# Outline

1. Freshwater Salinization –Thinking Globally, Acting Locally

2. Monitoring Water Quality across a Regional Gradient

3. Establishing a Science Partnership to Manage Salinization

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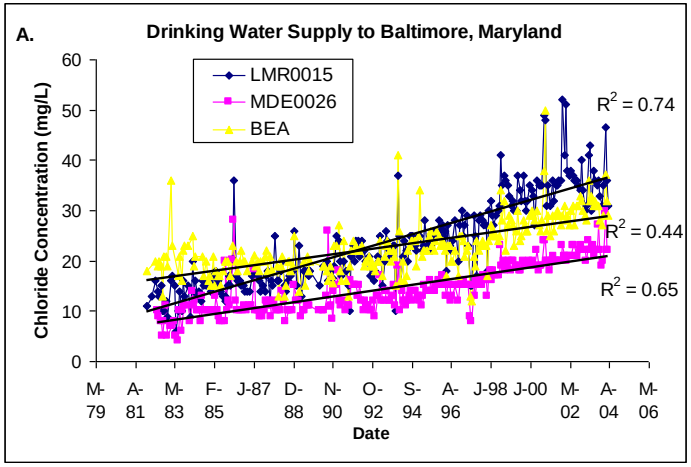
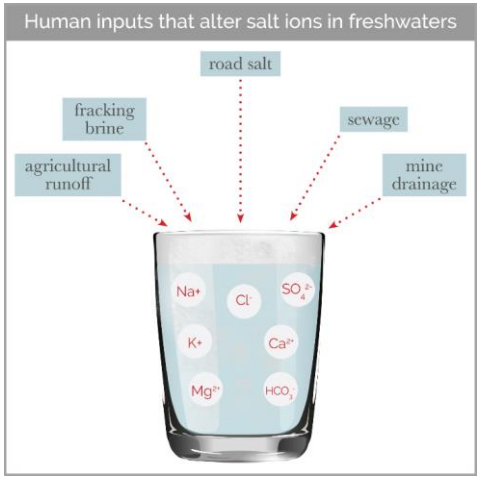


