Vision: SSWR's commitment to robust research and scientific analyses will support innovative scientific and technological solutions that ensure clean water to equitably protect people's health and livelihood, protect and restore watersheds and aquatic ecosystems, and strengthen the economy.

Approach: SSWR will take a *One Health* approach to collaborative problem solving, which recognizes the interconnection between people and ecosystems at local, regional, and national levels.

Organization: The SSWR research portfolio is organized into three interrelated topics: watersheds, nutrients and harmful algal blooms, and water treatment and infrastructure. Within each topic are specific research areas and outputs. Collectively, this work supports partner and stakeholder priorities and anticipatory research and carries specific near and long-term goals designed to yield practical tools and solutions for ensuring sustainable and equitable water resources.

Topic 1: Watersheds. This topic will advance integrated water quality and watershed management tools to protect and restore water resources. Research in this topic will provide nationally and regionally consistent tools to assess ecological status and trends, set attainable goals, and monitor progress toward achieving these goals. Research on high-priority issues, such as microbial pathogens in recreational waters and chemical contaminants in surface water and groundwater, will strengthen existing approaches for managing ambient water quality to protect human health and aquatic life. Research will refine and develop models, methods, and approaches to support improved aquatic resource mapping for both regulatory and non-regulatory purposes.

- *Research Area 1: Watershed Assessment*
    - NARS and National Assessment.
    - Stressor-Response and Cumulative Impacts.
    - Water Quality Modeling and Benefits.

- *Research Area 2: Ecosystem and Community Resilience*
    - Coastal Community Resilience.
    - Wildland fire water quality effects.
    - Water mapping and analytics.

- *Research Area 3: Advanced Ambient Water Quality Research*
    - Recreational water quality and human health.
    - Aquatic life guidelines for PFAS and other chemicals.
    - Research to support human health ambient water quality criteria for chemical mixtures.

Topic 2: Nutrients and Harmful Algal Blooms. Nutrient pollution is the most widespread water quality problem facing the United States with far-ranging consequences for human and environmental health and economic prosperity. Harmful algal blooms (HABs) are one of the primary impacts of excess nutrients in the environment and have been found in all 50 states. Managing excess nutrient runoff, characterizing legacy nutrient sources, and connecting nutrient reduction practices and water quality improvements are key to providing the tools necessary for communities to solve their nutrient issues.

- *Research Area 4: Assessment and Management of HABs*
    - Human and ecological health effects and toxicity
    - Management in surface water, drinking water and irrigation water.

- *Research Area 5: Nutrients in Changing Climate*
    - Characterizing nutrient sources and fate (terrestrial, freshwater, and estuarine) under changing climate patterns.
    - Nutrient impacts and tools to support criteria development.
    - Nutrient reduction strategies
    - Nutrient partnerships (translational science, evaluation, and synthesis).

Topic 3: Water Treatment and Infrastructure

Research focuses primarily on small systems and will provide innovative methods for assessing and treating water from source to tap and back to the source. The focus will be on characterization, assessment, and mitigation of lead in drinking water; assessment and control of opportunistic pathogens and disinfection byproducts (DBPs); analytical methods development, optimization, and application of tools for improving drinking water infrastructure; and augmentation of reliable water sources through water reuse research and stormwater capture.

- *Research Area 6: Alternative Water Sources for Climate Adaptation*
  - Water reuse from non-municipal sources.
  - Stormwater as a resource for aquifer recharge and water storage.

- *Research Area 7: Drinking Water/Distribution Systems*
  - Lead (Pb) and copper (Cu) – Treatment/mitigation strategies, exposure assessment tools, source characterization, sampling, and monitoring tools.
  - DBPs – Risk management and health effects.
  - Opportunistic pathogens.
  - Water Infrastructure and water quality models to improve performance, integrity, and resilience.

- *Research Area 8: Per- and Polyfluoroalkyl Substances (PFAS)*
  - Analytical methods.
  - Drinking water and wastewater treatment.
  - Treatment, fate, and transport in land-applied biosolids.

- *Research Area 9: Wastewater*
  - Effects-based bioassays for monitoring chemical risks in wastewater.
  - Antimicrobial resistance.
  - Standardized methods and approaches for surveillance of wastewater for biothreats.
  - Evaluation and mitigation of non-PFAS contaminants of emerging concern in wastewater treatment systems and biosolids.

- *Research Area 10: Stormwater*
  - Stormwater management to mitigate flooding. Development and application of stormwater management tools (models, cost/benefit tools) and guidance for communities.
  - Evaluating green/gray infrastructure effectiveness in urban settings to address combined sewer overflows and provide ancillary benefits for climate adaptation.

Cross-Topics Technical Support

- *Research Area 11: Technical Support for Communities*
  - Continue modeling support (e.g., EPANET, SWMM) and education and outreach (e.g., water research webinar series, small drinking water systems workshop and webinar series)
  - Site-specific technical support.

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Cross-Programs: Climate

- (New) Blue Carbon solutions driven research project. (SSWR, ACE, SHC).

- (Expanded) Wildland fire impacts on water quality. (SSWR, ACE, HS, SHC).