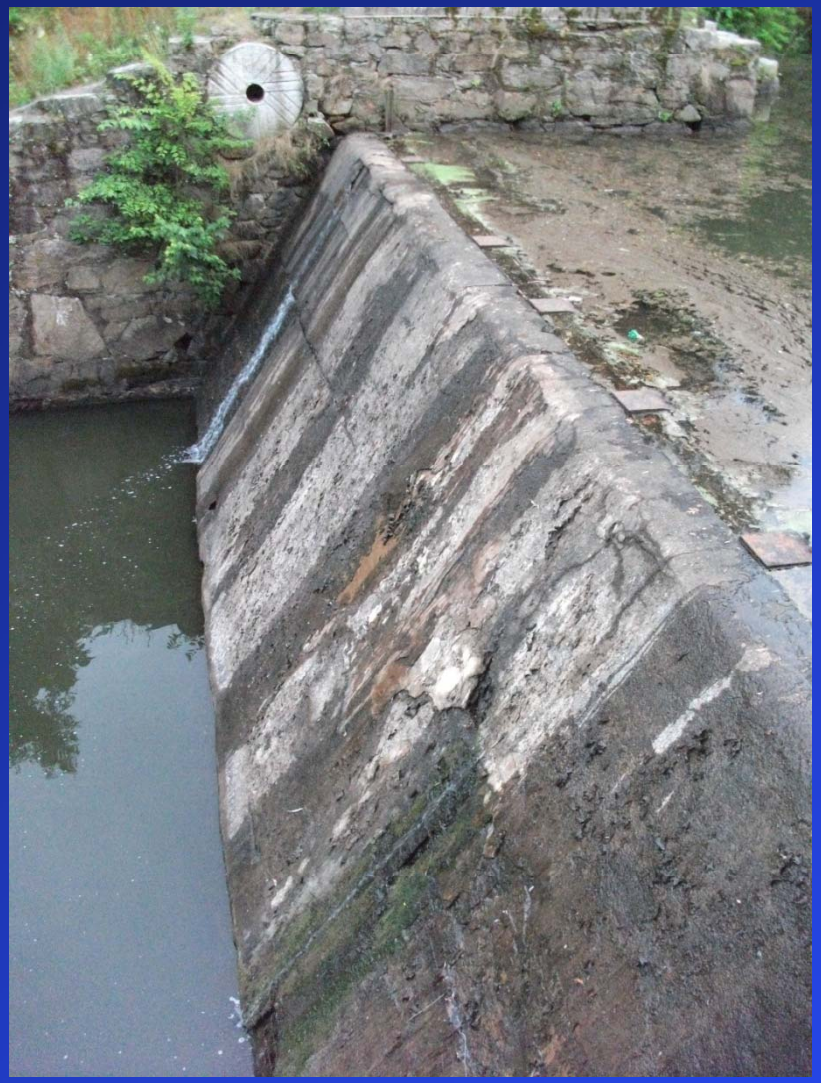
Dams in an Era of Climate Change



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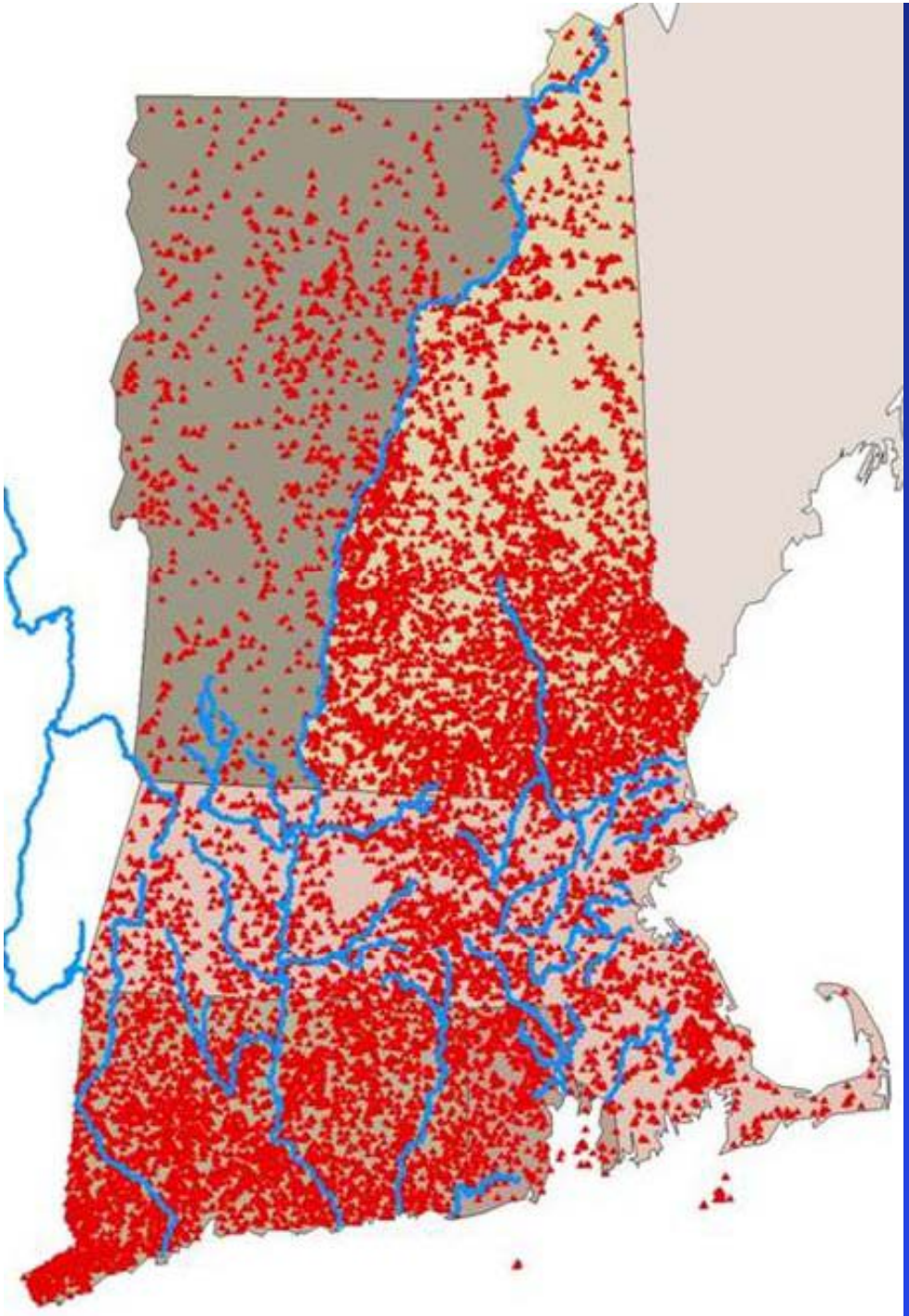
Climate changes forecast for the Northeast US

