



# Connecticut Department of Energy and Environmental Protection



# Statewide Response to Phosphorus Nonpoint Source (NPS) Pollution in State Waters

Nov 28, 2012

PA 12-155 Open Collaboration Meeting



Connecticut Department of Energy and Environmental Protection

# Overview of PA 12-155

## 1. Collaboration & Recommendations

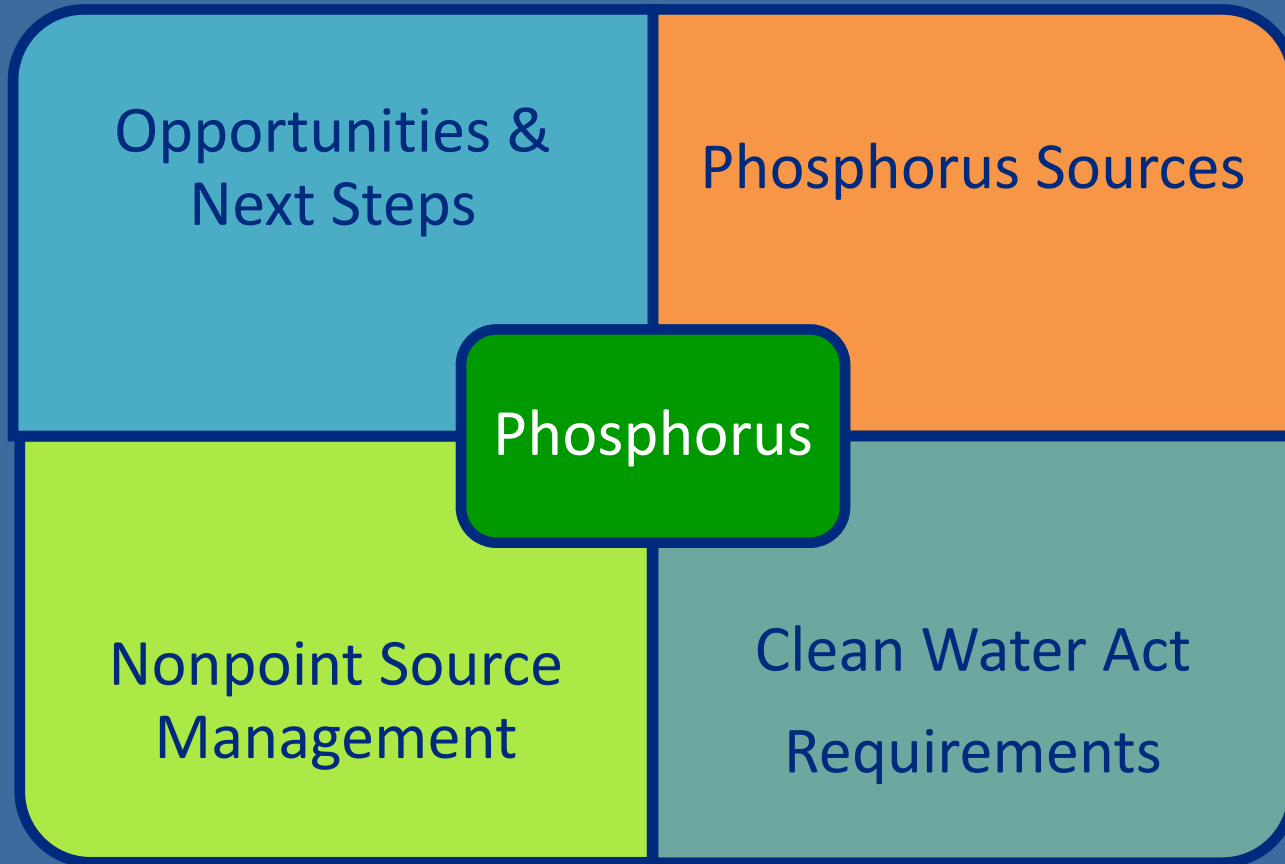
- Statewide response to NPS phosphorus
- Approaches for towns to comply with EPA standards, WWTP treatment & upgrade guidance
- Scientific methods to measure phosphorus in freshwaters

## 2. Phosphorus Limits in Lawn Fertilizer

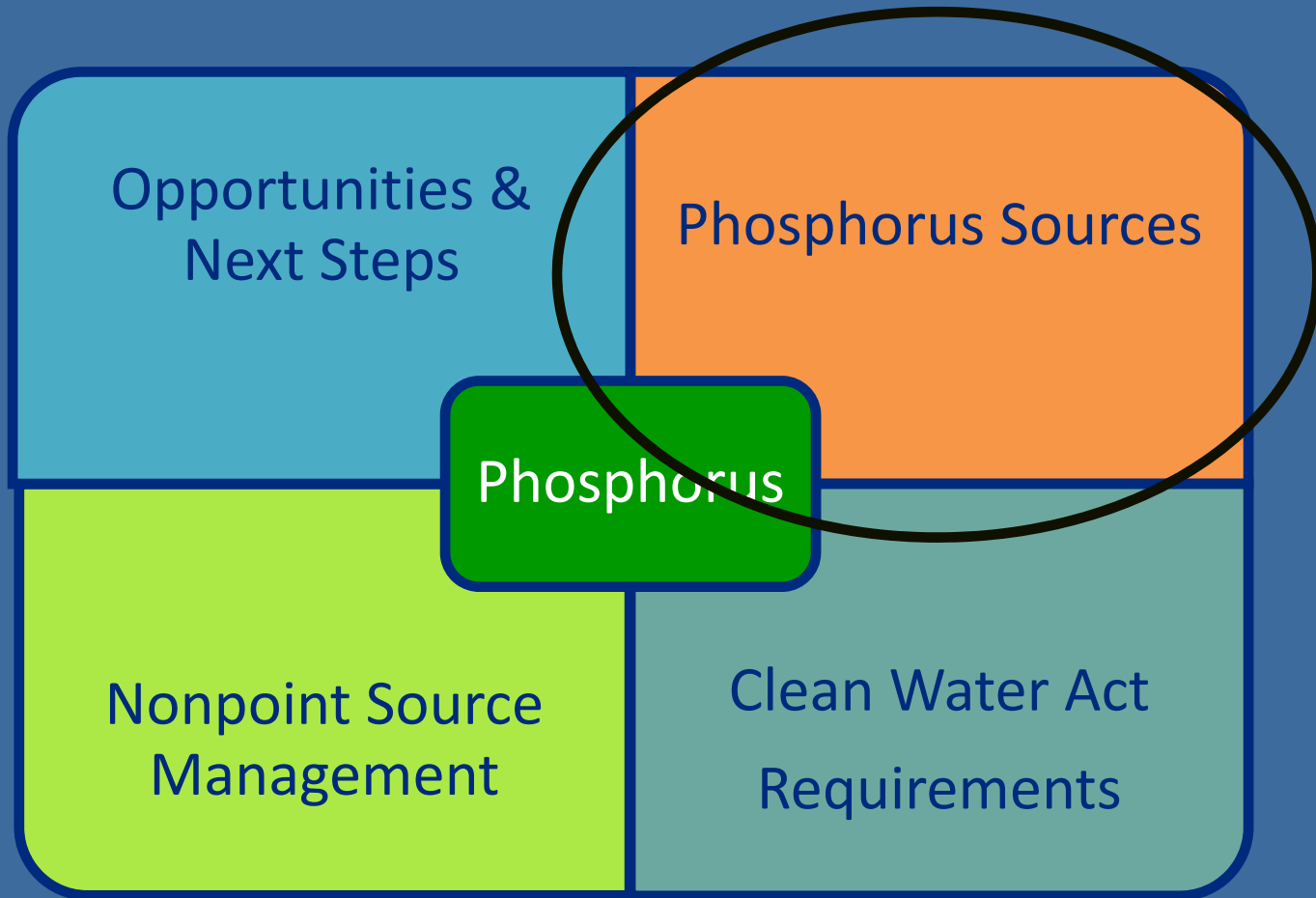
## 3. Clean Water Fund Eligibility for Phosphorus Treatment at WWTP



# Agenda



# Agenda



# Phosphorus

- Element essential for plant and animal life
- Used in fertilizer, detergents, food additives, pesticides, plasticizers, metallurgy, water softeners
- Ecological- excess amounts cause eutrophication in the freshwater



# Phosphorus the Pollutant

- **Nutrients are one of the leading causes of water quality impairment**
- **Phosphorus is naturally occurring however, excessive human inputs results in increased growth of algae (eutrophication) in freshwaters**
- **Excessive amounts of algae can:**
  - **decay and decompose, removing oxygen**
  - **impair or kill fish and other aquatic life**
  - **inhibit recreation**
  - **be harmful to human health**
  - **have economic impacts**

