

BROWN

Socio-Environmental Succession of Providence Greenspace

Consequences of an Industrial Legacy on Modern-Day Water Infrastructure

K. Acosta, C. Cole, L. Montieth, D. Tobe – Professor Scott Frickel, Advisor
Department of Sociology, Brown University, Providence, Rhode Island 02912

Introduction

Water is critical for the development of industry; it is used at all levels of industrial production as solvent, coolant, transport agent, and raw material. Abundant flowing water throughout New England powered rapid growth of factories during the Industrial Revolution. Tanneries, dyeworks, textile mills, and other industries discharged untreated wastewaters containing organic solvents, caustics, acids, and heavy metals. Though no longer active, these historic industrial sites continue to pose hazards when redevelopment disturbs persistent contaminants. Modifications to natural water ways and development of artificial water infrastructure has altered how contaminants enter and move through a now-complex water system.

This study will determine the relative concentration, distribution, and proximity to water of brownfield and

Superfund sites located within the Mossashuck and Woonasquatucket River watersheds, which converge to form the Providence River. Brownfield sites present potential human health hazards when redeveloped, expanded, or reused due to the presence or potential presence of hazardous contamination. Superfund sites have been identified as requiring a long-term response to mitigate or contain known hazardous contaminants.¹

Additionally, this study maps the sewage systems of relevant municipalities to investigate how artificial water infrastructure may be responsible for mobilizing contaminants from historic sites in unintended ways. In the context of present-day natural and artificial water infrastructure, these historic sites may pose a threat to both immediate and geographically removed communities.

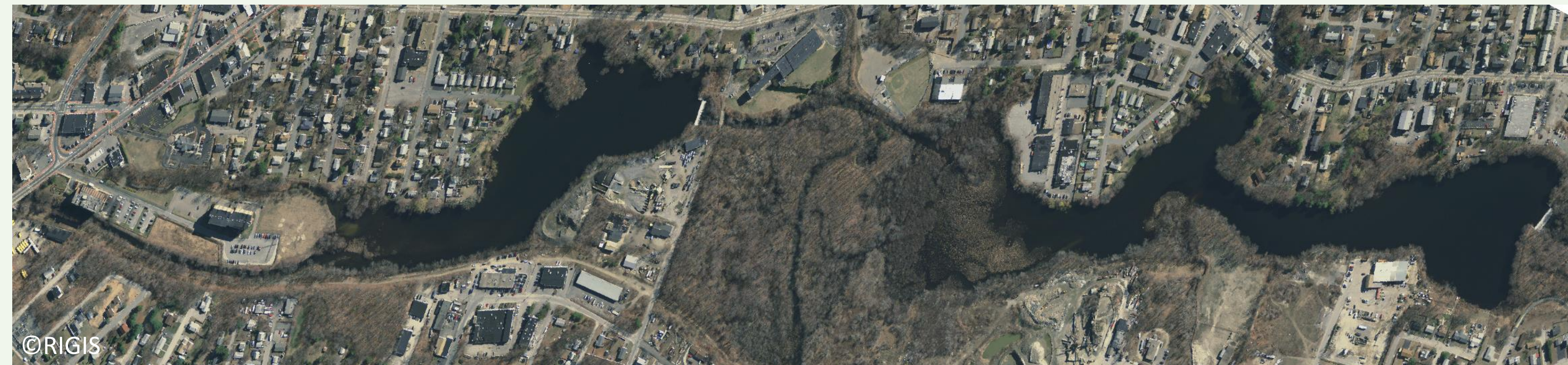


Figure 1: Aerial view of Centredale Manor, a Superfund site placed onto the National Priorities List in 2000. Located along the Woonasquatucket River in North Providence, RI, it is the former site of Centredale Worsted Mills, which was succeeded by chemical and drum-reconditioning facilities. Elevated levels of dioxin/furan, pesticides, volatile organic compounds, polychlorinated biphenyls, and metals have been documented both at the site and in the waters and sediments of the two former mill ponds shown in the image. Remediation attempts were made, and the site is currently occupied by a low-income housing development.²