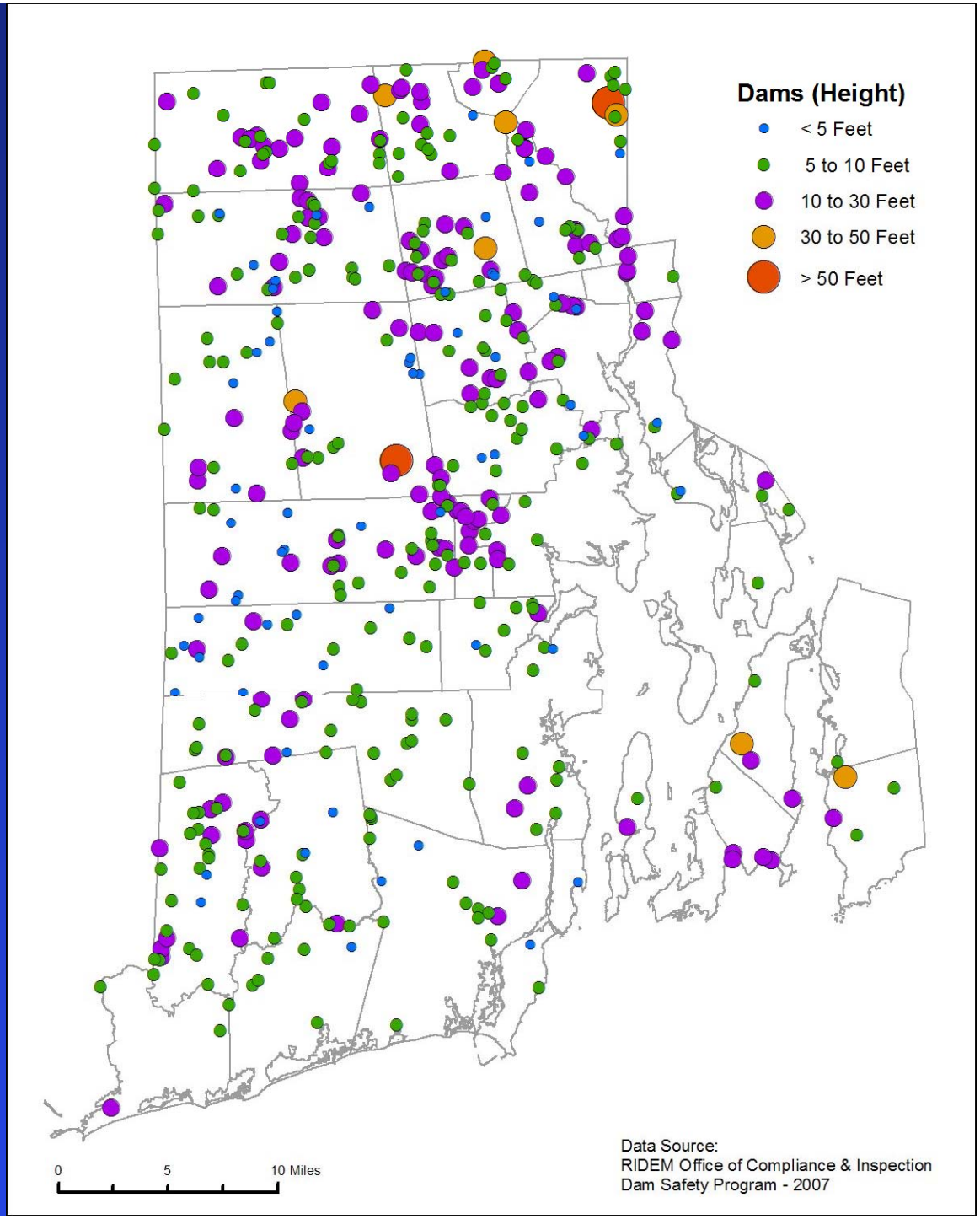
- Warmer and wetter
- Larger peak rain events with periods of drought
- Species migration northward
- Sea level rise of 3-5 feet or more
- Migration of wetlands



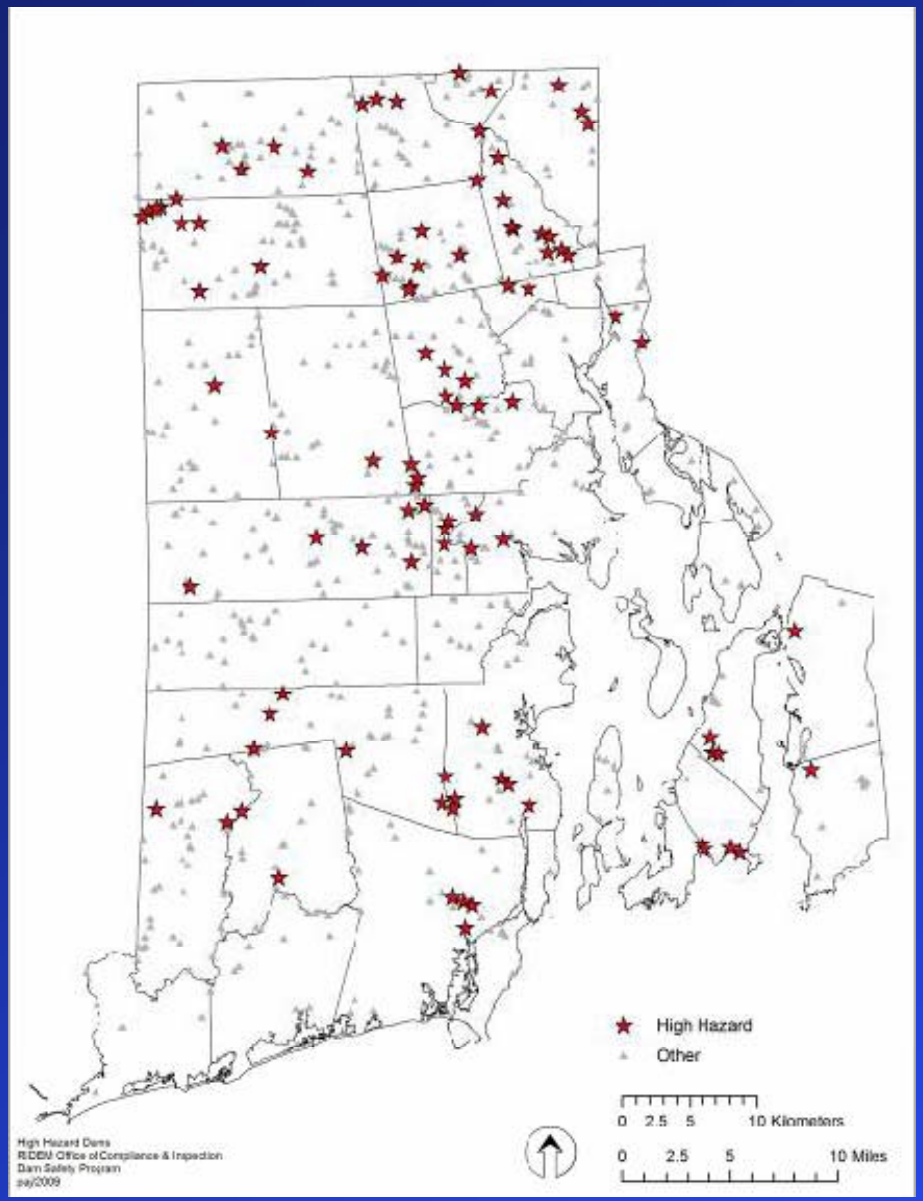
Dams in New England

- 13,126 Dams in CT, RI, MA, VT, NH (databases)
- Majority not serving original purpose

