The Nelson A. Rockefeller Center at Dartmouth College
The Center for Public Policy and the Social Sciences

Policy Research Shop

A WATERSHED APPROACH TO GOVERNING NEW HAMPSHIRE'S LAKES AND RIVERS

Evaluating RSA Chapters 481-488

Presented to the Department of Environmental Services

PRS Policy Brief 1314-16
September 2, 2014

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This report was written by undergraduate students at Dartmouth College under the direction of professors in the Rockefeller Center. The Policy Research Shop is supported by a grant from the Fund for the Improvement of Postsecondary Education (FIPSE). The PRS reports were developed under FIPSE grant P116B100070 from the U.S. Department of Education. However, the contents of the PRS reports do not necessarily represent the policy of the U.S. Department of Education, and you should not assume endorsement by the Federal Government.

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EXECUTIVE SUMMARY

New Hampshire adopted water management and protection laws in a piecemeal manner over many years, often without addressing the complex relationships between regional water systems and sources of nonpoint pollution. The Department of Environmental Services (DES) is currently implementing a more holistic watershed approach, based on where water drains and how it flows. This report assists in the transition to a watershed approach by presenting a detailed content analysis of existing statutes governing New Hampshire's natural and man-made bodies of water. Specifically, the content analysis identifies sources of statutory authority for DES to manage watersheds, areas of overlap in existing statutes, and stakeholders affected by the statutes. We then draw on the content analysis to trace how a hypothetical water drop traveling from Pawtuckaway Lake to the Lamprey River interacts with existing statutes and stakeholders. Taken together, the results can help the DES identify specific ways of effectively managing watersheds. Besides shedding light on potential regulatory gaps that influence water quality, it highlights stakeholder groups that the DES can engage in building community connections and promoting non-regulatory means of protecting watersheds.

1. INTRODUCTION

New Hampshire is known for its natural ecosystems and is rich in lakes, ponds, rivers, wetlands, and groundwater resources. The DES, led by Commissioner Tom Burack, has created a variety of programs and rules designed to ensure the protection of these waters. The DES implements management and protection plans, permitting processes, and enforcement activities under the authority of state statutes intended to preserve, protect, and improve the state's water. New Hampshire's Revised Statutes Annotated (RSAs), primarily Chapters 481 to 488, outline this implementation and regulation authority. Notable DES programs include the Winnipesaukee River Basin Project, which has been responsible for water quality improvements on a regular basis involving eight local communities, and the Drinking Water Source Protection program, which provides technical and financial assistance and enforces state regulations that protect the state's sources of drinking water.

Over the years, state statutes and DES programs have been developed separately, dividing oversight and programs into independent resource topics rather than connecting them through a more holistic watershed approach. RSAs have often addressed sources of point pollution, such as pipes in identifiable bodies of water. By contrast, a watershed approach limits and identifies the connections between sources of nonpoint pollution, such as those from agriculture, septic systems, and road maintenance. The DES estimates that nonpoint sources contribute to over 90 percent of New Hampshire's water pollution problems.[1] Consequently, the span and breadth of water-related issues that the DES oversees are vast but can overlook significant environmental hazards.

Commissioner Burack has tasked our team with evaluating and categorizing the current structure of the state's water governance statutes. This research may lead to an improved understanding of how the statutes can be integrated into a watershed approach. The DES seeks to implement a long-term watershed approach to more efficiently manage and protect the state's interconnected waters.

Our research consists primarily of two analyses that include (1) organizing the pre-existing RSA chapters relating to water governance into a comprehensive coded system that identifies the water bodies, stakeholders, and issues that each statute regulates, and (2) using the content analysis to trace the progression of how water is currently regulated as it moves through a state watershed. Through our content analysis, we hope to highlight the strengths and shortcomings in the current regulatory framework of the state's water management in order to help the DES create an improved and more efficient new system.

