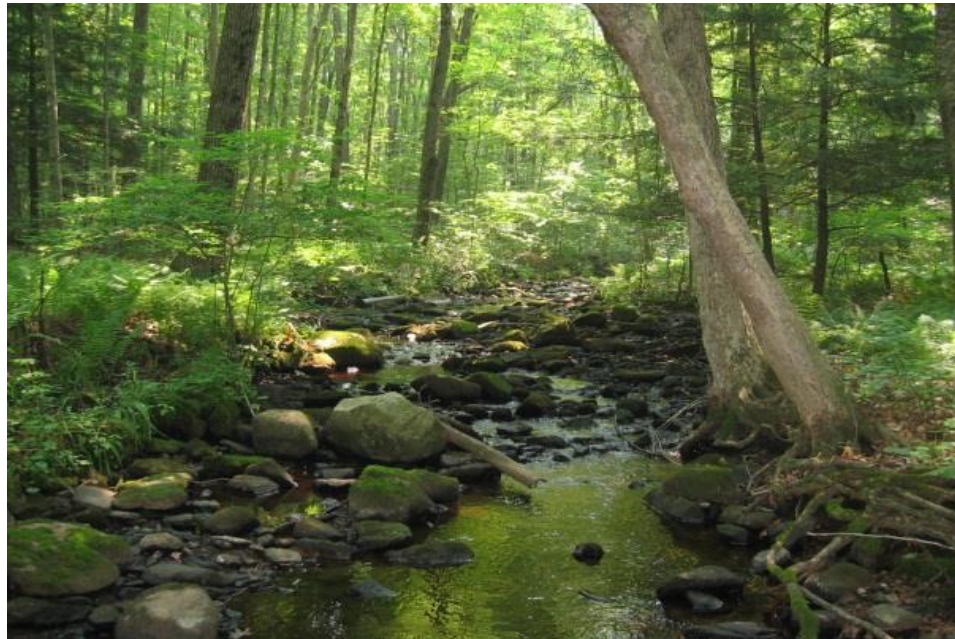


REGIONAL MONITORING NETWORKS FOR FRESHWATER WADEABLE STREAMS



The views expressed in this talk are those of the author and they do not necessarily reflect the views or policies of the U.S. Environmental Protection Agency

BACKGROUND

- EPA's Global Change Impacts and Adaptation Group (EPA Lead - Britta Bierwagen)
- Related work began in 2006
 - Conducted pilot studies to examine long-term climate-related trends in **macroinvertebrate** data from state biomonitoring programs in **Maine, North Carolina, Ohio and Utah**
 - **Lack of continuous temperature and flow data for minimally disturbed, unregulated freshwater wadeable streams** is an impediment to analyses of long-term trends in biological, thermal, and hydrologic data.



BACKGROUND

State biomonitoring programs in several regions have expressed an interest in incorporating **annual monitoring** at **targeted, minimally disturbed sites** into their existing programs

They are interested in **coordinating** these efforts at a **regional level** in order to pool resources and increase efficiency



