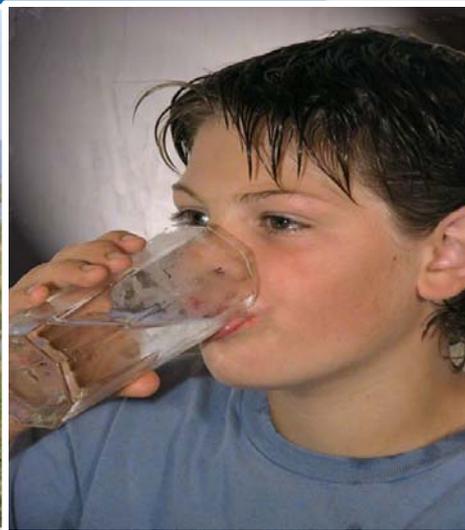


Safe and Sustainable Water Resources Research Program

*David G. Jewett, PhD, Acting Director
National Risk Management Research Laboratory
Ground Water and Ecosystems Restoration Division*

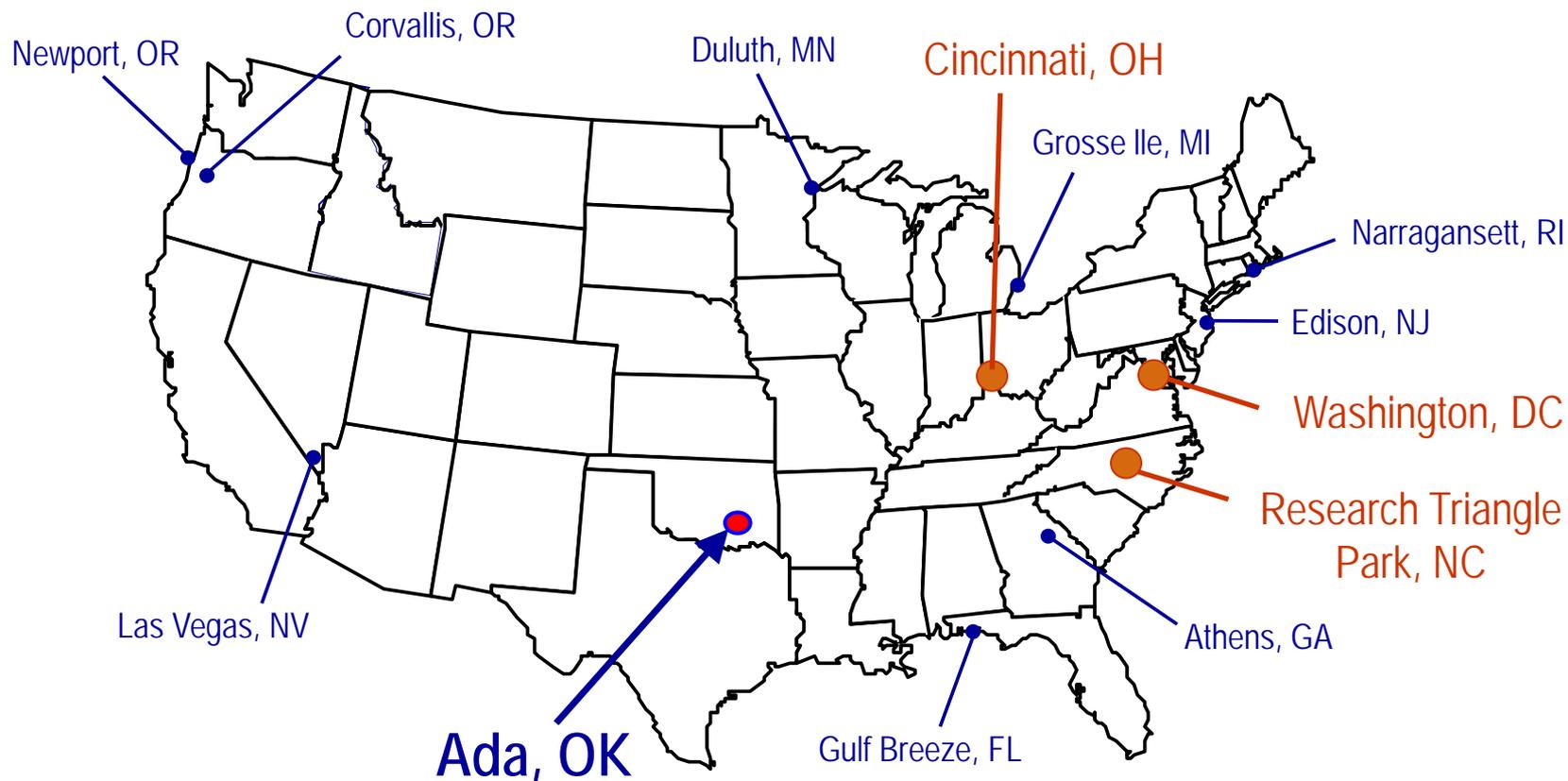




ORD's National Laboratories and Centers

- National Exposure Research Laboratory
 - National Health and Environmental Effects Research Laboratory
 - National Risk Management Research Laboratory
 - National Center for Environmental Assessment
 - National Center for Environmental Research
 - National Center for Computational Toxicology
 - National Homeland Security Research Center
- 

