



# **New Hampshire's *Dam Removal and River Restoration Program***

**Deb Loiselle  
NHDES - River Restoration Coordinator**

**West Henniker Dam, Contoocook River  
Removed Summer 2004**



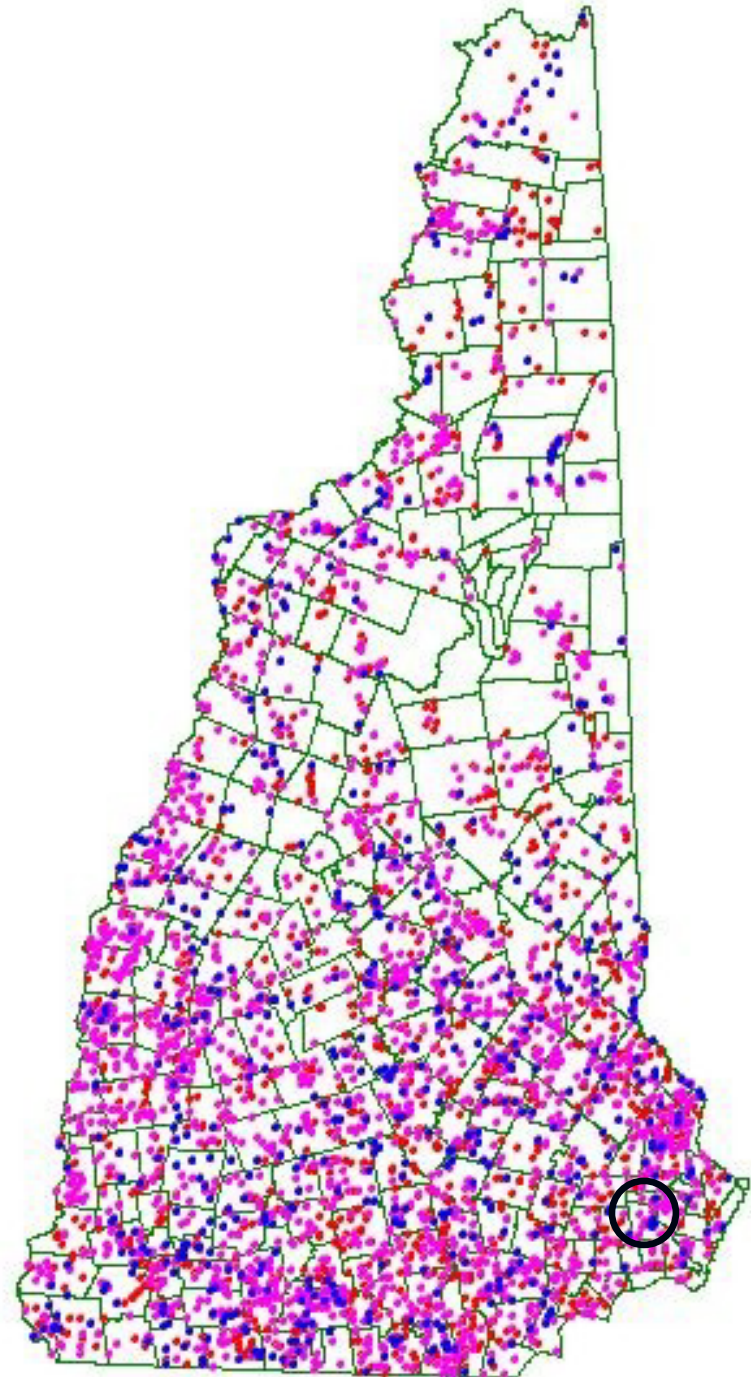


# How Many Dams are in New Hampshire?

National Inventory of Dams (NID)  
= 625

NID + Remaining Active Dams  
= 3,200

NID + Active + Inactive Dams  
= 5,124 dams in the state  
database



## Ownership of Active Dams

Private = 80%  
Municipal = 10%  
State = 9%  
Federal = 1%

## Hazard Classifications

High Hazard = 3 %  
Significant = 6 %  
Low = 16 %  
Non-menace = 75 %

## High & significant hazard dam ownership

35% - Privately owned  
32% - Municipally owned



# What are the Functions of New Hampshire's Dams?

<u>Use</u>	<u>% of</u>
Recreation .....	36
Stormwater Detention Pond ....	15
Conservation/Agriculture .....	14
Other .....	12
Fire Protection .....	8
Hydropower .....	5
Water Supply .....	3
Flood Control .....	2
Sewage Lagoon .....	2

A default category that includes many old mill dams.

Very few currently produce or are capable of producing hydropower.

Even fewer provide flood control. In fact, many exacerbate flooding.



# Why Remove Dams?

Nationwide thousands of dams (large and small) are at or near the end of their useful, safe and economical life.



Historically, dams were built with little, if any, consideration of their impact to the river system.