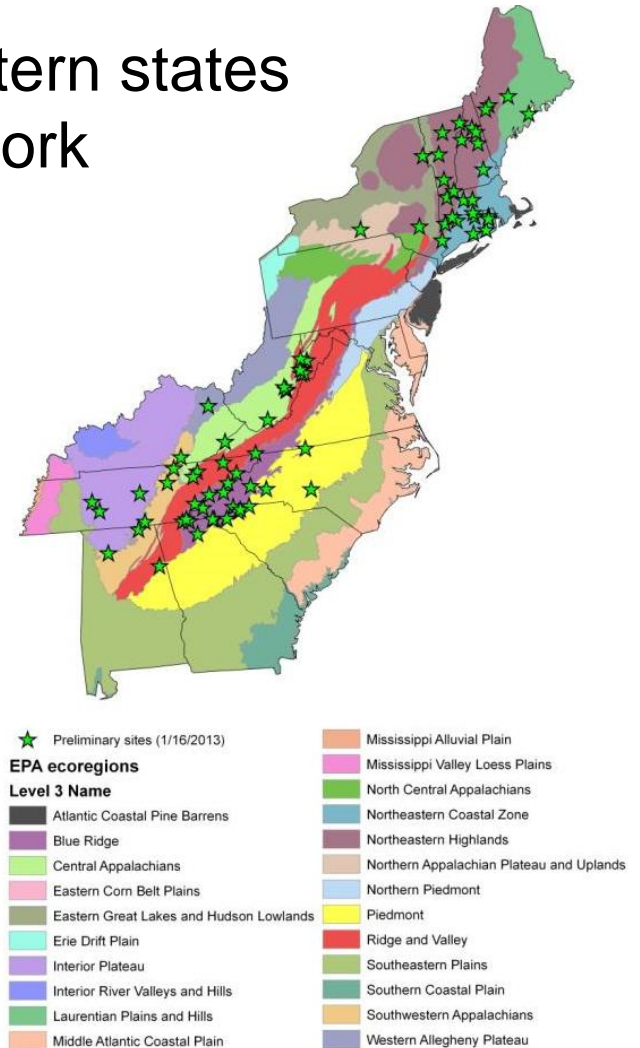
BACKGROUND

2012

EPA & Tetra Tech worked with Northeastern states on designing a regional monitoring network

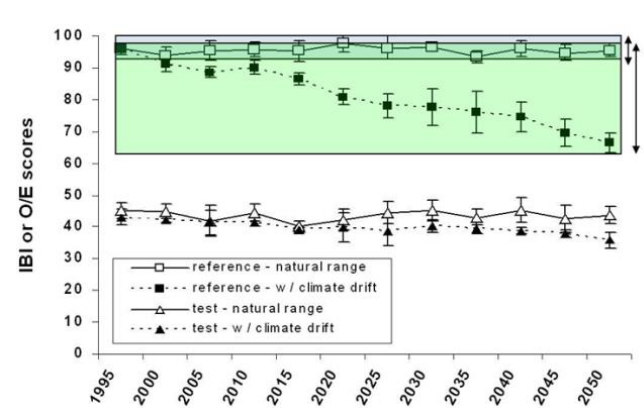
2013

- Providing technical support to Mid-Atlantic & Southeastern states
- Exploring strategies for assessing climate change vulnerability at national and regional scales



OBJECTIVES OF REGIONAL MONITORING NETWORKS

- Detect **climate change–related impacts** over the **long term**
- Further our **understanding of how biological, thermal and hydrologic conditions vary across sites and over time**, and how changes in temperature and hydrology **influence biological conditions**
- Inform state and federal agencies on how to **attribute altered environmental conditions to climate change versus other stressors**
- Relevant to efforts currently underway to set up a **National Network of Reference Watersheds and Monitoring Sites** for Freshwater Streams (NWQMC 2012)



OVERVIEW OF NETWORK DESIGNS BEING PROPOSED

- Current design recommendations call for the sampling of up to 5 targeted sites per state
- Samples will be taken from riffle habitats in medium-high gradient, forested freshwater wadeable streams
- Attempts will be made to collect continuous, year-round temperature and flow data and annual biological samples for multiple (10+) years at these sites



OVERVIEW OF NETWORK DESIGNS BEING PROPOSED

With limited resources, we recommend:

