Retrospective Governance Analysis for the Narragansett Bay Watershed and Airshed Project

Summary of Methods and Lessons Learned

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This document is the fourth and final product delivered by the Retrospective Governance Analysis for the Narragansett Bay Watershed and Airshed Project funded by The Environmental Protection Agency (EPA), Atlantic Ecology Division (AED). It concisely documents the framework and processes used, including:

- Project approach.
- Tasks and tasking.
- Implementation process approaches and observations.
- Methodology recommendations and observations.
- Extensions to other watersheds/Recommendations for future effort.

Project Approach

Lighthouse Consulting Group, Inc. of Warren, Rhode Island, hereafter referred to as Lighthouse, was the consultant leading this project and assembled a team of experts that included:

- Dr. Donald Robadue, Coastal Resources Center, University of Rhode Island.
- Julie Wyman and Susan Farady, Marine Law Program, Roger Williams University.
- Dr. Mark Imperial, University of North Carolina Wilmington.
- Dr. Timothy Hennessy, University of Rhode Island.

Drs. Robadue, Imperial, and Hennessy have written extensively on the topic of bay governance and contributed to much of the seminal thought pieces on bay management. These include:

- Robadue, D. and Lee, V. 1980. Upper Narragansett Bay: An Urban Estuary in Transition. Narragansett, RI: Coastal Resources Center, Graduate School of Oceanography, University of Rhode Island.
- Olsen, S., V. Lee, & D. Robadue. 1980. *An Interpretive Atlas of Narragansett Bay.* Narragansett, RI: Coastal Resources Center, Graduate School of Oceanography, University of Rhode Island.
- Needham, B. & D. Robadue. 1990. Historical Review of Water Quality Management and Pollution Abatement in Narragansett Bay. Narragansett Bay Estuary Program, NBP-90-45.
- Imperial, M. T. 1999. Analyzing Institutional Arrangements for Ecosystem-Based Management: Lessons from the Rhode Island Salt Ponds SAM Plan. *Coastal Management,* 27 (1):31–56.
- Imperial, M. T. 2005a. Using Collaboration as a Governance Strategy: Lessons from Six Watershed Management Programs. *Administration and Society* 37 (3):281–320.

- Imperial, M. T. 2005b. Collaboration and Performance Measurement: Lessons from Three Watershed Governance Efforts. In J. M. Kamensky and A. Morales (Eds) *Managing for Results 2005* (Lanham, MD: Rowman & Littlefield Publishers, Inc.): 379–424.

- Imperial, M. T. & T. Hennessey. 1996. An Ecosystem-Based Approach to Managing Estuaries: An Assessment of the National Estuary Program." Coastal Management 24 (2):115–139.

- Imperial, M. T., & T. Hennessey. 2000a. Environmental Governance in Watersheds: The Importance of Collaboration to Institutional Performance." In *Environmental Governance: Transforming Environmental Protection for the 21st Century.* Research Papers 7–10 Volume II. Washington, DC: National Academy of Public Administration:8.1–8.196.

- Imperial, M. T. & T. Hennessey. 2000b. Rhode Island's Salt Ponds: Using a Special Area Management Plan to Improve Watershed Governance. Washington, DC: National Academy of Public Administration. August 2000.

- Imperial, M. T., S. McGee, & T. Hennessey. 2000. The Narragansett Bay Estuary Program: Using a State Water Quality Agency to Implement a CCMP. Washington, DC: National Academy of Public Administration.

- Imperial, M. T., T. Hennessey, & D. Robadue, Jr. 1993. The Evolution of Adaptive Management for Estuarine Ecosystems: The National Estuary Program and its Precursors. *Ocean and Coastal Management*, 20 (2):147–180.

- Imperial, M. T., D. Robadue, Jr., & T. Hennessey. 1992. An Evolutionary Perspective on the Development and Assessment of the National Estuary Program. *Coastal Management* 20 (4):311–341.

The team drew on its members' extensive experience to bring depth and critical analysis to the questions being asked by EPA. The team also has:

- Strong roots and experience in Rhode Island as well as national and international perspectives to lend to discussions of scalability and application to other air/watersheds. (The Hennessey and Imperial work is a uniquely impressive, methodologically rigorous comparative approach that has had a practical impact in Rhode Island).

- A long history of working together to produce both analytical and applied results related to watershed and coastal governance — ensuring a smooth, creative and insightful process for this project.

- Ongoing involvement in the issues addressed by the project and a high likelihood that team members will disseminate and further advance the findings as part of their research and professional agendas.