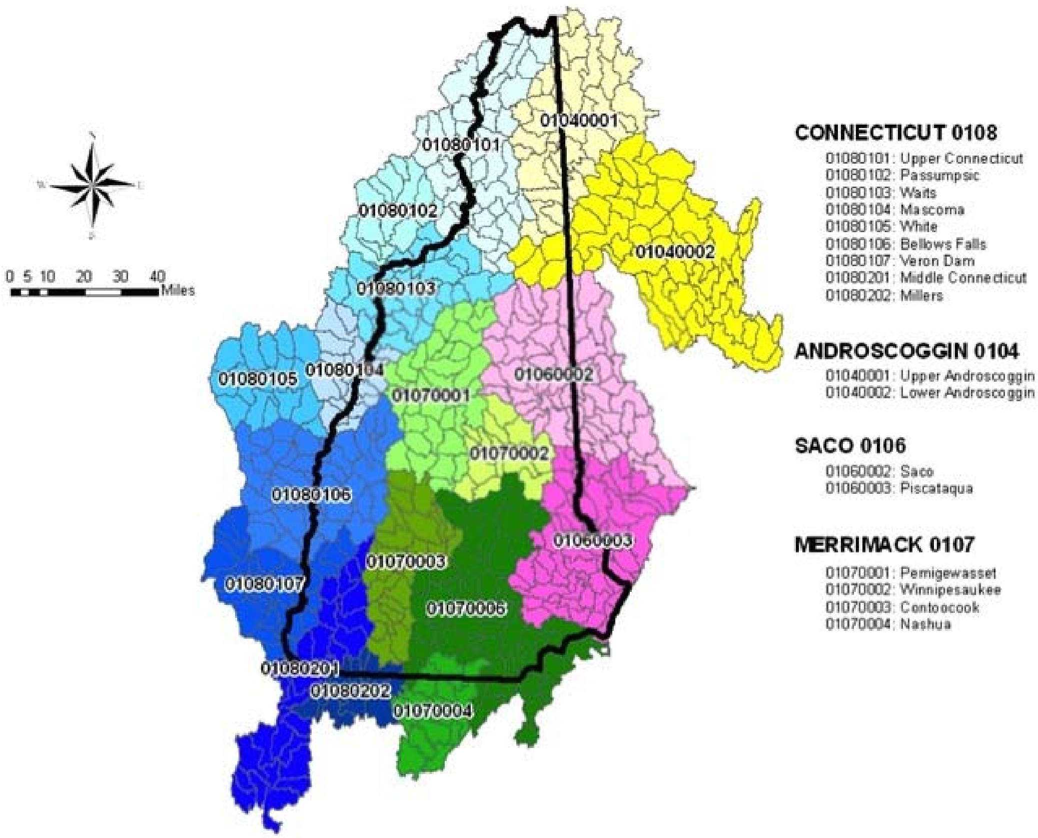
A complementary goal of the content analysis and water-tracing analysis is to identify stakeholders that affect the state's watersheds. This supports the DES's plans to build external awareness and capacity for implementing a watershed approach. In particular, we highlight the parties that would be significantly impacted by the DES's watershed transition, and that can be contacted to promote community discussions on how they will be affected by and can help in the transition toward a watershed approach.

1.1 Defining a Watershed Approach

A watershed is an area of land where all water drains into one point. New Hampshire has many interconnected watersheds, each nested within a broader hyodrologic unit, as defined by the U.S. Geological Survey. Figure 1 illustrates the boundaries of New Hampshire's watersheds and hydrologic units.

A watershed approach to policy and regulation involves identifying hydrologically-determined systems from source to delta in an effort to improve water quality and alleviate stresses on each drainage system.[2] Each watershed governing body would use local, state, and federal laws to develop management plans to restore or preserve the quality and quantity of the surface water. Through watershed programs, states can create local councils that focus on water flow, permitting, and pollution control. These councils are specific to each watershed and community, rather than one set of guidelines or rules applied to many areas. The watershed approach utilizes federal laws like the Clean Water Act (CWA) to control the specific pollution in watersheds or sub-basins.

Figure 1. New Hampshire Watersheds and Hydrologic Units



Source: New Hampshire Department of Environmental Services, "New Hampshire Watershed Boundary Dataset," http://des.nh.gov/organization/commissioner/gsu/nhhdp/nhwbd.htm.

A watershed approach facilitates coordination among private stakeholders, community-based groups, and public entities. Local coordination is both time and cost effective. Without a watershed approach, nonpoint source pollution tends to be managed on an incident-to-incident basis. If contaminants from a cattle farm are polluting a segment of the Pemigewasset River, for example, the state can address this source. However, many other sources near the river may be leading to deterioration. The state cannot efficiently address all nonpoint pollution sources. With watershed networks, a greater number of pollution sources can be addressed—and often voluntarily. Research by Mark Lubell and Allan Fulton demonstrates that when agricultural entities are exposed to local watershed networks, they are far more likely to adopt environmental practices.[3] In general, sharing monitoring responsibilities over multiple stakeholders tends to improve efficiency and efficacy.

Local watershed networks also promote efficiency and eliminate redundancy by synchronizing schedules for monitoring and reporting in the same area.[4] Public agencies can save time and money on multiple reporting trips. In Idaho, dairy inspections were spread across the EPA and the state's Departments of Environmental Quality and Agriculture.[5] With this approach, the EPA can still intervene when necessary, but the inspection agencies cast a wider net, with less overlap. As stated by the Environmental Protection Agency (EPA), the state of North Carolina was "able to monitor nearly 40 percent more waters with the same level of effort after monitoring was conducted on a more coordinated watershed basis."[6]

In addition to these cost-effective environmental benefits, the watershed approach also streamlines reporting requirements through CWA and permitting by extending reporting cycles to five years. The EPA anticipates that these changes will give the agency more time to spend monitoring and assessing watershed conditions. Other federal programs like grant money contributes to the success of watershed approaches around the country.

1.2 Vermont's Watershed Approach

In February, we contacted Vermont's Watershed Management Division to learn about how the state of Vermont was able to successfully transition to a watershed approach and to better understand the process and challenges of such a task. According to Neil Kamman, the program manager of Vermont's Monitoring, Assessment and Planning Program, the state underwent three major generations of watershed planning.[7] First in the 1980s, Vermont focused on updating wastewater treatment facilities. During this period, there was focus on improving the quantity of wastewater being managed and how much allowable pollution levels including point source pollution could be measured.

