Dam Removals in Massachusetts

A Nashua River Watershed Association presentation, supported by the MA Division of Ecological Restoration

About the Nashua River Watershed Association

The mission of the Nashua River Watershed Association is to work for a healthy ecosystem with clean water and open spaces for human and wildlife communities, where people work together to sustain mutual economic and environmental well-being in the Nashua River watershed.

About the Massachusetts Division of Ecological Restoration

This presentation is supported by the Massachusetts Division of Ecological Restoration (DER). DER initiates projects that restore our rivers, streams, wetlands, and watersheds. These projects improve habitat for wildlife and provide many benefits to communities, including reduced flooding, improved water quality, and public safety.

A Brief Overview of Dams

Dams can provide important functions:

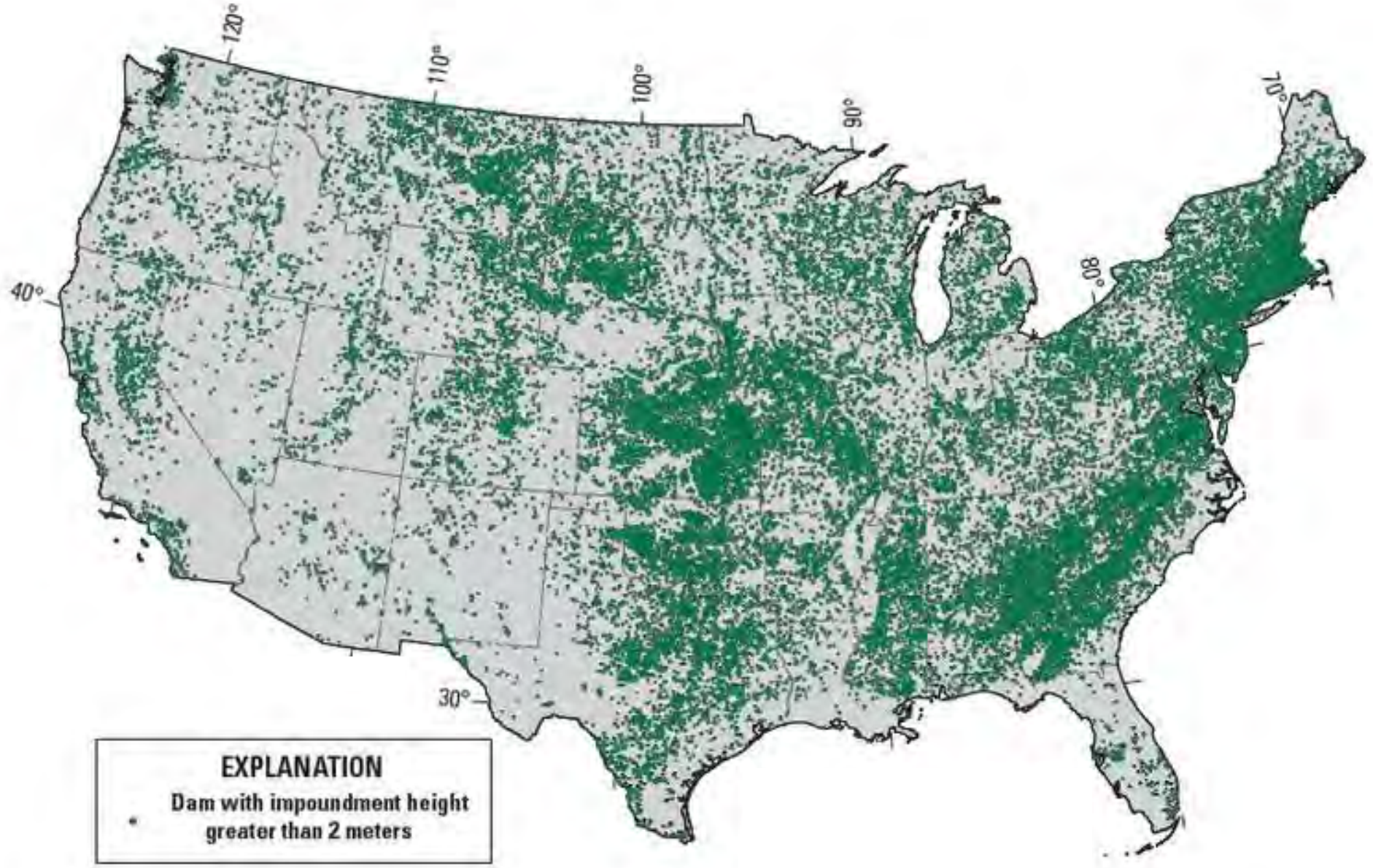
- drinking water supply
- flood control
- hydropower generation
- recreation

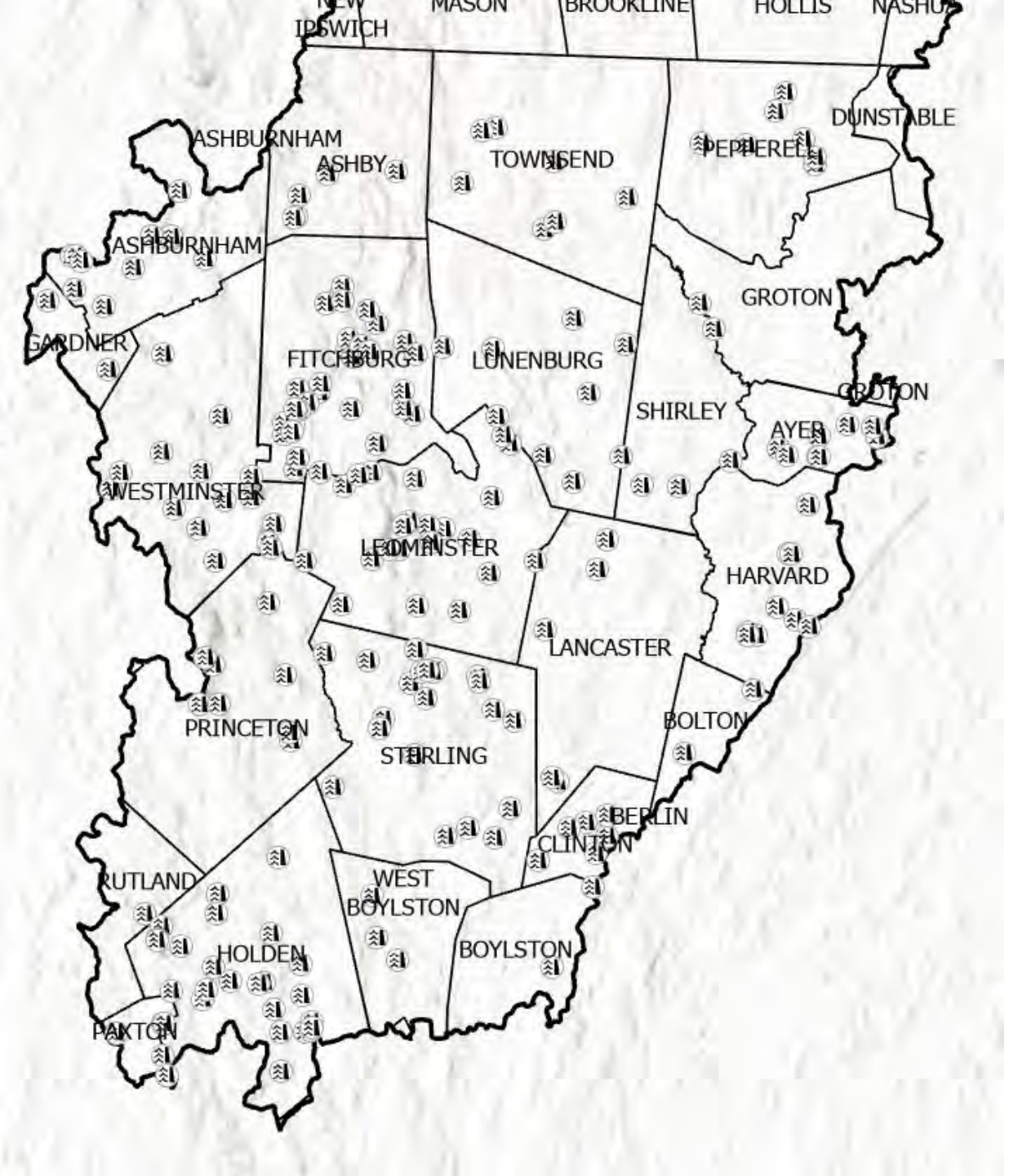
Many are now aging or structurally unsound

