

# UNH Stormwater Management Certificate

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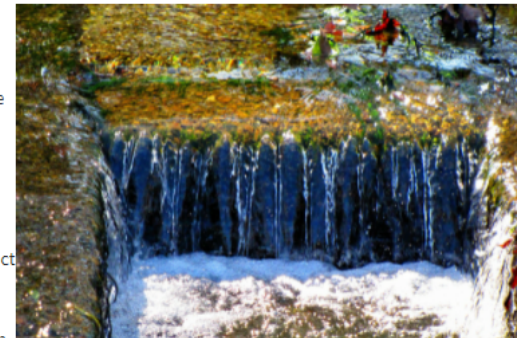
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## Stormwater Management Certificate

Our **Stormwater Management Certificate** program is a multi-workshop program that is cosponsored by the UNH Stormwater Center. Our program includes seven workshops held at the University of New Hampshire main campus in Durham, NH. The program is designed so that students can complete and obtain their certificate over a 12-month period. Students are required to attend & complete a minimum of **5 workshops** with a 2-year period to receive their certificate.

### What is the Stormwater Management Certificate?

This certificate is designed for landscape architects, engineers, surveyors, project managers and others involved in designing, building and maintaining stormwater management systems, which impact sustainability of their communities. Students will learn about site-scale hydrology, site design, system design, post construction performance estimates, modeling, and more. They will gain an enhanced understanding of the watershed impacts of infrastructure design and maintenance choices, and be equipped with best practices functional, cost-effective and that protect water resources.



There's a storm brewing...

# Structural BMP's

Appropriate  
Design

Installation

Maintenance

Design  
Certification  
Course  
Target  
Market:

Engineers

Landscape Architects

Designers

Regulatory reviewers

Other stormwater management  
professionals.

# Stormwater Certification Course

Objective: to create a more uniform certification program for stormwater engineering. The course focuses on the following topics:

- Class 1: Stormwater Hydrology.
- Class 2: Stormwater Site Design –
- Class 3: Filtration Treatment System Design & Post Construction Performance Estimates,
- Class 4: Infiltration Treatment System Design & Post Construction Performance Estimates, Part II
- Class 5: Stormwater Construction: Erosion and Sediment Controls
- Class 6: Stormwater System Modeling

# Now Using Digital Badges

## Stormwater Management Digital Badges & Micro-Credentials



Beginning in 2021, participants who successfully complete each individual workshop, along with the entire Stormwater Management Certificate Program, will be issued Digital Badges/Micro-Credentials alongside course completion letters and certificate. Past students will also be able to obtain these retroactively.

Learn more about the significance of Digital Badges [here](#).

### What is a Digital Badge?

- › It contains detailed information about the skill or experience that enables viewers to ascertain what activities and/or assessments the learner completed.
- › Skills and/or competencies are defined and evaluated by the digital badge issuer.
- › Badges represent the successful completion of a variety of learning experiences in credit and non-credit coursework.
- › Sharing badges is learner controlled and open across technology platforms including social media, blogs, online portfolios and others.



## Additional Targeted Training and Audiences:

- Installation and Oversight Certification Course: Contractors, municipal works staff and project oversight personnel and green stormwater infrastructure installers
- Inspection, Operation and Maintenance Certification Course: Operation and maintenance staff and inspectors

# Origin of the course

- Stormwater despite it's relative compliance with physics continues as a nascent science.
- Historical approaches are inadequate with respect to water quality and are playing catch up with land use changes and precipitation patterns.
- Site specific designs often fail to address watershed issues
- Regulations are slow to adapt innovations that more effectively and address flooding and water quality issues in a more economical way.





# Common Problems with Design Review

- Delineating and maintaining predevelopment subcatchment areas
- Calculating Time of Concentration
- Options for Site Investigations:
  - Geotechnical
  - Hydrologic Soil Group
- Innovative stormwater controls and up-to-date design specifications
- Site inspection and erosion control plans





# Results

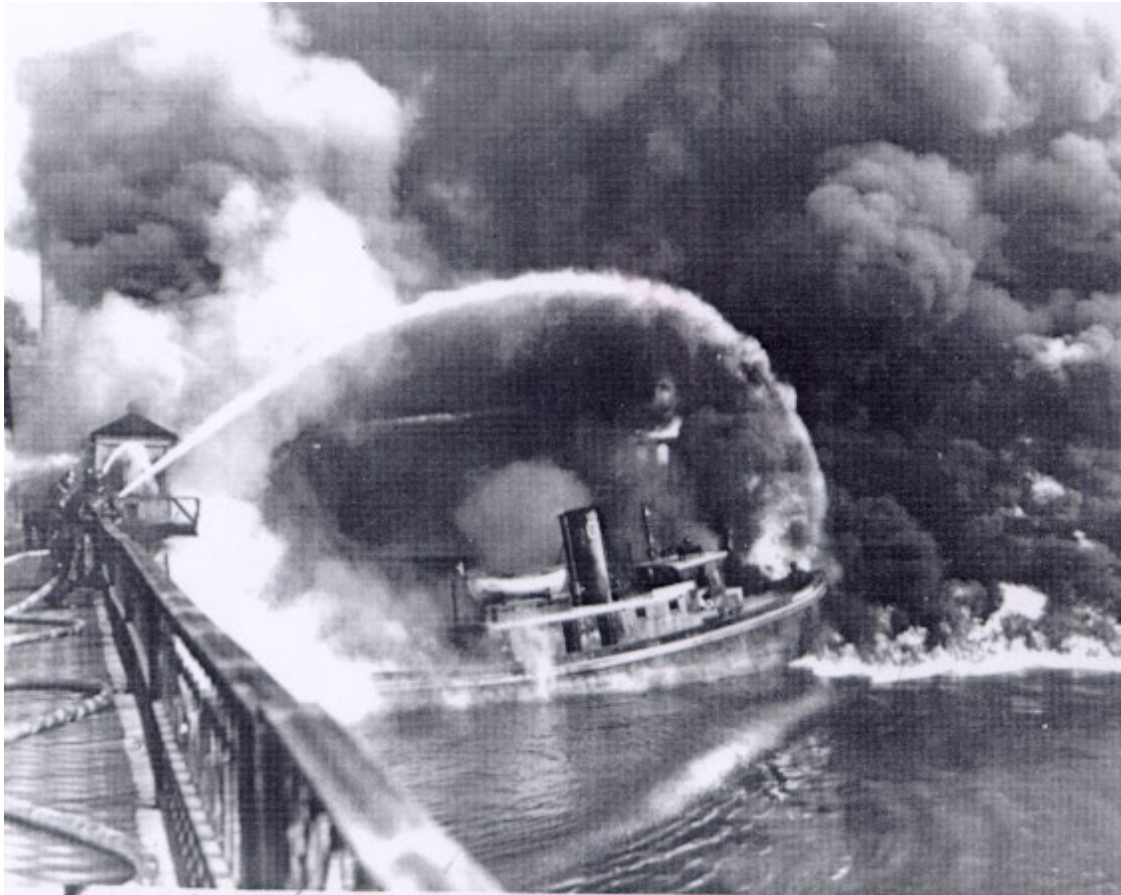
- UNH Stormwater Center has educated over two thousand nine hundred and fourteen (2,914) graduate and undergraduate students in water resource engineering
- Trained four thousand four hundred and thirty (4,430) water resource and stormwater design professionals.
- To date, eighty five (85) regional stormwater professionals have received certification through the stormwater design certificate course.

