

# Stormwater Master Plan University of North Carolina

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# Project Goals

- “Balance growth with the preservation of the natural drainage system.”
- Meet 8-year Development Plan requirements
- NPDES Phase II Post-Construction runoff requirements

# University Growth

- Over next 8 years, 5.9 million square feet of laboratory, classroom, office, and student housing space will be added
- Bond referendum

# Stormwater Requirements

- No increase in the volume of run-off
  - 2 Year, 24 hour, 3.6" storm event
- No increase in peak runoff rates

first inch of precipitation

- Promise to improve stormwater practices.

# Draft NPDES Phase II Post-Construction Requirements

- **Control and treat runoff from the 1-year, 24-hour storm**
- **85% removal for total suspended solids**
- **Side slopes no steeper than 3:1**
- **Minimum setbacks from surface waters**

# Campus Watershed

- Meeting of the Waters Creek drainage area  
441.3 acres
- Existing impervious cover 218.3 acres  
(49%)
- 8-year Development Plan impervious  
cover 221.47 acres (50%)
  - Increase of 3.17 acres
- Volume reduction required for 2 year 3.6"  
storm is 138,160 cubic feet (CF)



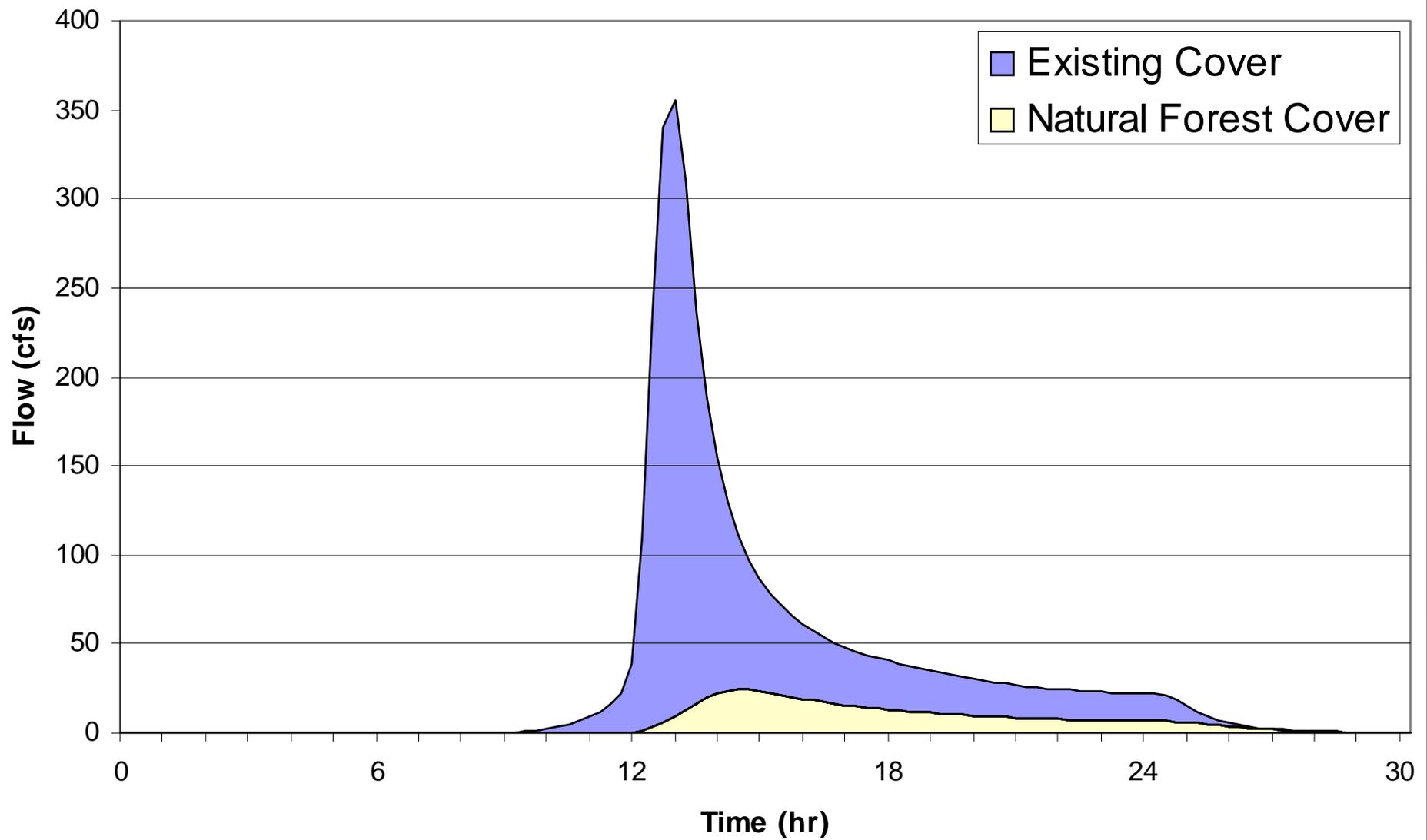




# The Problem with Pavement

- Increase in pavement or buildings (impervious surface) causes
  - More water to run off
  - Water to run off faster
  - Degraded water quality