In the second generation, which occurred from the 1980s to early 2000s, Vermont's watershed planners reached out to stakeholders and interested community members in order to build awareness and capacity in preparation for the transition. The state created local watershed councils in order to facilitate coordination and also conducted monthly educational forums on water quality issues such as river biology and storm water management. Most importantly during this time, a constituency invested in water quality was being built. Notably it was the local watershed councils that were the agents behind this effort to create a public information base, improve water-testing networks and build trust among residents at the local level.

Finally, in the last phase that began in the 2000s the state implemented its surface water management strategy. Kamman said the department built a basin plan internally and rolled out its programs incrementally through organizational partners such as federal and state agencies.

With Vermont's institutional memory in mind, Kamman suggested that New Hampshire would most benefit by working to develop relationships with local watershed associations and partners interested in specific water silos. Because technological advancements currently allow for a more refined understanding of the condition of surface waters than was available when Vermont began its transition, this reduces the need to survey the public for such information. But public engagement was very important for Vermont's transition. Through our conversation with Kamman, he emphasized the need to determine how to achieve community buy-in for transitioning to a watershed-based system. One tactic Vermont used was inviting stakeholders within a watershed to state-sponsored educational events, designed to promote community, and create the grounds from which local watershed councils could form.

Accordingly, our content analysis is designed to help the DES target appropriate stakeholders who are connected to, and invested in, New Hampshire's water-management RSA's, so that they can be invited to educational events on New Hampshire's water management. Moreover, our focus on identifying stakeholders in the water-drop analysis offers a way for the DES to identify stakeholders in implementing its watershed approach. Finally, examining the flow of water into various silos, in the context of DES rules and goals, might provide the subject matter for an educational event of interest to community members in specific watersheds.

1.3 Research Goals

The research consists of two analyses. In the first analysis, we code and describe the New Hampshire RSAs related to water governance, Chapters 481 to 488. The water drop tracing analysis examines the path a single hypothetical drop of water might travel as it journeys downstream. Because it matches locations along with the path with relevant laws and statutes, the water drop analysis can illustrate the wide variety of regulations affecting water in a single watershed. While the content analysis addresses how the RSAs govern water in the state, the water drop analysis provides a perspective more consistent with a watershed approach.

A goal of conducting the two analyses together is to facilitate improvement of the statutory framework to incorporate more comprehensive and realistic assumptions about how water is regulated as it travels through a major state watershed. A solely legislative-based understanding of New Hampshire's water management may be incomplete. The analyses also address the nature of the existing relationship between theory and practice by identifying the variety of existing regulations, the regulatory gaps in existing statutes, and a sampling of stakeholders affected by the movement of a drop of water in its path from source to silo.

2. STATUTE CONTENT ANALYSIS

Our first task involves organizing the existing RSAs concerning water governance. The relevant RSAs are located in Chapters 481 through 488. A content analysis is a research methodology intended to break down and codify elements of text. It isolates and targets the text's most important elements, and is designed to be as rigorously objective as possible in ensuring that the most important elements are coded simply and accurately.

The codebook served as our primary stage of content analysis, after which the data from our coding allowed us to aptly summarize and search within the statutes. The following sections describe the information we capture in our content analysis.

2.1 Codebook

We constructed a codebook to guide the coding of each sub-statute. The codebook outlines the specific information to be collected, to ensure a comprehensive, reliable, and rigorous content analysis. The final coding was checked for inter-coder reliability by two additional researchers. These researchers independently verified the work done in the original content analysis. Five identical pieces of information were obtained for each sub-statute, described in the following sections. Appendix A presents more detailed descriptions.

2.1.1 Basic Information

The codebook's first section asks for *basic information* on each statute within Chapters 481 to 488 of the New Hampshire RSA. The New Hampshire General Court website provides the original statute text. Basic information includes the statute number, name, a brief description of what it addresses, and whether it is active or repealed. Further information was not collected if the statute was repeated, since repealed statutes do not affect New Hampshire's current water management.

The next three codebook elements describe the *type of silos, content*, and *stakeholders* addressed in the statute. Answers are represented using numerical values. A value of 0 is assigned for "other" categorizations, indicating that additional notes must be taken to fully reflect the nature and scope of the sub-statute. The final data can therefore be sorted according to the water silo being regulated, the stakeholders they affect, or the substance of the legislation.

2.1.2 Types of Silos

When coding the *types of silos* element, the researcher determines whether the statute addresses a man-made or natural body of water, or both. Based on this coding, the researcher then proceeds to determine, within the context of man-made or natural, the specific type or types of silo the statute addresses, though more than one may apply. Specific options for silo types were determined based on the *New Hampshire Water Resources Primer* developed by the DES in 2008.[8] We standardized the definition of each silo, as described below.

2.1.3 Types of Man-made Silos

Artificial water storage defines any location where water is stored for later use. These range from small man-made ponds, tanks, and reservoirs behind major dams. A *reservoir* is any holding area used to store, regulate, or control water.

