small metropolitan area

April 2011 Syracuse was named one of 10 partner communities by the EPA in their new strategic green infrastructure agenda.

# The green roof

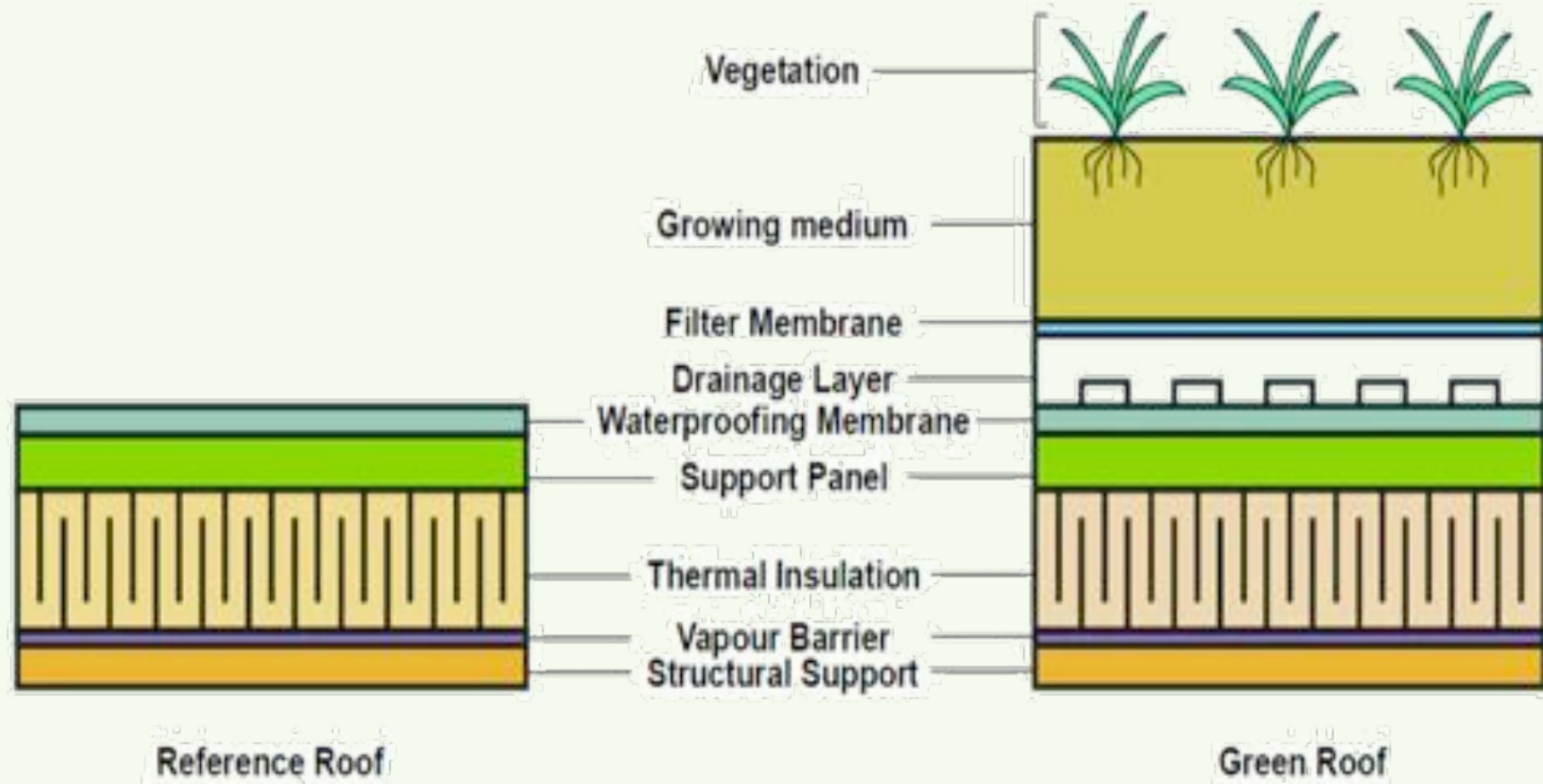


Cook and Jenshel. *National Geographic*.

