The Low Impact Development Center, Inc.

- Mission: Stormwater Management Technology
- Pilot Projects, Monitoring, Modeling, Manuals, Training, Education

Balancing Growth and Environmental Integrity

South Carolina LID Conference

2003

1200 Years and Still Working !!!

CHAPTER 26 CFR - WATER POLLUTION PREVENTION AND CONTROL

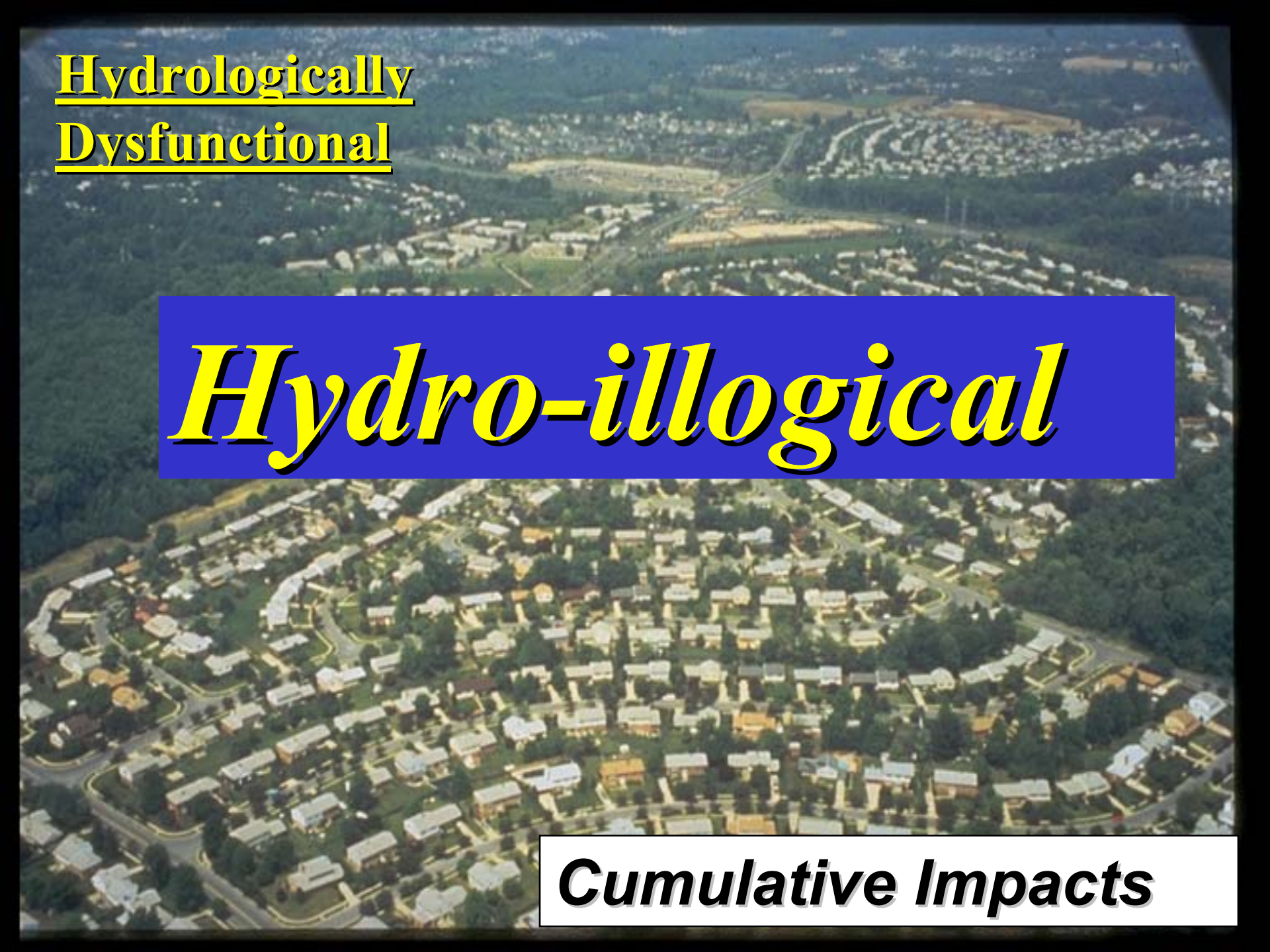
SUBCHAPTER I - RESEARCH AND RELATED PROGRAMS

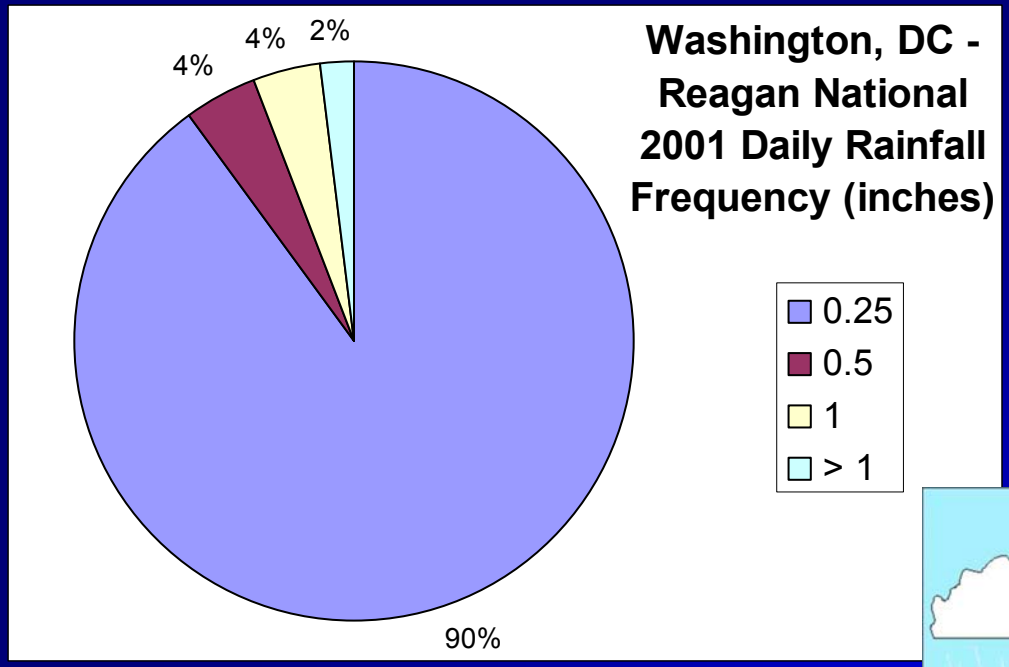
- § 1251. Congressional declaration of goals and policy.

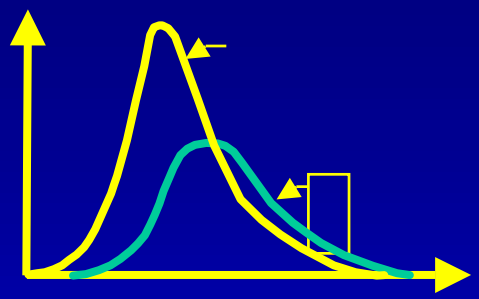
(a) Restoration and maintenance of chemical, physical and biological integrity of Nation's waters; national goals for achievement of objective.

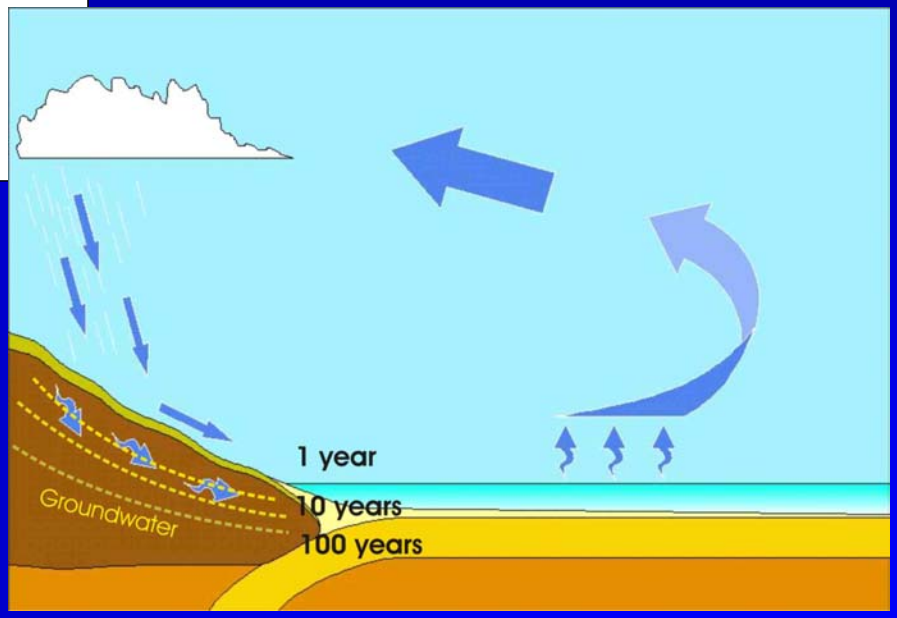
- Ecosystems Based
- Technology-forcing
- Comprehensive Research
- Total Maximum Daily Load