A *dam* is an artificial barrier that impounds or diverts water and has a height of six feet or more, or is located at the outlet of a great pond. Man-made barriers that create surface impoundments for liquid industrial or liquid commercial wastes, septage, or sewage, regardless of height or storage capacity, are considered dams.[9] The category of dam also includes watermills, which use a water wheel or turbine to drive a mechanical process such as flour, lumber, or textile production, or metal shaping such as rolling, grinding, or wire drawing. For the purposes of New Hampshire governance, mills include both manufacturing plants and plants at which electric power is generated for public distribution or for the operation of mills, railroads, or public utilities.[10]

Wastewater is any kind of water that has been mixed with waste matter or adversely affected in quality due to waste. Municipal wastewater is typically found in a combined sewer or sanitary sewer and processed at a wastewater treatment plant. The state's Wastewater Engineering Bureau ensures that all septage and sludge management meets state and federal standards.[11] Treated wastewater is discharged into receiving water through a sewer. Wastewaters generated in areas without access to centralized sewer systems rely on on-site wastewater systems.

Stormwater runoff begins as rainwater or snowmelt, falling either forested or developed landscapes. While stormwater runoff moving though forested areas naturally undergoes purification processes, runoff from developed areas becomes increasingly polluted as it moves, a problem that grows as more New Hampshire land is developed each year.

Flood control refers to efforts made to combat flooding which, along with droughts, is the state's most common natural disaster. While flooding is natural, it is exacerbated by development and climate change. Because settlement in New Hampshire historically occurred along waterways, floodplains are often the state's most densely populated areas.

2.1.4 Types of Natural Silos

Rivers and streams are naturally occurring surface waters that flow from regions of high altitude to regions of low altitude. New Hampshire's five major watersheds contain a total of 16,984 miles of rivers and streams.[12]

Lakes and ponds are accumulations of surface-water runoff and groundwater seepage, typically featuring limited current, deep waters, and limited surface vegetation.[13] While lakes are naturally occurring, most are attached to a man-made dam at the outlet which increases their depth. In the codebook, lakes are categorized as natural unless the sub-statute specifically addresses the attached dam. The surface area of all New Hampshire lakes and rivers totals 165,000 acres.[14]

Groundwater is any water found beneath the earth's surface.[15] In New Hampshire, groundwater typically lies 10 to 20 feet below the surface.[16]

Wetlands are areas covered by surface water or groundwater such as swamps and marshes. New Hampshire's wetlands, occupying roughly five to 10 percent of the state's landscape, are mostly non-tidal.[17]

Coastal and estuarine waters are transitional regions where freshwater meets saltwater.[18] Although New Hampshire features only 18 miles of coastline, its estuaries have almost 220 miles of shoreline. These regions tend to have the highest population densities of the state.[19]

2.1.4 Content

The third part of our codebook examines the type of content contained in the statute, with options to mark a secondary category as well as sub-categories.

Authorization relates to activities that require an agency or official's approval. Statutes that discuss licensing, permitting, approval processes, or contracts fall under this category. Licensing, permitting, and contracts are marked as a sub-category when a statute specifically mentions these words. The approval process designation is applied without a specific key word, and is based upon the researcher's best judgment and interpretation.

The *appropriations* category includes any statute that mentions how a program is or will be funded. This category does not have any subcategories because we sought to capture all funding sections into one place to make analyzing the data easier once we finished coding. Because much of the watershed approach depends on federal grant programs, appropriations will be essential when the DES begins to implement the new system.

The *administrative* category was designed to cast a broad net over most of the administrative activities found in Chapters 481 to 488. It is further designated by two sub-categories: *responsibility*, which covers sections that assign agencies or officials with job responsibilities, and *recordkeeping*.

Oversight includes *compliance*, *inspections*, and *assessments* throughout the statutes. This category connects directly to the watershed approach's emphasis on shared monitoring. When the DES divides monitoring responsibilities between multiple agencies, the department can easily access this category. Like other sub-categories, compliance, inspections and assessments were coded based judgments focusing upon these keywords.

Technical specifications, as a category, includes statutes referring to water *quality*, *quantity* and *spatial or locational limitations*. Quality includes statutes that mention water standards, chemical levels or water quality. For example, a statute stating "all surface waters must keep nitrogen levels below X per milliliter" would be considered quality. Quantity relates to the river flow management program that the DES has proposed as part of its push toward a watershed approach. This plan will try to set baselines for flow-levels for each river system. We searched for all sections pertaining to quantity in order to forward these flow management goals. For example, "the Vermont Yankee Power Plant can only intake X million gallons per hour for their cooling system," would be coded for quantity, as well as man-made. The locational or spatial limitations sub-category identifies statutes that apply only after a certain condition is met. For example, a water withdrawal law may only apply to lakes in the Saco watershed region. Knowing the limitations on a statute's application can help identify gaps in inter-statutory relationships.

The designation of *other* is used as catch-all for unanticipated types of statutes that we did not come across in the preliminary run-through conducted before formulating the codebook. When reviewing the final data, the DES can rely upon the quick descriptions researchers include with all "other" statutes. Whenever we found significant sections that we missed, however, we created a category or sub-category to address the issue.