- 75-90% of existing dams are considered non-functional

Image credit: Buzzards Bay Coalition

Estimated # Dams in the United States: 2,000,000 - 2,500,000



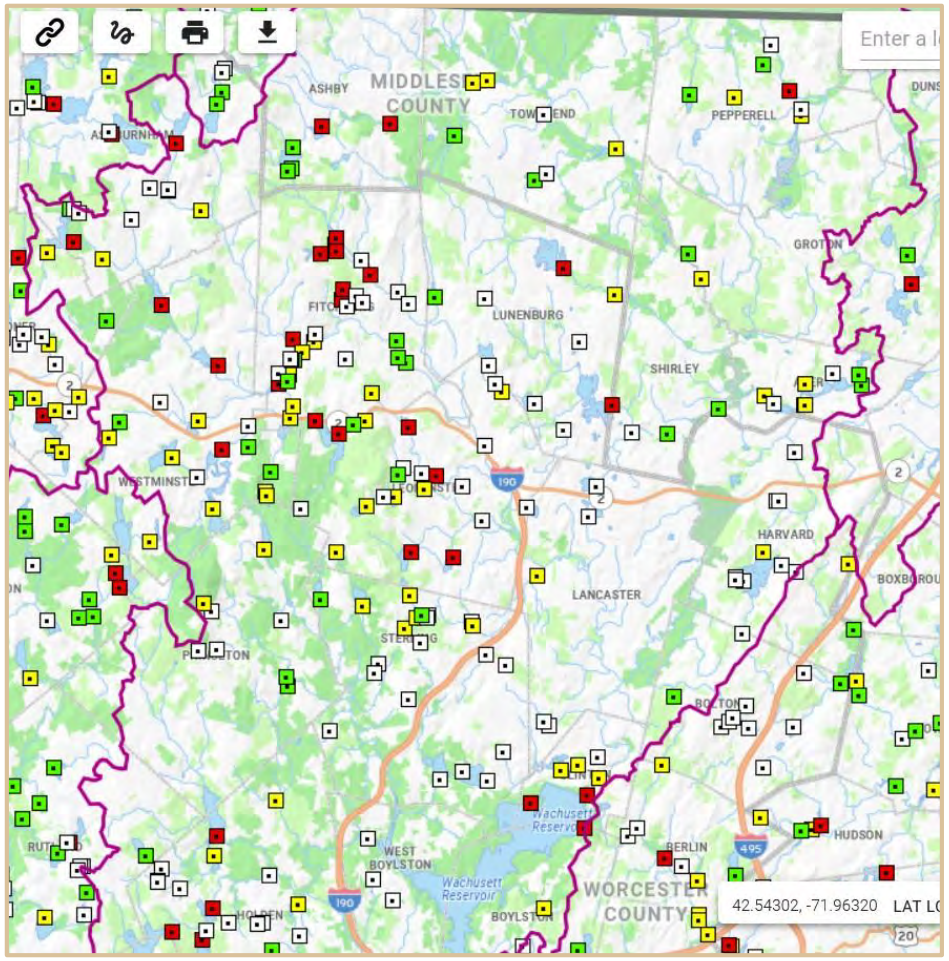


Dams in our Communities

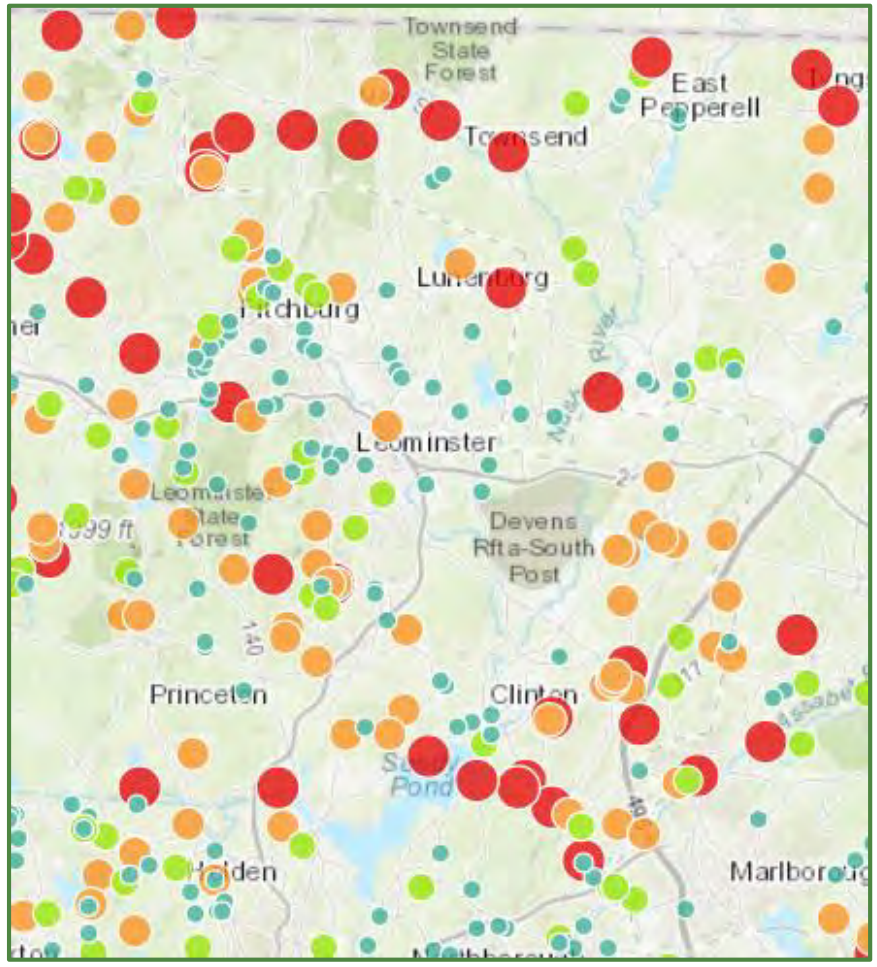
- Massachusetts has over 3,000 dams, the highest number of dams per stream mile in the nation

- 211 dams in the Nashua River watershed, (Massachusetts Office of Dam Safety)

Nashua River Watershed



Dams by Hazard Class



Dams by Ecological Restoration Benefit

Why Are So Many Dam Removals Underway?

Awareness

There is a growing awareness in the U.S. of the need to address obsolete dams that impair our waterways