Goals

- 1) Develop a database of historic industrial sites located within the geographic boundaries of the Mossashuck and Woonasquatucket River watersheds that are known to pose contamination hazards
- 2) Geo-locate sites in reference to major rivers, streams, and other water bodies using GIS software
- 3) Identify and map sewage systems, including combined sewer overflows (CSOs)

Methods

Researchers compiled a database of brownfield and Superfund sites located within the Woonasquatucket and Mossashuck River watersheds using Rhode Island Department of Environmental Management (RIDEM)³ and United States Environmental Protection Agency (EPA) lists.⁴ Researchers also mapped artificial water

infrastructure and its connections to the watershed(s) from data obtained from the Rhode Island Geographic Information System (RIGIS)⁵ and the Narragansett Bay Commission⁶ to ascertain potential source points for contaminated effluent.

References

1) Glossary. Environmental Protection Agency, n.d. Web. < <http://www.epa.gov/superfund/programs/reforms/glossary.htm#s> > Accessed 3 August 2015.
 2) Centredale Manor Restoration Project. Environmental Protection Agency, n.d. Web. < http://yosemite.epa.gov/r1/npl_pad.nsf/51dc4f173ceef51d85256adf004c7ec8/bbe0100a535e8840852576e90053b186!OpenDocument > Accessed 3 August 2015.
 3) Rhode Island Department of Environmental Management. *Response Action Sites*. (2004-2013). [Government Publication].

Results

Brownfield and Superfund Sites Located within the Mossashuck and Woonasquatucket River Watersheds