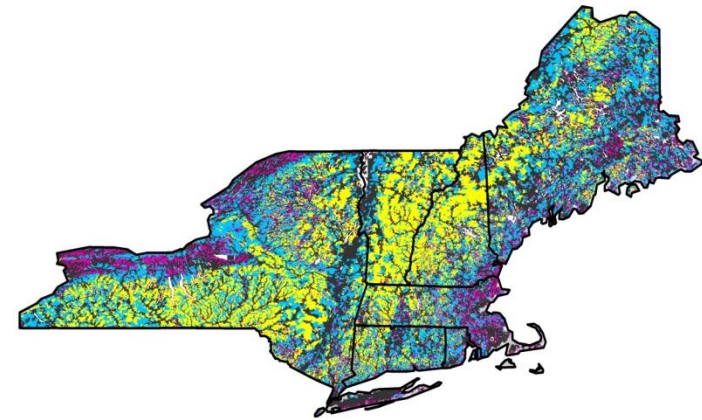
- Tie into routine monitoring efforts and existing resources as much as possible
- Target site selection based on scientific and practical considerations
 - prioritized based on input from state biomonitoring programs



SITE SELECTION

Northeast sites based on a mix of scientific and practical considerations, prioritized based on state input:

- Reference status (using standardized regional criteria)
- Class group: moderate-gradient, <100 km²
- Accessibility
- Location in relation to protected lands
- Spatial distribution
- Proximity to active USGS gages
- Composition of assemblage (i.e. presence of cold water taxa)
- Length of biological sampling record
- “Unique” characteristics (i.e. excluded sites with very low pH, lake influence)
- Location in relation to potential partners/collaborators