Bearcamp River Dam - Tamworth, NH

Removed in 2001

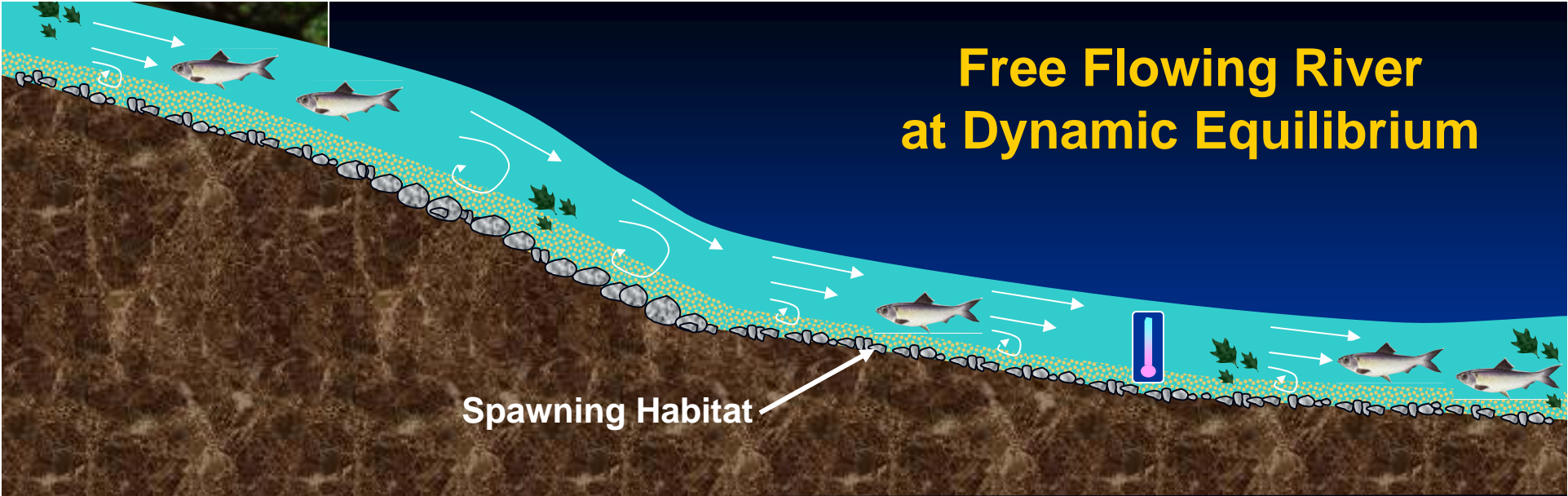
**We've learned:**

**Dams can be environmentally damaging**

**Free-flowing rivers play vital roles in ecosystem health**

**Growing public appreciation for rivers and desire to restore them**

# Free Flowing River at Dynamic Equilibrium



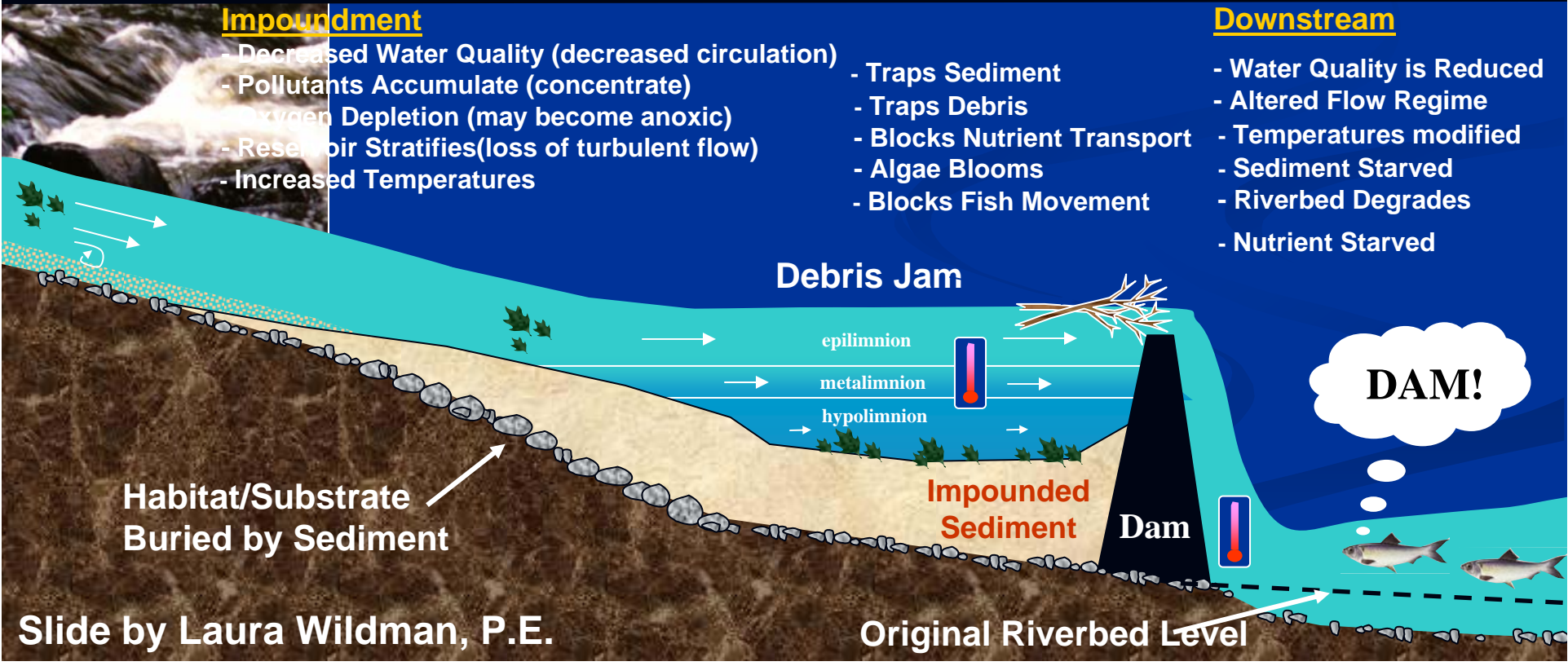
Spawning Habitat

## Impoundment

- Decreased Water Quality (decreased circulation)
- Pollutants Accumulate (concentrate)
- Oxygen Depletion (may become anoxic)
- Reservoir Stratifies (loss of turbulent flow)
- Increased Temperatures

## Downstream

- Traps Sediment
- Traps Debris
- Blocks Nutrient Transport
- Algae Blooms
- Blocks Fish Movement
- Water Quality is Reduced
- Altered Flow Regime
- Temperatures modified
- Sediment Starved
- Riverbed Degrades
- Nutrient Starved



Debris Jam

epilimnion  
metalimnion  
hypolimnion

Impounded Sediment

Dam

DAM!

Habitat/Substrate Buried by Sediment

Slide by Laura Wildman, P.E.

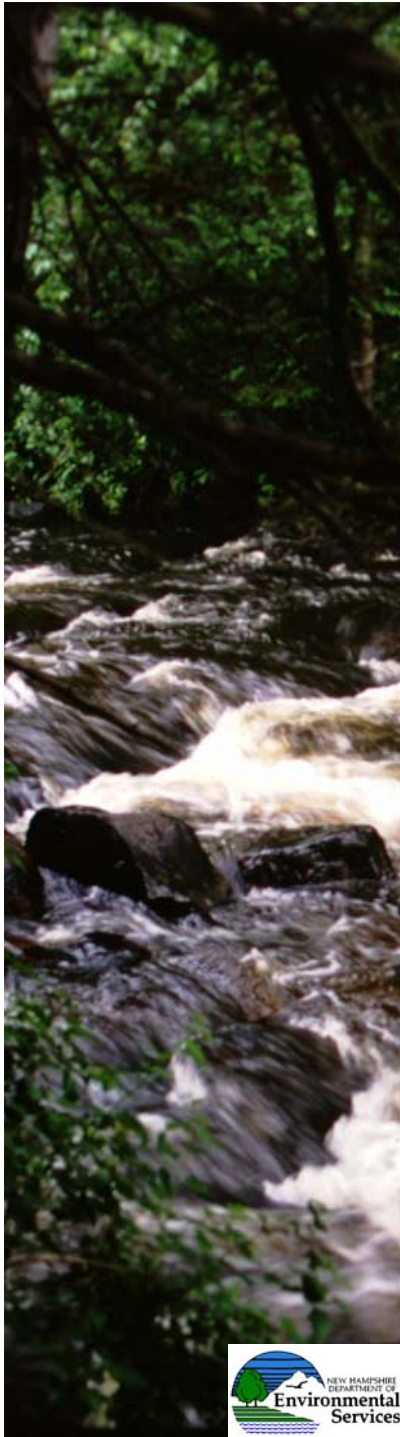
Original Riverbed Level



# N.H. River Restoration Task Force

*Initiated in January 2000*

- A public-private collaboration restoring rivers and eliminating safety hazards through selective dam removal.
- Goal: An efficient and effective process for removing dams and restoring rivers
- Operates at both statewide and project-specific levels



# River Restoration Task Force Members

- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- U.S. Army Corps of Engineers
- U.S. Geological Survey
- U.S. National Park Service
- NOAA Restoration Center
- USDA, Natural Resource Conservation Service
- N.H. Fish and Game Dept.
- N.H. Dept. of Environmental Services
- N.H. Office of Emergency Management
- State Historic Preservation Office
- American Rivers
- Coastal Conservation Association
- Coldwater Fisheries Coalition
- Connecticut River Watershed Council
- Conservation Law Foundation
- Lamprey River Local Advisory Committee
- Ashuelot River Local Advisory Committee
- Merrimack Valley Paddlers
- New Hampshire Rivers Council
- Trout Unlimited
- The Nature Conservancy



# The DES River Restoration Program *Initiated in 2001*

**Dam Owners**

**General Public**

**Government Agencies**

**Consulting Community**

... with information about dam removal, such as

- basics about dam removal & river restoration
- the latest research and available resources
- appropriate methods for a specific site

... in obtaining funding to offset costs of dam removal and associated work

... throughout the planning, decision-making and regulatory process

# Guidelines to Regulatory Requirements for Dam Removal Projects

## Introduction

Why Consider Dam Removal?

