# *Revisions to Rhode Island Stormwater Design and Installations Manual Public Review Draft:*

*June 24, 2009*

Presentation materials prepared by Horsley Witten Group

Edited by RIDEM for this session

Horsley Witten Group

# Why is the manual being updated

- A lot of technical/scientific advances since 1993;
- Current strategies and techniques have failed to adequately protect water resource quality;
- Impacts of hydrologic alteration not fully addressed in the 1993 manual (recharge and volume controls); and
- 80% TSS removal requirement has not prevented resources from degrading;
- Specific statute passed by the legislature

# Legislative Mandate

Rhode Island General Law, Title 45, Chapter 61.2, entitled "The Smart Development for a Cleaner Bay Act of 2007" states that "stormwater, when not properly controlled and treated, causes pollution of the waters of the state…" and "development often results in increased stormwater runoff by increasing the size and number of paved and other impervious surfaces…" The Bay Act of 2007 requires DEM and CRMC to amend the 1993 Stormwater Design and Installation Standards Manual to:

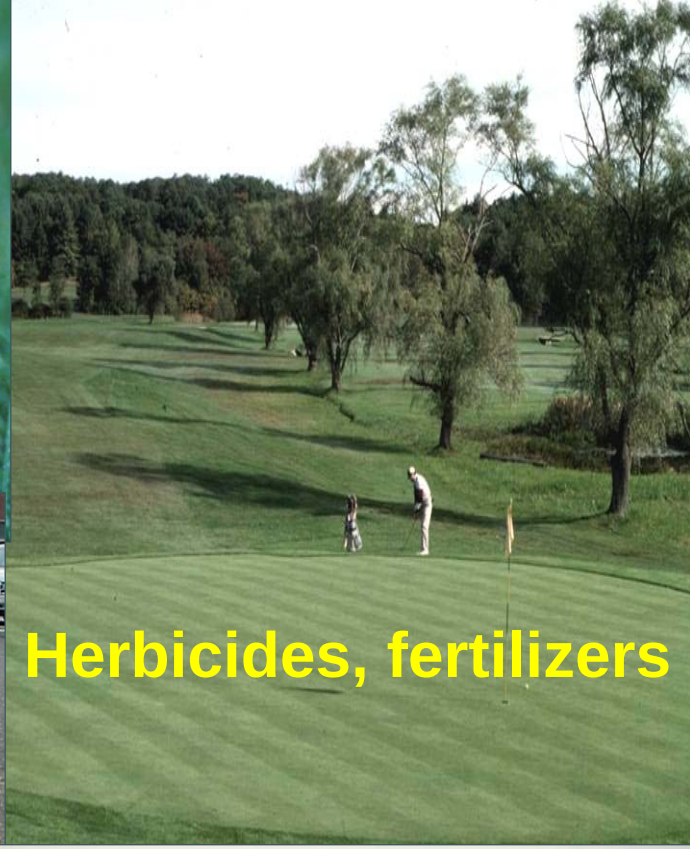
a) Maintain groundwater recharge to predevelopment levels;

b) Maintain post-development peak discharge rates to not exceed pre-development rates; and

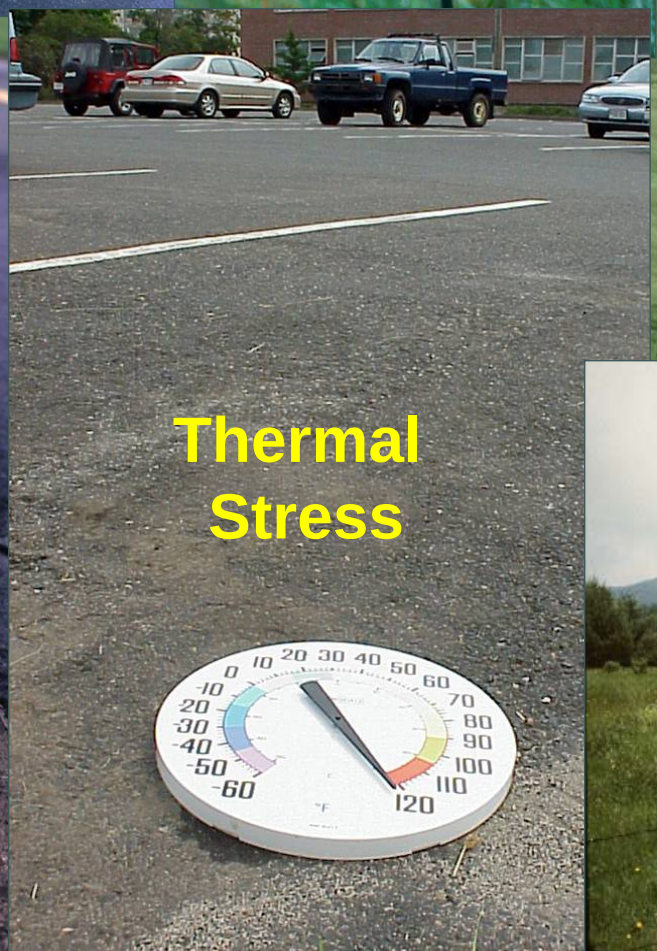
c) Use LID techniques as the primary method of stormwater control to the maximum extent practicable.