Joining the team were law students from the Roger Williams University Marine Affairs Institute, which works in partnership with Rhode Island Sea Grant and the University of Rhode Island on issues of marine law and policy. The Institute assists Rhode Island Sea Grant in meeting its three core components of outreach services, education, and legal research by responding to research

requests from state and regional agencies and other Sea Grant constituents on coastal zone management, fisheries, public access, aquaculture, ports and harbors, and other areas of marine law. The students, with oversight from their Roger Williams University professional staff, provided the team with the ability to complete in-depth and cost-effective research and analysis of the highest quality.

Supporting the entire project effort, Lighthouse professional and administrative staff provided a full range of project management services. Of special value was Lighthouse expertise in project design and management, specifically workshop design and facilitation.

Tasks and Task Planning

<u>Task 1. Project work planning</u>

As part of the workplan development process, the project team first met with the EPA team to understand their expectations and jointly conceptualize what was needed and feasible. Next, Lighthouse organized an orientation meeting with the project team to finalize elements of the timeline, organize the existing and citable information, and build the initial framework for governance analysis — how the range of information would be analyzed and how outputs would be organized and presented in the final report. Lighthouse captured this in a project workplan that was then finalized in cooperation with EPA. The workplan became the basis for quarterly reporting and was used to guide the agenda of quarterly meetings between the project team and EPA team. During this initial phase, the team also:

- Identified possible data collection systems, including timeline software and bibliographic software. After testing several systems, the team selected Microsoft Excel for storing the project's bibliographic references as it allows the greatest flexibility for use of the data post-project while also serving the purposes of the team during the data collection phase.

- Designed a website to store data on key bay governance events. The site was built using the open source timeline software TimelineJS, which operates on a WordPress platform. This provided the highest level of portability post-project while offering the most customizable and useful system for project purposes. The online timeline now includes all key events that have affected bay governance and either were referenced in the original EPA request for proposal or in the summary stories developed by the team. A more comprehensive list is captured in the Excel database. This includes not only governance events but nearly every reference the team identified regarding bay governance. The online timeline is open to the public for comment and contributions. The team successfully built a system that is portable — either as a whole unit or by exporting the information.

<u>Task 2. Complete research to create timeline</u>

Graduate students under the supervision of team experts researched and gathered a baseline of events that provided the foundation of the timeline, summaries and eventual analysis. Events included:

- Executive action.
- Interstate compacts.
- Judicial decisions.
- Legislation.
- Programs.
- Projects.

For each of the above, filters included:

- Context.
  - Air.
  - Economic.
  - Environmental.
  - Land.
  - Society.
  - Water.
- Location.
  - Rhode Island.
  - Massachusetts.
- Jurisdiction.
  - Federal.
  - First Circuit.
  - International.
  - Local.
  - Municipal.
  - National.
  - Regional.
  - State.

The team researched each governance event in more depth in order to complete the summary stories and analysis as outlined in the steps below. During that process, the team compiled an even more comprehensive timeline and captured this in the Excel document "Timeline of policies and actions." This timeline contains four elements: date, policy characteristic, pertinence to one or more storylines, and references for over 1,560 unique entries. The key items and those required by the grant were also reported in the online timeline.

Task 3. Prepare summaries of information on timelines

The team drafted summaries to provide illustrative vignettes about action that has been taken to achieve change. These vignettes provide examples of how management approaches can be applied appropriately. The team determined this was the best was for this project to highlight key lessons learned over time and share stories about the impact and implications of policy action or inaction. These stories were key during the team's discussions leading up to the initial draft analysis.

Task 4. Analysis of governance responses to ecosystem change

The team held a series of meetings (virtual and face-to-face) to review the timeline and summaries and build an analysis as specified in the statement of work. The greatest challenge was developing an intellectual framework to synthesize the volume of information that was collected and to identify key lessons. The team also conducted a limited number of key informant meetings with governance partners to solicit input and test and modify the analysis. In a final meeting, the project team and EPA team together vetted all project deliverables.

Task 5. Produce a report that details the project's methodology with recommendations for investigating other watershed governance experiences

A key project goal was to tap into the experience gained as the project unfolded and make the overall approach that was used and the information gained transferable to other locations. Toward that end, this report was produced using an ongoing, incremental process — one that captures information, insights and lessons learned throughout the life of the project. This is in contrast to the more usual approach of trying to capture everything learned at the end of the project while writing up the final analysis. This more incremental methodology allowed the team to compile its experience as it moved through the process, promoting reflective conversation that allowed the team to make adjustments to its own approach when appropriate.