Predevelopment
Condition

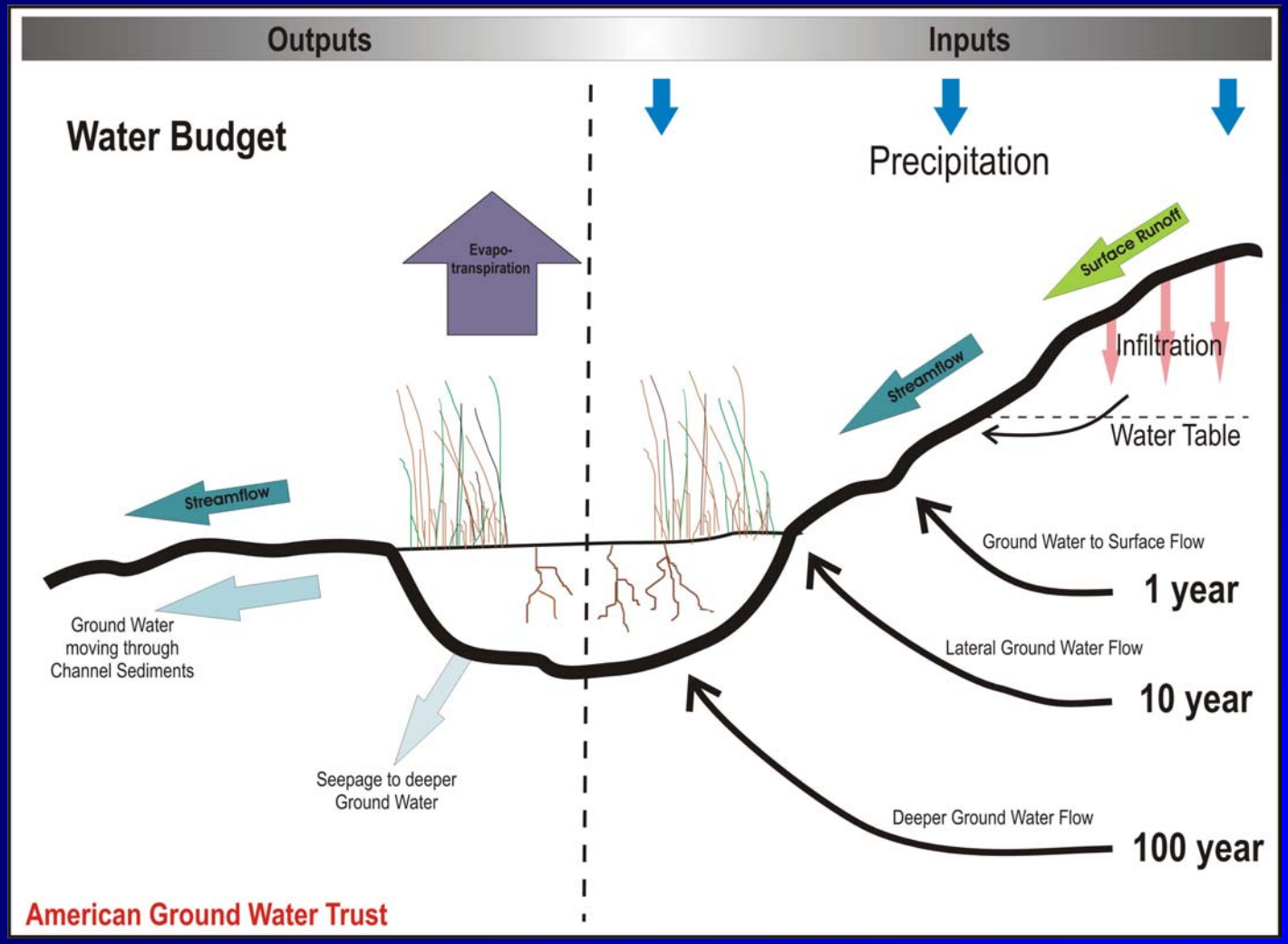

Hydrologically
Dysfunctional
Hydro-illogical
Cumulative Impacts





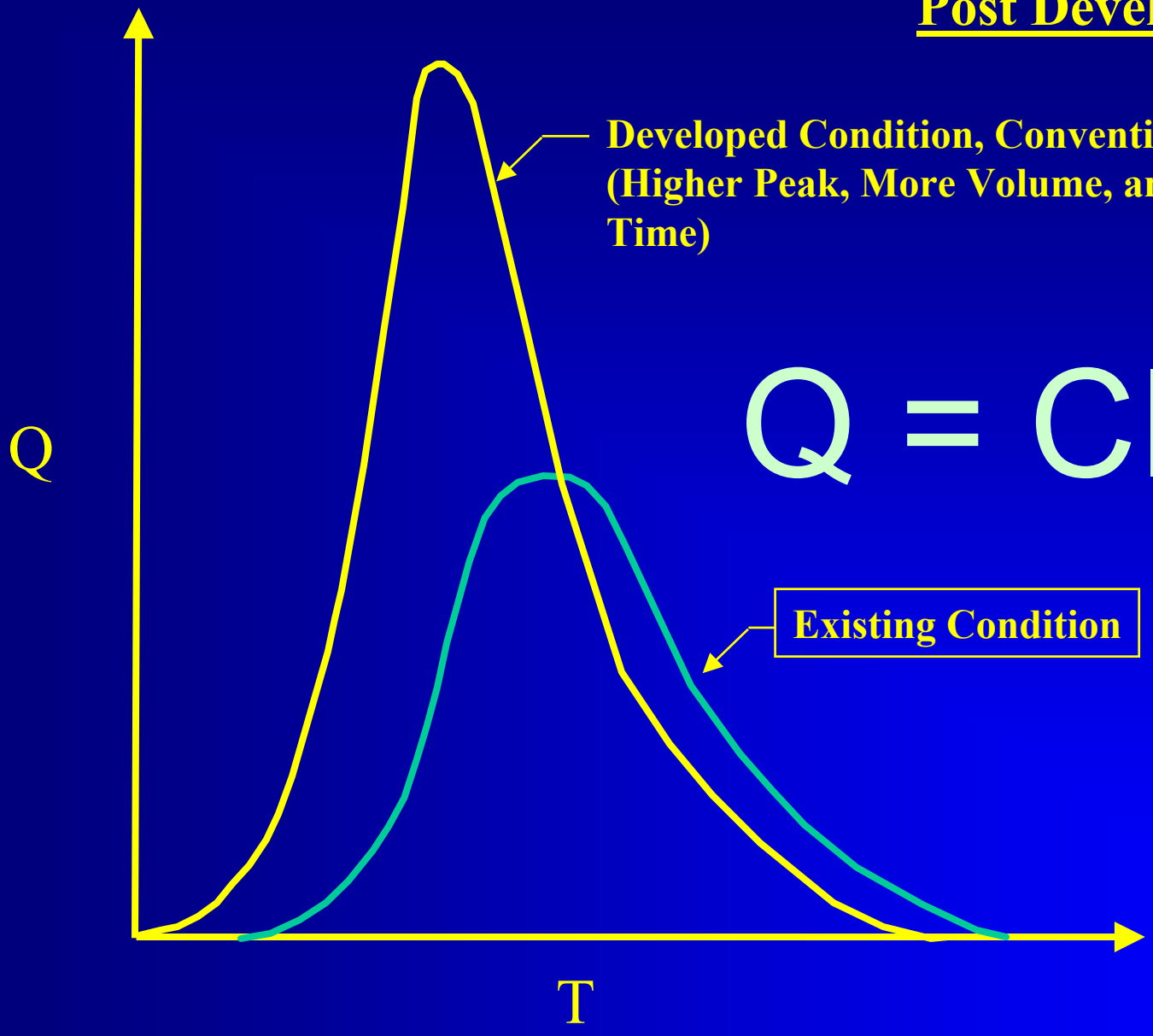


Address Frequently Occurring Events and Loads While Insuring Flood Protection



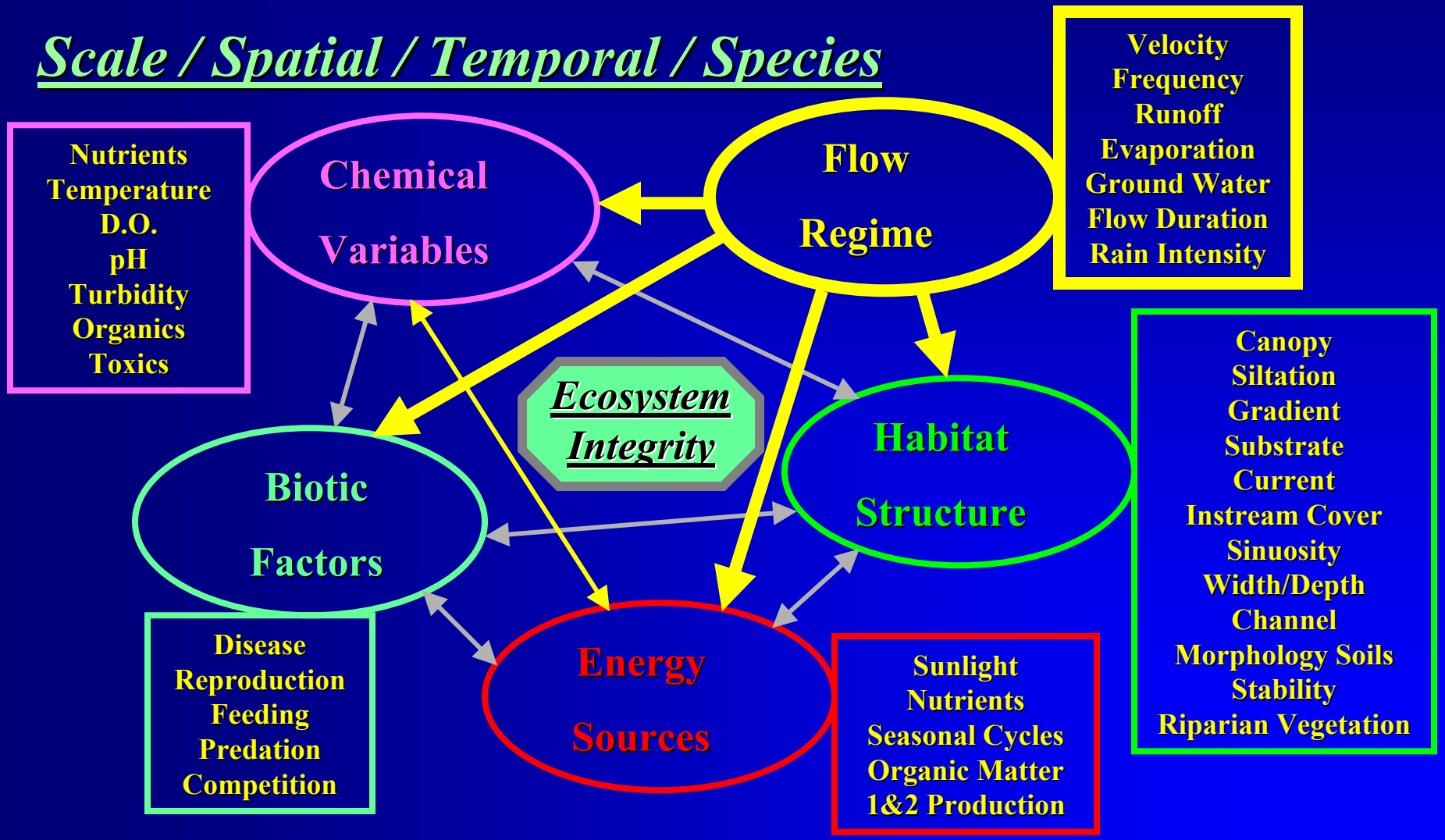
Compliance by Working with Natural Processes

Hydrograpgh Pre/ Post Development

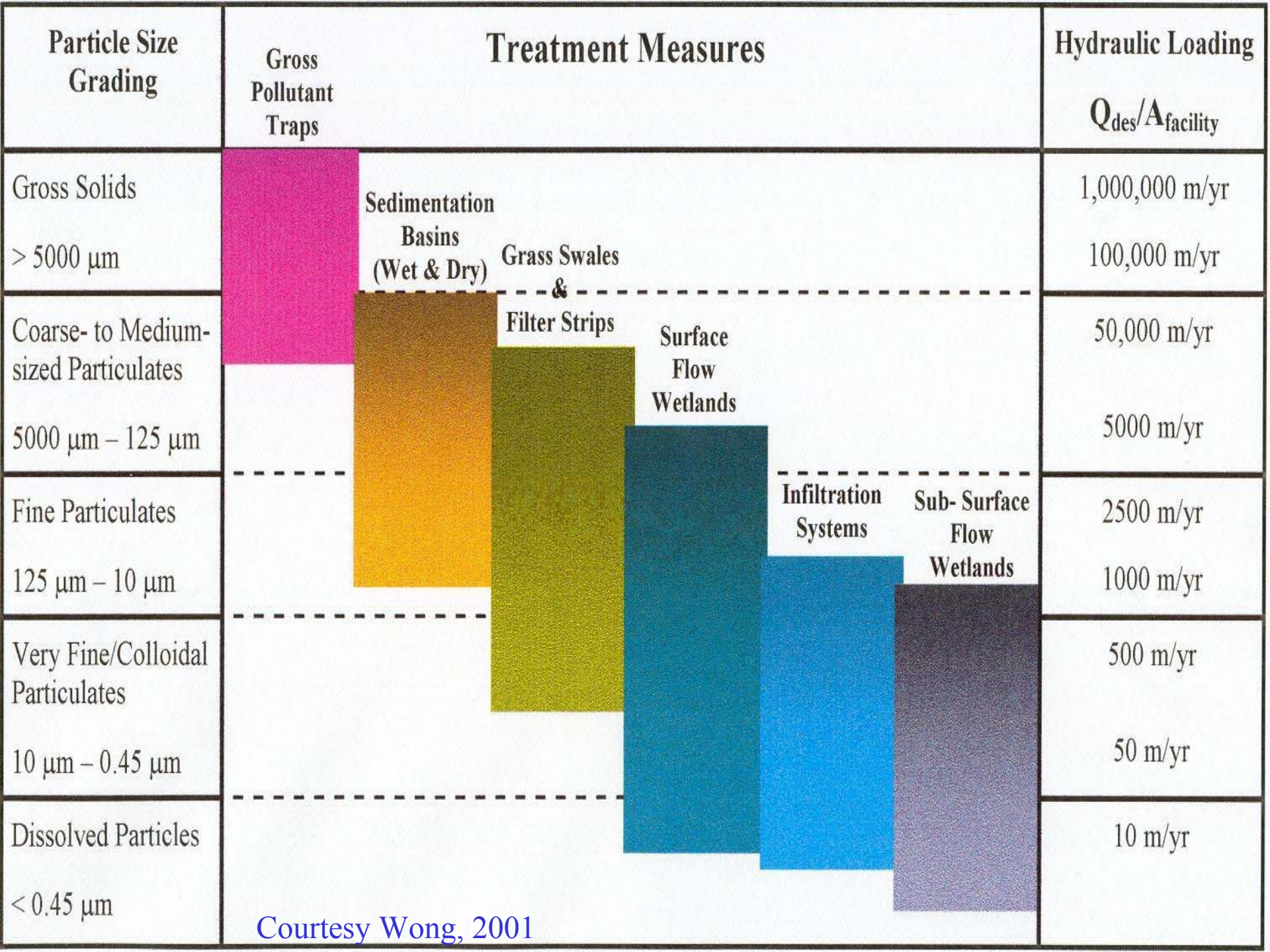


How well do we maintain the ecological integrity (functions) of aquatic systems (small streams)?