Detergents

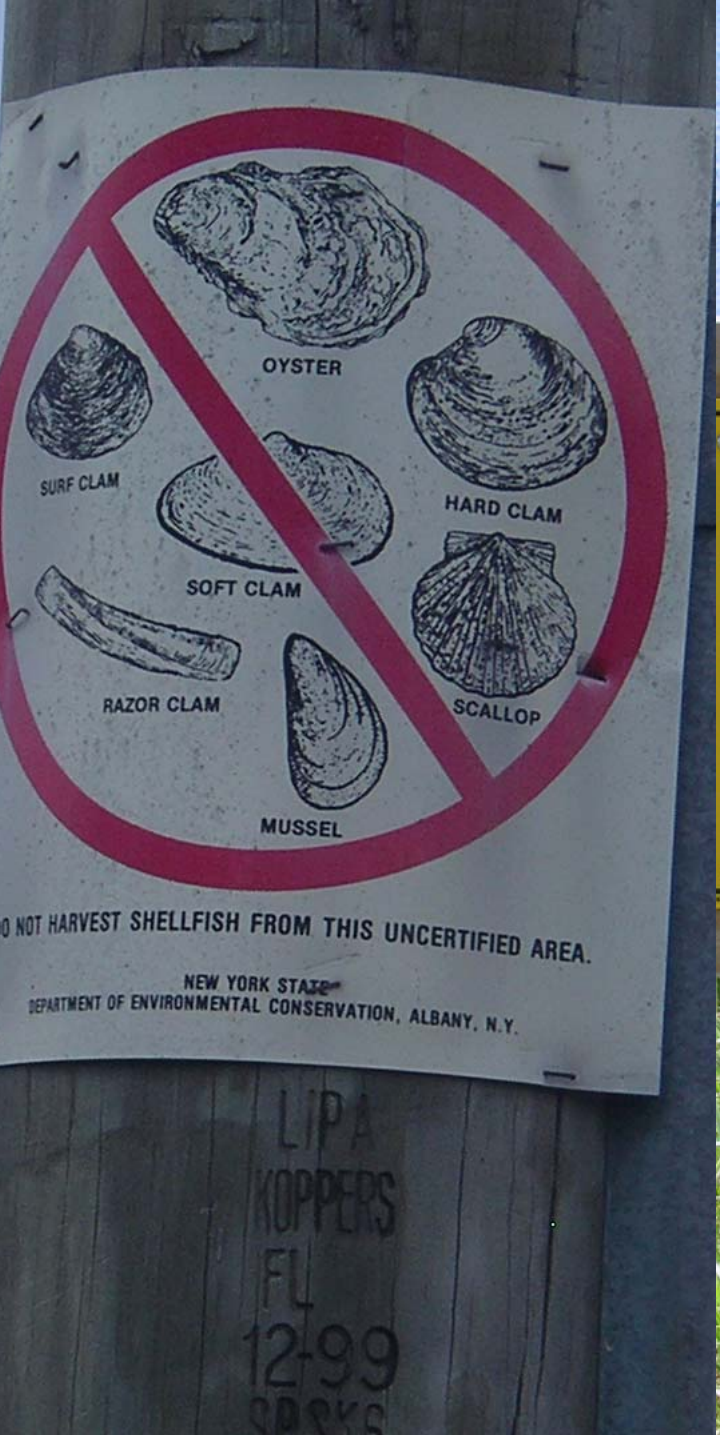

CAUTION
PESTICIDE APPLICATION
KEEP
OFF
Toxic
Contaminants


Herbicides, fertilizers


Debris,
Salt,
Sediment,
Oils &
Grease

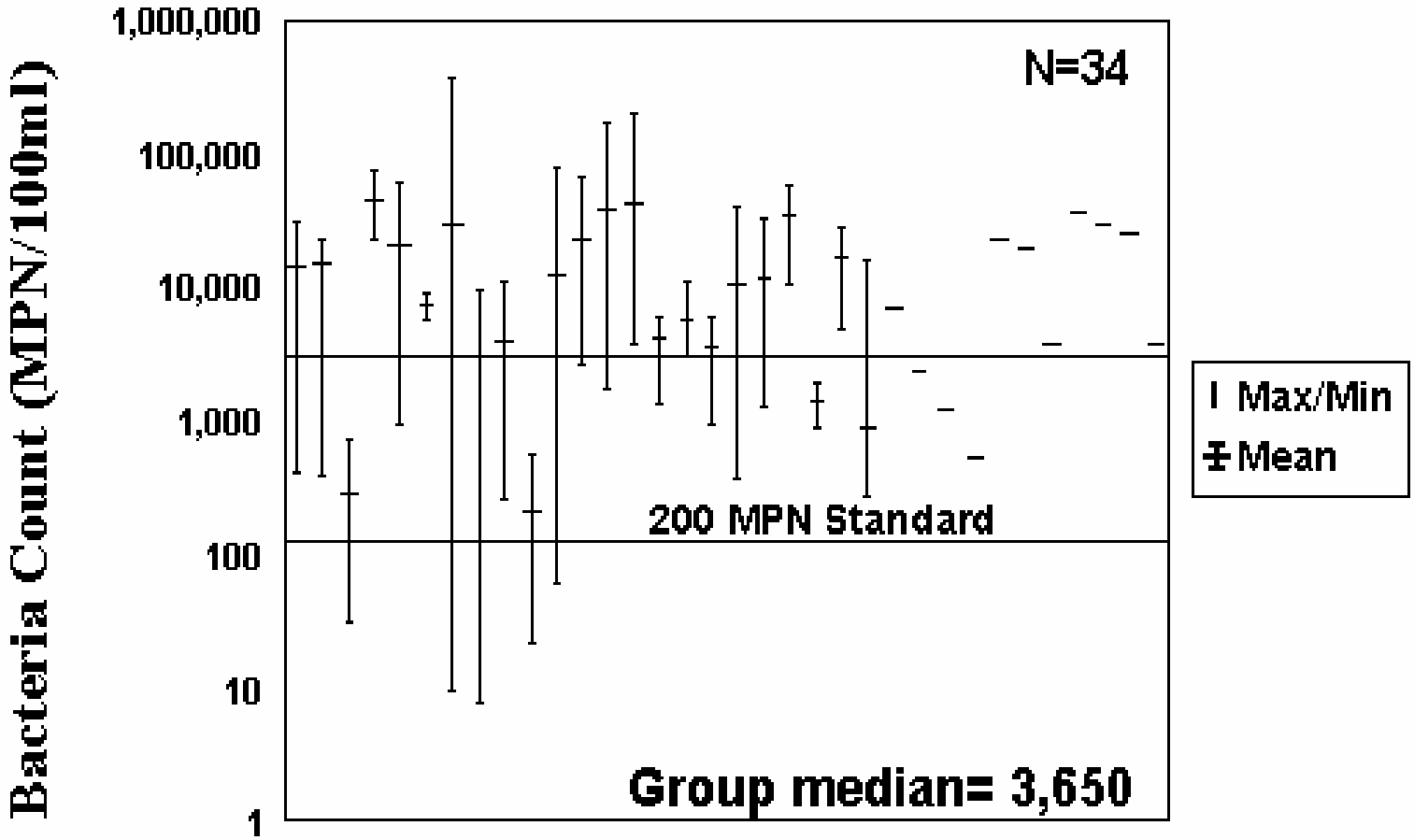

Thermal
Stress


Nutrients and
Pathogens


OYSTER
SURF CLAM
HARD CLAM
SOFT CLAM
RAZOR CLAM
SCALLOP
MUSSEL
O NOT HARVEST SHELLFISH FROM THIS UNCERTIFIED AREA.
NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION, ALBANY, N.Y.
LIPA
KOPPERS
FL
12-99

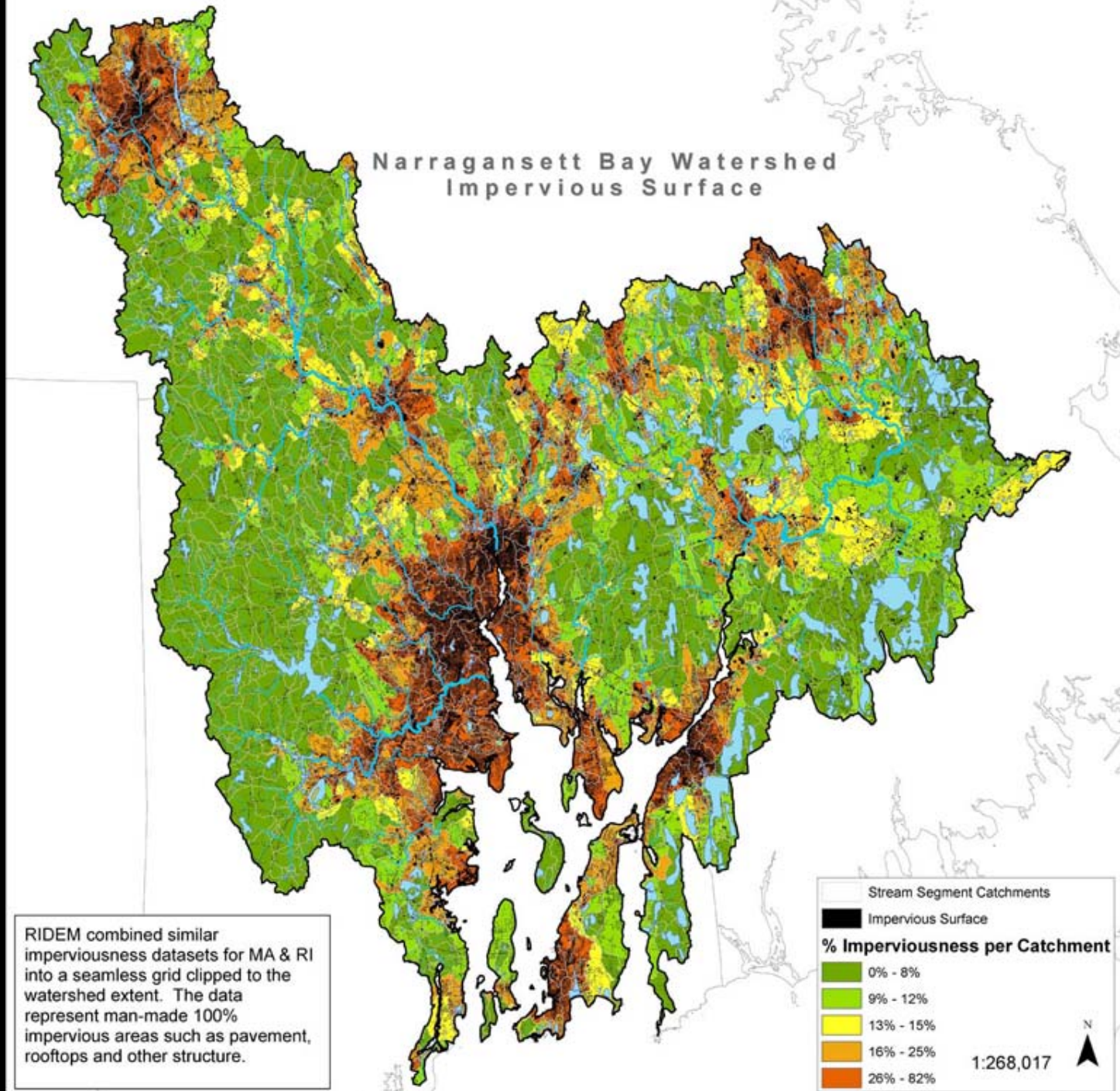

CLOSED AREA
NO SHELLFISHING
Due to fecal coliform bacterial contamination
PER ORDER OF
MASSACHUSETTS DIVISION OF MARINE
FISHERIES
PAUL S. MONTAGUE, SHELLFISH CONSTABLE
508-548-7611 ext. 334
GATHERING OYSTERS, CLAMS, AND
MUSSELS PROHIBITED BY LAW
FINES UP TO $100.00 OR 30 DAYS
IN JAIL FOR EACH VIOLATION.
WARNING
PROHIBITED AREA
THE CONSUMPTION OF OYSTERS, CLAMS,
AND MUSSELS FROM THIS AREA MAY
CAUSE SERIOUS ILLNESS.
RELAYING OR TRANSPLANTING ALLOWED
BY SPECIAL PERMIT ONLY.
S.C. DEPT. OF HEALTH &