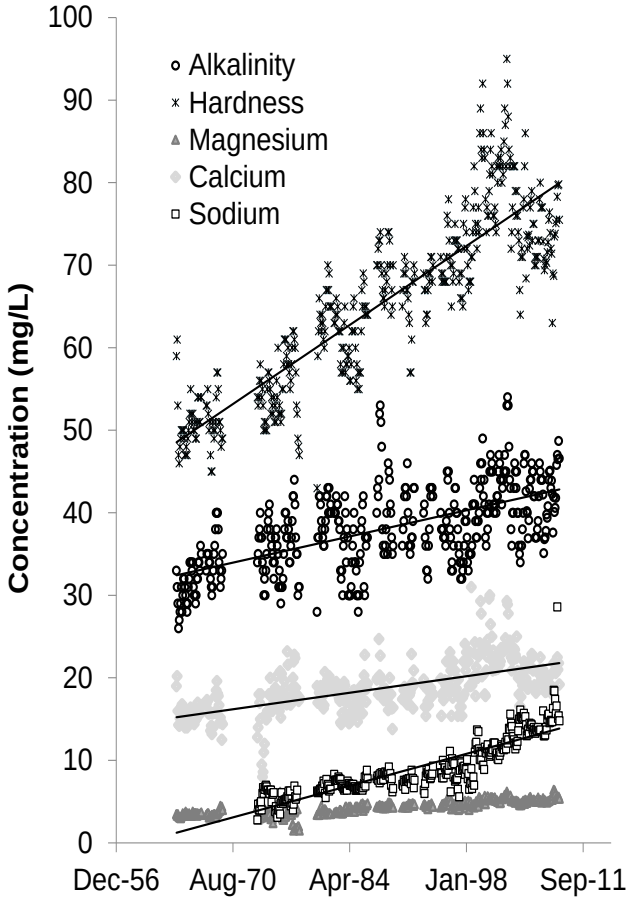

Kaushal et al. (2005) *PNAS*




L. Quillen (2018) FSS Press Release

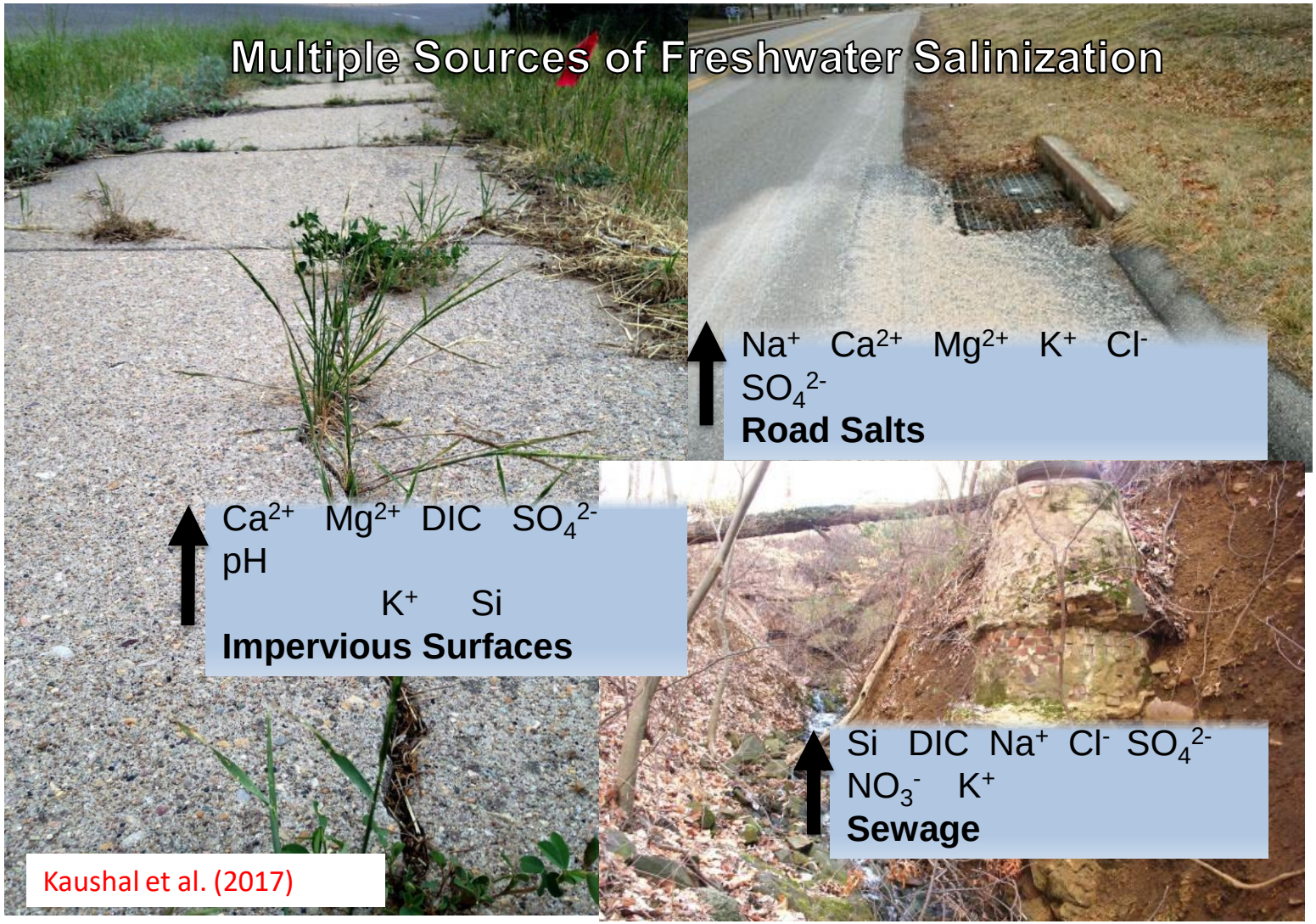
# 1. Freshwater Salinization – Why Care?