# Emergent and Innovative Stormwater Controls

- **Point Source Pollution:** any single identifiable source of pollution from which pollutants are discharged, such as a pipe, ditch, ship or factory smokestack (USEPA).
- **Non-point Source Pollution:** pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification (USEPA).



# Part of the Problem – Point Source Pollution



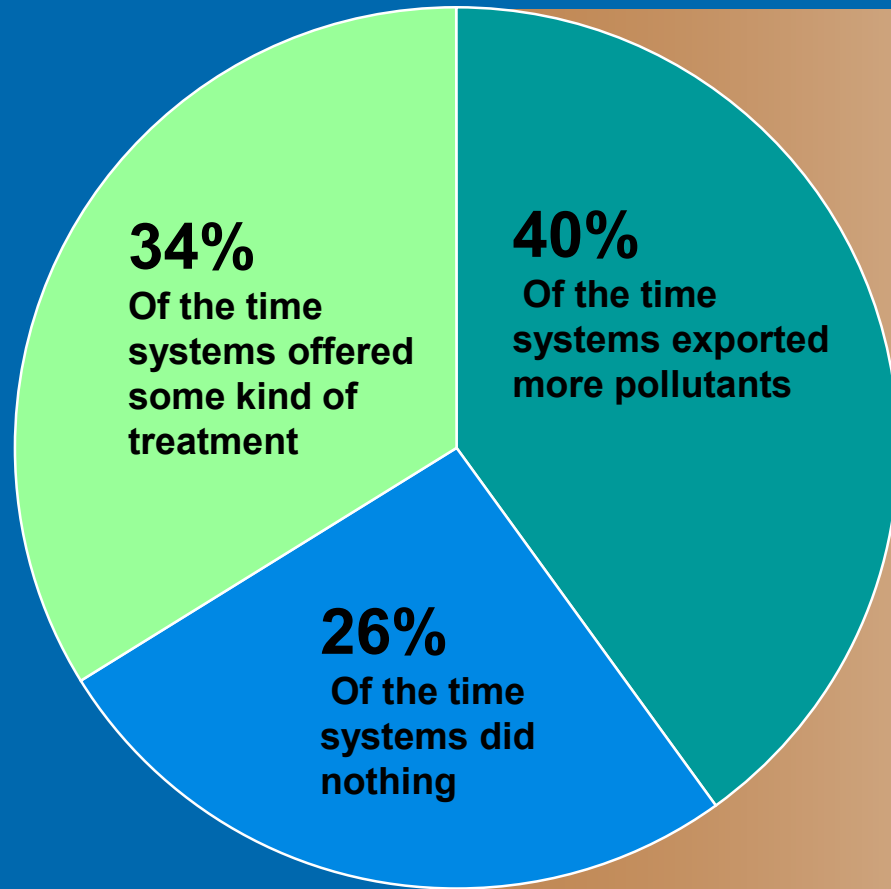
SMP97-11/1-CLEVELAND, O.: Firemen stand on bridge over Cuyahoga River to play water on tug Arizona as fire, started in an oil slick on the river, swept docks at the Great Lakes Towing Co., here today. The blaze destroyed three tugs, three buildings and the ship repair yards. Damage was not estimated. UNITED PRESS TELEPHOTO rw



# NPS is Part of the Problem and managing it is part of the solution



# Study Found That...



**Systems failed  
2/3 of the time!**

# Stormwater Control Requirements are Changing

- 20<sup>th</sup> Century Management
  - Peak flow control
  - 80% Total Suspended Solids (TSS) reduction
- 21<sup>st</sup> Century Management
  - Peak flow control
  - 80% TSS reduction
  - 50-60% Total Phosphorus (TP) reduction
  - 50% Total Nitrogen (TN) reduction
  - Volume reduction (now considering a 1" retention requirement)
  - Restoring altered urban hydrology





