Potential UM-SEAS Student Projects from Science Needs – 8/22/2024

Compiled by Alex Gunnerson, August Goldfischer, and Breck Sullivan

This document outlines science needs identified in the Strategic Science and Research Framework that may be a good fit for projects with Masters’ students from the University of Michigan School for Environment and Sustainability. UM-SEAS Master’s Projects are applied research projects for client organizations addressing a sustainability research need or related problem, over a one-and-a-half-year timeframe, with teams of approximately five graduate students spanning multiple disciplines of study within the SEAS master’s degree program. Teams receive back-end support through a UM-SEAS faculty advisor while working directly with client organizations.

The science needs are organized by outcome and include relevant comments. To learn more about the details of each science need, visit [the Science Needs Database here](https://star.chesapeakebay.net/), click on the “Science Needs” tab, filter by Primary Outcome, and then click on “Detail” for that specific need.

Blue Crab Management Outcome - No science needs are listed in the database for this outcome.

Blue Crab Abundance Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=28): Gauging public perceptions and commercial fishery stakeholder views on key Bay resources
  + Comment: A student could conduct a literature review and research how other estuaries & regional programs have gauged the public & industry perceptions. This could build foundational knowledge for conducting outreach or more formal surveys of public opinion later down the line, potentially through a GIT Funding project or other funding opportunity.
  + Note: this need also applies to the Oyster Outcome

Oyster Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=29): To explain to the public/justify costs of oyster reef restoration and explain their ecosystem services. Need to synthesize existing results and determine gaps in implementing oysters as a BMP.
  + Comment: A potential final deliverable might be a report synthesizing previous research on the ecosystem services provided by Oysters and/or an infographic explaining the ecosystem services oysters provide.

Forage Fish Outcome

* No identified science needs that seem to fit within the scope of a project.

Fish Habitat Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=3): Regional Fish Habitat Assessment, Parts 3-5: 3. pilot fish habitat assessment; 4. conduct watershed regional assessment; 5. ID/develop spatial tools useful to partners
  + Comment: A student could support the ongoing work at USGS and NOAA in steps 3 & 4. Potentially the student could help develop the geospatial tool in step 5 if the project reaches that stage.
* Develop social engineering strategy to change hearts and minds around fish passage, including additional incentives for dam owners.

Wetlands Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=190): Coordinate with Black Duck and Fish Habitat Action Teams to identify wetland areas that are suitable black duck and fish habitat and would be ideal for restoration.
  + Comment: A student might give the understaffed Habitat GIT some assistance by utilizing existing targeting tools to identify areas where all three overlap, tie in the lessons learned from the Wetlands Workshop, and produce a story map to communicate the findings.
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=196): Evaluate how to assess water storage opportunities for existing and future restoration opportunities.
  + Comment: A student could conduct a literature review to support any future original research on this topic.

Black Duck Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=199): A better understanding of mallard/black duck hybridization on resident birds.
  + Comment: A student could conduct a literature review to support any future original research on this topic.
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=200): A better understanding of heavy metal/pollutant uptake by black ducks (and/or all ducks).
  + Comment: A student could conduct a literature review to support any future original research on this topic.

Stream Health Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=219): Determine the effects of climate change on stream processes.
  + Comment: A student could conduct a literature review to support any future original research on this topic.

Brook Trout Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=41): Investigate applicability of eDNA to brook trout.
  + Comment: A student could conduct a literature review to support the pilot study.
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=222): Determine how interactions between climate change and land use will affect brook trout.
  + Comment: A student could do a research project utilizing geospatial tools and data provided by the Bay Program to examine correlations between brook trout habitat and climate & land use change data.

Fish Passage Outcome - No identified science needs that seem to fit within the scope of a project.

Submerged Aquatic Vegetation Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=44): Assess integrated impacts of shallow water uses (e.g. living shorelines, aquaculture, clamming, shoreline structures) on SAV habitat
  + Comment: This would be a mapping exercise that uses SAV data, aquaculture lease data, and bathymetry data to determine the potential for SAV-goal attainment in areas with current and expanding aquaculture industries.
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=13): Compare the ecosystem services of Ruppia maritima and Zostera marina and determine if a shift from Zm to Rm dominance in the polyhaline will impact fisheries such as blue crabs.
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=43): Determine the impact of the expanding aquaculture industry on SAV habitat and our ability to reach segment-specific and Bay-wide SAV restoration targets.
  + Comment: In situ and/or GIS assessment of aquaculture impact on SAV. One aspect could be a mapping exercise that uses SAV data, aquaculture lease data, and bathymetry data to determine the potential for SAV-goal attainment in areas with current and expanding aquaculture industries. Aquaculture impacts to SAV are being assessed but goal attainment potential in areas of aquaculture use is not being assessed.