Vegetated roof  
benefits:  
environmental  
economic  
aesthetic



# The green roof: typical structure



*Comparison of Typical Conventional vs. Green Roof Construction. Liu, 2003.*

# The green roof: types

- Extensive
  - Shallow substrate
  - Low maintenance
  - Limited plant variety
- Intensive
  - Deep substrate
  - Heavier weight load

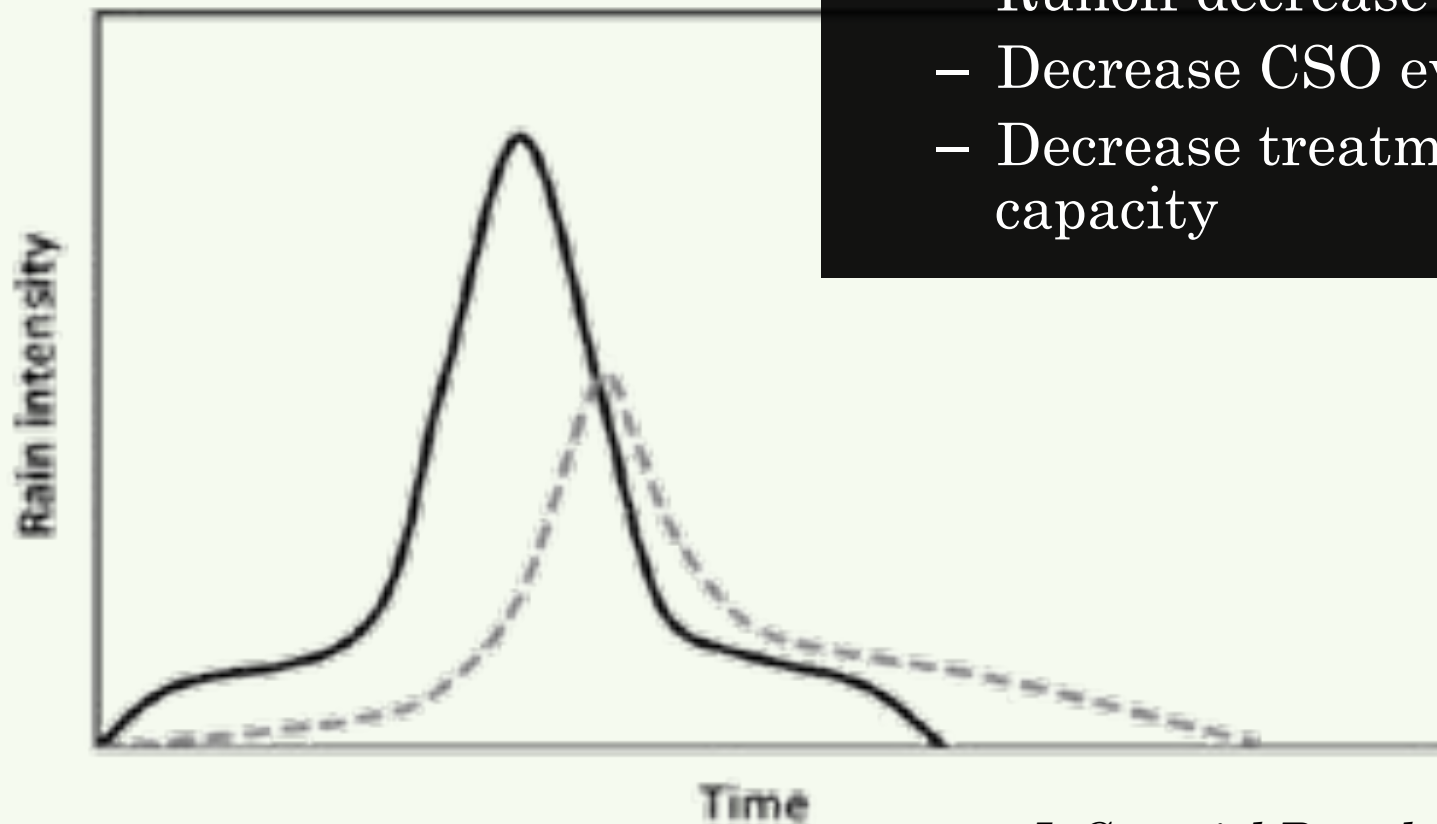


*Extensive green roof. City of Windsor, 2009.*

# The green roof: runoff reduction

## Volume reduction

- Peak discharge lag
- Runoff decrease
- Decrease CSO events
- Decrease treatment capacity