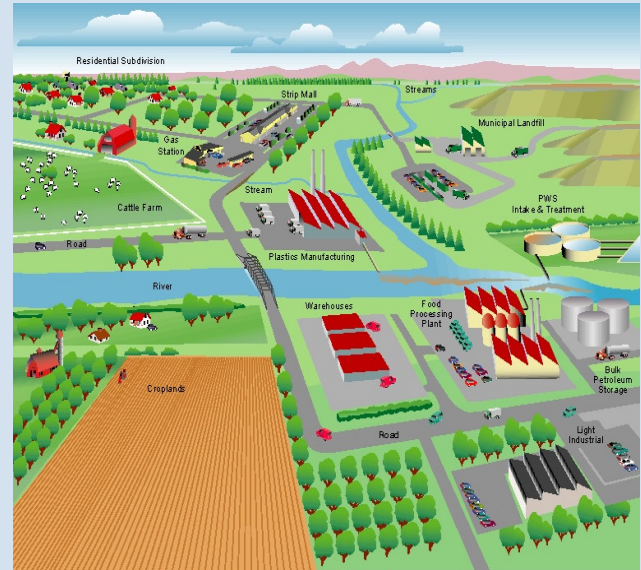


# Types of Sources

- Point Source



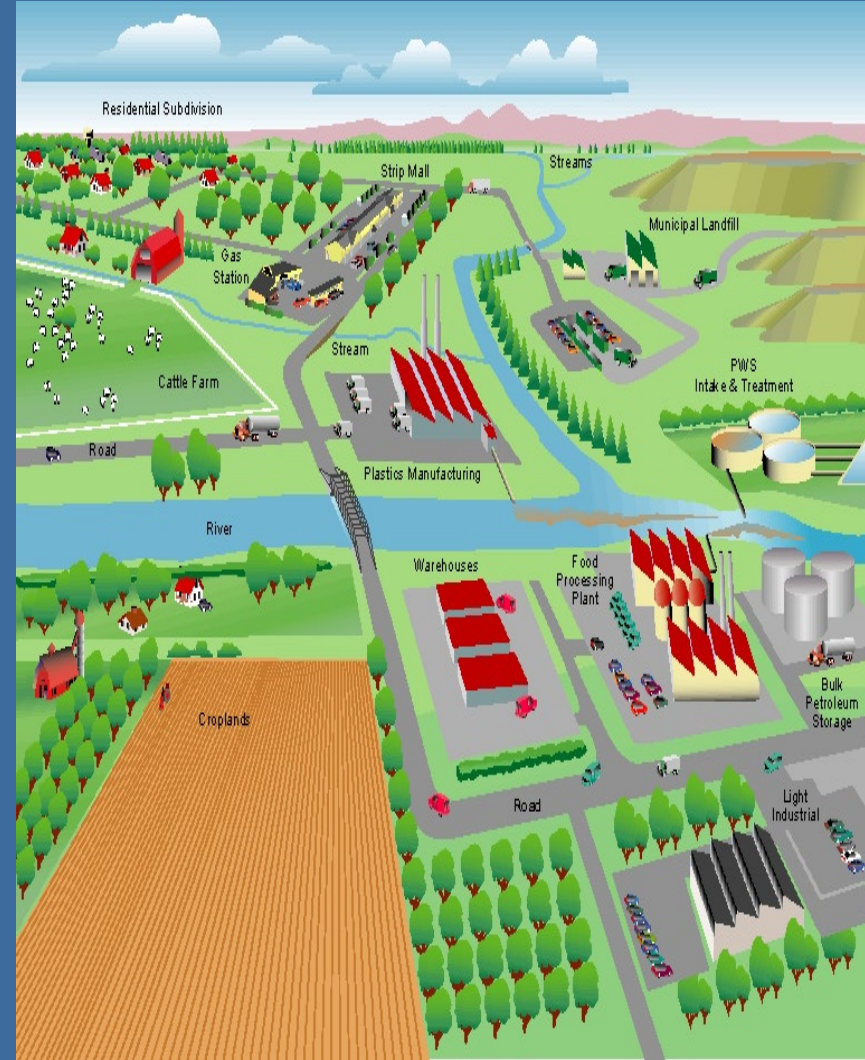
- Nonpoint Source

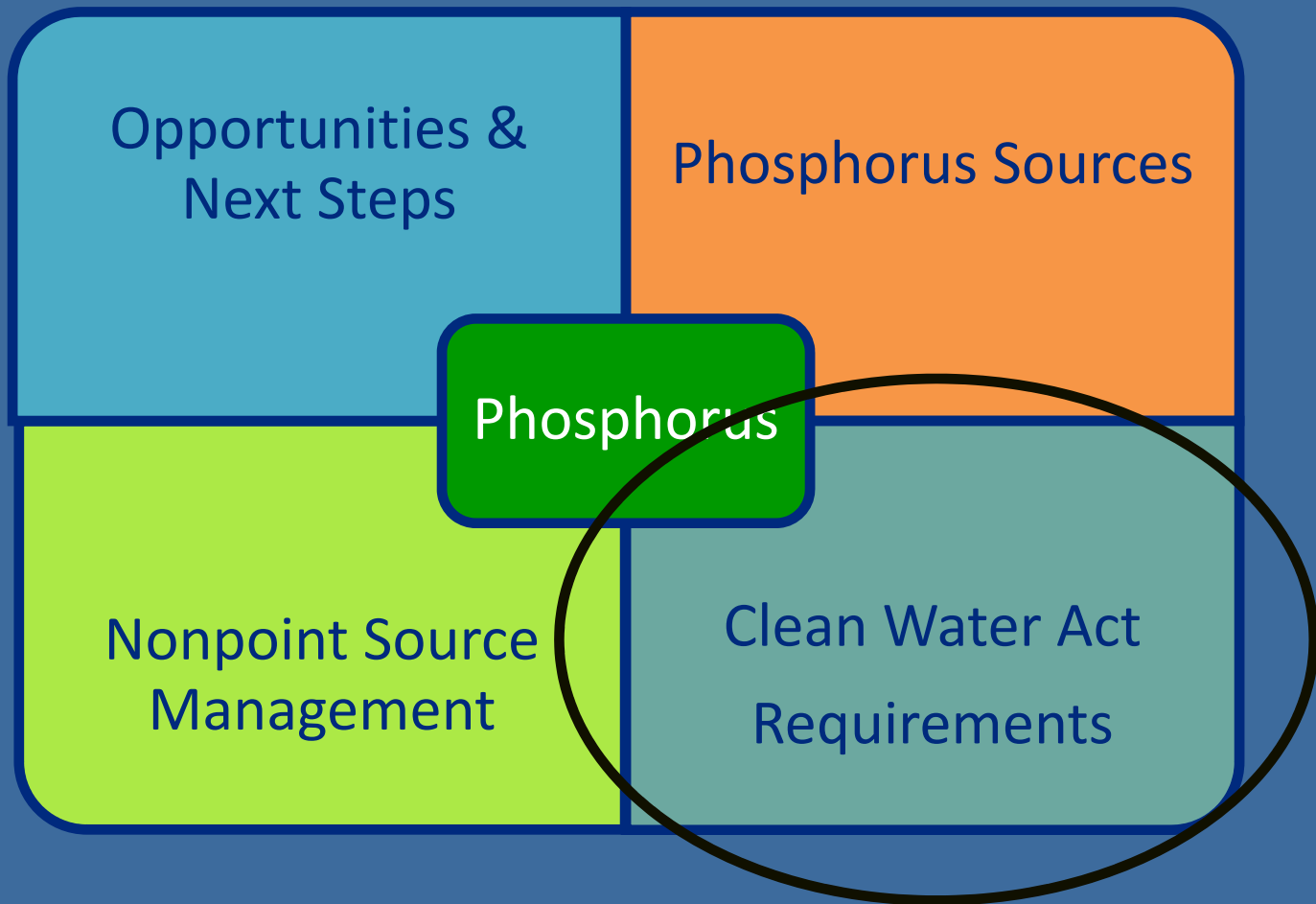




# Phosphorus- Nonpoint Sources

- Agriculture
  - manure, fertilizers, erosion
- Urban stormwater
  - developed landscapes, fertilizer, erosion
- Septic systems
  - malfunctions, failures
- At home
  - fertilizers, pet waste, detergents, yard waste





Opportunities &  
Next Steps

Phosphorus Sources

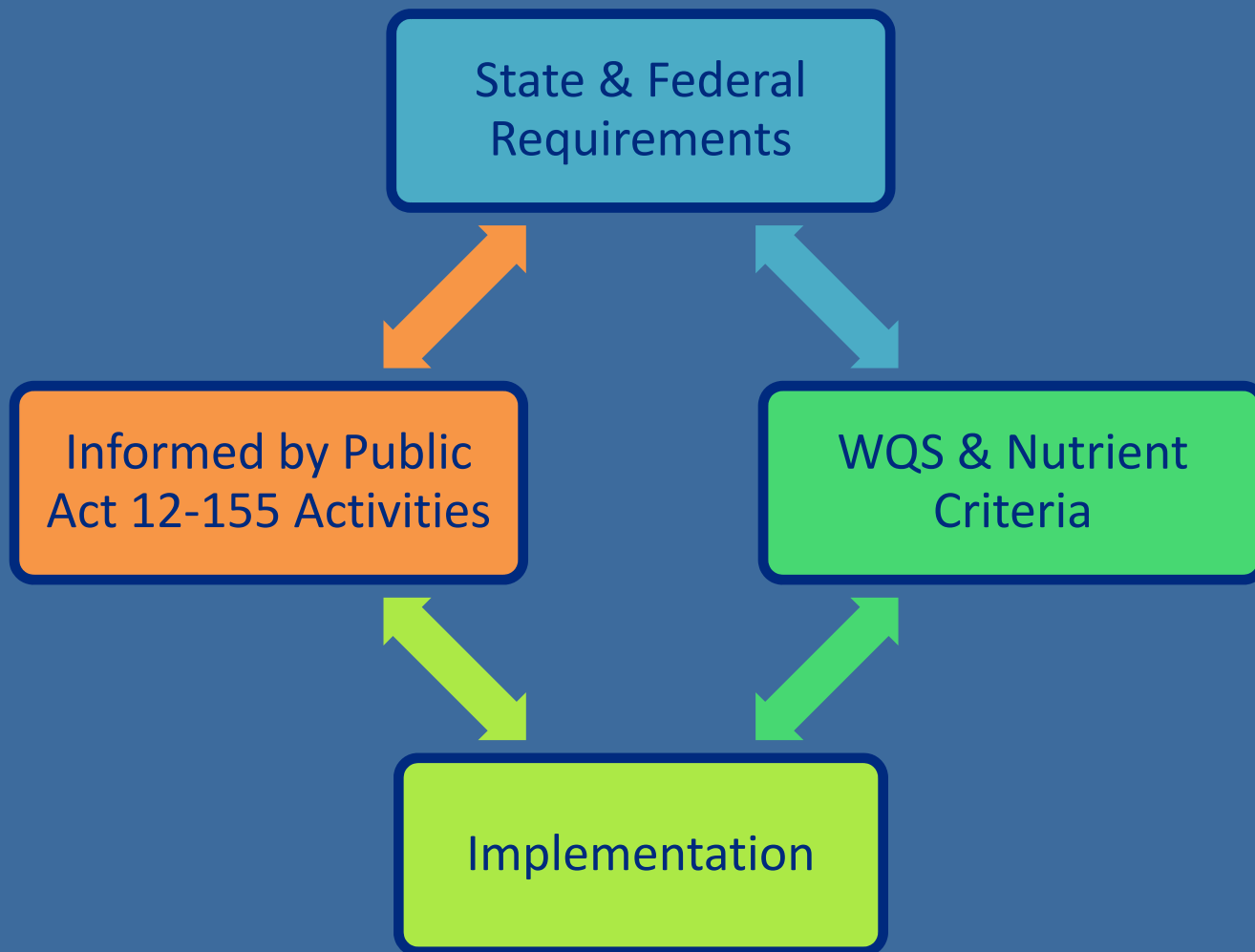
Phosphorus

Nonpoint Source  
Management

Clean Water Act  
Requirements



# CT Statewide Nutrient Strategy



# Federal and State Requirements

## State & Federal Requirements

Federal  
Clean  
Water  
Act

State  
Statutes

- Key Components
  - WQ Standards
  - Implementation Regs
- CT is delegated State
  - Fulfill Federal responsibilities
  - Provide for CT-specific approaches

Fishable &  
Swimmable  
Goals Met



# Water Quality Criteria

## WQS & Nutrient Criteria

### Existing

- Narrative criteria focused on anthropogenic sources and meeting water body uses

### On-Going

- Development of biologically based numeric criteria for phosphorus in freshwater streams