# Fecal Coliform Levels in Urban Stormwater: A National Review

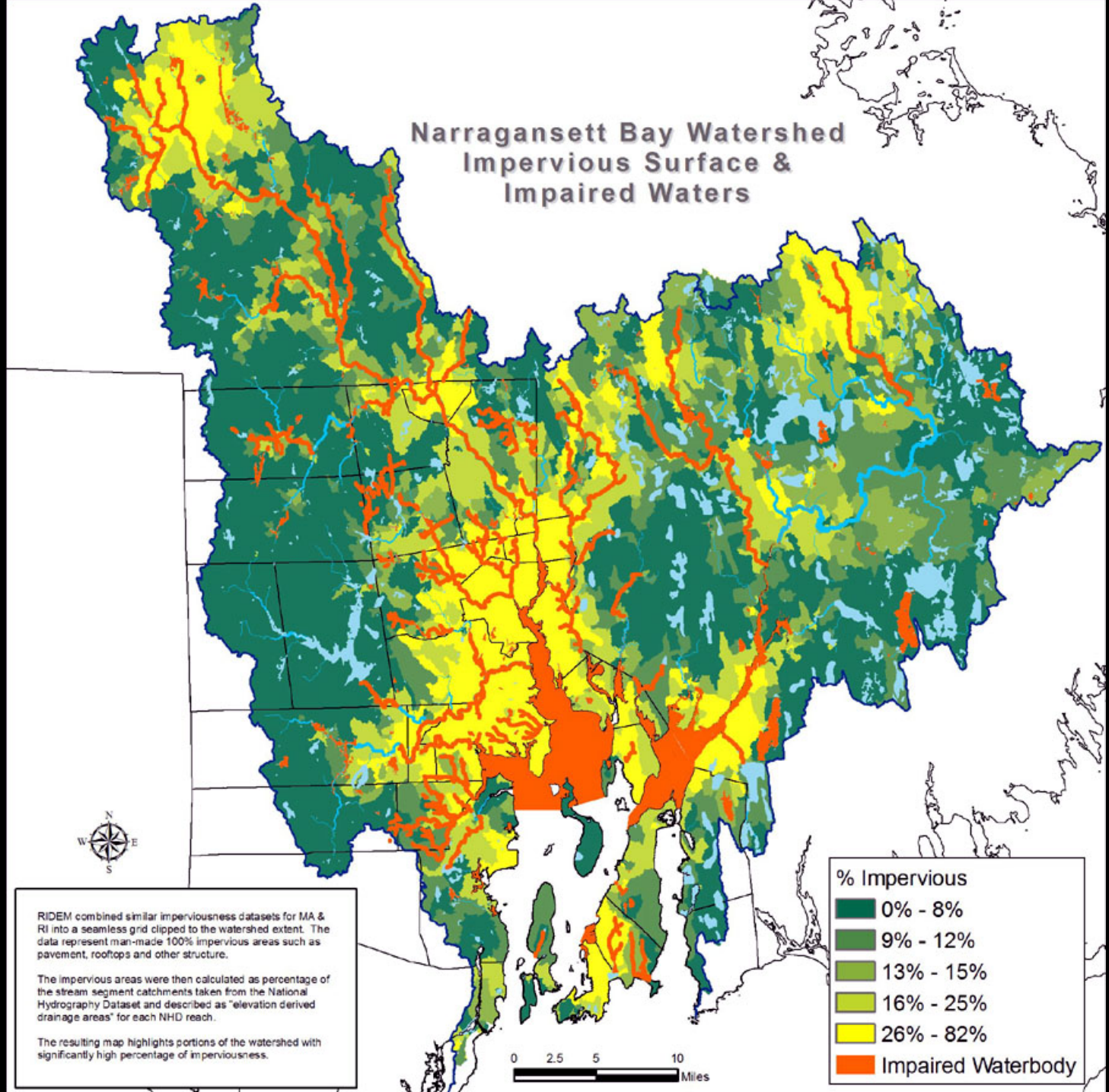



Stormwater runoff levels from 34 small catchments
in 13 monitoring studies conducted:
AL, AZ, ID, KY, MD, NC, NH, NY, SD, TN, TX, WA, WI

