

*Feasibility Study*

# CONCORD RIVER DIADROMOUS FISH RESTORATION

PUBLIC MEETING | FEBRUARY 23, 2016 | NORTH BILLERICA, MA



*Project Lead*



*Project Partners*



*Project Consultants*



# OVERVIEW

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- PROJECT PURPOSE
- EXISTING ENVIRONMENT
- TECHNICAL ASSESSMENT
- RESTORATION ALTERNATIVES
- SUMMARY / NEXT STEPS
- QUESTIONS

# PROJECT SUPPORT

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- Partners/technical assistance:

*Project Lead*



*Project Partners*



*Project Consultants*



- Funding:

Nyanza Natural Resource Damages Settlement

PURPOSE

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# PROJECT GOAL

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*Evaluate the feasibility  
of restoring populations of diadromous fish  
to the Concord, Sudbury, and Assabet Rivers*

# WHY? – Reasons to Restore Passage

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- **Importance of target species** – ecosystem functions, commercial/recreational fisheries, cultural values, range, etc.
- **History** – historical presence of diadromous species in the Concord River is well documented
- **Habitat** – significant lacustrine and riverine spawning and rearing habitat exists upstream of Talbot Mills Dam
- **Connectivity** – the Concord River is low in the Merrimack River watershed and fish must only navigate past one dam before reaching the it
- **Support** – active and involved watershed associations, volunteer organizations, community members, and state/federal agencies support restoration
- **Public Input** – one of 12 projects identified in the Nyanza Restoration Plan, which resulted from public input process

# EXISTING ENVIRONMENT

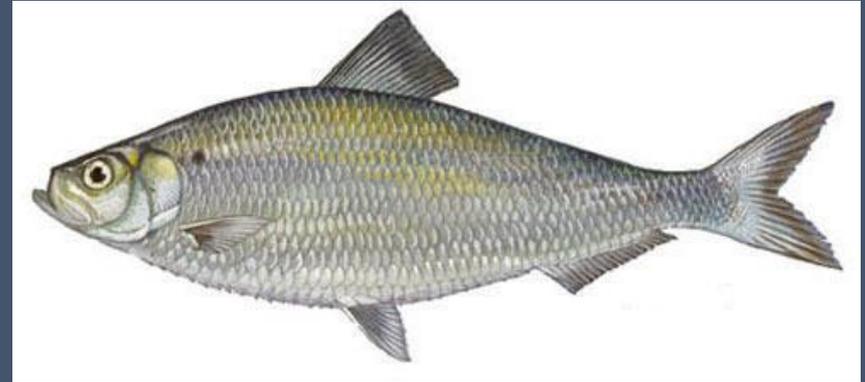
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# TARGET SPECIES

