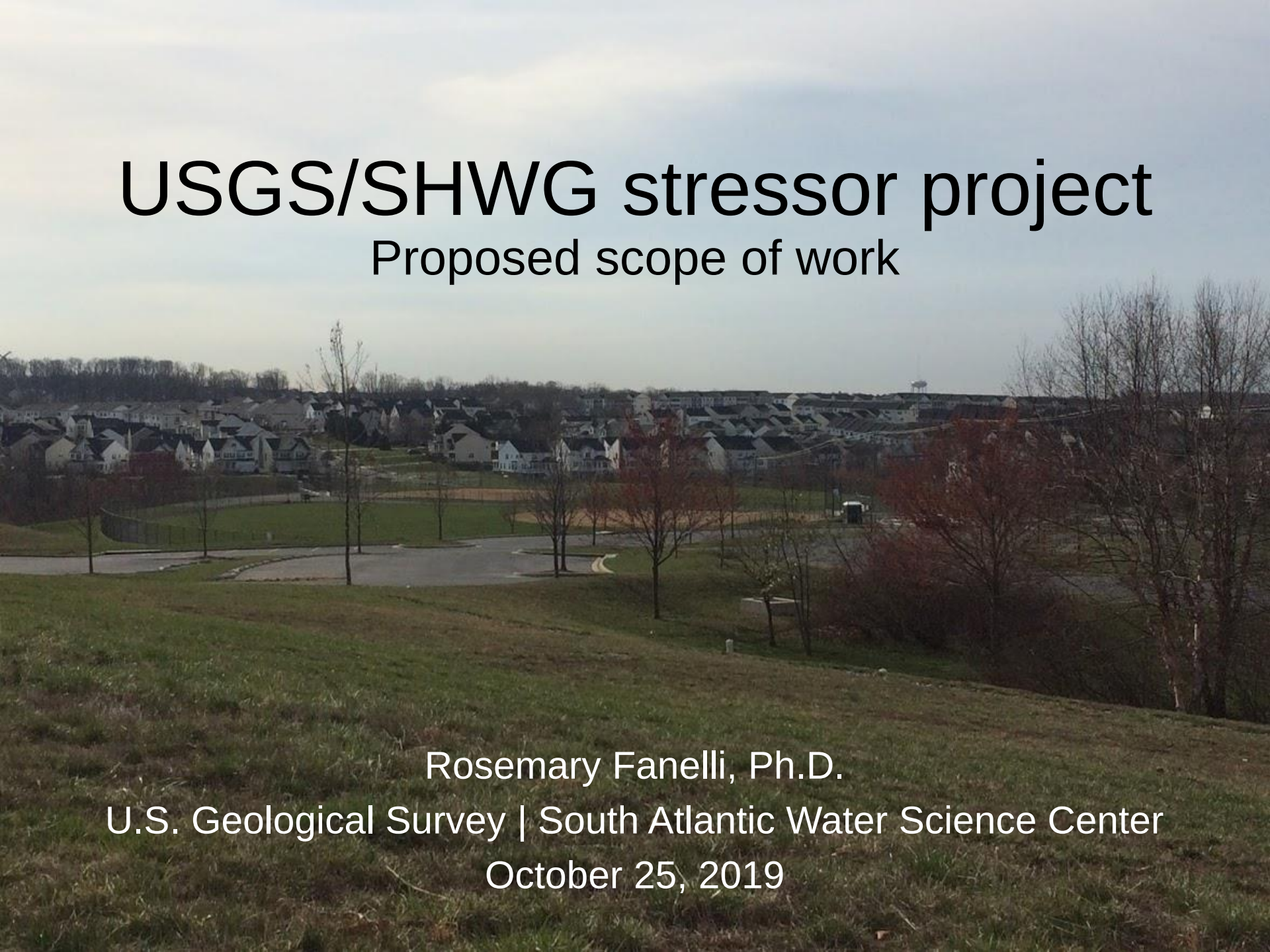
USGS/SHWG stressor project

Proposed scope of work



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U.S. Geological Survey | South Atlantic Water Science Center
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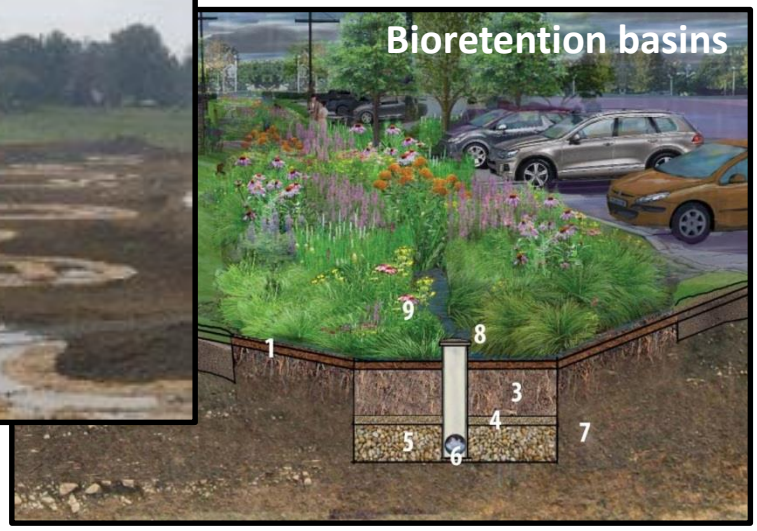
Motivation for stressor project

- Large financial investments in management practices
- Biological uplift often not observed despite watershed and stream restoration
- More information is needed to understand key stressors prohibiting biological uplift in streams



Primary science questions

1. Which stressors and drivers most affect stream health?