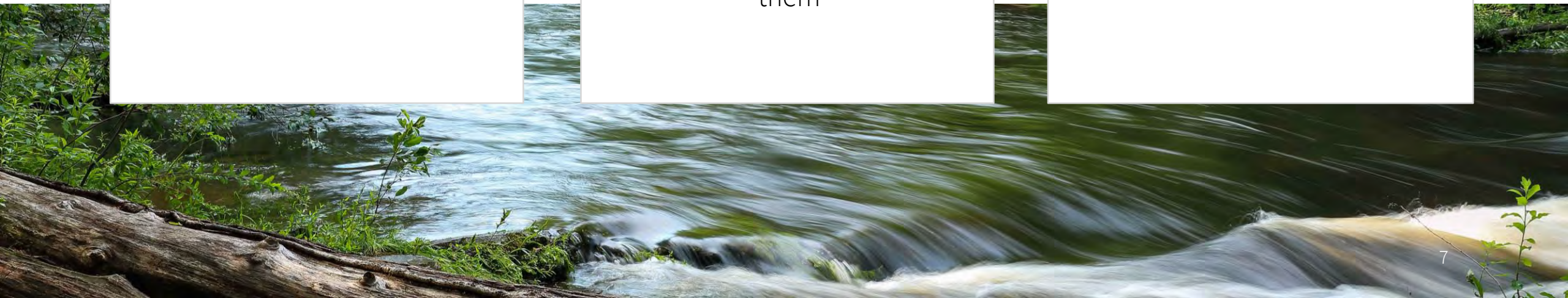
Cost

- Costs rise as dams age -

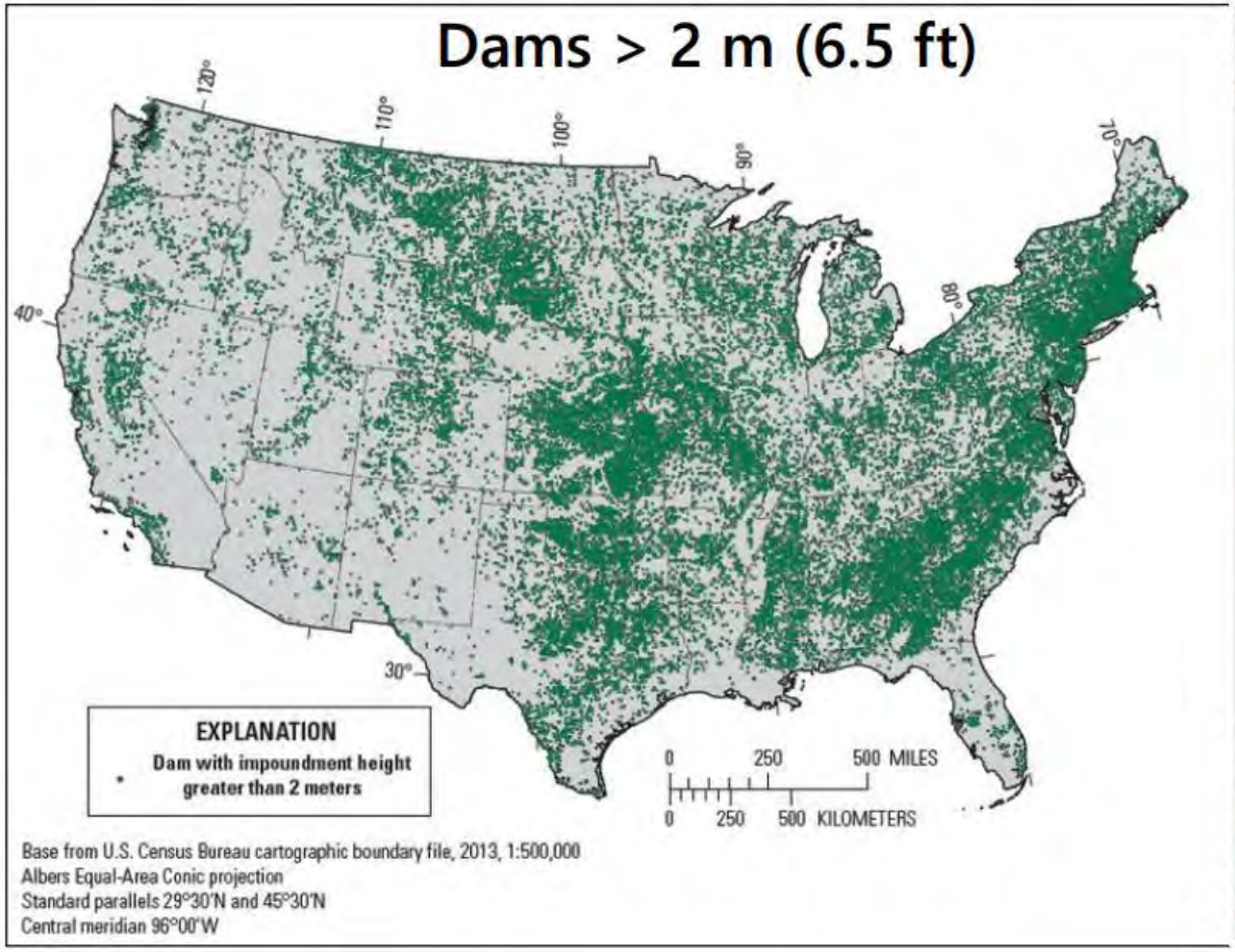
According to a study conducted by the MA DER, the average cost of removing dams is 60% less expensive than repairing them

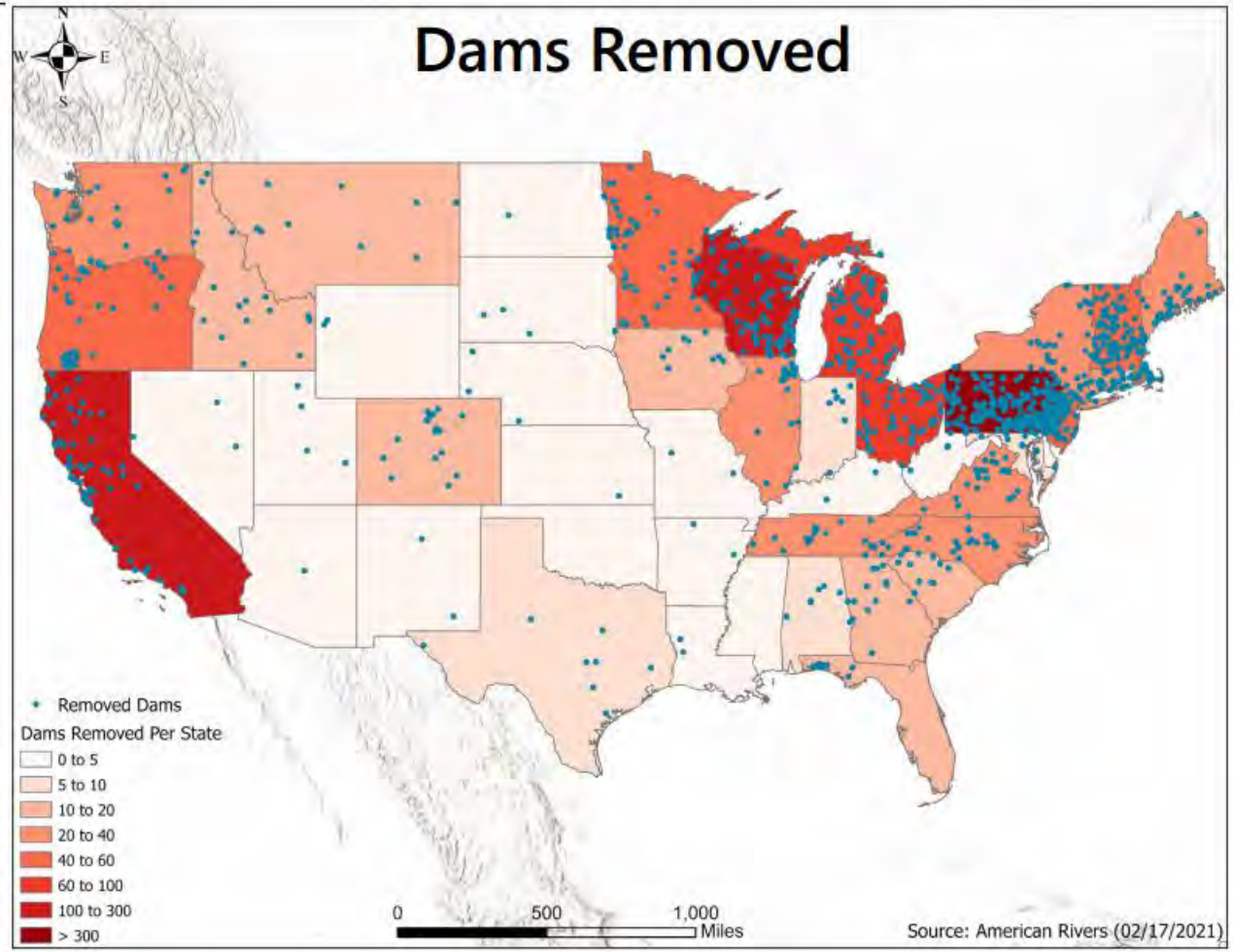
Benefits

Significant ecological, financial, and public safety benefits can motivate the removal of unsafe or obsolete dams



Dams are still a critical part of U.S. infrastructure: The remaining number far outweighs the amount removed





Understanding Dam Removal Benefits

Photo: Sentinel & Enterprise

Types of Removal Benefits

- Public Safety
- Financial
- Ecological
- Community

U.S. NEWS

Recent floods heighten concerns that New England dams may not be built for climate-induced storms

BY MICHAEL CASEY
Updated 12:01 AM EST, September 15, 2023

Share

BOSTON (AP) — The floods this week in Massachusetts that put a few dams at risk have raised concern the structures may increasingly be at risk as the region is hit by stronger and wetter storms.

There are thousands of dams across New England and many were built decades if not centuries ago, often to help power textile mills, store water or supply irrigation to farms. The concern is they have outlived their usefulness and climate change could bring storms they were never built to withstand.