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*Blueback herring*



*Alewife*



*American shad*



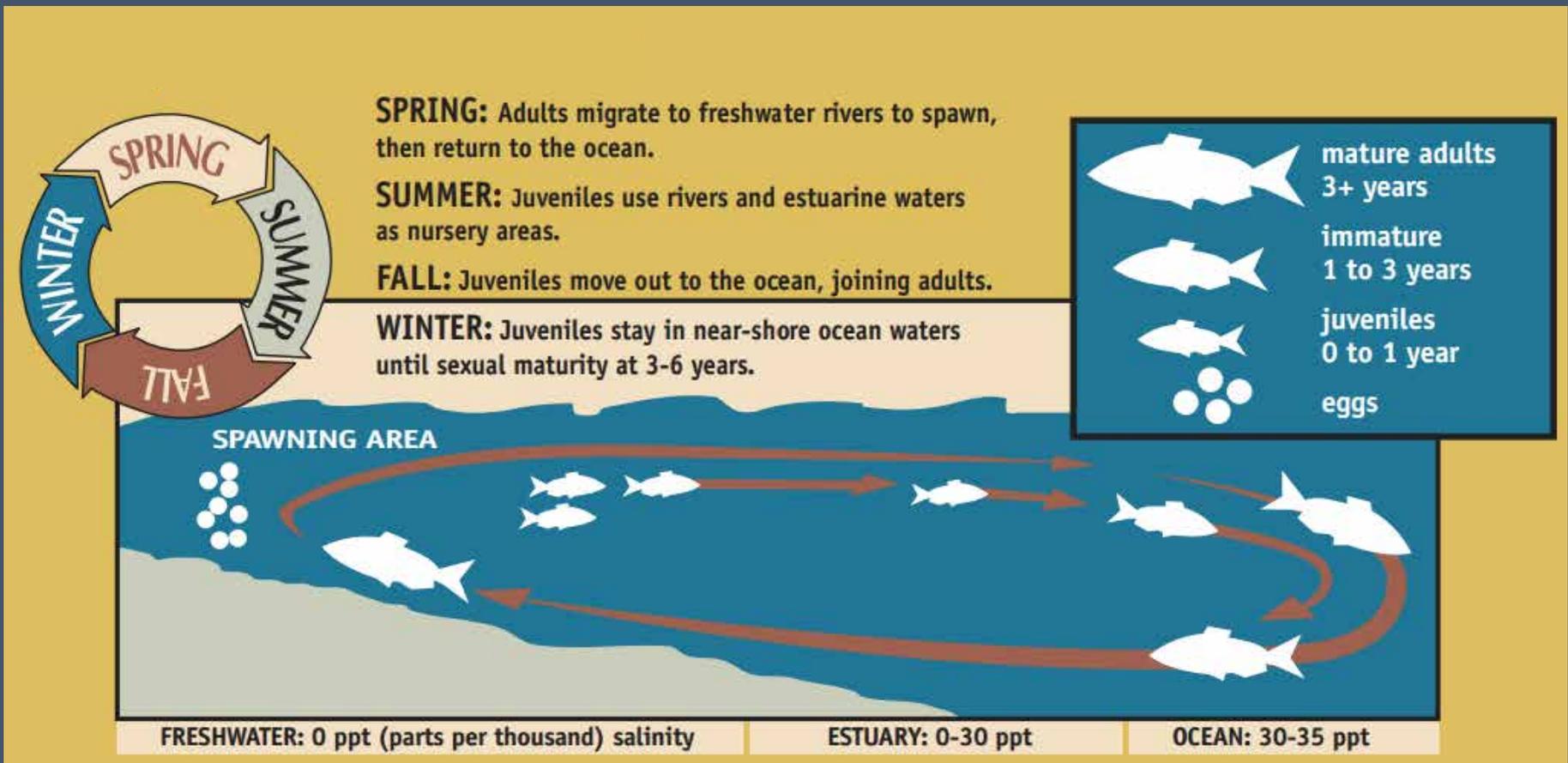
*American eel*



*Sea lamprey*

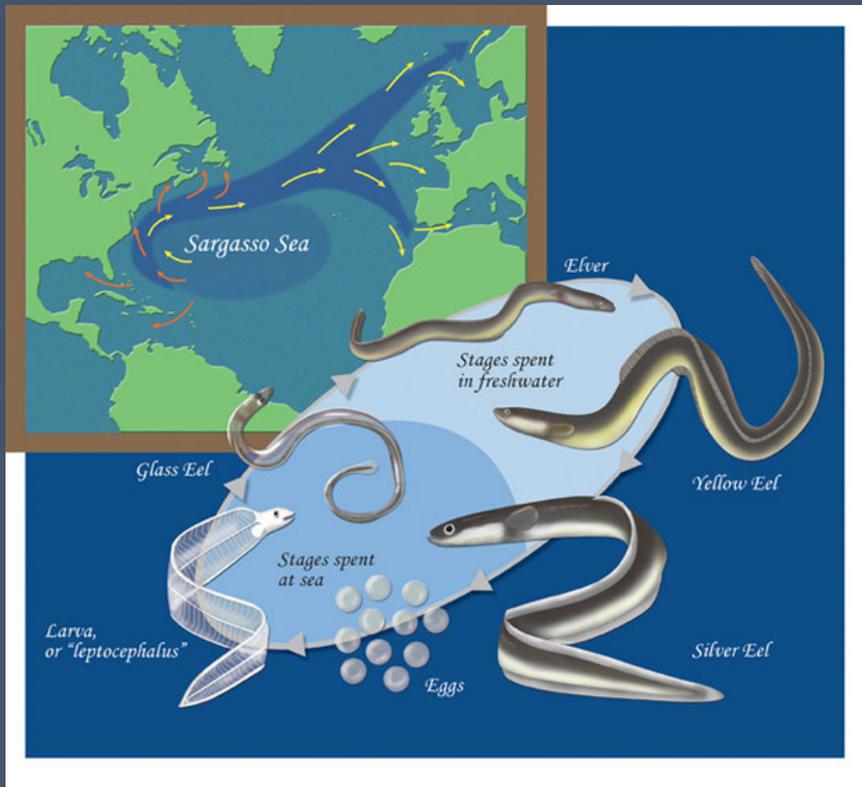
# TARGET SPECIES – Life Cycles

## River Herring & American Shad

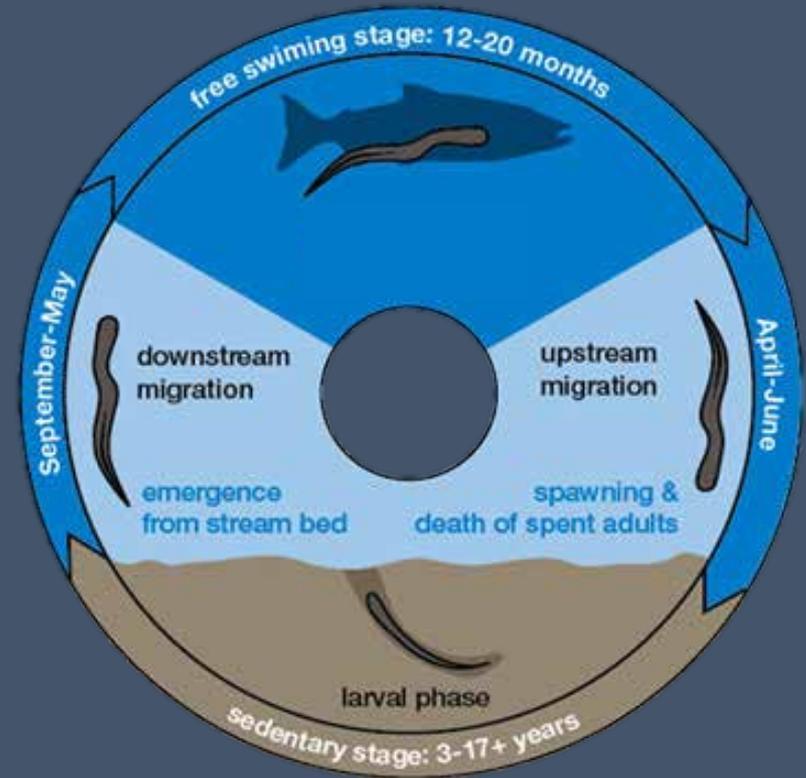


# TARGET SPECIES – Life Cycles

American Eel



Sea Lamprey



# TARGET SPECIES – Importance



**ECOSYSTEM  
FUNCTIONS**



**FISHERIES**  
(COMMERCIAL & RECREATIONAL)



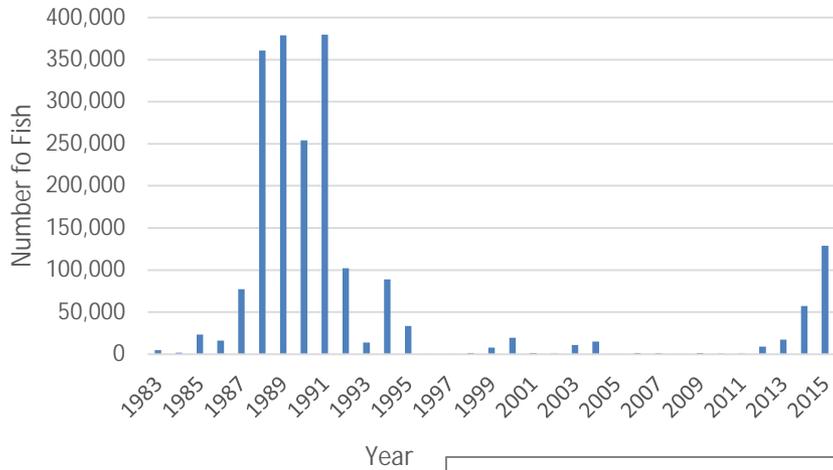
**RANGE**

**CULTURAL  
VALUES**

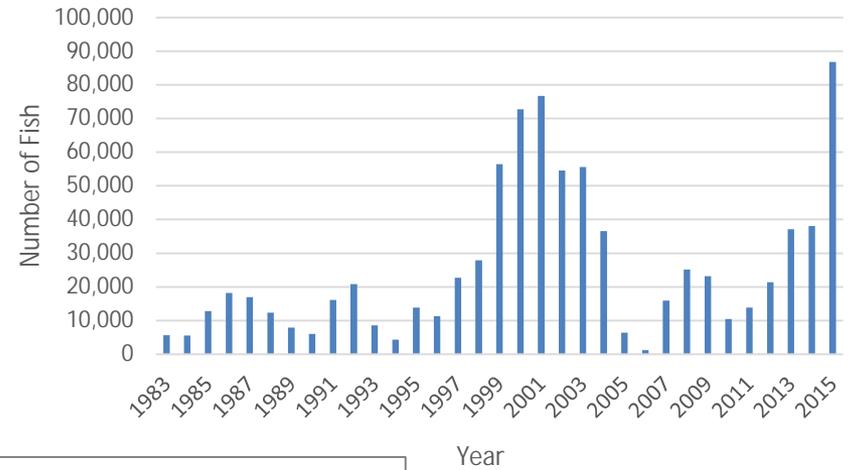


# TARGET SPECIES – Population Trends

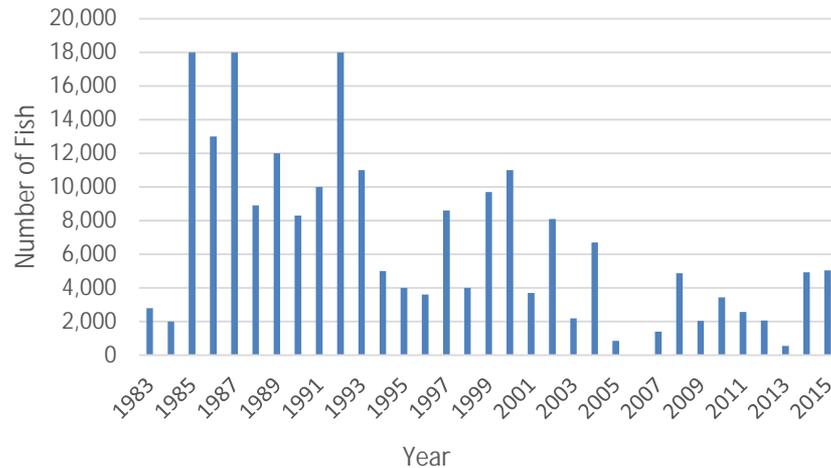
## River Herring



## American Shad



## Sea Lamprey



Fish returns for  
Merrimack River  
at Essex Dam  
in Lawrence, MA

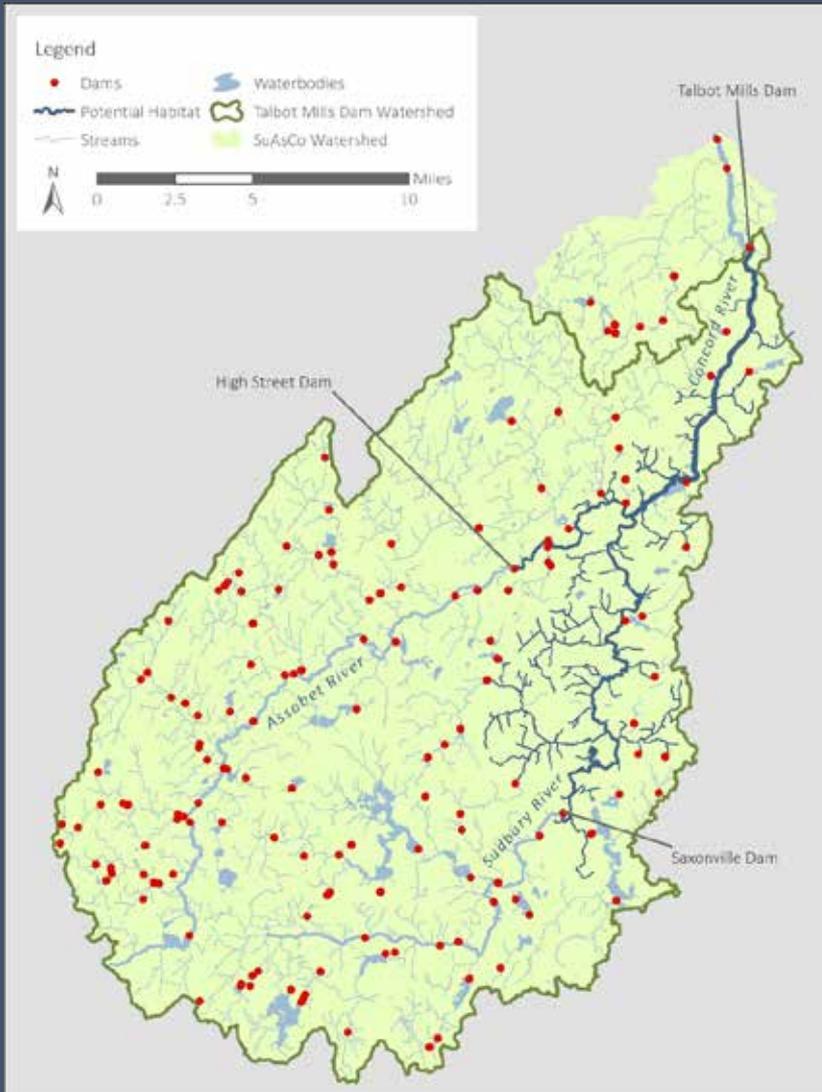
# WATERSHED

## Merrimack River Watershed



SuAsCo Watershed

# WATERSHED – Potential Habitat



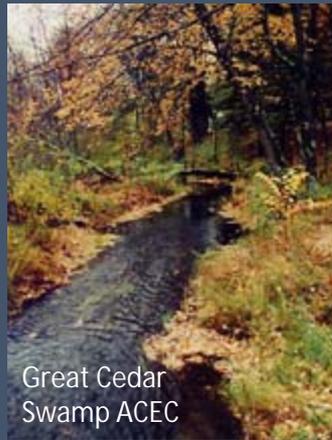
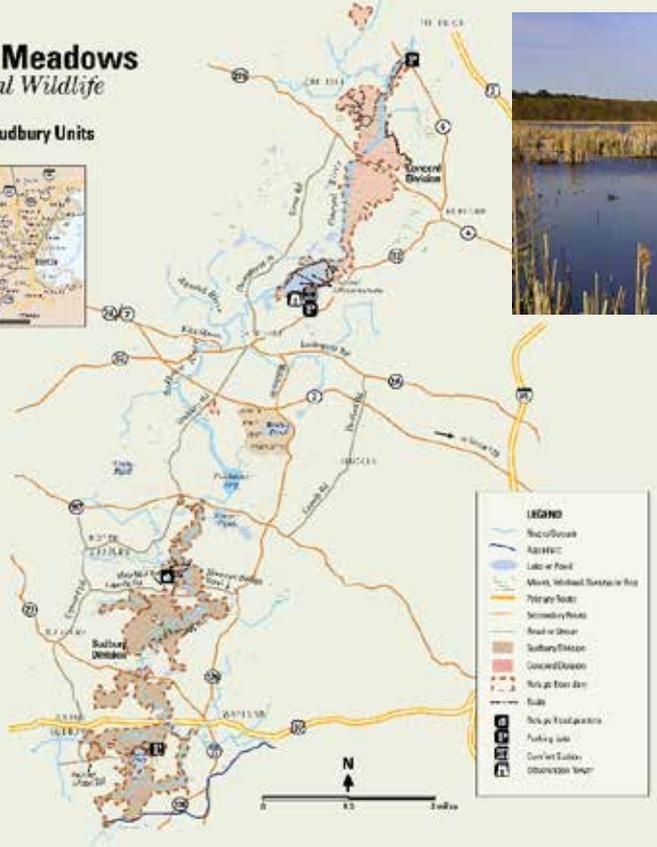
- Fish passage at Talbot Mills Dam would open access to:

- 35 miles (740 acres) of mainstem rivers
- 100 miles of tributaries
- 260 acres of lakes and ponds

*(Not including areas that could be accessed with fish passage at upstream dams)*

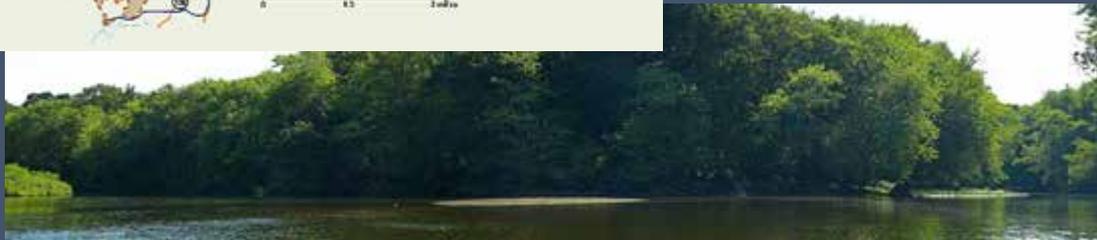
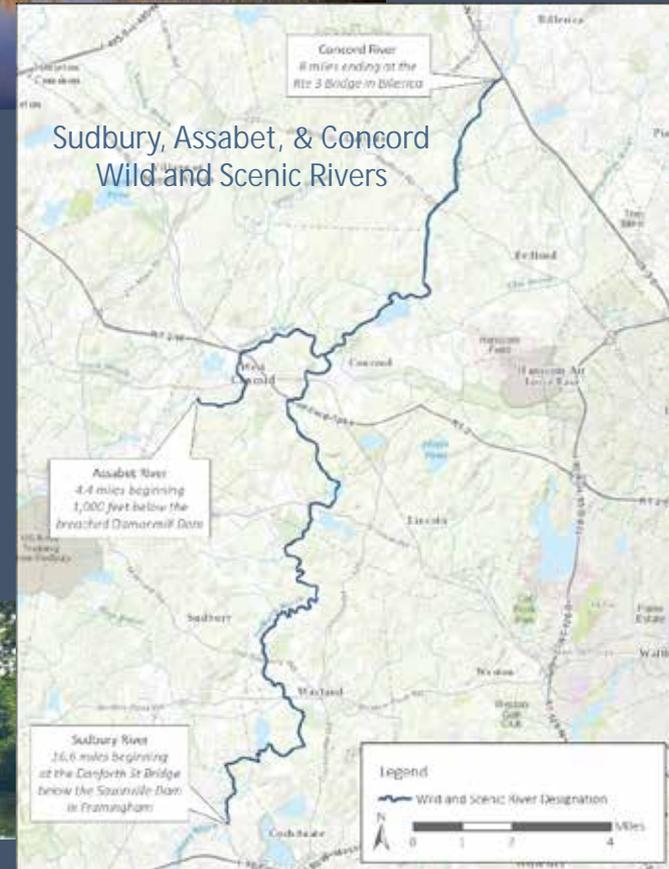
# WATERSHED – State & Federal Recognition