   - Stressors = water quality, toxic contaminants, habitat suitability, altered flow, temperature, etc.
   - Drivers = Climate change, land use change, land use legacies

2. Which of these stressors can be changed through management activities, especially those that align with practices associated with existing TMDLs/new WIPs?

3. How is stream health changing following management implementation, and how can we better characterize the response (biological and non-biological)?

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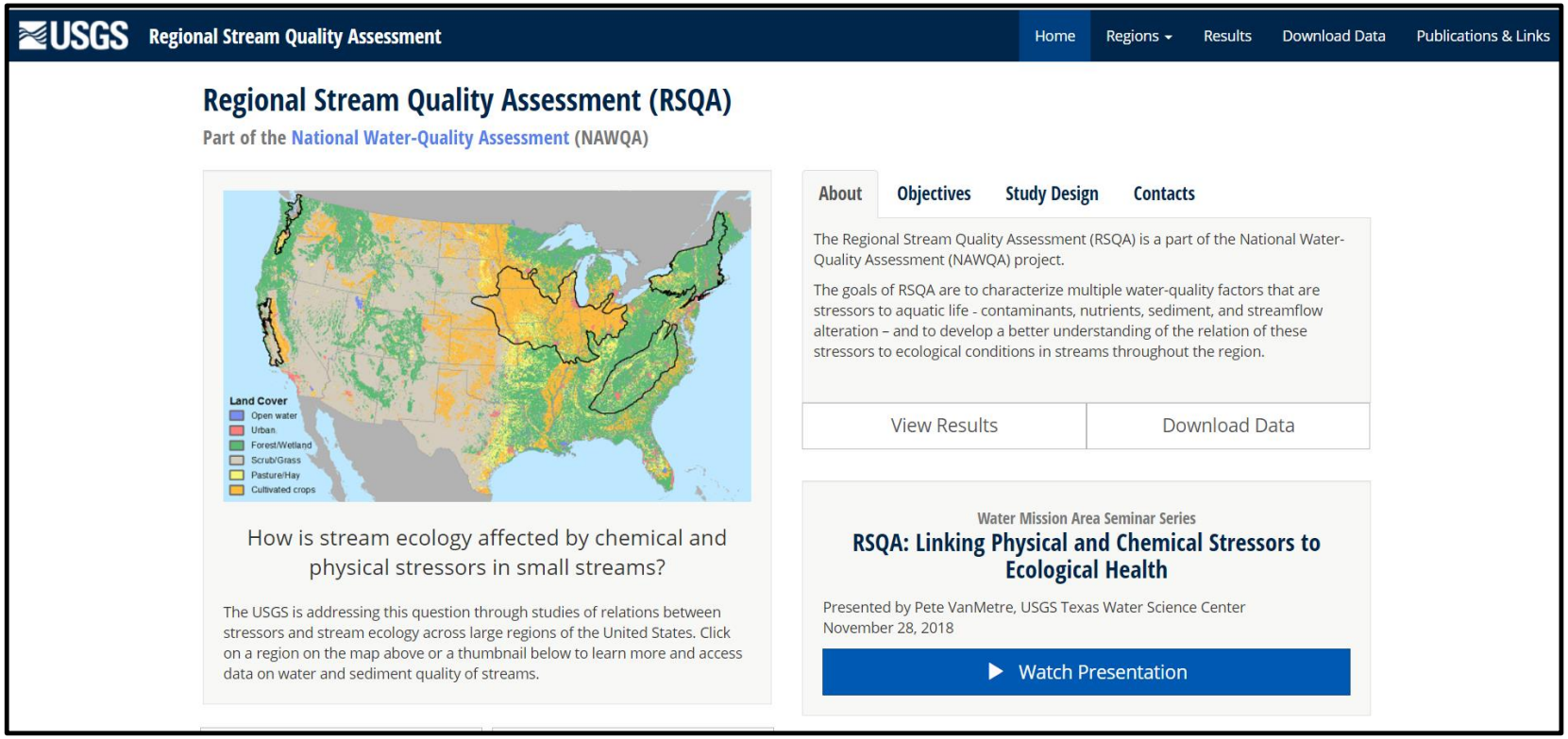
USGS research informing stressor study

