



Overview of the Safe and Sustainable Water Resources Research Program

April 16, 2012





Environmental Protection Agency Mission

Protect Human Health and the Environment



Three Overlapping Phases in the History of the EPA

- Command and Control



- Risk assessment / Risk management



- Sustainability

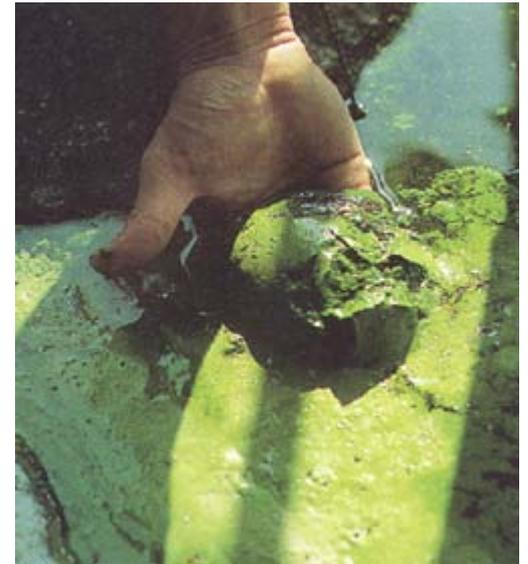


The Sustainability Challenge

- Daunting environmental challenges—population & resource pressures
 - Air and water quality Issues
 - Climate change impacts—adaptation & mitigation
 - Environmental justice for disadvantaged communities
 - Legacy cleanup sites, residual contamination
 - Emerging technologies, e.g., nanomaterials

EPA is making changes to better address the complex environmental problems facing our nation today and in the future.

- Strengthen collaborations
- Emphasize sustainable solutions
- Advance innovation
- Employ integrated, transdisciplinary research
- Apply systems thinking and life cycle approaches
- Sustainability emphasized government wide



Former ORD Research Structure	Integrated ORD Research Structure
Global Change Research	Air, Climate & Energy
Sustainability Research	
Clean Air Research	
Human Health and Ecosystems Research	
Drinking Water Research	Safe and Sustainable Water Resources
Water Quality Research	
Human Health and Ecosystems Research	Sustainable and Healthy Communities
Pesticides & Toxics Research	
Sustainability Research	
Fellowships	
Land Research (Excluding Nanotechnology)	
EDCs Research	Chemical Safety for Sustainability
Computational Toxicology Research	
Human Health & Ecosystems Research	
Human Health Risk Assessment (NexGen)	
Pesticides & Toxics Research	
Land Research (Nanotechnology)	
Clean Air Research (Nanotechnology)	
Sustainability Research	
Human Health Risk Assessment	Human Health Risk Assessment
Homeland Security	Homeland Security

Problem Statement

Increasing demands for sources of clean water combined with changing land use practices, growth, aging infrastructure, and climate change and variability, pose significant threats to our Nation's water resources. Failure to manage our Nation's waters in an integrated, sustainable manner will limit economic prosperity and jeopardize both human and aquatic ecosystem health.

Vision

SSWR uses an integrated, systems approach to research for the identification and development of the scientific, technological and behavioral innovations needed to ensure clean, adequate and equitable supplies of water that support human well-being and resilient aquatic ecosystems.

