Resilient Plant and Animal Communities

TEC Significance

The biological communities of the Hudson River estuary – the assemblages of organisms that co-occur in space and time – include a diverse array of species ranging from microscopic to enormous, plant to animal, terrestrial to aquatic, freshwater to saltwater specialist, obscure to iconic, and everywhere in between. Different communities can be distinguished in different major habitats of the river, such as in freshwater and brackish-water main channels, vegetated shallows, wetlands, tributary mouths, sandflats, mudflats, and so forth, although of course the movement of water, materials, and some organisms between these habitats blurs any sharp boundaries that we might draw between their communities. These communities drive ecosystem function in the estuary and are central to almost every way in which humans interact with the river – indeed, to a large extent they determine the value of the river to people. They control nutrient cycles and energy flow, determine water quality, provide aesthetic, recreational, and food benefits, and have intrinsic value that is closely tied to the cultural heritage of the Hudson Valley.

The Resilient Plant and Animal Communities TEC is connected to many of the other TECs. The Shallow Water and Intertidal Habitats TEC, , and the Hudson River Shoreline and Riparian Areas TEC are all habitats that support biological communities, and conditions in those places affect the structure of biological communities. The Sediment TEC influences the nature and location of shallow-water habitats that support important biological communities, and the Tributary Connectivity and Barriers TEC influences whether fishes and other organisms can move between habitats as their ecological needs change seasonally or through their life cycle. The Fisheries TEC is of course built upon the condition of biological communities, including fish and the food webs that support them.

Goal

The Hudson River estuary is home to diverse biological communities which have high value intrinsically and for the ecosystem services that they support. Native species continue to persist and flourish, and the risk that additional non-native species are established is minimized. Habitats that are important for supporting these diverse biological communities are protected and, where appropriate, restored.

TEC Context

Historical Context, Current State, and Trends and Drivers

The biological communities of the Hudson River estuary have varied appreciably over the past several decades, with large changes in the abundance and even the presence of some species. For instance, zebra mussels have fundamentally reshaped the Hudson River estuary since they first appeared in 1991; Atlantic Sturgeon populations have slowly begun to recover following substantial decreases, a fishing moratorium, and listing as a federally endangered species; and non-native genotypes of common reed have slowly been replacing native cattail in the estuaries' wetlands. We know the most about the status and trends of species that are most directly important or interesting to people. Even for these, data are

often fragmentary, with very little information before ~1980 and inadequate data on many groups even today. For more obscure species, data are scarce or absent. The overall picture is dynamic – with some species increasing and others decreasing, some by an order of magnitude or more – because of natural and anthropogenic forces. The most important stressors from an ecological perspective are probably those that limit or challenge the resilience and adaptability of communities, like habitat loss, fragmentation and degradation; toxic contaminants; shoreline hardening; high rates of biological invasions; and rapid climate change and sea level rise. Several additional stressors have big effects on the ways that people interact with the biological communities of the estuary or with species; these include overharvest, pollution, and the establishment of some non-native species.

Action Table

Objective	Action	Complete by
Objective 1: Minimize the risk that additional non-native species become established	1A. Install signage about proper procedures for cleaning gear and boats, and about risks posed by non-native species, at all boat launches and marinas in the estuary	2020
	1B. Install boat-washing stations at all boat launches and marinas in the estuary where motorized boats are launched	2020
	1C. Convene multiagency, multistakeholder group to assess feasibility and desirability of a biological barrier on the Erie Canal between Oneida Lake and the Mohawk River, and/or along the Champlain Canal	2020
	1D. If deemed feasible and desirable (see previous action), construct a biological barrier on the Erie Canal between Oneida Lake and the Mohawk River, and/or along the Champlain Canal. As a first step in this process, convene experts to consider design challenges and solutions for such a barrier	2030
	1E. Minimize risk of non-native introductions via port of New York by improved ballast water handling, and increased inspection of cargo	2020
	1F. Convene a panel of experts to consider replacing the state invasive species law (which is a retrospective “black list” of prohibited species) with a prospective “white-list” approach that allows importation only of species demonstrated to be harmless	2020
	1G. Convene a task force to evaluate compliance with, and enforcement of, existing laws and regulations concerning sale, movement, and possession of non-native species, and to recommend actions to improve compliance and enforcement	2020
	1H. Develop the legal authority and commit the funding to allow effective early detection and rapid response programs for new invasive species	2030
	1I. Develop a program to work with aquarium trade, horticulture trade, and other commercial groups to minimize risk of new invasive introductions, for instance, by removing potentially	2020

