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Hudson River Estuary Program
DRAFT Water Research and Outreach Agenda
Last Updated December 1, 2021

This does not represent an official state document. The research and outreach goals outlined in this draft document are still in progress and are subject to change.

Theme A. Water Quality

Water Quality Monitoring, Assessment, and Stewardship

1. Research and identify waterbodies for future monitoring and assessment.

2. Establish connections with data collected and surrounding land use.

3. Identify ways to incorporate water quality data and information into local land use decision making processes and policies.

4. Research linkages between water quality data and results and opportunities for strategically located and designed best management practices and wastewater infrastructure improvements.

5. Assist in refining a healthy watersheds model to identify healthy streams and rivers worthy of protection, beyond the use of traditional water quality data as the metric.

6. Use biological monitoring data, such as DEC’s macroinvertebrate data through the Rotating Intensive Basin Studies (RIBS) to understand trends in water quality and focusing on stream health needs.

7. Develop pollutant transport and dispersal models, either through Hudson River Environmental Conditions Observation System (HRECOS) or other water data, to assist communities reliant on Hudson River drinking water supplies to predict water quality conditions and manage their operations according.

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- 8.** Research how to best to utilize citizen science water quality data as a screening step to identify areas where on-water recreational activities may be occurring, and additional quality/certified monitoring is needed to protect public health.

 - 9.** Research the need and/or feasibility of restocking or relocating freshwater mussels, similar to oysters, to restore mussel populations in historic tributary locations where their populations are in decline or extirpated.

 - 10.** Synthesize existing research on microplastic prevalence in the Hudson River Estuary ecosystem.

 - 11.** Research the risks associated with microplastics to fish and tidal water aquatic life in the Hudson Estuary, through a consideration of plastics in the water column, aquatic habitats, and biological communities.

 - 12.** Research waste reduction or pollution avoidance solutions that the waste management industry could develop to educate people and manufacturers about plastic and other pollution reduction options.

 - 13.** Investigate opportunities to effectively use the Hudson River Environmental Conditions Observation System (HRECOS) to communicate other ecosystem information (e.g., menhaden fish kills) at public locations along the Hudson River.

 - 14.** Design outreach materials to inform local partners of water quality monitoring data and opportunities to implement local management, policy and land use strategies.

 - 15.** Highlight healthy streams and rivers to promote for protection through outreach and local strategies.

 - 16.** Assist in characterizing watershed conditions, natural resources, water quality, etc. to advance stewardship and watershed planning.

 - 17.** Evaluate ambient water quality in EJ and disadvantaged communities to determine if there are differences, discrepancies data availability, or trends in non-EJ vs. EJ communities.
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Theme B. Watershed Management

Restoring Aquatic Connectivity in the Hudson River Watershed

1. Develop landscape architectural post dam removal visualizations, renderings, and drawings to allow public and dam owners to understand the potential river corridor conditions after removal.

2. Monitor pre and post dam removal biological, physical, and corridor conditions to evaluate project effectiveness. This might include water quality and fish communities using environmental DNA or electro-shocking.

3. Develop a multi-objective optimization tool for stream barrier removal (e.g. minimize cost, minimize social barriers to removal, minimize natural barriers, maximize restored river miles, etc.).

4. Use LiDAR, programming and crowd-sourcing to identify un-inventoried dams across the Hudson River Estuary. The script could also be adapted to rank all Hudson River tributaries according to a passability index (both natural and man-made barriers). This will help prioritize streams/barriers according to restoration potential.

5. Develop social surveys and focus groups to characterize perceptions of dams, impoundments and dam removal in the Estuary. Evaluate public knowledge, information sources, and possible communication strategies for positive messaging on dam removal.

6. Incorporate road condition data into the Cornell culvert model to identify synergies between road maintenance priorities and fish passage priorities (i.e., piggyback culvert replacement for aquatic organisms passage off of existing road maintenance priorities).

7. Install automated fish counters in culverts to assess effectiveness of fish passage efforts. This might entail monitoring fish passage pre/post right-sizing or comparing passage rates across a gradient of barrier ratings (insignificant-severe).

8. Adapt the Cornell culvert model to estimate culvert velocities across a range of flows to assess aquatic organism passage in the context of their swimming ability.

9. Adapt the R package SHADIA, which has been used to model the cumulative effect of dams on shad populations in the Connecticut River, for other species (like eel) and/or just apply to the Hudson.