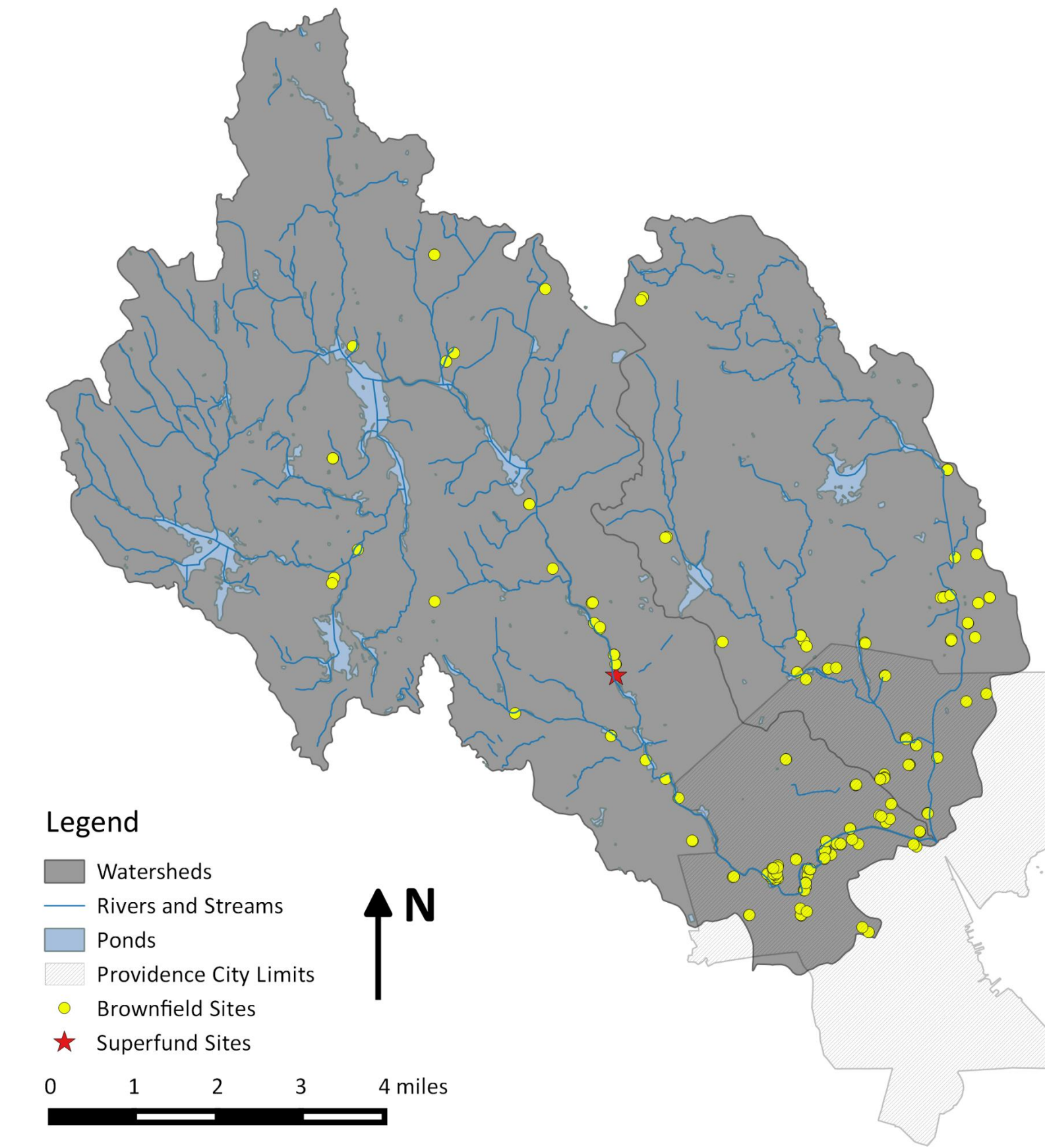


Figure 2 – Brownfield and Superfund sites on RIDEM active lists from 2004-2013³ that are located within the Mossashuck and Woonasquatucket River watersheds.

Sewer Systems and CSOs that Flow into the Mossashuck and Woonasquatucket River Watersheds