	harmful species from commerce, developing messages and educational materials for customers, encouraging the use of native species, setting up a program to certify retailers who handle non-native species responsibly, etc.	
Objective 2: Protect and restore tidal wetlands and shallow water habitats	2A. Design, implement, and conduct long-term (≥ 10 years) assessments of large-scale habitat restoration projects for at least 2 side channels, 2 SAV beds, and 2 tidal wetlands	2030
	2B. Allow low-elevation land near the river to stay in or revert to a "natural" (undeveloped) state as sea level rises, either by providing incentives to landowners or by prohibiting development of these lands	In place by 2020, but ongoing through entire period
	2C. Disseminate and/or develop guidelines to minimize use of herbicides, other pesticides, and fertilizers that would enter directly into estuary, and/or work to ensure compliance with existing guidelines	2020
Objective 3: Protect habitats that are essential for rare and important species.	3A. Identify and map habitats that are essential for rare and important species (building on existing efforts, and including plant and animal species of concern), and project future locations of these habitats in cases where they may move due to sea level rise	2020
	3B. Protect locations that currently provide, or are projected to provide, essential habitat for rare and important species	2030
	3C. Control or contain Phragmites at specific locations to protect New England bulrush and possibly other rare plants of the upper intertidal zone, at Croton River tidal marsh, Con Hook Marsh, and possibly other locations. Control and containment efforts should use herbicides and classic biocontrol methods only as a last resort, and with due consideration to their side effects and to the precautionary principle	2020
Objective 4: Understand the importance of connectivity among habitats for species and communities and restore connectivity where necessary	4A. Identify (from the literature, or with new research when necessary) cases in which restoring connectivity between habitats is essential for biological communities or important species	2020
	4B. Restore connectivity (e.g. by modifying culverts or removing dams) in cases where doing so would have substantial benefits for biological communities or important species	2030
Objective 5: Increase and maintain our understanding of the status of species and habitats	5A. Design a program to monitor the status and trends of species (both native and non-native) and habitats in the Hudson River	2020
	5B. Secure long-term (ideally in perpetuity) funding for a program to monitor the status and trends of species (both native and non-native) and habitats in the Hudson River	Funding by 2030; implementation ongoing

Objective 6: Minimize the harmful effects of human transportation and recreation activities that occur in and near the river	6A. Assess and minimize the impacts of transportation corridors in and near the river (commercial shipping, railroads, highways, power lines and pipelines)	All timeframes
	6B. Assess and minimize the impacts of recreation (marinas, launches, boating, angling, hunting, walking trails, river front parks, etc.) on and near the river	Assessment should be done soon; mitigation or management would be ongoing
Objective 7: Develop targeted controls, minimizing side effects, for problems caused by nuisance species	7A. Document and map occurrences of knotweed (Polygonum cuspidatum) in intertidal, supratidal, and floodplain habitats. Test control techniques that do not involve use of herbicides or classical biocontrol	2020
	7B. Devise techniques for small-scale local control of Phragmites, without use of herbicides or classical biocontrol, test them, and scale up in appropriate locations	2020
Objective 8: Assess and expand efforts to educate the public about the biological communities of the Hudson estuary, their values, and ways to protect and restore them	8A. Assess and expand existing educational efforts	2020 and ongoing

Action Narrative

While we focus extensively in this TEC on preventing establishment of new non-native species, we make two important notes. First, some species that are not native to the Hudson River estuary may move into the estuary on their own (i.e. without direct human intervention) in response to climate change or other large-scale environmental change. Second, it is conceivable that intentional introductions by humans might be deemed to be desirable at some point in the future, for instance in an “assisted migration” scenario.

Of the actions proposed here, many of those that could have the biggest positive impacts are also those that would be most difficult to enact, often because they interact with many diverse stakeholders or are otherwise politically complex. Two examples demonstrate this point. First, preventing movements of species from other watersheds, particularly the Great Lakes system (Actions 1C and 1D), could greatly reduce the risk that new, undesirable non-native species become established in the estuary, but might have significant implications for other uses of the Erie Canal. Second, securing funding for monitoring the status of the estuaries’ biological communities (Actions 5A and 5B) is essential for understanding their status and managing them appropriately, and no such secure long-term funding currently exists, but identifying a source for such funding is a significant challenge. We emphasize that any action plan for biological communities in the Hudson River estuary must address these thorny but potentially important problems, while also chipping away at those where consensus and action come more easily.

Research Needs

- A coordinated program with assured long-term funding to provide information on the Hudson's species and habitats into the future. Although the Hudson is very well known compared to most other rivers, existing programs that serve as the primary sources of information on the Hudson's species and habitats either are funded for short periods, are periodically threatened with disappearance, or were designed to be one-time studies.
- Experimental testing and long-term evaluation of habitat restoration projects for achieving biological objectives.
- Improved understanding of impacts of existing and emerging contaminants on biological communities.
- Conduct more research on poorly-known habitats and communities including tidal swamps and the supratidal zone (i.e., about the first vertical meter above Mean High Water).
- Study the potential impacts of flood and storm protection engineering on the biota, and devise methods to incorporate habitat for uncommon and rare species into planning and design of that technology.

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