Water Problem Areas

Nutrient Reduction Strategies

Hydraulic Fracturing

Legacy & Emerging
Contaminants

Sustainable Water
Infrastructure

Systems Approach to
Watershed Protection

Climate Impacts

EPA/ORD Research*

Watershed Protection &
Restoration

Sustainable Solutions for
Waterborne Chemical &
Microbial Contaminants

Green Infrastructure to Manage
Stormwater Runoff

Next Generation Water
Treatment Technologies

Integrated Systems Approach

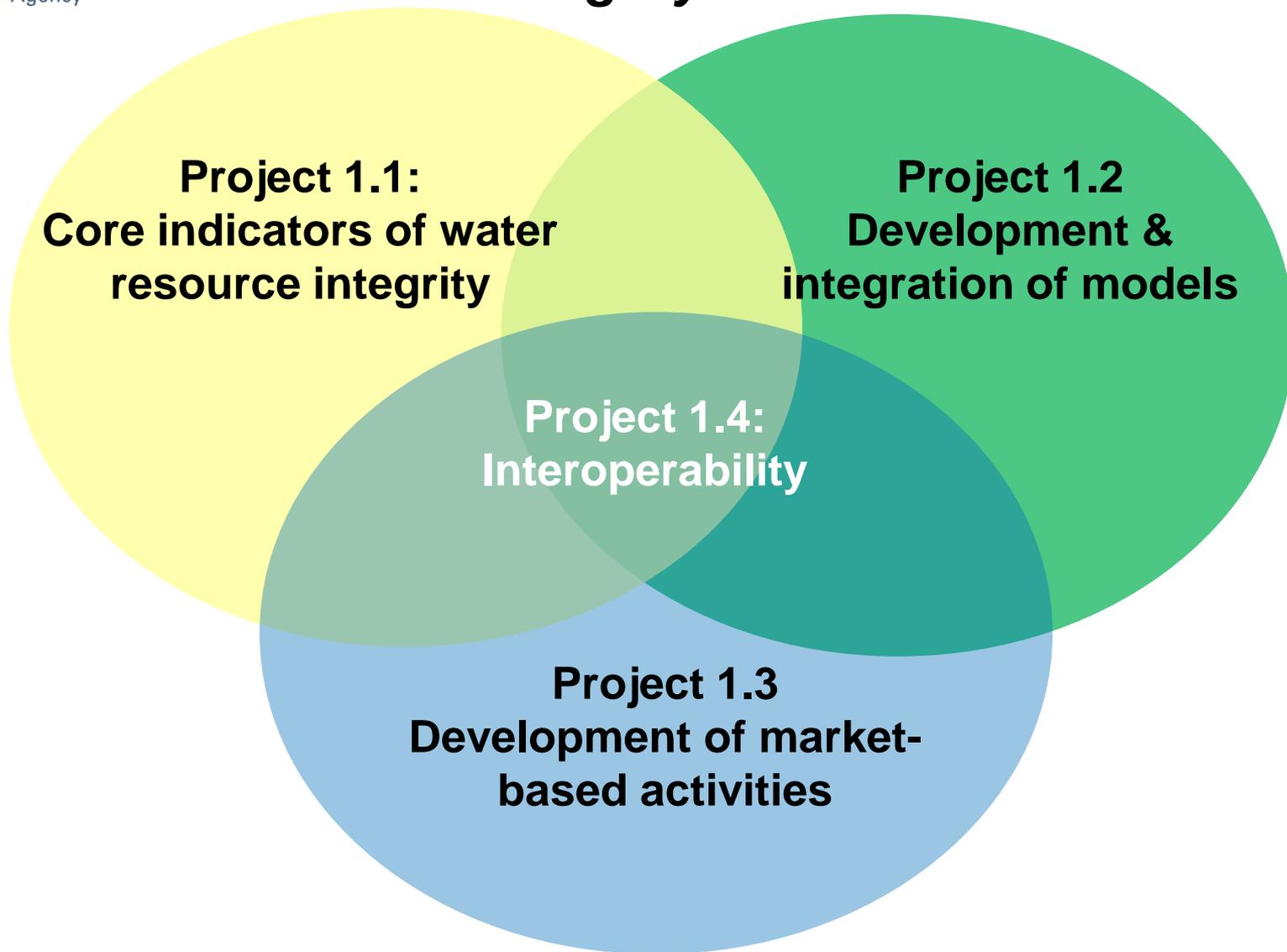
*Climate is a stressor considered
across the research program

Topic #1 - Sustainability & Integrity of Water Resources

What factors are most significant & effective in ensuring the sustainability & integrity of water resources?

- Understand pressures, stressors, drivers
- Assess the condition of aquatic ecosystems
- Quantify the social, economic & environmental costs of water quality degradation (prioritization, forecasting & mitigation)
- Systems understanding of watershed processes

What factors are most significant & effective in ensuring the sustainability & integrity of water resources?