## Great Meadows National Wildlife Refuge Concord/Sudbury Units



Great Cedar  
Swamp ACEC

## Sudbury, Assabet, & Concord Wild and Scenic Rivers





# WATERSHED – Flooding

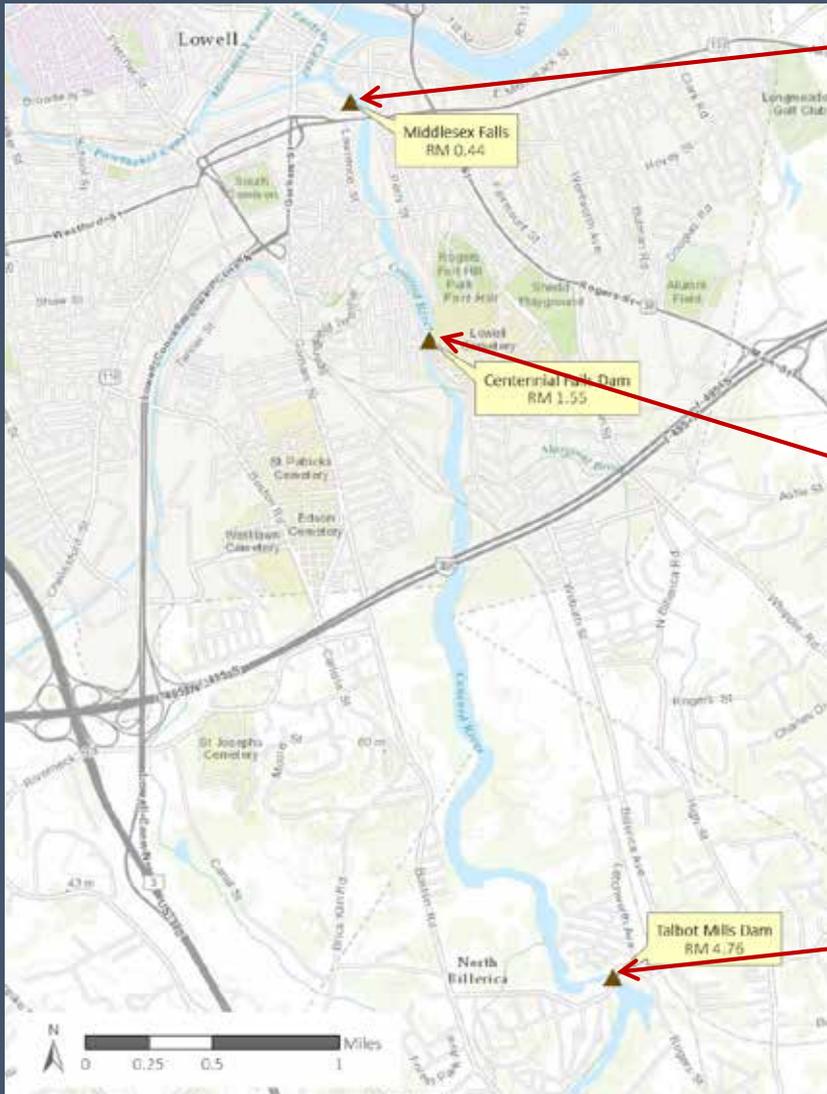
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March 2010  
Flood in  
Billerica



# FISH PASSAGE OBSTACLES



# OBSTACLES – Middlesex Falls

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# OBSTACLES – Middlesex Falls

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- Former Middlesex Dam (breached in 1980s)
- 2000 NRCS/USFWS survey
- Possible fish passage impedance at some flows
- Minor channel modifications may improve passage
- Potential use of former raceway channel

# OBSTACLES – Centennial Falls Dam

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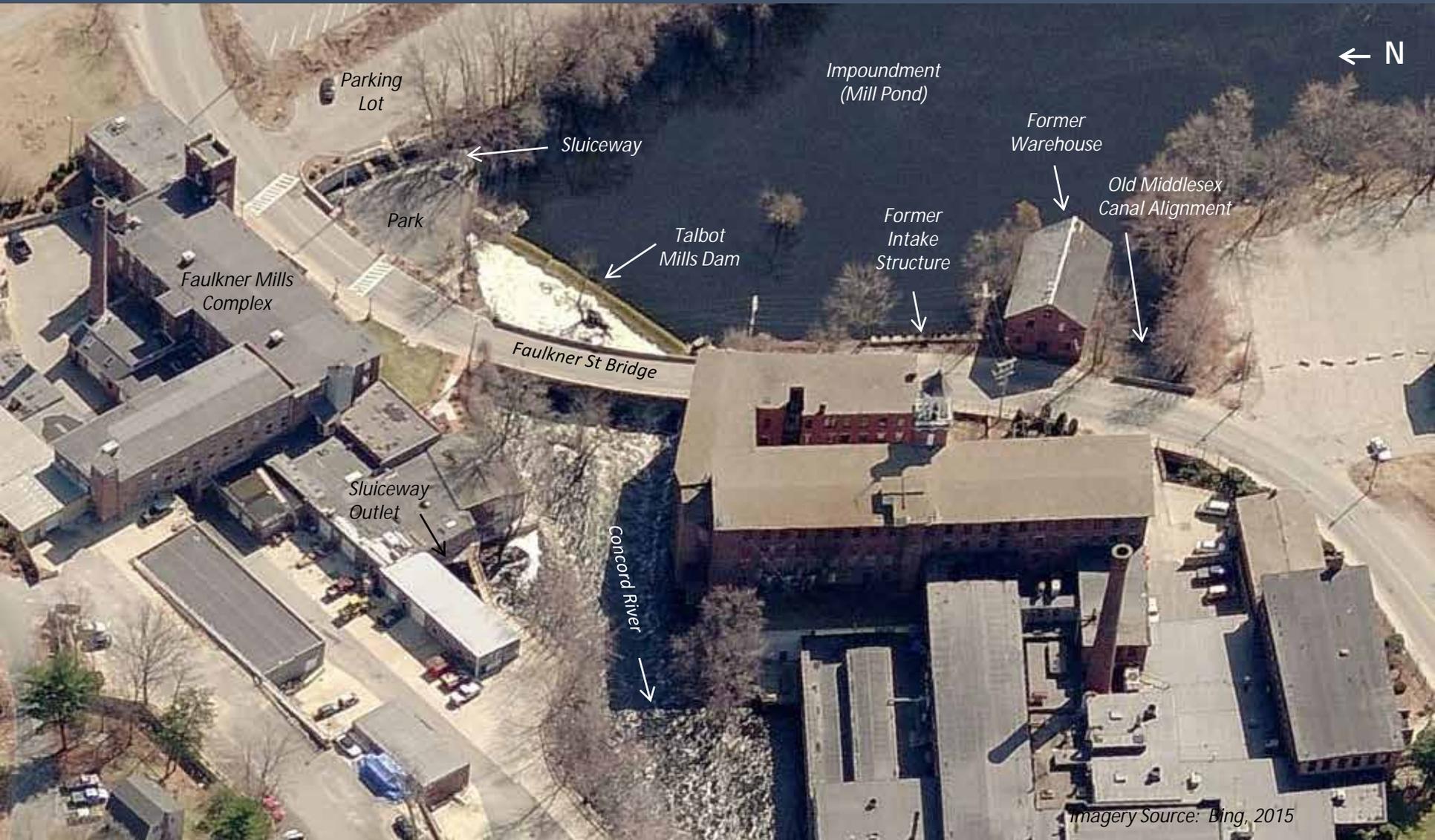
# OBSTACLES – Centennial Falls Dam

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- 8-foot-high dam with hydropower (22-foot hydraulic head)
- Fish ladder & downstream bypass sluice added in 1990
- History of deficiencies
- More recent active management and coordination
- River herring observed in fish ladder in 2015

# OBSTACLES – Talbot Mills Dam



# OBSTACLES – Talbot Mills Dam

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- 10-foot-high former mill dam
  - Primary spillway (127 ft)
  - Abutments
  - Non-overflow section
  - Former intake structure
  - Sluiceway
- Privately owned  
(CRT Development Realty, LLC)
- No current fish passage facilities

# TALBOT MILLS DAM – Dam Safety

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- 2015 inspection
  - Intermediate size, significant hazard, fair condition
  - Deficiencies:
    - Lack of operation & maintenance plan, routine oversight
    - Lack of working controls, low level outlet, emergency bypass
    - Seepage in the abutments
    - Trees below spillway and on embankment
  - Estimated repair cost: \$105,000+
- Feasibility study findings
  - Does not meet regulations to pass spillway design flood
  - NOT a flood control dam

# TALBOT MILLS DAM – History

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The Concord River evolves over thousands of years post-glaciation without a dam

The site is a Native American encampment and fishing grounds with exposed falls

Pre-dam colonial use of river's fisheries

Dam Constructed

Timeline: ~ 9000 BC, 1653, 1711

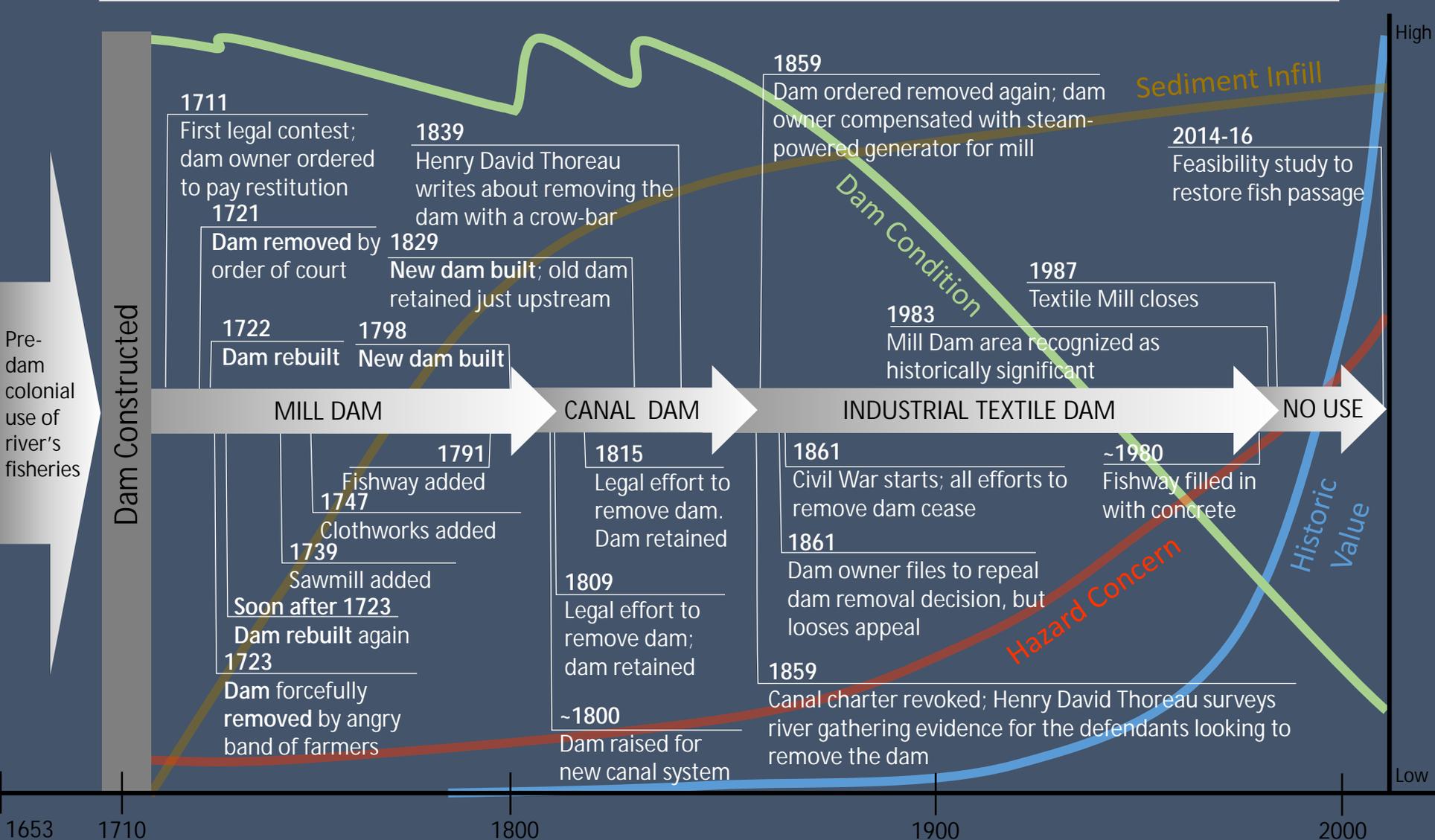
The diagram features a horizontal timeline at the bottom with three vertical tick marks. A large white arrow points from left to right, starting at the first tick mark and ending at the second. A smaller white arrow points from the second tick mark to the third. A vertical grey bar is positioned at the third tick mark. The text is arranged in a sequence from left to right, corresponding to the timeline.