## Meeting of the Waters: 2-yr Runoff Hydrographs







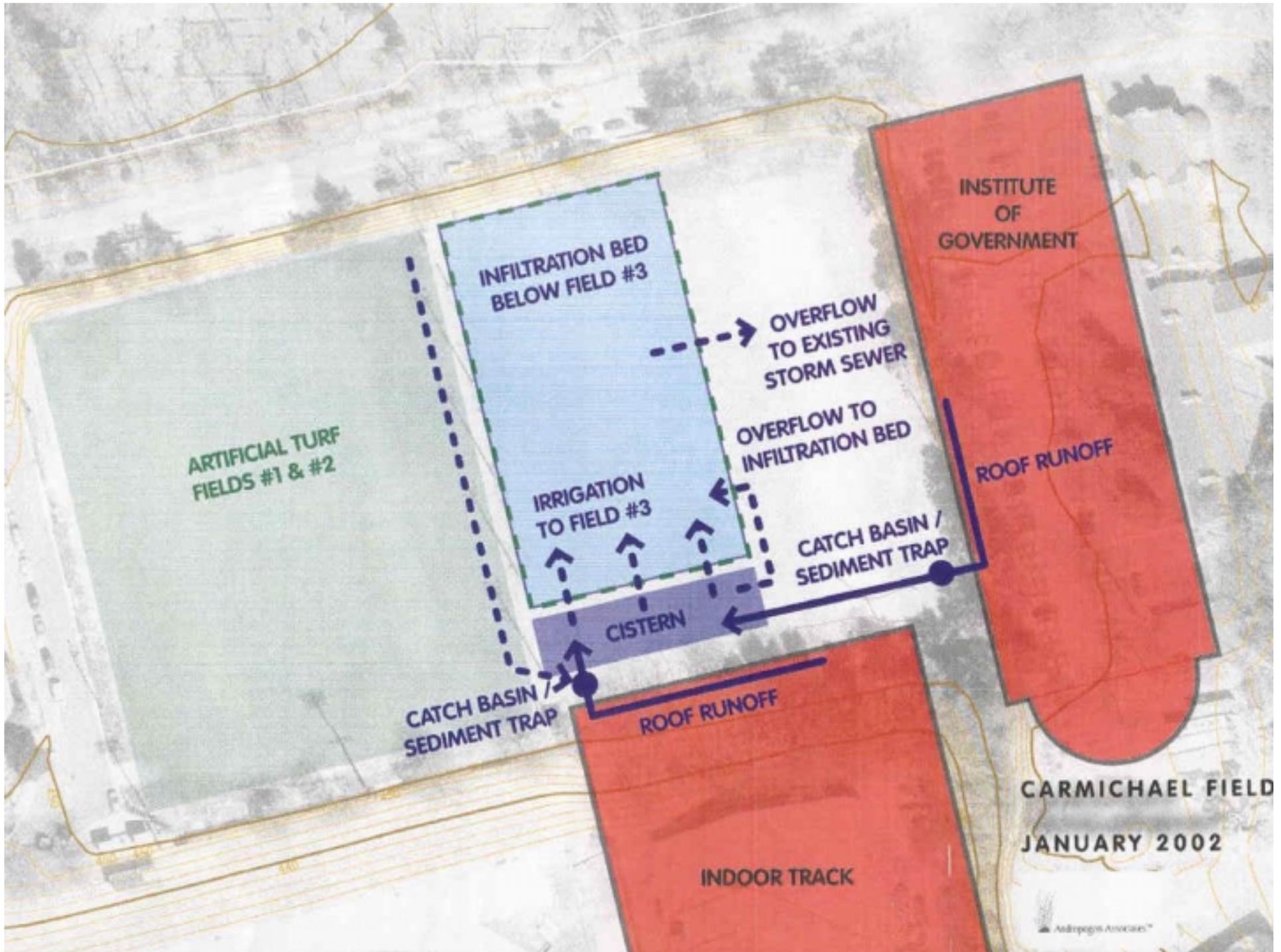


# Practices (BMPs)

- UNC BMP requirements
  - allow stormwater to infiltrate
  - allow stormwater reuse
  - reduce runoff
  - fit existing landscaping (National Landmark for Outstanding Landscape Architecture by the American Society of Landscape Architects)
  - allow continued University growth