# **Evolving Research for Stormwater Management**

**James Houle and Tom Ballestero  
UNH Stormwater Center**

**Providing Data to Protect Water Quality Since 2004**





Hydrodynamic Separator



Isolator Row



Subsurface Infiltration



Filter Unit



Porous Asphalt



Pervious Concrete



Retention Pond



Stone Swale



Veg Swale



Gravel Wetland



Sand Filter

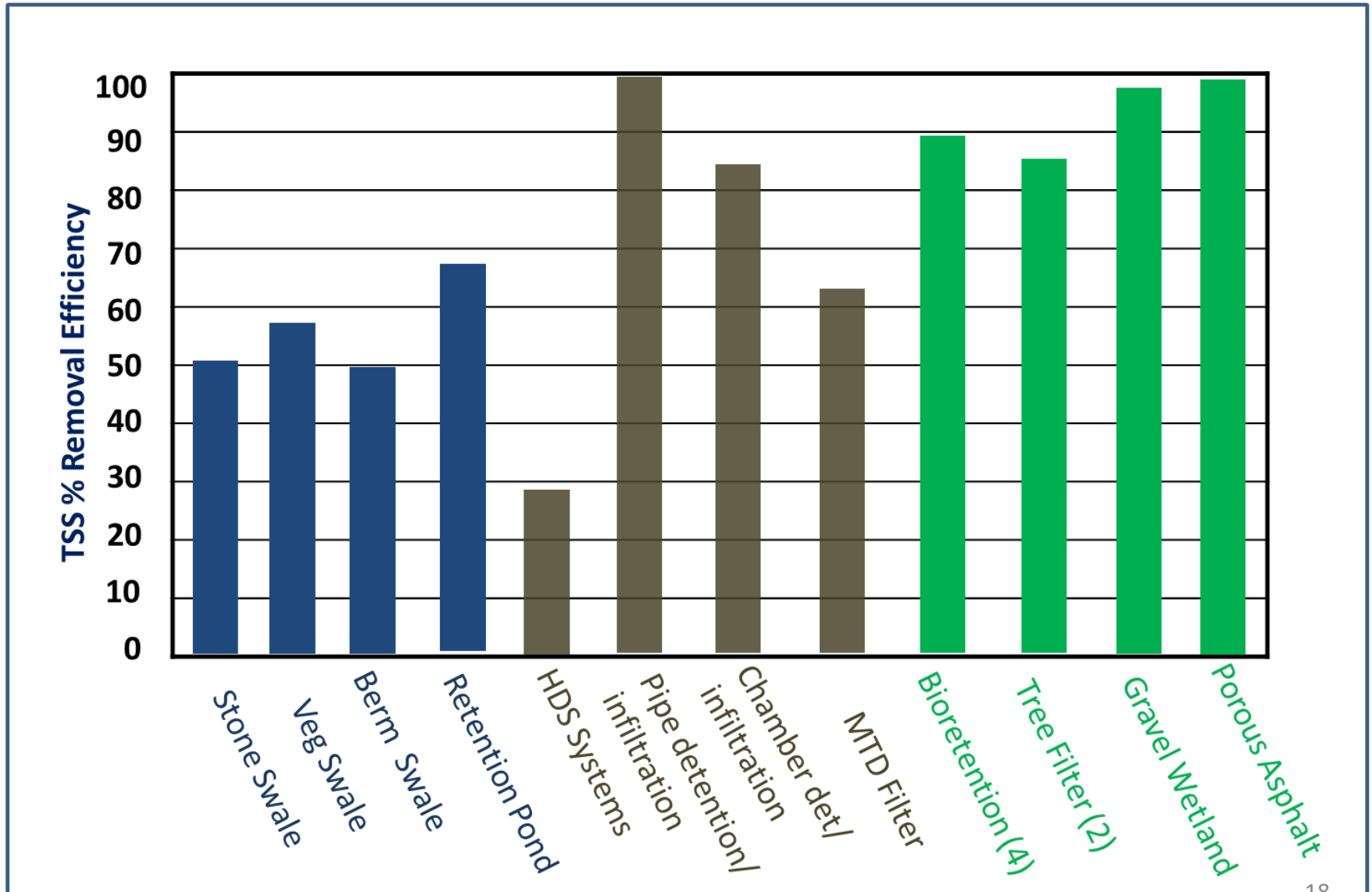


Bioretention Unit

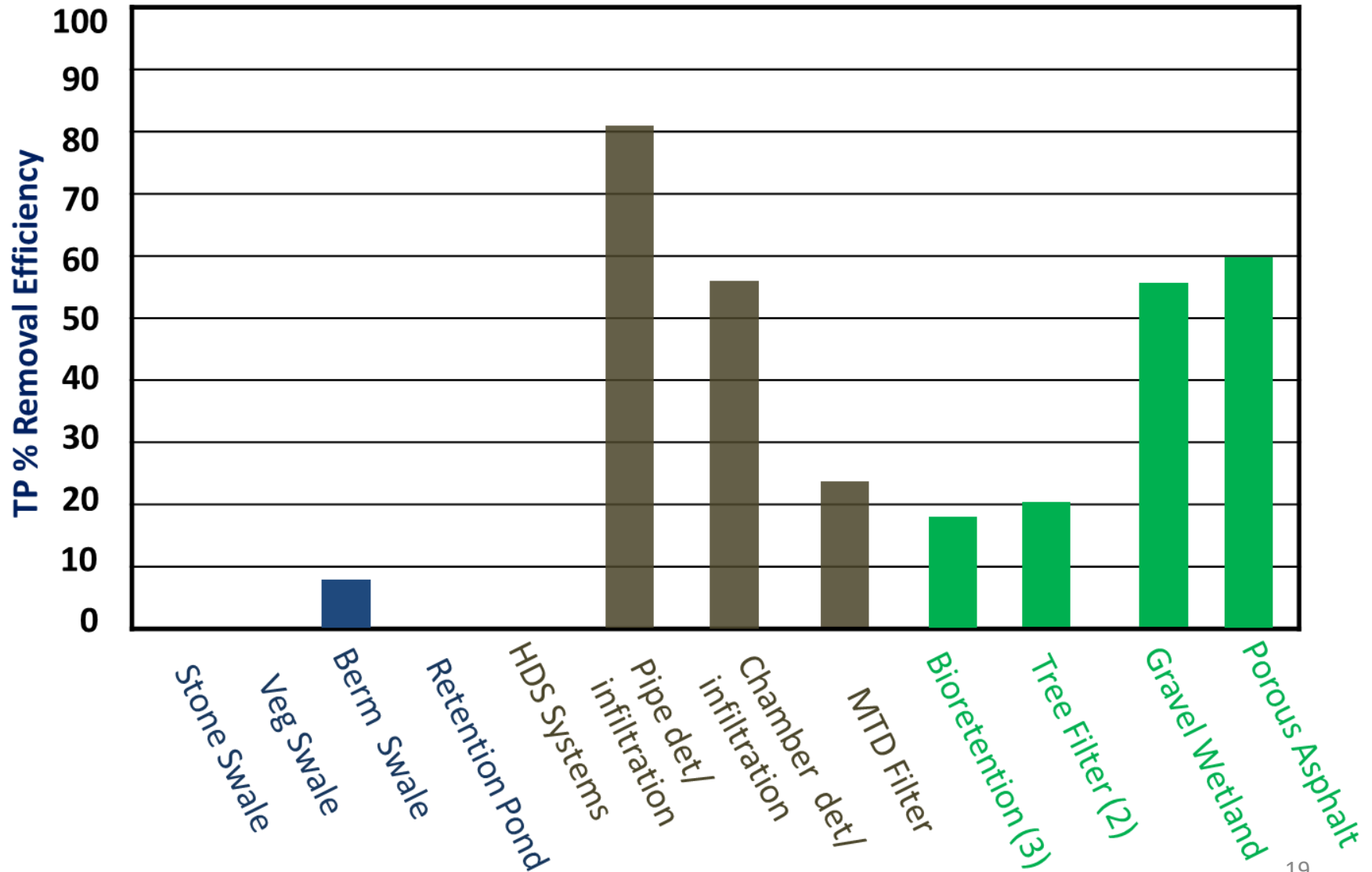


Tree Filter

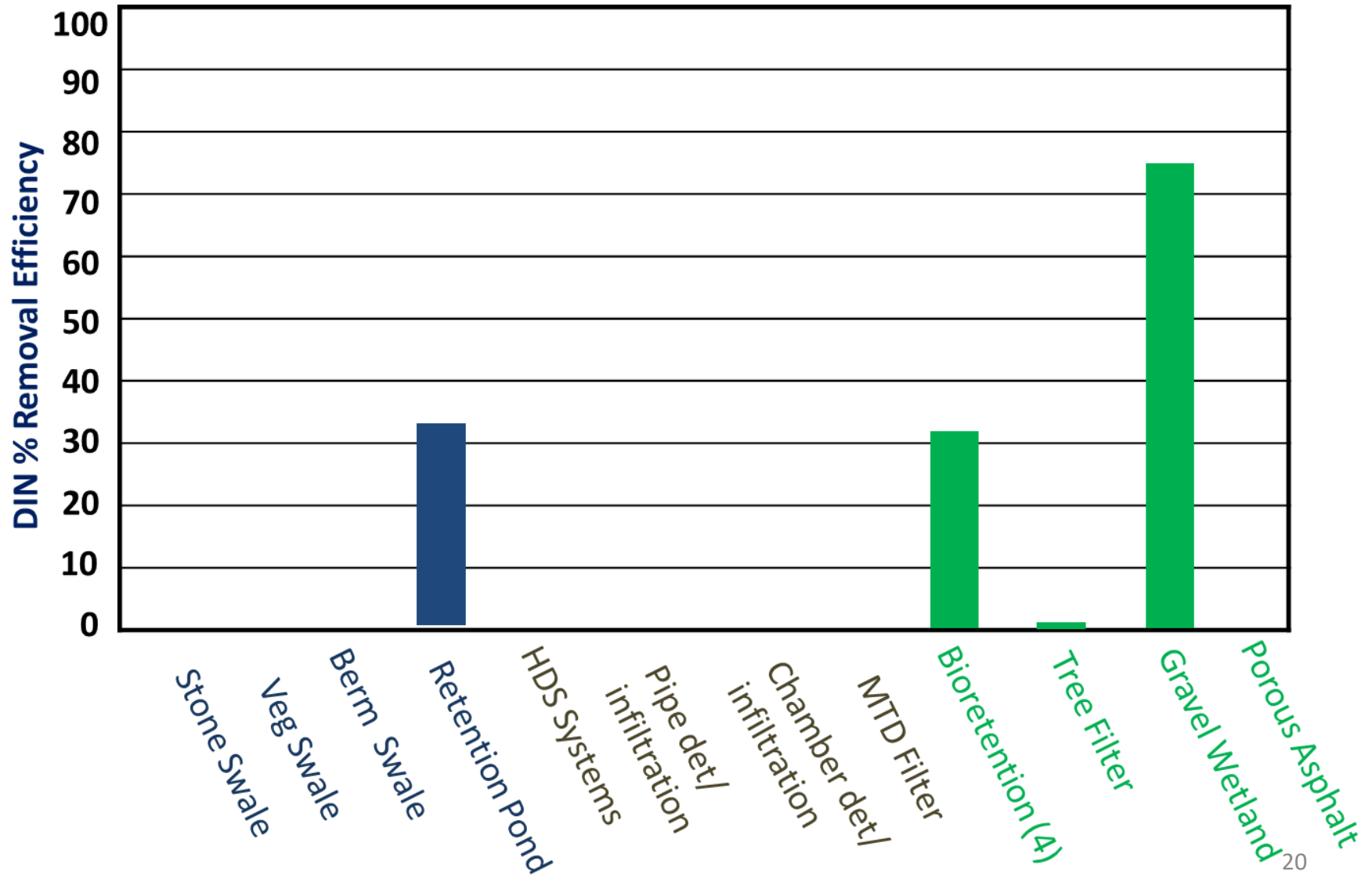
# Total Suspended Solids (TSS)



# Total Phosphorus (TP)



# Dissolved Inorganic Nitrogen (DIN)



# Other Design Targets

Storm volume control

Peak flow control

Fecal indicator bacteria control

Chloride and other dissolved parameters

Understanding system hydraulics

Emerging areas of concern

# Big Picture

We are not going to BMP our way out of this

We need a growing toolbox of approaches

We need buy-in at all levels

We need your innovations

Innovations will reduce cost over time and increase effectiveness of controls



# 1975

- **IBM 5100 Portable Computer**
- **Price tag: \$8,975**
- **Inflation adjusted price: \$42,000**
  - 16K to 64K main storage
  - CPU 1.9MHz
  - Storage Internal 200K tape





# 2022

- **Dell Inspiron 24 5000**
- **Touch Screen All-in-one**
- **Price Tag: \$799.00**
- **11<sup>th</sup> generation Intel Core i7**
  - 16GB Memory
  - 256GB SSD + 1TB Hard drive
  - 4.7 GHz

# Over the Long Term

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Prices come down with  
competition

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Many manufacturers enter  
business

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Many manufacturers go out  
of business

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Performance increases  
dramatically

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Provided there is ownership  
and embrace of the science

## 1946 Prediction

- “It is very possible that ... one machine would suffice to solve all the problems that are demanded of it from the whole country.”