~ 9000 BC

1653

1711

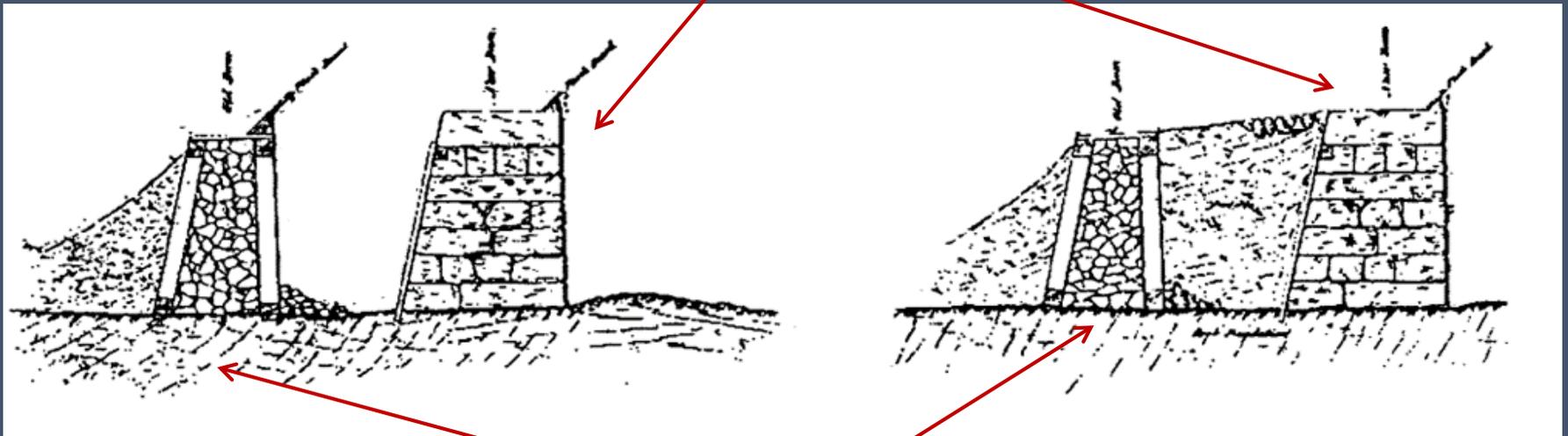
# TALBOT MILLS DAM – History



# TALBOT MILLS DAM – History

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Current (1828) dam



*Ingraham, 2009*

1798 "legacy dam"  
submerged upstream

# TALBOT MILLS DAM – History

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*"...so long as there shall be kept and upheld, a dam across Concord River, in the Town of Billerica...there shall be kept open at the usual place in said dam, a **sluice or passage way for fish** to pass up and down the river through said dam, from the first day of April to the twentieth day of May in each year..." (1820 Chap. 0070)*

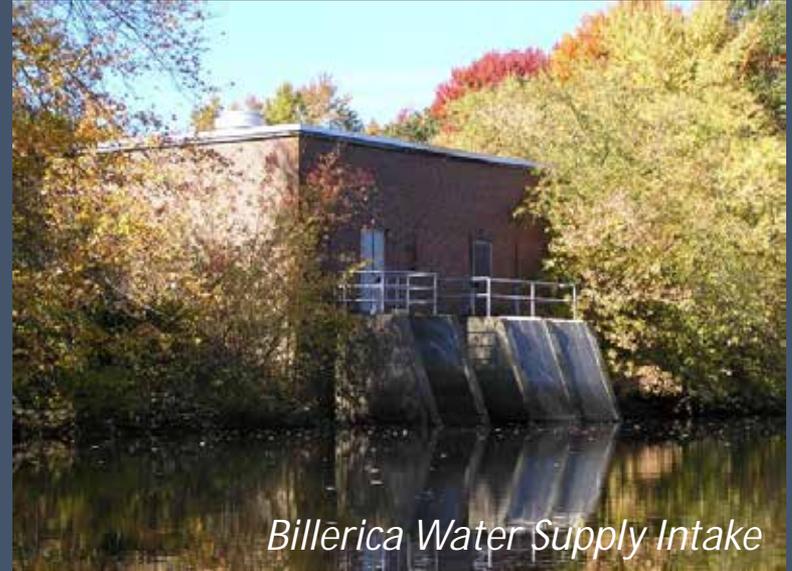


# OTHER INFRASTRUCTURE

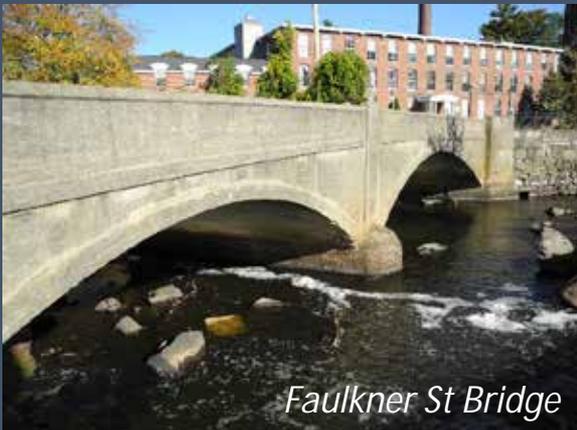
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*Middlesex Canal*



*Billerica Water Supply Intake*



*Faulkner St Bridge*



*Pollard St Bridge*



*Boston Rd/Rte 3A Bridge*

# TECHNICAL ASSESSMENT

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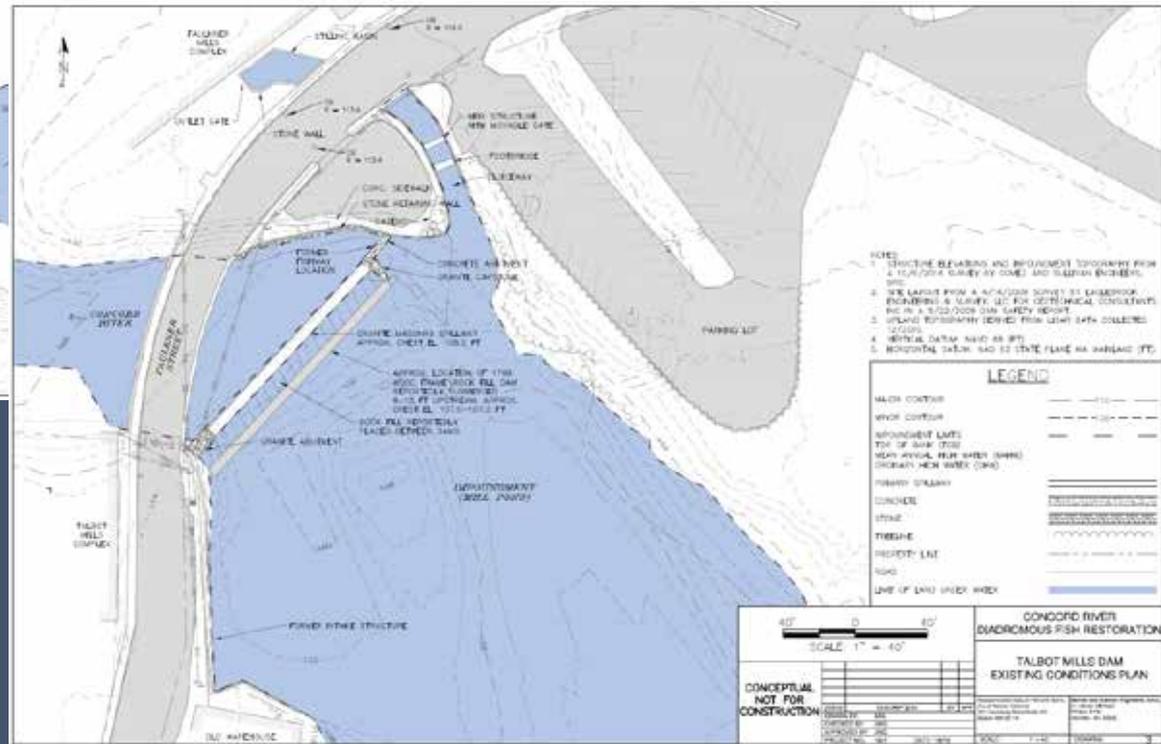
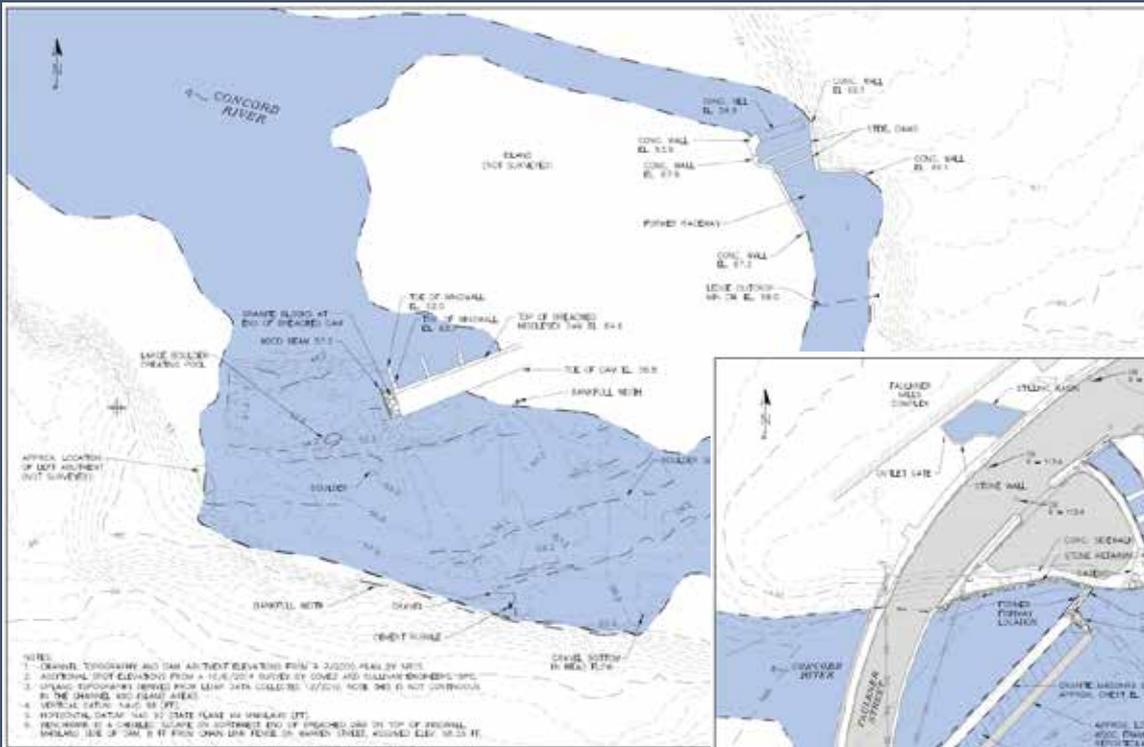
# PROJECT SCOPE