*Drinking Water, Infrastructure, Aquatic Life, etc.*

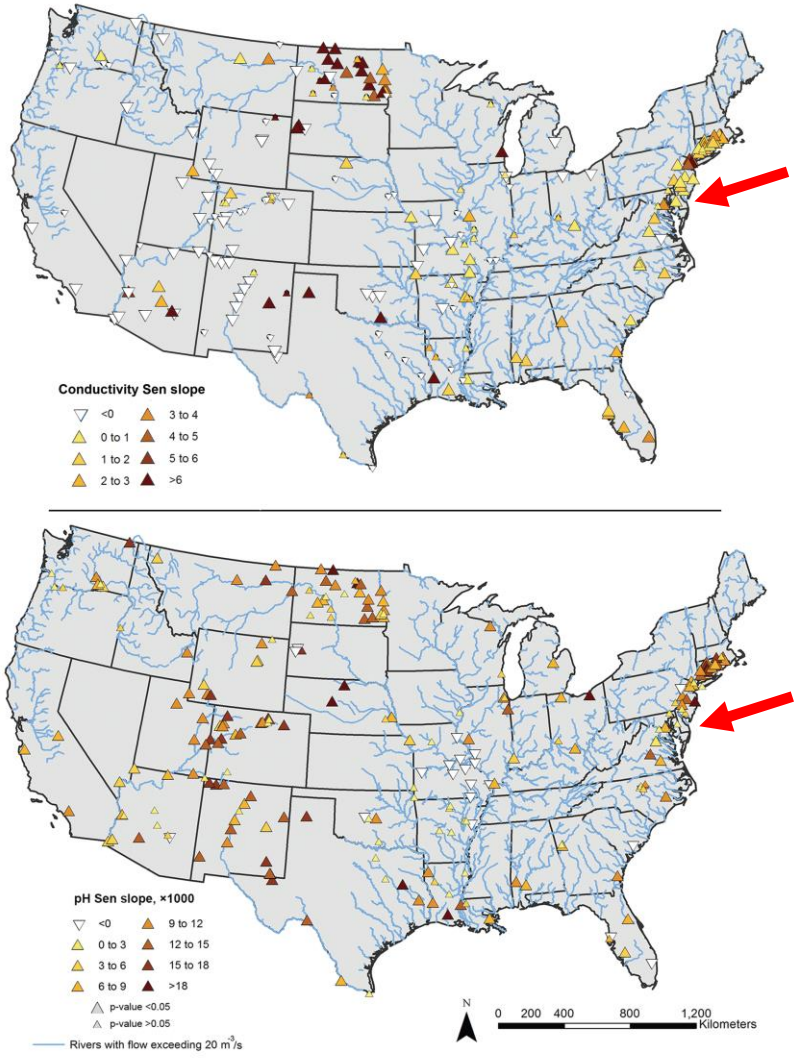



Kaushal et al. (2017) *Appl. Geochem*

# Multiple Sources of Freshwater Salinization



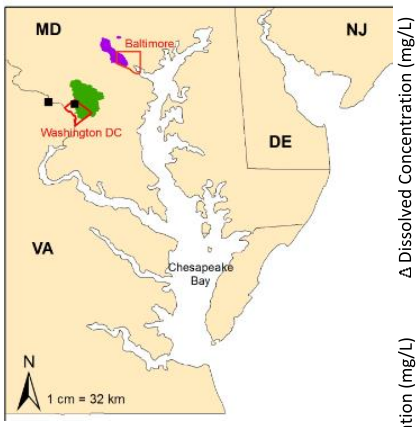

Kaushal et al. (2017)