Implementation Process Approaches and Observations

Orientation of information collection

Historians of environmental governance point out that the emergence of problems, policy debates and implementation efforts frequently have deep historical roots. In New England, the origin of watershed-scale pollution, fisheries and land use problems can often be traced to the consequences of settlement, use patterns and policy choices of the colonial and industrialization eras. This matters because a key motivation for examining the roots of watershed management is to reveal patterns of adaptive management. This, in turn, requires understanding the drivers of change, the changing definition of policy problems, the political preferences shaping changing solutions, and the ability to frame outcomes in a given time period. Outcomes in one period depend greatly on policy choices made many years earlier. Conversely, the impacts of policy choices and newly formed institutions in one era may take years or decades to take hold.

The study completed by this project does not attempt to systematically evaluate the impacts of any particular policymaking episode nor attempt to explain in detail what combination of economic uses, human settlement, and waste disposal practices led to the emergence of a problem that became of political concern. What it does is focus on sketching out broad streams of governance activity throughout the watershed of one estuary. This includes an emphasis on problem definitions, choices and implementation efforts that tie together in some way upstream choices with estuary consequences to reveal instances where regional or watershed-scale thinking has been in evidence. This helps expand the understanding of the governance stage within which studies of environmental change are occurring and suggests additional episodes worth examining. This orientation, combined with the pre-selection of a dozen relatively familiar storylines, uncovered a much larger number of examples and quantity of materials than the researchers expected. Still, this left uncollected an equal amount of potentially relevant material.

On balance, the pre-selection of themes or storylines led to important surprises, and the methods used could now be more effectively employed to pursue other important watershed storylines or fill in gaps related to particular geographic areas, time periods, or types of policy issues and interventions. For example, the Wood-Pawcatuck River system, which straddles Rhode Island and Connecticut, is, along with the Connecticut and Merrimack Rivers, one of the earliest regional efforts to set and implement water quality standards and pollution controls. It would reveal important governance insights, even though the river itself does not discharge into Narragansett Bay. The transition from the Metropolitan District Commission, which was created in 1919 to manage parks, waterworks and sewage, to the establishment of the Massachusetts Water Resources Authority — which affects some municipalities in the Narragansett Bay watershed — plays a major role in the evolution of watershed governance in Massachusetts. Meanwhile, John Cumbler's book "Reasonable Use" (2001) provides a cogent history of watershed governance in the Connecticut River Basin. It sheds considerable light on parallel developments to those in Narragansett Bay in terms of the evolution of issues and of understanding policy and implementation in Massachusetts and Connecticut. His more recent volume, "Cape Cod; An Environmental History of a Fragile Ecosystem" (2014), provides a similar sweeping story of the other adjoining bioregion to the east, setting out the interplay

between shifting human uses and exploitation patterns of the region and the impacts on natural resources and ecosystems. He raises the question of "whether public concerns combined with local, state and federal politics can adequately protect the environment of the Cape" (2014, p.197).

Personal experience and knowledge

The project research team of Hennessey, Imperial and Robadue drew initially from their extensive personal knowledge, each having worked on Narragansett Bay issues from both practitioner and researcher perspectives since the early 1980s. Robadue co-authored a history of bay governance for the Narragansett Bay Project (Needham and Robadue 1990), while Hennessey and Imperial carried out a comparative analysis of estuary and watershed management in six cases for the National Academy of Public Administration in the late 1990s (Imperial 1999; Hennessey and Imperial 2000a; Imperial and Hennessy 2000b; Imperial et al. 2000). Imperial was a planner for the Rhode Island Coastal Resources Management Council in the early 1990s and assisted the Coastal Resources Center in examining the U.S. National Estuary Programs for their relevance to international marine and coastal management (Imperial 1995).

Even with this advantageous background to guide them, the research team recognized early on that developments in each sub-watershed were rich, detailed and surprising. They noted that regional efforts extended back in time many decades before the 1972 Clean Water Act. In the case of Narragansett Bay, efforts extended back to the release of the Southeastern New England study in 1975. To replicate or improve upon the organization of a similar historical examination, a broad environmental history perspective combined with governance and technical planning viewpoints would be valuable in uncovering episodes, patterns and tendencies from dispersed information sources.