# Narragansett Bay Watershed Impervious Surface



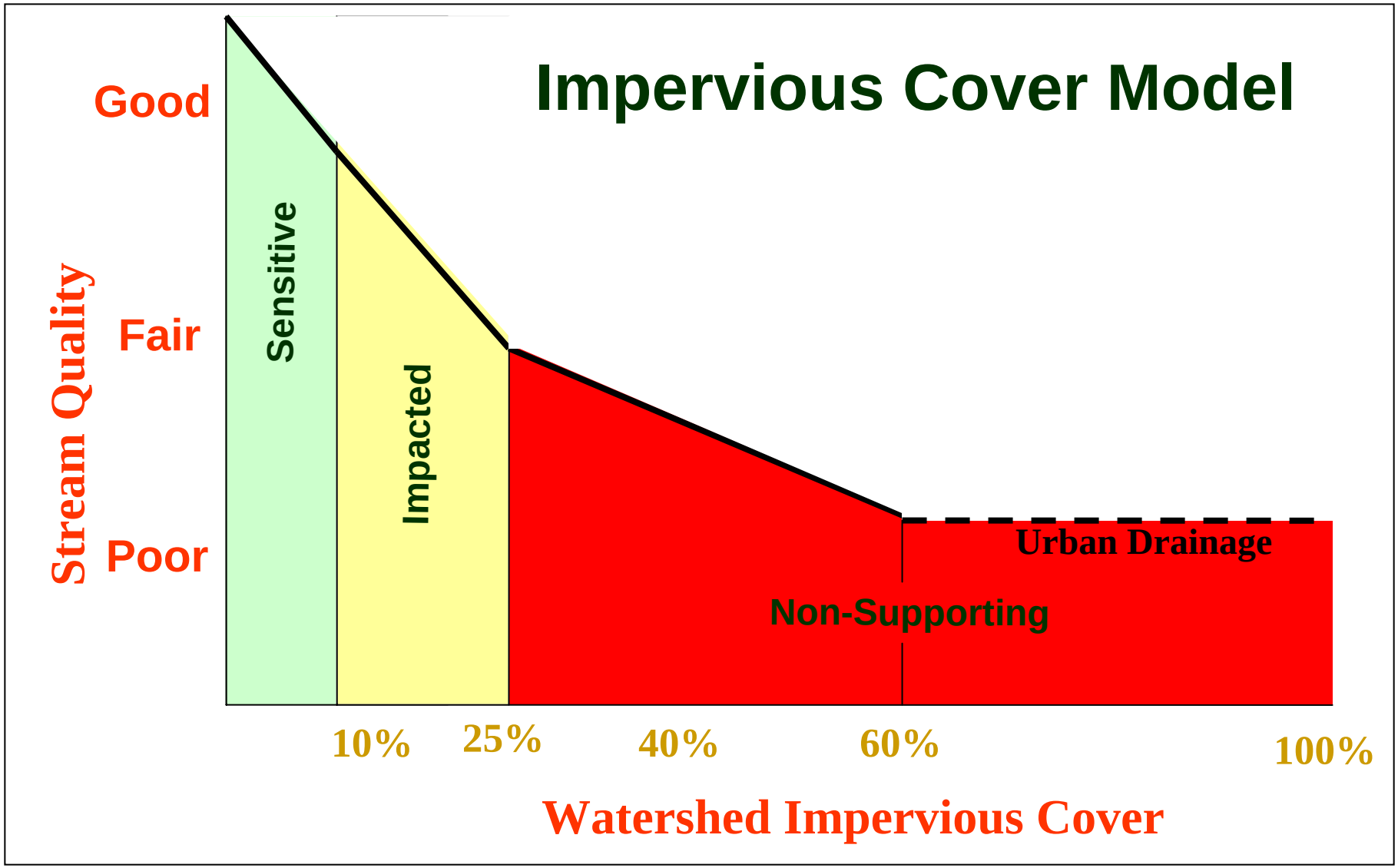
# Narragansett Bay Watershed Impervious Surface & Impaired Waters




RIDEM combined similar imperviousness datasets for MA & RI into a seamless grid clipped to the watershed extent. The data represent man-made 100% impervious areas such as pavement, rooftops and other structure.

The impervious areas were then calculated as percentage of the stream segment catchments taken from the National Hydrography Dataset and described as "elevation derived drainage areas" for each NHD reach.

The resulting map highlights portions of the watershed with significantly high percentage of imperviousness.