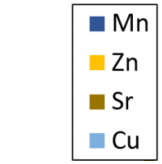


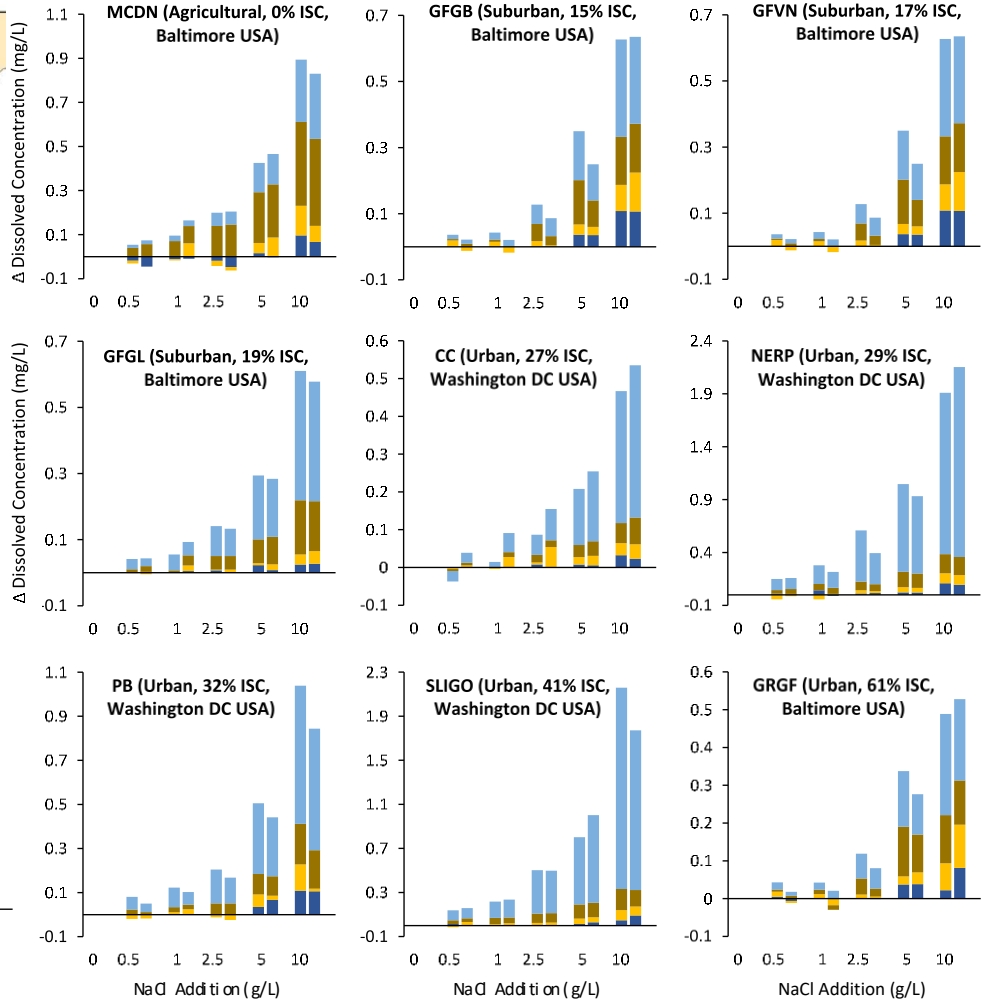

# Freshwater Salinization Syndrome on a National Scale

Increased pH and specific conductance over 50 years

Kaushal et al. (2018a) *PNAS*




# Freshwater Salinization Syndrome Mobilizes 'Chemical Cocktails'

Kaushal et al. (2018b) *Philosophical Trans. Royal Society*

and *sensu…*

Kaushal et al. (2018c), *Biogeochemistry: Metals, Organic Matter, Nutrients, etc.*

Haq et al. (2018), *Biogeochemistry: $Ca^{2+}$, $Mg^{2+}$, $K^{+}$, DOC, DIC, N, P*

Duan and Kaushal (2015), *Biogeosciences: C, N, P*

## Freshwater Salinization Is an Emerging Issue

1. Freshwater Salinization Syndrome (FSS) emerges across local, regional, and continental scales

2. Chemical cocktails are a consequence of FSS

3. Salt ions and chemical cocktails corrode infrastructure, impact drinking water, and degrade aquatic habitat

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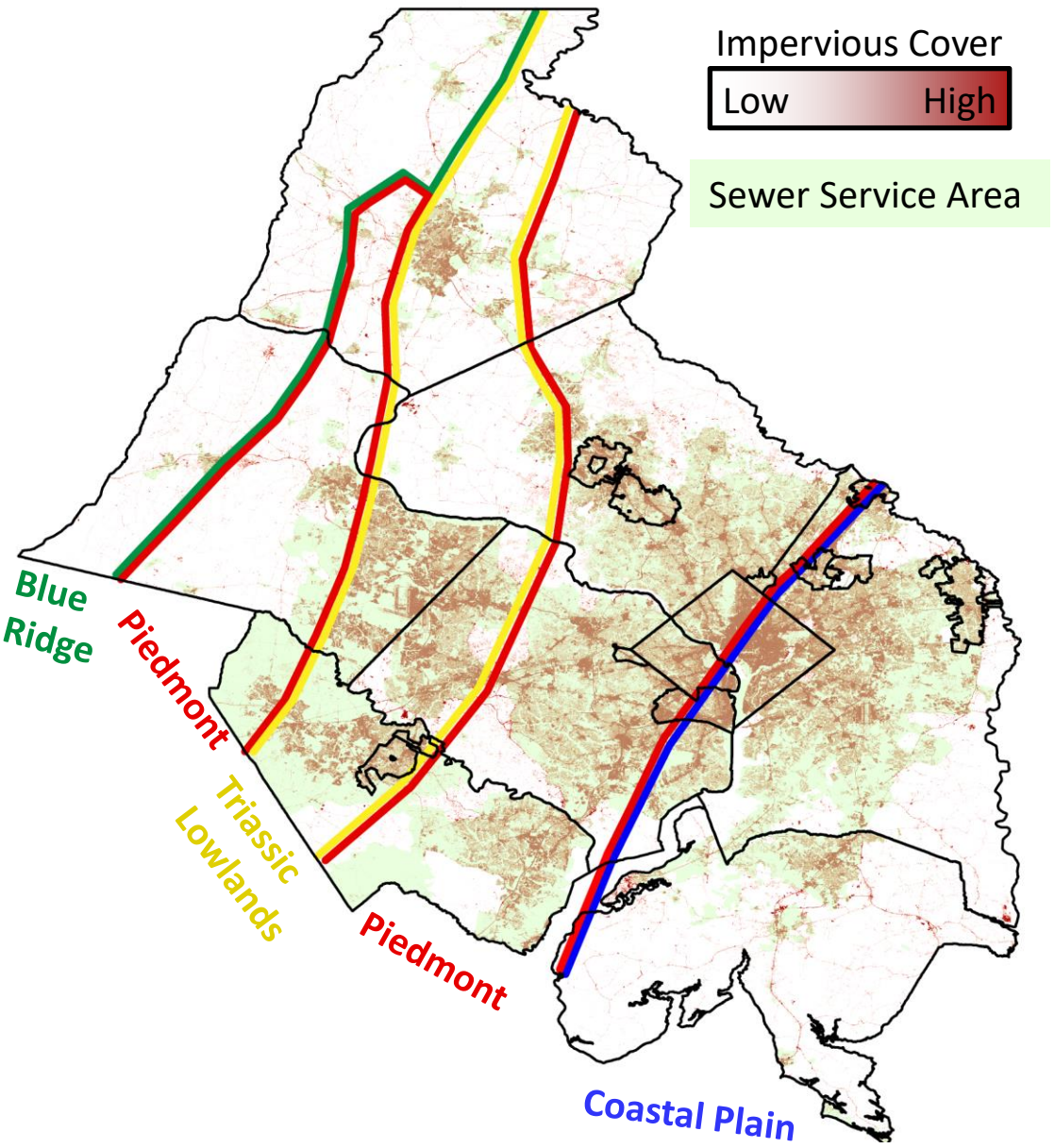
3. Establishing a Science Partnership to Manage Salinization