# Infiltration Bed with Reuse

- Carmichael Intramural field with storage/infiltration in underlying gravel with water reuse from cistern
- Projected Storage = 72,000 CF
- Project Cost \$1,105,415
- Cost Benefit (\$/CF) = \$15.35







# Pervious Pavement

- Infiltration through porous asphalt or concrete
- Campus total projected storage = 45,788 CF
- Campus total projected cost = \$610,515
- Cost Benefit (\$/CF) = \$13.33





# Roof Gardens

- Low maintenance plants in light, engineered soil over a waterproof membrane
- Projected storage for Carrington Hall = 960 CF
- Projected cost for Carrington = \$137,709
- Cost Benefit (\$/CF) = \$143.45



# Completed and Proposed BMPs

- Five infiltration beds under fields
- Three pervious pavement lots
- Numerous tree trenches
- Five roof gardens
- One rain garden

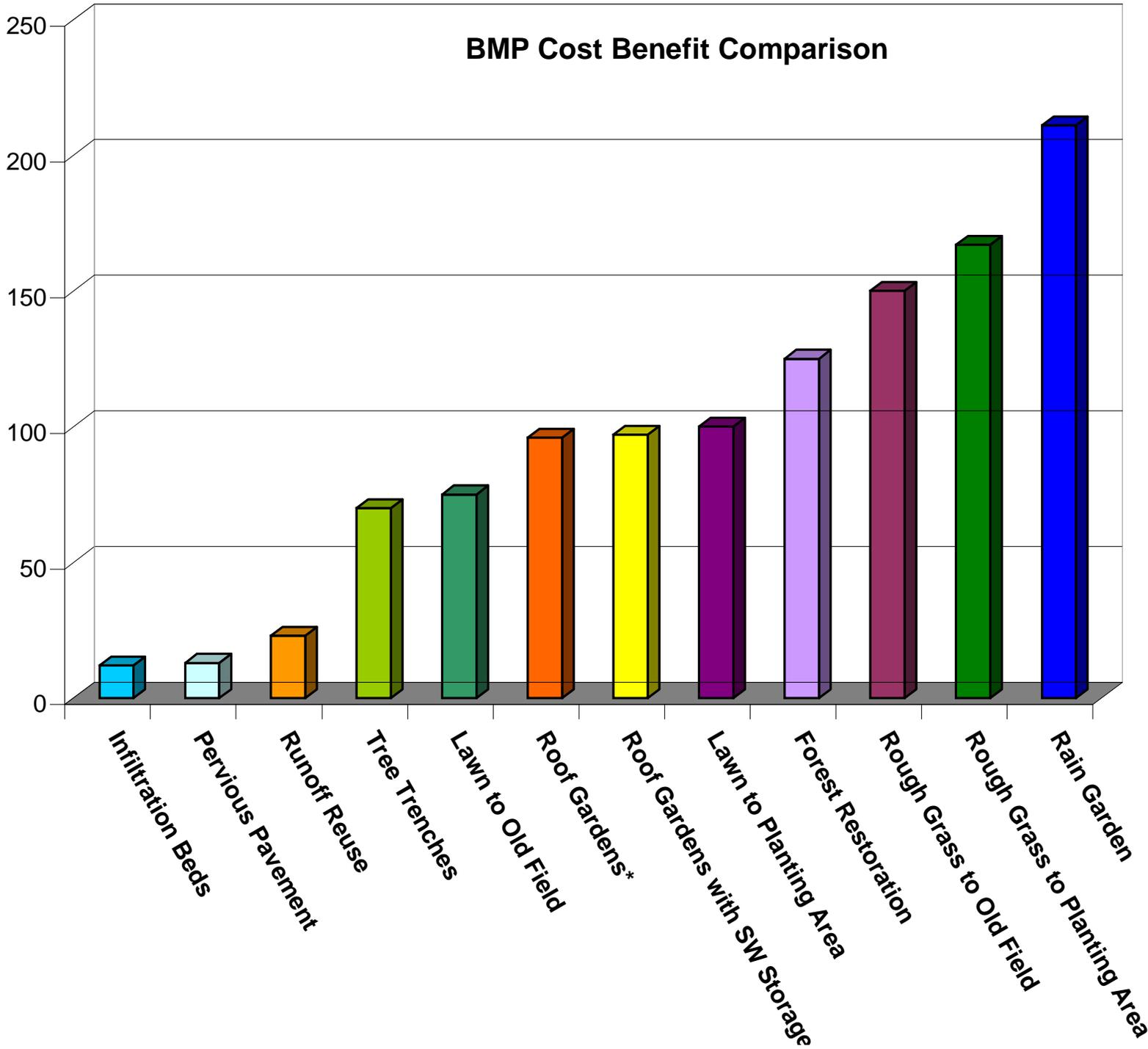
# Other BMPs Under Consideration

- Rain gardens
- Landscape conversions (lawn to fields, planting areas, reforestation)
- Cisterns
- Water quality inlets