Topic 2: Minimizing the environmental impacts of land use practices for sustainability of surface and subsurface water resources

This research addresses

Current and future best, cost-effective management practices that minimize impacts to water resources

Evaluation of risks from chemical and microbial contaminants to aquatic life and drinking water

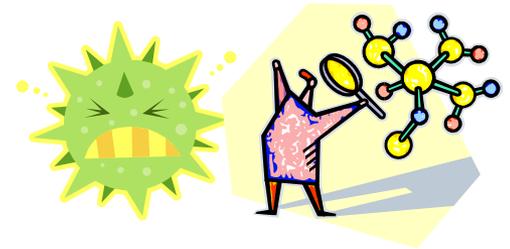


Topic 2: Minimizing the environmental impacts of land use practices for sustainability of surface and subsurface water resources

Project 2.1 - Approaches and predictive tools for sustainable solutions to the impacts of land use and climate change on water resources



Project 2.2 - Predictive tools for sustainable solutions for waterborne chemical and microbial contaminants



Project 2.3 - Optimized solutions for sustainable nutrient management



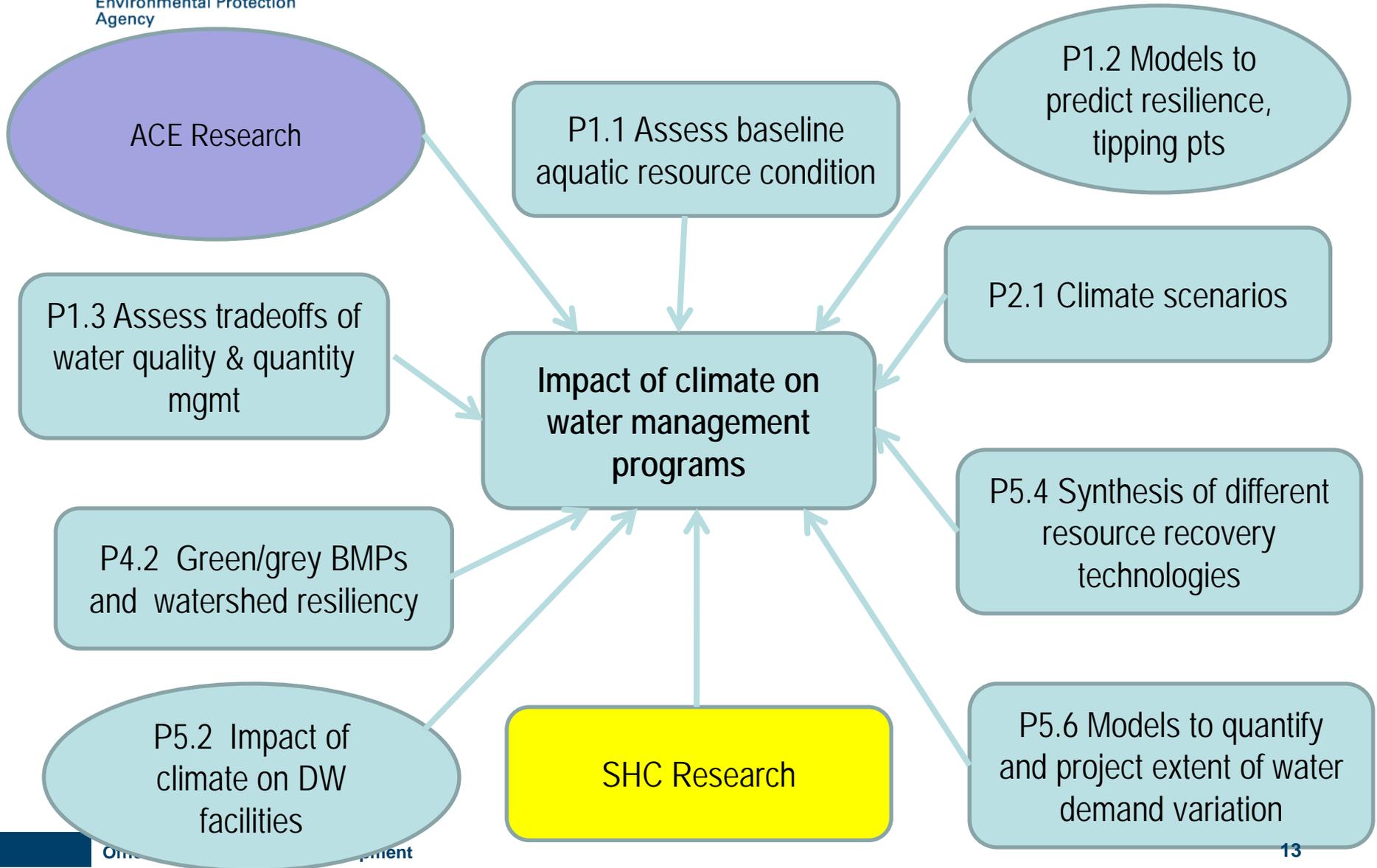
Project 2.4 - Mitigating environmental impacts of surface & subsurface land use practices