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- TOPOGRAPHIC SURVEY
- SEDIMENT ANALYSIS
- HYDROLOGIC ANALYSIS
- HYDRAULIC ANALYSIS
- CULTURAL RESOURCES ANALYSIS

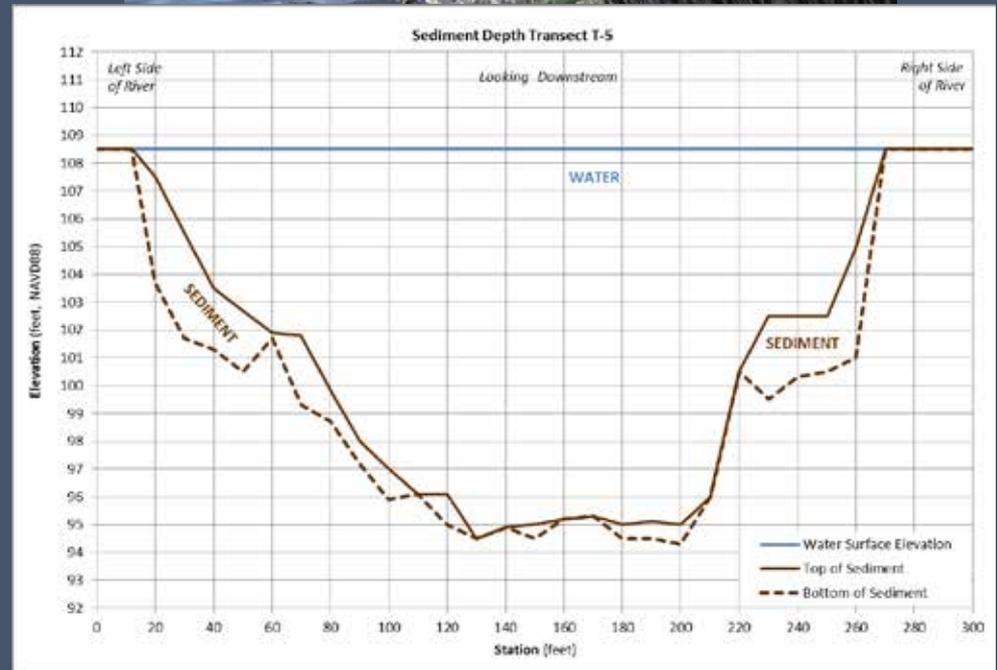
# FIELD DATA – Topographic Survey

Middlesex Falls

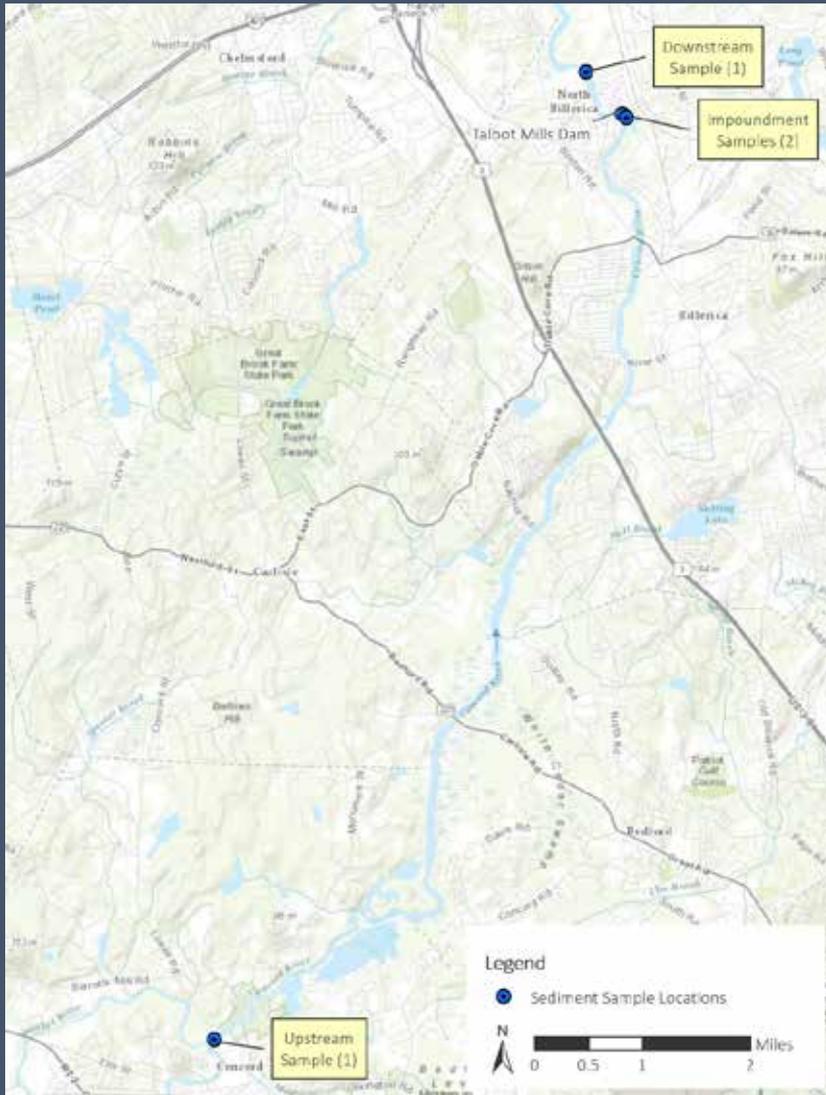


Talbot Mills Dam

# FIELD DATA – Sediment Quantity

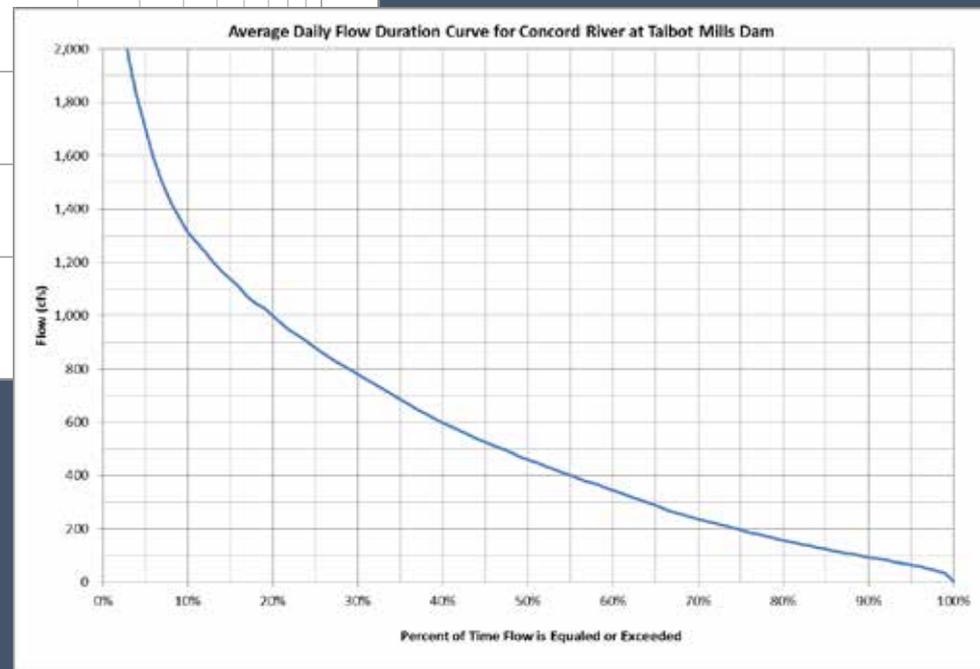
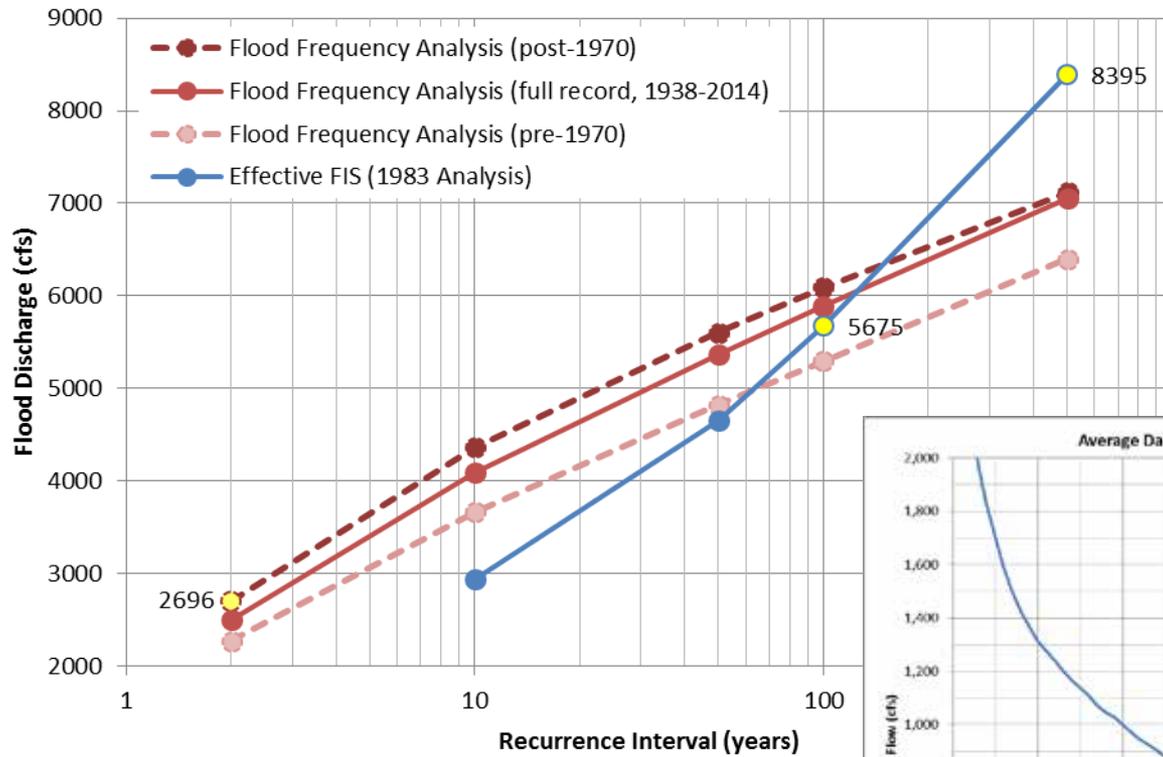