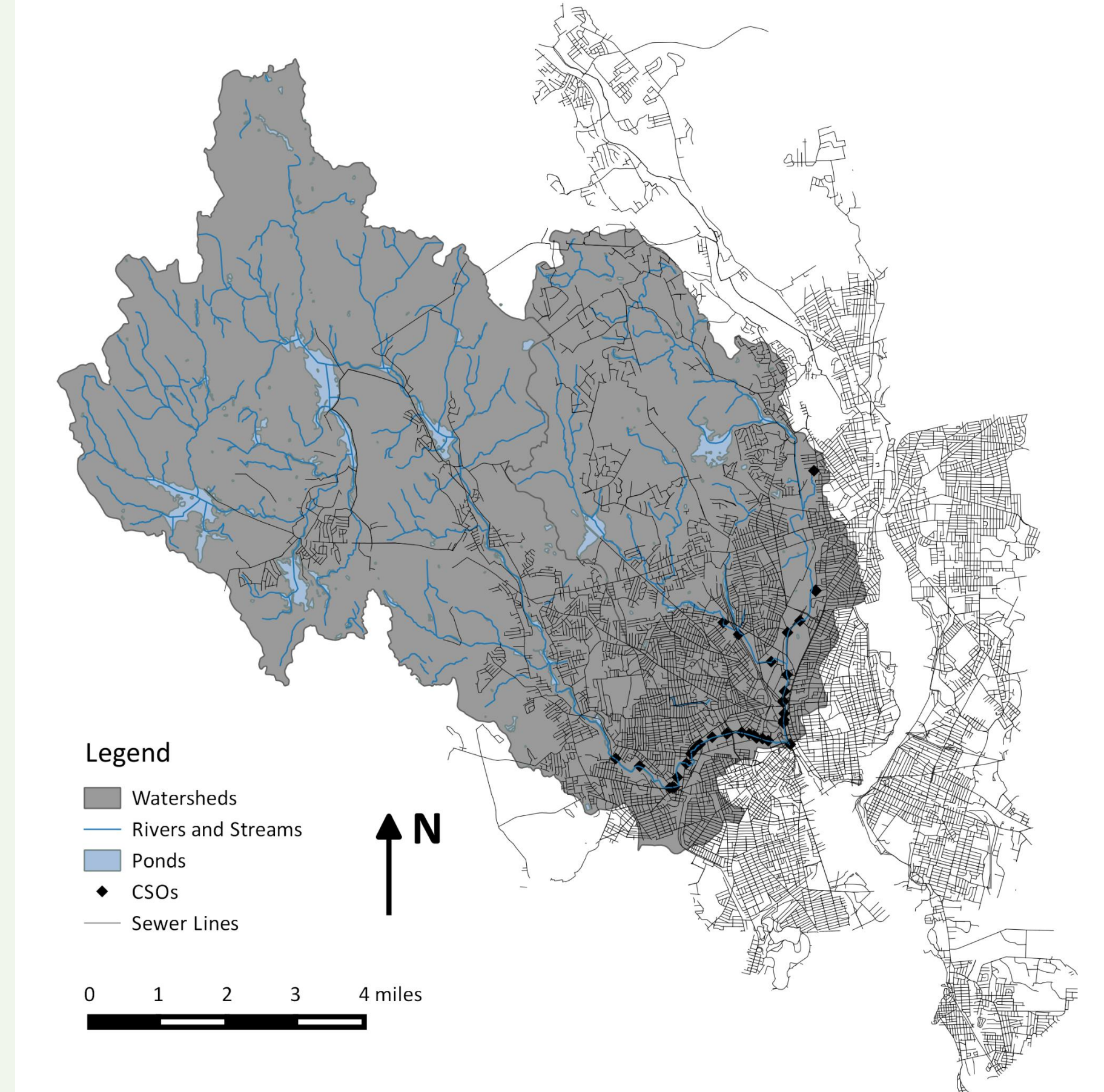


Figure 3 – Current sewer systems that flow into the Mossashuck and Woonasquatucket River watersheds. When overwhelmed untreated wastewater empties into rivers at 36 indicated CSOs.

Conclusions

As shown in Figure 2, most sites of concern lie on or near major waterways or other bodies of water. It is likely that contaminated effluent directly entered those waterways historically, and it is possible that persistent contaminants such as heavy metals, dioxins, and polycyclic aromatic hydrocarbons still present at these sites continue to find their way into waterways via rainwater runoff or other disturbances. After entering the water system, these contaminants spread

downstream and broadly impact communities not immediate to the source of contamination.

Additionally, multiple CSOs empty into those same rivers as shown in Figure 3. Pollutants from historic industrial sites well removed from natural waterways may be carried through the sewer system and enter rivers at one of these CSOs. In this manner, artificial water infrastructure contributes to pollutant loads and introduces new sources of hazardous contamination.

Future Directions

This study would investigate the identified sites to determine the types of contamination present at each and how that contamination may move downstream. Water quality and pollution studies may explicate any correlation between the contamination present in waterways and the types of pollution associated with particular industrial processes located at these sites.

Additionally, it will be important to understand how dams, an enduring mill feature, affect the distribution of pollution downstream by interrupting the flow of water. Further investigation of municipal wastewater systems will give insight into how much untreated wastewater enters the rivers and what contaminants it may carry.

4) Waste Cleanup and Reuse in New England. Environmental Protection Agency, n.d. Web. < <http://www.epa.gov/region1/superfund/> > Accessed 28 July 2015.
 5) Narragansett Bay Commission. *Service Area*. Web, n.d. < <http://www.narrabay.com/en/About%20Us/ServiceArea.aspx> > Accessed 29 July 2015.