2.1.5 Stakeholders

In addition to addressing water itself, sub-statutes can affect a variety of stakeholders. It is therefore important to determine which parties a statute affects and to whom it applies. Stakeholders are not mutually exclusive, as one statute often affects more than one group, so the codebook allows researchers to select more than one category when necessary.

Categories of stakeholders range from individual residents to state-wide government bodies. The *state* category refers to the DES and its water management programs and divisions. As the department's mission states, the organization helps sustain public health and the environment for all of New Hampshire.[20] *Municipalities* are typically cities or towns with a local government and *community members* are the residents that live within them. The *Businesses* category includes private, commerce-engaging companies, while *water suppliers* are individuals or organizations that own or operate a public water system. *Judicial body* refers to a New Hampshire court, and *silo owners* are those who operate or have the property rights to one of the aforementioned man-made or natural silos.

The *other* category has a few types of stakeholders that occur more frequently, including the federal government, non-DES state agencies, applicants to the permits or programs described in the statutes, and individuals who stand to be punished by the statute, including non-compliant persons and polluters.

2.2 Content Analysis Results

An Excel spreadsheet containing the full results of our content analysis can be found in an online appendix to this report. This appendix can be located at the following address: goo.gl/W7ZwQW. Readers may interpret the data from that Excel file by using the codebook attached to this document in appendix A. Accompanying tables (Tables 1, 2, and 3) found at the end of this section provide a visual breakdown of the contents of Chapters 481-488.

Our findings from undertaking the content analysis may be summarized as follows:

First, a significant portion of RSAs found in Chapters 481 to 488 are dedicated to administrative and compliance guidelines, such as the process for obtaining and granting permits. We therefore classified these regulations as *procedural*. Of the 748 total sub-statutes that were coded for a primary content category, 61 percent were classified as procedural in nature: pertaining to oversight, authorization, or administrative matters.

In contrast, the regulations we originally sought to find were *substantive*, such as target lake levels or dam capacity measurements. We concluded after the content analysis that substantive regulations were not the main focus of RSAs 481 to 488. In fact, only 15 percent of all coded sub-statutes were substantive in nature: of or relating to technical specifications on water quality or quantity or spatial and locational limitations.

The remaining 24 percent of RSAs were coded for "Other" in primary content, meaning that they were topics not originally included in the codebook. The most frequently occurring "other" content areas were definitions, statements of purpose, and regulations concerning federal compliance.

Moreover, 13 percent of all active RSAs were not coded for either primary or secondary silos, meaning that they do not directly pertain to any single silo. Of the remaining 653 RSAs that did receive a primary silo assignment, silo types were found to be diverse, with no single silo dominating the contents of Chapters 481-488. However, silos tend to be clustered and fairly uniform within chapters. For example, almost all RSAs in Chapter 482-A were coded for wetlands and coastal or estuarine waters. Similarly, almost all sub-statutes in Chapter 482 were coded for dams. The most frequently regulated silos are rivers and streams, wetlands, wastewater, dams, and "other" silos. These other silos included wells, public and surface waters, and non-water silos pertaining to timber, sand dunes, and recreation camps.

In all, manmade silos comprise 340 of the 653 silo-specific RSAs, while natural silos comprise the remaining 313 RSAs. Thus, silo types are evenly distributed between those regulating manmade waters and those regulating natural waters, at 52 percent and 48 percent, respectively.

Furthermore, the DES was found to be the majority stakeholder of all RSAs coded, at 54 percent. Less prominent but frequently occurring stakeholders include silo owners, businesses, and "other" stakeholders such as the federal government, state agencies besides the DES, permit applicants, appellants, and non-compliant persons such as violators and polluters. The overall picture of stakeholders in Chapters 481-488 is thus very diverse, concerning a wide range of institutions both public and private.

Finally, given the state-focused nature of the RSAs, we concluded that significant outside legislation is also at work to govern water movement in New Hampshire. Specifically, in tracing the actual path of the water drop back to relevant legislation, we found that the Certified Administrative Rules were more applicable to our water drop analysis than the RSAs themselves. In addition, within the parameters of our analyses, we found that many local or site-specific regulations exist beyond the scope of the RSAs, such as the Instream Flow Program in the Lamprey River. This in itself reveals the disjointed nature of existing water regulation, as there is no central source of laws governing the movement of water in a watershed. For this reason, we recommend a review of broader regulatory frameworks for future study, including the Certified Administrative Rules, site-specific programs, and a more focused analysis of the administrative RSAs specifically.

In sum, the RSAs in these chapters served as the basis for authorization, compliance, and classification purposes. To this end, RSAs 481 to 488 are as a whole better suited to answering questions of administrative nature, such as the process for resolving settlements or disputes regarding allowed silo use.