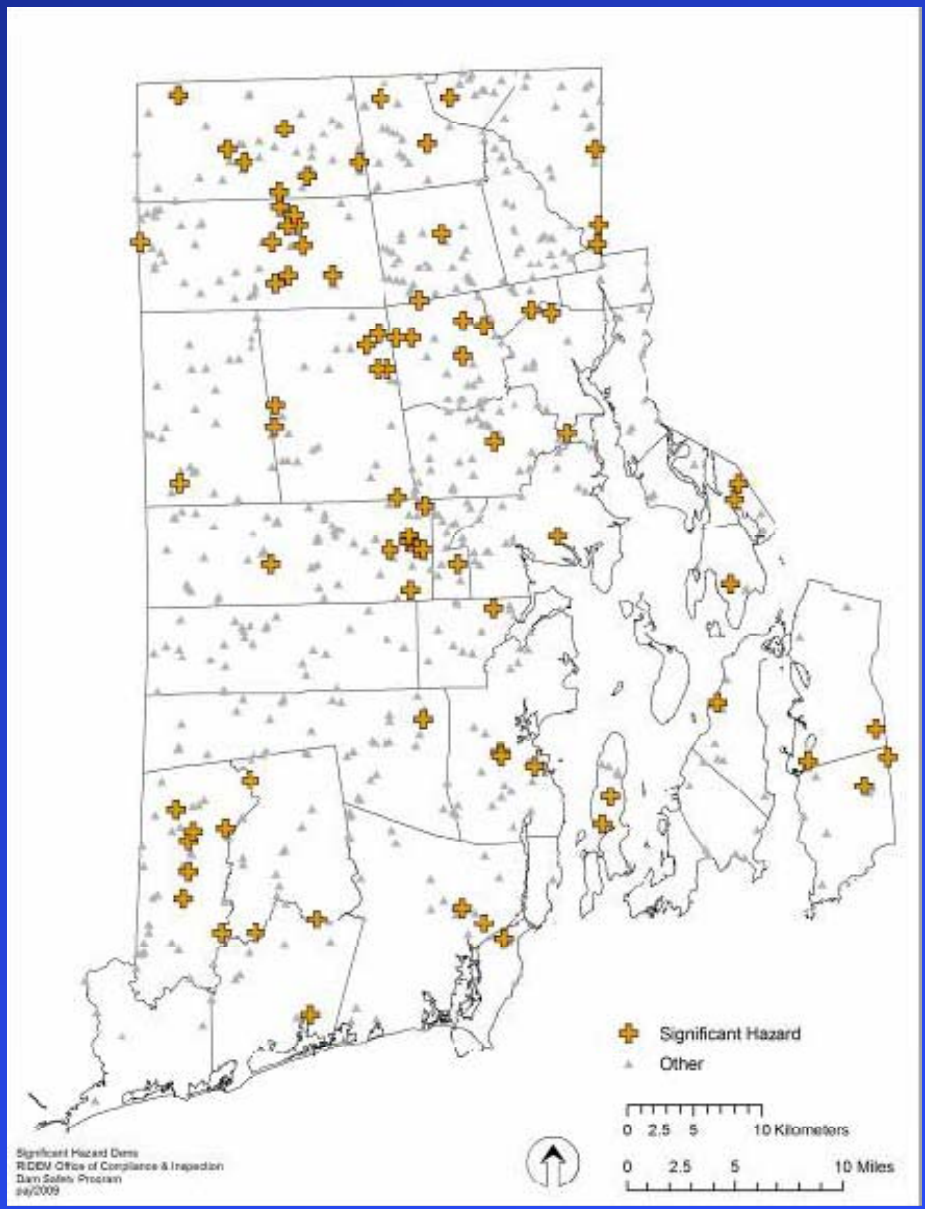
There are 671 regulated dams in Rhode Island