Data Sources

In addition to online-based sources, the story-oriented timeline and master bibliography collection for this project were assembled largely from secondary information available through the libraries, online catalogs, database and journal subscriptions, and special document collections at the University of Rhode Island. By and large, this search could be replicated by any member of the public using these facilities. Materials included books and monographs, journal articles, government plans and reports, legislation, policy documents, and digital newspaper archives specific to events in the watershed. Also included was information on the history of southern New England dating from the colonial period on the activities of Massachusetts, Connecticut and Rhode Island. The research team did not visit nor utilize non-circulating personal archives stored at the University of Rhode Island or any other library, agency or private collection in the region. However, many of the articles and reports included in the bibliography and timeline are based on this type of information gathering. About 15 percent of the citations are from copyright protected books and journal articles, the majority of which are scientific papers about Narragansett Bay that include historical research. While abstracts of all these materials are publicly available through journal publishers, downloads of individual articles

can be extremely expensive. However, JSTOR (short for Journal Storage and found at http://www.jstor.com) maintains large collections of older scientific publications and selectively offers online reading access to some materials. The full-length bibliography of materials collected contains the online links to either full text or abstracts of this material.

The Hathi Trust (http://babel.hathitrust.org), an excellent source of digitized historical materials, selectively allows read-only access to many out-of-copyright materials and has a larger, downloadable collection available only to a limited set of participating institutions. Google Play/Books (https://play.google.com/store/books) contains a large number of scanned books from research libraries. It also makes out-of-copyright materials available to read online or as PDF files.

Information management

More than 1,400 documents containing 125,000 pages of material have been compiled in digital, searchable form to accompany the production of the timeline. Most of these are government-generated reports that are either already available online or were scanned. These cover a range of themes including fisheries, pollution control and land development within the watershed. These reports also cover regional efforts in neighboring watersheds — the Connecticut River, Long Island Sound, and the metropolitan Boston area — on issues of water supply, pollution control and land conservation efforts. Most Rhode Island and Massachusetts public documents that were not already available online were digitized using optical character recognition technology and then saved as PDF files to make them searchable. Documents from online archives that provided image-only versions of PDF documents, such as the archive of the Coastal Zone Information Center (http://www.gpo.gov/fdsys/browse/collection.action?collectionCode=CZIC) and the New England Interstate Water Pollution Control Commission (http://www.neiwpcc.org/annualreport.asp), were exported as jpeg files that were then reconstituted and processed using optical character recognition technology. A file naming convention was developed that included the publication year, the source and a brief title. This allowed for storing and searching the resource materials in chronological order. Document series, such as the annual reports of the New England Interstate Water Pollution Control Commission, which date to 1947, or the complete set of Narragansett Bay Journal publications can be located in historical sequence.

Although not initially planned as an output, the resulting folder of organized documents (about 13 gigabytes of material) became an easy-to-access corpus using the document search capabilities built into Windows 7 Explorer. A search for any text string quickly results in a listing of the documents containing the string. For example, searching for "208 Plan" yields 30 documents. Adobe Acrobat was then used to create a full-text search of the entire corpus. The resulting file will open up a full search window in Acrobat Reader. The same search, using the index, identifies 28 documents and lists 474 excerpts and links to the term "208 Plan." Creating this type of file collection and index from the outset speeds the compilation of a timeline and case analysis. The files related to each case were developed first, and stored in separate folders.

Later, the most useful or representative pieces from each case were included in the master collection. However, PDF files can be easily tagged to individual case studies.

In addition to the collection of core documents, the team used LexisNexis to search the Providence newspapers (available online via the University of Rhode Island from the early 1980s to present) and other regional newspapers on specific topics and storylines. Key-word searches yielded several thousand news articles that generated hundreds of relevant timeline entries and rudimentary statistics on trends over time. These were combined into key-word based compilation PDFs but kept separate from the master bibliography. The Providence Journal Bulletin (the Journal) newspaper, in its multiple regional editions, serves as one effective record for events in the watershed. However, the research team did not draw upon the microfilmed collections of the Journal and its antecedents held by the University of Rhode Island, Rhode Island College and the Providence Public Library, which date back to 1800. In addition, the Providence Public Library maintains a daily index of the Journal newspaper from 1900 - 2004.

Other timelines and document collections

Several prior efforts have been made to compile information about the environmental governance history and policy, focusing mainly on Narragansett Bay and, to a lesser degree, its watershed. These tend to be inventories (RI Water Resources Board 1970; Hughes 1989; ESS 2003) or case studies centered on specific policies or situations (Ingram 1971; Kumekawa et al. 1990; Needham and Robadue 1990). There are relatively few comprehensive analyses that apply an analytical framework or a comparative perspective, such as in the document by Imperial et al. (2000). Fortunately, many planning and technical reports and scientific papers published since the 1960s have included some kind of timeline or recapitulation of information describing historical events and early efforts to analyze and address a specific problem, such as managing oyster beds in Upper Narragansett Bay or establishing and treating wastes from the Providence Metropolitan Area.