As the climate changes, obsolete dams put Mass. at risk for flooding similar to Vermont

SHARE

Jodi Kelly, left, practice manager at Stonecliff Veterinary Surgical Center, behind, and her husband, veterinarian Dan Kelly, use a canoe to remove surgical supplies from the flood-damaged center, Tuesday, July 11, 2023, in Montpelier, Vt. The supplies included orthopedic implants for an upcoming surgery on a dog. A storm that dumped two months of rain in two days brought more flooding across Vermont Tuesday.
Steven Senne/AP / AP

By Craig LeMoult and Casey Choung
July 14, 2023 Updated July 17, 2023

LOCAL

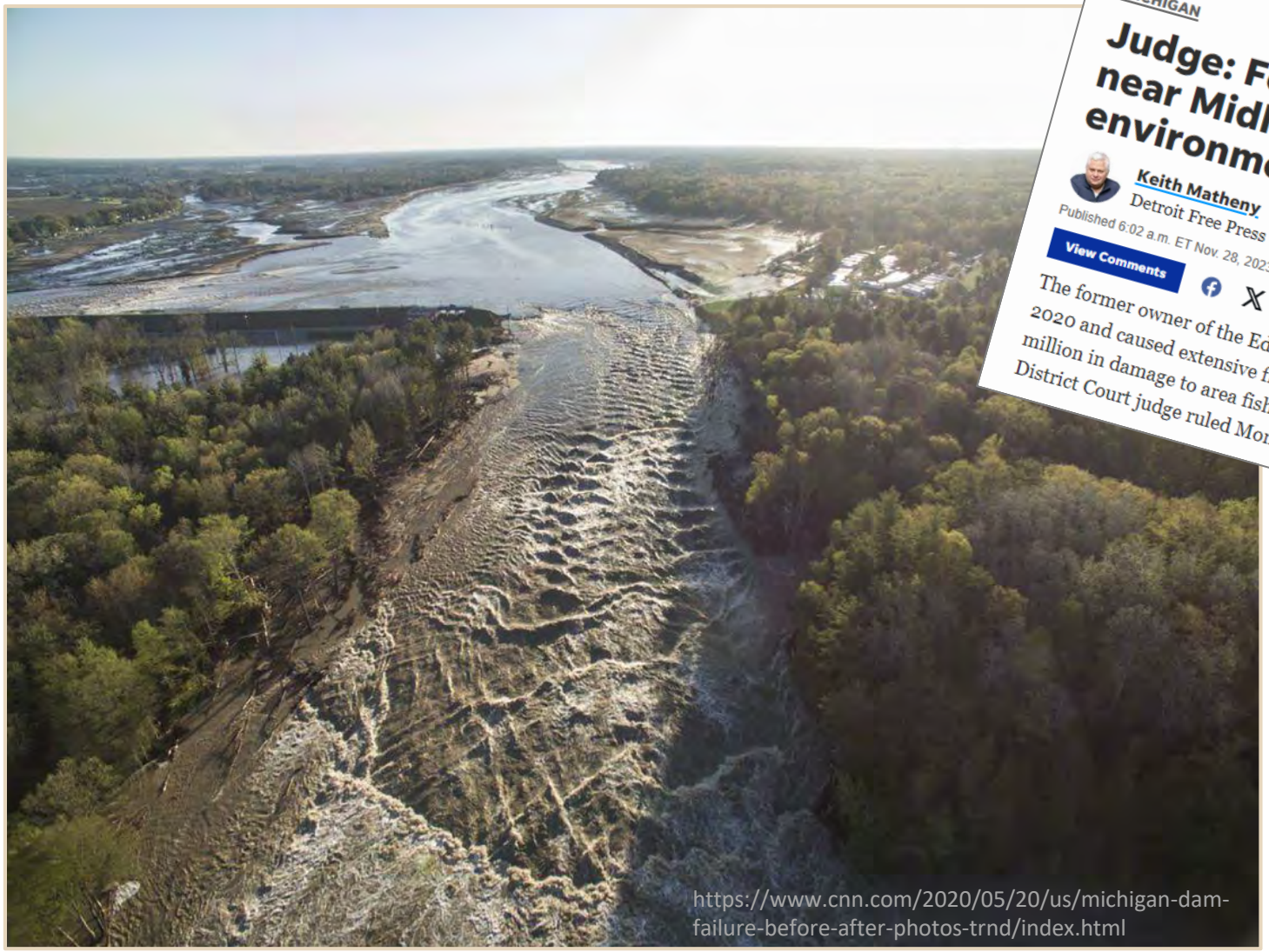
'Wakeup call': Leominster floods show risks posed by deficient dams in Mass.

Henry Schwan
Worcester Telegram & Gazette
Published 6:08 a.m. ET Sept. 14, 2023 | Updated 9:02 a.m. ET Sept. 14, 2023

'Catastrophic flooding' damages hundreds of homes as a Massachusetts city engulfed in water is now at risk of dam failure

By Holly Yan and Jennifer Henderson, CNN
4 minute read · Updated 9:52 PM EDT, Tue September 12, 2023

Graphics Credit: Susie Bresney, MA DER



https://www.cnn.com/2020/05/20/us/michigan-dam-failure-before-after-photos-trnd/index.html

MICHIGAN

Judge: Former owner of failed dams near Midland liable for $119M in environmental damage

Keith Matheny
Detroit Free Press

Published 6:02 a.m. ET Nov. 28, 2023 | Updated 11:00 a.m. ET Nov. 28, 2023

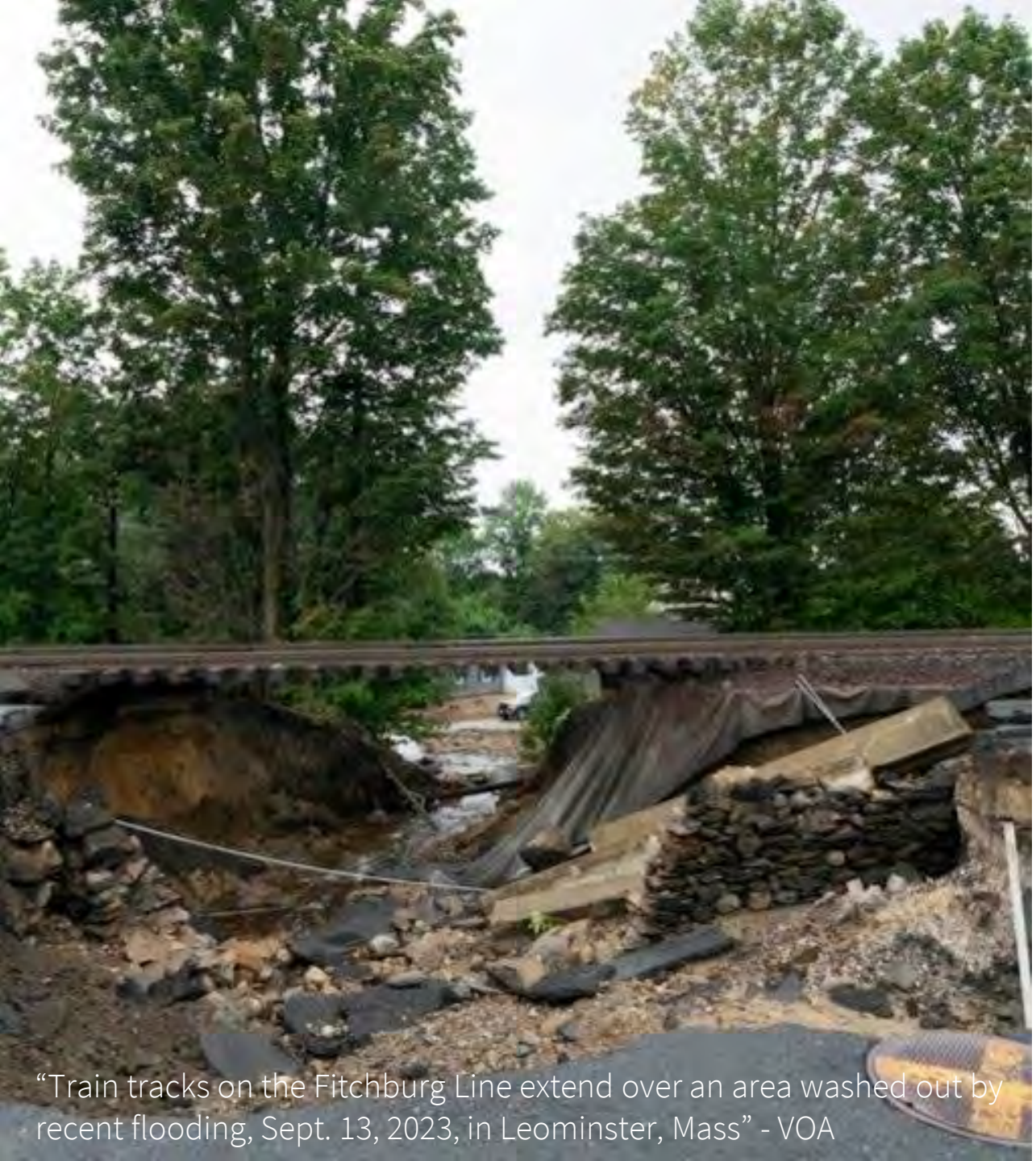
View Comments

The former owner of the Edenville Dam, which failed in record rainfall in May 2020 and caused extensive flooding around Midland, is liable for nearly $120 million in damage to area fisheries and freshwater mussel populations, a U.S. District Court judge ruled Monday.