10. Research connections between dams, their impoundments and opportunities they provide to both inhibit and foster invasive plant and animal species movement and occupation, such as carp, snakehead, water chestnut, phragmites, or knotweed.

11. Research connections between tributaries and the Hudson to better understand the impacts and stressors originating from tributaries and the watershed, and estuary-watershed connections, including the sources pollutants, such as sediment, water chemistry (especially nutrients to help inform Harmful Algal Blooms work or even contaminants (to identify major contributing upland/shoreline sites.

12. Create and deliver presentations and workshops for the general public, watershed groups, and municipalities. Produce factsheets and short videos to disseminate information on the benefits of stream barrier mitigation and to highlight success stories.

13. Create press releases through local media outlets, trade publications and social media to disseminate information on the benefits of stream barrier mitigation and to highlight success stories.

14. Evaluate vulnerabilities and risks from dam failures to downstream disadvantaged and environmental justice communities.

15. Evaluate municipal financial cost benefit analysis of repairing vs. removing dams to taxpayers, and, in particular, disadvantaged lower income communities who may not have equal access to impoundments.

Watershed Planning and Management

16. Analyze traits of effective local watershed groups, as well as outline strategies for their success. Identify challenges and solutions encountered by said groups.

17. Assess how watershed outreach and support correlates with stream water quality and determine if watershed outreach and stewardship lead to improved water quality.

18. On a tributary scale, identify reasonable and technically feasible approaches that stakeholders may use to monitor pollutants and determine pollution sources.

19. Refine partnerships and approaches to incorporate watershed planning and implementation into local, and municipal land use decision making.

20. Refine, develop, and apply multi-metric approaches to identifying healthy streams and watersheds, using existing field and remotely sensed data to highlight waters that

warrant watershed protection measures. Develop approaches to incorporate scenery and their community value into watershed characterizations and planning, while also incorporating watershed and water resource data and messages into community-based scenic resource inventories and plans.

21. Produce outreach materials on watershed planning for municipalities and watershed groups.

22. Package research findings on source tracking for sewage pollution into outreach product to help groups identify potential options and next steps.

Riparian Buffer Revegetation

23. Better quantify/define which conditions on individual riparian planting sites indicate “effectiveness” for water quality, quantity and/or habitat (at 5 years, 10 years, 20 years). Create simple protocol that can be followed by interns or local partners.

24. Assess the community or organization benefits of participation with the Trees for Tribs program (Continuation of the type of work started by Anne Armstrong – https://wri.cals.cornell.edu/sites/wri.cals.cornell.edu/files/shared/documents/Armstrong_etal_2013.pdf). Develop further research into partner motivations and project maintenance to maximize conservation benefit.

25. Prioritize riparian planting and protection location to get the most bang for our buck. Guidance that regional or state staff can use as well as a simplified version that we can share with regional and municipal partners for local planning. This could include guidance for using and improving Statewide Riparian Opportunity Assessment tool (<http://www.nynhp.org/treesfortribsny>) for local planning.

26. Understanding the best long-term maintenance so that planted and/or protected riparian buffers can continue to provide the functions of healthy riparian areas. This might include best management practices in response to threats (e.g. deer, beaver, invasive pests that kill trees).

27. Evaluate methods and approaches to assess the success and progress of riparian restoration. In particular, the presentation of the Hudson River Estuary Program’s Trees for Tribs in the “State of the Hudson.” https://www.hudsonriver.org/wp-content/uploads/2021/03/HREP_SOH_Final_12-2020.pdf.

28. Produce outreach products for Landowners/TFT applicants, municipalities, and regional planning partner, including a short pamphlet on streamside living (do’s and don’ts) and fact sheets on the importance of protecting & restoring riparian buffers and floodplains.

29. Develop maintenance guides to common issues faced during establishment (in addition to existing general guidance).

30. Produce guidance for watershed groups, municipalities and regional planners to prioritize areas for restoration and protection.

31. Reach out to partners/projects that are already working with DEI/EJ communities to find planting project/collaboration opportunities.

32. Continue to pursue partnerships with Center for Native Peoples and the Environment or other similar groups.

Theme C. Climate Change and Resilience

1. Research whether disadvantaged or potential environmental justice communities are at higher risk of contaminated drinking water than non-disadvantaged communities.