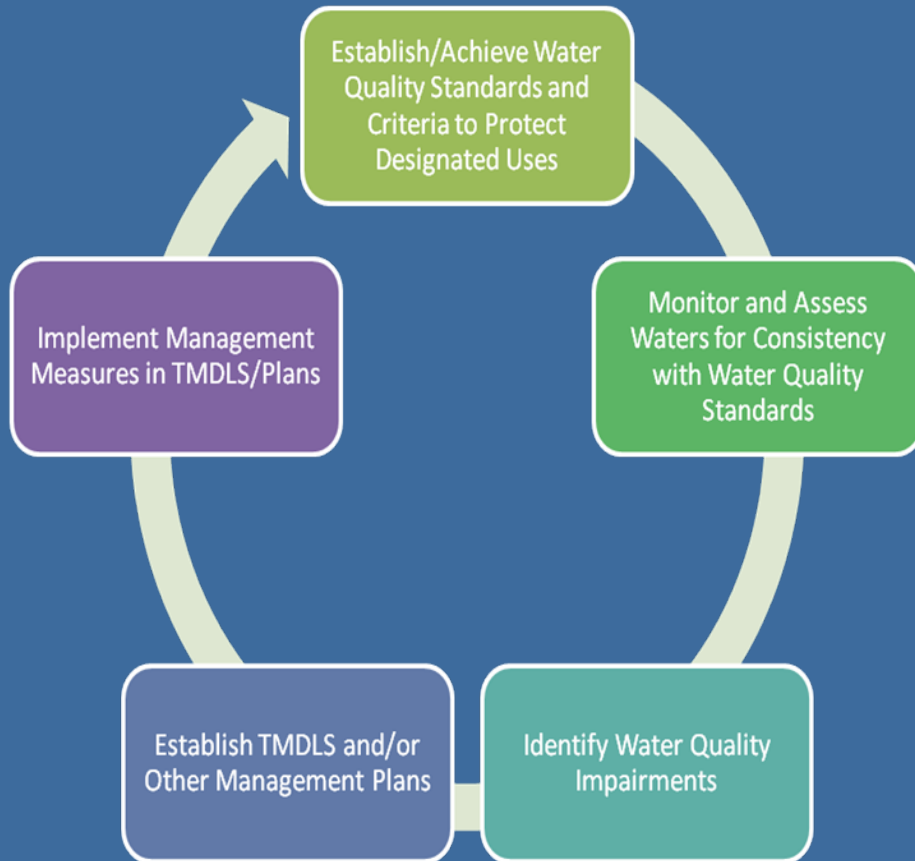
### Future

- Evaluate need for other types of nutrient criteria



# Water Quality Driven Activities

## Resource Based Activities



## Implementation Activities

Water Quality Based Point Source Permitting

Nonpoint Source Management



# EPA Recommendations



Prioritize Watersheds



Set Watershed Load Reduction Goals



Ensure Effective Point Source Controls



Partner with Agricultural Stakeholders



# EPA Recommendations



Address Storm Water and Septic Systems



Establish Accountability and Verification Procedures



Report on Implementation Activities and Load Reductions



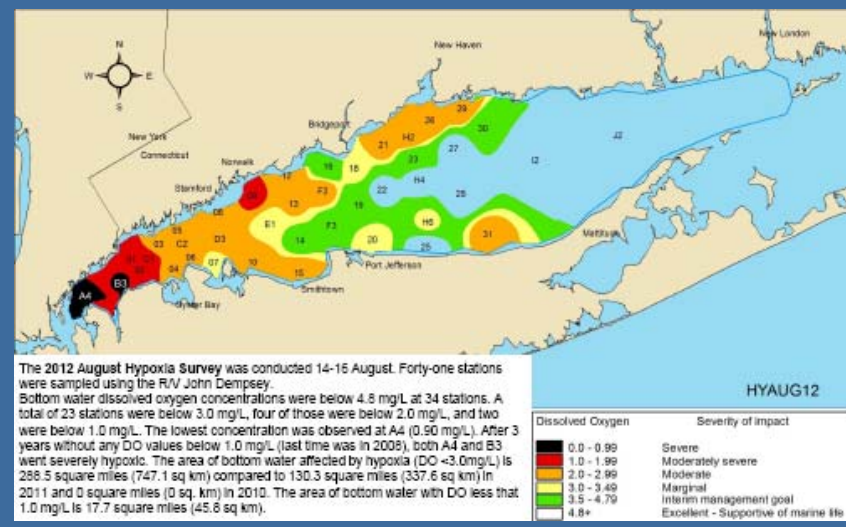
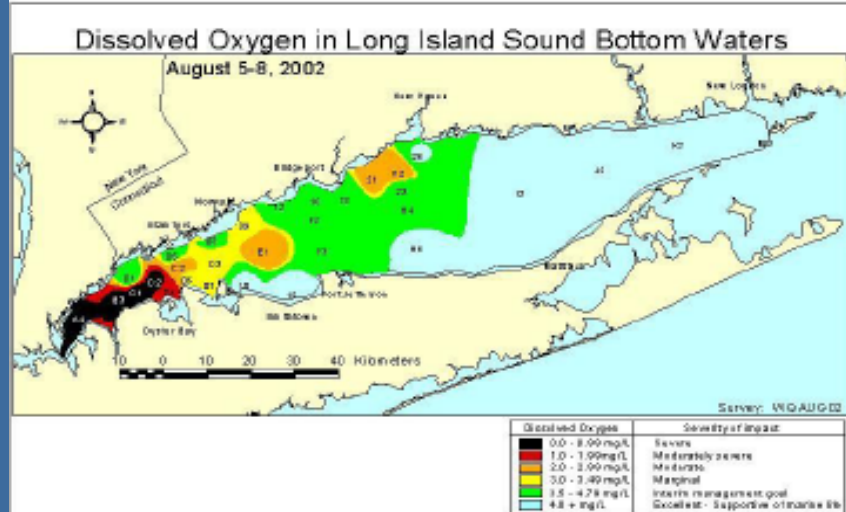
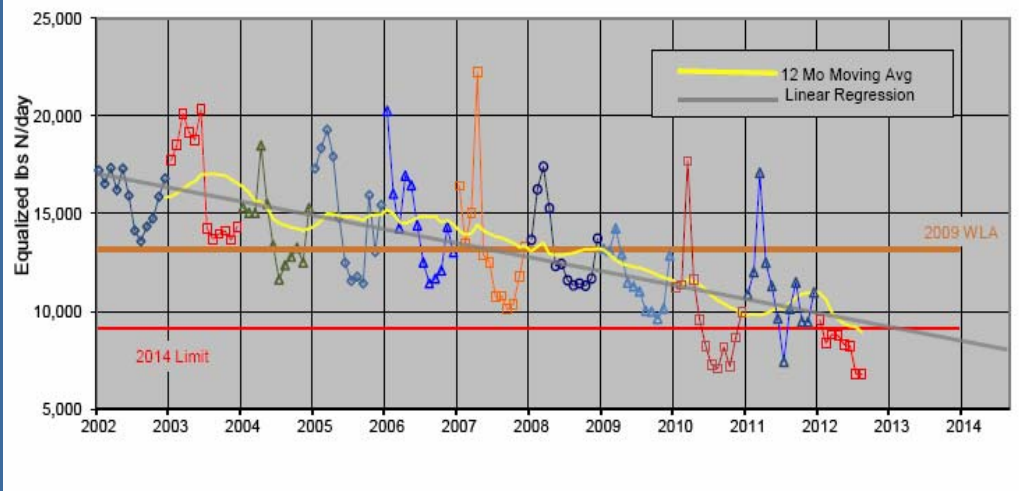
Develop work plan & schedule for criteria development





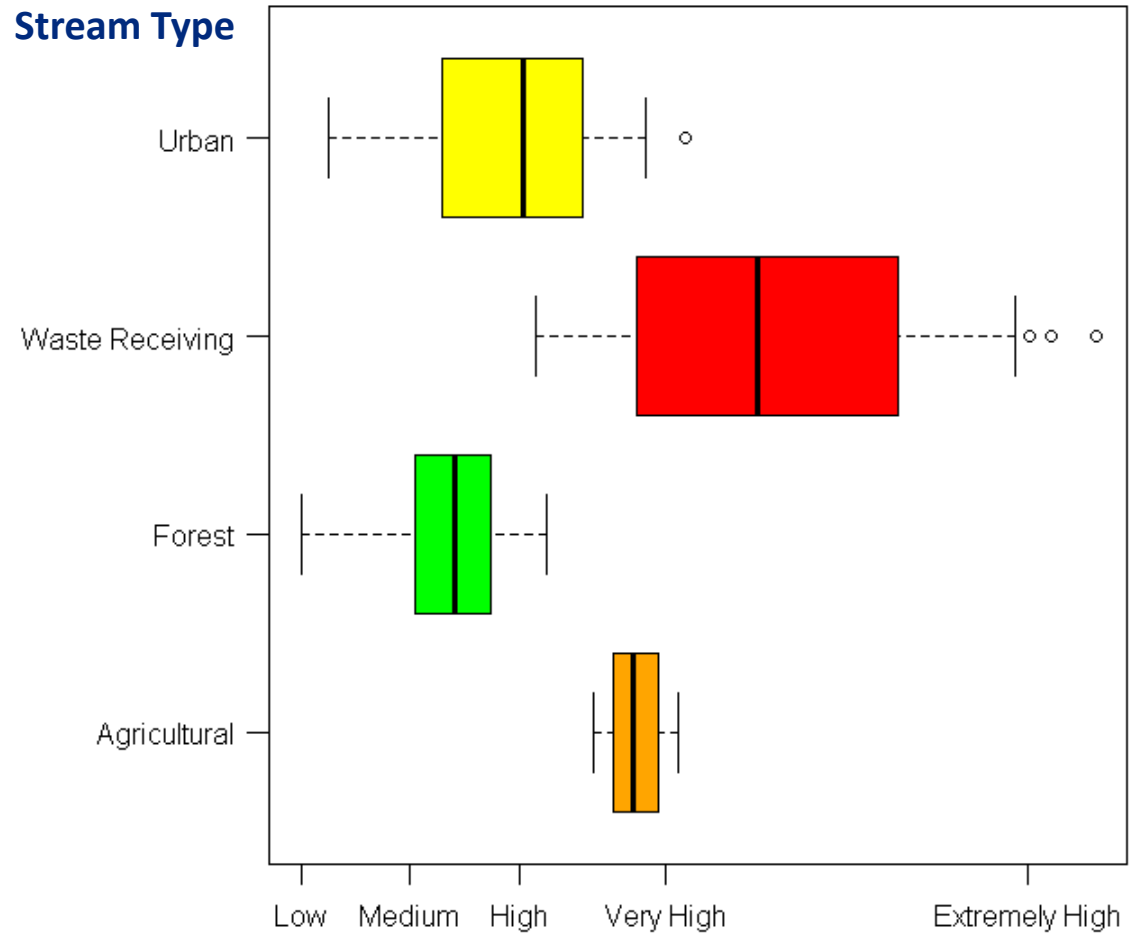
# Nutrient Management Success: LIS

Monthly Average Total Equalized Nitrogen Loading to Long Island Sound  
Projection to 2014