Graphics Credit: Susie Bresney, MA DER

Other Costs

Graphics Credit: Susie Bresney, MA DER

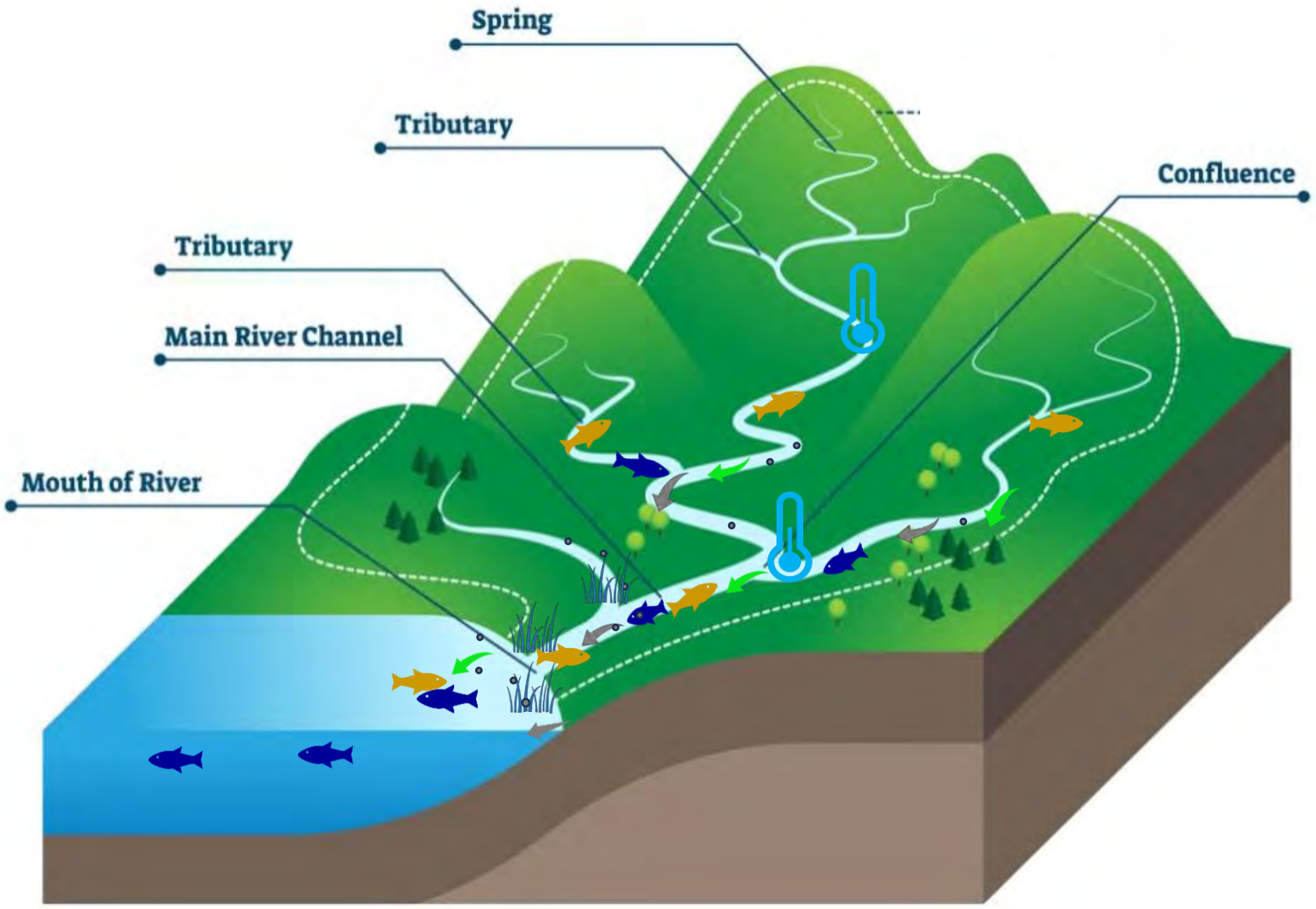


"Train tracks on the Fitchburg Line extend over an area washed out by recent flooding, Sept. 13, 2023, in Leominster, Mass" - VOA

Financial and Public Safety Benefits

Graphics Credit: Susie Bresney, MA DER

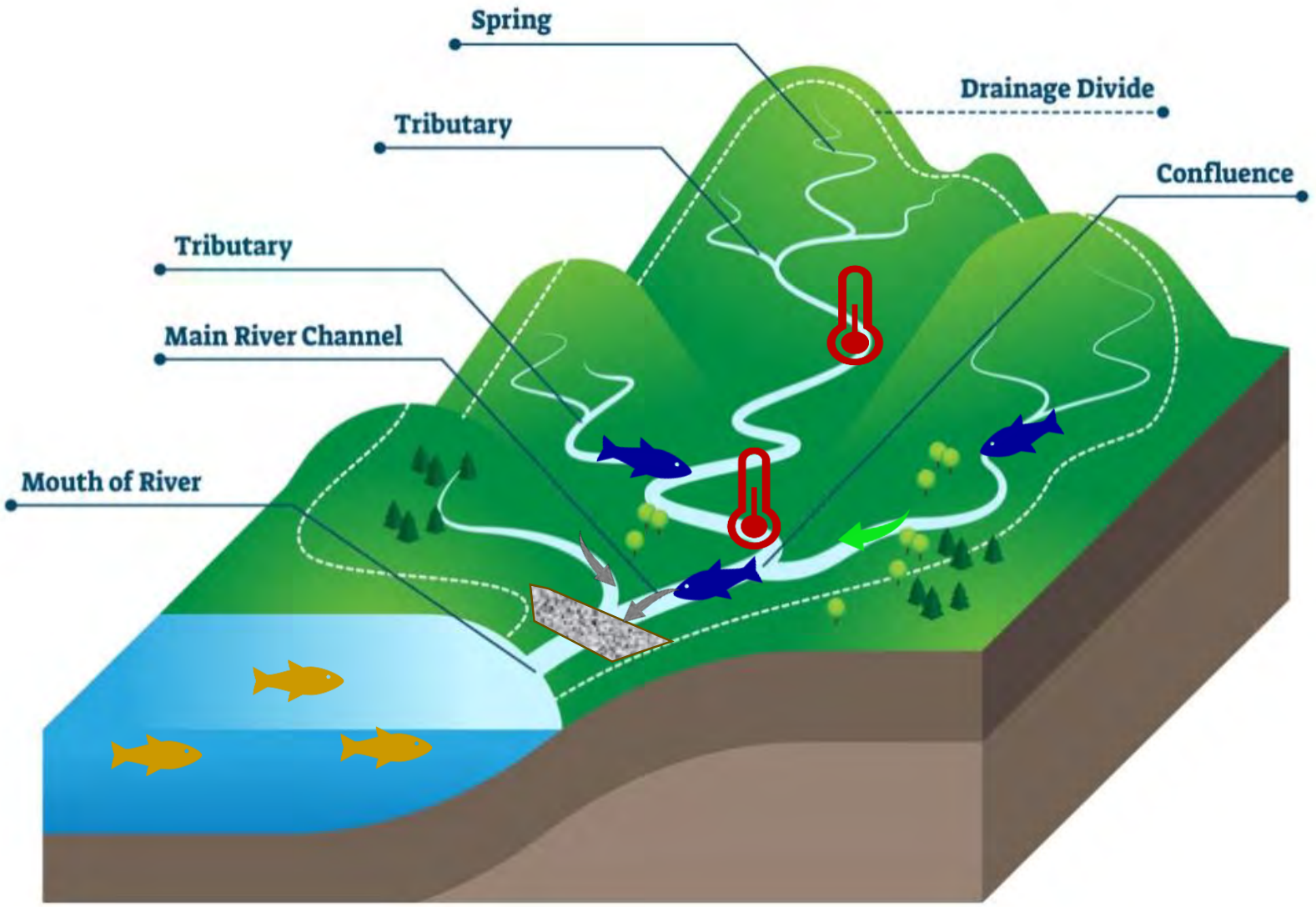
Healthy stream system:



- Free flowing
- Lower temps
- Higher oxygen
- Sediment & nutrient transport
- Wetlands and floodplains
- Fish and wildlife passage

Image credit: Hydrology Studio; Slide adapted from an original by: Susie Bresny, MA DER

Dammed stream system



- Blocked:
  - Flow
  - Sediment & nutrient transport
  - Fish and wildlife
- Higher temps
- Lower oxygen
- Minimal wetlands and floodplains

Image credit: Hydrology Studio; Slide adapted from an original by: Susie Bresny, MA DER