*J. Czerniel Berndtsson (2010)*

# *OnCenter* green roof



*Google Earth. September 2011.*

- 60,000 square feet
- Designed to retain 1 million gallons stormwater annually

# *OnCenter* green roof



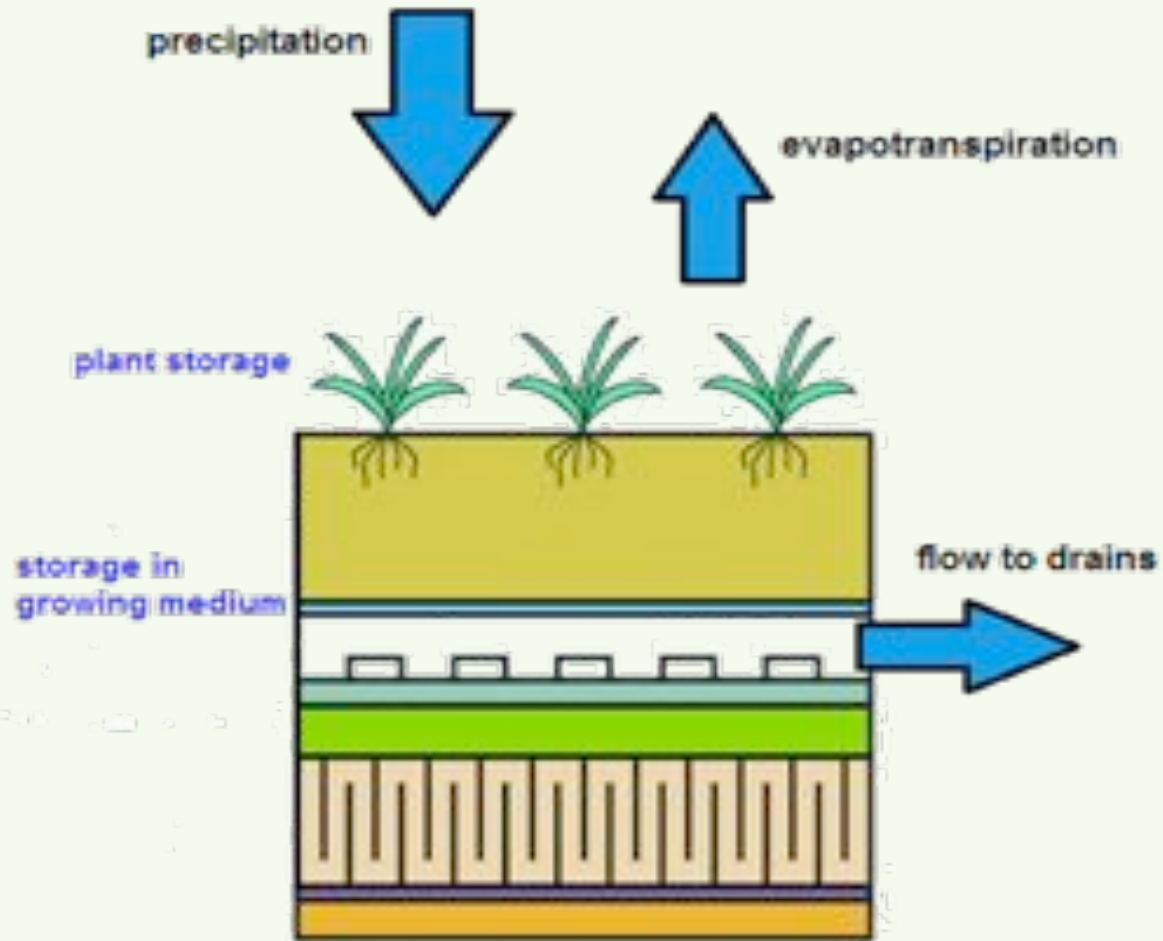
- Extensive
  - 3 inches growth medium
- Plants
  - Sedum album
  - Sedum sexangulare
  - Sedum rupestre
  - Sedum spurium
  - Sedum floriferum
  - Phedimus taksimense