Topic 3: Climate

- Provide human exposure and environmental modeling, monitoring, metrics and information needed by individuals, communities, and governmental agencies to adapt to the impacts of climate change
- The impacts of climate change on water availability and quality, the potential for exposure to different pathogens, and the composition and health of ecosystems and watersheds

OW/Regional Problem Area: Impact of Climate on Water Management Programs



Topic 4: Most effective and sustainable approaches that maintain and improve the natural and engineered water system

- Land development has altered hydrology to net runoff of stormwater, vs. net infiltration
- Stormwater runoff has led to discharge of pollutants to receiving waters (including untreated wastewater in communities with combined sewer systems) and degradation of water quality, stream condition and health, as well as recreational water risks
- Stormwater permitting and enforcement to protect our waters (*National Pollutant Discharge Elimination System (NPDES), 1994 Combine Sewer Overflow Policy's Long Term Control Policy requirement enforced via consent decree*)
- In April 2011, Deputy Administrator Bob Perciasepe announced the Green Infrastructure (GI) Agenda – EPA activities to encourage adoption GI solutions for stormwater management
- Also in April 2011, OW-OECA Joint Memo supporting and encouraging use of GI for wet-weather control in permitting and enforcement
- Sustainable approaches needed to control source (stormwater) while providing other community benefits - enhancing engineered water system (grey) solutions



Topic 4: Most effective and sustainable approaches that maintain and improve the natural and engineered water system

- **Project 4.1:** Combine Sewer Overflow (CSO) mitigation through multi-scale implementation of green infrastructure in communities
 - *e.g., Cleveland, Cincinnati consent decree enforcements of CSO policy, STAR RFA to support upcoming Philadelphia CSO consent decree*
- **Project 4.2:** Green Infrastructure Best Management Practice (BMP) performance and metrics
 - *e.g., monitoring rain gardens, permeable parking lots, etc.*
 - *e.g., impact of GI adoption on aquatic ecosystem health*
- **Project 4.3:** Green infrastructure modeling tools and data inventories
 - *e.g., Storm Water Management Model (SWMM), HSPF BMP toolkit, Green Infrastructure databases in EPA GeoPlatform*



Topic 5: Manage water infrastructure to produce safe and sustainable water resources

- How do we manage the water infrastructure of today, while moving toward next generation water infrastructure systems?
- Aging and overloaded infrastructure leads to significant water loss, contamination, and inefficiencies
- Need to demonstrate more sustainable approaches for managing, routing, and using water
- Requires innovations in water treatment, resource recovery and reuse, water infrastructure design, ...