Ecological Impacts

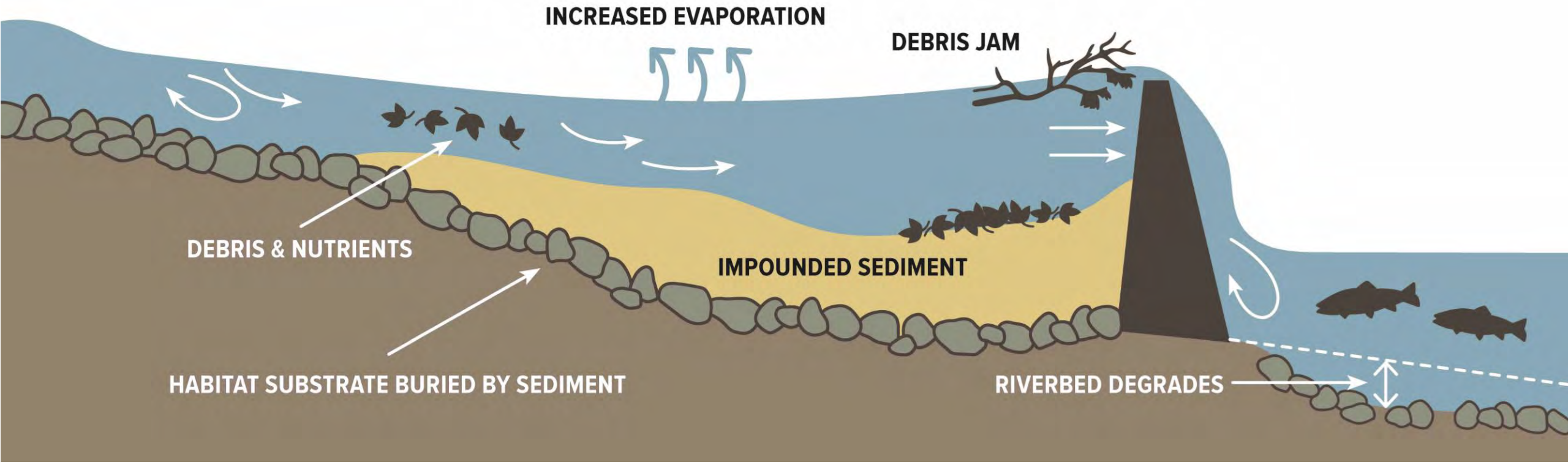
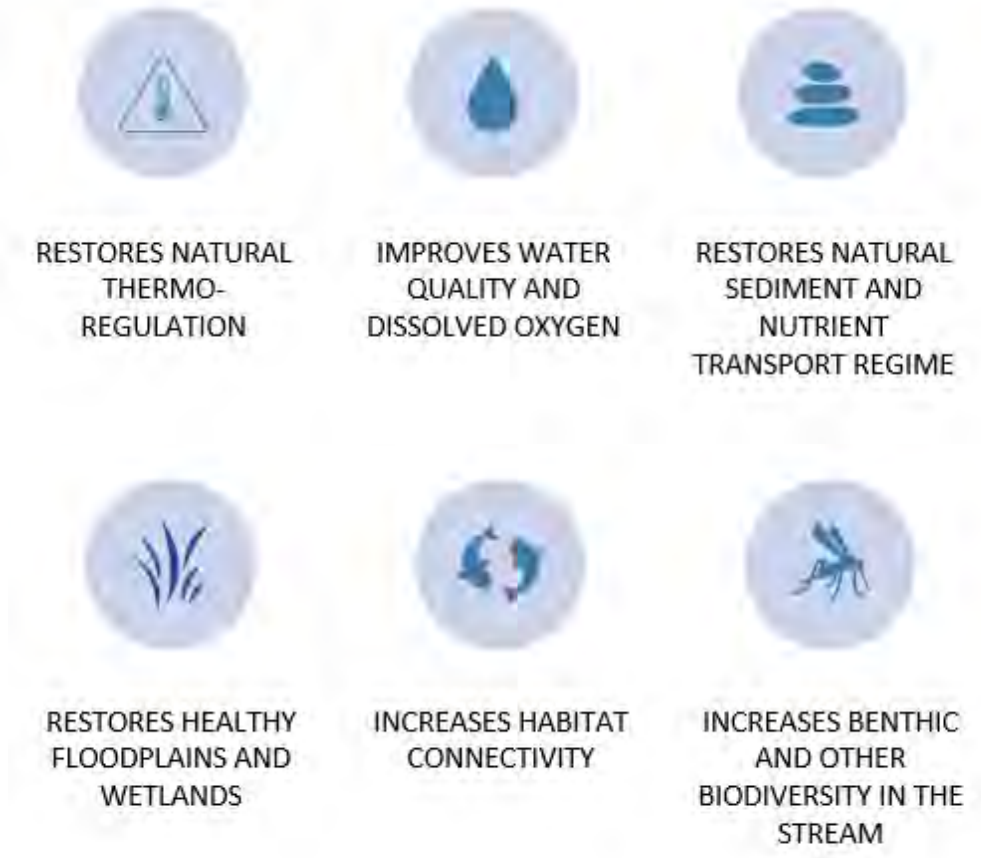


Image credit: Sherry Anders

Ecological Benefits



Graphics Credit: Susie Bresney, MA DER

Image credit: Sherry Anders

Community Benefits

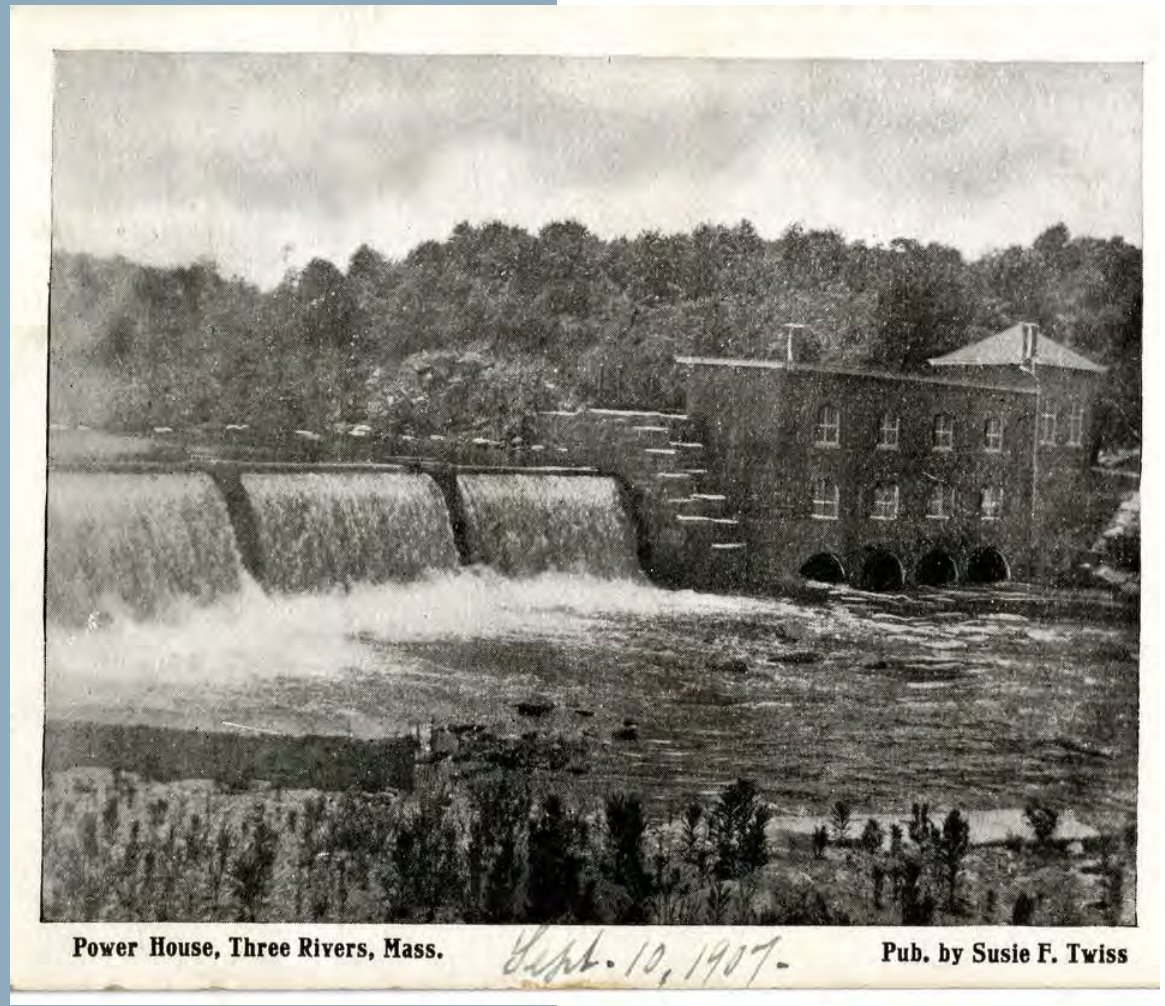
OPPORTUNITIES FOR PUBLIC ACCESS

OPPORTUNITIES FOR PARK AND FLOODPLAIN IMPROVEMENTS

IMPROVED FISHING AND BOATING

RESTORED NATURAL BEAUTY

Graphics Credit: Susie Bresney, MA DER



Historic Value of Dams

- Dams are integral to New England's history.
- Assessing impacts to historical resources is part of the planning process
- If a dam is of great historical significance, alternatives to removal may be explored.
- Public safety is the top priority. Even historically significant dams may be too hazardous to keep.