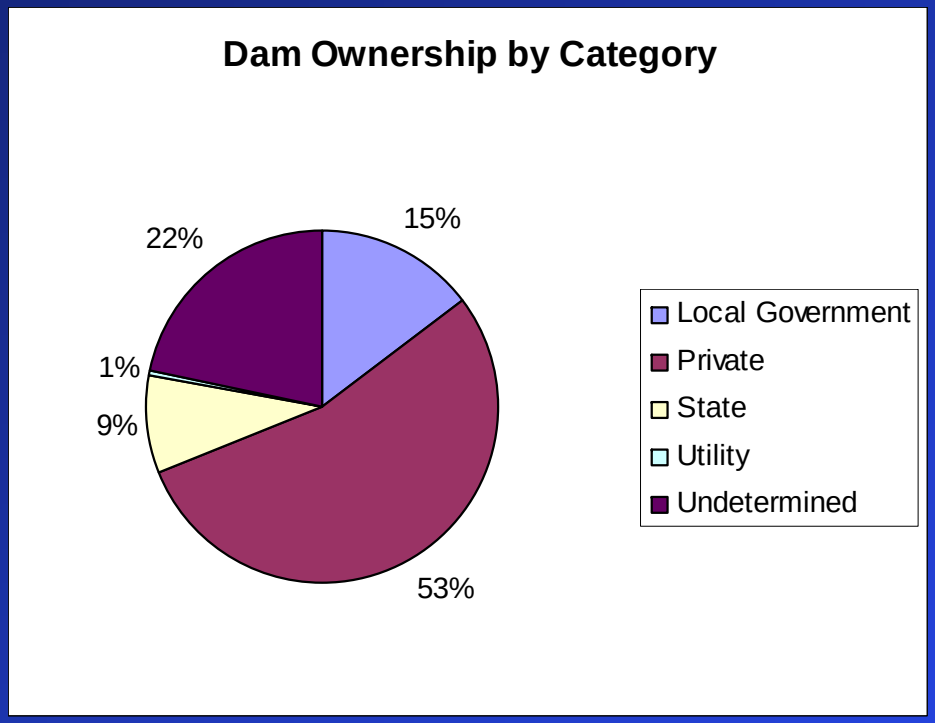
97 High Hazard

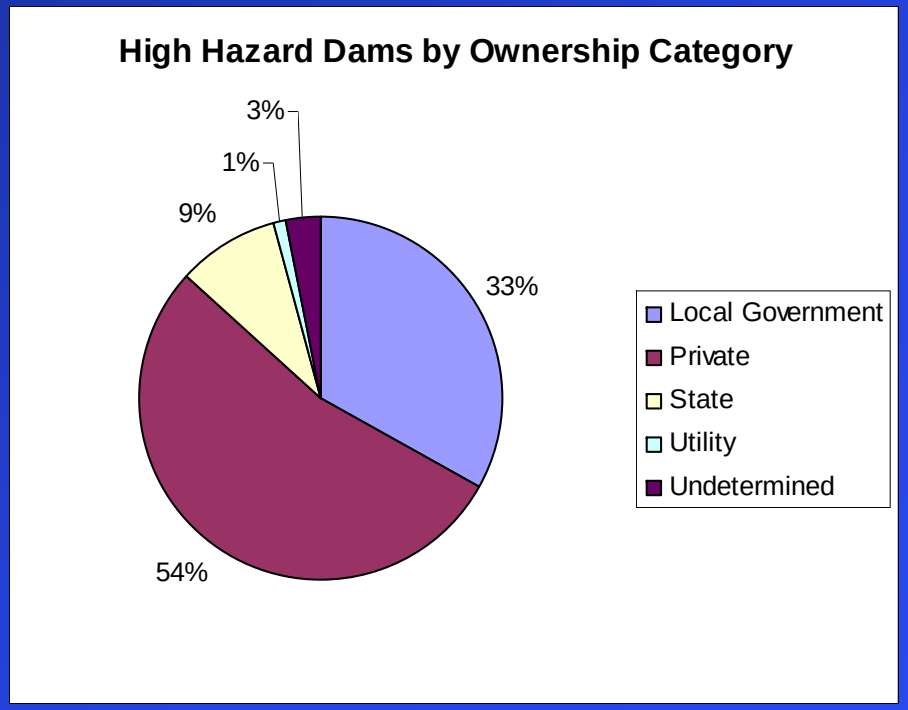


83 Significant Hazard



Most dams in RI are privately owned, but almost one quarter have no category and more have either wrong or no ownership information



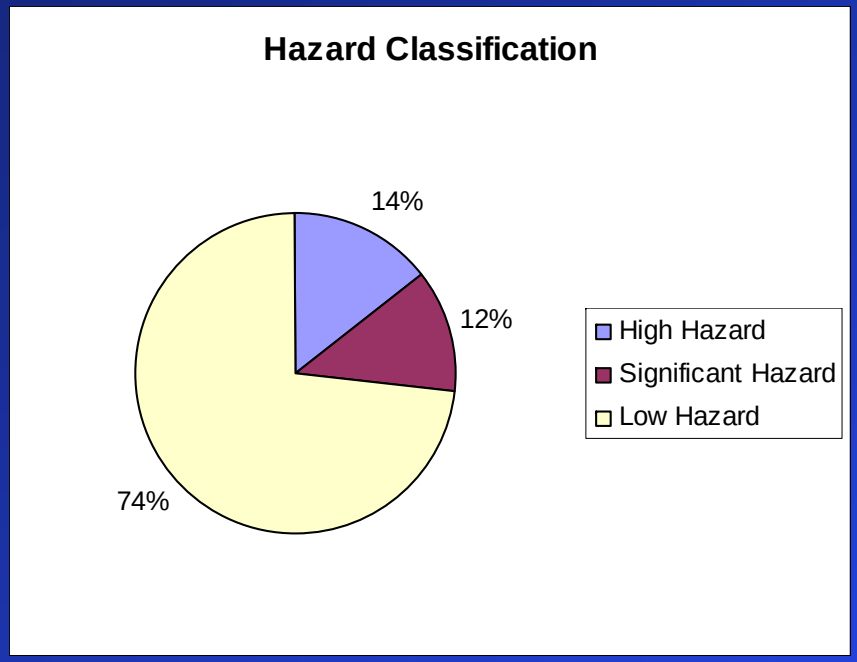


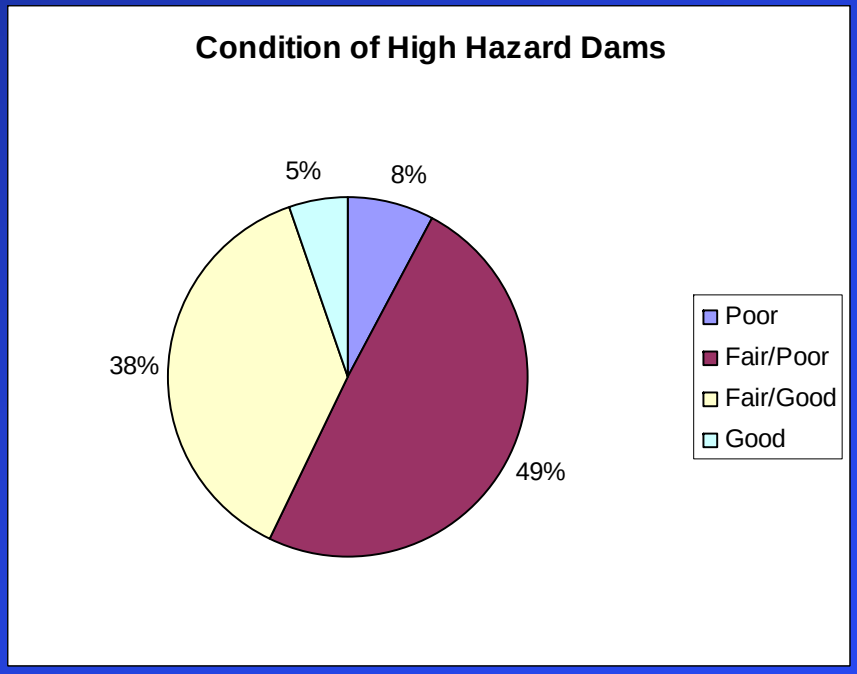
More than 150 dams have questionable ownership…

Lakes in RI

- DEM tracks 237 lakes covering 18,845 acres (91%)
- Most of RI's lakes are considered small - 70% are 50 acres or less in size.
- Among the lakes tracked by DEM, only 25% are considered natural lakes or ponds and of these only five are larger than 100 acres
- 43 lakes are drinking water reservoirs
- About 75 % of the state population relies in whole or part on freshwater reservoirs for its drinking water supply.

97 dams are listed as High Hazard, 43 of which are in poor/fair condition





Dam Safety

- Dams can be a liability
- Owners need to understand responsibilities
- Infrastructure that needs maintenance

CNN.com

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Officials still fear dam collapse

Break in Massachusetts could leave town under 8 feet of water

TAUNTON, Massachusetts (CNN) -- Water pouring through a 173-year-old wooden dam protecting Taunton has placed increasing strain on the structure, and officials said Tuesday they fear it could collapse.

"If the dam were to break ... we will see rising floodwaters in downtown Taunton," Mayor Robert Nunes told reporters. "We are monitoring the situation minute-by-minute."