# FIELD DATA – Sediment Quality

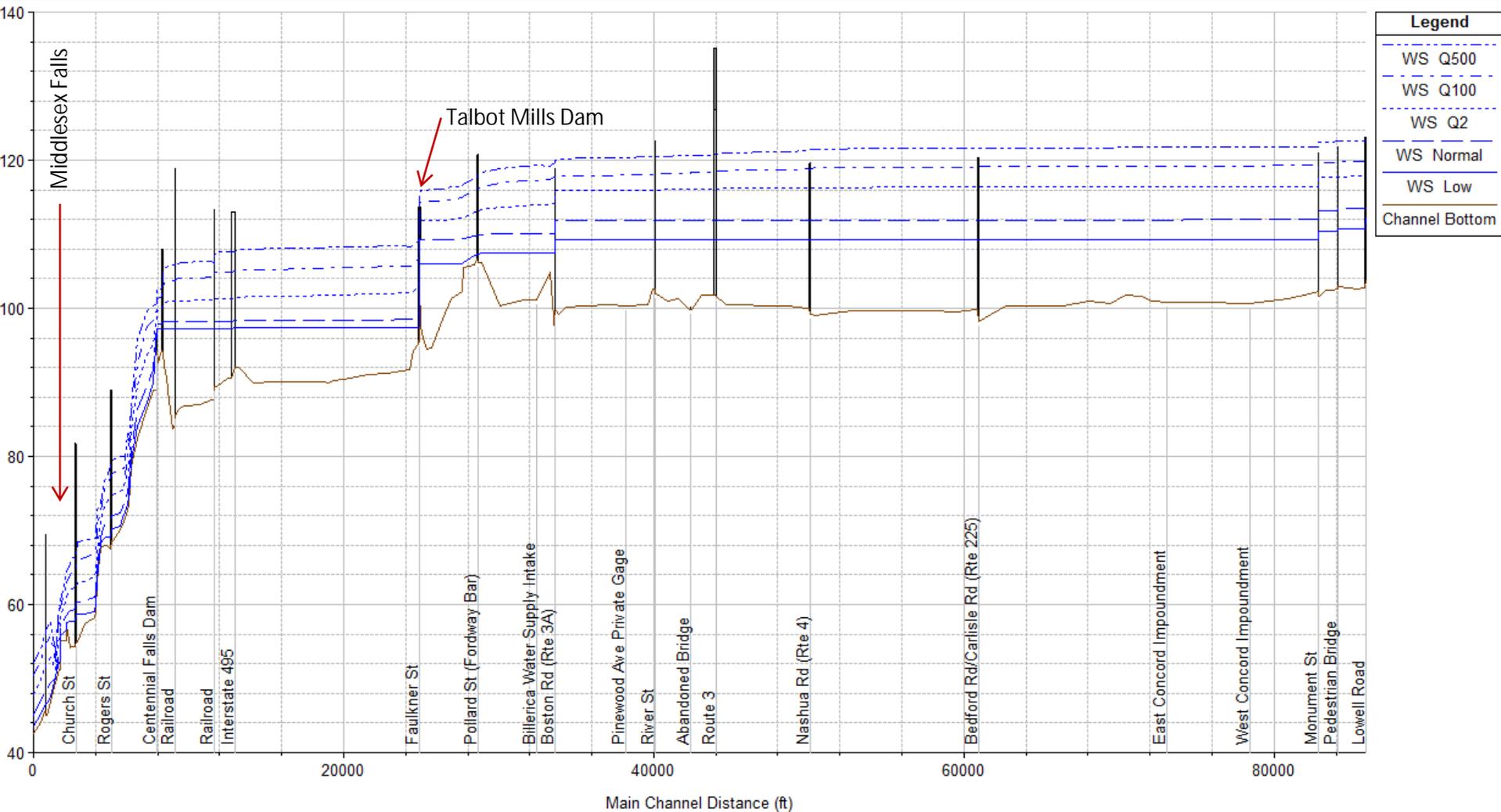


- Sediment quantity:
  - ~18,200 CY total sediment
  - ~9,500 CY mobile sediment
- Sediment quality:
  - Overall low pollutant concentrations

# ANALYSIS – Hydrology



# ANALYSIS – Hydraulics



# CULTURAL RESOURCES

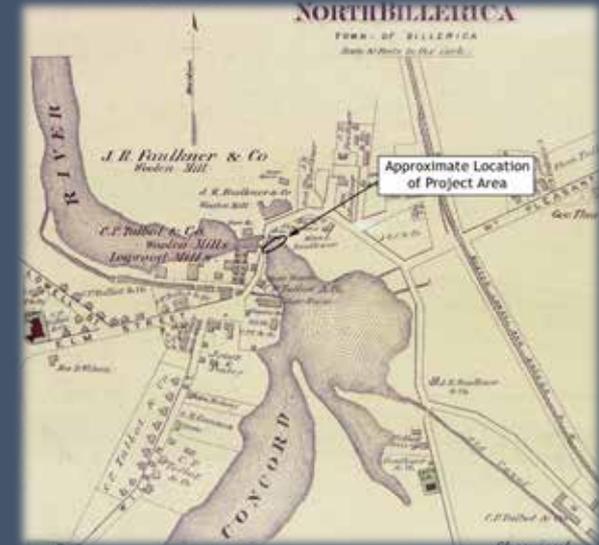
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## SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT (NHPA):

*"....take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register".*

### 106 PROCESS (CONSULTATIVE):

1. Determine where the project may result in effects to historic properties (the APE)
2. Identify historic properties
3. Assess the potential impacts of the project to those properties
4. Seek ways to avoid, minimize, or mitigate adverse effects (MOA)



### HISTORIC / ARCHAEOLOGICAL RESOURCES RECONNAISSANCE SURVEY (2015)

- Identified properties and sensitive archaeological areas
- Assessed potential effects for the project alternatives

# CULTURAL RESOURCES – Architectural / Industrial

Talbot Mills Dam (aka Middlesex Canal Dam and Locks—MHC No. BIL.900/BIL-HA-09) within 2 historic districts listed in the National Register:



- Middlesex Canal Historic and Archaeological District (MHC Nos. BIL.T, BIL.K, BIL.P)
- A potential contributing resource to the Billerica Mills Historic District (MHC Nos. BIL.O, BIL.E)

Project APE contains multiple resources relating to the 2 districts



TALBOT MILLS Dam Removal Billerica, Massachusetts	
Project No.	14-001
Date	1/4/2014
Author	Michael J. G. ...
Reviewer	...
Applicant	...
City/Town	Billerica, MA
State	Massachusetts
County	Middlesex
Project Location	...
Project Description	...
Project Status	...
Project Phase	...
Project Start Date	...
Project End Date	...
Project Duration	...
Project Budget	...
Project Funding	...
Project Sponsor	...
Project Manager	...
Project Contact	...
Project Address	...
Project Phone	...
Project Email	...
Project Website	...
Project Logo	...

KEY:	
[Red outline]	RECOMMENDED PROJECT APE FOR HISTORIC RESOURCES
[Blue hatched]	RESOURCE LISTED IN THE NATIONAL REGISTER
[Black hatched]	PROPERTY CONTRIBUTING TO A NATIONAL REGISTER LISTED DISTRICT
[Symbol]	SEE PLAN SHEET

MIDDLESEX COUNTY	
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# CULTURAL RESOURCES – Archaeological

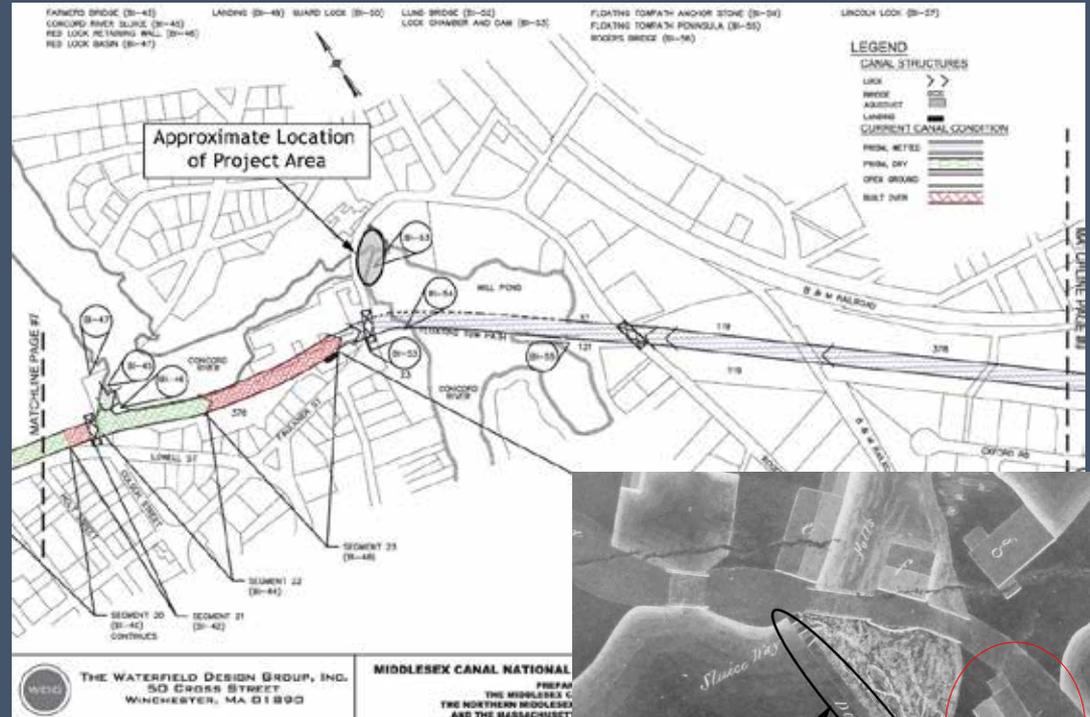
Four recorded pre-contact Native American “village” sites upstream and downstream of the Talbot Mills Dam

Four contributing archaeological resources to the Middlesex Canal Historic and Archaeological District:

- Middlesex Canal Lock and Dam Site;
- Middlesex Canal Prism;
- Floating Towpath Peninsula;
- Anchor Stone

Potential for 1798 wood dam remains (underwater) a few feet upstream of the current dam site

Potential for belowground mid-19<sup>th</sup> c. dye/store house used by the Faulkner Manufacturing Company