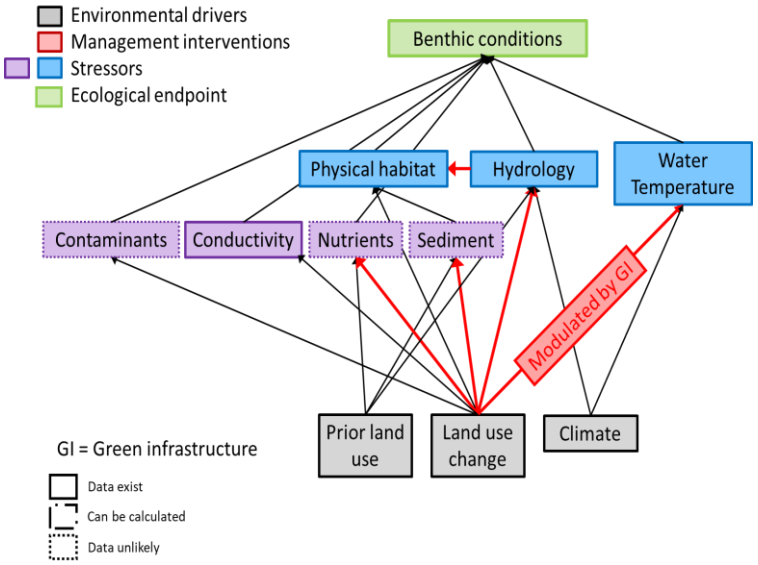
- Regional Stream Quality Assessment
- Five regions selected across the U.S. to determine primary stressors affecting biological conditions (fish, algae, macroinvertebrates)



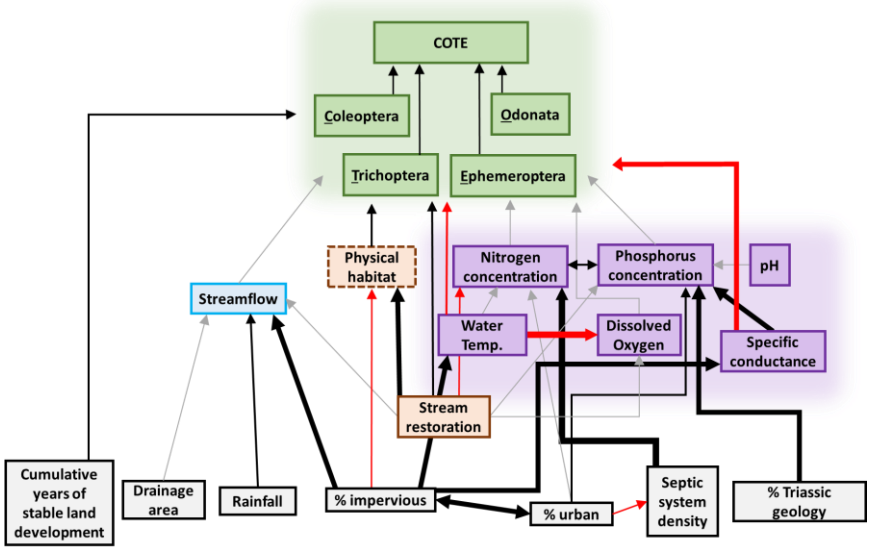
USGS research informing stressor study

- Regional BIBI modeling and forecasting (K. Maloney)
- Fairfax County water-quality and biological monitoring network (J. Webber, A Porter, J. Jastram)
- Montgomery County monitoring network (R. Fanelli, K. Hopkins, M. Cashman)

Montgomery Co., MD streams



Fairfax Co., VA streams



Proposed approach for Question #1

Question: *Which stressors are most affecting stream health* in the Chesapeake Bay watershed?*