*Emory Knoll Farms. 2011.*

# Research goals

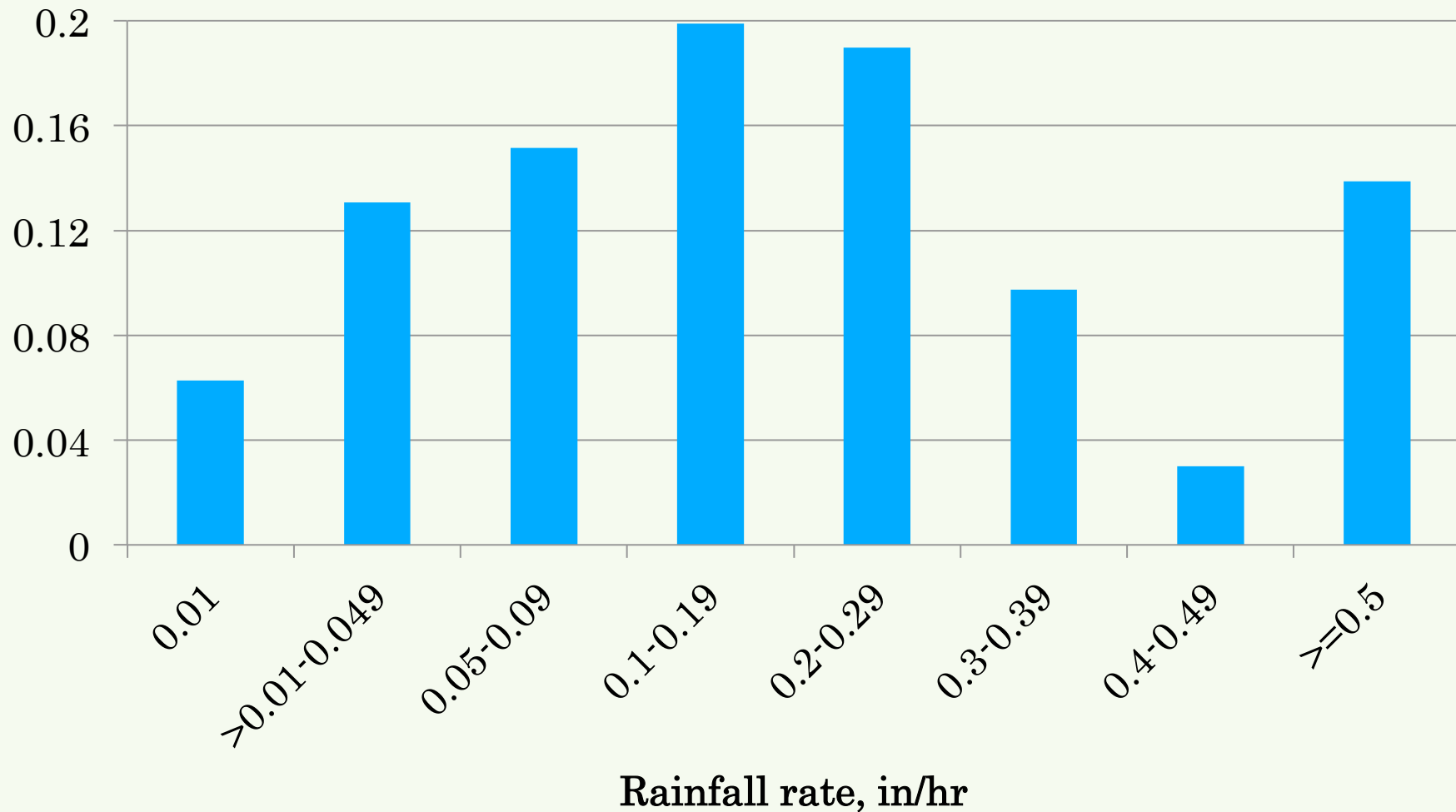
- Water mass balance over roof
  - quantify stormwater captured and delay
  - measure precipitation
  - measure growing medium water content
- Water chemistry study
  - growing medium leachate
- Temperature gradient through roof