ORD Locations



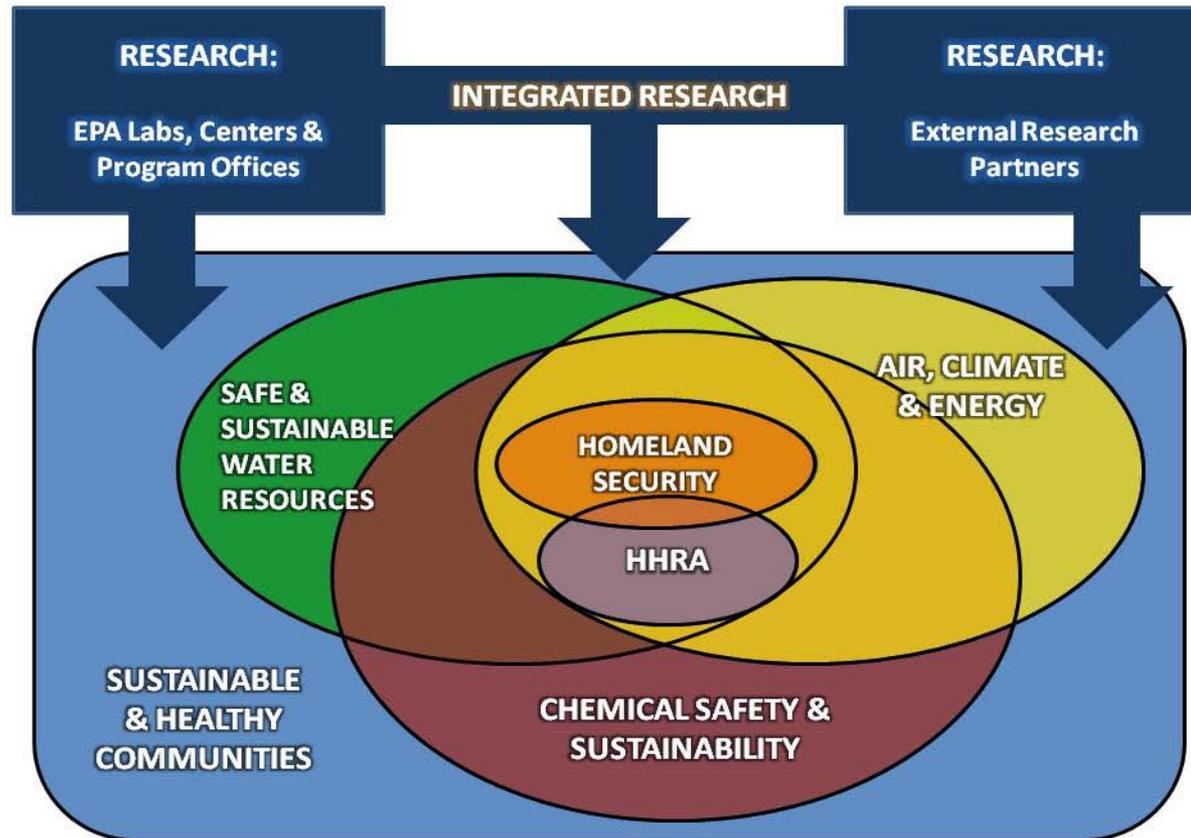
Transformation of ORD

- Sustainability is the “true north”
 - guides our research and innovation priorities
- We will:
 - create broad sustainability research programs based on systems thinking
 - engage our stakeholders to develop sustainable solutions relevant to their needs
 - engage in integrated, transdisciplinary research throughout our portfolio
 - be a catalyst for progress in sustainability

Aligning EPA Research Programs to the Agency Strategic Plan

Air, Climate & Energy	Goal 1: Taking Action on Climate Change & Ensuring Air Quality	Objective 1.1: Address Climate Change	Global Research
		Objective 1.2: Improve Air Quality	Sustainability Research (partial) Air Research Human Health & Ecosystems Research (partial)
Safe and Sustainable Water Resources	Goal 2: Protecting America's Waters	Objective 2.1: Protect Human Health	Drinking Water
		Objective 2.2: Protect & Restore Watersheds and Aquatic Ecosystems	Water Quality
Sustainable Communities (Built & Natural Environments)	Goal 3: Cleaning Up Our Communities	Objective 3.1: Promote Sustainable & Livable Communities	Human Health and Ecosystems Research (partial)
			Pesticides & Toxics Research (partial)
			Sustainability (partial)
			Fellowships
Chemical Safety for Sustainability	Goal 4: Assuring the Safety of Chemicals	Objective 4.1: Assure Chemical Safety	Land (Excluding Nanotechnology)
			Pesticides & Toxics Research (partial)