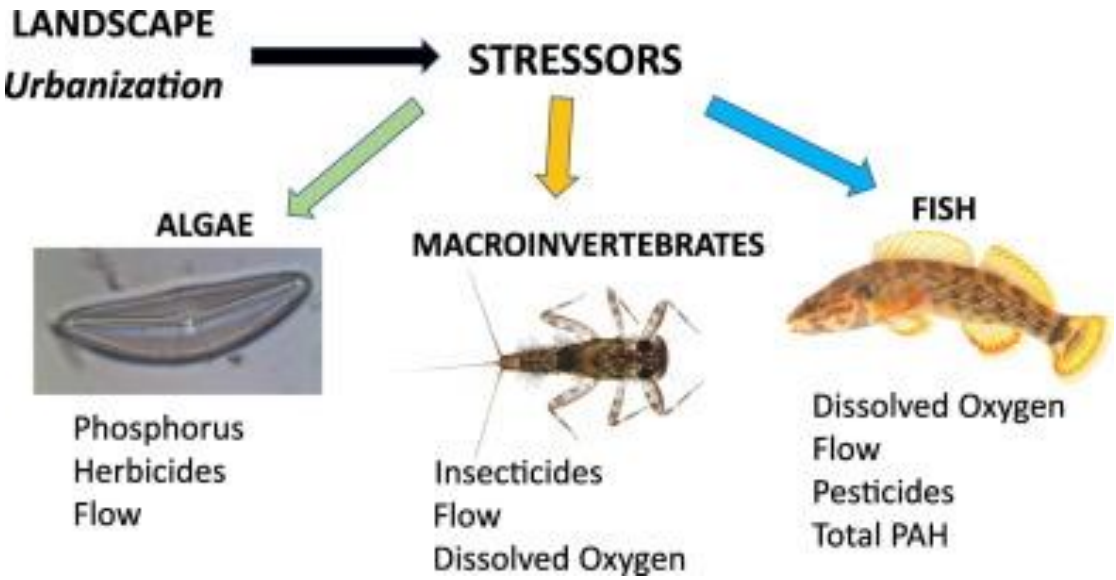
- Use existing information to summarize current understanding of the dominant stressors in specific landscape settings (agricultural, urban, mixed)
- Summarize two sources of stressor information
  - Scientific literature through a structured literature review
  - Summarize stressors identified as responsible for causing impairment of streams through jurisdictional 303d lists
- Synthesize results and communicate to SHWG and USGS science teams

Stream health = benthic IBI

Literature: Multiple stressor studies

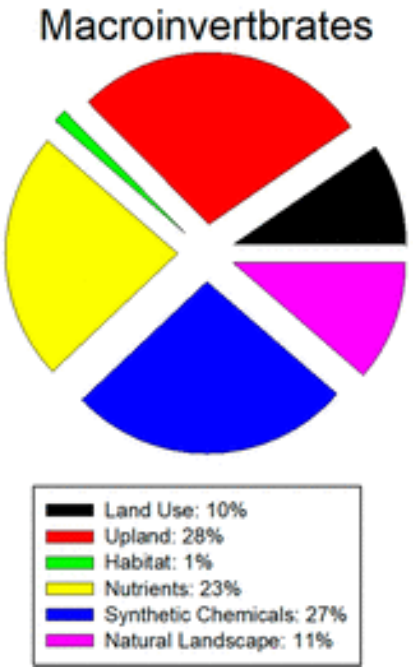
- Multiple stressors observed and ranked using statistical modeling/analyses
- May only address a single driver (land use or climate)

Urban landscapes



Waite et al. 2019 (STOTEN)