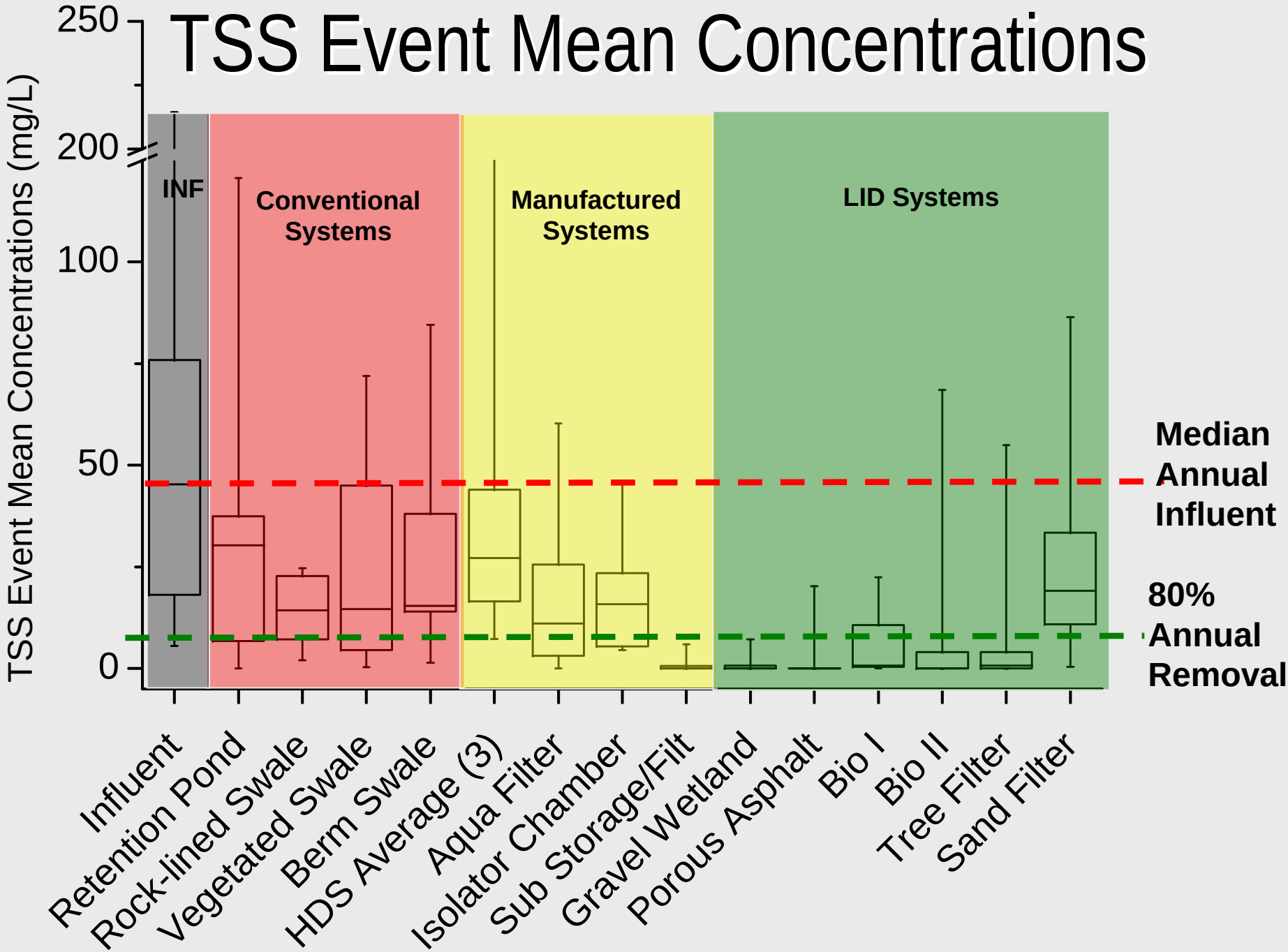

Impervious Cover Model
Good
Fair
Poor
Stream Quality
Sensitive
Impacted
Non-Supporting
Urban Drainage
10%
25%
40%
60%
100%
Watershed Impervious Cover

# What is Low-Impact Development?

- Avoid stormwater impacts
- Reduce stormwater impacts
- Manage stormwater impacts
  - BMPs

Horsley Witten Group


40 yds
© 2009 Microsoft Corporation © 2009 NAVTEQ © AND
© 2009 Pictometry International Corp.


TSS Event Mean Concentrations
TSS Event Mean Concentrations (mg/L)
250
200
100
50
0
INF
Conventional Systems
Manufactured Systems
LID Systems
Median Annual Influent
80% Annual Removal
Influent
Retention Pond
Rock-lined Swale
Vegetated Swale
Berm Swale
HDS Average (3)
Aqua Filter
Isolator Chamber
Sub Storage/Filt
Gravel Wetland
Porous Asphalt
Bio I
Bio II
Tree Filter
Sand Filter

# What are the most significant changes to the 1993 manual

- Low impact development (LID) required to the maximum extent practicable;
- Recharge criteria added to infiltrate runoff from up to 0.6 inches per impervious acre;
- Revised design precipitation rates based on latest rainfall data;
- Raised water quality pollutant removal targets (90% TSS, 90% FC, 40% TP, 30% TN);
- Reduces the number of options for water quality treatment (extended detention and wet basins no longer acceptable as stand-alone practices);
- Changes infiltration practice application – must pre-treat for direct discharge at a high rate, not permitted in fill, no dewatering;
- Special design requirements for discharges in cold-water fisheries;
- Extended detention of the 1-year storm required;
- Elimination of sub-drains/French drains near OWTSs; and
- New approach and criteria for re-development projects.

# Draft Stormwater Manual
# 12 Stormwater Management Standards

1. Low Impact Development Site Planning and Design
2. Groundwater Recharge
3. Water Quality
4. Conveyance and Channel Protection
5. Overbank Protection
6. Redevelopment Projects
7. Pollution Prevention
8. Land Uses with Higher Potential Pollutant Loads (LUHPPLs)
9. Illicit Discharges
10. Construction Erosion and Sedimentation Control
11. Stormwater Management System Operation and Maintenance
12. Stormwater Management Plan

Horsley Witten Group

# Stormwater Management Capability

No single practice achieves all stormwater management objectives. A combination of practices is often needed to provide desired level of:

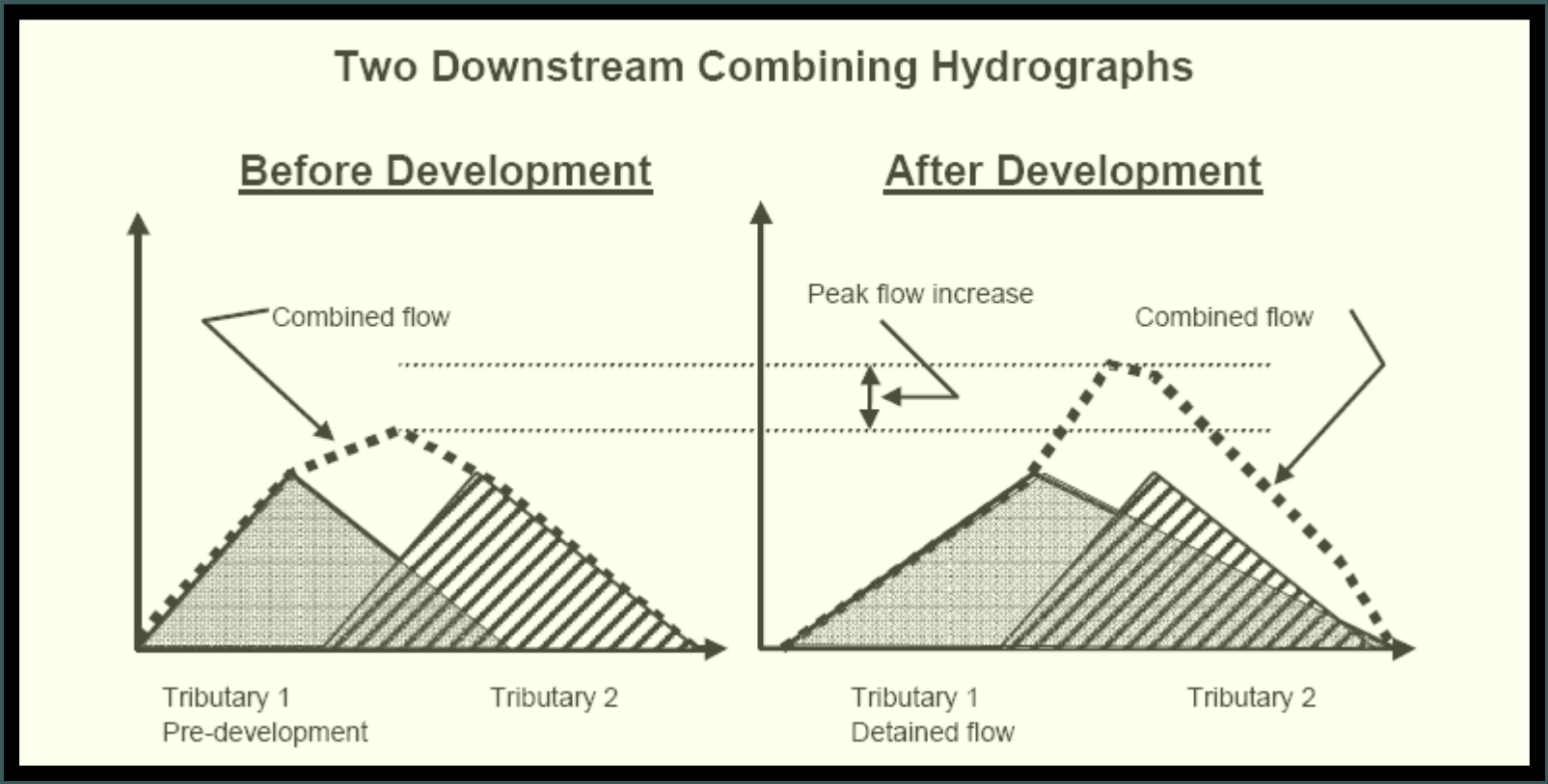
- Groundwater recharge
- Water quality treatment
- Channel protection
- Flood control
- Ability to treat LUHPPLs