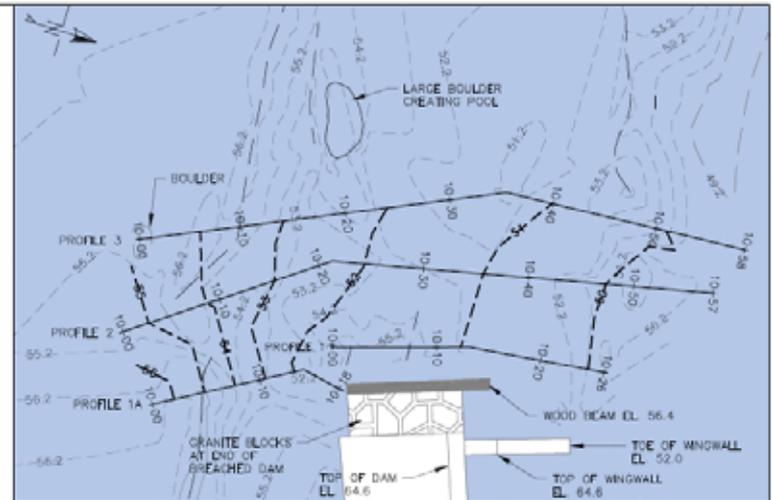
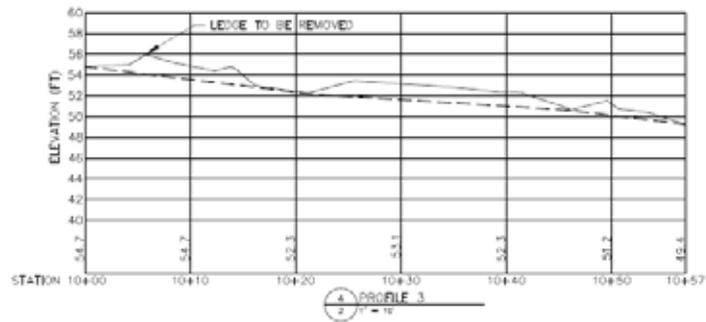
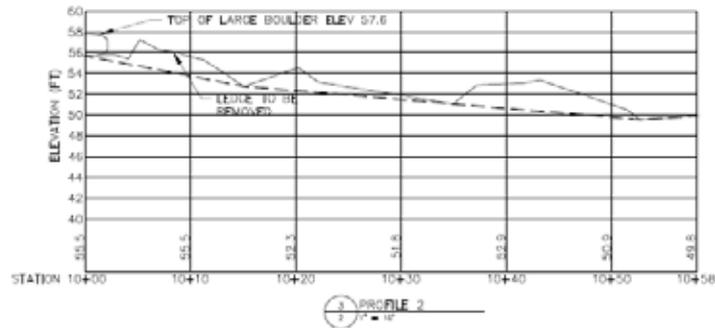
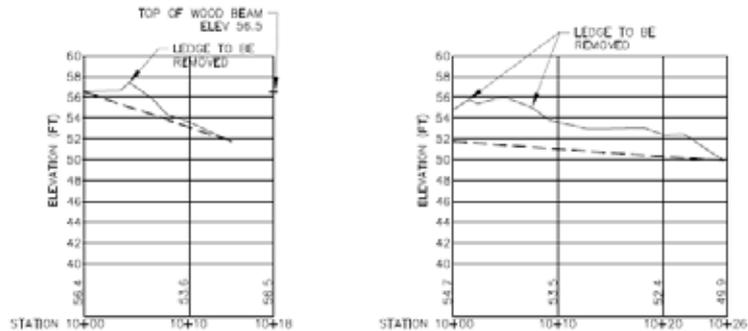


# RESTORATION ALTERNATIVES

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# MIDDLESEX FALLS



CONCORD RIVER  
DIADROMOUS FISH RESTORATION

ALTERNATIVE 1A  
MIDDLESEX FALLS  
PROPOSED PLAN SECTIONS

SCALE: 1" = 10'

CONCEPTUAL NOT FOR CONSTRUCTION

DATE	DESCRIPTION	BY	APP.
08/16	DESIGNED	JWG	[Signature]
08/16	CHECKED	JWG	[Signature]
08/16	APPROVED	JWG	[Signature]

PROJECT NO. 1947 DATE: 08/16 SCALE: 1" = 10' DRAWING: 2

Massachusetts Dept. of Fish and Game  
241 Liberty St. Room 400  
Boston, MA 02114

Worcester and Sullivan Engineers, INC.  
241 Liberty St. Room 400  
Boston, MA 02114

# CENTENNIAL FALLS DAM

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- No Action
- Fishway Improvements (2A)
  - Fish ladder entrance
  - Tailwater staff gage
  - Trash rack
- Volunteer Coordination (2B)
  - Part-time coordinator
  - Training & observation (video monitoring system)
  - Education & outreach



# TALBOT MILLS DAM

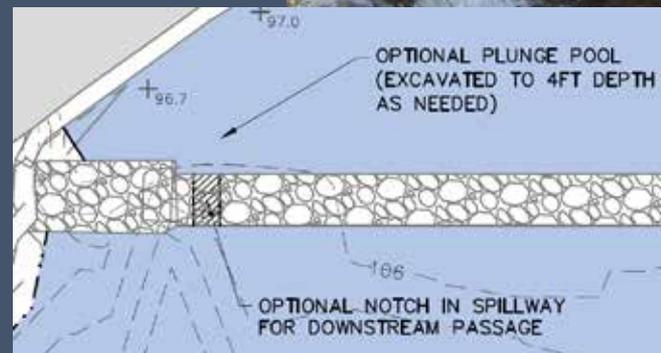
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- No Action
- Technical Fishway (3A)
- Partial Dam Removal (3B)
- Other concepts considered:
  - Nature-like fishway
    - Rock ramp
    - Bypass channel
  - Sluiceway bypass channel



# TALBOT MILLS DAM – Technical Fishway

- Denil fish ladder
- Eel ramp
- Downstream passage notch & plunge pool
- Water controls (stoplogs, flashboards)



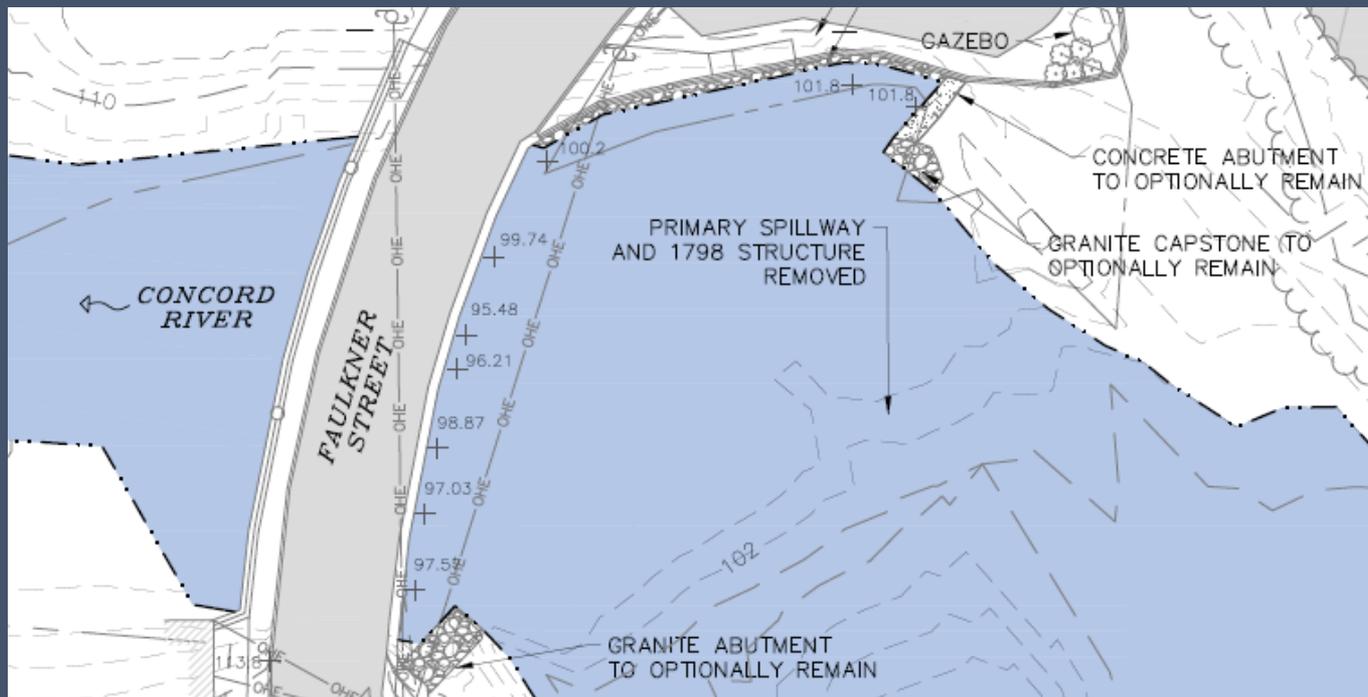
# TALBOT MILLS DAM – Technical Fishway

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# TALBOT MILLS DAM – Dam Removal

- Removal of primary spillway & legacy dam
- One or both abutments could optionally remain
- Preliminary recommendation for instream sediment mgmt.

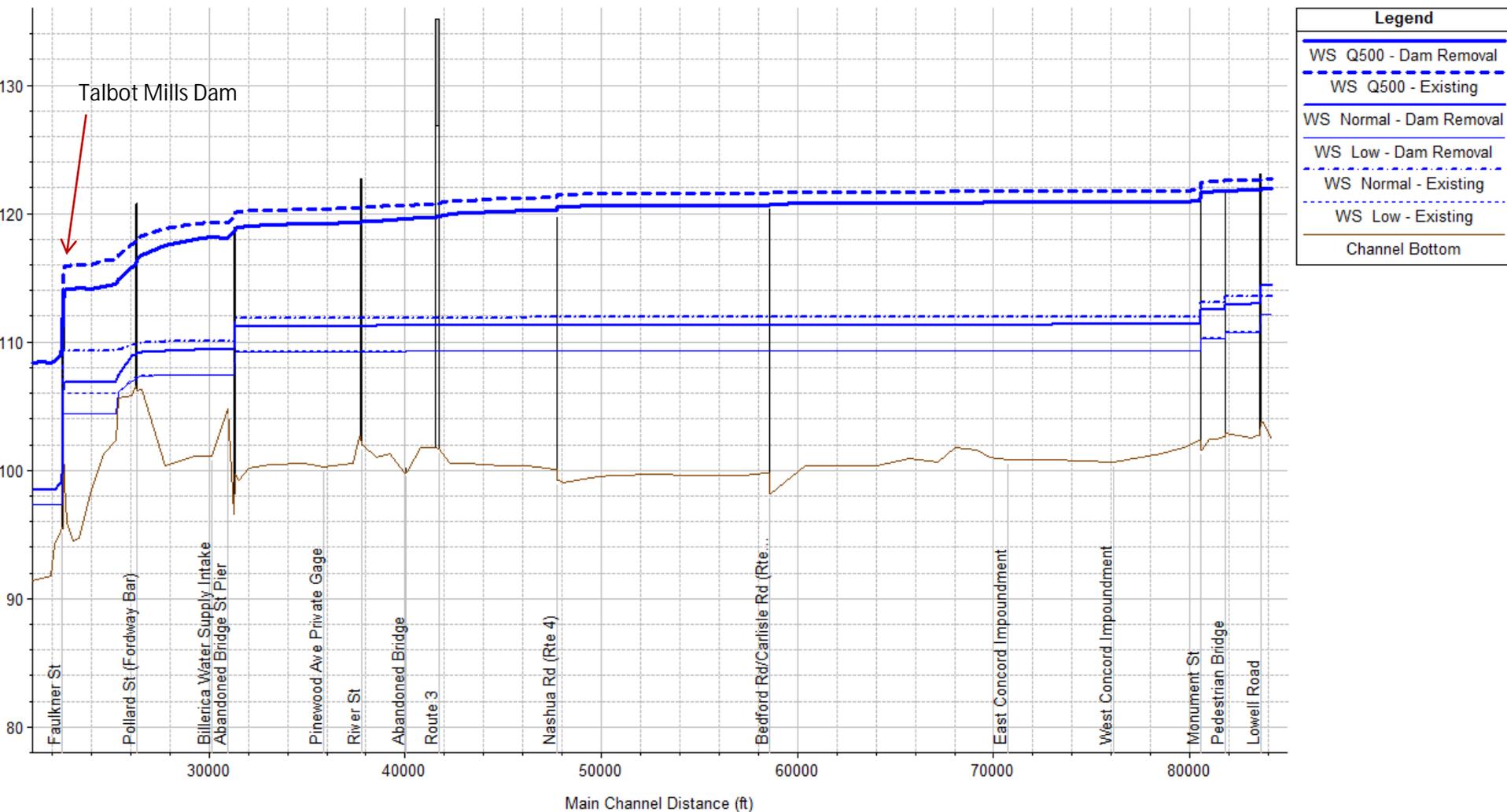


# TALBOT MILLS DAM – Dam Removal

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# TALBOT MILLS DAM – Dam Removal