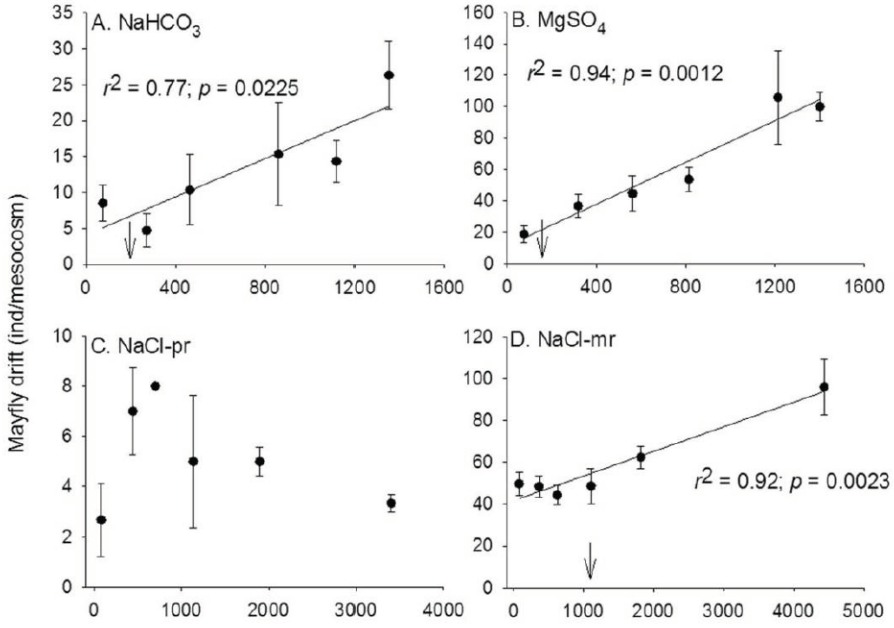
Agricultural landscapes



Schmidt et al. 2019 (ES&T)

Literature: Single stressor studies

- Identify thresholds above which biological impairment occurs for single stressors
- Compare effects of different drivers on single stressors



Clements and Kotalik 2016 (Freshwater Sci)

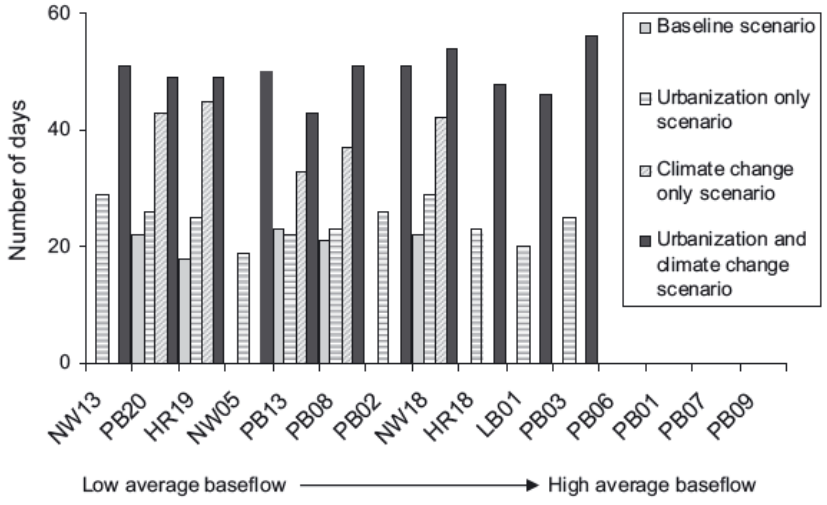


FIGURE 8. Number of Simulated Summer Days out of 10 Years on Which Temperature Exceeded 28°C Under Each of the Four Scenarios at Each Site.

Nelson and Palmer 2007 (JAWRA)

Summary of 303d listed stressors

- Biological stressors identified through procedures specific to each jurisdiction
  - Methods for identifying stressors vary from state to state (Griggs and Bucanan, 2012)
  - Unclear if a Bay-wide synthesis of the listed causes of impairment has been conducted
- Important source of information as literature is sparse and may not cover all settings in the watershed
- Provides more spatial coverage of watershed
- Need more information from SHWG

Expected results

- Summary document of stressors identified through scientific literature and jurisdiction stressor identification
  - Summarize by land use, physiographic region, jurisdiction, etc.
  - If additional data are available, more quantitative analyses of 303d stressor information could be conducted
- Discussion of **stressor associations** (flow and geomorphology, metals and conductivity, etc.)
- Preliminary discussions of **metrics** used to describe stream health/recovery
- Preliminary discussions of stressors/drivers that also affect **other CBP outcomes** (e.g., fish habitat, brook trout, fish passage)

Proposed team and timeline

- **USGS team**: Matt Cashman, Jennifer Rapp, Kelly Maloney, John Jastram, and Krissy Hopkins

Proposed timeline

October 2019: Present to SHWG for feedback

November 2019: Planning call with team to discuss approach, tasks for literature review; initiate 303d info gathering (SHWG)

December 2019: Establish tasks for literature review; continue 303d info gathering (SHWG)

January- February 2020: Conduct literature review

March 2020: synthesize literature review, identify gaps/needs

April 2020: Secondary literature review

May-December 2020: Incorporate SHWG 303d impairment summaries, report out to SHWG on preliminary findings

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Items for discussion

1. Mode of communication- What product would be most useful for communicating results?
2. Scope of assessment
    1. All waterbodies, small streams only?
    2. Benthic IBI as ecological endpoint
3. Compiling 303d listed impairments
    1. Ease of collecting information
    2. Availability of ancillary information
4. Others?