Creation of timelines and story narratives

The team began by compiling and updating timelines and event sequences from its own work, focusing on the Narragansett Bay National Estuary Program and water pollution control in the Providence River. This approach immediately lent itself to identifying threads or stories already familiar to the researchers. This included the emergence of the Narragansett Bay Commission and its antecedents in Providence wastewater treatment; the Narragansett Bay Project and its successor efforts; Greenwich Bay pollution control and special area planning; and, post-WWII areawide plans articulated by Walter Shea of the Department of Health and its successors, spurred by the federal water pollution control laws of the 1960s and the Clean Water Act in 1972. Also included were the 303e basin plans and 208 areawide planning; the effort to create a regional basin plan in the early 1900s by the New England River Basins Commission; and attempts to introduce a watershed approach in both Rhode Island and Massachusetts in the 1990s.

Other topics and storylines were relatively unfamiliar to the research team. This included topics such as regional land use management, Mount Hope Bay and the Taunton River, the timeline for the Blackstone River, activities involving shared watersheds along the Rhode Island and Massachusetts border, air quality issues related to water quality, and the details leading to recent judicial decisions upholding waste load reduction requirements for nitrogen in the Blackstone River and Ten Mile River.

This led the team to two conclusions. First, compiling a fully comprehensive timeline and reference list for the watershed and the estuaries was not feasible nor would it lead to drawing ready conclusions about the dynamics of policy development and governance over time. Second, it was possible to shed considerable light on these dimensions through episodes or stories about a place or specific pollution control effort. Ultimately, the team identified 11 of these episodes to use in focusing efforts to build a timeline, compile a digital library of relevant documents, and prepare vignettes to aid in analysis.

The team used systematic qualitative techniques to examine these data. The consolidated timeline contains more than 1,600 unique entries spanning the years 1823 to 2014. This consolidated version drew from 11 separate timelines developed in researching each episode. The entries mark important events and changes in the network governance processes. The team also developed reflective essays focused on some of the more significant network governance efforts. As the team coded and analyzed these data, it identified quotes and short vignettes that would help provide context. As the analysis continued, the team also developed tables, figures, matrices, and network displays of these data; identified trends; and made observations (Miles and Huberman 1994). A cross-case analysis was then used to deepen the team's understanding of the different network processes.

The final timeline is compiled in an Excel spreadsheet that contains four elements: date, policy characteristic, pertinence to one or more storylines, and references.

DATE: Year of the entry, with exact dates added in an entry where it is particularly significant.

POLICY CHARACTERISTIC: Description of the event, arrayed where possible using a simplified scheme based on some basic public policy concept — this element is only partially successful, as there is some overlap and ambiguity in the concepts, and an event can be both the culmination of an implementation effort and a symbol of policy failure that launches a new round of governance effort. The public policy concepts used in this characterization scheme are:

- *Problem stream*: *key information and reports.* This attempts to capture the role of key reports and documents in motivating policy change.
- *Problem stream*: *environmental and social impacts.* These are events or findings describing the actual physical or social impacts causing a change in the watershed or bay health.

- *Politics stream.* These are overarching political events that either change the context for action on watershed issues or where a watershed issue becomes enmeshed in state or national political debate.

- *Legal and institutional framework.* These are changes in the law or institutional arrangements that have an effect on watershed management.

- *Policy change based on laws and planning.* This category attempts to capture the substance of a watershed-related policy once a law is in place or a planning process is completed.

- *Operational milestones.* These are physical events that represent a concrete result of pollution control or watershed management, usually associated with progress or success.

- *Implementation issues and focusing events.* This category overlaps somewhat with operational milestones. However, it more broadly identifies difficulties or failures that occur despite a pollution control program or because of a mismatch between policy focus and outcomes.

STORYLINE: Eleven storylines emerged that focused the search for documents and construction of the timeline.

- "A Sensible Approach to a Complicated Problem" (Walter Shea's 1947 Plan).

- Before and After the Comprehensive Conservation and Management Plan for the Narragansett Bay Estuary.

- The Blackstone River: Two Centuries of Conflict and Cooperation in Watershed Management and Narragansett Bay.

- The Decade of Environmental Planning: Southern New England Study (Level B plan) and the New England River Basins Commission Story.

- Watershed Stewardship for the Taunton River and Mount Hope Bay.

- The Evolution of Open Space and Regional Land Capability Planning.