Expensive

- Maintenance costs
- Inspection costs
- Repair costs
- Repeated repairs

Forge Pond Dam, Freetown MA

- High rains the week of Feb. 22nd 2010 caused dam to breach endangering downstream homes, dam and bridges

Photo: Boston Globe

- A dozen homes evacuated
- Traffic rerouted at downstream bridges

Forge Pond Dam, Freetown MA

March 31, 2010 – Dam continues to fail, DCR has emergency meeting

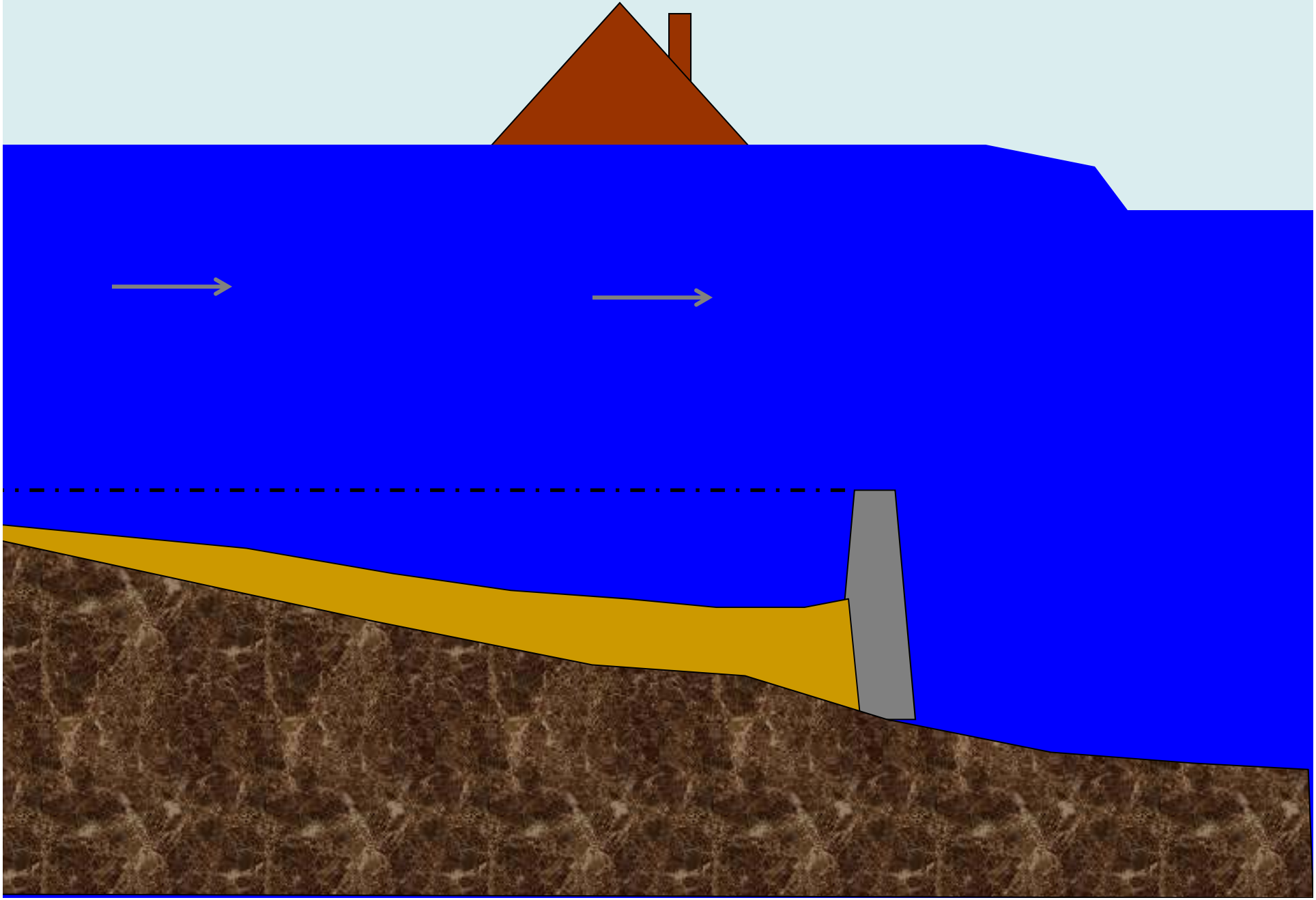
April, 2010 – DCR removes part of dam

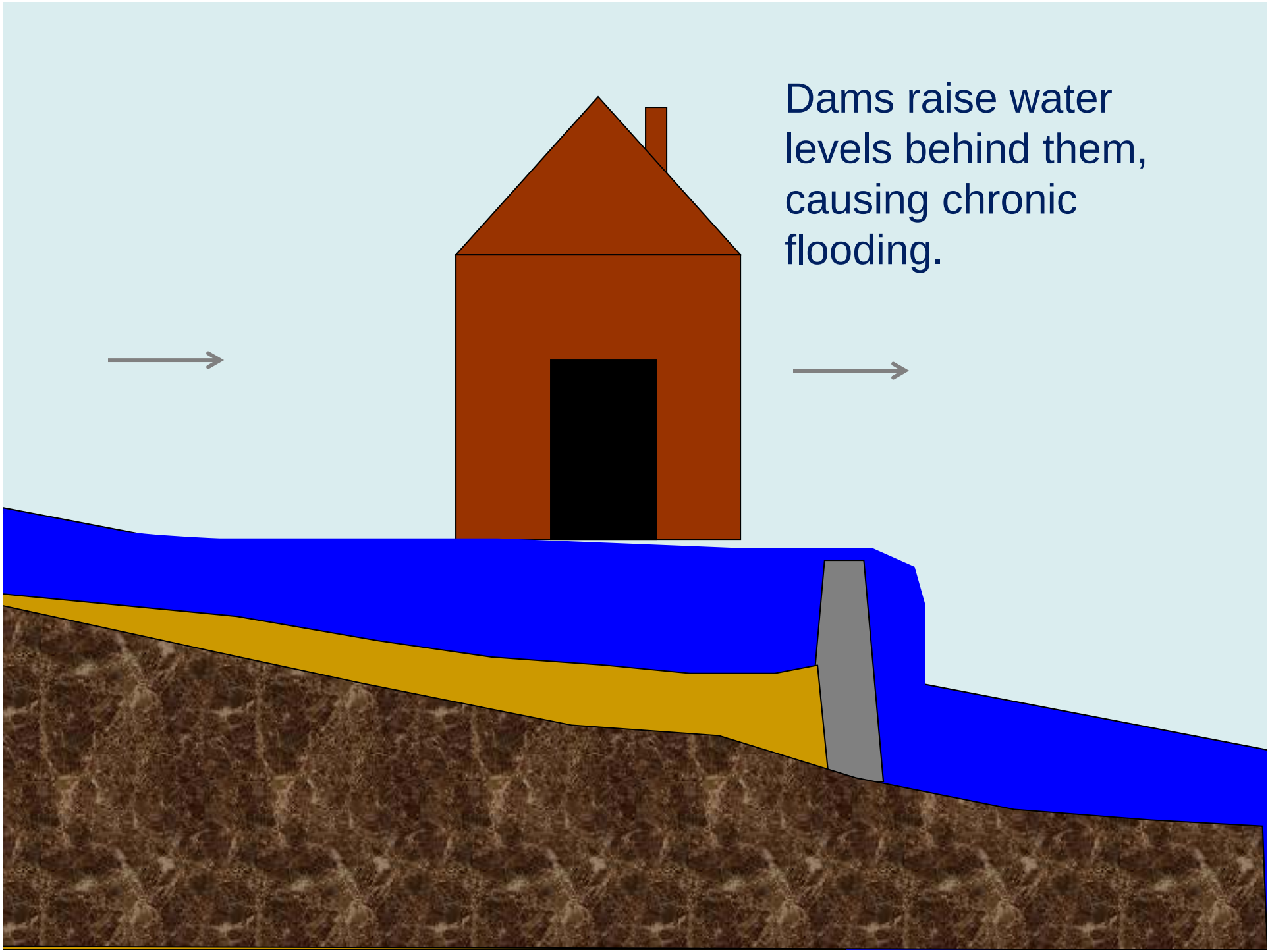
Does your dam provide flood control? Probably not