# Water mass balance



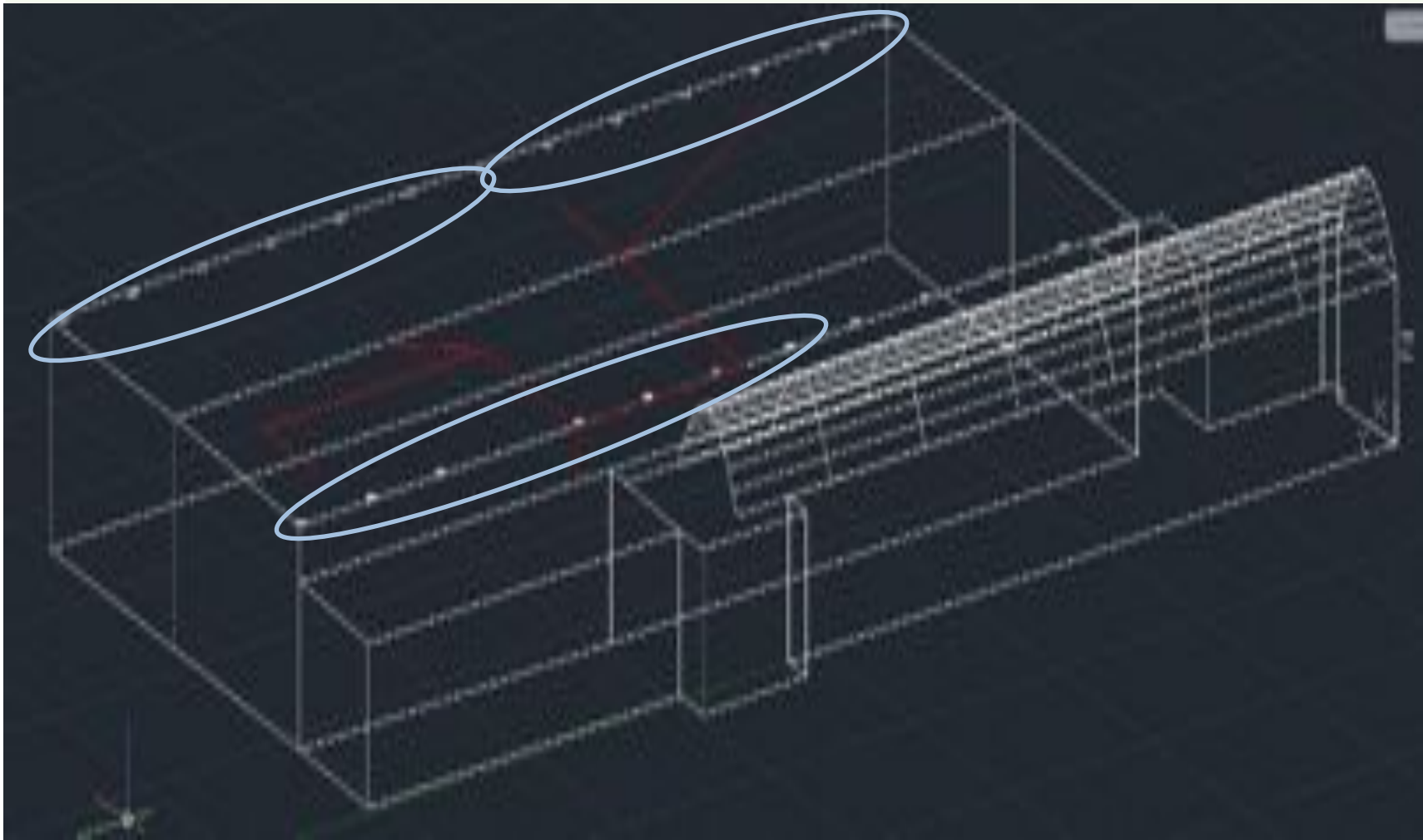
*Adapted from Liu, 2003.*

# Precipitation: Syracuse 2010



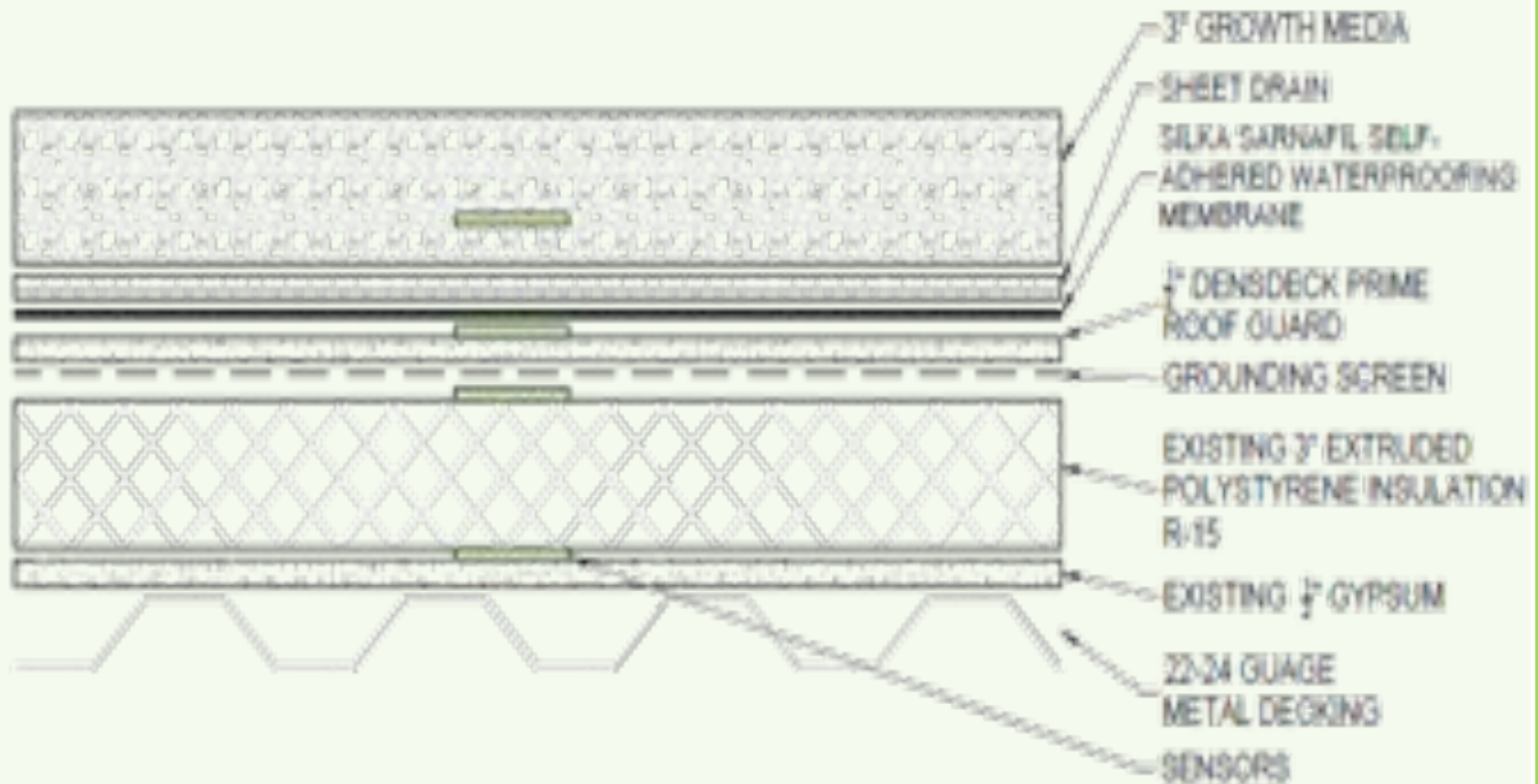


# *OnCenter* drain location