- Section 208 Comprehensive Water Quality Management.

- Total Maximum Daily Loads and Nutrient Controls for Narragansett Bay.

- The Mercury Total Daily Maximum Loads and Metals in Narragansett Bay.

- Prelude and Epilogue to the 2003 Fish Kill in Greenwich Bay.

- Field's Point and Narragansett Bay Commission: A Tale of Two Successes.

REFERENCES

Specific references are included for more than half the timeline entries. This less-than-complete listing of references is an oversight recognized only after information from author-generated and other familiar sources had been entered. The authors have confidence all entries are accurate. However, the timeline would be more robust with comprehensive citations to original sources.

Methodology Recommendations and Observations

Extension of the Narragansett Bay watershed governance history

The team estimates that a corpus of no more than twice the 1,300+ documents already collected would provide a relatively comprehensive survey of land and water issues and policies for the Narragansett Bay region. That would be an average of approximately 10-15 as-yet-uncollected documents per municipality to capture issues related to land use and open space policy, municipal water supply and wastewater management, wetlands, and flooding in the post-WWII period.

A greater challenge, one far beyond the scope of the present study, is to assemble this information in a way that reveals the unfolding of the problem stream as problems intensified as a result of waves of urbanization and then decentralization, industrialization and economic change, pollution loadings and riparian habitat modification. All of these contributed to human health problems and environmental concerns that sparked public policy change. Along with this is the need to fill in details on the policy, politics and implementation streams that are happening alongside the problem stream. While there is an overarching watershed change and estuary management story to tell, there is no equally data-rich story of the interplay of economic and physical change and governance activity to catch up, ameliorate and — in rare instances — get ahead of and redirect or shape these forces. Harvard Forest's "Changes to the Land Project" and the Massachusetts Audubon's "Losing Ground: Planning for Resilience" provide examples of such depictions of policy impacts — both past and future scenarios — regarding land use and conservation and landscape change in terms of merging summaries of policy covering the Massachusetts side of the watershed. We would have hoped to find far more comprehensive analysis and documentation of pollutant loadings from point and nonpoint sources over time; landscape change; water quality trends in streams, rivers and coastal waters; as well as the value of public and private economic investments in restoring and maintaining the watershed's environmental quality.

In addition, much of the variety and unfinished drama takes place at the sub-basin level, where sustained local interest and investment occurs. This level is also deprived of a kinescopic depiction of problems, choices, changes, impacts and adaptation. All of these sub-basins face transboundary concerns for landscape and ecosystem management and pollution control. The ongoing total daily maximum load process represents an effort to rationalize findings of current conditions, their deviation from long-established water quality standards, and the need to update or intensify control of contaminants. However, it is only one part of a broader understanding of what a watershed approach would entail — an approach that fully meshes federal, state and local policy and is accompanied by more comprehensive, policy-aware assessment of long-term change.

General guidance in assembling and processing bibliographic information for a watershed governance history

<u>Building a corpus of local and regional information</u>

It will be most efficient in the long run to maintain a detailed bibliography in citation format and, wherever possible, link it to source documents that are text searchable. The team initially focused on materials with timelines or narratives containing dates, in order to extend the limited number of chronologies already available in published sources. The device of researching individual stories made it easier to assemble and follow up on related information. The bibliographies contained in most documents were a more fruitful source of dates. By comparing the citations from different documents, it was possible to identify the most important, frequently cited, older documents that we needed to collect and study.

The legislative and regulatory timeline developed for the Narragansett Bay study is a starting point for logging federal developments that are common to all estuaries. However, regional, state and local laws, programs and initiatives will vary considerably among watersheds in different regions. This is especially true before the Clean Water Act legislation of 1972. New England is among the oldest settled regions. It is the birthplace of industrialization, and its states have several shared watersheds. On one hand, this creates a unique motivation for regional planning. On the other hand, the states in this region have a strong tradition of municipal home rule and governance —factors that confound collaborative planning efforts. The situation in other regions of the United States may differ.

Wherever possible, searchable digital copies of documents themselves can be compiled as PDFs in a central folder or use software that combines these functions. Preferably, bibliographic information should be entered into the properties fields of each PDF so that bibliographic tools can be used later to create and manage a complete citation set. For the Narragansett Bay study, the team also created file naming conventions that aided in sorting and searching materials, including the year of the document, author or source, and a brief title. Web pages, downloadable PDFs, document page images, and information in other formats can all be transformed into searchable PDFs. Some effort will also be required to scan public documents or microfiche sources of major policy documents and plans and make them searchable by applying optical character reading software.