No Flood Storage Potential: has full impoundment and constant flow over spillway

Flood Storage Potential: Has storage volume and flow through a controlled outlet

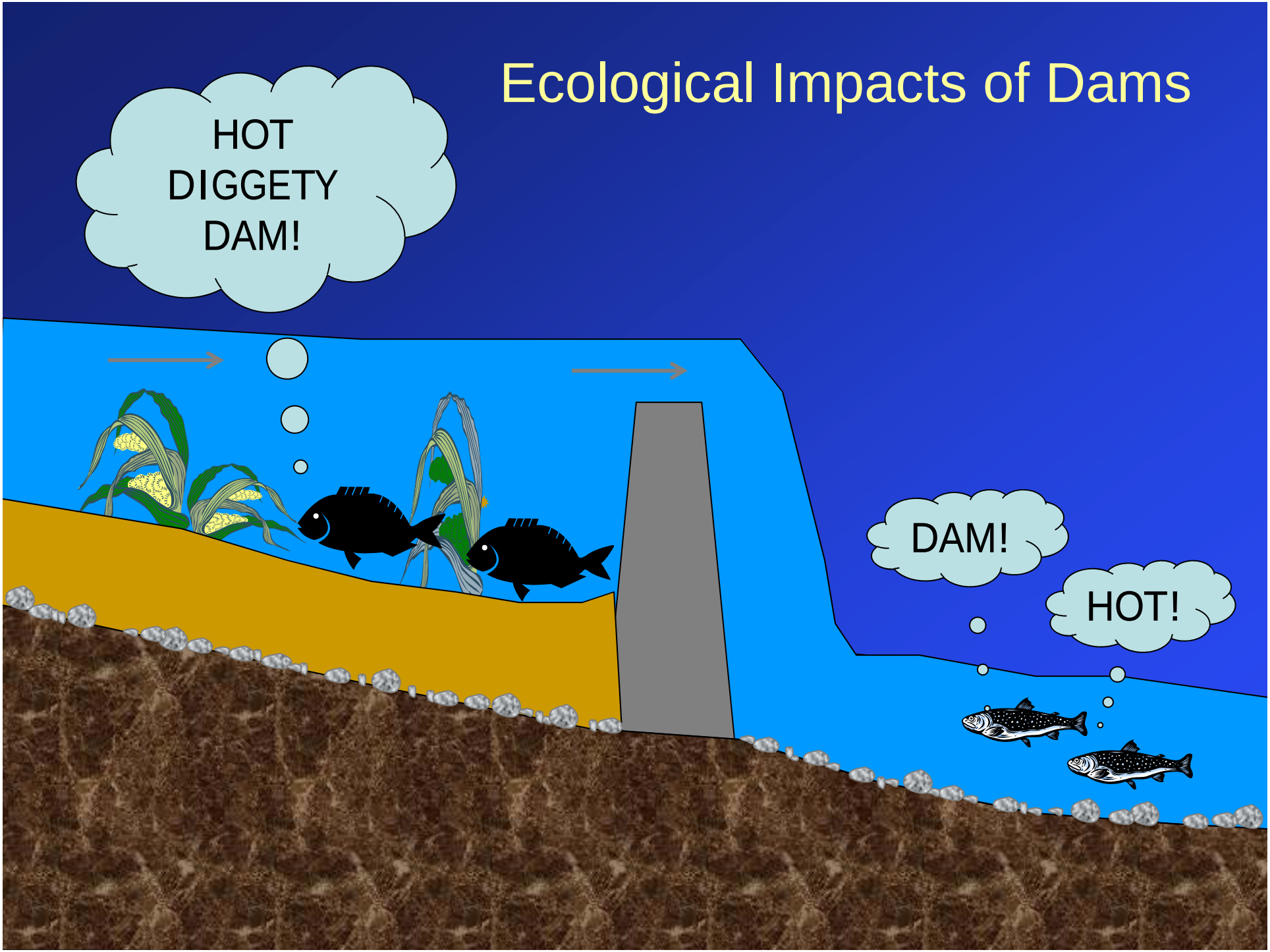
Dams in Rhode Island do not control floods.