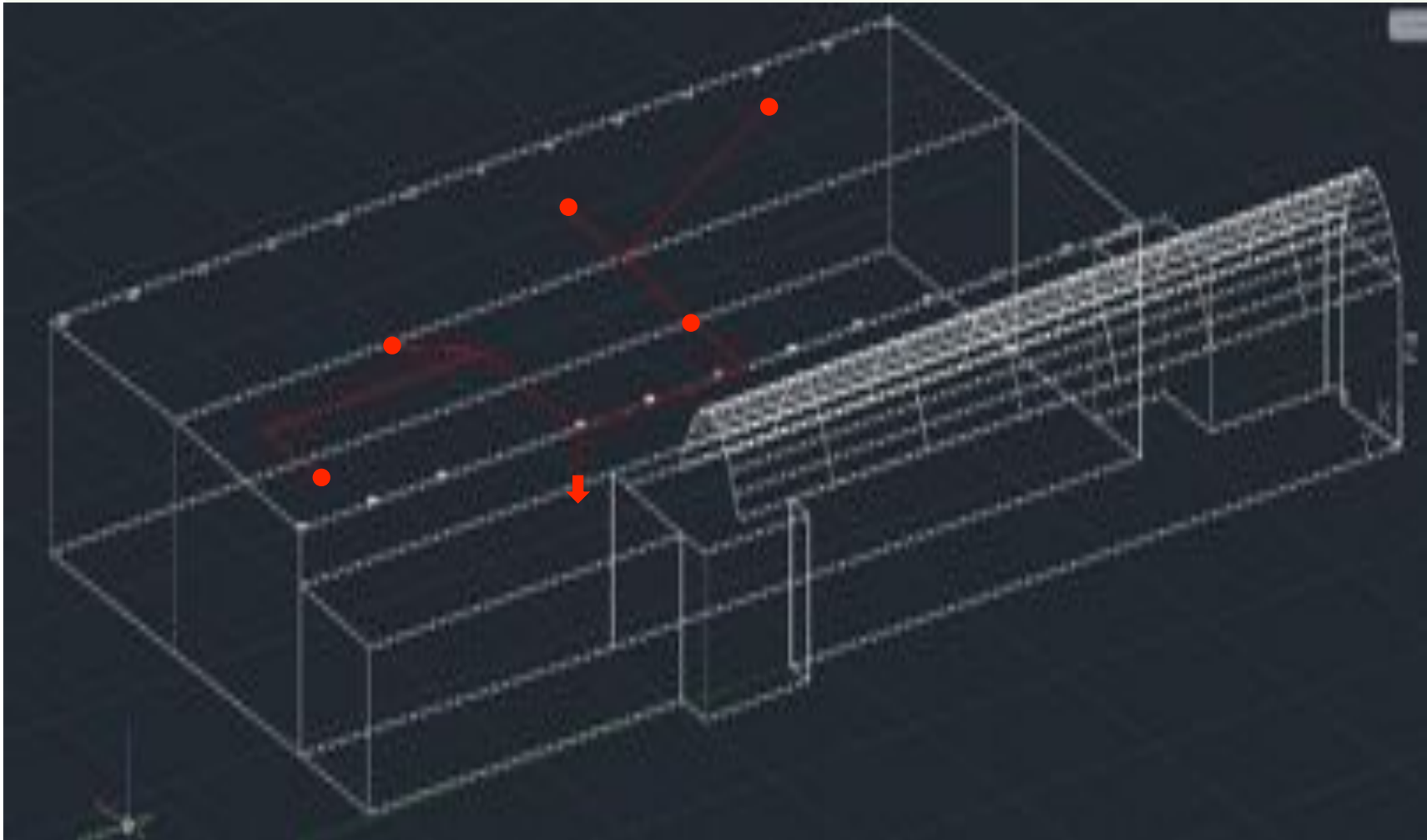




# *OnCenter* roof profile



# *OnCenter* sensor location



# Temperature sensors



# Soil moisture sensors















# Future work

- Website
  - real-time monitoring
  - live feed webcam
  - accessible to public and schools
- Joint project with SU School of Education
- War memorial water re-use
- Other monitoring opportunities

# Special thanks