The Dam Removal Process

Dam removals typically take 3-5 years from start to finish

Project Scoping/ Reconnaissance

Fundraising

Engineering

Permitting

Construction

Every dam removal will have site-specific engineering, environmental, and community considerations that affect the process

Reconnaissance Study

Dam Ownership and Uses

Dam age, ownership and interest in removal, and any current uses/benefits of dam.

Rare Species

Is the dam, impoundment, or abutting land in priority or estimated habitat for state listed species, based on Natural Heritage Endangered Species Program maps?

Community Concerns

Is the impoundment used for recreation? Is the dam an important historic resource? Concerns about potential impacts to water supplies and flooding. Are other parties willing to contribute to its long-term maintenance and liability?

Sediment Quality

Are there contaminants trapped behind the dam that will affect the project scope?

Infrastructure Impacts

Will any infrastructure be damaged by dam removal? This includes water and sewer, telecommunications, and nearby structures

Funding Possibilities

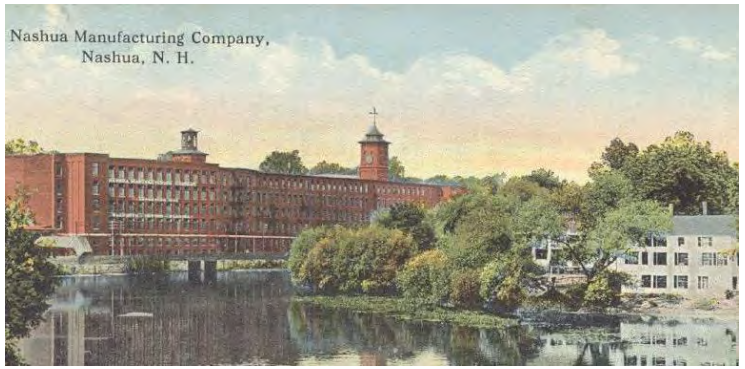
Foundations and agencies have varying interests (i.e., safety vs. river restoration)

Flooding

Aquatic organism passage/ habitat/ ecology/ wetlands benefits

Infrastructure: Water/ Sewer/ Gas

Recreation



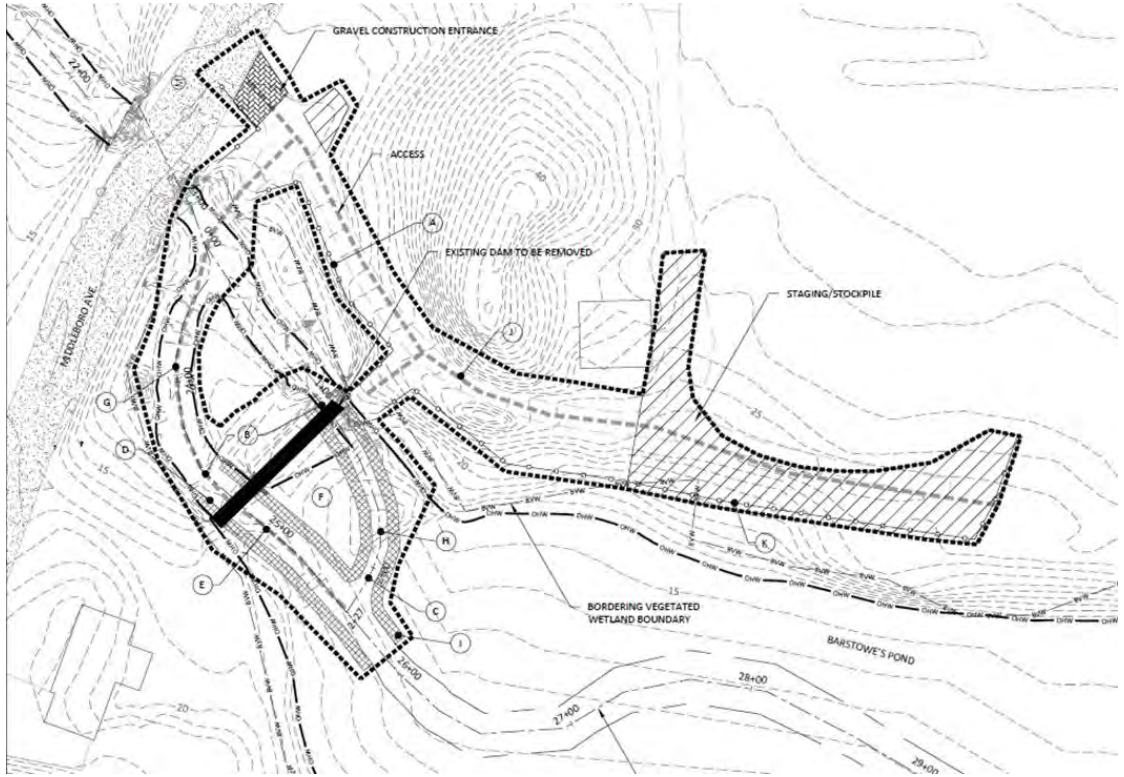
Historical and Cultural Resources

Site Specific Challenges; Sediment Quality

Rare Species

Technical Memorandum and Cost Estimates

• Existing Conditions Plans



• Feasibility Assessment

- Preliminary engineering design
- Scoping may entail:
    - Sediment Management Plan
    - Hydrology and Hydraulics Assessment
    - Channel and Riparian Restoration Plan
    - Permit Identification
    - Site-Specific Issues
        - Natural resources
        - Historical and Cultural Resources
- Budget level cost estimates $

Community Engagement and Decision Making

Stakeholder Participation

- Public Meetings
- Local boards

Cost Evaluation

- Cost to remove vs. Cost to maintain

Public Visioning

- Examine what is lost vs. what is gained for a given dam removal
- Renderings – what will site look like before and after dam is removed?

Outcome: Decision whether to proceed

Funding

Federal

- Army Corps of Engineers
- NOAA Fisheries
- FEMA

State

- Division of Ecological Restoration
- Ex. Office of Energy and Environmental Affairs

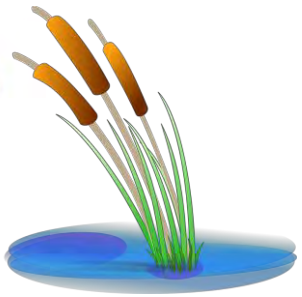
Private

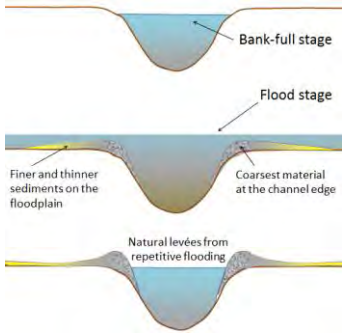
- Corporations
- Private Foundations

Nonprofit

- Audubon
- Trout Unlimited

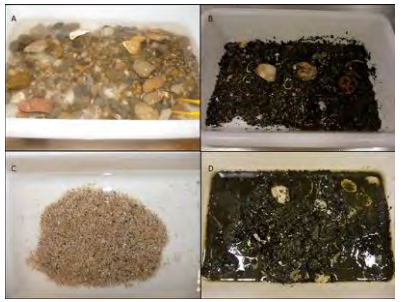
ENGINEERING AND DESIGN PROCESS





survey of dam, impoundment, upstream, downstream, utilities

- **wetland delineation and estimate of change**
- **evaluation and testing of sediment**
- **structural review of dam and adjacent infrastructure (walls, bridges, buildings, etc.)**
- **water level studies**
- **cultural resource inventory**
- **coordination with Natural Heritage re: sensitive species**