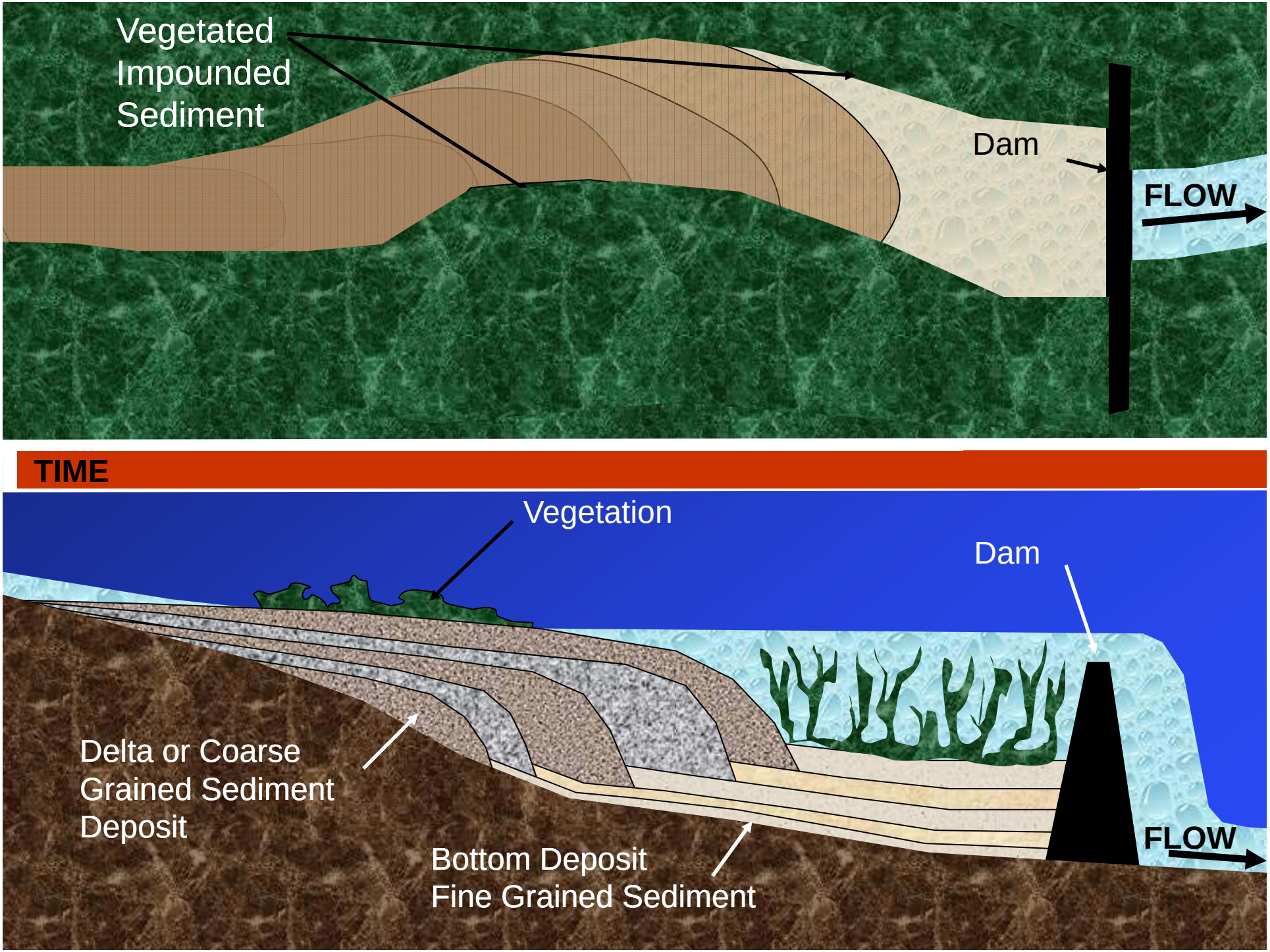


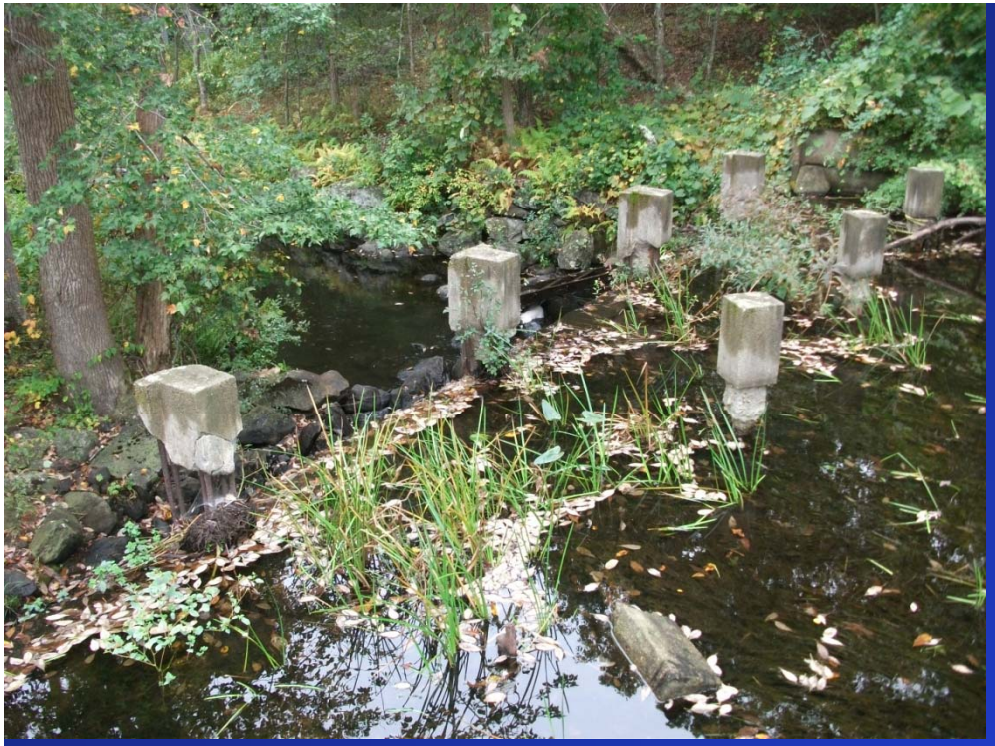

Dams raise water levels behind them, causing chronic flooding.

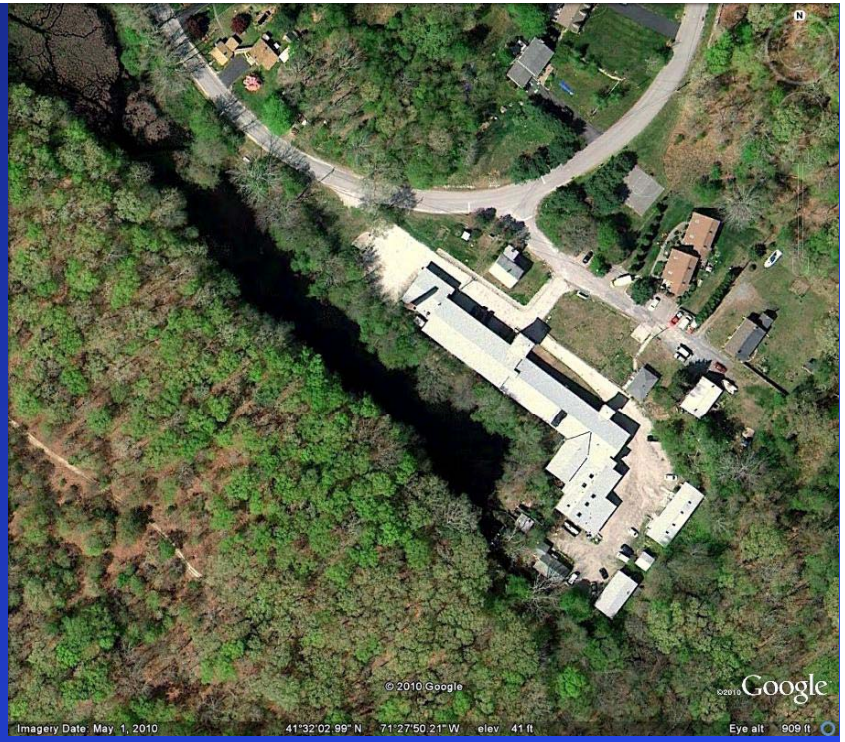
Flood control dam, Brimfield Lake, Massachusetts