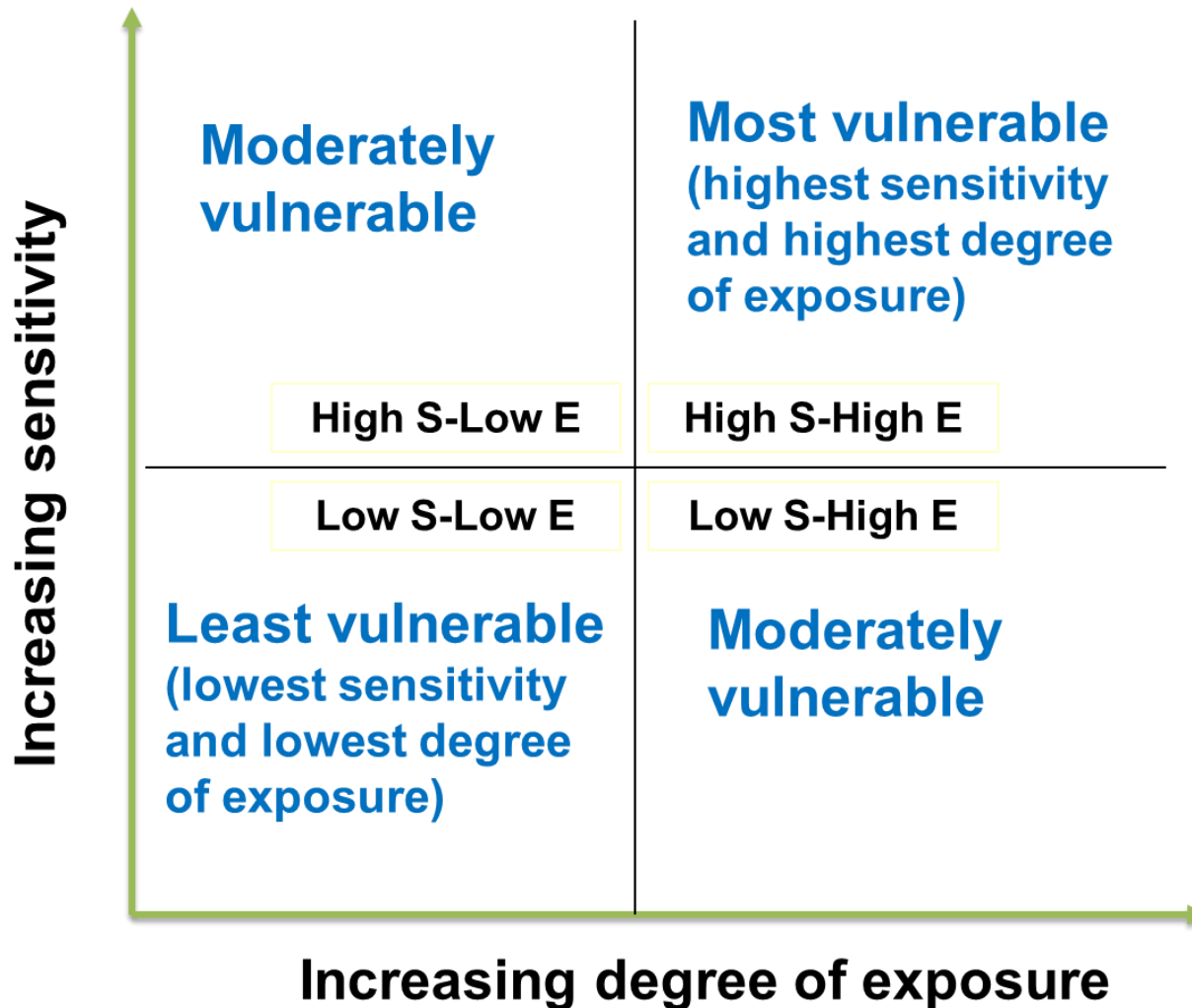
NHDPlus local catchments

Classification groups

- High gradient, drainage area < 100 km²
- Moderate gradient, drainage area < 100 km²
- Low gradient and/or drainage area >100 km² (except 'Others' listed below)
- Other (low gradient, <10 km²; high gradient, >100 km²)
- Size and slope data not available