Scale / Spatial / Temporal / Species



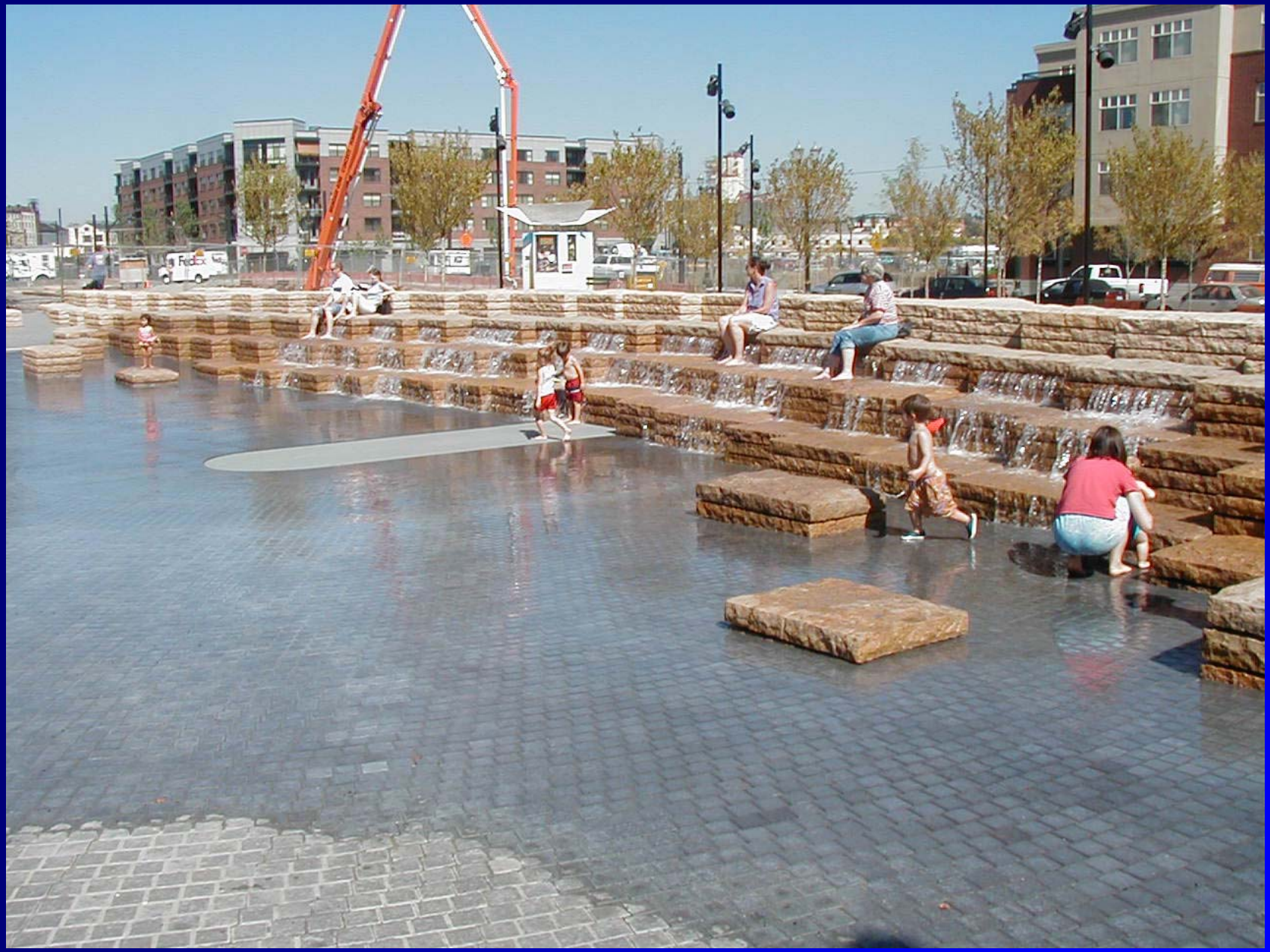
Urban Stormwater Art



Courtesy Wong, 2001

Canadian
TMDL Goose

Engineers Fountain Design



The Living Water Park:

Ecology and Education

MARGIE RUDDICK LANDSCAPE

MARGIE RUDDICK LANDSCAPE

Limitations of Conventional Stormwater Approaches

- Technology Gaps
  - Cumulative impacts
  - Not an anti-degradation strategy
  - Allows hydrodynamic modifications
  - Allows continued stream degradation
  - Limited use for urban retrofit
  - Unsustainable maintenance burdens

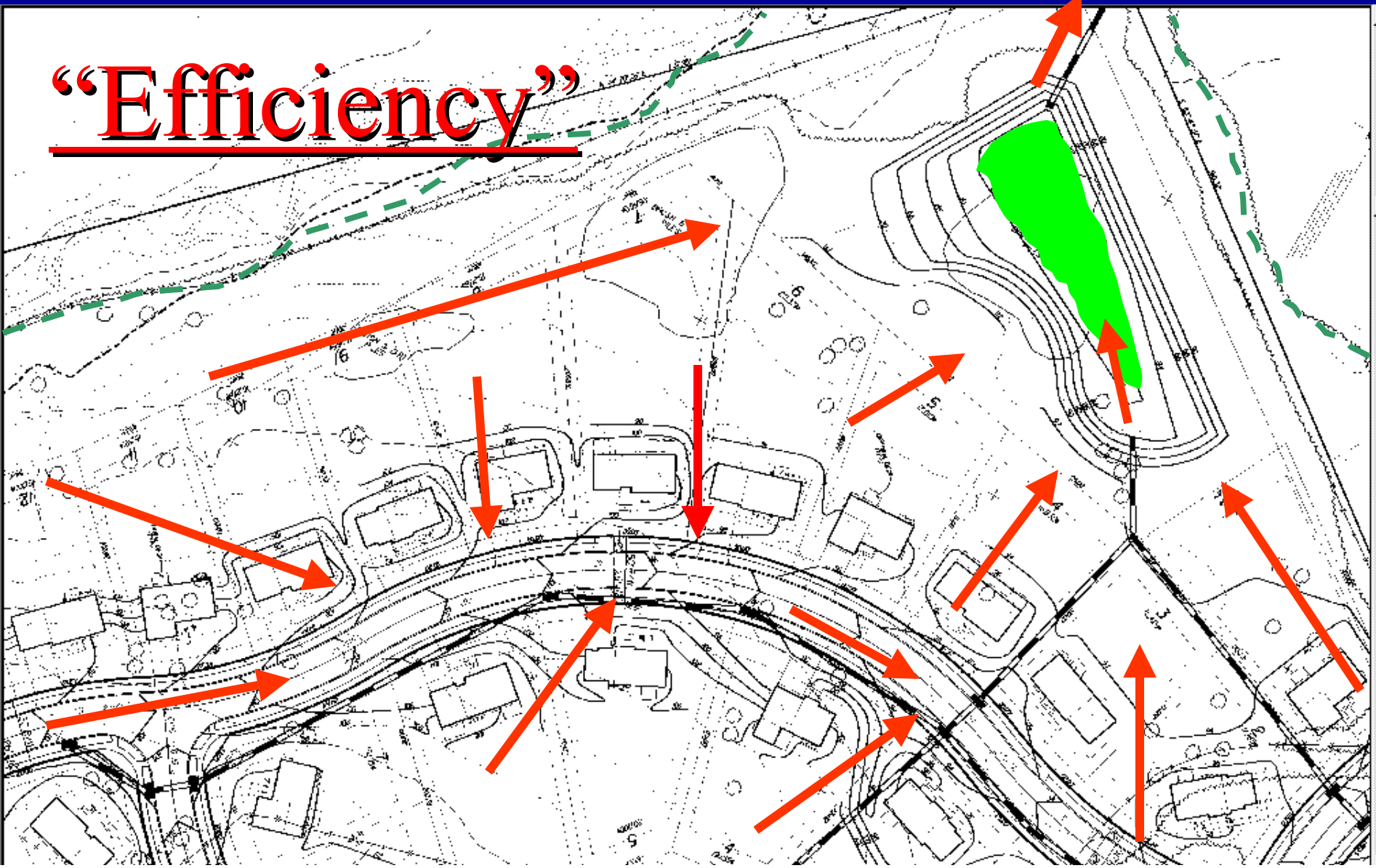
Limitations of Conventional Stormwater Approaches

- Economics
  - Cost of Maintaining a Growing / Aging Infrastructure
- New Objectives (Public Health / Ecological)
  - Source Water, CSO's, Living Resources / Streams
  - Regulations
    - NPDES / TMDL's / ESA