## State Laws and Rules Affecting Dam Removal Projects

## Removing a Dam in New Hampshire: A Four-Step Process

Detailed Flow Chart of Process

Step One: Obtain Necessary Information

Step Two: Research, Plan and Design the Project

Key Technical Issues to Address Early

Sediment Issues

Historical Resources

Effects to Infrastructure

Step Three: Prepare Permit Applications and Supporting Materials

Completing the Application Forms

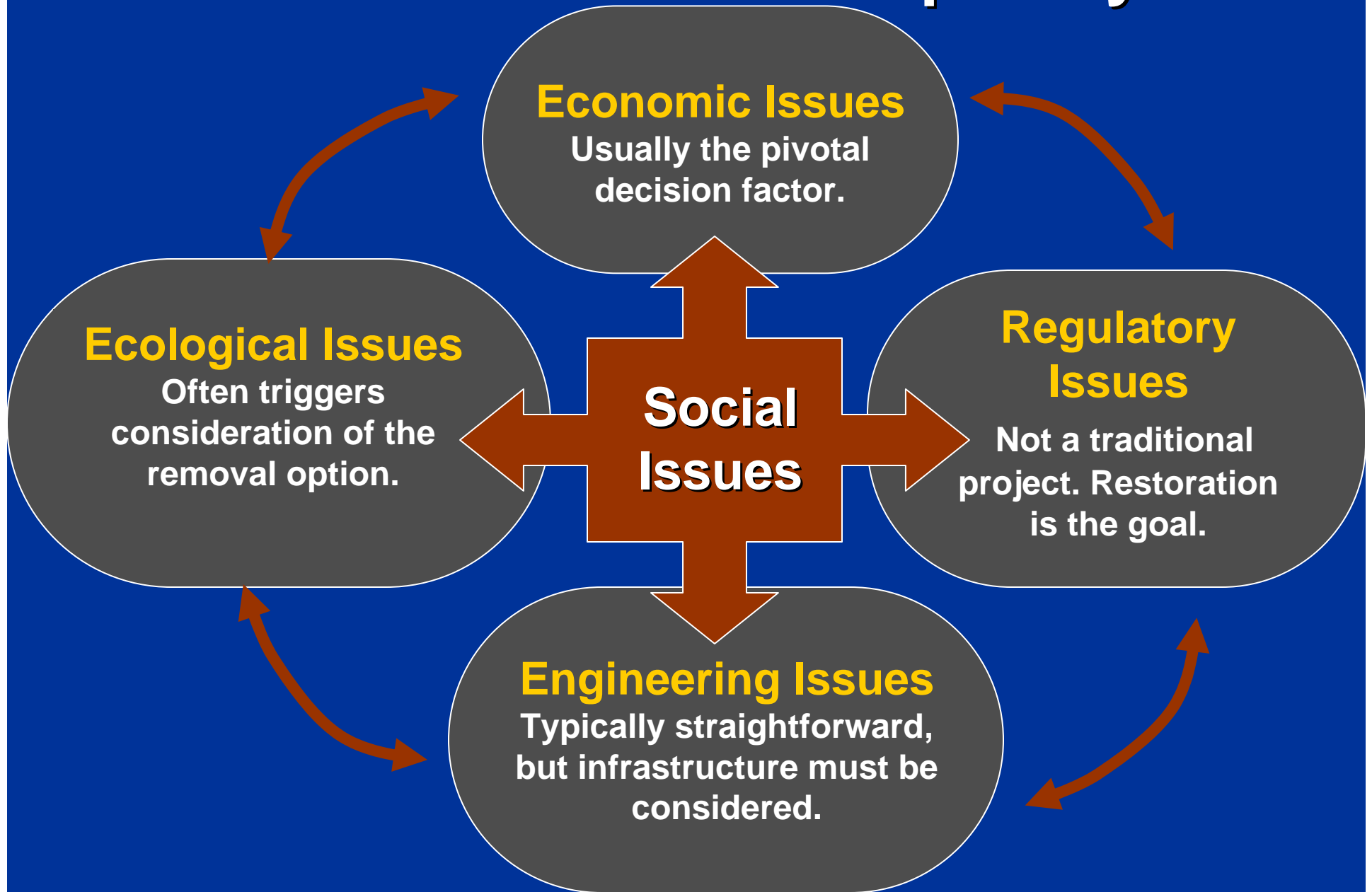
Permit Application Checklist

Step Four: Permit Review and Issuance





# Dam Removal: A Multi-disciplinary Issue



**GOAL:  
Enable Proactive  
Discussions,  
Rather than Reactive  
Decisions**

**Project  
Implementation**

**Project Initiation**

**Regulatory  
Process**

**Public  
Involvement  
is Internal**

**Conduct  
Studies**

**Alternative Selection  
& Project Planning**

**Studies Completed**





# Feasibility Assessment

## ENGINEERING

TYPE & CONDITION OF DAM  
SITE LIMITATIONS (Utilities, Topography)  
UPSTREAM & DOWNSTREAM ISSUES  
(bridges/structures, tributaries)  
PROJECT PERMITTING  
ALTERNATIVES ANALYSIS

## SOCIOECONOMIC

OWNERSHIP (Dam & Water Rights; Easements)  
CURRENT USES  
RECREATION  
PUBLIC SAFETY  
ECONOMIC ANALYSIS  
ARCHEOLOGICAL/HISTORICAL  
SENTIMENTAL VALUE  
AESTHETICS

## ECOLOGY

ANADROMOUS & RESIDENT FISHERIES  
AQUATIC HABITAT  
HABITAT FRAGMENTATION  
ECOLOGICAL INTERCONNECTIONS  
VEGETATION  
WILDLIFE  
SPECIES OF SPECIAL CONCERN

## WATER QUALITY

CHEMICAL PROPERTIES  
PHYSICAL PROPERTIES (i.e. temperature, turbidity)  
PUBLIC HEALTH

## HYDROLOGY

WATERSHED HYDROLOGY  
FLOODWATER STORAGE  
IMPOUNDMENT DRAWDOWN  
WELL IMPACTS

## HYDRAULICS

CHANNEL HYDRAULICS (& safety)  
FLOODPLAIN HYDRAULICS  
ICE JAMS

## FLUVIAL MORPHOLOGY

TESTING (quality & quantity)  
SEDIMENT STABILITY/TRANSPORT  
SEDIMENT MANAGEMENT  
SEDIMENT DISPOSAL  
CHANNEL MORPHOLOGY/DESIGN (form, function,  
process, materials)  
SITE RESTORATION

Compiled by Laura Wildman, P.E.