Sir Charles Darwin (grandson of the famous naturalist), head of Britain's National Physical Laboratory

Copeland, Jack (2006). *Colossus: The Secrets of Bletchley Park's Codebreaking Computers*. Oxford University Press. p. 109

# Decadal Reflections: Cart Before the Horse

The expression cart before the horse is an idiom or proverb used to suggest something is done contrary to a conventional or culturally expected order or relationship.

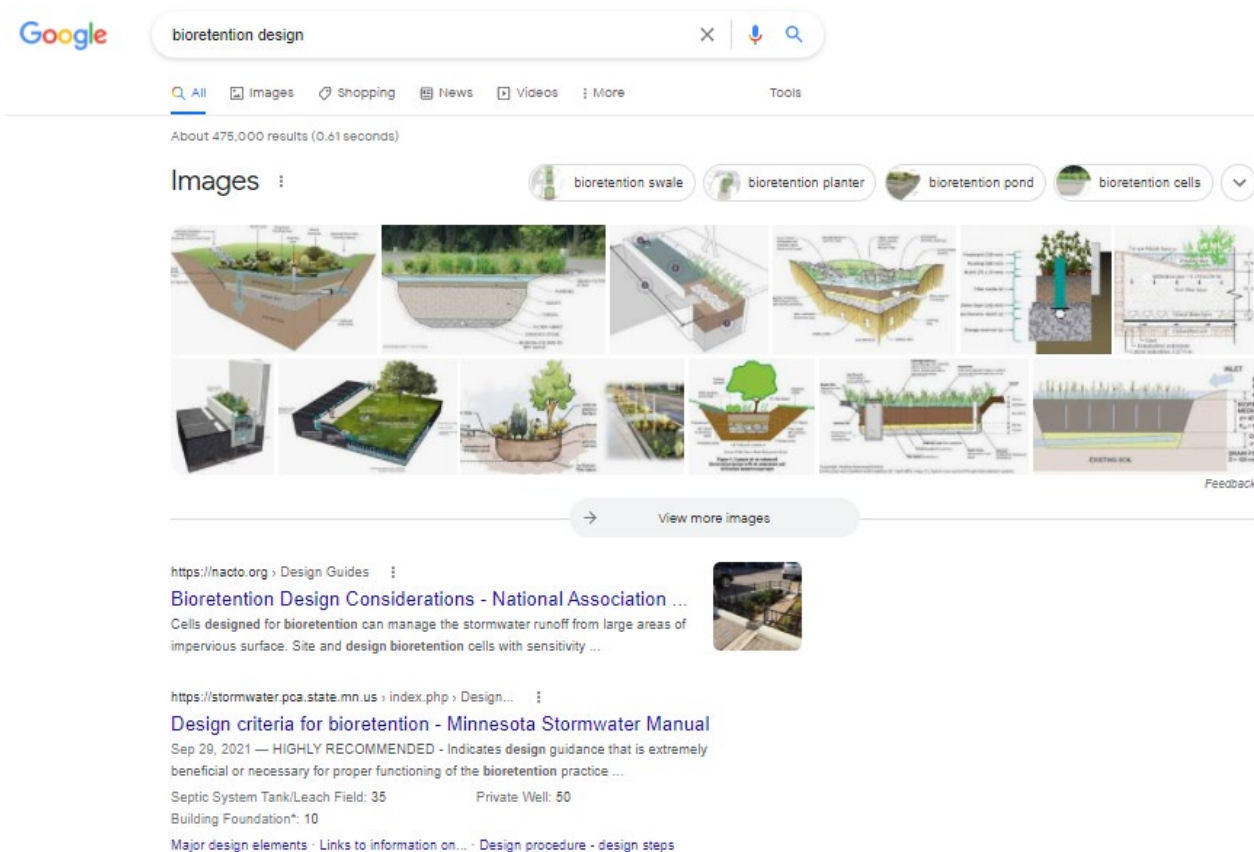


也要馬兒好也要馬兒不吃草

*Want the horse to prosper, but not want the horse to eat grass*

# “Bioretention Design”

475,000 results!



Google search results for "bioretention design". The search bar shows "bioretention design" with a search icon. Below the search bar are filters for "All", "Images", "Shopping", "News", "Videos", and "More". The search results show "About 475,000 results (0.61 seconds)". The "Images" tab is selected, showing a grid of 12 images related to bioretention design, including cross-sections of swales, planters, and ponds. Below the grid is a "View more images" button. The search results also include two text-based links:

- <https://nacto.org> > Design Guides > **Bioretention Design Considerations - National Association ...**  
Cells designed for bioretention can manage the stormwater runoff from large areas of impervious surface. Site and design bioretention cells with sensitivity ...
- <https://stormwater.pca.state.mn.us> > index.php > Design... > **Design criteria for bioretention - Minnesota Stormwater Manual**  
Sep 29, 2021 — HIGHLY RECOMMENDED - Indicates design guidance that is extremely beneficial or necessary for proper functioning of the bioretention practice ...  
Septic System Tank/Leach Field: 35 Private Well: 50  
Building Foundation\*: 10  
Major design elements - Links to information on... - Design procedure - design steps