# A gradient of urbanization and geology in the COG region provides an ideal setting to study freshwater salinization

Impervious cover ranges throughout suburban and urban areas. Salinity sources and delivery to streams varies along this gradient, with runoff of de-icing salts and weathering of infrastructure quickly reaching streams in heavily urbanized areas.

Wastewater disposal is accomplished through treatment plant processing or on-site septic systems. Treated effluent from both sources can contribute a suite of ions to surface waters.

Geology affects the source and transport of salt to streams, with natural dissolution contributing to ionic strength and groundwater conveyance allowing other inputs to reach streams year-round.



# Analysis of existing water-quality data and results can begin to address priority salinization concerns

Water-quality data are being collected throughout the COG region that can be leveraged to better understand the sources, extent, and effects of freshwater salinization.

The use of existing data capitalizes on current water-quality investments and allows for the production of timely results.

The research team will assess geographic regions or source sectors that are poorly represented in the current monitoring network and develop a plan for their inclusion in future years.

COG members can assist this effort by sharing water-quality data that are not represented by UMD, USGS, or VT-OWML efforts.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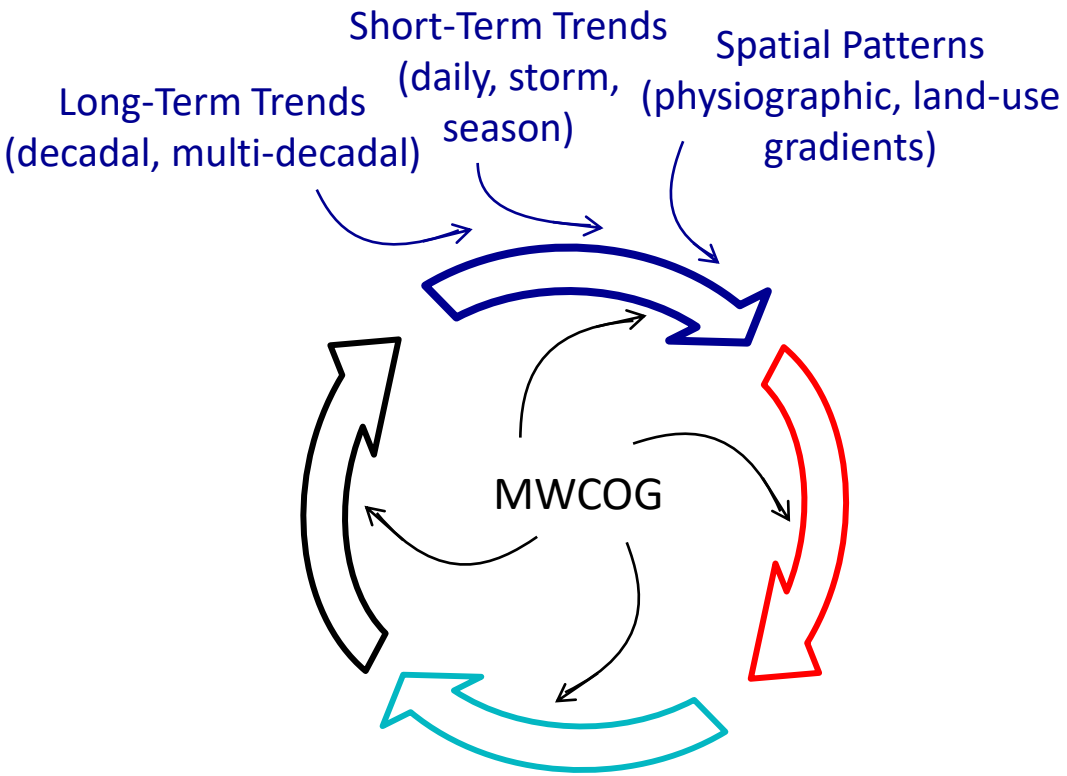
# Establishing a Science Partnership to Support Understanding of the Freshwater Salinization Gradient in the Metropolitan Washington, D.C. Region