# Economic Considerations

**What would it cost to maintain the dam & impoundment? Remove the dam?**

On-going costs v. One-time costs

**What is the economic benefit of maintaining the dam?**

(e.g., recreational uses, hydropower, water supply, flood control)

**Restoring the river?**

(e.g., recreational uses, water quality improvements, riverfront revitalization, tourism opportunities)

**Do the benefits outweigh the costs? Is funding available?**





# Engineering Issues

- Dam Safety
- Public Safety
- Sediment management
- Assessment of effects to services the dam/impoundment provides (e.g., fire protection, flood control, hydropower, water supply)
- Assessment of effects to infrastructure (e.g., bridges, dry hydrants, storm sewer outfalls, water mains)
- Riverine ice regime issues (i.e., ice jams)

Homestead Mill Dam, Ashuelot River,  
West Swanzey, N.H.



# Key Issue: Social Concerns

Some concerns are based on a lack of information; these may be addressed through information gathering and public outreach.

*The river will disappear!  
Flooding will increase!  
All the fish will die!*

Other concerns are value-based; these may not be possible to reconcile – dam removal is a fundamental change to the site.



Photo: Wis. DNR

**Many people have a combination of concerns.**  
A range of concerns can be addressed with public involvement throughout a project.



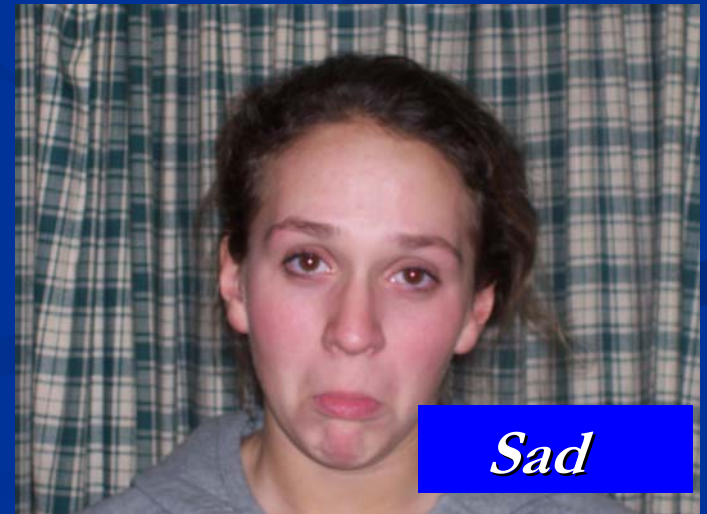
# Emotions



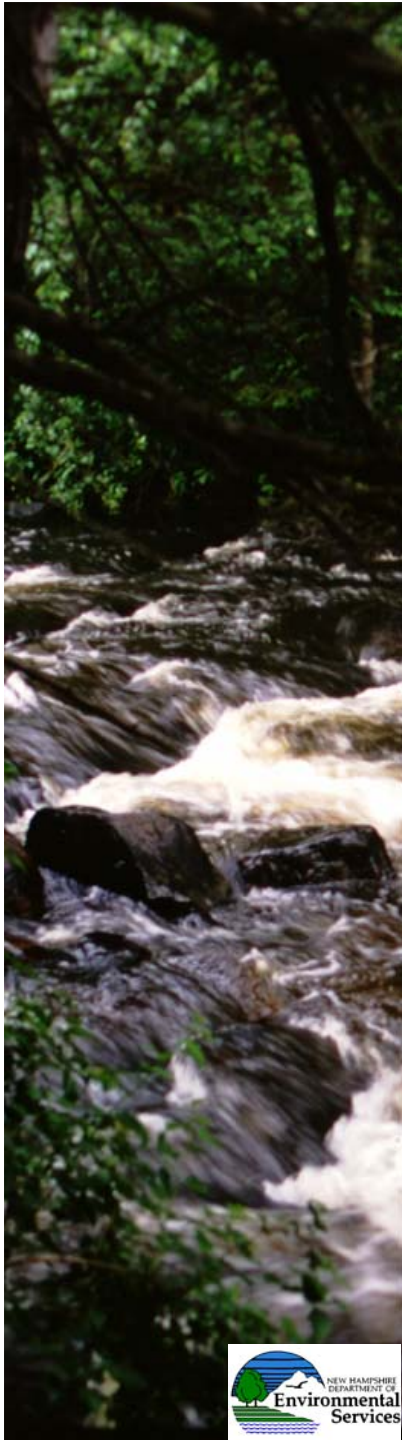
Happy



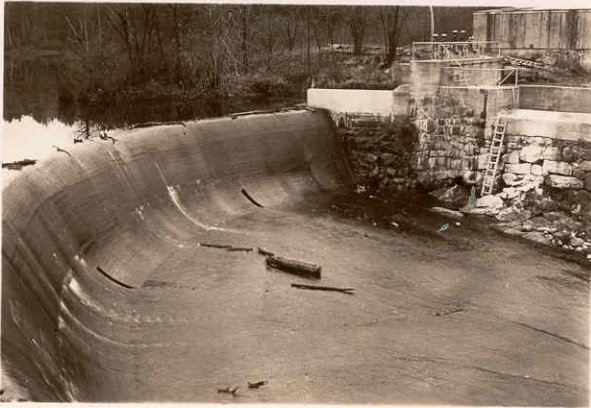
MAD



Sad



# Historic Issues



1939 photos



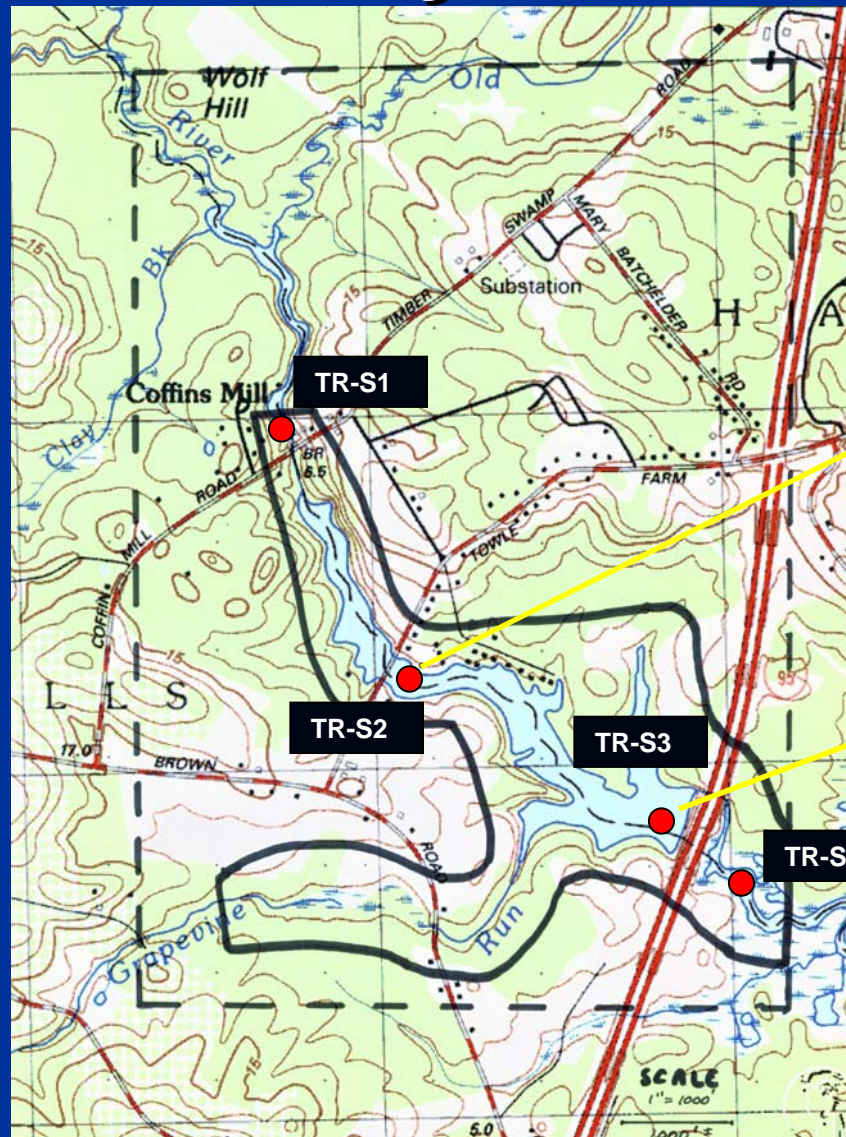
Archaeological test pit



Current photo



# Sediment Quantity and Quality





**Days after removal**



**Champlin Pond Dam  
Rochester, NH**

**Aesthetic Concerns**



**9 months after removal**

# Funding Dam Removal Projects

## Sources

Dam Owner

Federal and State Agency Grants

Private Foundations

Conservation Organizations

Corporate Funding (CWRP)

Fines from Environmental Violations

Other, including in-kind assistance –

Consultants, Military Readiness Training,  
Universities/Schools, etc.









# NHDES Dam Removal and River Restoration Program Webpage

NHDES DAM BUREAU - Dam Removal and River Restoration Program - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://des.nh.gov/Dam/DamRemoval/>