			EDCs Research
			Human Health & Ecosystems Research (partial)
			Sustainability
			Nanotechnology Research (contains parts of Land, Air, Sustainability, and Human Health research programs)
			Computational Toxicology Research
			Human Health Risk Assessment
			Homeland Security Res.
			Human Health Risk Asses.

Integrated ORD Research Programs



<http://www.epa.gov/planandbudget/annualplan/fy2012.html>

20th Century Challenges and 40 Years of Progress in Protecting Water Resources



Cuyahoga River, 1969



Love Canal, 1978



6 Acid Rain impacts to water quality

In Step ▾ April 22-May 5, 1993 ▾ Page 8

'Crypto' And Controversy in Milwaukee Water Debacle

Immune compromised hit hardest; 4 deaths possibly linked to contamination

By Ron Geiman

Milwaukee — The "don't drink the water" ban — in place in Milwaukee

the city health department wide testing revealed the area-wide spread of the contamination.

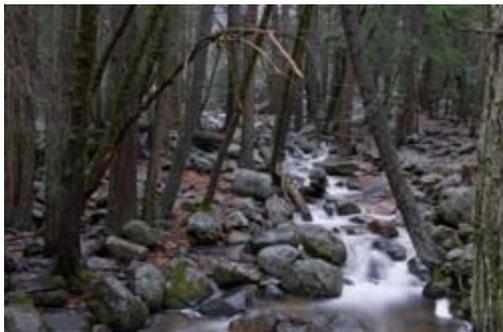
Rumors, especially on the south side of the city, about "cloudy," "murky" and "vile tasting" tap water were substantiated when the protozoa was found in both the city's water treatment plants on the shore of Lake Michigan that supply Milwaukee and ten of its neighbors. Test results indicated the south side Howard Avenue treatment plant had much heavier concentrations of the organism; and subsequently the homes and businesses supplied by that plant suffered, by far, the highest number of infected people.