Stanley B. Grant (Virginia Tech, Occoquan Laboratory), Sujay Kaushal (University of Maryland), John Jastram, James Webber, and Charles Walker (USGS)

- Phase 1 (two years, $120K Y1, $150K Y2): analyze existing data across the network
- Phase 2 (three years, $150K/year): field, lab and modeling studies in two or three stream testbeds
- Phase 3 (ongoing, $150K/year): extension of Phase 1 and 2 results, targeted monitoring

# Phase I: focus on existing data

**Patterns & Trends** | **Ion/SC Relationships** | **Outreach & Products** | **Planning & Next Steps**



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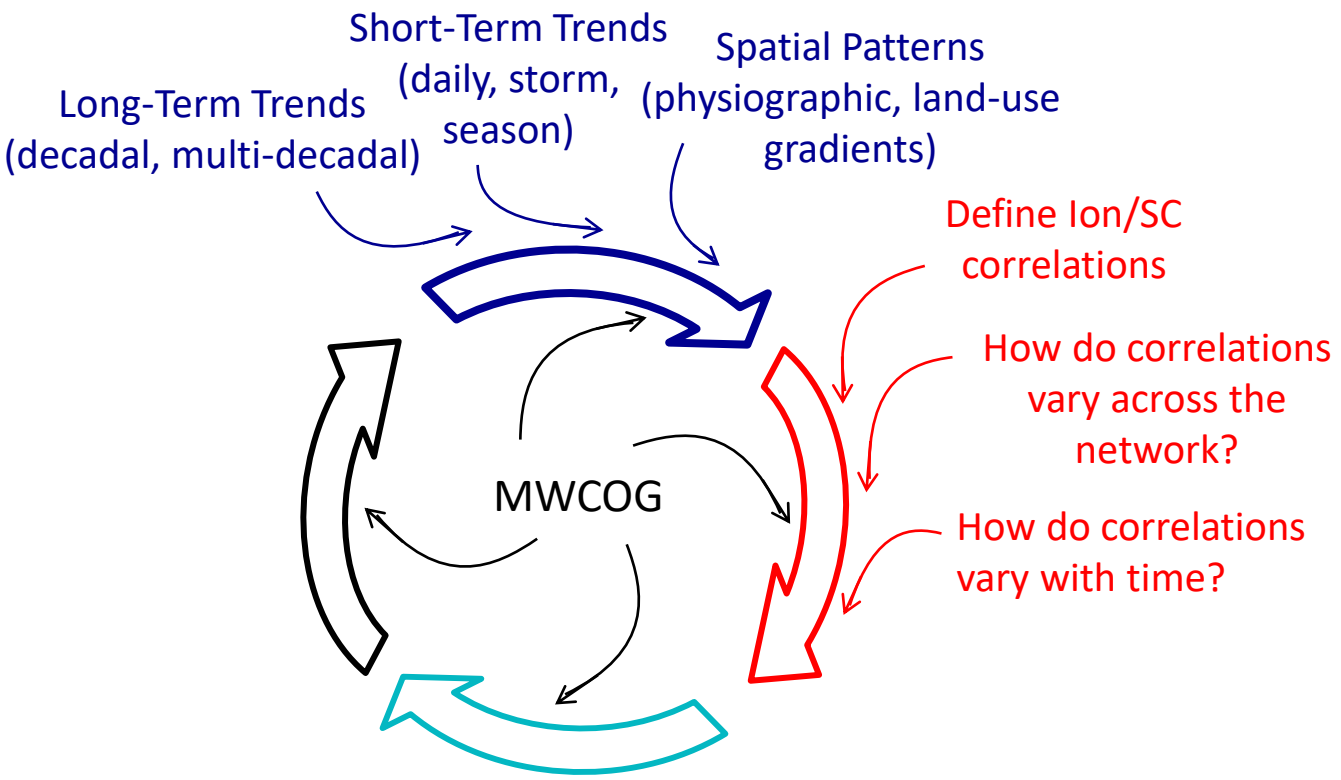