# Design Storms

Stormwater Modeling

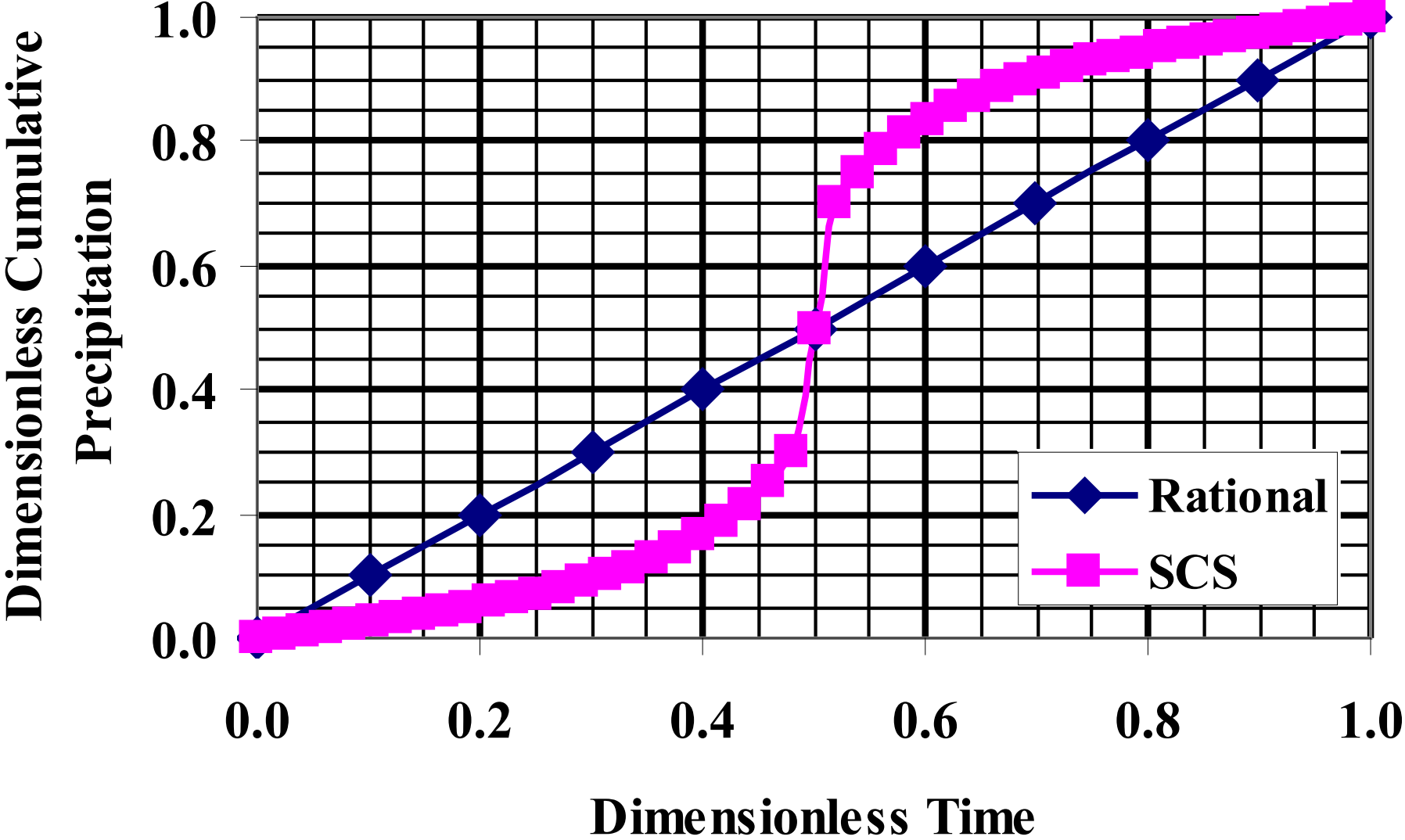
Do we know what we are doing?



也要馬兒好也要馬兒不吃草

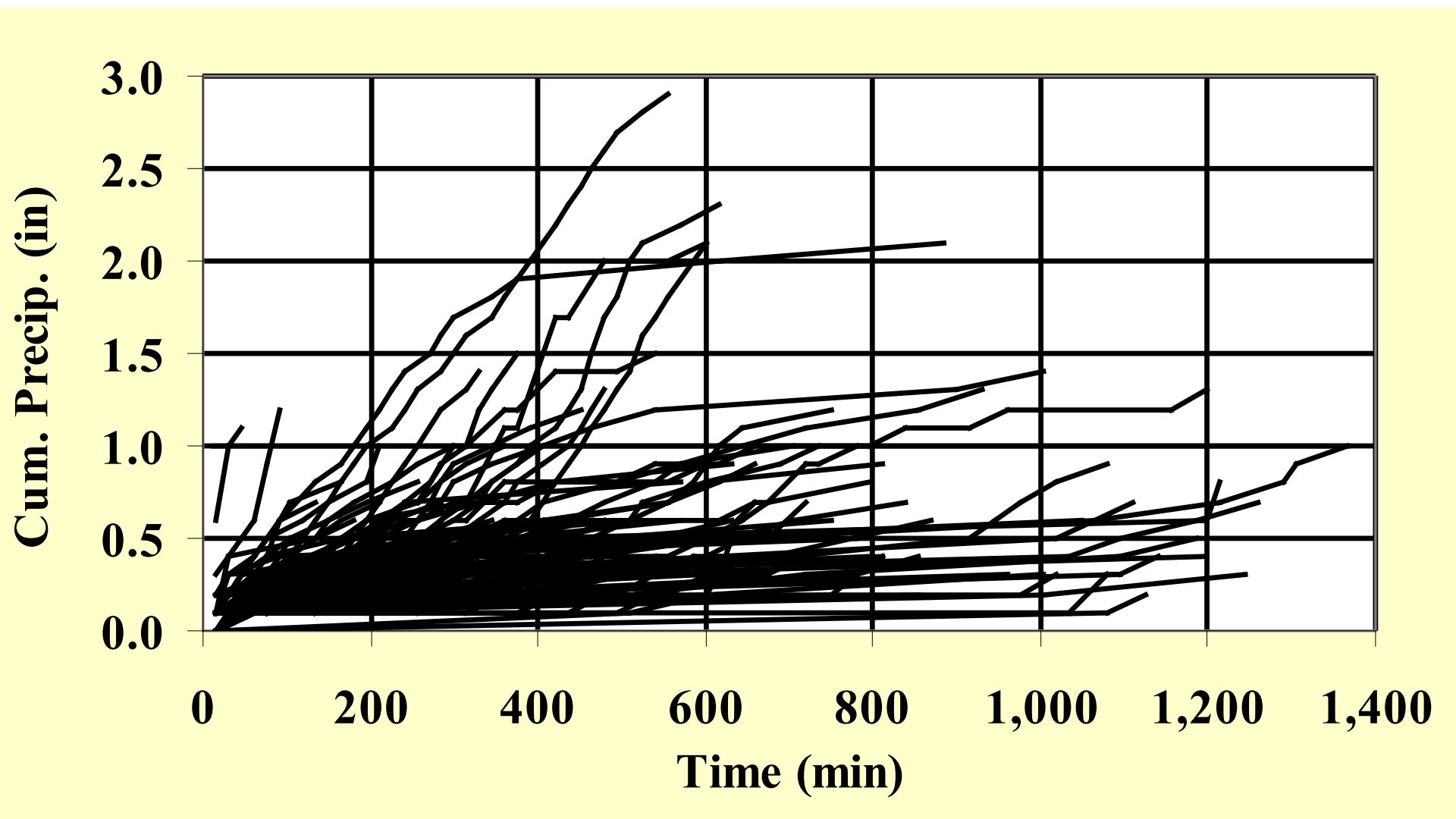
*Want the horse to prosper, but not want the horse to eat grass*