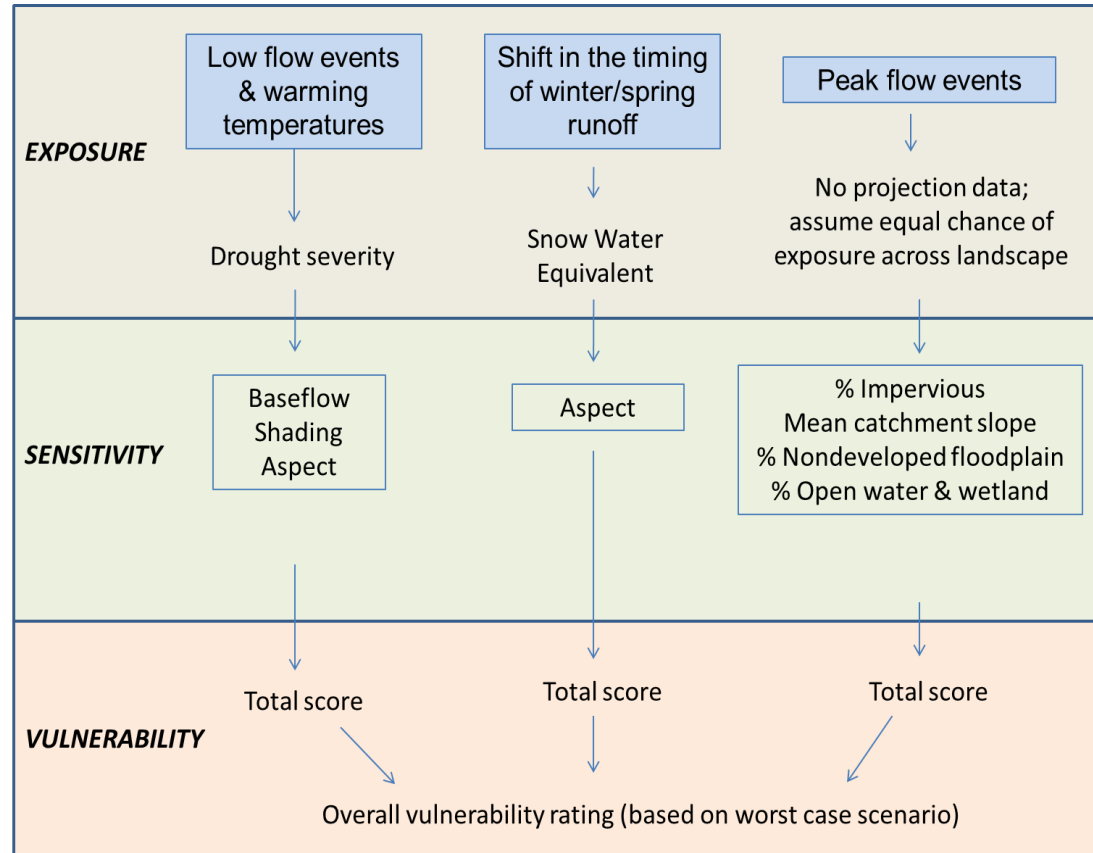
CLIMATE CHANGE VULNERABILITY ASSESSMENT

Local catchments sorted by degree of exposure to climatic change (E) X sensitivity (S)

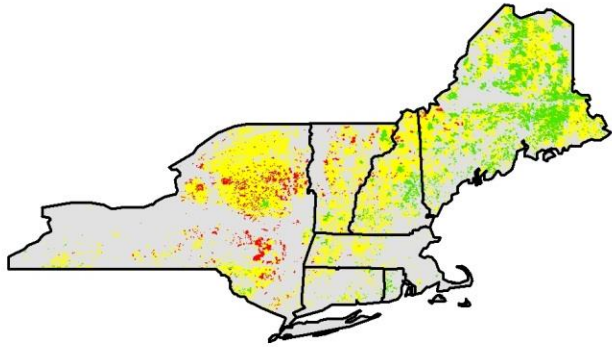


CLIMATE CHANGE VULNERABILITY - NATIONAL & REGIONAL PERSPECTIVES

Currently building/improving/expanding upon the vulnerability assessment that we did in the Northeast