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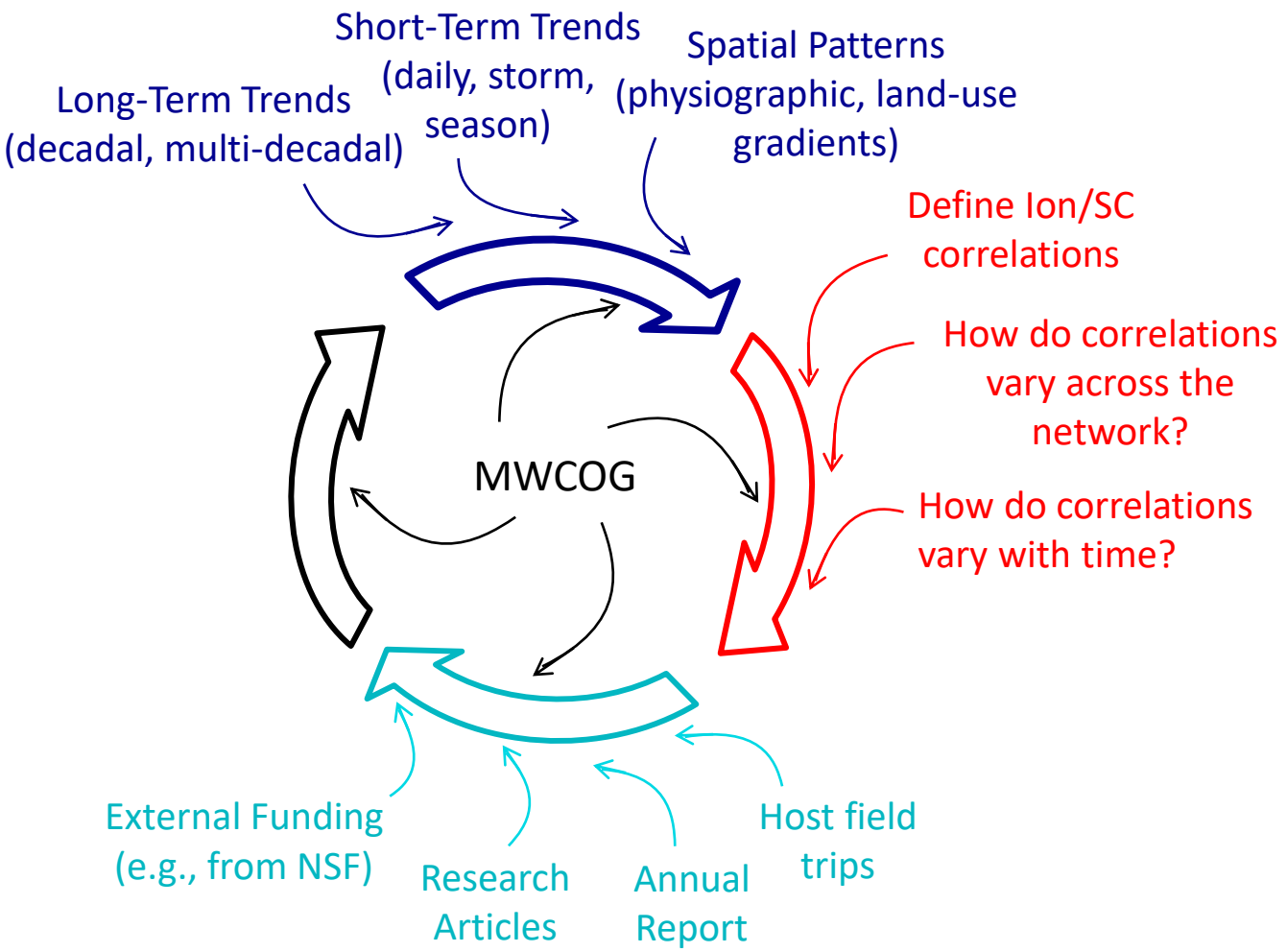