# Phosphorus is a Complex Pollutant

Unlike Toxic Pollutants, Phosphorus Levels Vary Naturally In Streams

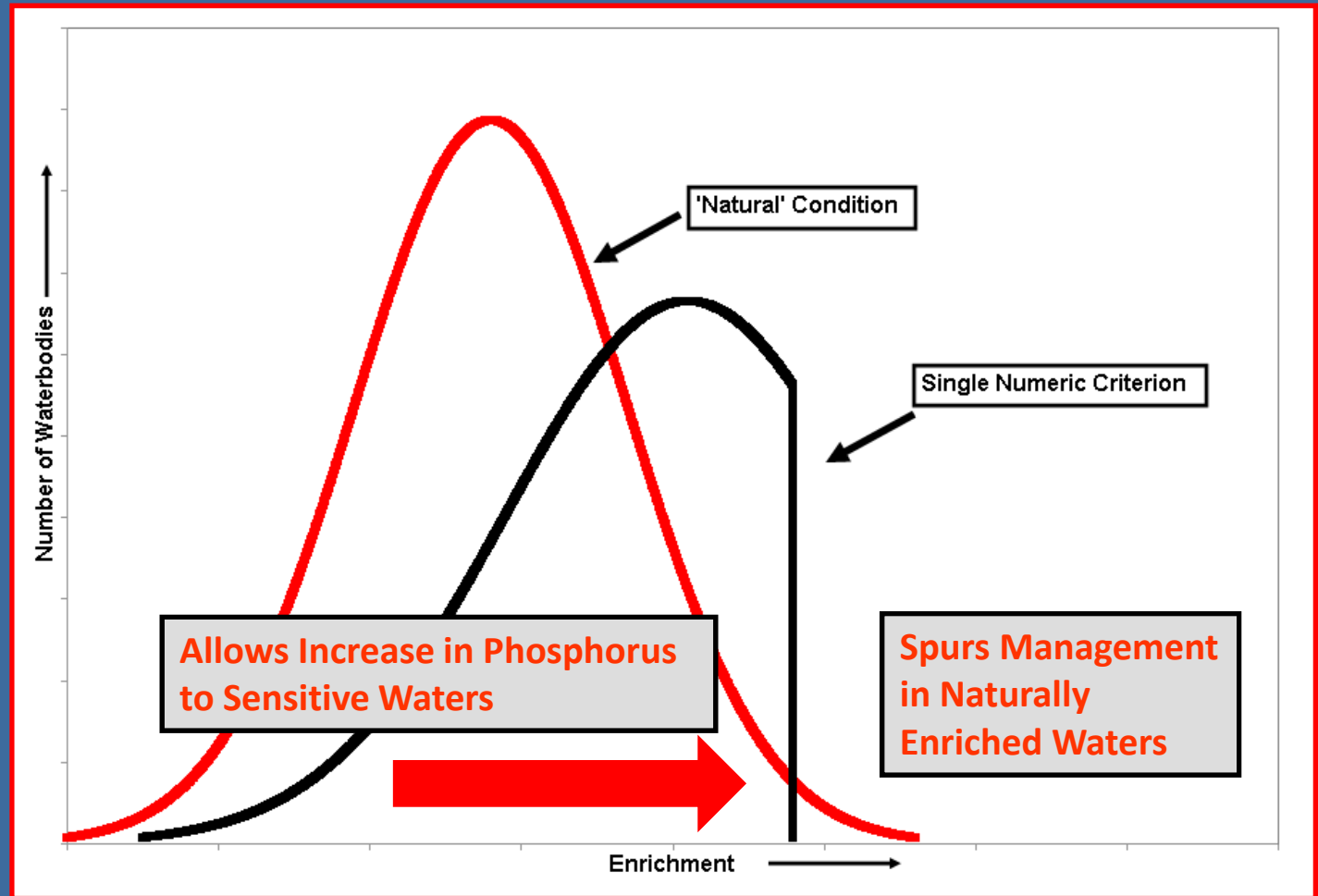


**Phosphorus Levels in CT Non-Tidal Freshwater Streams**



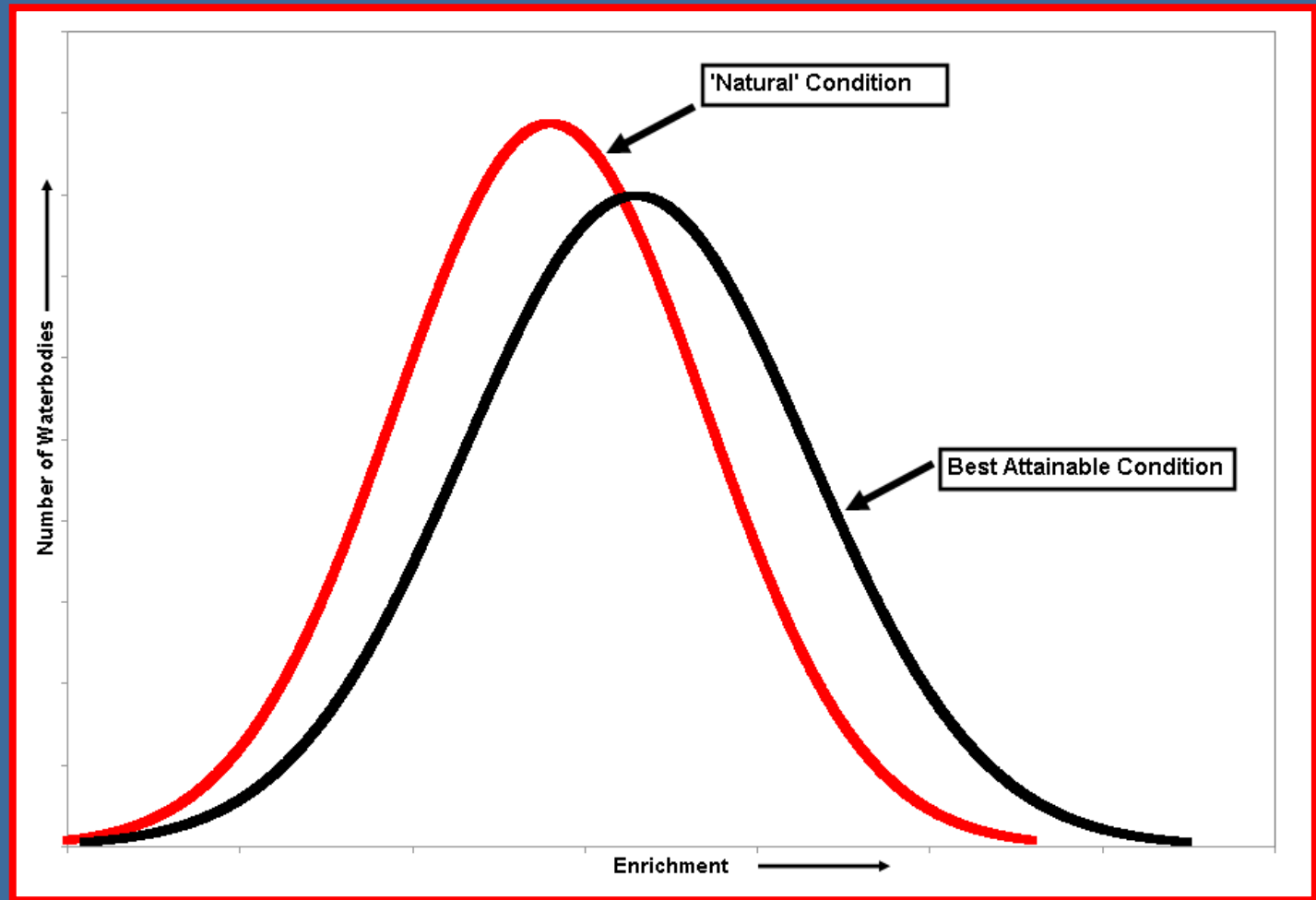
# Phosphorus is a Complex Pollutant

Application of a threshold concentration like toxic pollutants could create a truncated distribution

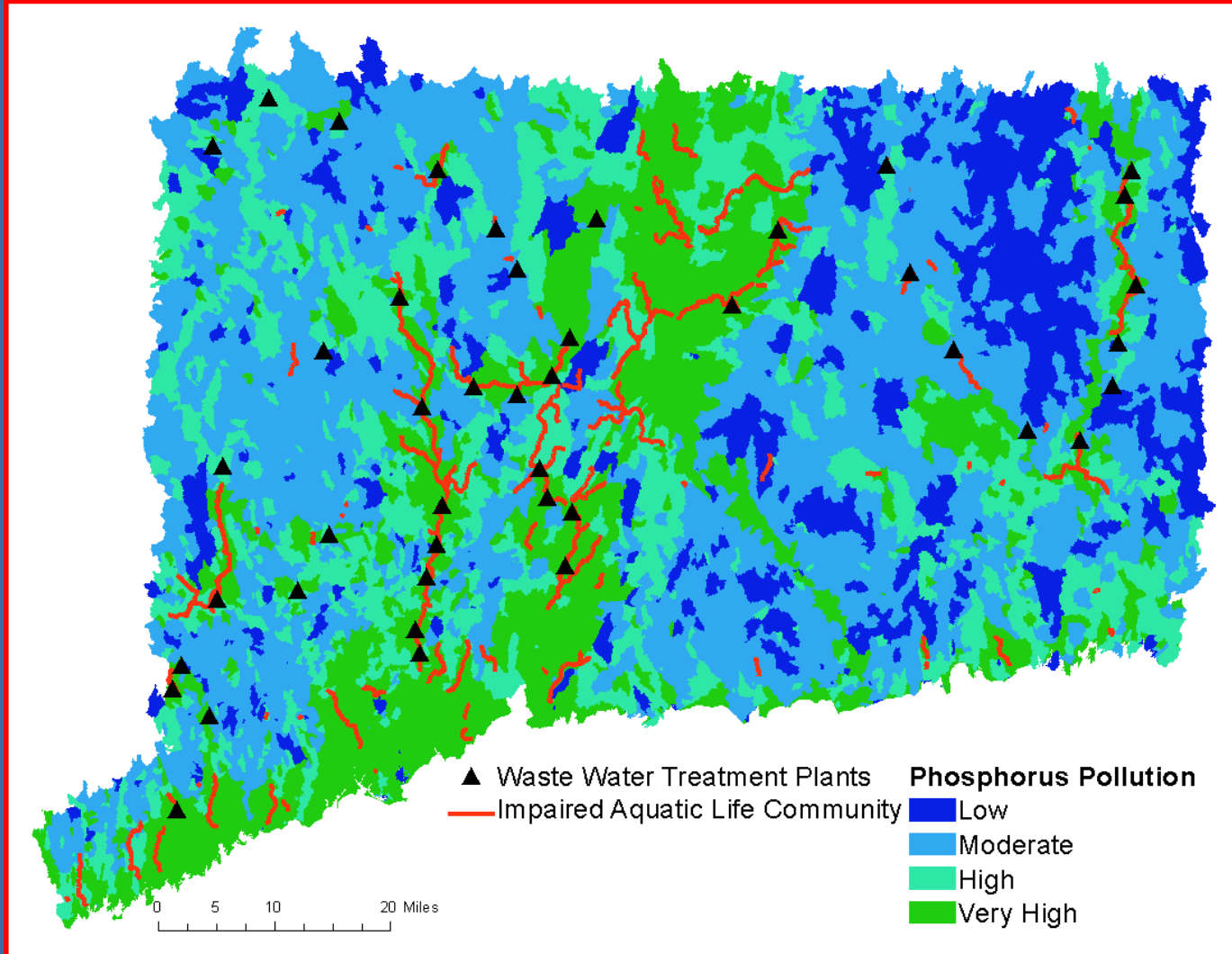


# Phosphorus is a Complex Pollutant

Management Goal in CT is to maintain varying enrichment conditions



# Current Management Efforts in Non-Tidal Waste Receiving Streams



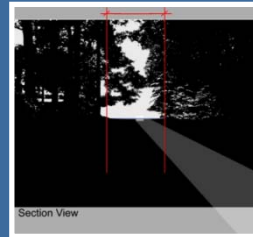
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# Studying the Effects of Phosphorus on Aquatic Life



## Human Sources

NPDES Discharges, Urban and Agricultural Runoff



## Habitat Conditions

Canopy Cover, Flow, Temperature, Natural Nutrient Loading



## Algal Response

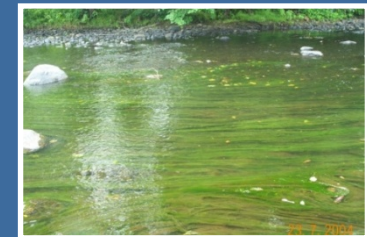
Increases and Changes in Algal Communities