# Manage Hydrology

- Increased Storm Intensities – e.g. 8.9” – 100 yr storm
- Channel Protection
  - Detain the 1-yr storm (2.3”)
- Conveyance Protection
  - Peak runoff attenuation
  - Emergency outlet sizing
  - downstream analysis – 10% rule
- Recharge
  - 1” X soil factor x area
  - Infiltration basins;  QPAs
  - Subdraining land?

Horsley Witten Group

# Graphical Depiction of Coincident Peak Phenomena



# Water Quality BMPs
# Soil and Biological Treatment Systems

- Improved Practices
  - Wet vegetated treatment systems
  - Infiltration (basins, alternative paving)
  - Filtering (bioretention)
  - Open channels or swales
  - Green roofs
- Cold Water Fisheries
  - Newly designated BY DEM
    - effective June 2, 2009

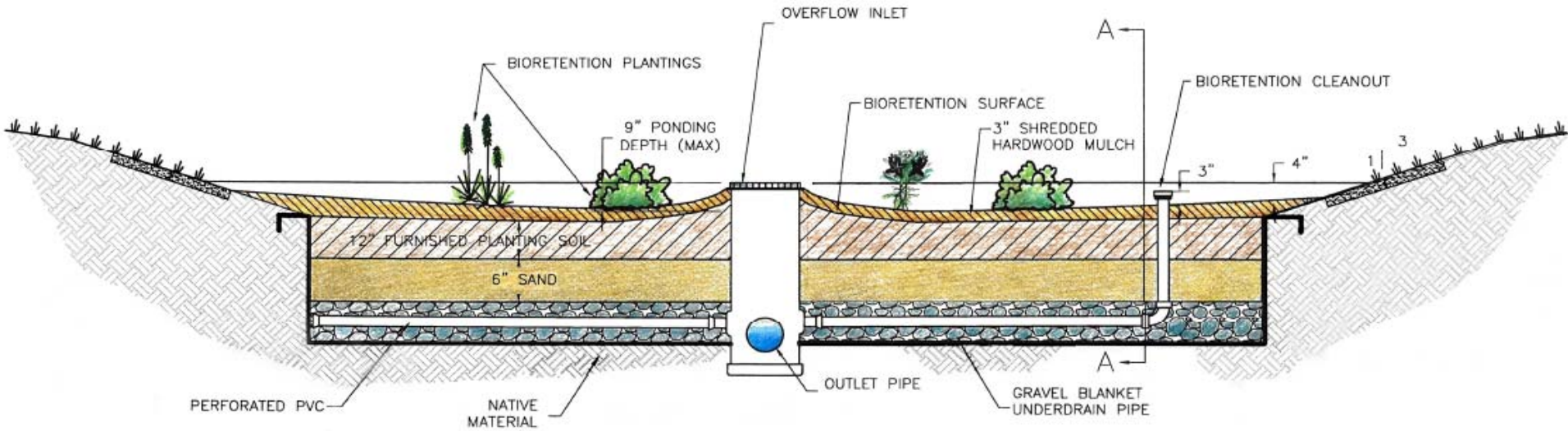
# Wet Vegetated Treatment Systems

# WVTS: Design Notes

- Shall not be located within jurisdictional waters, except may be allowed in previously developed upland buffers
- Restricted in cold-water fisheries watersheds
  - Discharges prohibited within 200 ft of jurisdictional waters
  - Beyond 200 ft, discharges shall be designed to discharge up to the CPv through an underdrained gravel trench outlet
- LUHPPL runoff requires a 3-ft separation to groundwater, no separation distance required for non-LUHPPL runoff
- Forebay required for pretreatment, 10% of WQv

# Shallow WVTS: Design Notes

- Minimum flowpath of 2:1 (length to width)
- Deeper forebay and micropool are essential (25% of WQv)
- Shallow depths over remaining surface area
- High surface area to volume ratio
- Complex internal microtopography
- Potential wildlife habitat creation
- Consumes most land of any BMP option
  - 1.5% of DA


OVERFLOW INLET
A
BIORETENTION PLANTINGS
BIORETENTION CLEANOUT
BIORETENTION SURFACE
9" PONDING DEPTH (MAX)
3" SHREDDED HARDWOOD MULCH
3"
4"
1
3
12" FURNISHED PLANTING SOIL
6" SAND
A
PERFORATED PVC
NATIVE MATERIAL
OUTLET PIPE
GRAVEL BLANKET UNDERDRAIN PIPE