Public Information  
Rules/Regulatory  
Business Center  
OneStop Data


What's New?  
Sign up for e-news

A-Z Topics List

Contact DES  
Site Search

There are more than 4,600 active and inactive dams in the State of New Hampshire. Many of these dams were built during the Industrial Revolution in the 19<sup>th</sup> and early 20<sup>th</sup> centuries, and they played central roles in New Hampshire's economic and societal growth during that period. But as technological and societal needs have changed, so too has the need for some dams.

Select/Click on photos for a closer view.



Free-flowing Bearcamp River, eight months after dam removal.  
May 2004

Very few dams in New Hampshire are currently under consideration for removal. However, dam removal is an option that should be considered on its merits. When the costs associated with a dam outweigh its benefits, removal may be a wise decision, one that can result in significant environmental, economic and social benefits.

**For more information about dam removal contact the River Restoration Coordinator at [dloiselle@des.state.nh.us](mailto:dloiselle@des.state.nh.us) , (603) 271-3406.**

**Guidelines to the Regulatory Requirements for Dam Removal Projects in New Hampshire**

Evaluation of Sediment Quality

Guidelines for Historical and Archeological Resources

Contact the Program Coordinator

Why Remove Dams?  
What is the Process?  
What is the NH River Restoration Task Force?  
Frequently Asked Questions About Dam Removal  
Projects

Collecting Data on Dams and Rivers  
DES Fact Sheet DB-18  
Permit Application  
River Restoration Resources  
Consultants

Wiswall Dam Public Informational Meeting  
Homestead Dam Feasibility Study

About Dam Removal...

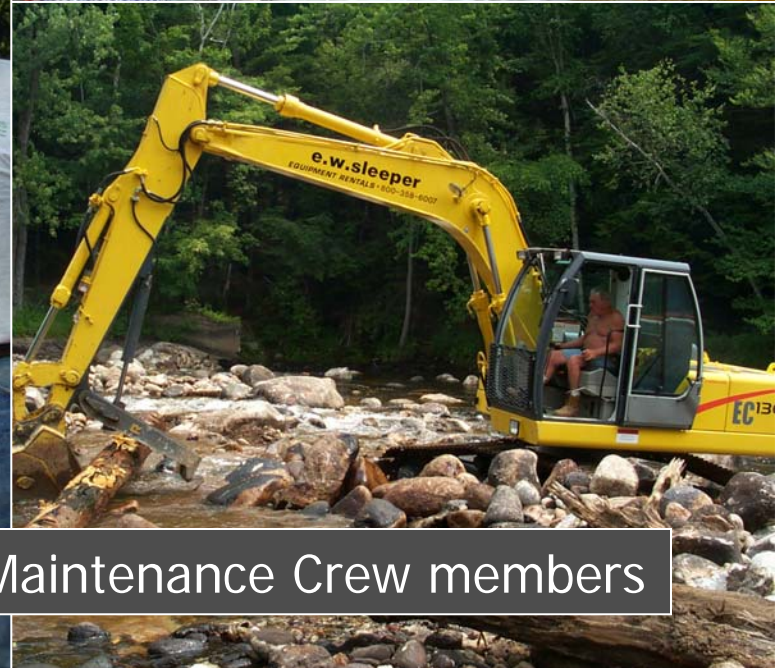
Start

Desktop My Docum... My Computer My Networ... Recycle Bin Internet E... Microsoft ... ACDSee 8

Internet 10:56 AM

# McGoldrick Dam Removal Ashuelot River, Hinsdale, N.H. July 2001

Governor Shaheen breaches the dam



Governor Shaheen and NH DES Dam Maintenance Crew members

Photos: NH DES Dam Bureau



July 18, 2001



# McGoldrick Dam Removal Ashuelot River, Hinsdale, N.H.

Photos: NH DES Dam Bureau

April 9, 2002

Cost - \$53,000

Funded by several  
federal and state  
agencies, and  
foundation support.