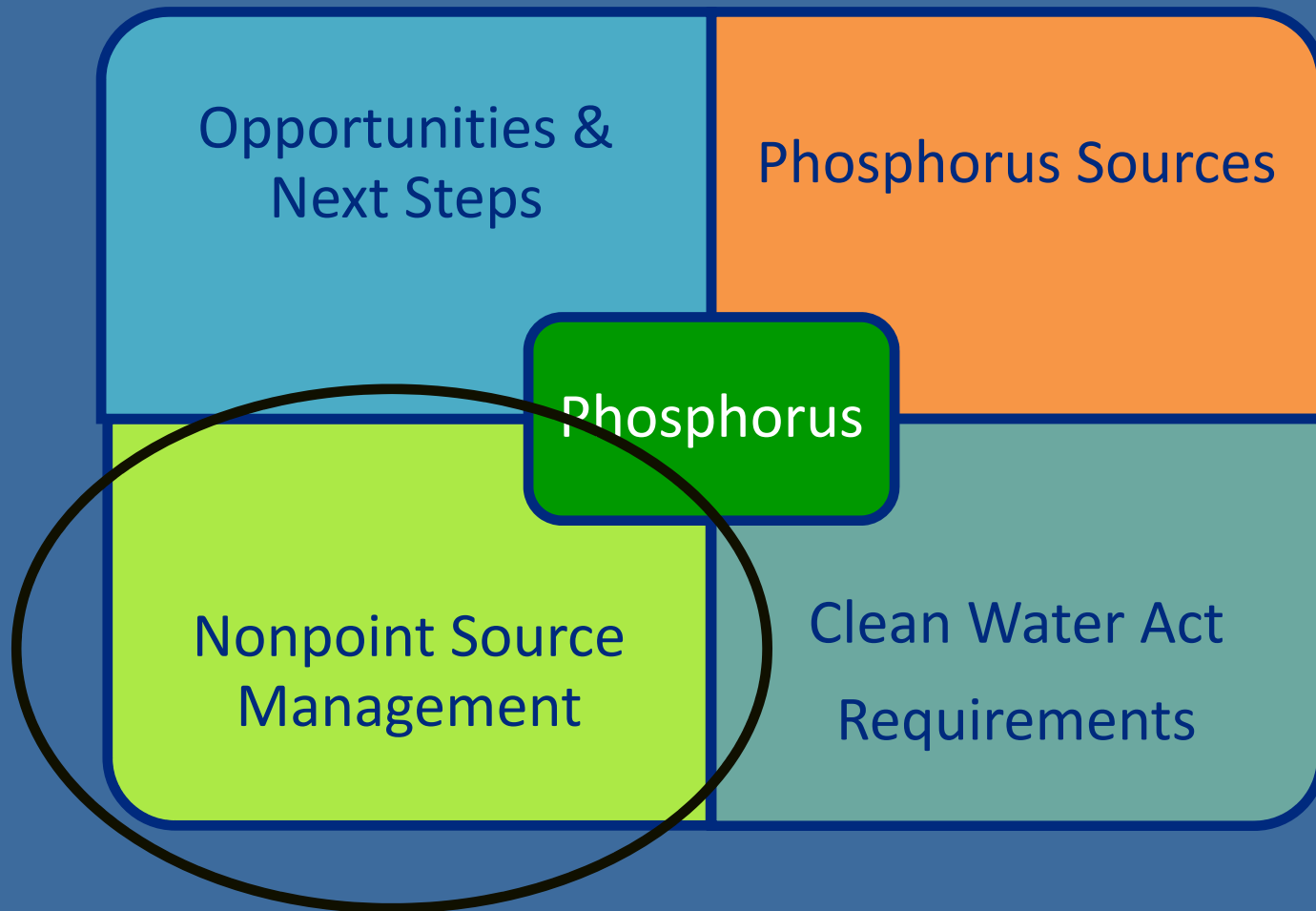
Changes in Habitat Structure and Water Chemistry

## Physical / Chemical Changes

Changes in Fish and Other Aquatic Life Communities or Fish Kills

## Aquatic Life Response





# NPS Management





# Pollution Prevention/Source Controls

Pollution  
Prevention

- Phosphorus free laundry detergent (1972)
- Phosphorus fertilizer restrictions
- Regional Fertilizer Initiative
- Organic lawn care
- Landscape stewardship
- Central theme in both regulatory and non regulatory

NPS management



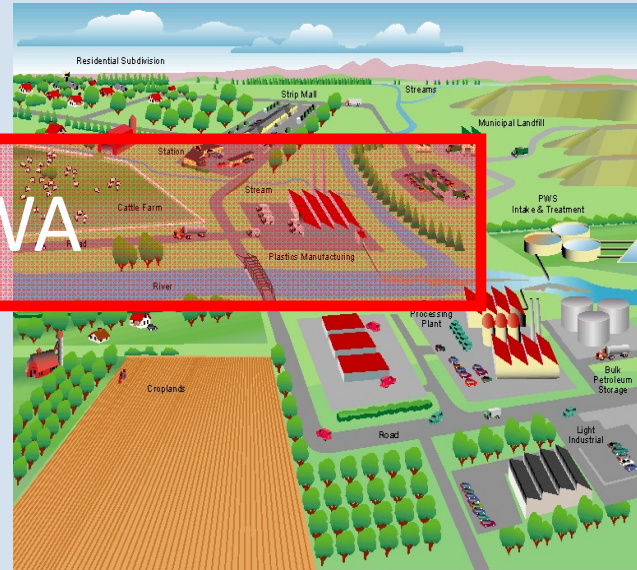
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# NPS Management Transition

- Point Source



- Non Point Source



# Urban Stormwater Management

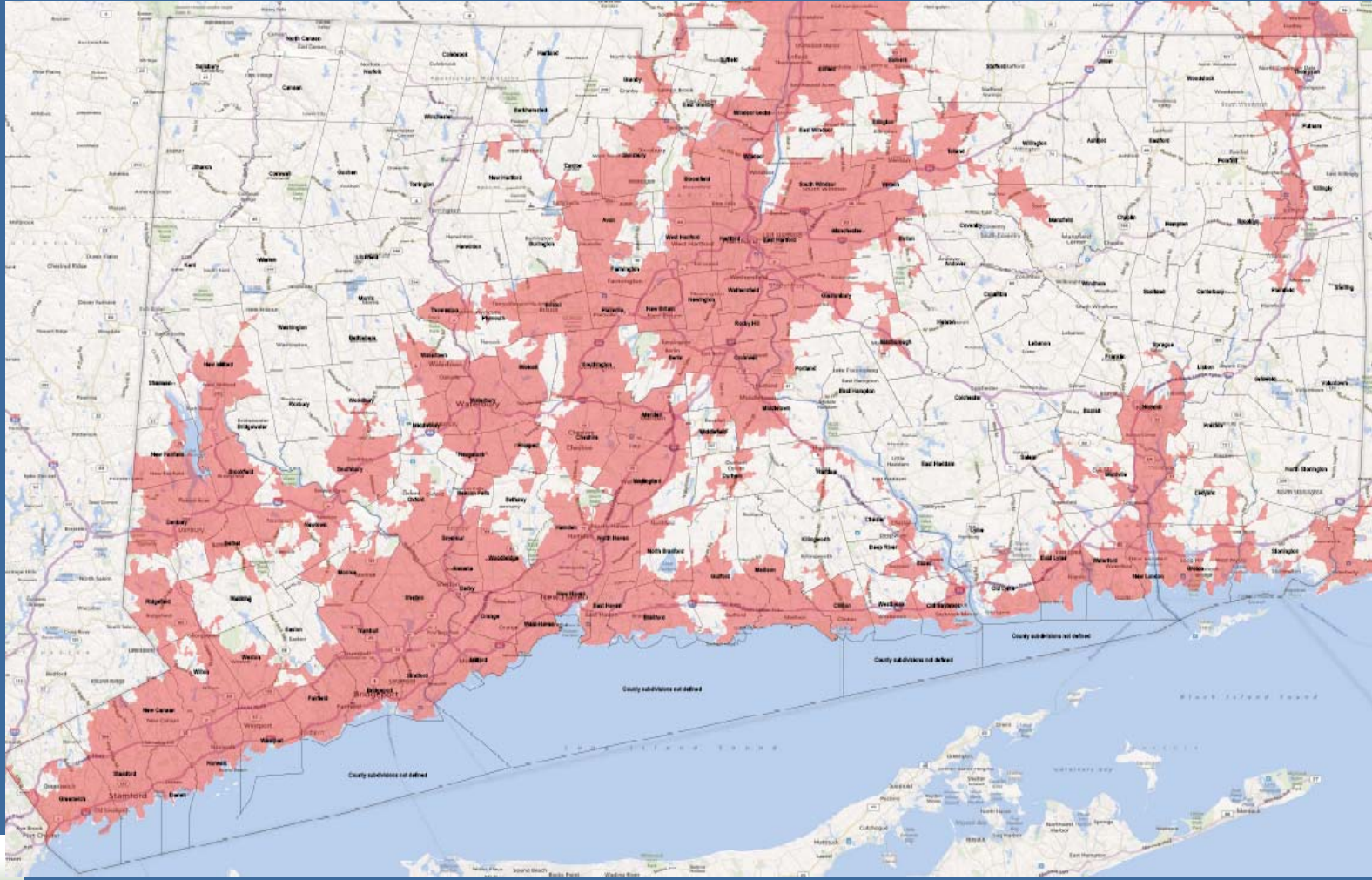
- DEEP Regulated Stormwater (permits)
  - MS4 urban areas – 113 towns
  - Industrial – 1650 facilities
  - Commercial – 240 sites
  - Construction – 450 sites
- Planned Enhancements
  - Construction performance standards
  - LID/Runoff Reduction
  - Impaired waters, TMDLs
  - Stormwater utility incentives

Regulated  
Stormwater  
(Permits)



# MS4 Program

## Urbanized Areas in Connecticut



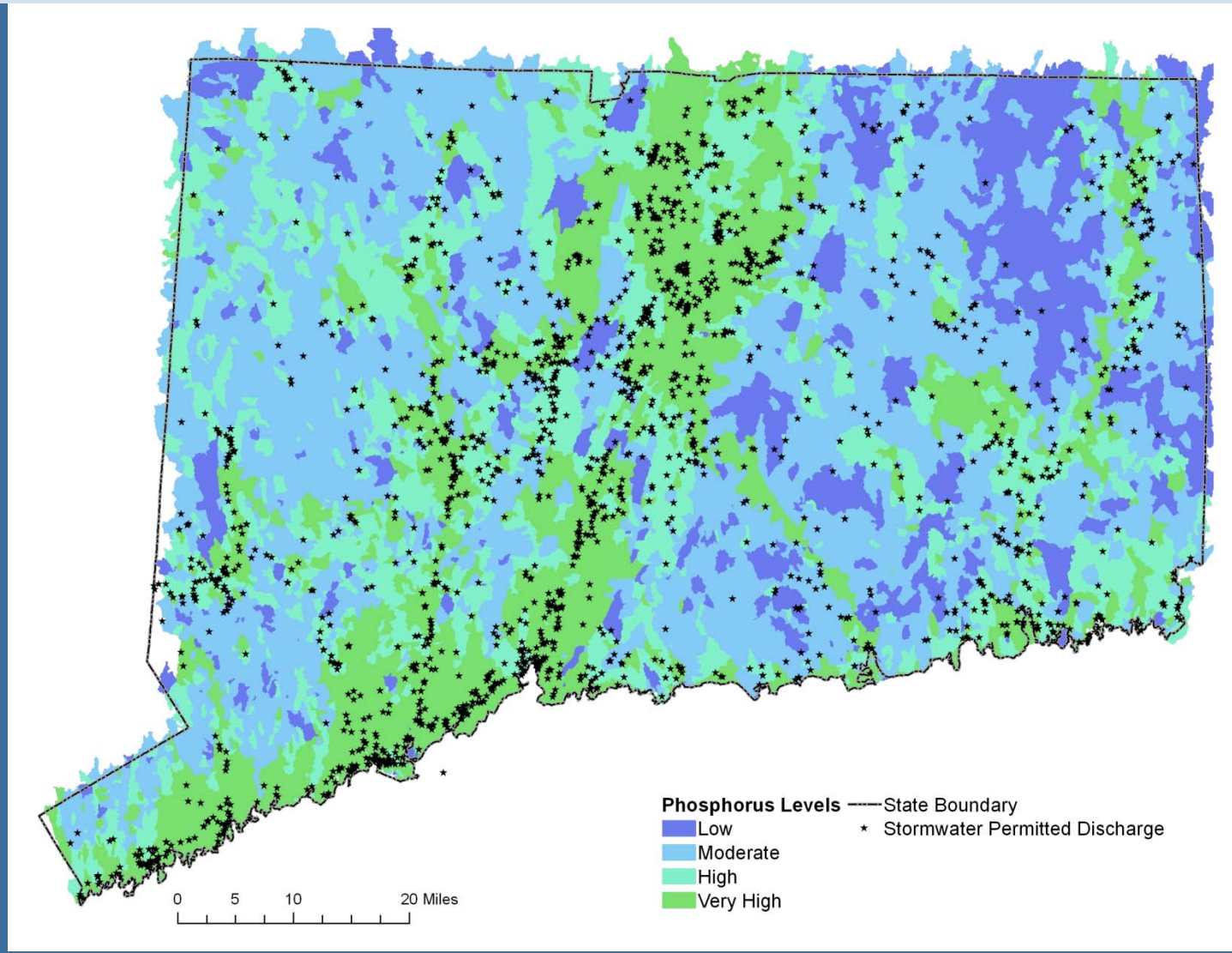
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# MS4 Program