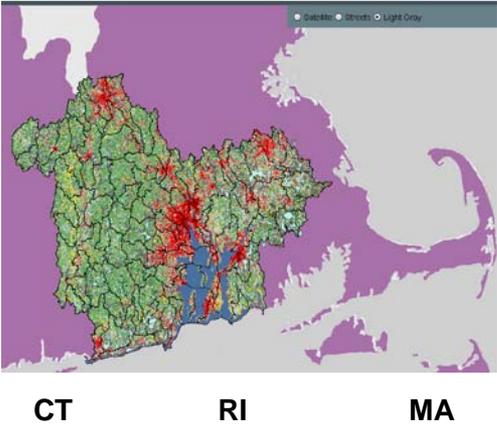


Topic 5: Manage water infrastructure to produce safe and sustainable water resources

- **Project 5.1:** The development and application of tools and metrics for the next generation of water systems
- **Project 5.2:** Innovation for water treatment system efficiency and integration
- **Project 5.3:** Water Technology Innovation Cluster (WTIC)
- **Project 5.4:** Develop and implement innovative approaches to water infrastructure based on resource recovery
- **Project 5.5:** Public health protection from distribution, conveyance, and storage system contaminants
- **Project 5.6:** Determine new and innovative technologies and approaches that can be used to monitor and mitigate aging distribution and collection systems

SSWR Project 6.1

Promoting safe and sustainable waters through integrated management of nutrients in New England



SAB INC 2011:

For the Nation, if we are to reduce Nr introduced to the environment by 25% what would be the most economically efficient, social acceptable, and environmentally sound way to do it?

Involves integration across the SSWR projects using a systems approach with additional connections to ACE & SHC programs.

Geographic Focus. Narragansett Bay it's watershed & airshed. Reductions of 25-50% in landside Nr loading are technically feasible.

Goal / Rationale:

Demonstrate an approach to informing more holistic & integrated nutrient management decisions for the Narragansett Bay System, so that human well-being and ecosystem conditions related to water are maintained, protected or improved. Informing: air, land & water management decisions.

Approach: Knowledge transfer at a range of governance scales.

- Other Research Activities in this Watershed
 - Federal Agencies (e.g. [USGS](#); [EPA OW](#), [OAR](#), [R1](#); [NOAA - CHRP](#)),
 - Several Environmental Governance Institutions, and Universities (e.g. [URI](#), [Brown](#))
- Supported by: lab & field work, monitoring, & modeling, e.g: [CMAQ](#), [SPARROW](#), [SWAT](#), [N-Sink](#), [ESDSS](#), [FVCOM](#), [ROMs](#), [EcoGEM](#), Climate Change Models, [NB Data Viewer](#)
- Decision support tools, designed with end-users in mind
 - e.g. for [Northeastern lakes](#). Involves use of [SPARROW MRB-1](#) & [DSS Nr](#) & [TP](#)
- A framework, approach & decision support tools that can be adapted for use in other watersheds.