The protozoa may be found in

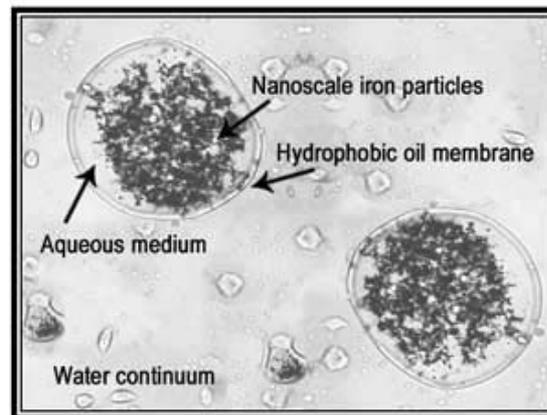
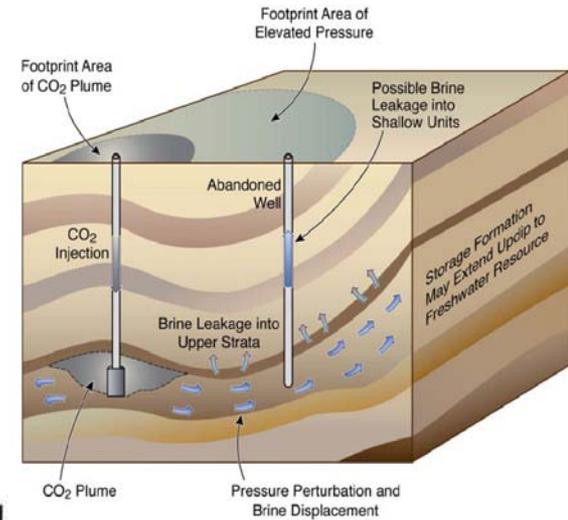
1993 Cryptosporidium outbreak

21st Century Challenges

- Rate of waters listed for impairment exceeds rate at which they are being restored
- Causes of degradation are more complex; less visible
- Multiple sources of pollution requiring new, innovative approaches
- Key challenges include
 - aging water infrastructure
 - legacy and emerging contaminants
 - competing demands for water
 - pathogens
 - nutrients

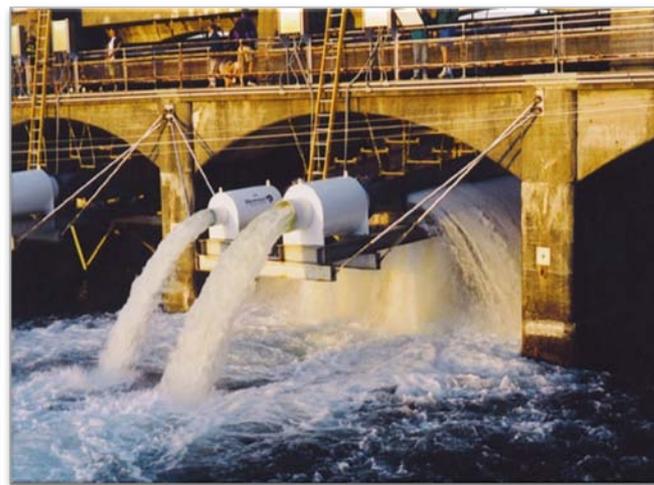


Water resources are not sustainable using 20th Century approaches to address 21st Century problems



Safe and Sustainable Water Resources (SSWR) Research Program:

- Seek sustainable solutions to 21st century problems facing our Nation's water resources
- Integrate existing Drinking Water and Water Quality research programs into one holistic program



Overarching Goals

- Protect public health and the environment
- Provide safe and sustainable water to meet societal, economic and environmental needs
- Water resources are managed in a sustainable manner that:
 - integrates drinking water, wastewater, stormwater, and reclaimed water;
 - maximizes energy production, nutrients and materials management, and water recovery; and
 - incorporates comprehensive water planning (such as low impact development and smart growth) and optimum combinations of built, green and natural infrastructure