The Problem: Conventional Site Design

Good Drainage Paradigm

Conventional Pipe and Pond Centralized Control



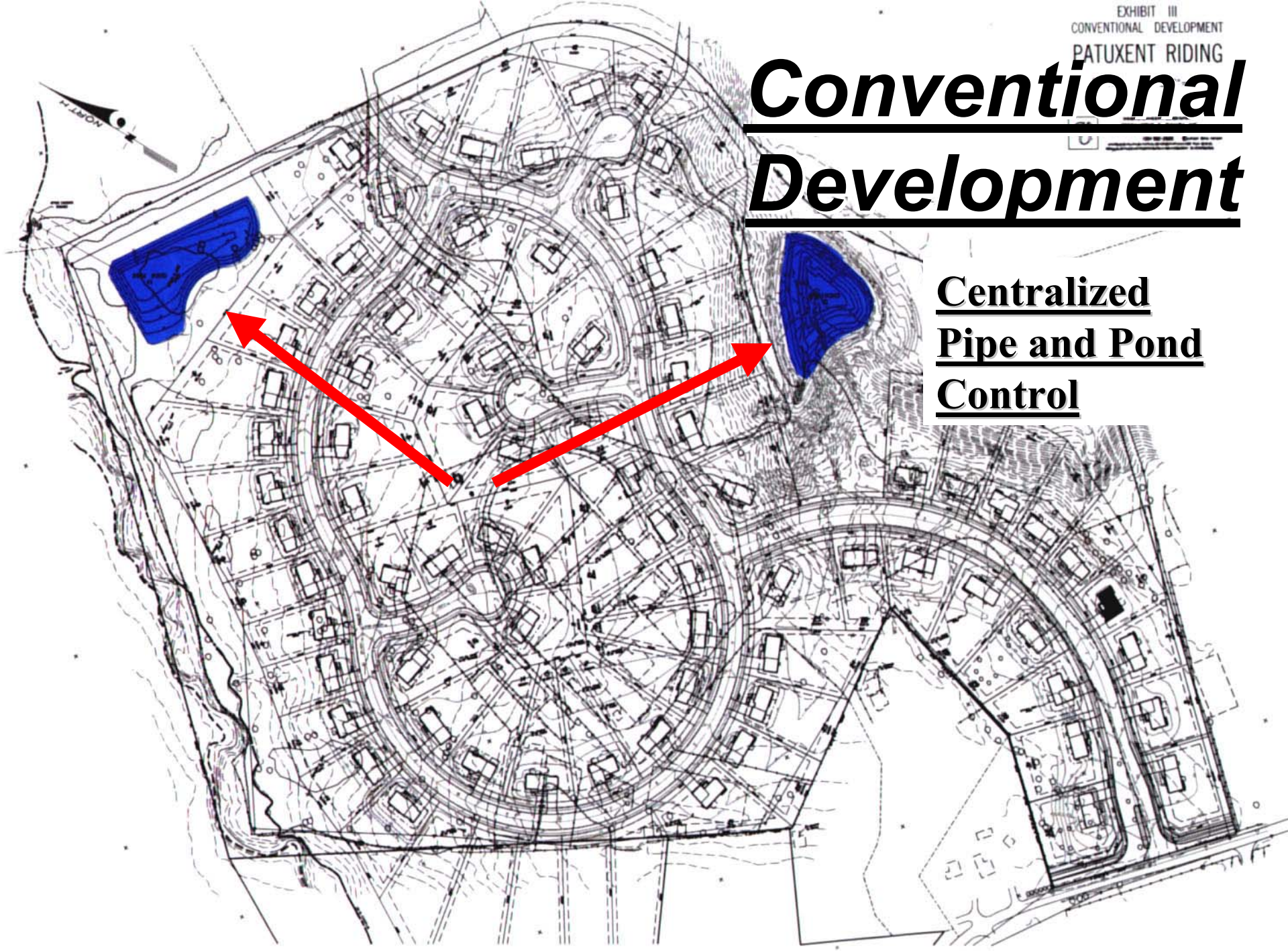
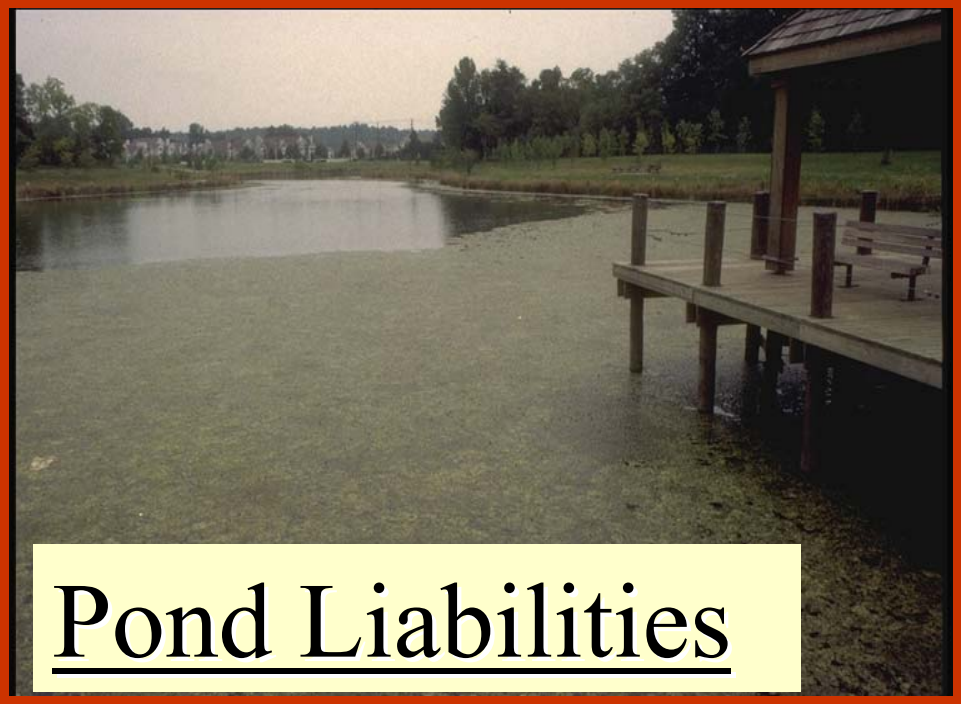


EXHIBIT III
CONVENTIONAL DEVELOPMENT
PATUXENT RIDING
Conventional Development
Centralized Pipe and Pond Control

Maintenance



Pond Liabilities

Limitations

- Safety / Health
- Inspection / Maintenance
- Inefficient Pollutant Removal
- Temp / Sediment / Frequency / Volume