Projects 6.2 and 6.3 – FY12 Planning Year

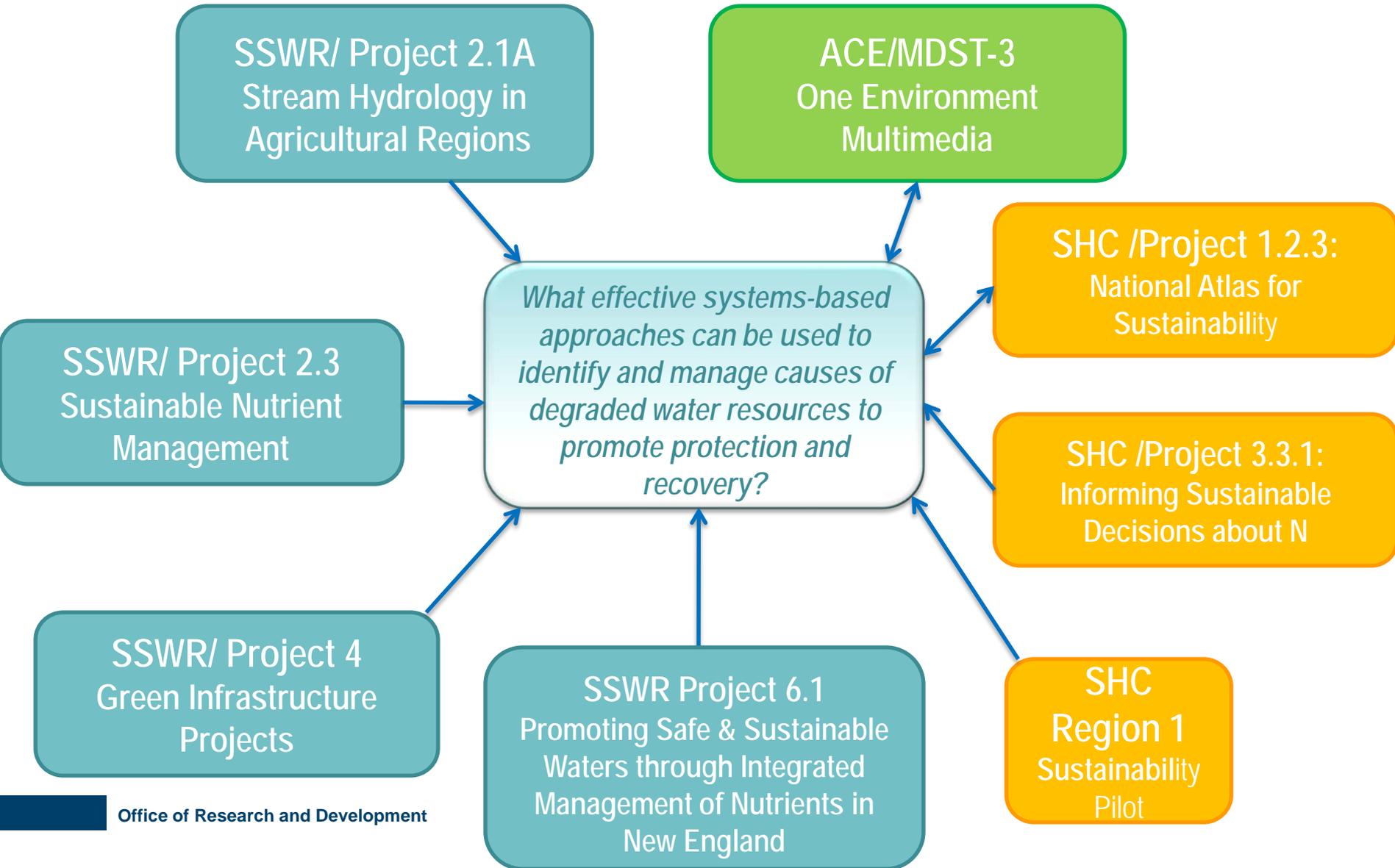
- **Project 6.2. Southern New England Program for Innovative Estuarine Approaches (SNEPIEA)**
 - Public-private stakeholder-driven forum to develop sustainable solutions to restore coastal watersheds in southern New England
 - Serve as a regional catalyst for innovations in management and policy for adoption of new approaches and technologies and promote job creation
- **Project 6.3. Technology Demonstration Partnerships for systems approaches to Net Zero (minimizing water use) for Sustainable Military Bases**
 - Integrating research from across the SSWR research portfolio to develop real, sustainable solutions for communities' next generation of water management
 - Specific research efforts in the SSWR portfolio will be applied, tested and demonstrated on selected Army and DOD installations

Elements of Cross-EPA Integrated Nitrogen Research

A holistic, systems approach to address sustainable nitrogen management that:

- Engages & benefits Program Offices, Regions & external Stakeholders
- Addresses OW, OAR & Regional needs, plus SAB recommendations
- Informs decisions & recognizes impacts on other decisions
- Recognizes associated nutrient co-pollutants (P, S, C)
- Produces interoperable tools & frameworks that can inform N reduction approaches across multiple scales & multiple media, and minimizes human health and ecological impacts

ORD's Cross-cutting Nutrient Research



EPA Integrated Nitrogen Research

- **Key Question:** If our goal were to reduce N pollution by 25-50% in land, air and water, what would be the most economically efficient, socially acceptable, and environmentally sound way to do so?
- **Vision:** A one-EPA, systems approach to managing N_r (& co-pollutants) sustainably for the protection of human & environmental health
 - The magnitude of the nutrient problem is reduced
 - The need for multiple lines of regulatory controls is eliminated
 - Excess nutrients are recycled and put to beneficial uses
 - Variety of tools & approaches to meet range of needs

Questions?