- Stormwater Management Plans
- 6 Minimum Control Measures
  - Public Education & Outreach
  - Public Participation
  - Illicit Discharge Detection & Elimination (IDDE)
  - Construction Stormwater Management
  - Post-Construction Stormwater Management
  - Pollution Prevention & Good Housekeeping

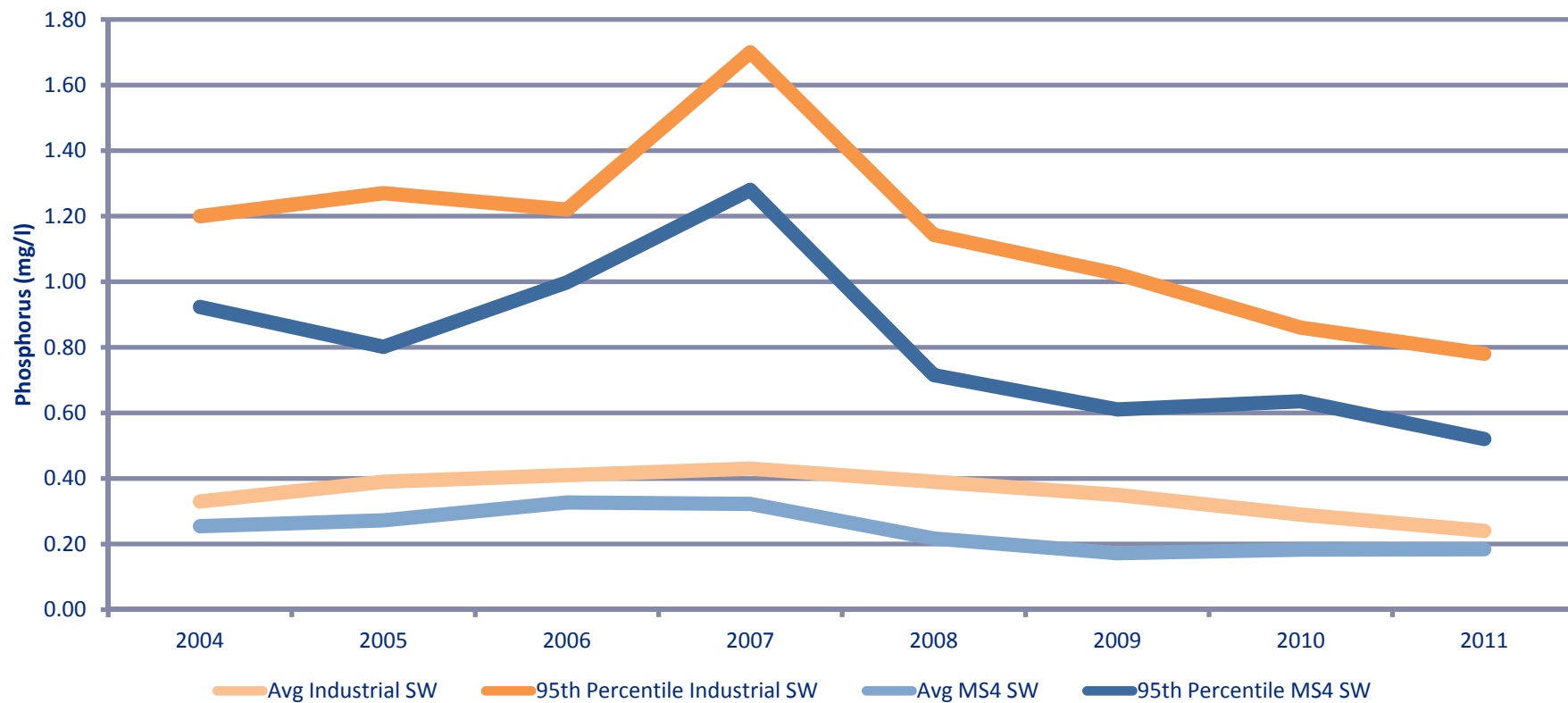


# Stormwater Permits in CT

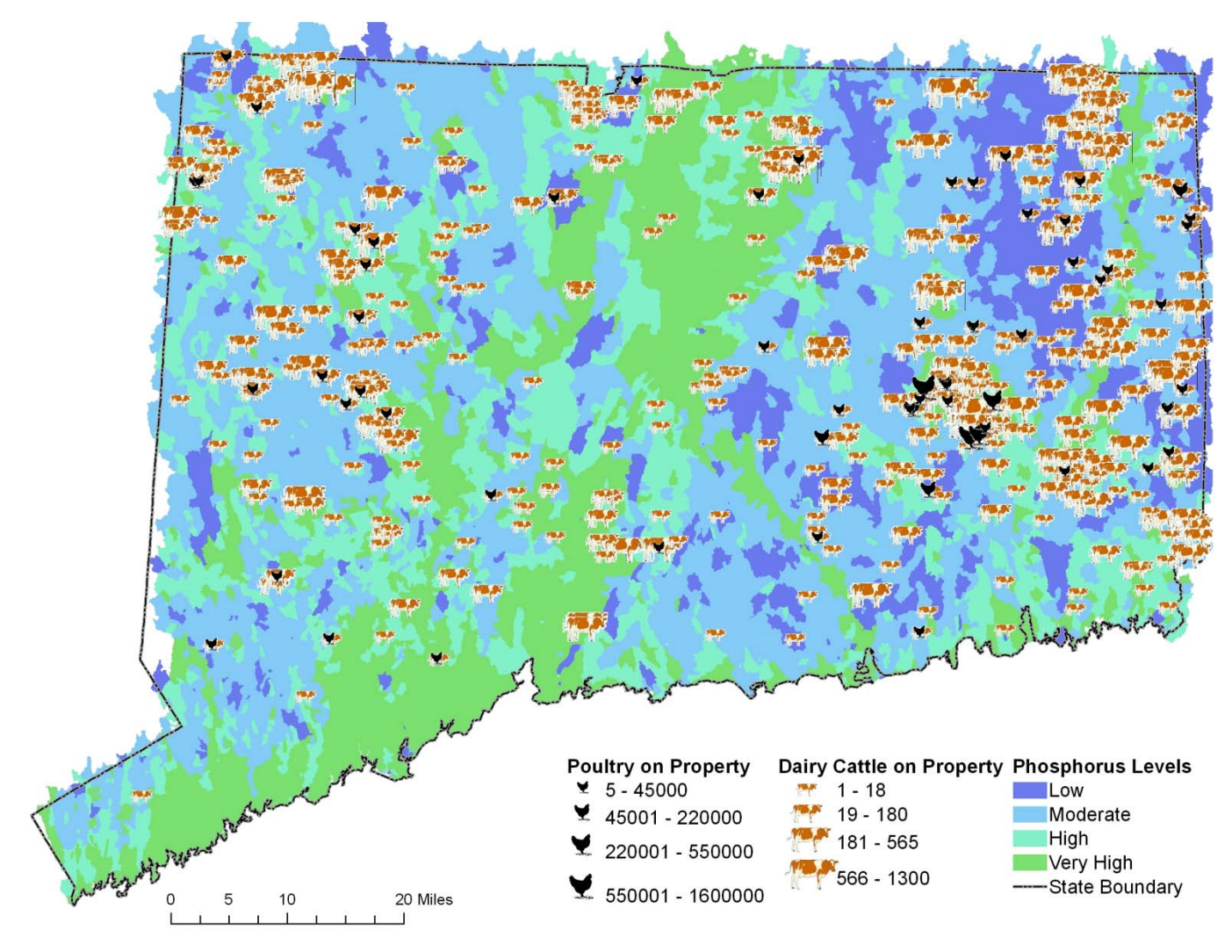


# Phosphorus Trends in Stormwater

## Total Phosphorus Concentrations Statewide Industrial & MS4 Stormwater



# Dairy and Poultry Agriculture in CT





# Dairy Agricultural Management

Agricultural  
Management

- Comprehensive Nutrient Management Plans (CNMP)
  - animal waste & nutrients
- Technical Assistance
  - State and federal partnerships
    - NRCS, CES, DOA
  - Agriculture BMPs
  - Soil Erosion Control technology
- Concentrated Animal Feeding Operations (CAFOs) General Permit (under development)



# CAFO General Permit



- Concentrated Animal Feeding Operations
  - Regulated thresholds depend on:
    - number and types of animals
    - have a discharge.
- Numbers in CT
  - Large: 5 dairy, 5 poultry
  - Medium: ~30+ dairy
  - Small: others if direct discharge to stream
- CNMPs Required

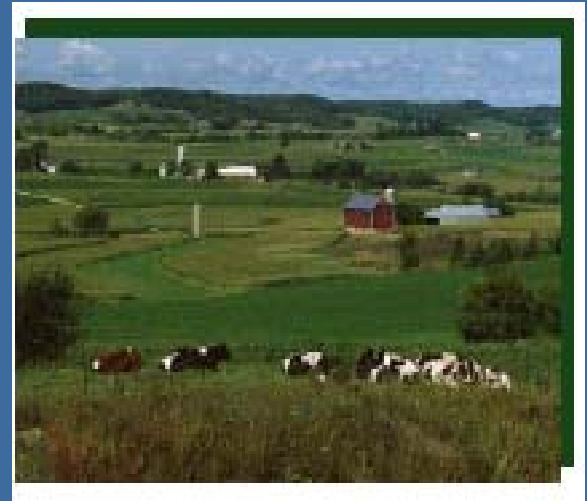
# CNMPS

- Waste & Nutrient Management Addressing:
  - Adequate storage of manure and wastewaters
  - Clean water diverted from production areas
  - Land application of manure and wastewaters
  - Management of dead animals
  - Record keeping to document implementation



# Agricultural BMPs

- Livestock Exclusion Fencing
- Manure Collection & Storage
- Nutrient Management
  - remove, reuse, land application
- Cover Crops
- Vegetated Buffers, Filter Strips
- Covered Heavy Use Areas
- Diverting Clean Water



# Agricultural Waste Alternative Technology



- Volume Reduction
  - Solids removal
- Value Added Products
  - Compost
  - Mulch
  - Planting pots
- Energy
  - Methane digesters

# Onsite Sewage Systems

Onsite  
sewage

- 40 % of population
- Shared regulation- local & state
- Phosphorus is not an issue if systems are properly designed, installed, operated, and maintained.
- Structural measures to address failures
  - On-site renovation, community systems, public sewers
- Management measures to minimize failure potential
  - local health dept training & staffing
  - land use planning
  - education of homeowners, system maintenance



# Statewide NPS Program

- Strategic statewide NPS plan
- Prioritized NPS funding and initiatives
- Regionalized NPS Watershed Management
- Coordinated agency NPS implementation

CT NPS  
Program  
Elements



# DEEP - NPS Initiatives

Urban NPS	Stormwater Permits (MS4, Commercial, Industrial, Construction)	Stormwater Guidance and LID Appendices	Urban Watershed Based Plans & Implementation
Agriculture NPS	CAFO Permits including farm management	Comprehensive Nutrient Management Plans	Ag. Watershed Based Plans & Implementation
Technical Assistance	SW/6 Minimum measures	UConn campus mgmt, NRCS Farm practice installation	EPA, DEEP, CEPA, NEMO, DECD, DPH, DOT, towns