<u>Compiling timelines of critical events within stories or themes</u>

Focusing on specific storylines made assembling a chronology more manageable. It was not always easy to assign a fact or an event headline to a single category in the process-oriented portion of the table. However, it became clearer, as more stories were developed, which events had relevance to other storylines and the overall narrative itself. Where possible, a storyline should be developed using alternative sources in order to triangulate perceived importance or interpretation of facts, to uncover additional context, or to fill in the gaps. In some cases, organizations have created long-term digital archives of their publications in addition to posting new content. For example, The New England Interstate Water Pollution Control Commission

posted its annual reports from the time of its inception in 1947 to the present. The team made these reports searchable using the optical character recognition process or by providing a unique long-term perspective on events in terms of problem definition, policy debate, and implementation in wastewater treatment over nearly 70 years. On the other hand, very few older state or municipal pollution control documents are available already scanned, are searchable through the optical character recognition system, or are otherwise available online. While critical achievements and dates can be gleaned from these documents, they also contain narratives, proposals, maps and data reflecting beliefs, attitudes and understanding about watershed issues that may differ considerably from contemporary views. They may also represent benchmarks against which later progress should be measured. Newspaper coverage, where readily available from online digital sources such as LexisNexis, can provide a great deal of distracting granularity in coverage. For example, the key Narragansett Bay watershed group, Save The Bay, appears in 6,000 newspaper articles or notices since the early 1980s. However, most of these are not substantive in nature. Periodically, however, local journalists prepare feature articles summarizing the chronology of an issue that incorporates the views of the public, including Save The Bay leaders and members, who otherwise would not appear in official plans and public documents. Environmental journalists with long-term experience in a watershed can be particularly effective in preparing such features.

Finding documentation of regional and watershedwide governance perspectives

Save for writing by environmental historians such as Samuel Hays and John Cumbler and by a few rare individuals who have played a unique role in both leading and documenting the regional perspective — for example, Charles H.W. Foster — there would be relatively little coherent exposition of an areawide, if not watershedwide, view of governance for Narragansett Bay. Among the very few documented efforts explicitly aimed at setting basinwide policies across state borders is the virtually unheard of 1975 Southeastern New England Study, which was an early example of a Level B basin study under the Water Resources Planning Act but was shut down completely by 1981. There are also the short-lived efforts of the Partnership for Narragansett Bay in the early 1990s. It is, however, possible that watersheds in other regions of the country have state or regional watershed or river management agencies that provide some form of ongoing formal organization whose activities can be traced over time.

Evidence of policy network membership and functioning

Since the early 1970s, public participation requirements in water quality and land use planning — including open meeting laws and federal and state freedom of information acts — have made it relatively easier to identify the individuals, agencies and organizations involved in watershed policy making. Regional conferences cosponsored by multiple organizations also provide a public window into the interplay of government and nongovernment actors. Such an example would be the Narragansett Bay Summit held in 2000. This in no way implies that networks failed to appear before the 1960s. Newspaper coverage of municipal and state level legislative action to create regional policies, to create institutions to plan water supply and sewage facilities, to acquire open space and conservation areas, and to present referenda for funding public works all indicate the leadership and policy stances of key individuals and organizations on these issues.

Extensions to other watersheds/recommendations for future efforts

Although this research team has met the project's initial obligations, there is much left to do. This work has provided an important understanding of the history of Narragansett Bay and how the system of its governance has evolved. It provides key insights into what makes the governance system healthy (or not) over the different historical epochs and can provide important guidance about the future of bay management.

To ensure this work's maximum impact, however, and to expand upon the foundational work created by this process, the project research team offers the following recommendations. These recommendations are based on the team's experience with this project and the watershed and with its understanding of the ongoing EPA needs.

1. **Prepare and deliver publicly facing material** to ensure the outcomes of this project are accessible and easily assimilated by key user groups. The contract documents were written for EPA as consultant reports and narrowly focused on the requirements of the contract and its obligations. Making this material available to a broader audience is important because of its inherent value (especially in terms of the timelines, bibliography and library) and useful insights for future governance research projects. Specifically, the team recommends that EPA:

   – As an immediate priority, turn the Analysis Report into an EPA unpublished report, making it available for distribution to stakeholders and agencies. This would require an internal review by the Agency's Atlantic Ecology Division and a quality check.

   – Post the documents, especially the Analysis Report — as an EPA unpublished report — as well as the bibliography and library, online at a publicly accessible website.

   – In support of the above, develop a full bibliographic citation for all documents with links to the original source of the online version when possible.

