09.23.2020_STAC Cold Water Workshop Research Topics
Maryland Department of the Environment (MDE) Integrated Water Planning Program (IWPP)

1. The Maryland Department of the Environment (MDE) Integrated Water Planning Program (IWPP) remains interested in participating and/or helping to organize a temperature oriented STAC workshop. IWPP is nearing completion of the first Temperature TMDL in the State of Maryland and is also completing a draft of the first iteration of the TMDL's companion guidance document for Maryland jurisdictions. It is noteworthy that IWPP focused on loadings in TMDL development, which essentially dictate habitat suitability for designated uses. In the case of cold water in Maryland, this means TMDLs dictate loading as it relates to habitat suitability for brook trout, *Salvelinus fontinalis* (i.e. the designated use). Therefore, the research interests of IWPP are directly related to this concept.
2. IWPP thinks it is important to begin by asking natural resource management related questions to get a better idea of the goal of the STAC meeting.
    a. What is the resource the STAC workshop (e.g. what fish species) is trying to conserve through research?
    b. What is the workshop's focus, reducing temperature watershed wide or just high quality "areas" (i.e. specific spawning areas or refugia)?
    c. Is there a methodology that reconciles the feasibility of implementation and biological conditions?
    d. What is the base literature review that the STAC workshop will be using? Is there an annotated bibliography on the topic yet? Can the literature review be helpful for prioritizing a topic?
3. In the modeling analyses performed by IWPP, two BMPs have already been identified and factored into models that can mitigate thermal impairments, which are (1) riparian buffer restoration/reforestation, and (2) infiltration practices.
    a. What is the efficiency of these practices individually and combined? Of particular interest are SWM types, both traditional and innovative, that do not necessarily provide full infiltration, but are designed to provide cooling of heated runoff. These could include, but are not limited to, filtering practices of variable depths, wet detention facilities with a gravel lens, submerged gravel wetlands, etc.
    b. How does the quantification of operational performance of BMPs, locally and regionally, compare to model results?
    c. What will determine if jurisdictions are encouraged to implement both BMPs?
        i. Future data collection efforts will determine what jurisdictions are encouraged to implement. Current resources indicate that both riparian buffers and a reduction of heated SW runoff are needed to meet temperature endpoints. As the monitoring process continues to collect more data into the future, that data should be able to confirm, adjust, or provide more specifics regarding this breakdown.

    d. IWPP is currently relying on hydrologic models and available literature to answer questions related to BMP effectiveness and climate change. Applied research in these areas would allow IWPP to better calibrate existing and future hydrologic models used in TMDL development and to improve accounting tools utilized in implementation programs.

4. Groundwater withdrawals can significantly impact baseflow and the overall hydrology of a watershed. Acquiring a better understanding of the impact of water withdrawal on groundwater flow to streams is important to estimating the subsequent impact on stream temperature.
    a. What does the established literature say with regard to simulated withdrawals' impact on hydrology in different regions of the Chesapeake Bay?
    b. What cold water watersheds in the Chesapeake Bay Region have groundwater withdrawals that make up a significant portion of the water balance?
    c. What is a good land use surrogate metric to use when determining over allocations of groundwater
        i. What percent of a watershed has groundwater irrigated agriculture before temperature is impacted?
    d. Could the Phase 6 model be used to answer this question for Maryland? If we know the impact on groundwater recharge in the region due to withdrawals therefore we could simulate its effect on local temperature with the tools we already have.