# Infiltration

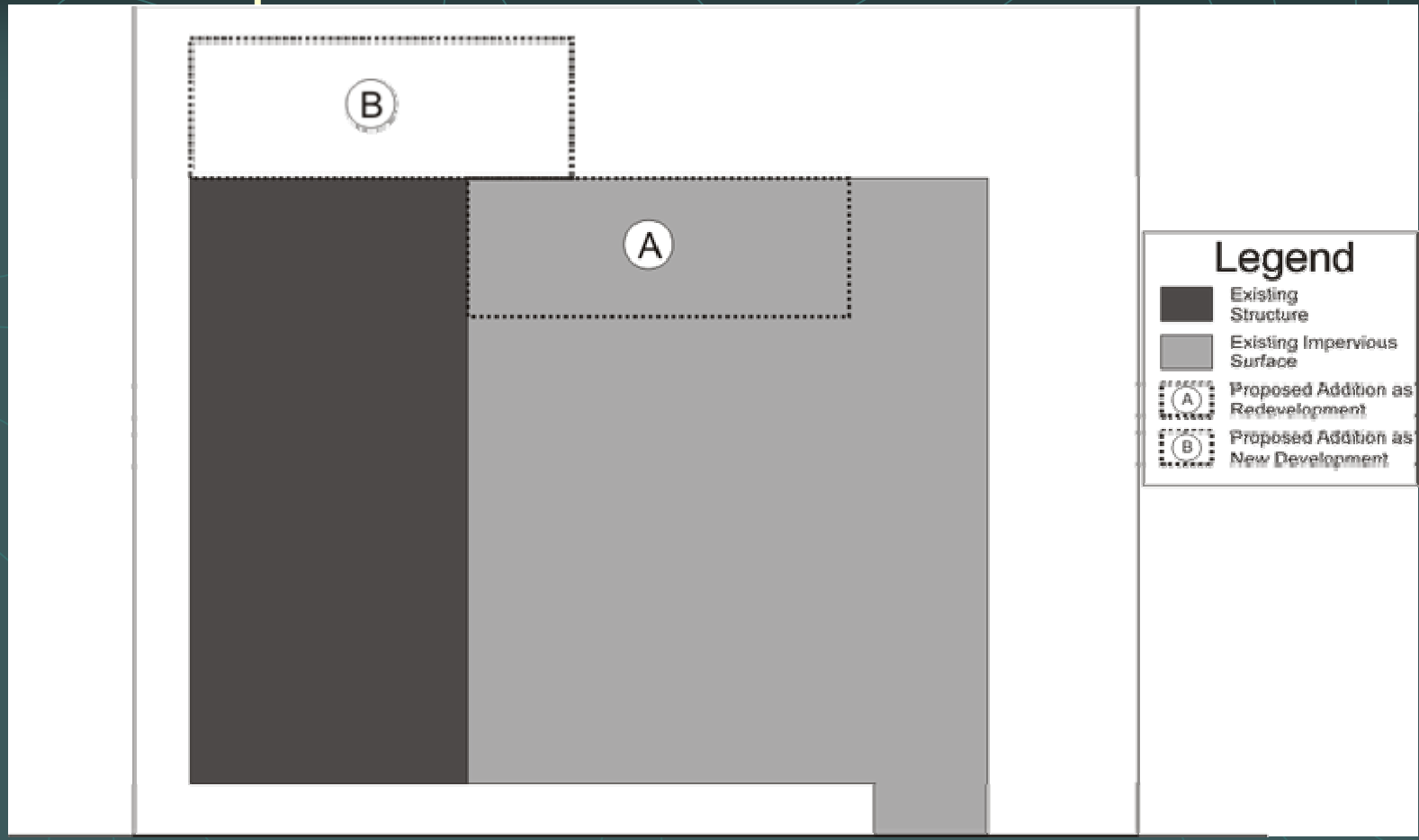


# Wet Swale

# Other Provisions

- Redevelopment
  - Disturbs 10,000 SF or more impervious
  - Options
    - Reduce impervious by 50% or more
    - Use other LID to reduce 50% runoff
    - Provide WQ treatment for 50% area
    - Off-site mitigation
- Erosion Controls
- Stormwater management system operation and maintenance plan

# Redevelopment




- Existing Conditions: 200,000 $ft^2$ lot; 60% of the lot is existing impervious surface coverage (>40%)
- Two options for a proposed 12,600 $ft^2$ addition:
  - Option A) "Redevelopment" - Manage stormwater in accordance with the Manual for 50% of the redevelopment area (A) (6,300 $ft^2$) for water quality only; or
  - Option B) "New Development" - Manage stormwater in accordance with all aspects of the Manual for 100% of the proposed additional area (B) (12,600 $ft^2$)
- Note: If the property was larger, resulting in the lot's existing impervious surface coverage <40% of the entire lot, Option A would be treated as "new development".

Horsley Witten Group

# Stormwater Practice Maintenance Burden*

Maintenance Burden is a function of the type of facility as well as the design and implementation

- WVTS ---------- Medium
- Infiltration --------- Medium to Difficult
- Filters ---------- Medium to Difficult
- Open Channels ---------- Easy

* Source: 2000 Maryland Stormwater Design Manual

# What else is happening with stormwater?

- Revisions to Stormwater Manual
- Revision to RIDEM and CRMC Regulations
- Revisions to MS4 permits
- Low Impact Development Practices Manual
  - Better and more cost effective planning and design techniques
- Local ordinance developments
- Stormwater Collaborative – coming
  - Bay, Rivers and Watersheds Coordination Team

# Draft Schedule

- Comments — June 30th - July 15th +/-

  Stormwater @dem.ri.gov

- Address comments; — July – August
  - further discussions
- Public Notice — September ‘09
- Adopt New Manual — Fall ‘09
- Training Sessions — Fall – Winter

www. dem.ri.gov www.crmc.ri.gov

Horsley Witten Group