Final Engineering Design

Design Plan

- Dam removal plan
- Stream restoration plan
- Base maps and drawings

Project Specifications

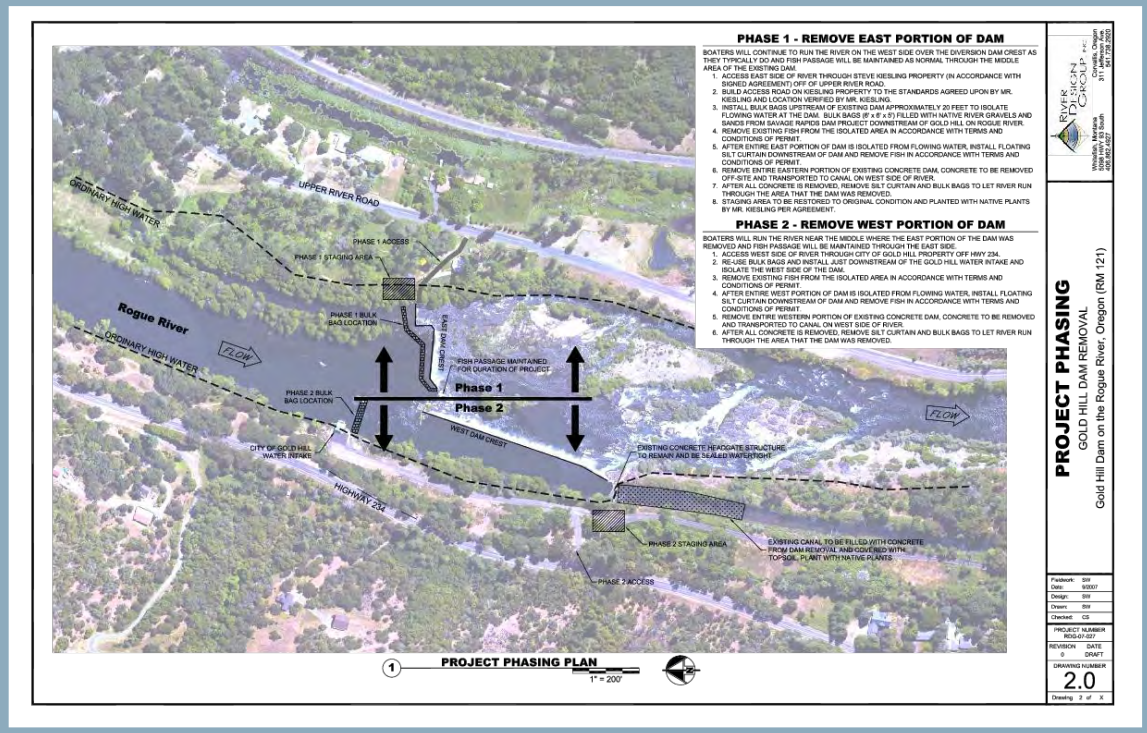
- Construction needs
- Material specifications
- Project sequencing

Technical Memorandum

- Description of analysis that informed the design
- Rationale behind project approach

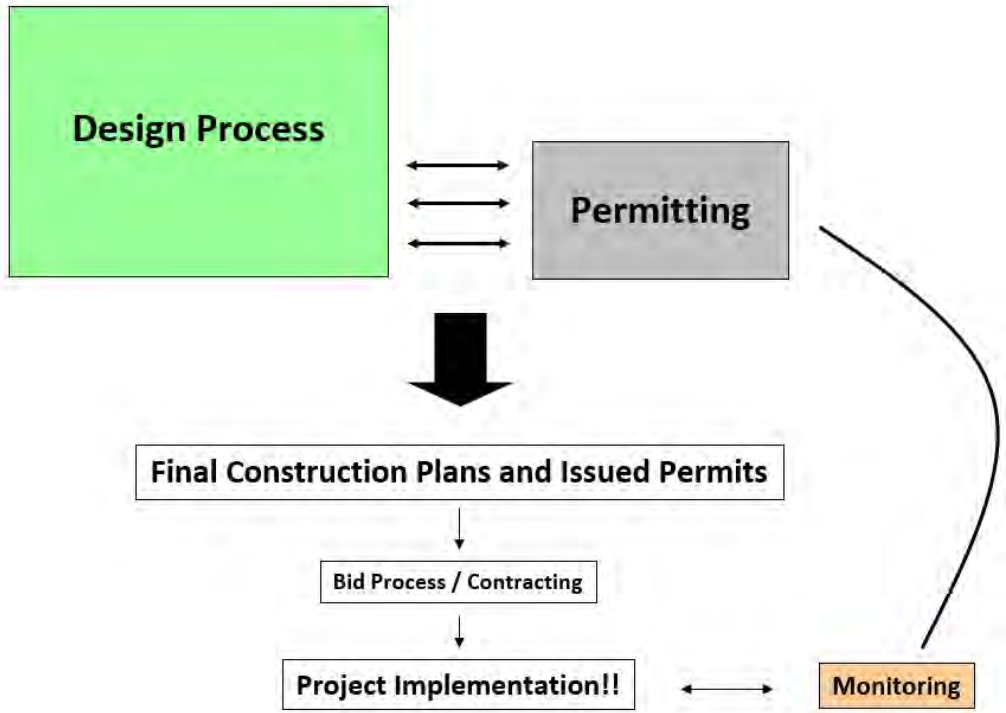
Final Cost Estimate

- Itemized cost estimate based on design and specifications



Permitting

- Local, state and federal agencies have authority over dams, including dam removal and ecological restoration
- Multiple permit applications may be required, depending on dam specifics



Graphic by Kris Houle, Tighe & Bond

Permits that may be needed in Massachusetts:

- Massachusetts Environmental Policy Act
- Notice of Intent to Conservation Commission
- Water Quality Permit (DEP)
- Chapter 91 Dredge Permit (DEP)
- 404 permit (regulates the discharge of dredged or fill material)
- Massachusetts Historical Commission
- Chapter 253 Dam safety permit (if Jurisdictional Dam)

Image credit: Tighe & Bond

Implementation and Construction

- Construction is typically bid out to qualified contractors
- Can cost up to several million dollars

Key Considerations for Design and Construction

Entire vertical extent of dam should be removed from stream

Natural portions of nearby stream should be simulated to restore habitat

Focus on creating diverse habitat (i.e., streamside vegetation or complex instream features)

Slowly drain impoundment to prevent damage to infrastructure/habitat

Consider revegetation plan and/or invasive species management

Dam Removals: Before and After


NA river otter photo by Dmitry Azovtsev--http://www.daphoto.info


Sherry Anders


Sherry Anders


Sherry Anders

Sucker Brook Restoration: Pepperell, MA

Yokum Brook Restoration: Becket, MA

Traphole Brook Restoration: Norwood, MA

Wekepeke Brook Restoration: Lancaster, MA


Image Credit: MA DER


Image Credit: MA DER


Pare Corporation

Nissitissit River Restoration: Pepperell, MA


Image Credit: Trout Unlimited


Image Credit: Trout Unlimited


Image Credit: theconcordbridge.org

Additional Dam Removal & Ecological Restoration Presentations

Thursday, March 14 at 6:30 pm at the Leominster Public Library
Located at 30 West Street in Leominster, MA. Registration is not required.

Wednesday, March 27 at noon at The Groton Center
Located at 163 West Main Street in Groton, MA. Register in-person at The Groton Center, call 978-448-1170, or register online through the MyActiveCenter.

QUESTIONS: Please email Jessica Veysey Powell, NRWA Watershed Scientist: jessicavp@nashuariverwatershed.org

These presentations were made possible in part by a grant from the MA Division of Ecological Restoration.

Thank You! Any Questions?

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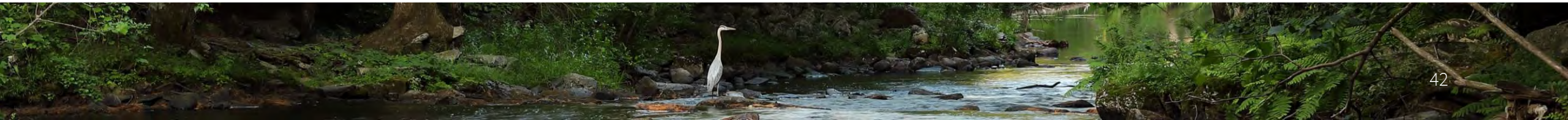

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- New Hampshire Department of Environmental Services. (2019). *Frequently Asked Questions about Dam Removal*
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- Massachusetts Division of Ecological Restoration (MA DER). "Economic and Community Benefits From Stream Barrier Removal Projects in Massachusetts."
- Photo credit (slides 1, 2, 4, 6, 8, 15): Sherry Anders
- Massachusetts Division of Ecological Restoration (2007). *A Basic Guide for Project Proponents*
- *https://www.fema.gov/sites/default/files/documents/fema_dam-removal-cost-drivers_022023.pdf*