# Design Dimensionless Hyetographs

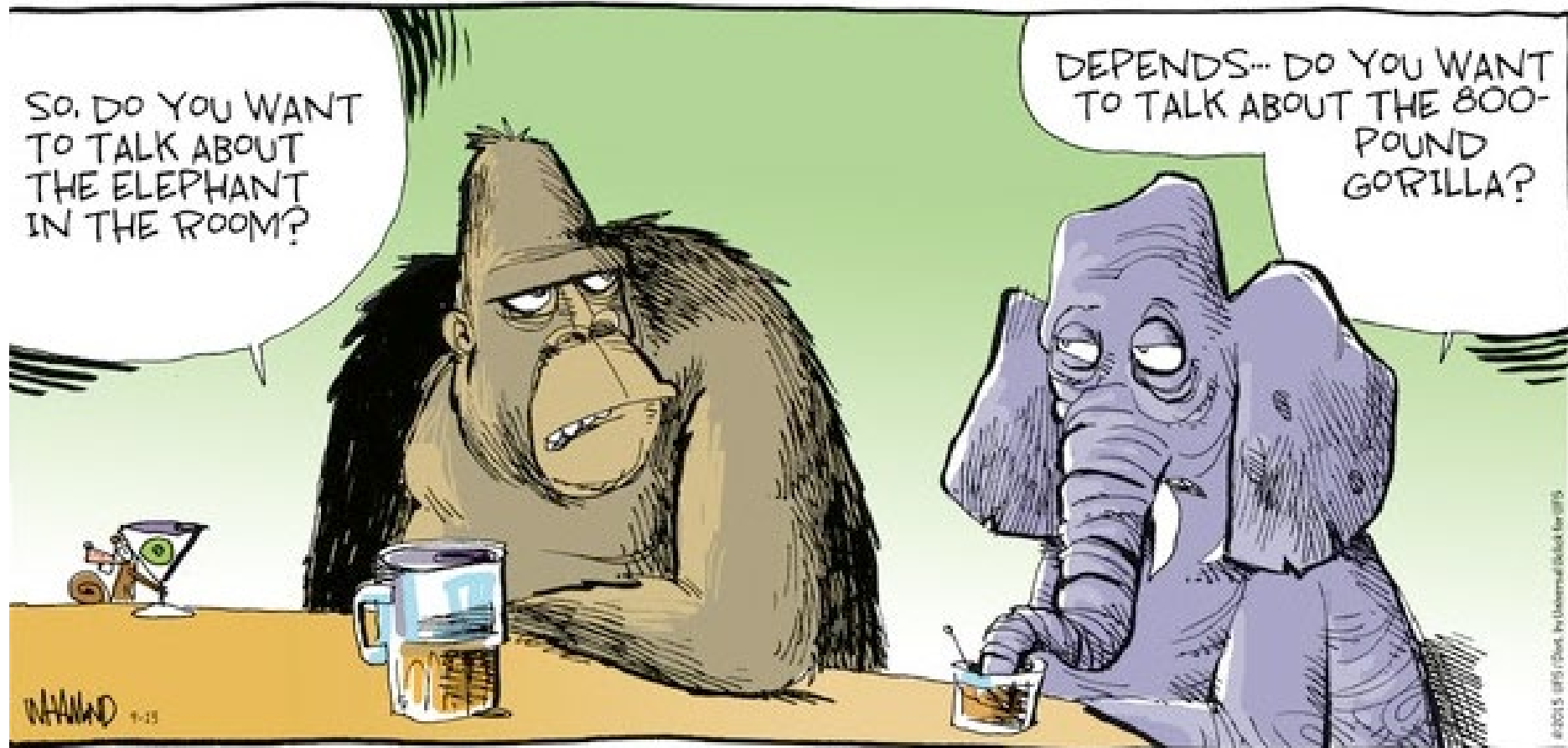




# Sampling of Observed Hyetographs Durham, NH NOAA Gage



Yes, climate change gives us pause to think, but IC is the 800-pound gorilla



# Operation and Maintenance

Are we inadvertently modeling optimized system performance ahead of long term operation and maintenance?