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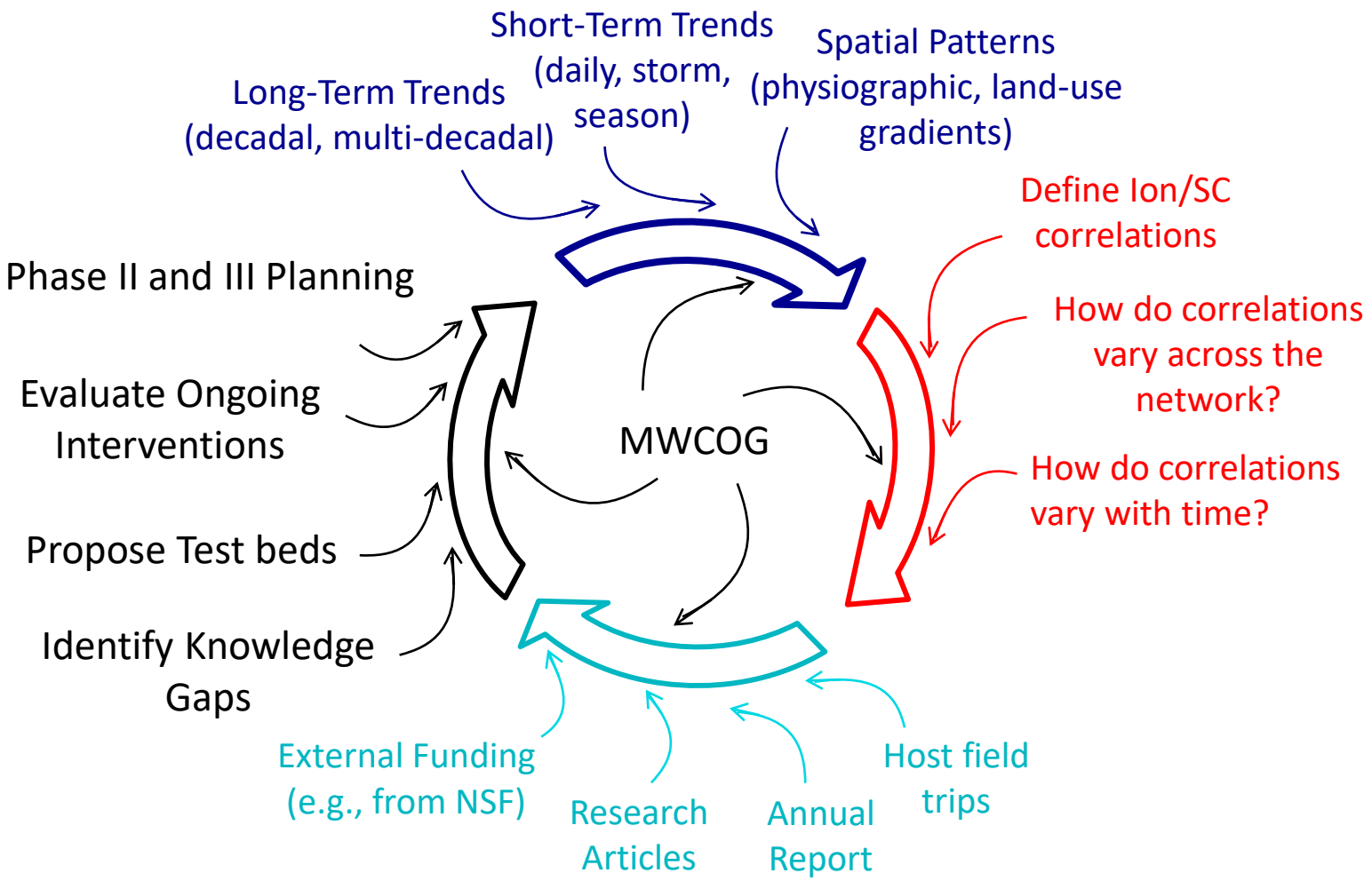

# Leveraging MWCOG Resources

- National Science Foundation “Convergence” Proposal on Facilitating Bottom-Up Solutions to the FSS ($3.6M over five years, under consideration)
- Water Research Foundation (Tailored Collaboration Program)
- Moon shots (e.g., NSF Engineering Research Center, $50M over 10 years)
- Stakeholder funded site-specific studies

# Next Steps

- Develop a process for identifying and funding additional COG-related projects (e.g., through a COG Technical Advisory Committee)
- Jump on potential funding opportunities, like the upcoming WRF Tailored Collaboration (pre-proposal due July 8, 2020)
  - One possible idea we are kicking around is working with a quarry on Cub Run in Fairfax County to investigate how quickly streams recover after a major salt source is removed