Using GIS Technology to Inform Environmental Health Policy

A Case Study Involving USEPA's Decision-Making Process of Remedy Selection and Building Community Capacity

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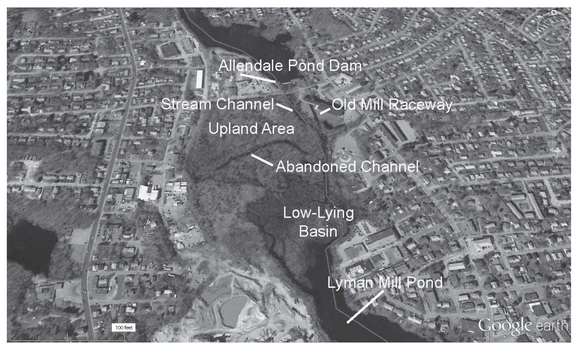
PURPOSE

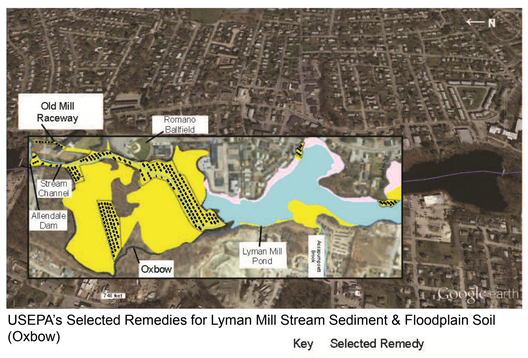
To assess the adequacy of USEPA remedy selection and to build a community's capacity to participate effectively in this decision-making process.

BACKGROUND

USEPA identifies and remediates the nation's worst hazardous waste (Superfund) sites. While USEPA employs a number of analytical tools, the use of geographic information systems (GIS) technology is not widely used in site assessment. USEPA must engage the public as stakeholders throughout this science-driven process. As non-scientists, community organizations operate at a disadvantage. While communities want to maximize long-term health, responsible parties want to minimize costs. Collaboration with a multi-disciplinary team from academia provides communities with access to technical resources and content expertise, thus building community capacity to participate effectively in this decision-making process.



Key Features of the Woonasquatucket River Oxbow Located Downstream of Centredale Manor Superfund Site in Providence, Rhode Island



USEPA's Selected Remedies for Lyman Mill Stream Sediment & Floodplain Soil (Oxbow)

Key	Selected Remedy
	Thin Layer Cover (3-in. thickness)
	Excavation

METHODS

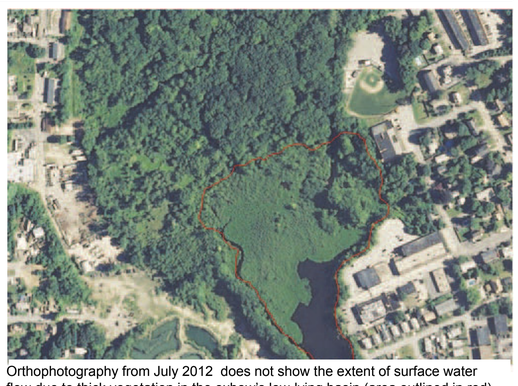
A community-based participatory process identified community concerns about USEPA's remedy selection. for the Woonasquatucket River Oxbow in Providence, Rhode Island:

1. What is the historic and current surface water flow through the Woonasquatucket River Oxbow?
2. What has been the flood frequency, magnitude and extent of flooding in this area?
3. What additional evidence exists of continued human activity in this area?
4. Are the existing USEPA environmental sampling data adequate for assessing risk to human health?

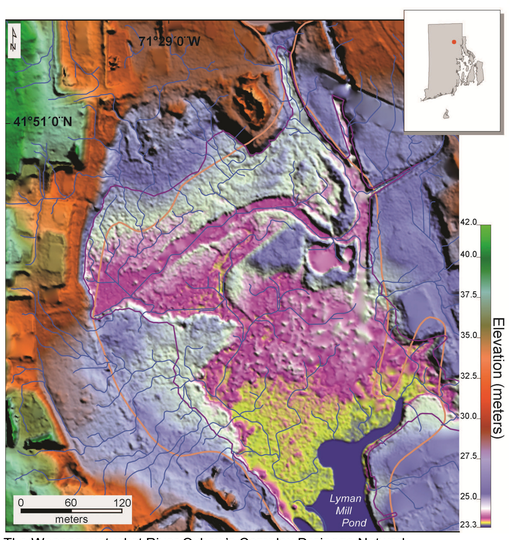
Researchers conducted document analysis, analyzed data on flooding frequency and magnitude, and used geospatial data to generate microtopographical figures of surface water flow and flood simulation. Direct visual site observations documented human activity. Community members evaluated the impact of using GIS technology on their ability to engage effectively with regulators.

RESULTS

Orthophotography from April 2011 clearly shows surface water flow with sparse vegetation in the oxbow's low-lying basin (area outlined in red).



Orthophotography from July 2012 does not show the extent of surface water flow due to thick vegetation in the oxbow's low-lying basin (area outlined in red).