   – Transfer the JS timeline and URL to EPA or an EPA partner who will host the site, continue renting the URL, and maintain the site.

   – Expand the 11 summary stories from vignettes on key inflection points to articles for publication in mainstream literature, such as magazines and online websites and blogs.

   – Add additional bay stories that were not explored but are key to understanding the bay governance system. These may include stories on the Ten Mile River and Wood-Pawcatuck Rivers and articles on comprehensive land use planning and agricultural impacts on the watershed.

   – Create and make widely available webinars that present the material, especially the Analysis Report, supported by a master PowerPoint presentation.

   – Produce peer-reviewed articles for the research and practitioner community. This would ideally be articles that flow from the academic institutions and experts who were part of this project team and also co-authored articles with EPA staff.

2. **Expand the governance analysis.** There is an opportunity to expand the governance analysis to include other elements that will further illuminate how Narragansett Bay and its watershed was managed.

- Map the social network (story map). The governance network for the Narragansett Bay Watershed can be visualized as it has evolved over time, using social network analysis. There are good records, some dating to the 1960s, of participants in task forces, commissions, public meetings and planning efforts. This is especially true after the early 1970s with open meeting law requirements and greatly expanded outreach programs to engage citizens and foster coordination and collaboration across agencies responsible for setting policy as well as implementing it.

- Use affiliation mapping techniques in this network analysis to identify the individuals and institutions involved in key policy developments, especially bi-state watershed management efforts. Participant lists, involved agency staff, plan or policy authorship, and technical support can be identified for key meetings and documents that have occurred in the Narragansett Bay Watershed, which are called "events" in affiliation network studies. These events and their participants can be documented over time. A matrix is created with participant names listed down the first column and every "event" with which they are affiliated during the span of the study period listed across the subsequent columns. Network analysis software can be used to trace the role of individuals over time via the events, locations, analysis and roles they play. This, in turn, can be used to understand leadership patterns or how information might have been shared amongst groups within the region or the extent to which watershed management efforts are fragmented and isolated from each other. The relative power of meetings can be measured by examining the network characteristics of the attendees as well as the change in engagement or leadership roles of individuals over time.

- Engagement as staff or participants in key planning efforts can reveal the nature and extent to which network collaboration occurred over time. The links among organizations of different types are also important. In the 1970s, a great deal of funding was utilized to convene advisory panels and reach out to citizens. By the 1990s, there existed many more citizen level groups, many of them focused on individual subwatersheds, who were ready to engage in regulatory and planning work. By the 2000s, EPA was widely promoting its "Watershed Approach," and Rhode Island and Massachusetts authorities recognized and worked directly with a number of watershed groups. Municipalities have made efforts in some cases to find common ground with their neighbors to address watershed issues. Some projects, such as Watershed Counts, attempted to develop indicators to track the trajectory of biophysical change in the Narragansett Bay watershed, and represent or serve many dozens of organizational collaborators and prepare easily understood reports for the public. Other organizations, such as the Narragansett Bay Commission, with a much larger staff, budget, and delegated institutional authority have far more power to implement policy and take actions in response to regulatory pressures address an identified water quality problem related to point sources of pollution loading to the bay. .

- To augment what has been done, it would be insightful to add a resource allocation overlay to the analysis. To do this, researchers would have to identify and collect

information on the main funding streams for the primary pieces of legislation, policies and projects. This would create an unprecedented opportunity to compare how much was being spent on the governance of the bay. This could then be matched with the environmental trends data to assess the correlation between funding for governance and positive environmental impacts on the watershed.

– Independent of the expansion work, the great challenge and opportunity is to apply these insights as new governance systems are being designed and implemented. The current landscape is ripe with this opportunity, as regional planning efforts are continuing to expand their reach and aspirations. Working with incumbent and evolving programs would provide a real-time opportunity to test the lessons learned articulated in the historical analysis. More importantly, it could positively affect governance efforts and their impact on the bay and its watershed.

3. **Replicate the analysis in other watersheds**. Given the team's experience and the knowledge gained through this initial work, it would be easy to use the analysis framework to create other stories in other watersheds. More specifically, it would be useful to extend this work to another watershed where the story revolves around an issue other than sewage, for example, an issue tied to agriculture or forestry.

From the beginning, this project has been designed and executed with an eye toward replicability. The Methods and Lessons Learned Report, delivered as part of this project, concisely documents the framework, approach and process used for this work. It provides detailed instructions that explain precisely how each step was implemented and, in many ways, could serve as the basis for a future EPA request for proposal.

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