- Regulated
- Coordinated
- Non Regulated



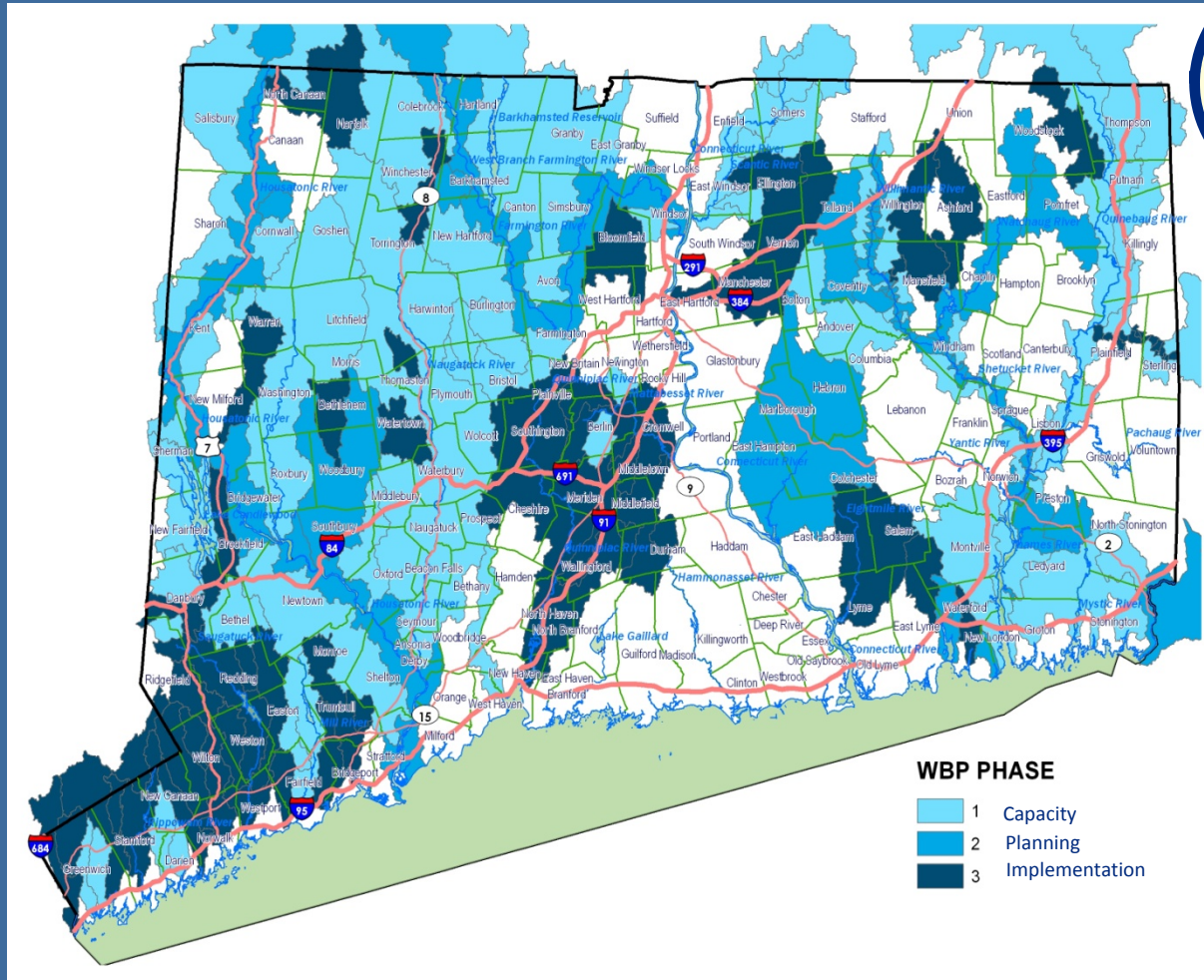


# NPS Program – Statewide Plan

2013

-Update  
Statewide  
Nonpoint  
Source (NPS)  
Management  
Program Plan  
-CWA NPS  
funding  
-Interested  
partners  
invited

CT NPS  
Program  
Elements



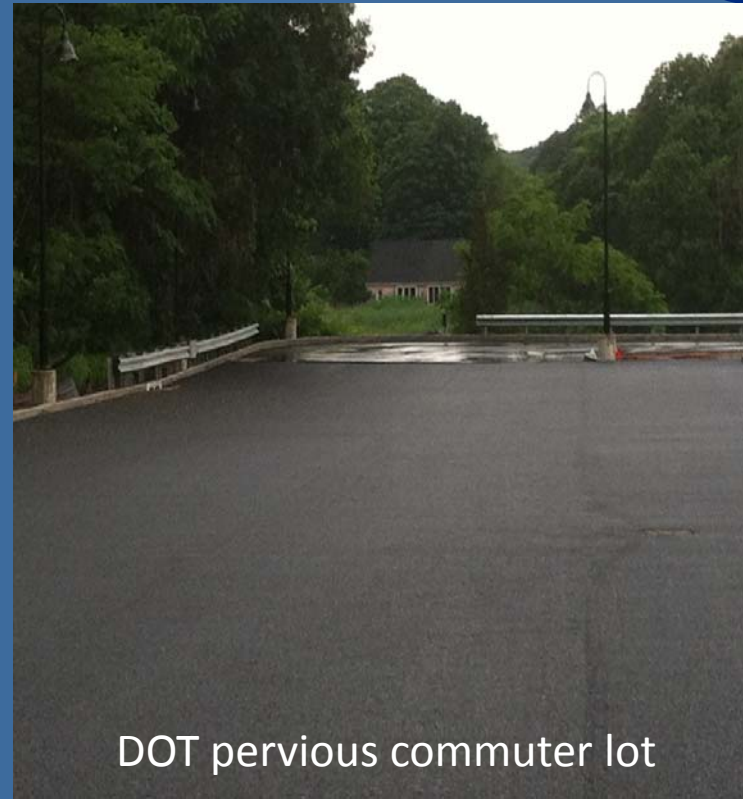
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# NPS Program - Statewide Partners

Monitor, implement and assess NPS projects

Pollution  
Prevention  
/Outreach

- EPA
- DOT
- Conservation Districts
- DPH
- Dept. of Agriculture
- USDA/NRCS
- USGS
- NEMO
- COGs & Municipalities



DOT pervious commuter lot



# NPS – Statewide Assistance

Municipal  
Tech Assist

- Land Use Planning
- Watershed Management
- Stormwater Management
- Landscape Stewardship



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# NPS Program – Prioritized Funding



- Federal and State funding
  - Clean Water Act - NPS implementation
  - Clean Water Act - NPS water quality/planning
  - Long Island Sound Study – planning and implementation
  - NRCS agriculture technical assistance and cost share programs
  - EPA National Urban Waters grants and assistance



# Statewide NPS Outreach

## NPS & Conservation District Technical Assistance



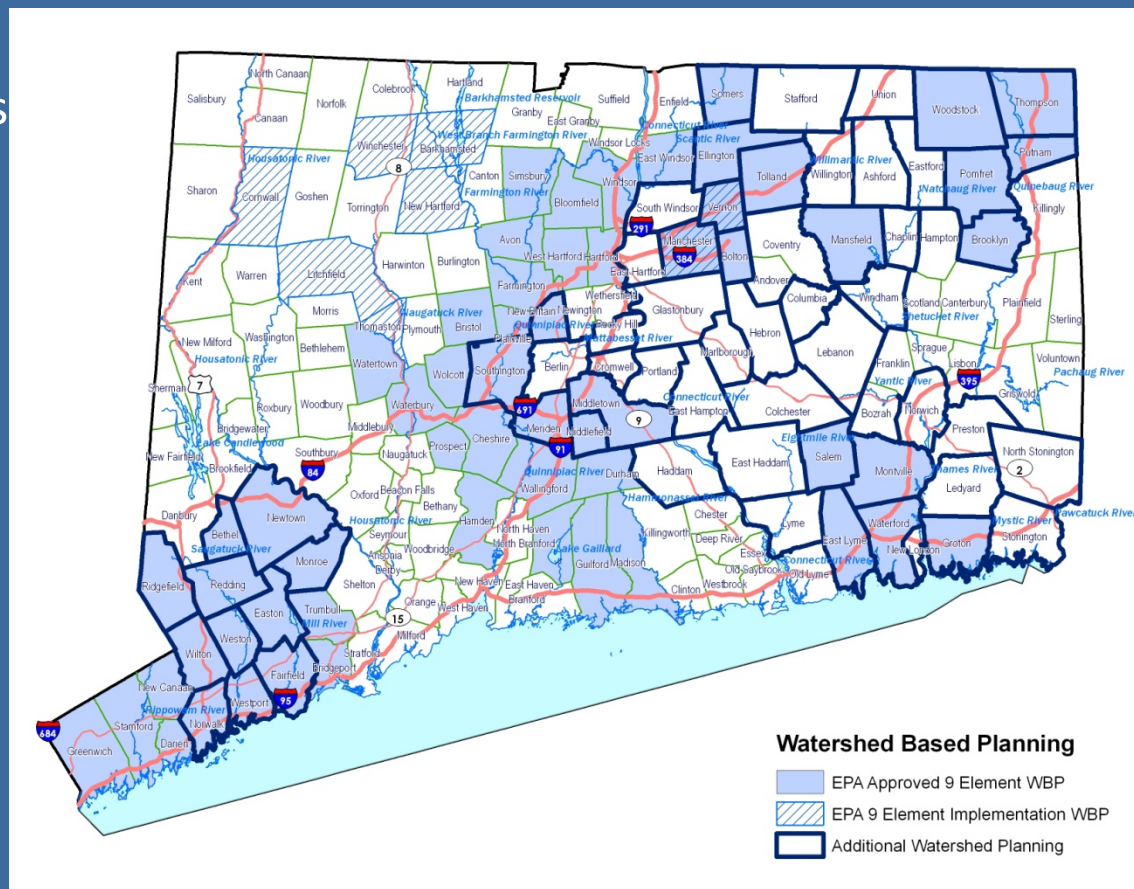
- Professional Technical Assistance
- Homeowner Technical Assistance
- Municipal Technical Assistance



# NPS Program – Regional Approach

- Watershed Based Planning in CT
  - Watershed Based Plans targeting impaired waters
  - Healthy Watershed planning and protection EPA initiative

Targeted Watershed Management Plans



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# Examples of Success



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# NPS Agricultural Watershed Success

Agricultural  
Management



## Statewide Partners

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# NPS Agricultural Watershed Success

- Equipment installations
  - Centrifuge and composting system installation
- Stormwater management
  - Gutter diversion system, heavy use area planning strategy
- Product development
  - Cowpots, fertilizer
- Sustainable agriculture
  - Farm assessment and agricultural planning



# NPS Agricultural Watershed Success

Agricultural  
Management



Fairfield County Hunt Club, Westport

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# NPS Agricultural Watershed Success



Agricultural  
Management

South Kent School, Kent



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# NPS Agricultural Watershed Success

Agricultural  
Management



Elm Farm, Woodstock (Peckham family)



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# NPS Agricultural Watershed Success

Agricultural  
Management



Valleyside Farm, Woodstock (Young Family)

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# NPS Urban Watershed Success



Targeted  
Watershed  
Management  
Plans

Non  
Regulated  
Stormwater

5 Mile River WBP  
Norwalk  
Darien  
Westport



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# NPS Urban Watershed Success -LID

Rain gardens

Engineered swales

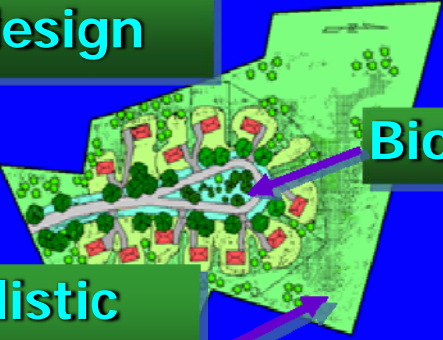
Targeted Watershed Management Plans

Non Regulated Stormwater



Pervious roadway

Cluster design



Bioretention

Naturalistic landscaping



"buffer" zone

Pervious driveways



# NPS Urban Watershed Success



## Little River Watershed Based Plan

Targeted  
Watershed  
Management  
Plans

Non  
Regulated  
Stormwater





# NPS Urban Watershed Success

## North Branch Park River Watershed Based Plan

Targeted  
Watershed  
Management  
Plans

Non  
Regulated  
Stormwater



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# NPS Urban Watershed Success