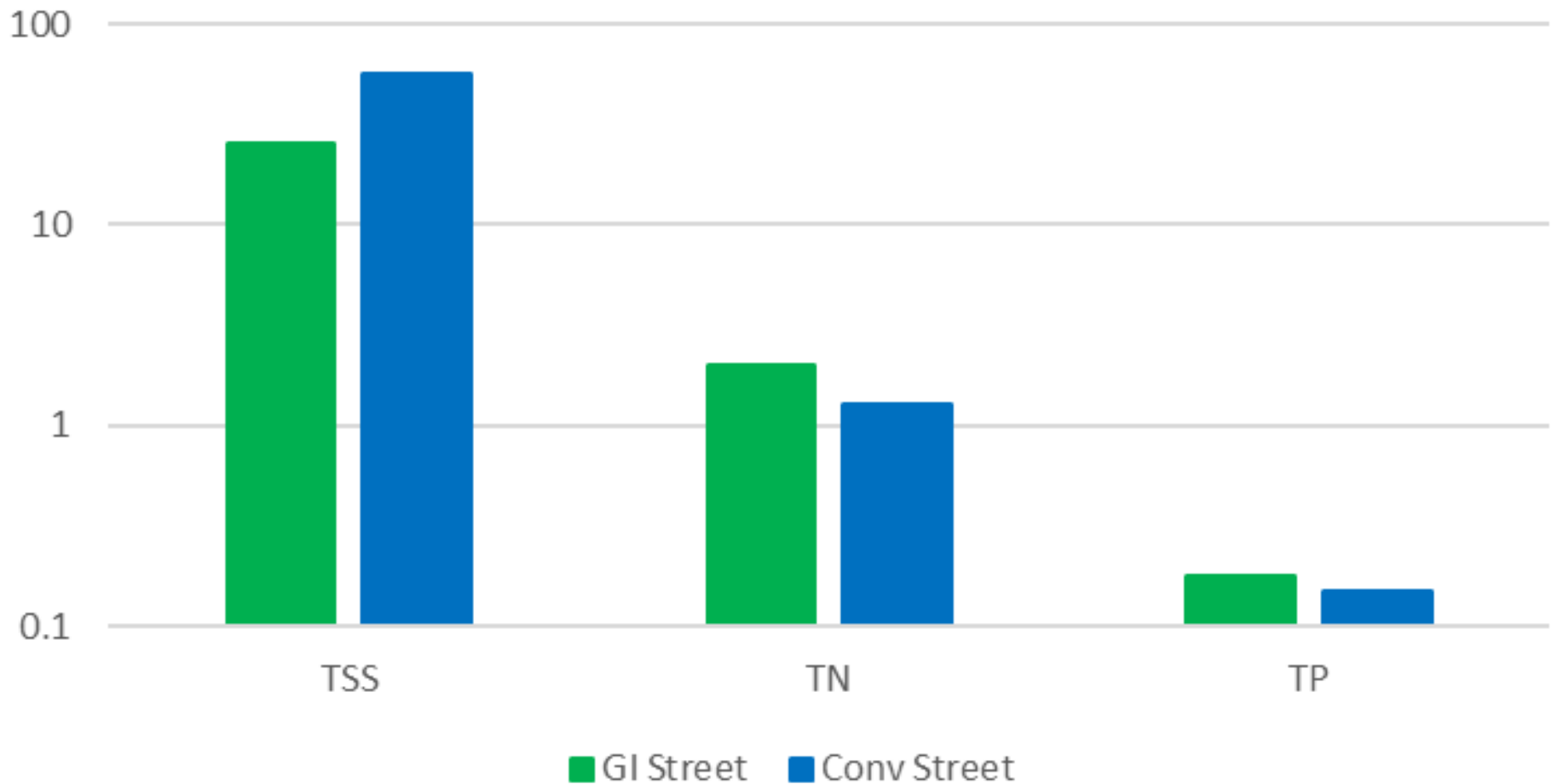


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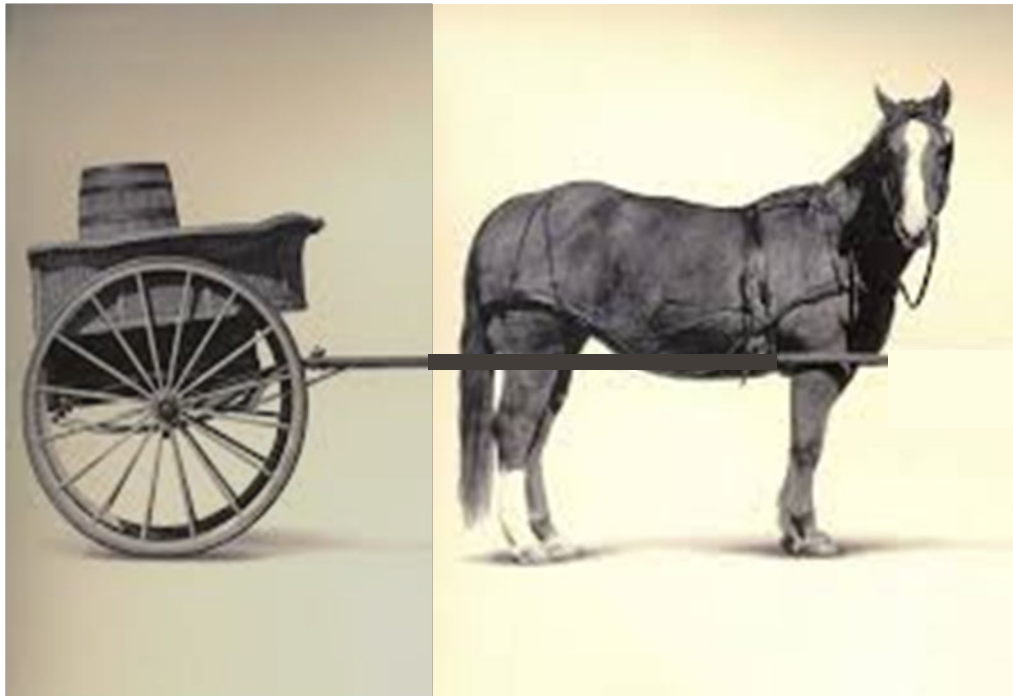
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# Maintenance Basics

GI Vs Conv St Drainage Outfall Monitoring



Let's use science and technology to get us back on track!



# Structural BMP's

1. Appropriate Design
2. Installation
3. Maintenance



**Questions???**