Safety

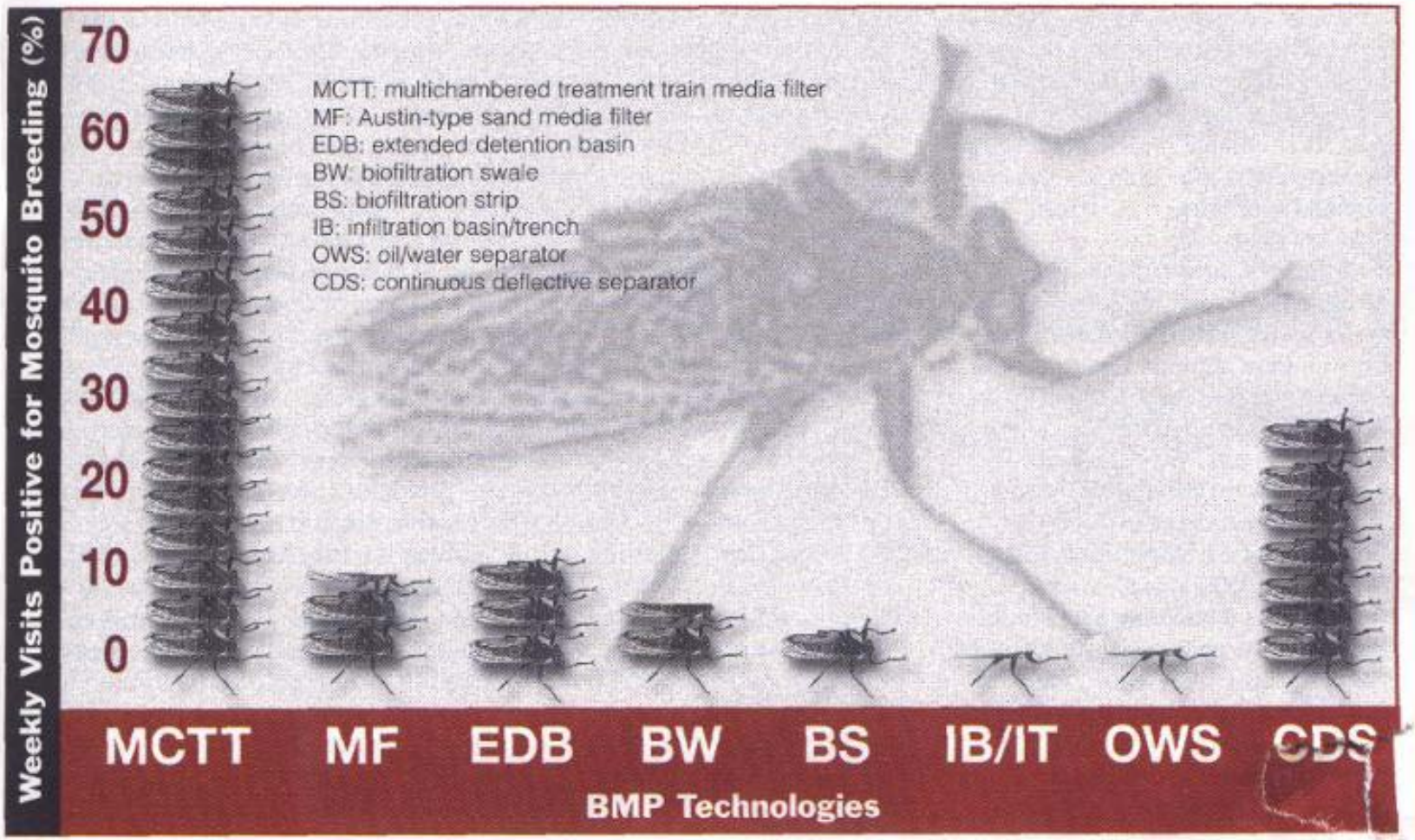
Anacostia Tributary

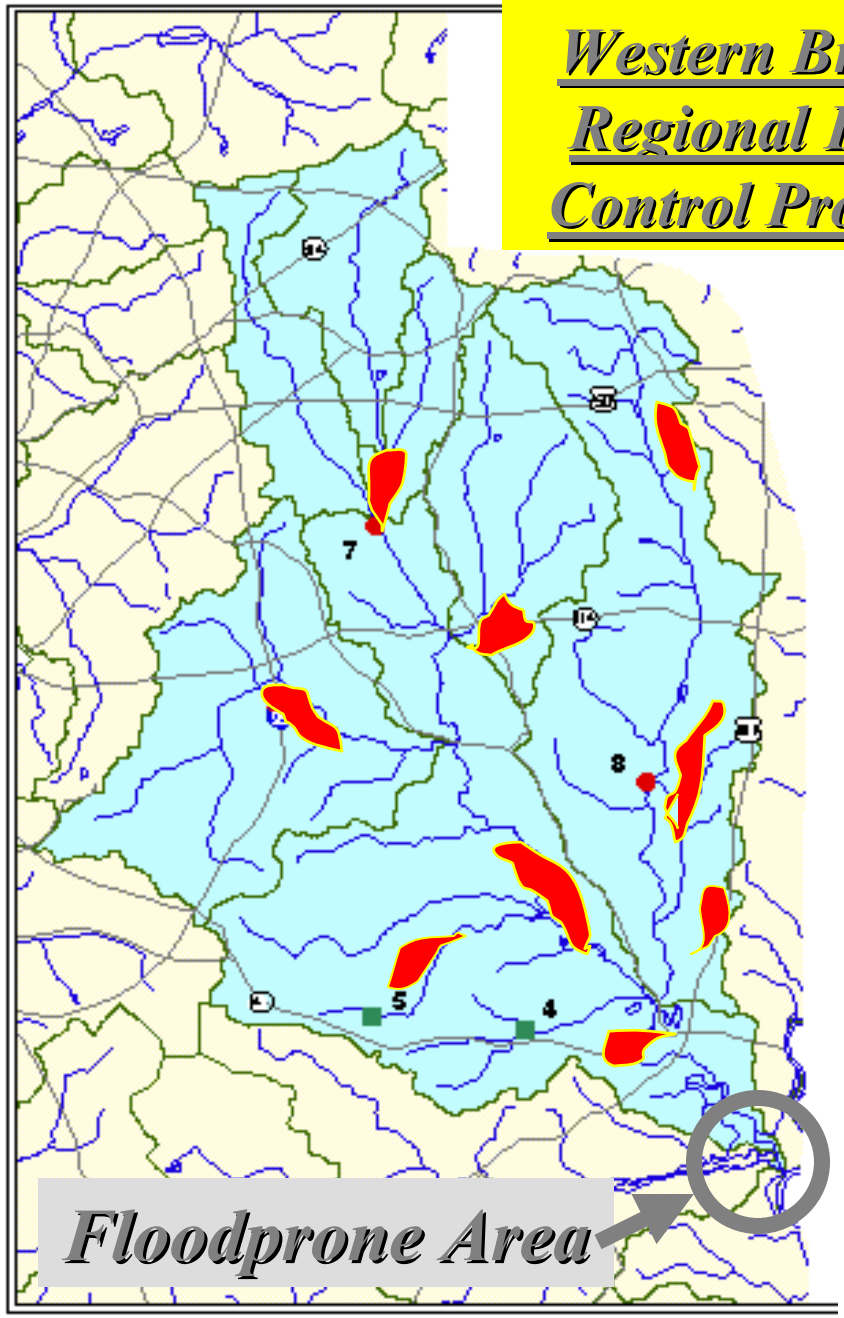
Conventional Ultra-Urban Retrofit

Creating Blackholes of Infrastructure

Stormwater Competes With Other Programs

- Space
- Cost
- Inefficiency
- Pollution
- Maintenance
- Safety





Regional Pond Programs Issues

135 Regional Ponds
Size 400 to 1500 ac
1/3 Coverage $270,000,000

High Costs

Planning / Land / Design / Construction

Limited Effectiveness

Flood Control / Water Quality / Ecology / Erosion

High Maintenance Costs

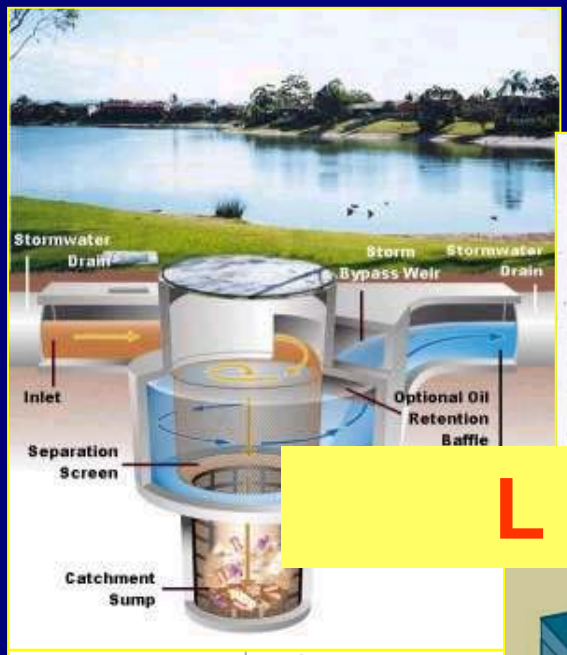
Dredging / Inspections / Structures

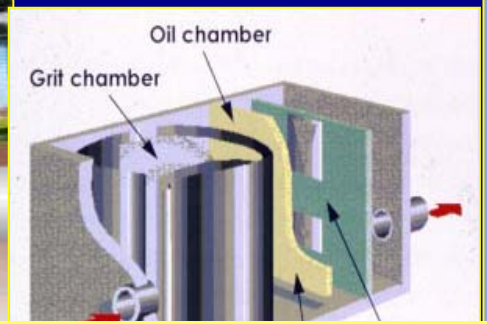
Liabilities

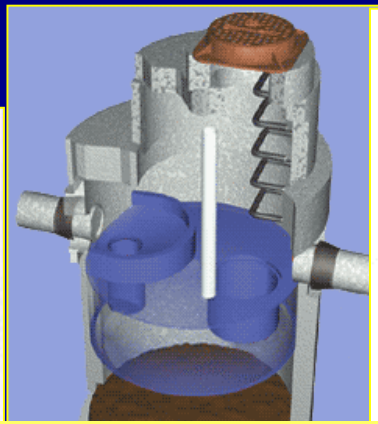
Safety / Dam Safety / Public Health

BOMB SHELTER/STORMWATER MANAGEMENT FACILITY

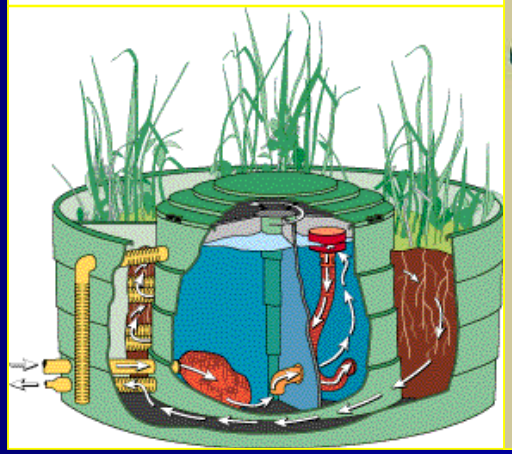
Proprietary Devices