Forest Buffer Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=183): Develop tailored buffer outreach materials for farmers and non-farmers, reflecting different motivations and benefits that can be derived from buffers.
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=178): Exploring restoration systems, effectiveness, and plant species. What kinds of forests are we trying to create? Are we planting the right trees and shrubs to ensure the highest success rates?
  + Comment: Literature review/professional conversations. How can we utilize ground coverings such as cover crops and green mulch to help stabilize erosion and combat invasive plant species? Does natural regeneration take longer to be effective?
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=179): Identify agricultural landowners who have the greatest amount of bufferable acreage to target for buffer outreach.
  + Comment: Potential GIS Project? Is the group already working with NRCS?
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=98): Monitor forest and tree cover change in developed areas using hi-rez data
  + Comment: Does this need more engaged resources?

Tree Canopy Outcome

2025 WIPs

Toxic Contaminants Research and Toxic Contaminants Policy and Prevention Outcomes

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=56): Generate further information on mercury in the watershed (water, sediment, fish tissue).
  + Comment: story map updates
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=59): Document occurrence, concentrations, and sources of legacy and widespread contaminants in different landscape settings
  + Comment: Utilize DRBC databases of 1668 PCB data and PCB-era and current land use to develop a statistical model to identify patterns in PCBs related to current/former land use categories
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=55): Improved understanding of BMP effectiveness for removal of PCBs
  + Comment: Summary science document from January national PCB strategy meeting; ongoing literature tracking of BMP removal efficiencies
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=54): Improve understanding of PCB sources and fate in the environment to better inform PCB mitigation
  + Comment: Tracking new TMDLs, implementation of existing TMDLs, and alternative approaches (e.g., and science used to move toward compliance (round table, status document)); literature review to assess need for further study of PCBs in environment from biosolids

Healthy Watersheds Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=100): Develop and apply tools or methods that integrate various inputs to characterize watershed vulnerability to future high-level risks including development and climate related stressors
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=263): User Experience and Research/Synthesis and Communication
  + Comment: Understanding end user needs (of different stakeholder audiences); improvements to data and communication to meet local needs; communication, translation of technical information, pathways and trusted sources to share information, how to effectively engage locals directly.
* Need: DEIJ, Public Health, and Communities Understanding of relationships and intersections of data between healthy waters and watersheds and at risk and underserved communities.
  + Comment: Metrics like percent tree canopy, percent impervious cover; need to assess disproportionate impact of land use change over time in underserved communities and incorporate public health considerations. Investigate determine how best to incorporate DEIJ considerations into our CHWA framework.

Stewardship Outcome

* Need: 2022 Stewardship behavior data assimilation into chesapeakebehaviorchange.org.
  + Comment: OpinionWorks is collecting the data, but are they comparing it too? Intern could compare data and create code on how to display it on website.

Local Leadership Outcome - No science needs are listed in the database for this outcome.

* Comment: Do you need any support with creating/finalizing the new indicator?

Diversity Outcome

* Need: Develop a better understanding of effects from external factors such as climate change, public health, and economic inequity.
  + Comment: Initial literature review could help narrow down the focus of this science need

Protected Lands Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=124): Develop additional health criteria via a study synthesis and document those values as key inputs to conservation planning and implementation.
  + A project could focus on a specific region.
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=126): Review of forest definitions and high-resolution mapping products
  + A review and planning a session to explore this; a student could do a review and convene a short workshop.
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=260): Synthesis of Science around conserving 50% of land by 2050
  + This is another very broad topic but there could be a project within it.

Land Use Methods and Metrics Development Outcome, Land Use Options Evaluation Outcome -

* There is a need to better understand the incentives structures around land use planning and how to support local government planning. Students can conduct case studies with 3 local governments from around the watershed (maybe one in PA, one in MD and one in VA)? The student group could interview each local government and relevant state partners, review existing land use planning documents, connect them with CBP tools/data etc. The final product could be three local government land use case studies and then a series of recommendations on how to best engage with this audience (given the unique landscape in each state).

Student Outcome - No science needs suitable

Sustainable Schools Outcome - No science needs suitable

Environmental Literacy Planning Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=268)
  + A student could potentially work with the Workforce Action Team on anything not covered by the GIT funded project.

Climate Monitoring and Assessment Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=242): Establishment of an Ocean Acidification Monitoring Network
  + A student could convene OA subgroup meetings and do the initial coordination to get it off the ground. They could also do a comparison of the existing OA monitoring plans that are already in place in some states. Another project could be working with the experts to start developing a plan for what an ideal sentinel monitoring for OA would look like, and/or outlining a communication strategy around OA.

Climate Adaptation Outcome

* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=139): Better understanding of green infrastructure (e.g., living shorelines) performance in building resilience to climate change impacts, cost-effectiveness of these strategies, and potential unintended consequences to other restoration metrics (e.g., sediment dynamics).
  + Maybe there is a smaller chunk of this that can be a project.
* [Need:](https://star.chesapeakebay.net/Need/NeedDetail?needID=208) Saltwater inundation impacts on wetland habitats (e.g., brackish waters), SAV, and land use (e.g., ag, forest).
  + This science need was brought forward due to MD’s Salt Intrusion Plan - Maybe they have an action item that could be a student project
* [Need](https://star.chesapeakebay.net/Need/NeedDetail?needID=207): Evaluation of science needs to implement blue carbon financing strategies
  + background/literature review to identify science and monitoring needs