CLIMATE CHANGE VULNERABILITY ASSESSMENT

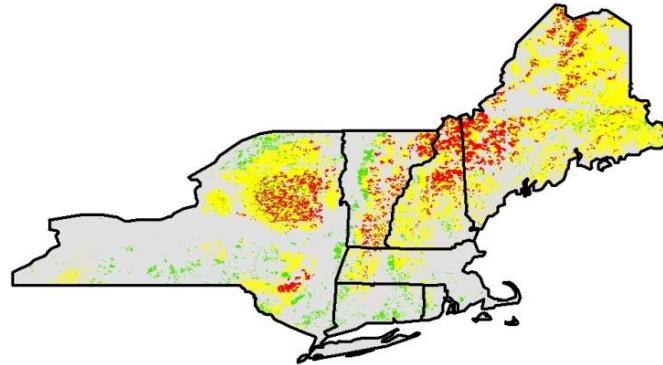


Reference catchments

Vulnerability to low flow events & warming temperatures

- Least
- Moderate
- Most

Non-reference catchments

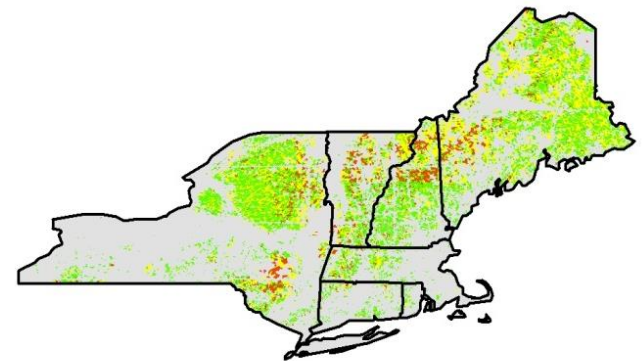


Reference catchments

Vulnerability to shift in timing of spring runoff

- Least
- Moderate
- Most

Non-reference catchments



Reference catchments

Vulnerability to peak flow events

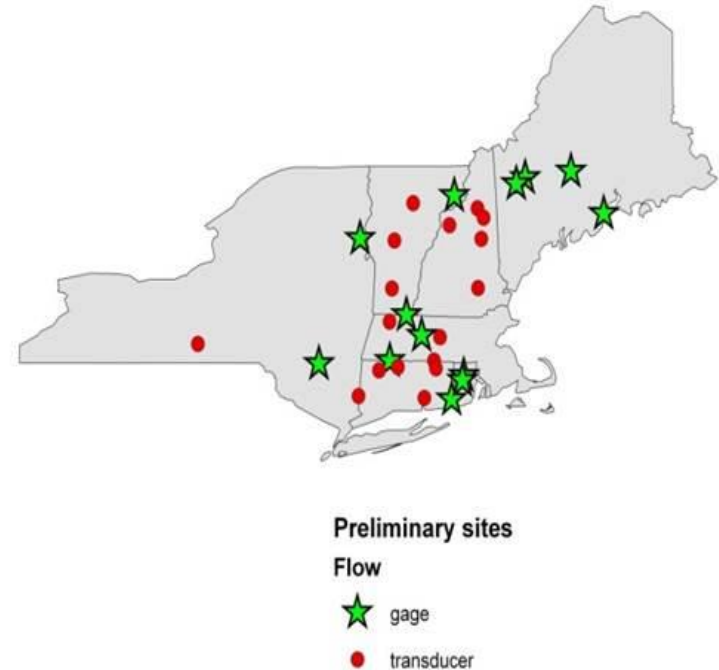
- Least
- Moderate
- Most

Non-reference catchments

STATUS UPDATE – NORTHEAST REGIONAL NETWORK

Biggest needs

- Funding to process and ID bug samples at a common lab
- Equipment - pressure transducers
- Guidance - installing and using pressure transducers
- Partners
 - Minimize # site visits (e.g., help with depth/stage readings)



INDICATORS TO TRACK OVER TIME

Biology

- Bugs (metrics, thermal indicator taxa)
- Fish (optional)
- Periphyton (optional)

Continuous water and air temperature

Continuous stage/depth (ideally translated into flow)



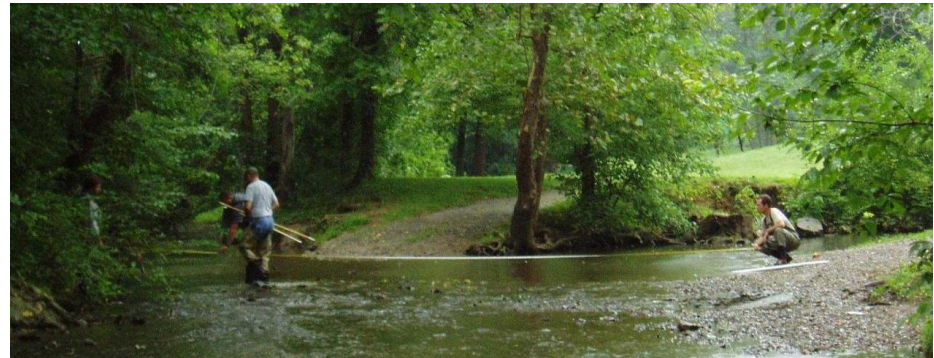
ALSO OF INTEREST, BUT LOWER PRIORITY

Habitat

- Geomorphologic - do the first year to establish a baseline, then as needed
- Aquatic and riparian habitat data
- Photo-documentation
- Catchment information (GIS-based, using exact watershed delineations)
- Land cover and impervious surface
- Historical land cover

Water chemistry:

- Specific conductance, nitrogen and phosphorus, other major ions
- Ideally collect multiple samples per year, during different flow conditions
- Ideally use standardized collection method and processing of samples at same laboratory



QUESTIONS? COMMENTS?



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