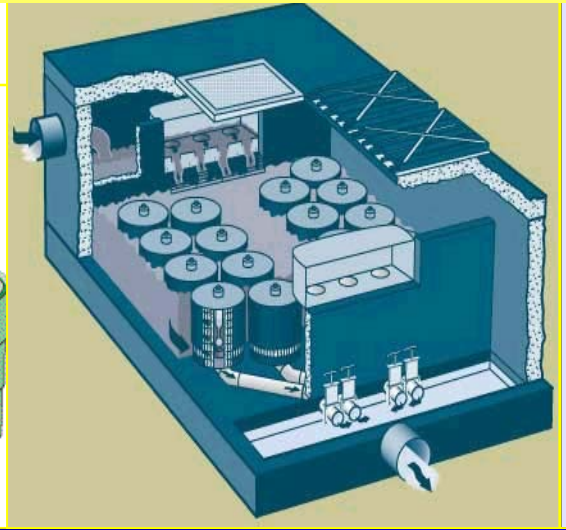


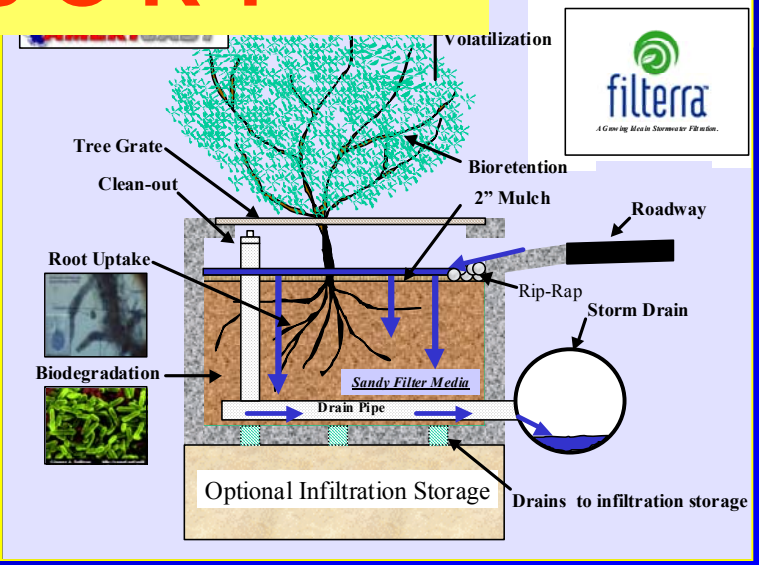




LAST RESORT



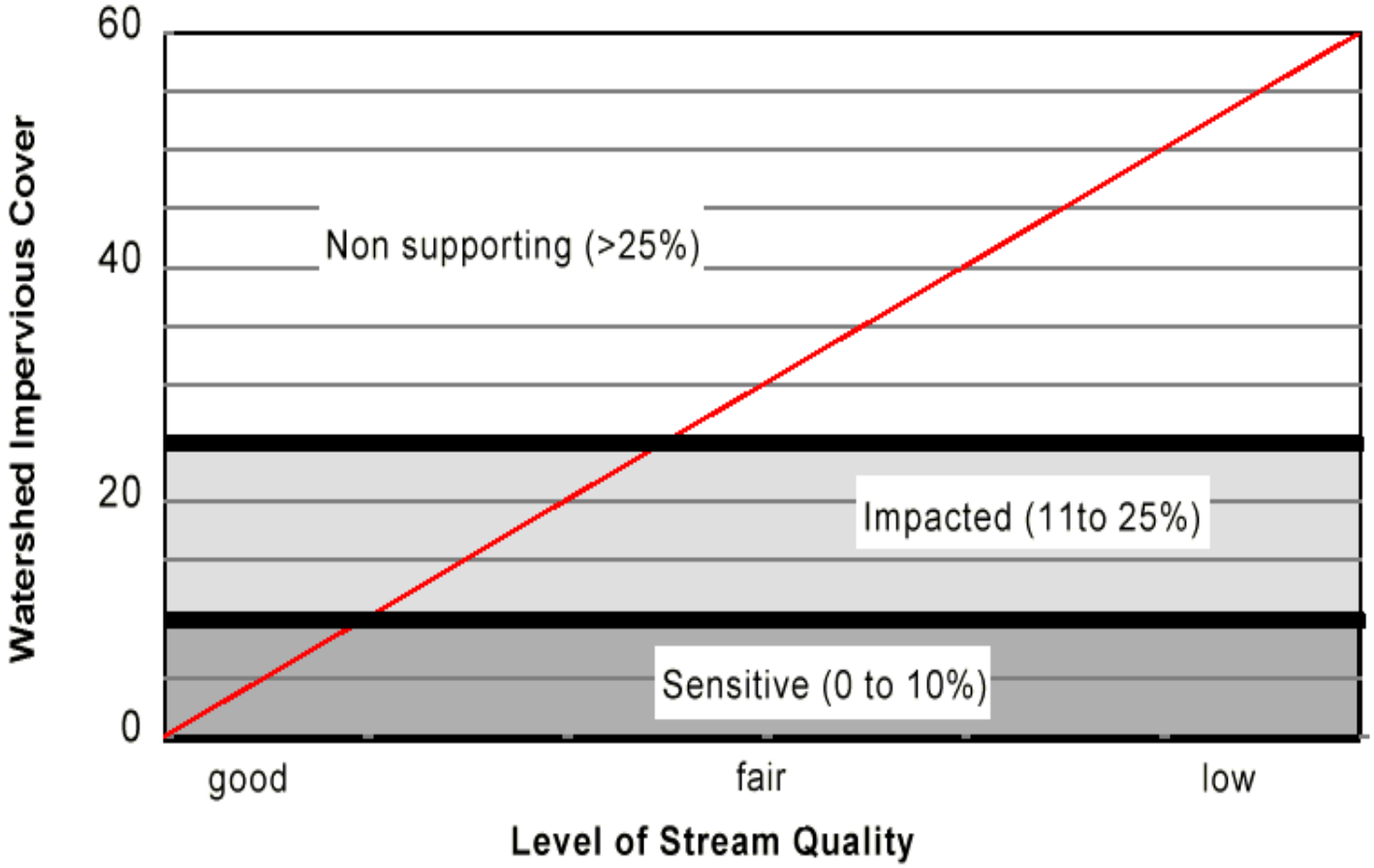




LAND USE CONTROLS

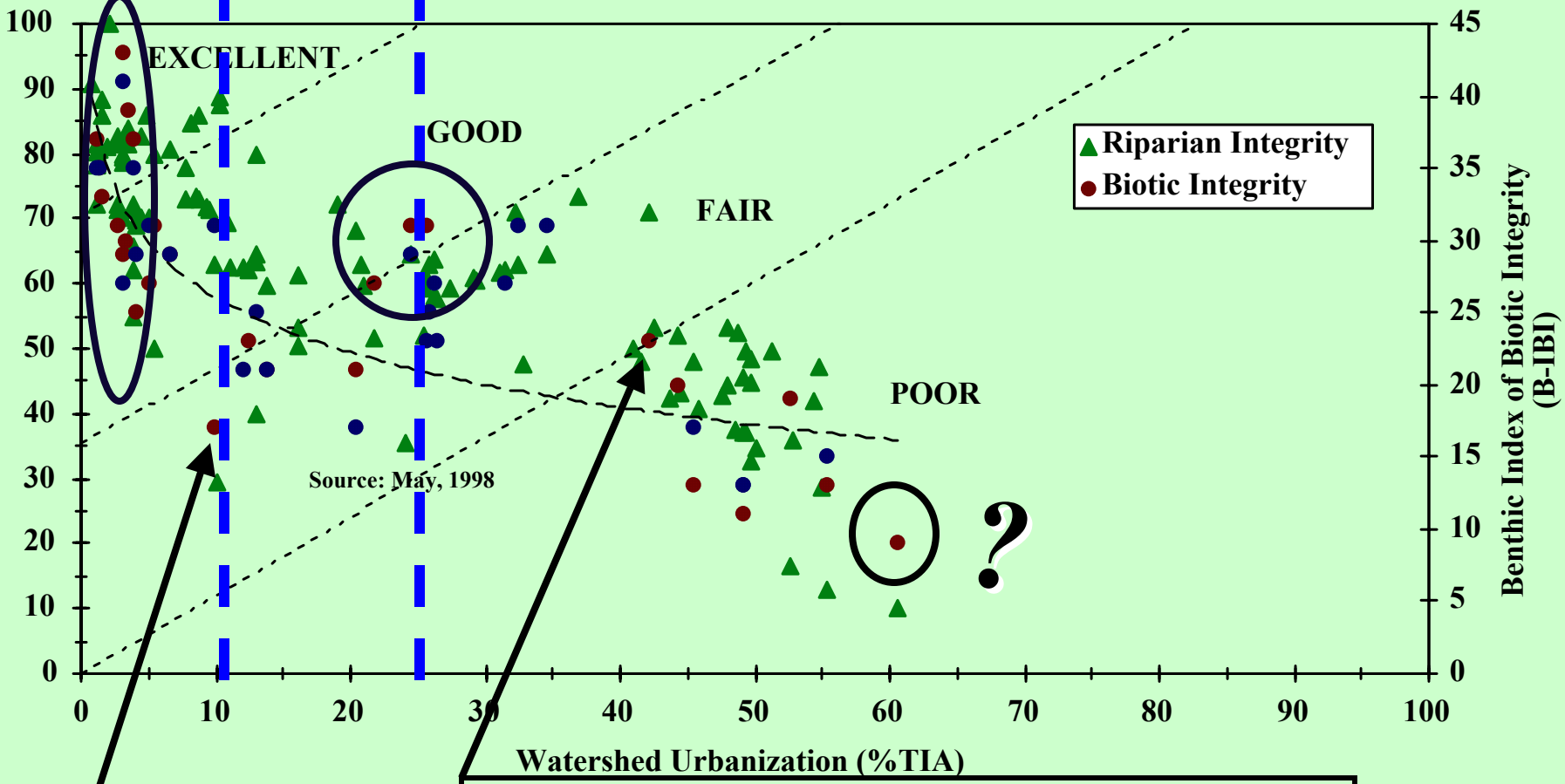
Imperviousness & Threshold Theories

It's not so simple - very complex!



Source: Schueler and Claytor, 1995

Relationship between basin development, riparian buffer width, and biological integrity in PSL stream

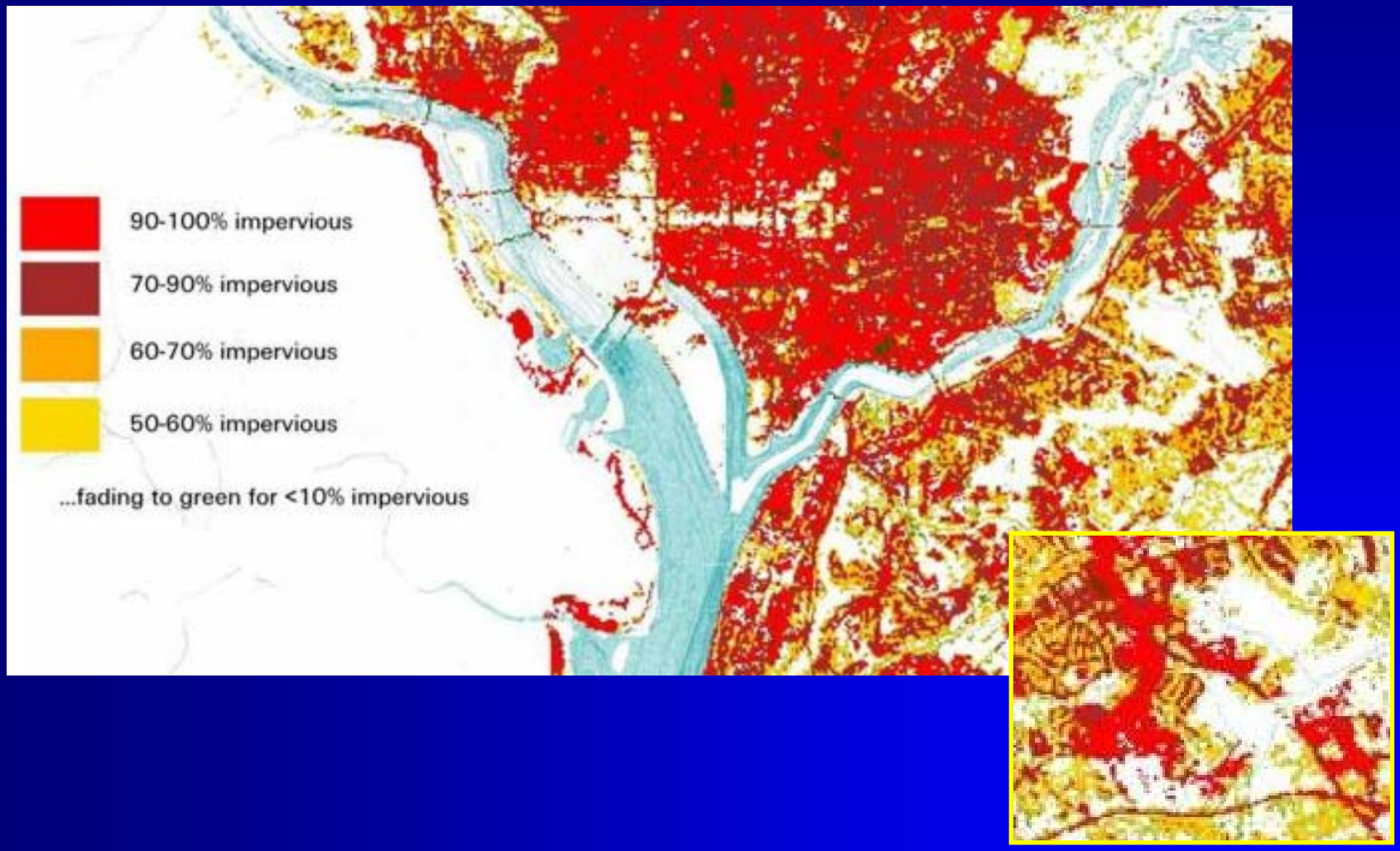


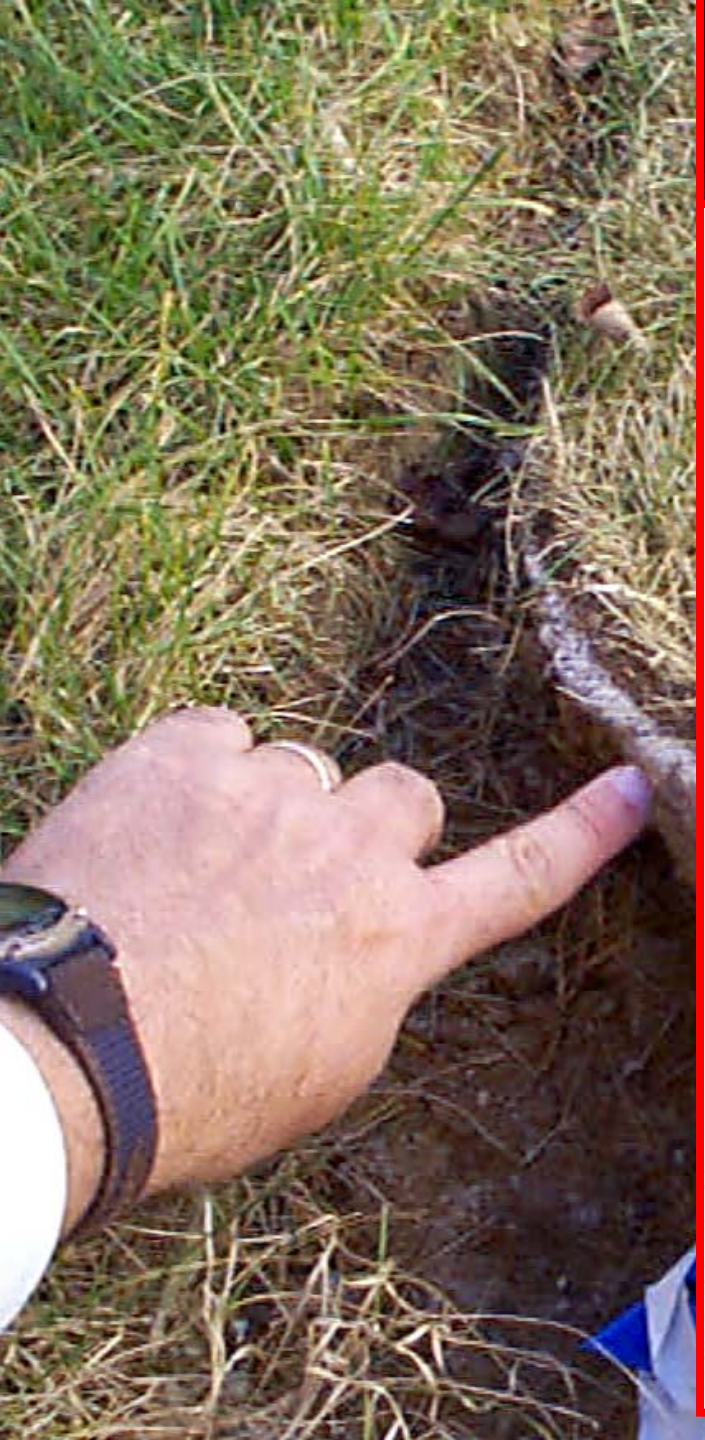
Low Imperviousness 9% Fair Integrity

High Imperviousness (40%) Fair Integrity

Chris May, 1998

An estimate of imperviousness can be derived directly from the satellite image for developed areas. (Water bodies from the USGS topographic maps are overlaid for orientation, and areas identified as undeveloped in the National Land Cover dataset are left white.)