2. Determine specific locations for strategic investments in water supply or wastewater infrastructure that could benefit disadvantaged communities.

3. Research the interactions of stormwater, climate change, watershed management and environmental justice to lead to specific stormwater treatment and flood mitigation actions and tools at the local level.

Climate-adaptive Communities

4. Determine the physical and planning solutions for integrating marsh migration into urban waterfronts (e.g., innovative zoning, adaptive uses, Transfer of Development Rights).

5. Evaluate options for rail elevation strategies and how they would impact urban waterfronts.

6. Assess impacts of future transportation systems (e.g., driverless cars, high speed rail) on the urban waterfront environment.

7. Assess options for adapting brownfield and landfill areas and their regulatory considerations.

8. Evaluate how wetland planting strategies can address sea-level rise and long-term resilience (building off of Graham Harlan’s research).

9. Develop innovative strategies to engage stakeholders around difficult conversations about adapting their homes and communities that we can support in Hudson riverfront communities.

10. Increase public awareness and support for climate resilient projects.

11. Scale up local government climate vulnerability assessments for the Hudson Valley region.

12. Determine public and private financing mechanisms for adaptation at the parcel and waterfront scales. Research what market and policy solutions could be used to incentivize developers to build more climate resilient projects (e.g., consider and respond to sea-level rise and flooding projections in waterfront development).

13. Assess innovative strategies to engage stakeholders around difficult conversations about adapting their homes and communities that we can support in Hudson riverfront communities.

14. Evaluate the perception, understanding and interest of climate justice and social equity across planners working in the Hudson Valley region.

15. Research the specific areas of overlap and potential collaboration between the housing sector (esp. affordable housing) and climate adaptation.

16. Find or develop a model for zoning and building code that addresses climate change, marsh migration, public access, natural resilience, and other adaptation and resilience goals in an integrated way.

17. Measure social perceptions of risk relating to hard shorelines/gray infrastructure as compared to natural shorelines/green infrastructure and compare to independent risk measures.

18. Are natural and nature-based climate adaptation solutions more cost effective and resilient in the long term? Consider how to improve valuation of ecosystem services in our cost-benefit analysis of adaptation strategies.

19. Research distributed wastewater treatment alternatives (compared to armoring and elevating an existing centralized system, many of which are in need of upgrades and in the floodplain) that are financially feasible and permittable in NYS communities.

20. Assess the landscape for heat stress risk in the Hudson Valley today and through the century.

21. Evaluate social vulnerabilities related to climate risk (e.g., compounding health risks, substandard housing, green gentrification, etc.) and solutions to mitigate these vulnerabilities (e.g., smart growth, increased density, etc.) that could be considered in the Hudson Valley region.

22. As sea-level rise impacts the tidal Hudson River, research possible uses of waterfront properties that may become available as people "retreat" from the growing flood plain. One example is the aquaculture movement in the Long Island Sound to farm and harvest oysters, mussels, clams, etc. Another potential use would be wind or solar power in these areas. Determine barriers to these alternative uses (e.g., land use policies).

23. Map "ungentrifiable" locations in the Hudson Valley region where land value is protected (e.g., public housing, affordable housing, public land, etc.). Create a map layer that funders can use to target socially-responsible green investments.

24. Review the status of community land trusts in NY and beyond. Assess efficacy for combating gentrification and examples of collaboration with environmental conservation groups. Determine considerations/ recommendations/challenges/opportunities for them to exist in the Hudson Valley region.

25. Research specific and trackable metrics for understanding current and future diversity of Hudson River access site users.

Theme D. Water Literacy

1. Build and apply the tools needed to assess our educational program effects on participant knowledge, intent, behavior change, and future choices. Evaluate continued engagement in programs through multiple ages and grades.

2. Create an interesting, but data-robust platform for learners to examine our many monitoring programs.

Hudson River Eel Project

3. Analyze eel migration data for spatial and temporal patterns.

4. Evaluate how community-science data can help inform management targets and strategies for conserving American eels and their habitats.

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5. Research what makes an effective and sustainable community science project.

Education: Day in the Life of the Hudson and Harbor

6. Investigate how to make student-collected data appropriately robust for various stakeholders, including the public, decision makers, and scientists.

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7. Evaluate how field experiences improve classroom learning, and change student attitudes and behavior towards the environment.

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8. Continue to create videos, lesson plans, and materials primarily aimed at a teacher/educator audience.