# BMP Cost Benefit Comparison

Cost Benefit (\$/CF)  
for the 2-Yr Storm



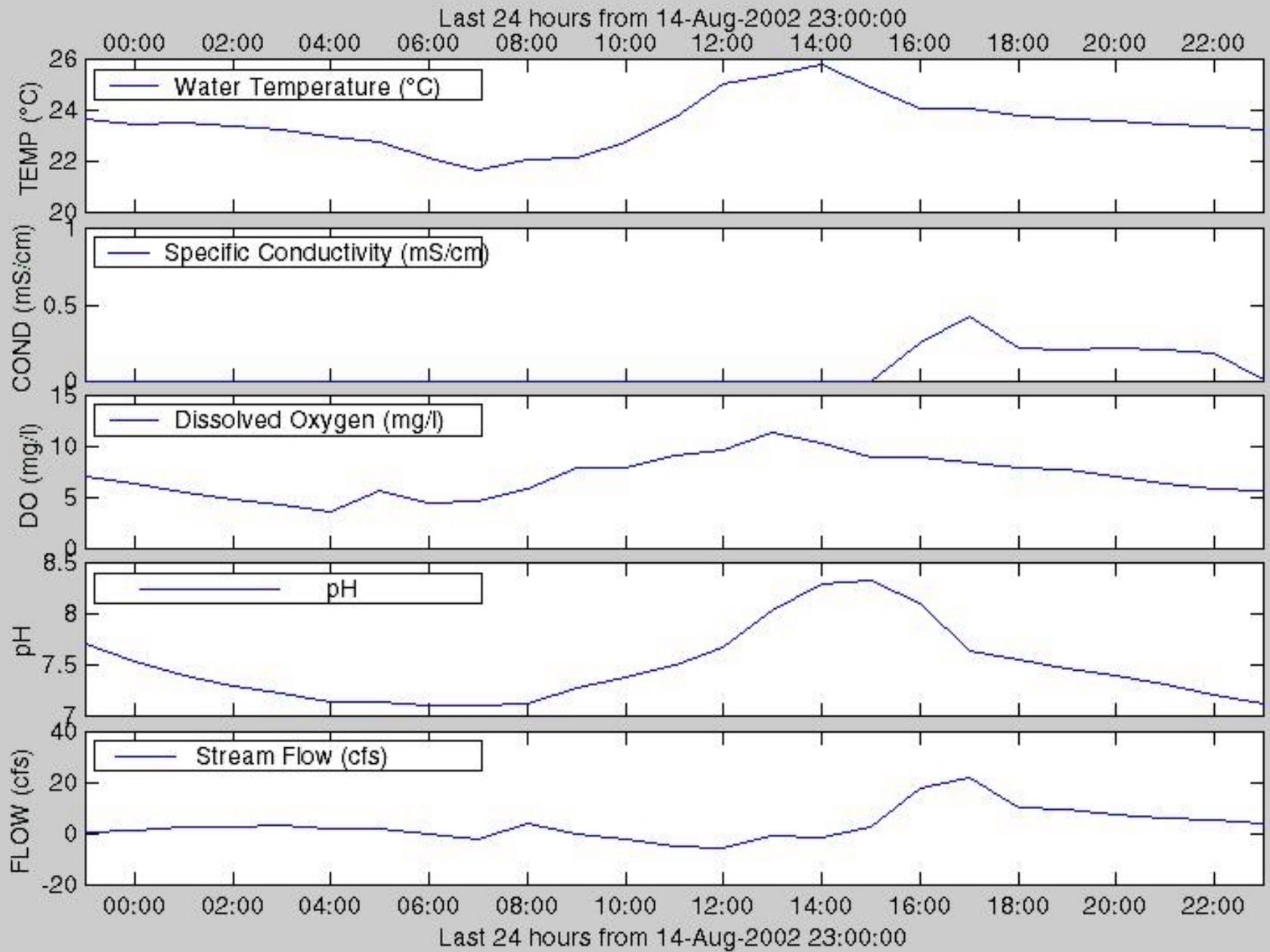
# Will We Comply?

- 138,160 CF volume reduction required for Development Ordinance Compliance
- Total projected stormwater storage volume 372,804 CF
- Estimated BMP cost \$12,634,741

# How Will We Know?

- Quarterly visual inspections where stormwater leaves campus
- Semiannual aquatic insect sampling
- Continuous stream flow gauge with indicator parameter monitoring
  - [ehs.unc.edu/environmental/water\\_quality/](http://ehs.unc.edu/environmental/water_quality/)





# Avoiding Problems

- Determine your priorities
- Hire creative consultants
  - Andropogon Associates
  - Cahill Associates
  - The Rose Group
- Assume that there are many utility corridors that are not accurately mapped