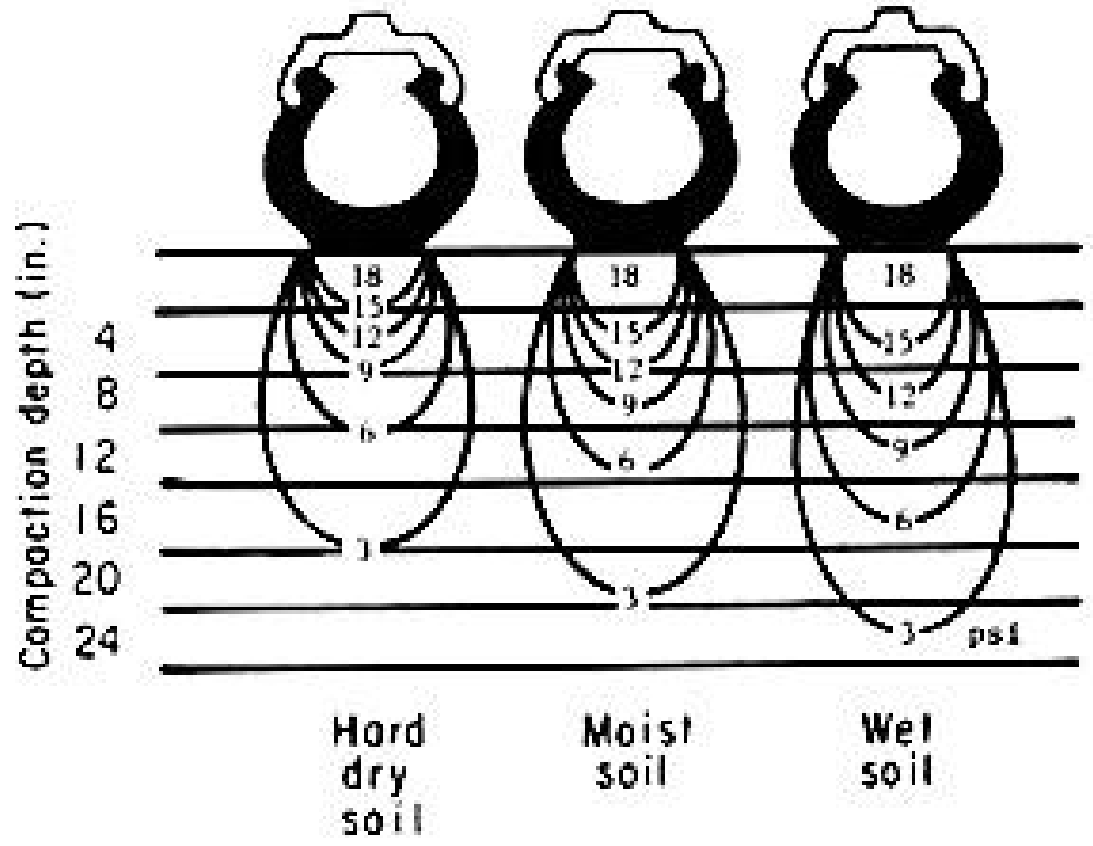
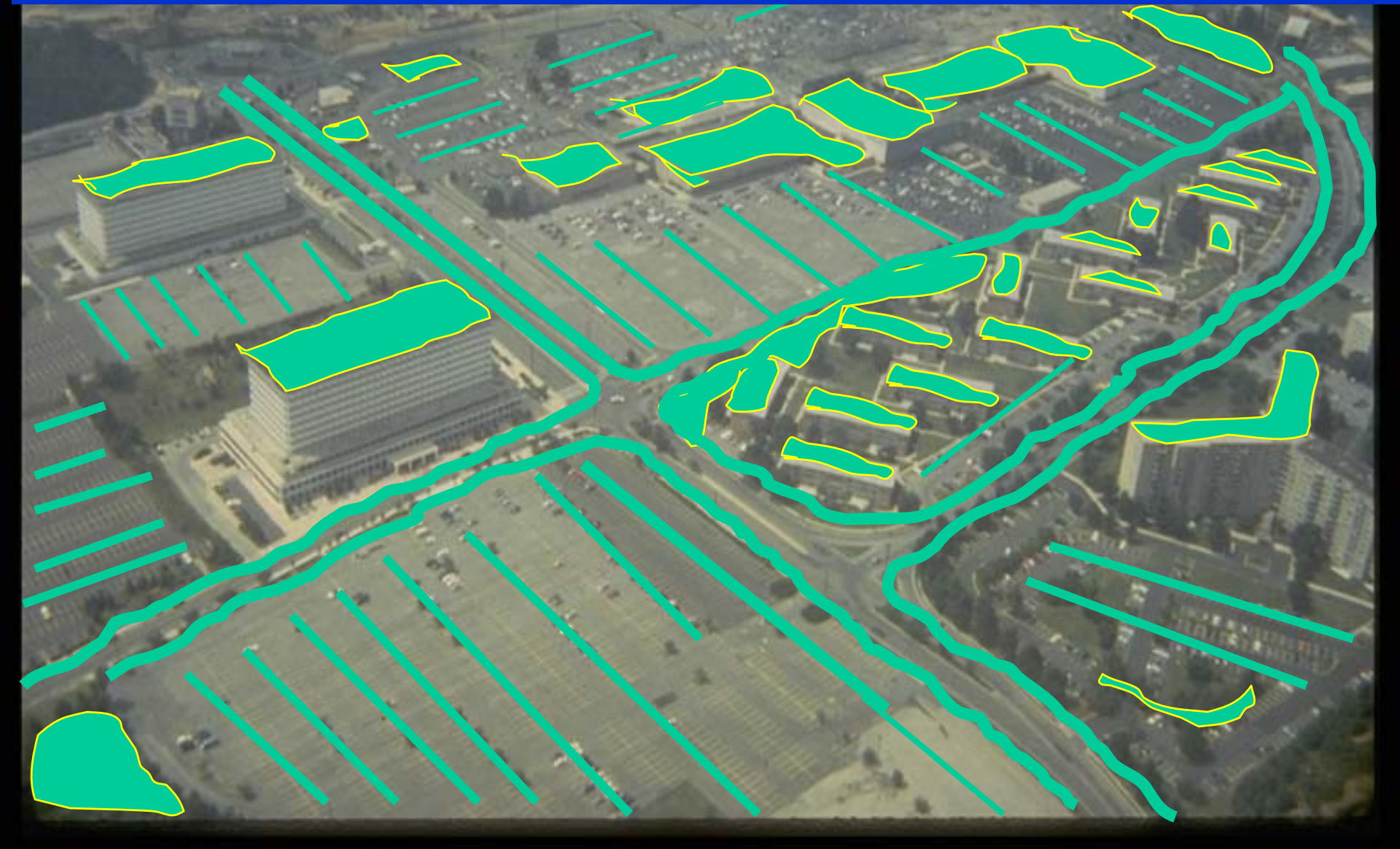


Figure 3. How soil moisture affects soil compaction. The lines in the soil under the tire represent curves of equal pressure. In all three situations the tire size was 11 x 28, the load was 1,650 pounds and the pressure 12 psi. On wet soil, pressures were transmitted to depths of more than 24 inches. (Source—Soehne, Jour. of Agr. Eng., May 1958.)

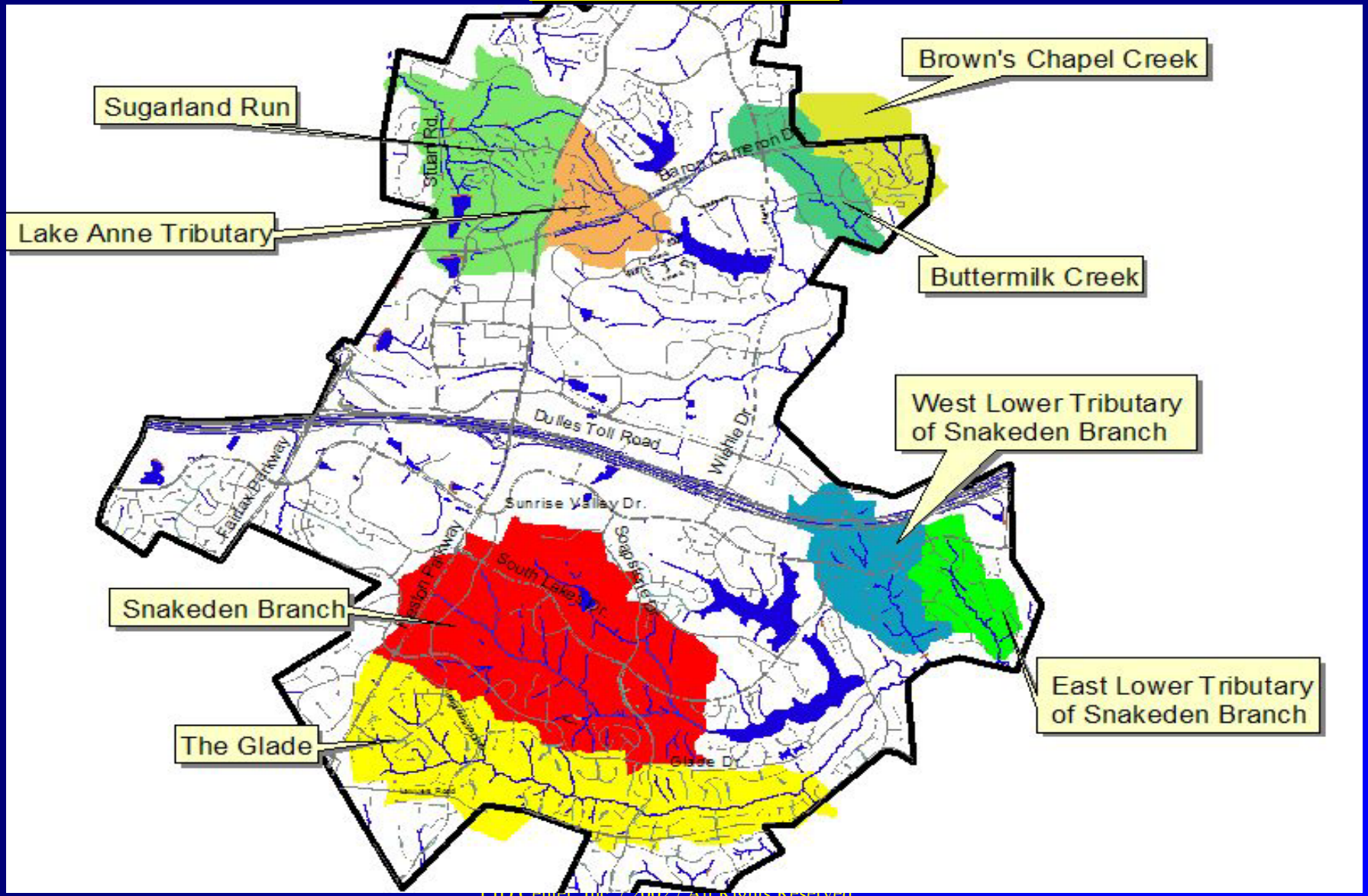
Urban LID -- Rooftop Storage, Bioretention Landscaping, Parking Lot Storage, Longer Flow Paths, Swales, Water Use, Pollution Prevention ……