# Winchester Dam Removal

Ashuelot River  
Winchester, N.H.  
Removed July 2002

**Cost - \$31,400**

**Funded by several federal  
and state agencies, and  
foundation support.**







**Bearcamp River Dam  
South Tamworth  
Removed Sept. 2003**

**Re-connected  
28+ miles of river**



**Two weeks after project  
completion**

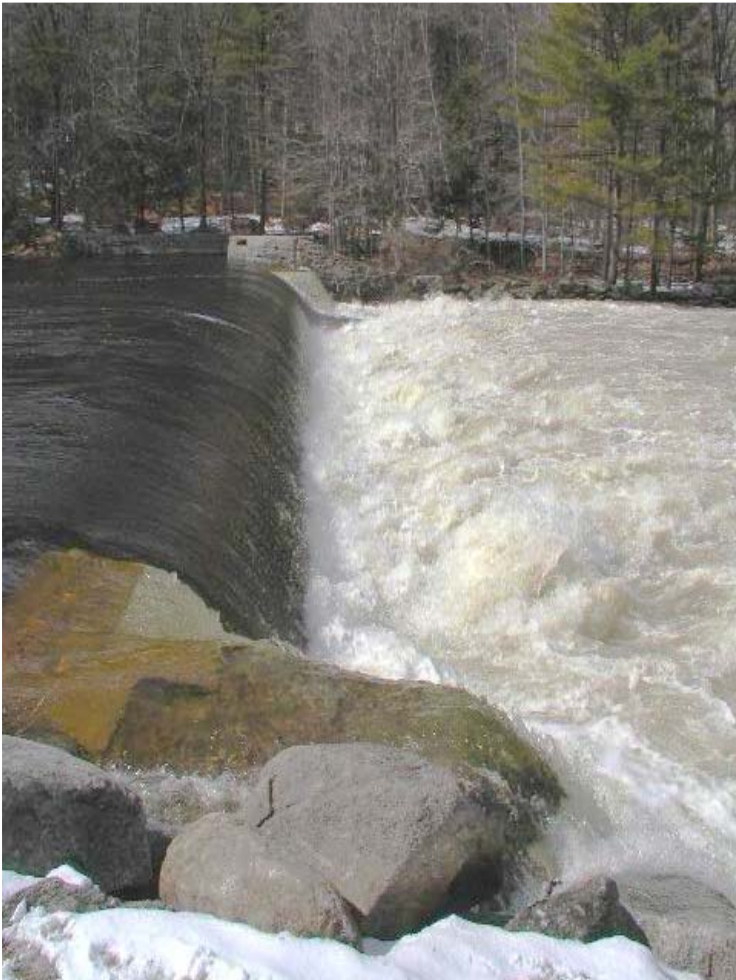
**Removal Cost  
Estimate:  
\$ 120,000 (w/ studies)**

**Actual Cost:  
\$ 75,000 (w/ studies)**



# West Henniker Dam, Contoocook River Henniker, N.H.

Removed, Summer 2004



Photos: NH DES Dam Bureau

Height – 10 feet, Length – 140 feet

Will restore 15 miles of river to  
free-flowing

Estimated project cost: \$160,000





October 11, 2000

John's River Dam  
NH Dam# 252.03  
Whitefield

September 18, 2006

Standing in River Bed  
looking upstream at downstream face of dam



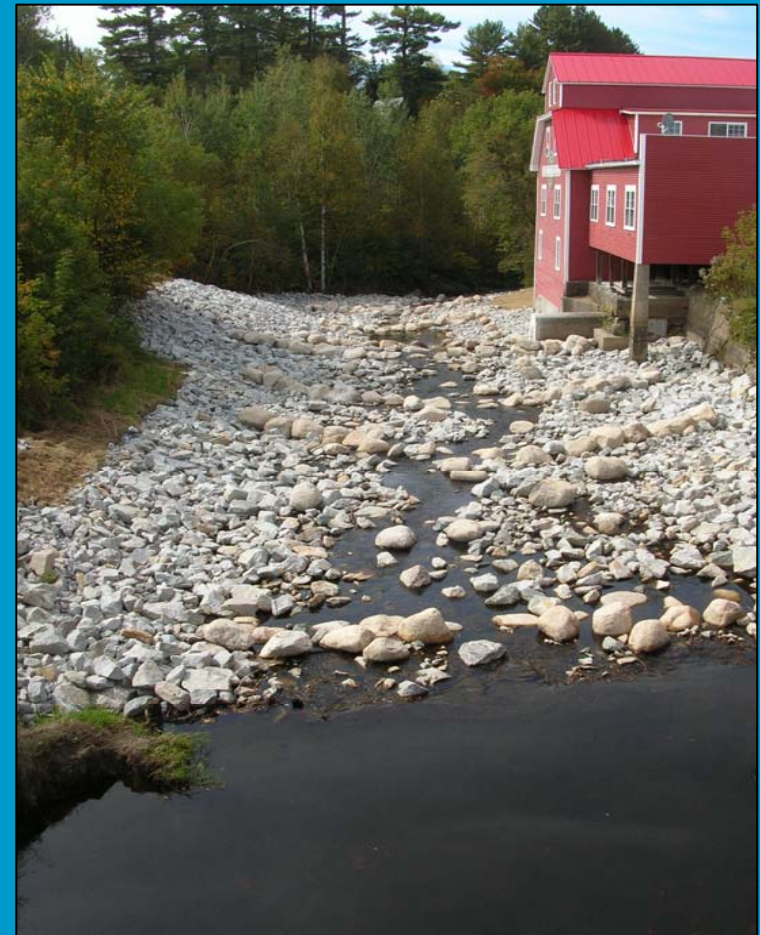


April 12, 2000

Standing on Bridge  
looking downstream at upstream face of dam

John's River Dam  
NH Dam# 252.03  
Whitefield

September 18, 2006







April 12, 2000

Standing on left embankment  
looking towards right downstream

John's River Dam  
NH Dam# 252.03  
Whitefield

September 18, 2006





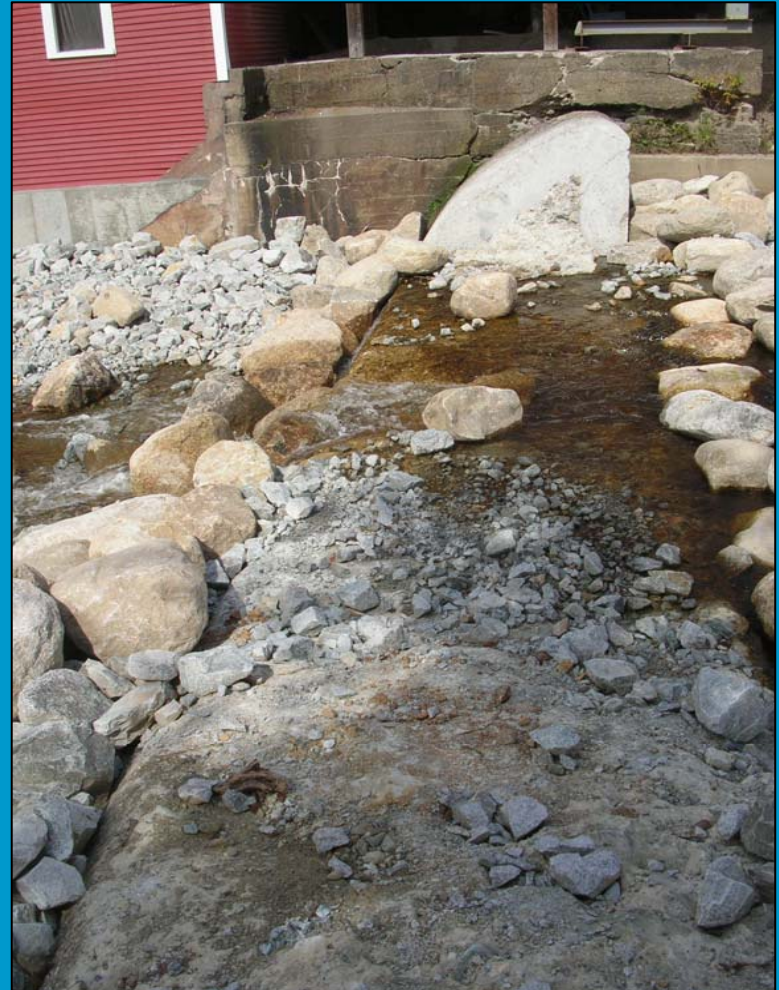
John's River Dam  
NH Dam# 252.03  
Whitefield