Table 1. Content of Sub-statutes, RSAs 481-488

	Primary Content		Secondary Content	
	Count	%	Count	%
Authorization	**140**	***19%***	**64**	***9%***
Licensing	21	*3%*	7	*1%*
Permitting	49	*7%*	18	*2%*
Approval Process	40	*5%*	20	*3%*
Contracts	25	*3%*	18	*2%*
Authorization Not Specified	5	*1%*	1	*0%*
Appropriations	**26**	***3%***	**35**	***5%***
Administrative	**146**	***19%***	**87**	***12%***
Record-Keeping	9	*1%*	19	*3%*
Responsibility	137	*18%*	68	*9%*
Oversight	**174**	***23%***	**65**	***9%***

Compliance	89	*12%*	42	*6%*
Inspection	17	*2%*	9	*1%*
Assessment	9	*1%*	8	*1%*
Settlements/Disputes	59	*8%*	6	*1%*
Technical Specifications	**112**	***15%***	**148**	***20%***
Quality	33	*4%*	47	*6%*
Quantity	6	*1%*	17	*2%*
Limitations	73	*10%*	84	*11%*
Other Content	**150**	***20%***	**29**	***4%***
No Primary/Second. Content	**4**	***1%***	**324**	***43%***
All Substatutes	**752**	***100%***	**752**	***100%***

Table 2. Silo Types in Sub-statutes

	Primary Silo		Secondary Silo	
	Count	%	Count	%
Natural				
Rivers and Streams	101	*13%*	18	*2%*
Coastal/Estuarine Waters	70	*9%*	37	*5%*
Wetlands	42	*6%*	1	*0%*
Lakes and Ponds	38	*5%*	7	*1%*
Other Natural	33	*4%*	33	*4%*
Manmade				
Dams	90	*12%*	3	*0%*
Wastewater	64	*9%*	4	*1%*
Artificial Water Storage	52	*7%*	2	*0%*
Groundwater	29	*4%*	11	*1%*
Flood Control	5	*1%*	5	*1%*
Other Manmade	129	*17%*	6	*1%*
No Silo Type	**99**	***13%***	**625**	***83%***
All Substatutes	**752**	***100%***	**752**	***100%***

Table 3. Primary Stakeholders Affected in Sub-statutes

	Count	%
State/DES	407	*54.1*
Other	161	*21.4*
Municipalities	42	*5.6*
Businesses	26	*3.5*
Silo Owners	26	*3.5*
Judicial Body	9	*1.2*
Water Suppliers	2	*0.3*
Community Members	1	*0.1*
No Primary Stakeholder	78	*3.5*
All Substatutes	**752**	***100.0***

3. WATER DROP ANALYSIS

3.1 Water Drop Analysis

To create the water drop analysis, we selected a representative path in which a drop of water drop travels through several types waterways and encounters both natural and man-made obstacles. Next, we identified the stakeholders along the route and attempted to match RSAs and federal regulations to the various waterways and obstacles.

3.2 Identifying Stakeholders

While the content analysis is designed to depict the current state of New Hampshire water law, the water drop analysis was designed for two purposes: to illustrate how the current system works at ground level, and to provide a framework for possible educational topics that would tie in the transitional strategy of Vermont, should the DES wish to use it as a subject for a community meeting. This process ranged from searching for an appropriate example watershed to interviewing stakeholders about their individual business and personal interactions with New Hampshire water law. Our goal is to create a model example of how community members operate in relation to the water droplet and the laws that govern it.

We began the process by finding a suitable watershed that was representative of many areas in New Hampshire. Many of the watersheds were too large and complex to describe concisely. The Lamprey River system was a good candidate, as it transitions from rural Pawtuckaway to urban New Market. Along the way, we studied various types of stakeholders, from sand and gravel companies to wine vineyards. We also factored in known entities like the Epping Waste Treatment Plant, which operates directly with RSAs.

The water drop analysis begins with a hypothetical water drop, as it falls in Lake Pawtuckaway. On its path toward the Great Bay Estuary, it would pass the following key silos and stakeholders. Upon leaving Lake Pawtuckaway, it would pass the Dolloff Dam and join the Pawtuckaway River. While on the river, it would pass several possible pollutants, including the N. Sherman Trucking (Sand & Gravel Pit), the Abenakt Timber Company, the Epping Waste Water Treatment Plant, and Flag Hill Winery and Distillery. Other key stakeholders along the watershed include the Lee Hook Farm, which holds cattle and horses, the Lamprey River Reservoir and Packard Falls Dam, and the Water Treatment Facility in New Market. A summary of these key stakeholders and silos, as well as a representative list of RSAs which may affect them can be found in Table 4.

Table 4. Connections between RSAs, Key Silos, and Stakeholders in the Lamprey River Watershed