Targeted  
Watershed  
Management  
Plans

Non  
Regulated  
Stormwater

- North Central Conservation District Implementation Watershed Based Plan



# Managing Surplus Manure in Blackberry River Watershed Canaan Valley Agricultural Cooperative



**Freund Farm**  
**CowPots**



**Laurelbrook Farm**  
**Roofed Composting Facility**



# Jordan Cove Urban Watershed Project - Overview

- An EPA National Monitoring Program Project (1995-2005)
- Located in Waterford, CT
- Determined water quantity and quality benefits of using pollution prevention BMPs
- Monitoring over a 10 year period
- Active engagement of Federal, State, Local, Academic, and Business partners
- Project is documented at <http://jordancove.uconn.edu>



# Jordan Cove Urban Watershed Project



- Water Quantity:
  - Traditional Subdivision: Runoff volume increased 894%!
  - LID Subdivision: Runoff volume decreased -97%!
- Water Quality:
  - Traditional Subdivision: Mass export of most pollutants increased significantly
  - LID Subdivision: Only small increases in mass export of TSS and TP (significantly less than traditional)



# Technology Transfers and Lessons Learned



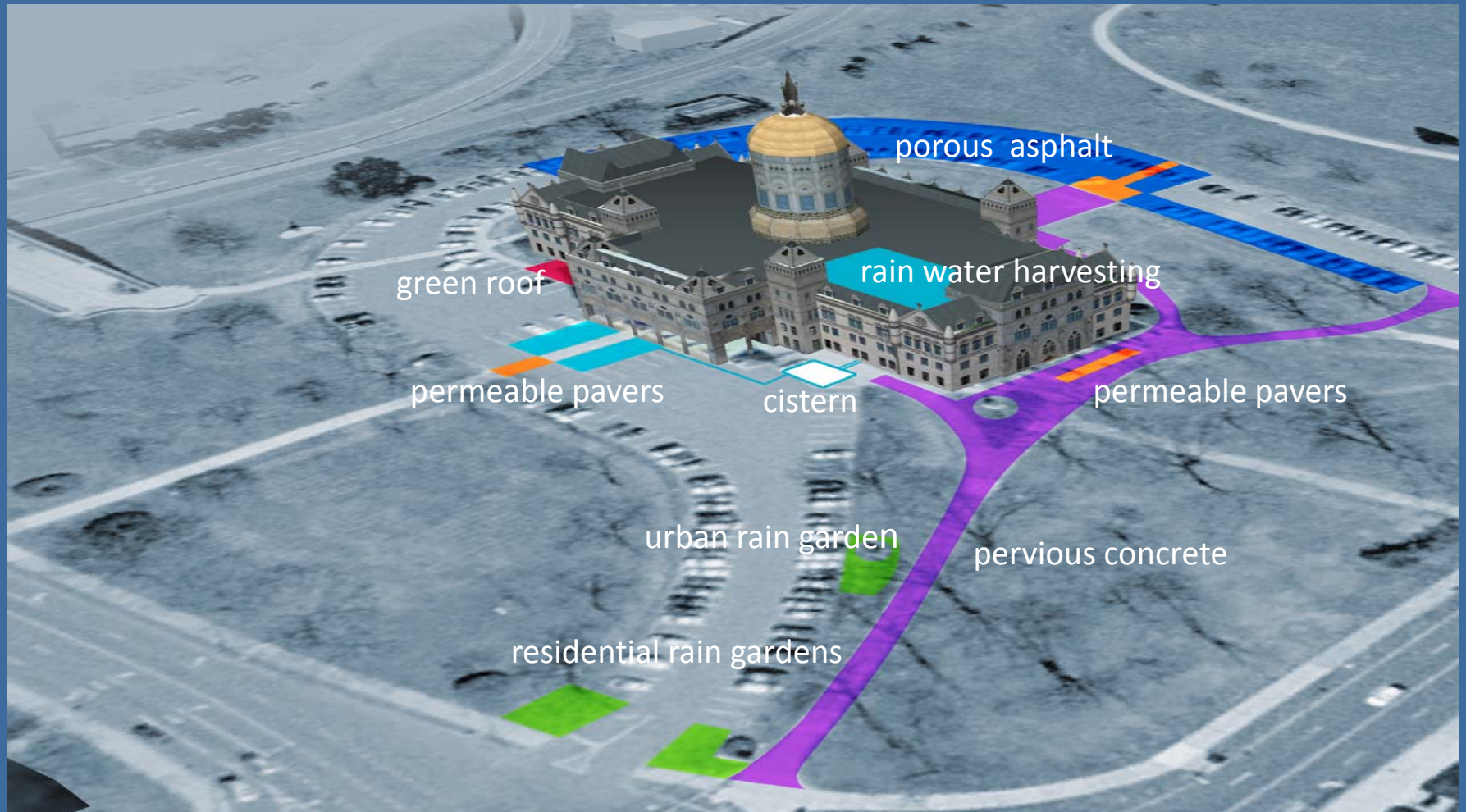
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# Applying Technology Transfers across Connecticut



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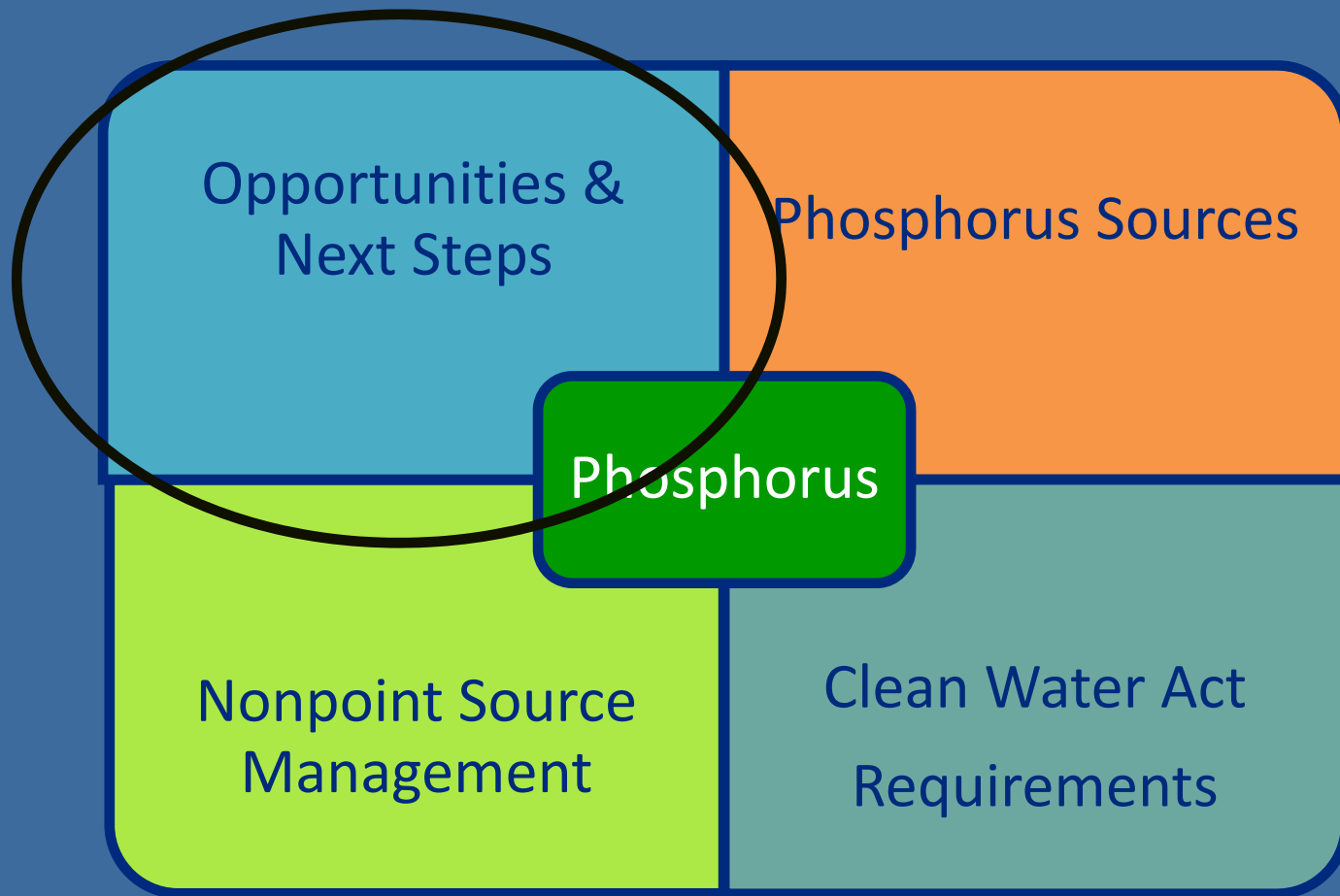
# Greening our State Capitol with LID or Green Infrastructure



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# USEPA Regional Perspective



# Upcoming NPS Efforts

- NE Regional Fertilizer Initiative (on going)
- State NPS Plan Revision (2013)
- Green Infrastructure/LID Conference (2013)
- Watershed Management Plans (on going)
- TMDLs (on going)
- Stormwater GP Revisions
- Agriculture CAFO GP Development



# Things We Continue to Evaluate

- Monitor and Assess
  - data and trends
  - in stream, land use, regulatory programs
- BMP nutrient removal efficiencies
- Research of New BMPs
- Tech. transfer
- NPS Tracking



# Potential Opportunities



# Potential Opportunities

NON POINT SOURCE	REGULATORY	NON-REGULATORY	SIGNIFICANCE	OPPORTUNITIES
Storm water	<ul style="list-style-type: none"> <li>- MS4</li> <li>-DEEP General Permits</li> <li>- Varying Local Reg.</li> </ul>	<ul style="list-style-type: none"> <li>-Other Urban Runoff</li> <li>-local controls</li> </ul>	HIGH	<ul style="list-style-type: none"> <li>-Tech. Assist.</li> <li>-Regulatory Enhancements</li> <li>-LID/Green Infra.</li> </ul>
Agriculture	<ul style="list-style-type: none"> <li>- CAFOs</li> </ul>	<ul style="list-style-type: none"> <li>-Other cropland</li> </ul>	HIGH	<ul style="list-style-type: none"> <li>-Tech. Assist.</li> <li>-CAFO GP</li> <li>-BMPs</li> </ul>
Source controls	<ul style="list-style-type: none"> <li>- Laundry Detergent</li> <li>- Lawn Fertilizer</li> </ul>	<ul style="list-style-type: none"> <li>-Other Fertilizer</li> <li>-Dish Washer Detergent</li> <li>-Water softener</li> </ul>	HIGH	<ul style="list-style-type: none"> <li>-Legislation</li> <li>-Reg. Programs</li> <li>-Tech. Assist.</li> <li>-Education</li> </ul>
On Site Sewage	<ul style="list-style-type: none"> <li>-Systems large and small</li> </ul>		LOW	<ul style="list-style-type: none"> <li>-Education</li> <li>-Training</li> <li>- Failure Corrections</li> </ul>

# Collaboration Suggestions

- Website to receive comments:  
[DEEP.Phosphorus@ct.gov](mailto:DEEP.Phosphorus@ct.gov)
- 



# Next Steps

- Compiling of today's and website comments
- Analysis of comments
- Consider recommendations
  - Alignment with existing efforts
  - Potential workgroups to study further
  - Potential new initiatives





THE END



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