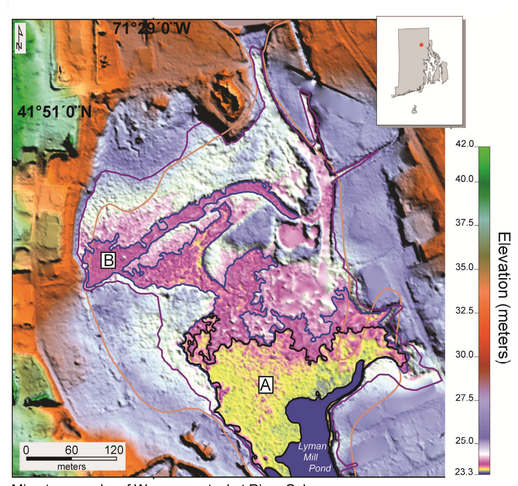


The Woonasquatucket River Oxbow's Complex Drainage Network

Base Flood Elevation (RIGIS/FEMA)

100-Year Flood Zone (USEPA/Batelle)

Estimated Drainage Network (based on elevation)



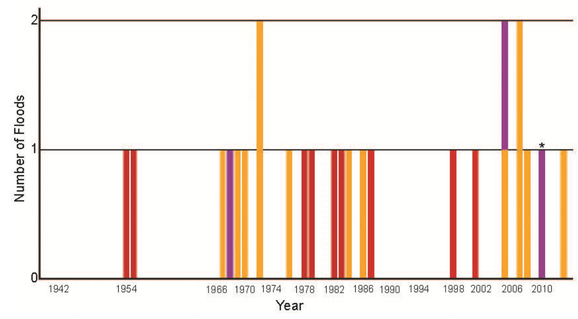
Microtopography of Woonasquatucket River Oxbow

Key	DFIRM	Annual Chance Flood Hazard
		0.2%
	A	1.0%
	AE	Base Flood Elevation
	AO	Area Subject to Shallow Flooding

100-Year Flood Zone (Batelle) Base Flood Elevation (FEMA)

Extent of Area B (24,223 m²)

Extent of Area A (24,201 m²)

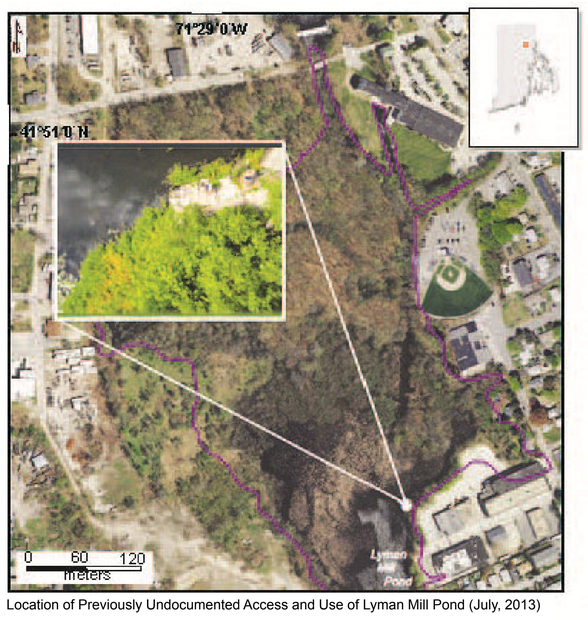


Number of Floods per Year by Flood Category for the Woonasquatucket River (1942-2012)

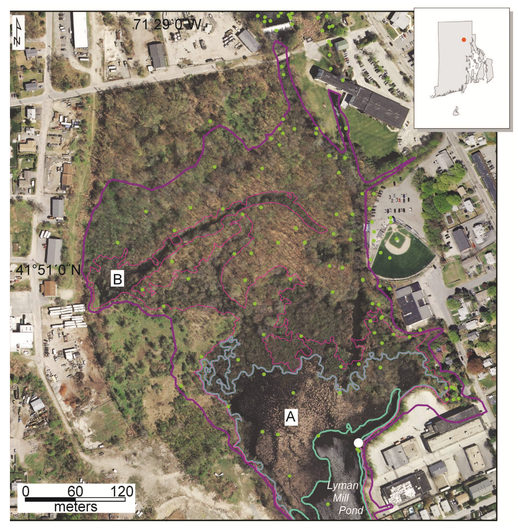
Key	Flood Category (n=25)
	Minor (5.5 - 6.49 feet)
	Moderate (6.5 - 7.49 feet)
	Major (≥ 7.5 feet)

* Record (9.2 feet)

Evidence of Current Use and Access to Lyman Mill Pond (July, 2013)



Location of Previously Undocumented Access and Use of Lyman Mill Pond (July, 2013)



Location and Distribution of Soil Samples within the Woonasquatucket River Oxbow Area (September, 2013)

Key	Description
	100-Year Flood Zone (Batelle)
	Area of Concern A
	Area of Concern B
	Location of Soil Sample
	Location of Improvised Dock for Site Access

CONCLUSIONS & IMPLICATIONS

This study informed decision documents and operational data for scoping the remedial design and the 5-year review with respect to three of nine criteria critical to the statutory adequacy of the remediation plan. GIS provided visual clarity and scientific substantiation and played a transformative role in public participation. Enhancing community capacity facilitates a more equitable voice in defining issues and promoting effective and long-term solutions for hazardous waste sites.

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