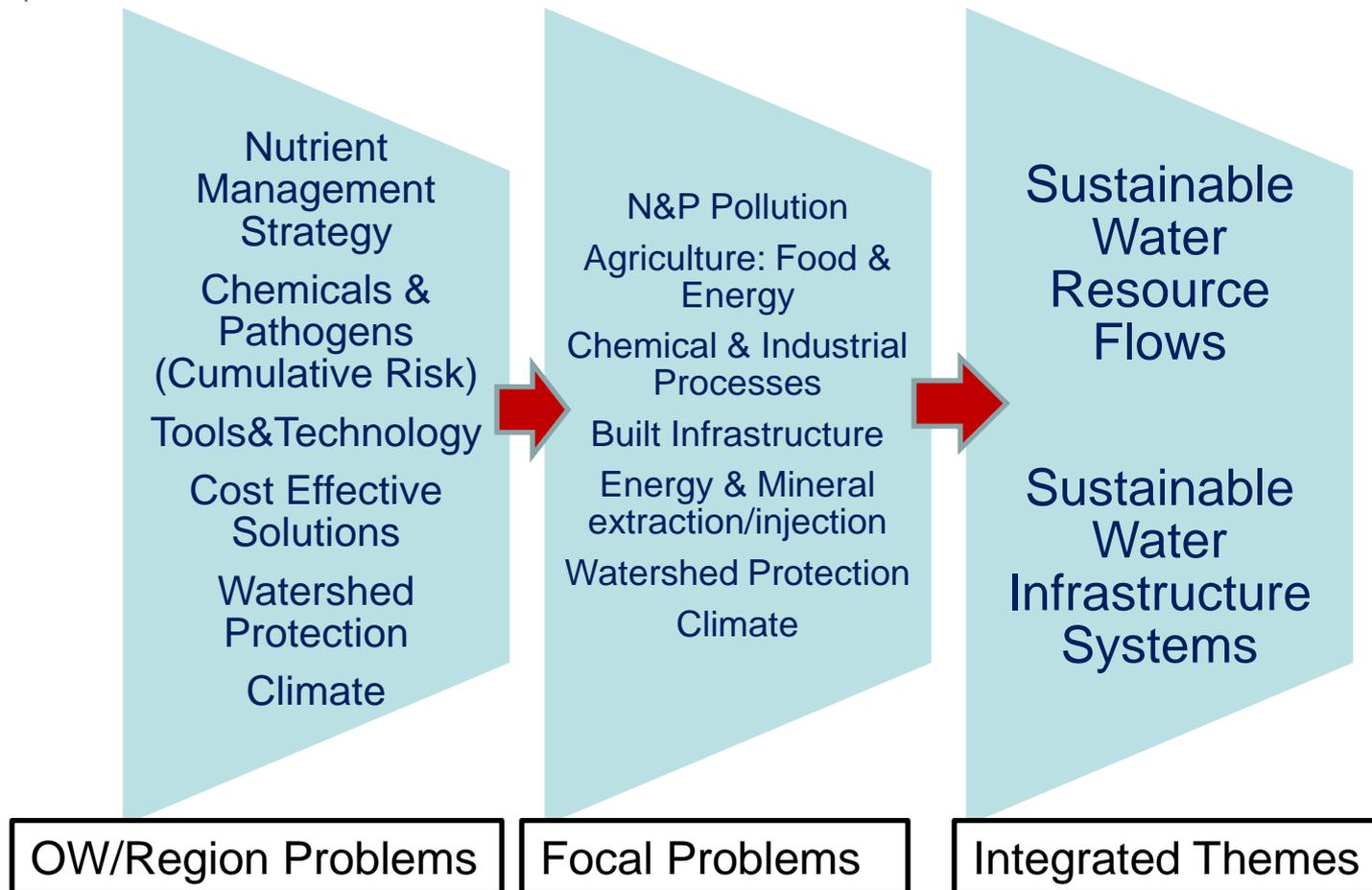
Problem Statement

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 and adequate and equitable supplies of water that support human well-being and resilient aquatic ecosystems.