Silo	RSAs
1. Pawtuckaway Lake	Clean Lakes Program: • RSA 487: 15-23, 16-a, 17-II, 18, 20, 21, 22, 24-II to VII Surface Water Quality: • RSA 485-A: 6-I, 8-VI • CWA 33 USC 1251 Watershed Purity: • RSA 485: 23, 24 Surface Water Discharge Permits: • RSA 485-A: 8, 13-I
2. Dolloff Dam	• RSA 482
3. Pawtuckaway River	Rivers Management and Protection Program: • RSA 483: 6, 11 River Instream Flow: • RSA 483: 9, 11 • RSA 485-A: 8
4. Abenakt Timber Corporation	• RSA 485-A: 17, 22-a • RSA-B: 1 • RSA 482-A: 14-a • 483-B: 5-b-II
5. Waste Water Treatment Plant - Lagoon Road	Wastewater Treatment Plant Operator Certification: • RSA 485-A: 5-a, 7, 9 Pretreatment of Industrial Water: • RSA 485-A: 4, 5, 22, 45 to 54 Mercury-Containing Amalgam: • RSA 485-A: 4 Revolving Loan Fund (for municipal water pollution control): • RSA 486:14 • CWA 33 USC 1251-1387 Waste Water Treatment Facility Construction Standards: • RSA 485-A: 4-VI and IX, 13-I Sewage Disposal System Design: • RSA 485-A: 1, 2, 29, 30, 32, 38, 34, 41 Sludge Management: • RSA 485-A: 4, 6 Septage Management: • RSA 485-A: 4, 5-c, 6 • RSA 485-C: 13 • RSA 483: 12-a, 15 Inspection: • RSA 149-M: 6 Solid Waste Program, Procedures: • RSA 149-M:7 Facility Requirements: • RSA 149-M: 6, 7, 9
6. Lee Hook Farm	Cattle/Horses • RSA 483-B: 3-III, 9-V (with exemptions for agriculture)

3.3 Water Drop Analysis Summary

As the water drop began flowing eastward in Lake Pawtuckaway, we found that most of the RSAs which it would encounter pertained to procedural, not substantive, governance. For example, the RSAs give the DES the power to regulate lake depth, but administrative rules act on that authority by placing specific restraints on depth. This begs further analysis of the administrative rules for a more substantive-specific picture of New Hampshire water laws.

As the drop moved down river toward some of our community stakeholders, we found that relatively large stakeholders were not governed by pollution RSAs. We interviewed representatives from a local trucking company. We asked them about their relationship with New Hampshire water law specifically related to the Lamprey River. We also asked if there were any permits associated with operating a trucking company so close to the River. They made no mention to the pollution regulations or permits that governed them. They did have a trucking license, but this did not originate from within the pollution control regulations. The trucking company operates approximately one hundred feet from the Lamprey River. This highlighted some possible benefits to switching over to the watershed approach, away from macro-level regulation. For example large farms, defined as those with 500 head of cattle or more, are regulated by the state through the Clean Water Act. However, on the aggregate level many small cattle ranches may have the same impact on the watershed, but go unregulated. We were met with stiff resistance when we tried to interview most rural livestock owners throughout the Lamprey Watershed. This resistance creates doubt around the full representation of business interests at the watershed education programs.

As we moved farther downstream to a cattle ranch, a winery, and timber company, we found more of the same: no interaction with the state- or local-level regulation. We are aware of certain thresholds for federal legislation for what constitutes a point-source ranch polluter or runoff polluter, but nothing that governs small sets of polluters who would collectively constitute a large aggregate pollutant. In this way, the water drop analysis highlights a potential gap in an approach to water management driven by RSAs: the disaggregation of watersheds into silos might effectively lead to “missed” pollution, simply because the pollutants are not a single large entity. The Lamprey River is known to carry high levels of agricultural waste, automotive pollutants, and residential chemicals that have runoff from sources like driveways and lawns. Some of these pollutants may be linked to small, unregulated stakeholders like the ones we interviewed, but the rest come from a rapidly urbanizing community with more paved area resulting in more runoff. A governing watershed council may have an impact in this case because it focuses on local regulation instead of large-scale regulation like federal and state plans.

The water droplet analysis exposed three issues. First, the current pollutant governance misses a large piece of pollution by limiting regulation to only the largest polluters. An aggregation scheme on the watershed scale where communities hold community polluters accountable would catch more specific pollution. Second, that many of the laws found in the content analysis are procedural, and therefore dependent on the more substantive administrative rules. Future research would benefit more from analyzing that portion of water law. Finally, the education plan operating at the watershed level depends on the breadth of community members involved. Based on the resistance shown when asked to, "talk about the Lamprey watershed for five-minutes", community business members may need incentives or punishments in order to take watershed councils seriously.

5. CONCLUSION

By coding the State's water-related RSAs we have created a searchable online database for New Hampshire water law. This provides a source with which users can examine and sort relevant RSAs by function, silo, or relevant stakeholders. Moreover, our water drop analysis illustrates that few stakeholders perceive much of a relationship with the existing RSAs, and in truth, very little substantive relationship may exist, as the RSAs are largely procedural.

This report also provides a foundation for future research projects designed to delve deeper into the existing water management policies in New Hampshire, and the possibilities of transitioning to a watershed approach. Specifically, by following the water drop through different facets of governance we found that a focus on administrative rules could be the next step in this sort of analysis. Should the DES want to continue with this line of inquiry, a similar content analysis approach, focusing on the administrative rules of the DES, might serve as a next step in describing and delimiting the existing nature of New Hampshire water regulations. Once that takes place, an additional water drop analysis can take place, adding complexity to this initial survey. Finally, creating a research project with one of Vermont's first, second, or third generation as a goal may serve the Department better. For New Hampshire to move toward a statewide watershed approach, our report points to the importance of further research on both the Certified Administrative Rules and Vermont's watershed transition experience.