September 18, 2006



October 11, 2000

Standing on left embankment  
looking across at right side of dam



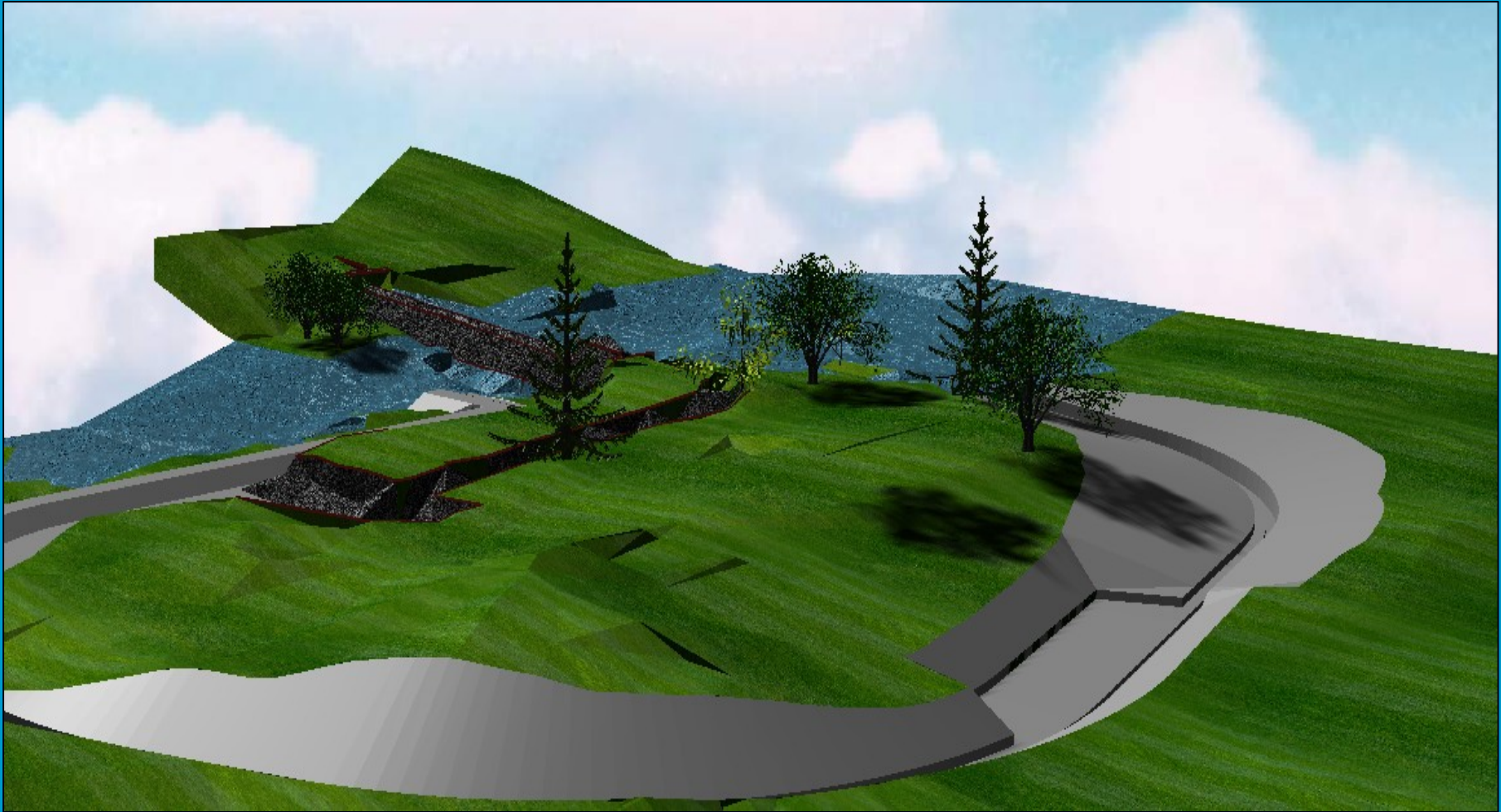


# Wiswall Dam Durham, NH



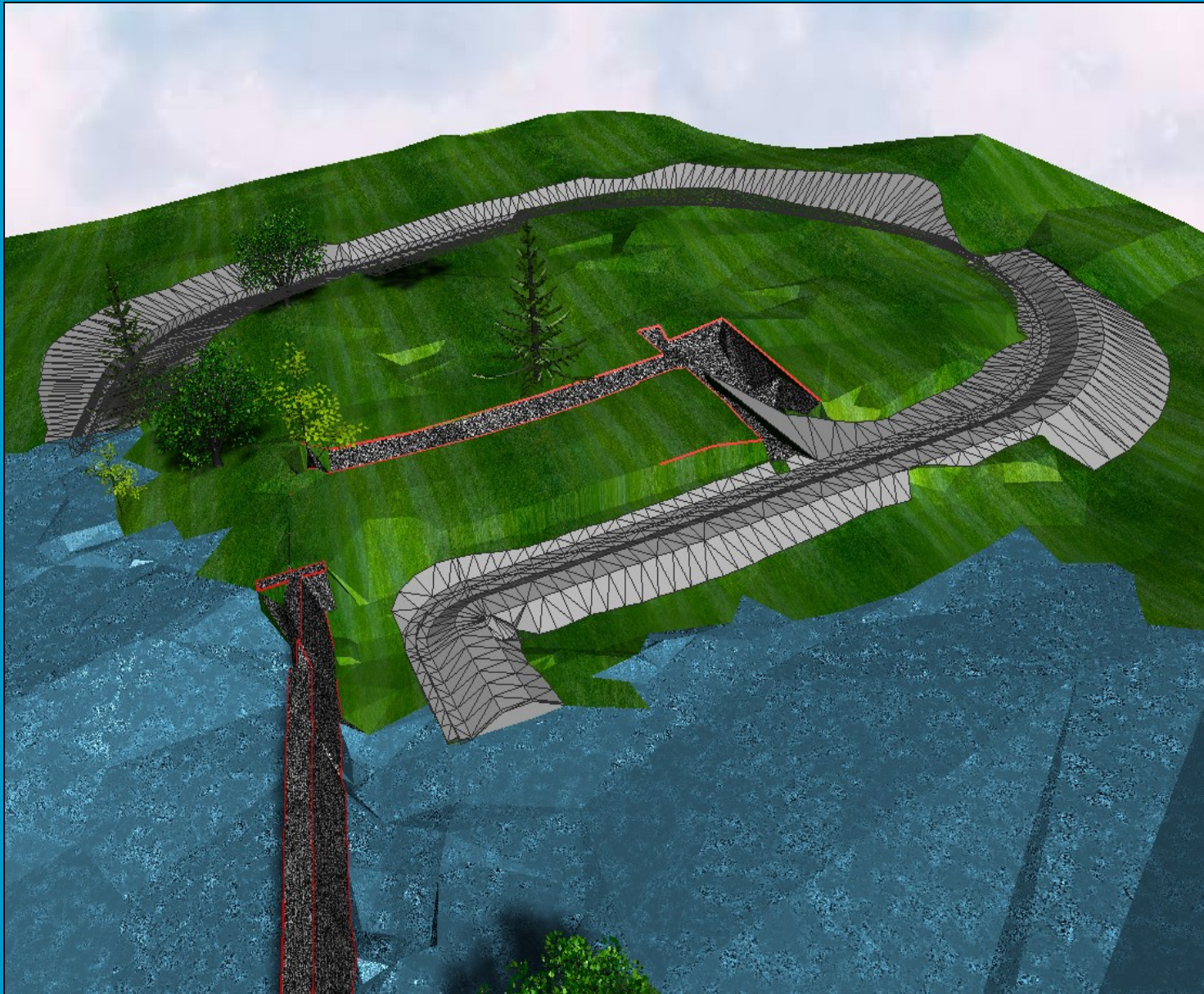


# Wiswall Dam Bypass Channel





# Wiswall Dam Bypass Channel





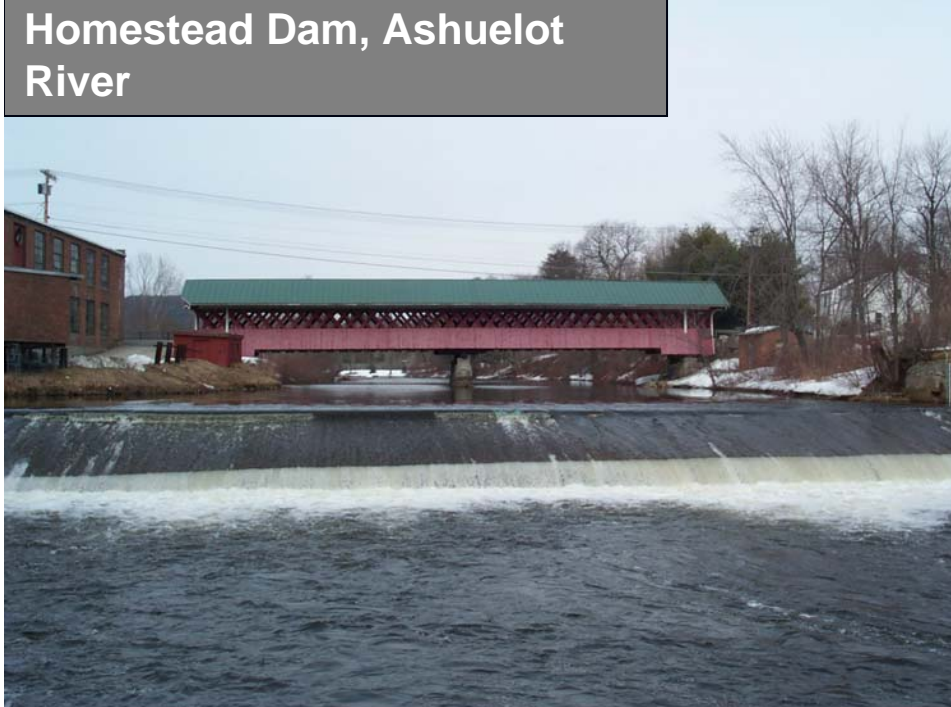
**Merrimack Village Dam, Souhegan River**



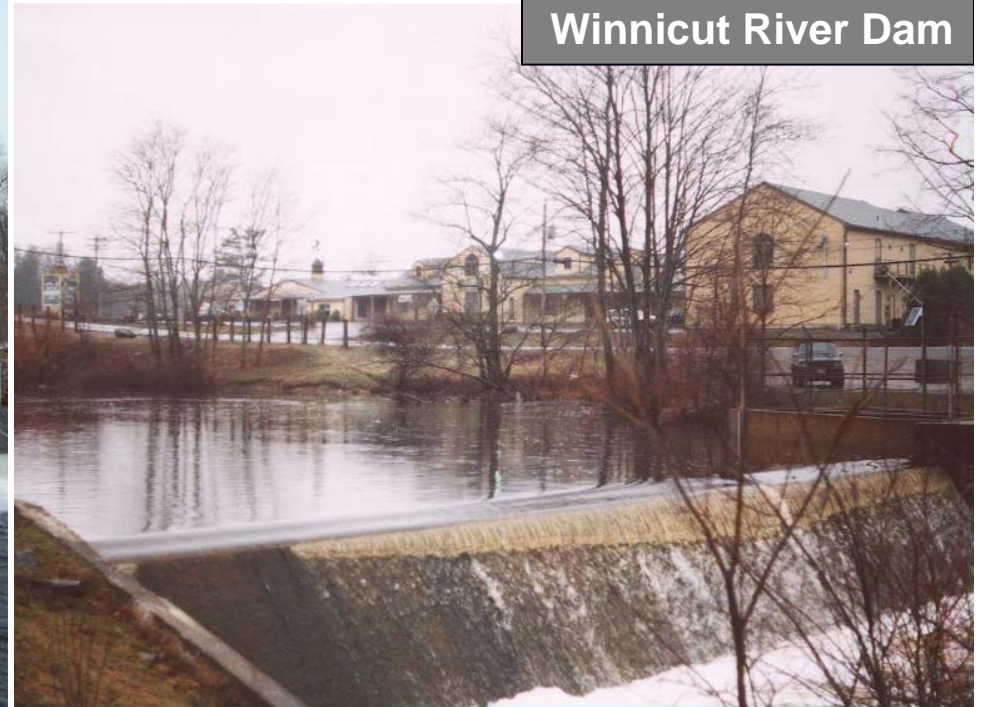
**Maxwell Pond Dam, Black Brook**



**Homestead Dam, Ashuelot River**



**Winnicut River Dam**







*Thank you ...*

**Deb Loiselle**

River Restoration Coordinator  
N.H. Dept. of Environmental Services

(603) 271-8870

[dloiselle@des.state.nh.us](mailto:dloiselle@des.state.nh.us)

[www.des.nh.gov/dam/damremoval](http://www.des.nh.gov/dam/damremoval)