Evolution of SSWR Program



ORIGINS OF THE PROBLEMS

Urbanization

Including:

- Land use management
- Industrial Processes

Population demographics

- aging drinking water and wastewater infrastructure

Non point source pollution

- Agriculture

MANIFESTATIONS OF THE PROBLEM IN THE WATER ENVIRONMENT

Poor Water Quality

- Physical processes (e.g., flow; degraded habitat)
- Loadings: Nutrients, Pathogens, Chemicals, Sediments

Additional stressors:

- Insufficient Water Quantity
- Climate change and variability

NEW FOCUS -
Pro-active,
Integrated,
Sustainable
Solutions

SYSTEMS APPROACH TO SOLUTIONS

Sustainable Water Resources –

Ensure safe and sustainable water quality and availability to protect human and ecosystem health by integrating social, economic and environmental research for use in protecting and restoring water resources and their designated uses (e.g., drinking water, recreation, industrial processes, and other designated uses) on a watershed scale.

Sustainable Water

Infrastructure Systems– Ensure the sustainability of critical water resources using systems-integrated water resource management where the natural, green and built water infrastructure is capable of producing, storing and delivering safe and high quality drinking water, and providing transport and use-specific treatment of wastewater and stormwater.

Sustainable Water Resource Systems

Economy



products & services

Public Health & Communities



water supply

runoff and wastewater

recycled water

human exposure

*extractive uses:
energy, irrigation,
industrial processes*

*recreational
and cultural uses*

*infra-
structure*

*freshwater
depletion*

*ecosystem
degradation*

Water Environment

water cycle provides ecosystem services



Research Questions

- **Theme 1 – Sustainable Water Resources**
 - **What factors are most significant and effective in ensuring the sustainability and integrity of water resources and watersheds**, including downstream estuarine and coastal receiving waters?
 - **What approaches are most effective in minimizing the environmental impacts of naturally occurring contaminants and different land use practices** (e.g., energy production, mineral extraction and injection activities, agriculture, urbanization) leading to the sustainability of surface and subsurface water resources?
 - **What are the impacts of climate variability and changing human demographics on water quality and sufficient quantity** in freshwater, estuarine, coastal aquatic ecosystems, and drinking water? What approaches are needed to mitigate these impacts?

Research Questions

- **Theme 2 – Sustainable Water Infrastructure Systems**
 - **What are the most effective and sustainable approaches which maintain and improve the natural and engineered water system** in a manner that effectively protects the quantity and quality of water?
 - **How do we effectively manage water infrastructure to produce safe and sustainable water resources** from source to drinking water tap to receiving waters?
 - **What effective systems-based approaches can be used to identify and manage causes of degraded water resources?**

SSWR Theme 1

Question 2 - Project 2.4: “Mitigating Impacts of Subsurface Land Use Practices”

Land use practices to be addressed:

- hydraulic fracturing
- geologic sequestration of CO₂
- mining
- aquifer storage & recovery
- emergent energy and mineral resource extraction & injection issues

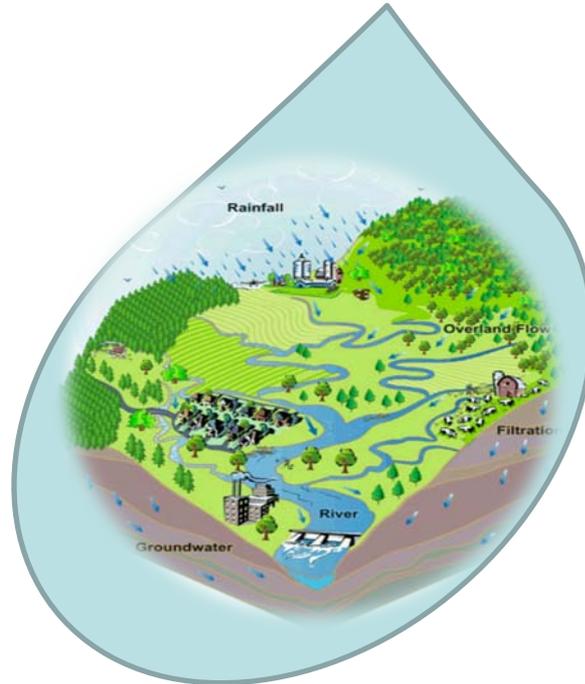
Next Steps



- Finalize the Framework
- Initiate Research Action Plan Development
- Develop Research Portfolio
- Determine how we measure success



Questions?



www.epa.gov/ord/

www.epa.gov/ord/priorities/waterresources.htm