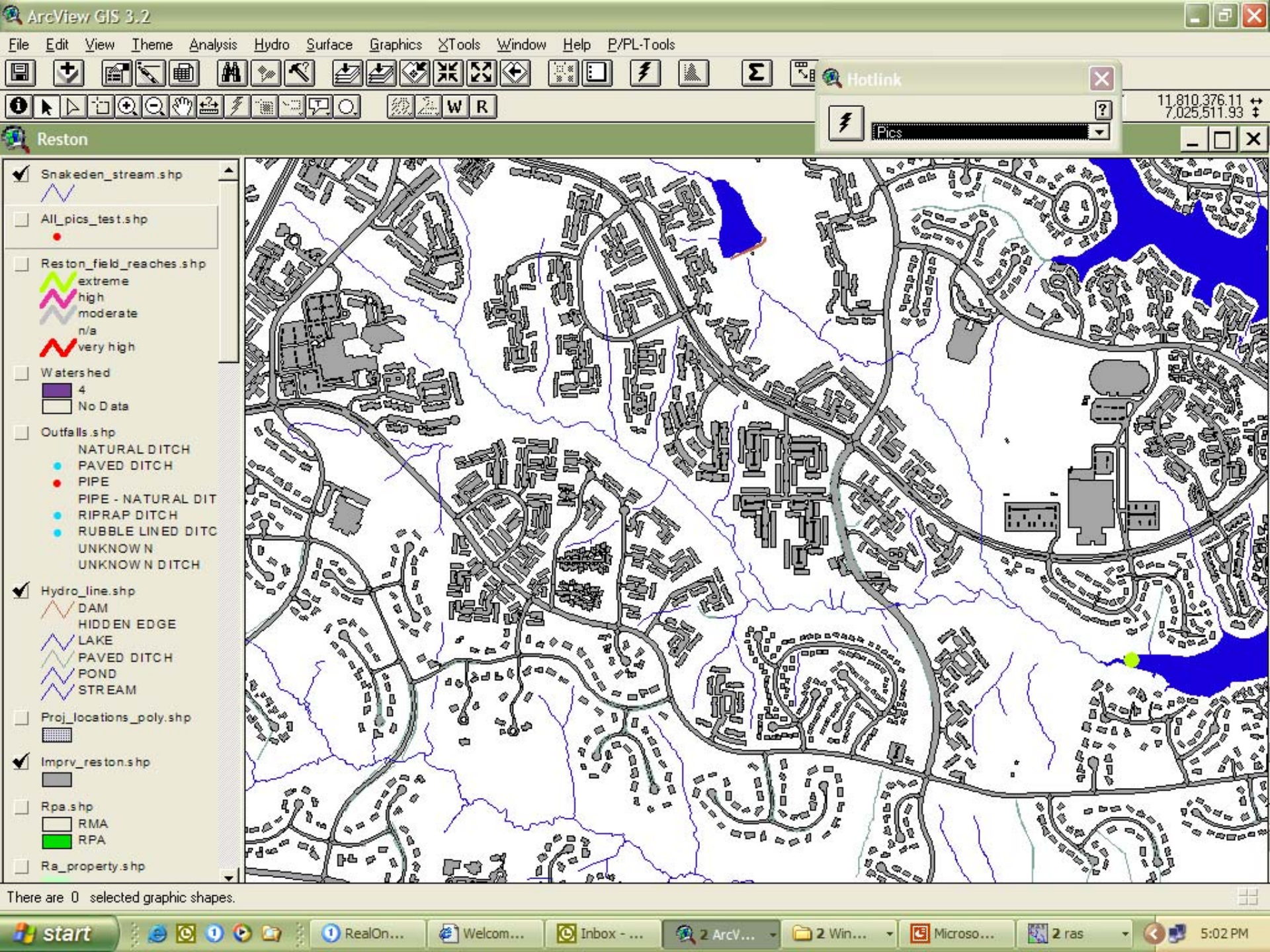


Ford Rouge 2003

Cahill Associates

Reston Watershed Management Planning

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Reston
Snakeden_stream.shp
All_pics_test.shp
Reston_field_reaches.shp
extreme
high
moderate
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Watershed
4
No Data
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NATURAL DITCH
PAVED DITCH
PIPE
PIPE - NATURAL DIT
RIPRAP DITCH
RUBBLE LINED DITC
UNKNOWN
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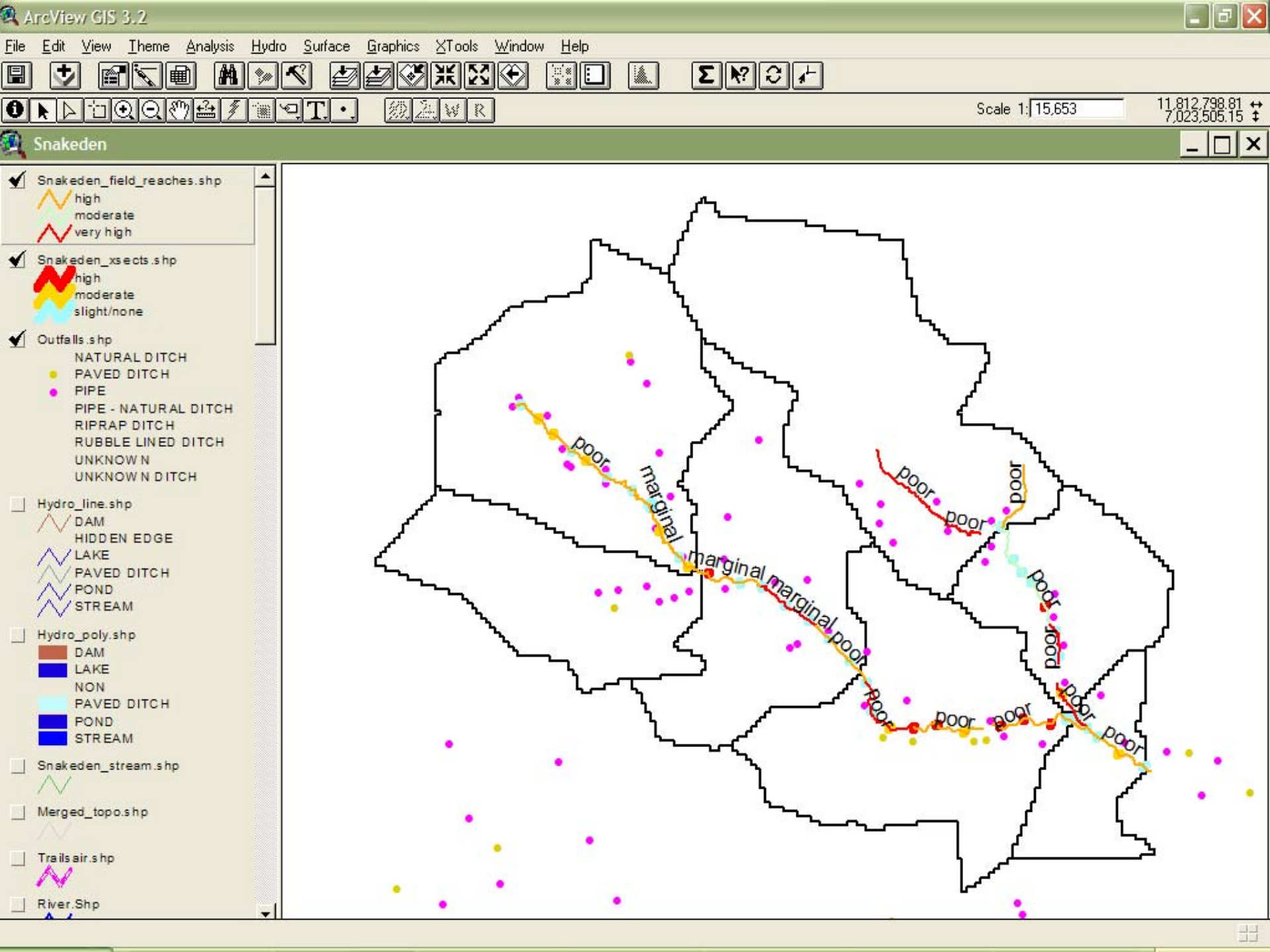
ArcView GIS 3.2
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Snakeden
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moderate
very high
Snakeden_xsects.shp
high
moderate
slight/none
Outfalls.shp
NATURAL DITCH
PAVED DITCH
PIPE
PIPE - NATURAL DITCH
RIPRAP DITCH
RUBBLE LINED DITCH
UNKNOWN
UNKNOWN DITCH
Hydro_line.shp
DAM
HIDDEN EDGE
LAKE
PAVED DITCH
POND
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PAVED DITCH
POND
STREAM
Snakeden_stream.shp
Merged_topo.shp
Trailsair.shp
River.Shp
poor
marginal
poor
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poor
poor
poor
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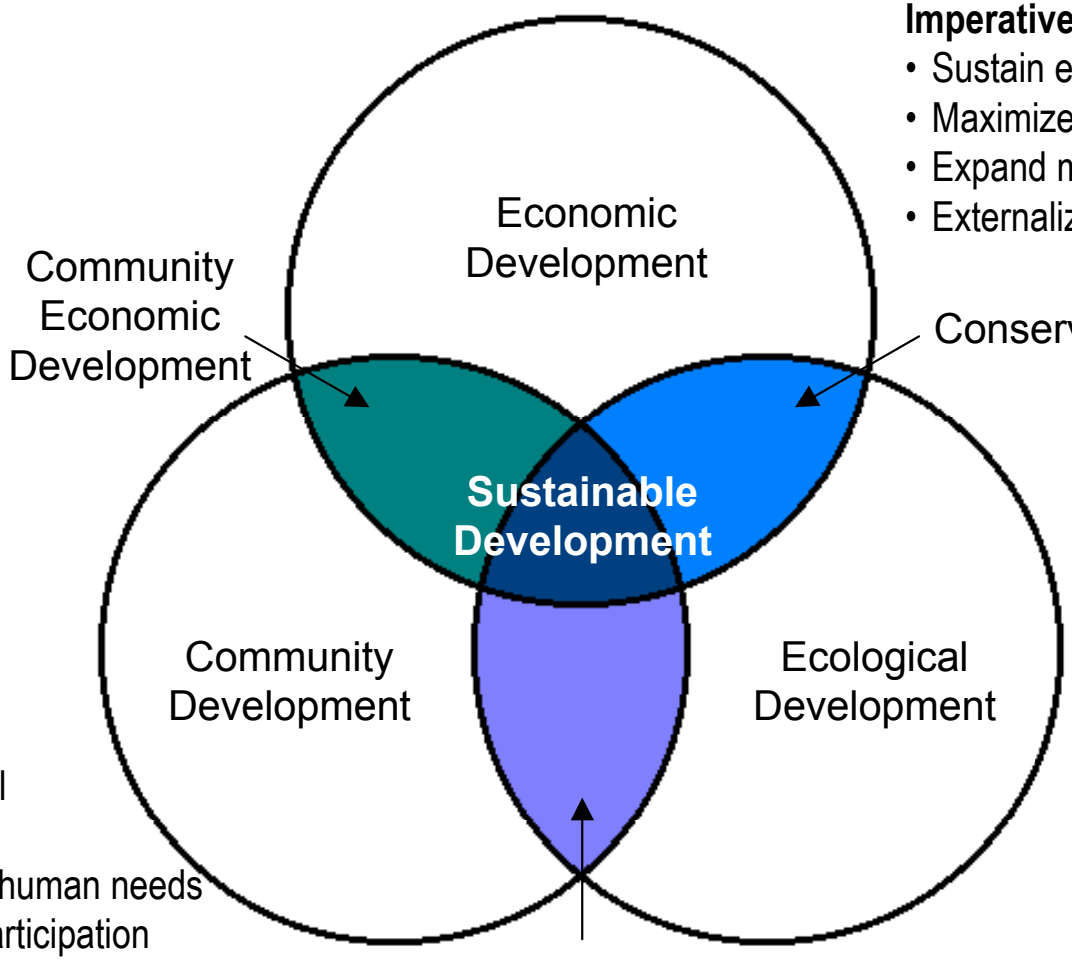
poor

Where's the ~~Beef~~ Buffer?

Buttermilk off North Shore

Buttermilk off Ring Road

Why is it always Monday?



Imperatives:
- Sustain economic growth
- Maximize private profit
- Expand markets
- Externalize costs

Imperatives:
- Increase local self-reliance
- Satisfy basic human needs
- Guarantee participation and accountability
- Use appropriate technology

Imperatives:
- Respect carrying capacity
- Conserve and recycle resources
- Reduce waste

Courtesy ICLEI, 1999

Stormwater Management!!!