# FACTORS TO CONSIDER

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- Dam safety/liability
- Public water supply
- Cultural resources (*historic structures, Native American artifacts, etc.*)
- Fisheries (*passage, assemblage, etc.*)
- Water quality (*sediment, temperature, etc.*)
- Water quantity (*upstream water levels, flooding, etc.*)
- Wetlands
- Abutter interests
- Public access/recreation
- Aesthetic resources
- Economic impact (*businesses, tourism, property taxes, etc.*)
- Cost (*additional studies, engineering, permitting, construction*)
- Ongoing operation and maintenance

# TALBOT MILLS DAM – Decision Matrix

	ALTERNATIVE		
	No Action	Technical Fishway	Dam Removal
<b>POTENTIAL BENEFITS</b>			
Upstream passage of target fish species	Low	Moderate	High
Downstream passage of target species	Moderate	High	High
Passage of other species (connectivity)	Low	Moderate	High
Improved water quality & aquatic habitat	None	None	High
Reduction of invasive species	None	None	High
Restoration of natural wetland habitat	None	None	High
Restoration of ecological functions (e.g., sediment transport)	None	None	High
Reduced upstream flooding	None	None	High
Improved recreation	None	Subjective	Subjective
Improved aesthetics	None	Subjective	Subjective
Decommissioning of aging infrastructure	None	None	High
Environmental justice for Nyanza	None	Low	High
<b>POTENTIAL IMPACTS</b>			
Blockage of fish passage	High	Low	None
Impairment of water quality	High	High	None
Fragmentation of aquatic habitat	High	High	None
Rare/threatened/endangered species	None	Low	Low
Loss of upstream wetlands	None	None	Moderate
Impoundment of sediment	High	High	None
Sediment management impacts	None	Low	Moderate
Artificial upstream flooding	High	High	None
Reduction of spillway capacity	None	Low	N/A
Water supply impacts	None	None	None
Infrastructure impacts (e.g., bridges)	None	None	Low
Cultural resources impacts	None	Moderate	High
Recreation impacts	None	None	Subjective
Aesthetic impacts	None	Subjective	Subjective
<b>OTHER FACTORS</b>			
Permitting effort	Moderate	High	High
Operation & maintenance	High	High	None
Estimated cost (engineering, permitting, construction)	\$105k+	\$590k	\$470k



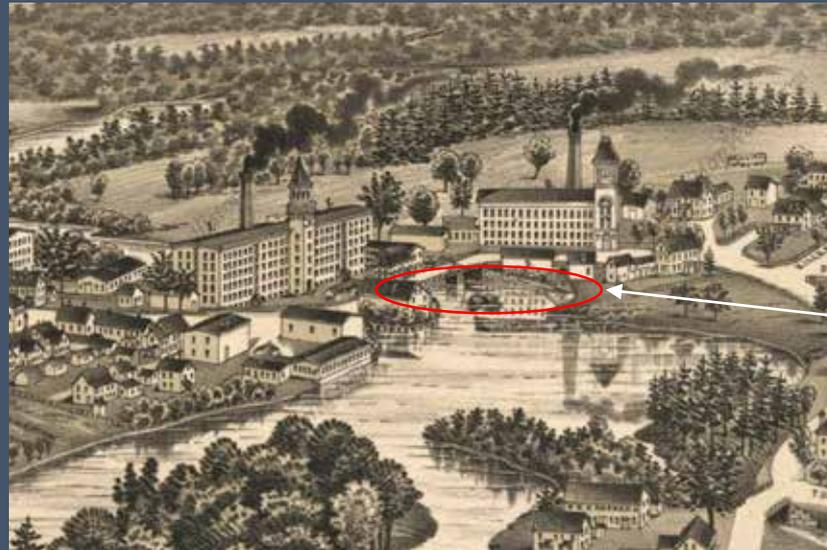
# CULTURAL RESOURCES – Architectural/Industrial

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## IMPACTS/EFFECTS AND RECOMMENDATIONS – Fish Ladder

Design of fish ladder should conform to the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (36 CFR Part 68) to minimize potential adverse effects to the districts

Notch in dam spillway would result in adverse effect—to the dam, also if the impoundment water level is so low that it changes relationship between canal components



Talbot Mills Dam

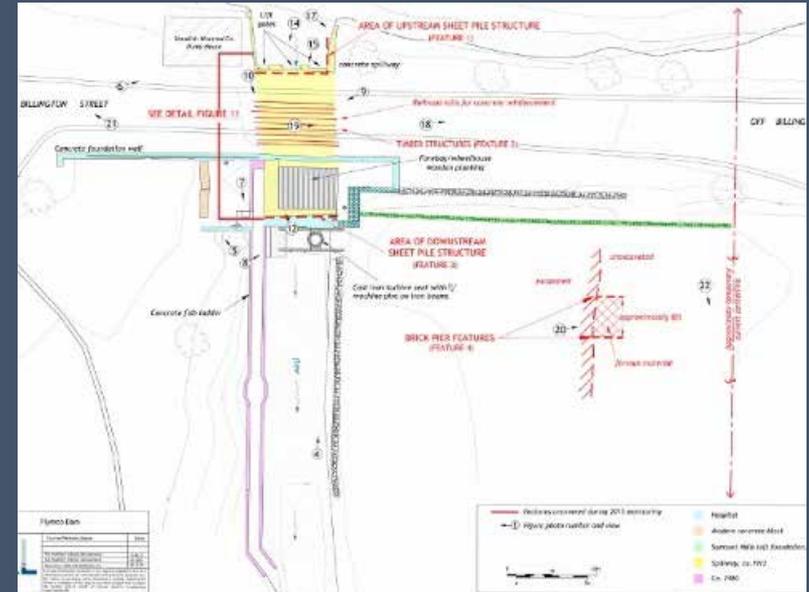
## IMPACTS/EFFECTS – Partial Dam Removal

Adverse effect on the Middlesex Canal Historic and Archaeological District and the Billerica Mills Historic District.

# CULTURAL RESOURCES – Archaeological

## RECOMMENDATIONS – Technical Fishway

Archaeological monitoring and recordation in high sensitivity areas during construction, to identify and record any buried surviving components of the earlier dams and fishways.



## RECOMMENDATIONS – Partial Dam Removal

Archaeological monitoring and recordation in high sensitivity dam area (same as above), plus archaeological walkover with close ground surface inspection of high sensitivity pond shoreline and exposed impoundment drawdown areas.

# SUMMARY

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- Feasibility study is not intended to identify a preferred alternative
- Found that fish passage restoration in the Concord River is technically feasible
- Possible to combine two or more alternatives together, implemented simultaneously or in phases
- Over 35 miles of diadromous fish habitat on the mainstem rivers, plus more than 100 miles of habitat on tributaries could be restored

# NEXT STEPS

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- Planning
- ➔ • Feasibility
  - Public comments
  - Final report
  - Preferred alternative?
- Additional feasibility/consultation
- Design
- Permitting

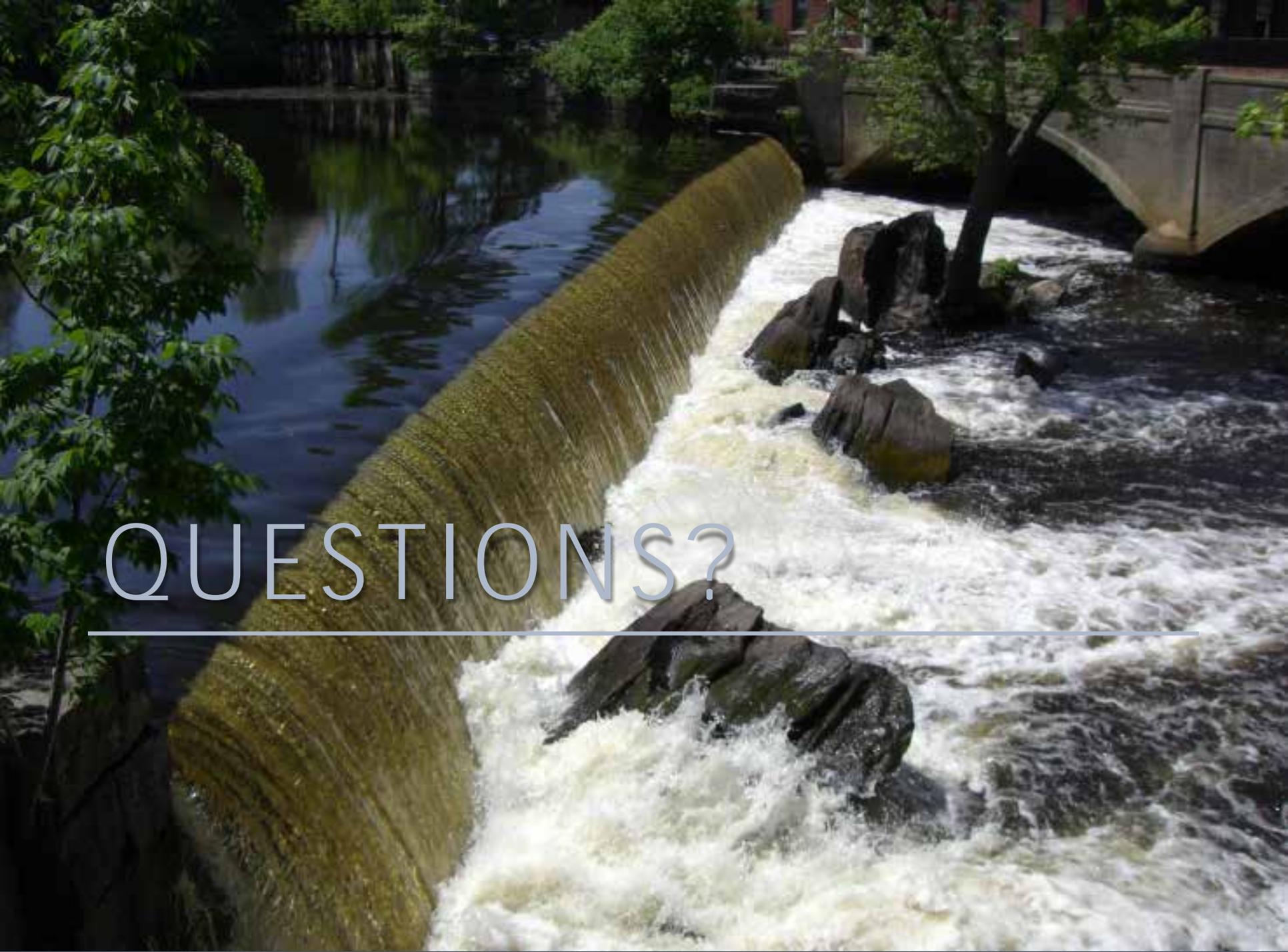


# COMMENTS

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- Written comments welcome & encouraged
- Feasibility report:
  - <http://tinyurl.com/ConcordRiverFishStudy>
  - Hard copies available at Billerica Public Library
- Send comments by April 6, 2016 to:

Jill Griffiths, PE | Gomez and Sullivan Engineers  
PO Box 2179 | Henniker, NH 03242  
[jgriffiths@gomezandsullivan.com](mailto:jgriffiths@gomezandsullivan.com)



QUESTIONS?

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# PROJECT CONTACTS

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michael\_bailey@fws.gov  
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<http://www.mass.gov/eea/agencies/massdep/cleanup/nrd/nyanza-chemical-waste-dump-superfund-site-nrd-settlement.html>