APPENDICES

Appendix A: Content Analysis Codebook

Codebook: New Hampshire Lakes & Rivers, Chapters 481-488

Unit of Analysis:
Each row in the codebook represents an individual sub-statute in Chapters 481-488 of the New Hampshire RSA. These chapters of New Hampshire law deal with water management and protection.

Steps and Procedures for Identifying and Describing Statutes:

1. Identify each sub-statute in RSA Chapters 481-488

2. Code the sub-statute into the spreadsheet titled "Chapters 481-488 Data" based on descriptive categories drawn from information in the Chapters 481-488 law.

3. A useful research tool that outlines the relevant New Hampshire statutes can be found on the website http://www.gencourt.state.nh.us/rsa/html/NHTOC/NHTOC-L.htm. This is the primary resource where Chapters 481-488 can be found in full text form. The RSA text is also found, organized by statute, on the website http://www.lawserver.com/. To access Chapter 481-488, selected "New Hampshire Revised Statutes," then "Title L Water Management and Protection." You can then look through the different recommendations for related statutes and regulations.

4. Proceed to research and answer questions presented in columns A-M in "Chapter 481-488 Data" to refine an understanding of each sub-statute. The answers coded in response to these questions will help us organize and categorize each sub-statute by silo. Use the "Notes" section at the end of each question to fill in information on why you answered the question the way you did.

Where to Find the Statutes
http://www.gencourt.state.nh.us/rsa/html/L/ (click the statute number, e.g. 481, then click on the last link, e.g. "481-mrg.htm")

Codebook Questions
Note that "Other" is an option for most of the following questions. If you decide to select this answer, please indicate your reasons for doing so. Continue through the Codebook and answer as many questions as possible. In order to resolve a response of "Other," identify resources where you may be able to get further clarifying information.

I. Basic information

This information is drawn from Chapters 481-488 statute descriptions (Code in "Chapters 481-488 Data" Columns A-D)

a. Statute Name
b. Statute Number
c. Statute Description *(This is a short summary of the statute's entire text.)*
d. Status
  0 = repealed
  1 = active

If the answer to part D is repealed, no further information is needed on this statute, and the additional questions may be skipped.

II. Type of Silo

In each statute, identify which types of silos apply. Silos are distinct categories of water, and each statute may address more than one silo. (Code in "Chapters 481-488 Data" Column E-F)

Does this statute address man-made or natural silos?

Coding an answer zero through five means that the silo is man-made and the statute covers water systems that are artificial or constructed, whereas numbers six or higher means that the sub-statute concerns flowing water within a physical system that has developed without human intervention, in which natural processes continue to take place.

0 = Other (man-made)
1 = Artificial water storage
2 = Dams (including watermills and hydropower)
3 = Wastewater
4 = Stormwater
5 = Flood control
6 = Other (natural)
7 = Rivers and streams
8 = Lakes and ponds
9 = Groundwater
10 = Wetlands
11 = Coastal and estuarine waters

III. Purpose of statute:

Determine the regulatory goal of each statute. (Code in "Chapters 481-488 Data" Columns G-L)

Some statutes may have multiple regulatory aims. In these cases, the coder is permitted to list primary and secondary purposes. Moreover, some regulatory goals have different end structures. For example, a statute with the primary goal of "Technical specifications" may be designed to regulate the "quality" or the "quantity" of water in a silo. In these cases, a "sub-content" column is offered to further designate the purpose of the statute. A statute designed to regulate water quality, for example would be coded with as five for "Primary content," and as one for "Primary sub-content."

0 = Other (use keywords)
1 = Authorization
  1 = Licensing
  2 = Permitting
  3 = Approval Process
  4 = Contracts
2 = Appropriations
3 = Administrative
  1 = Record-keeping
  2 = Responsibility
4 = Oversight
  1 = Compliance
  2 = Inspection
  3 = Assessment
  4 = Settlements/disputes
5 = Technical Specifications
  1 = Quality
  2 = Quantity
  3 = Limitations (spatial or locational)

IV. Stakeholders:
Identify which parties are affected by or addressed in this sub-statute. Stakeholders are not mutually exclusive, so more than one may apply. In these cases, the coder is permitted to list primary and secondary stakeholders. Moreover, each stakeholder could either be the regulator of the statute or regulated by the statute. (Code in "Chapters 481-488 Data" Columns M-P)

0 = Other
  0 = Regulator
  1 = Regulated
1 = State (DES)
  0 = Regulator
  1 = Regulated
2 = Municipalities
  0 = Regulator

- 1 = Regulated

3 = Community members
- 0 = Regulator
- 1 = Regulated

4 = Businesses
- 0 = Regulator
- 1 = Regulated

5 = Water suppliers
- 0 = Regulator
- 1 = Regulated

6 = Judicial body (e.g. courts, attorney general)
- 0 = Regulator
- 1 = Regulated

7 = Silo owners (e.g. dam owners, marshland owners)
- 0 = Regulator
- 1 = Regulated

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