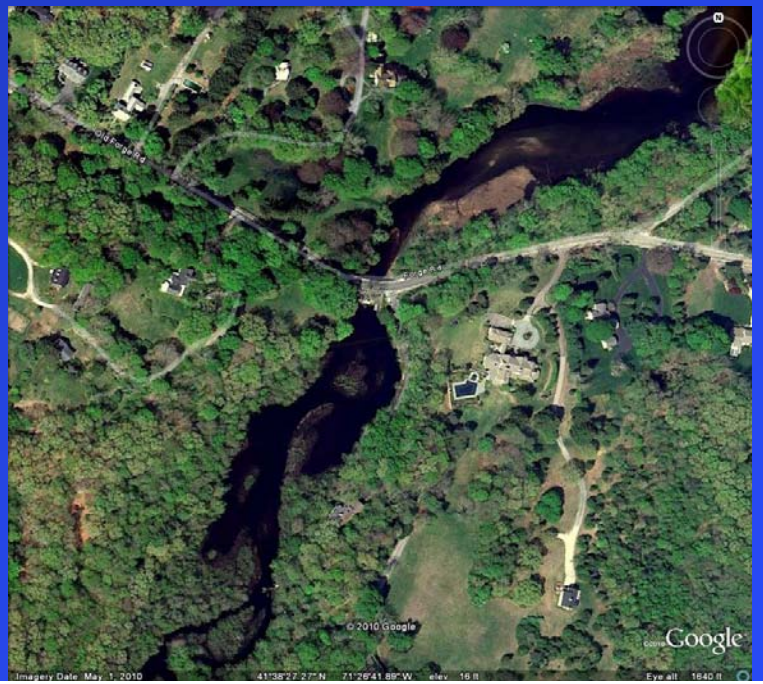
Massachusetts has 43 flood control dams.


Ecological Impacts of Dams
HOT DIGGETY DAM!
DAM!
HOT!


Vegetated
Impounded
Sediment
Dam
FLOW
TIME
Vegetation
Dam
Delta or Coarse
Grained Sediment
Deposit
Bottom Deposit
Fine Grained Sediment
FLOW




© 2010 Google
©2010 Google
Imagery Date: May 1, 2010 41°32'02.99" N 71°27'50.21" W elev 41 ft Eye alt 909 ft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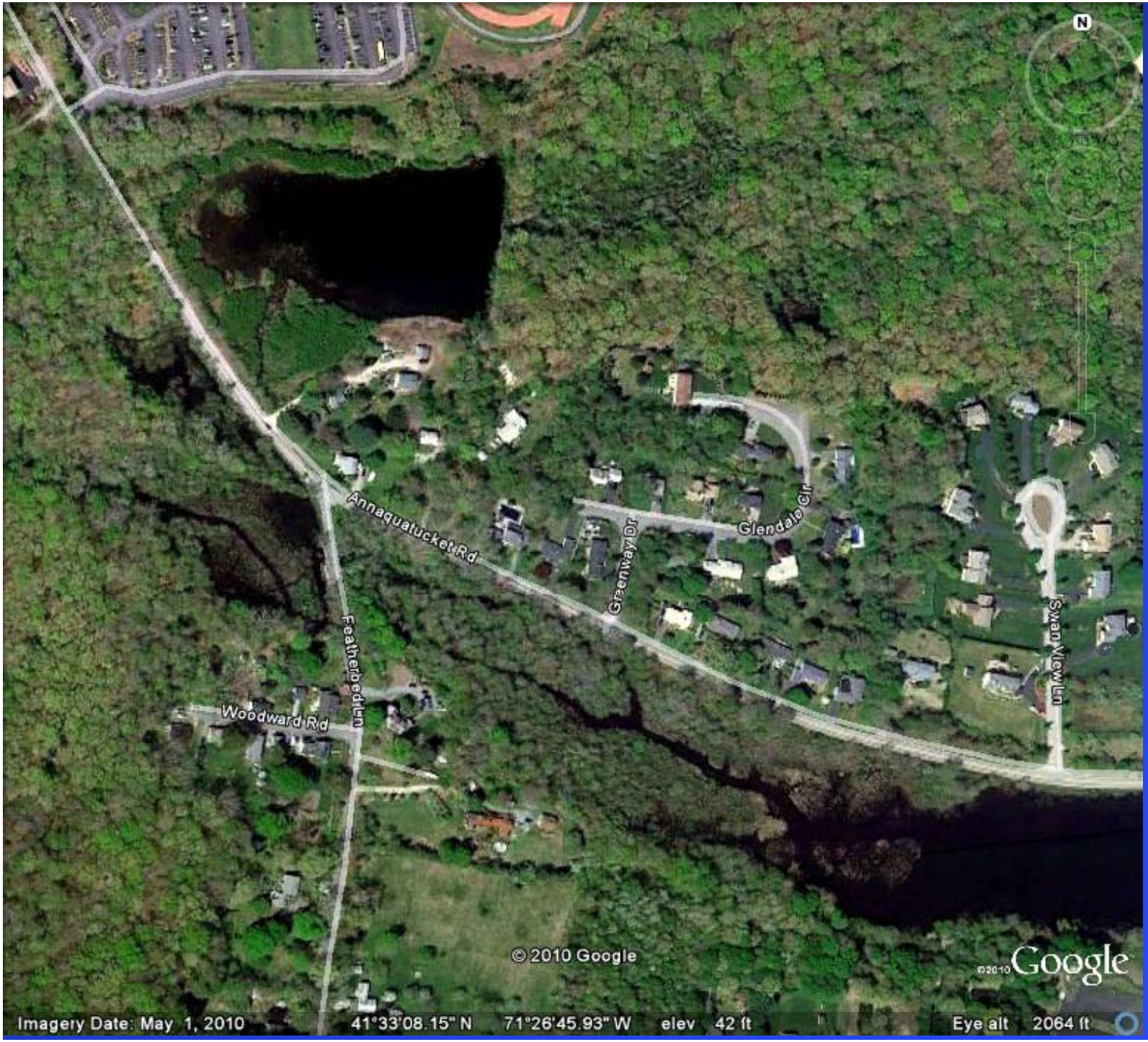
Imagery Date: May 1, 2010 41°38'27.27" N 71°26'41.89" W elev 16 ft Eye alt 1640 ft


N
Annaquatucket Rd
Greenway Dr
Glendale Cir
Swan View Ln
Featherbed Ln
Woodward Rd
© 2010 Google
©2010 Google
Imagery Date: May 1, 2010
41°33'08.15" N
71°26'45.93" W
elev 42 ft
Eye alt 2064 ft

Fish and Wildlife Need to Move

Need access to different habitats for:

- Lifetime needs
  - spawning habitat
  - nursery habitat
  - adult habitat
- Seasonal needs
  - refuge from heat or cold
  - different food sources

Having the ability to move makes populations better able to adapt to a changing climate

Dam Effects on Fish Populations

- Atlantic salmon – extirpated from most of east coast U.S. by early 1800s in large part due to dams
- Other anadromous fish like herring, shad, sturgeon, and smelt have all suffered population declines to levels less than 5% of historic levels and many rivers lost these species completely
- American eel - recently reviewed by the federal government for threatened/endangered status because of dramatic population decline
- Only 5% of intact brook trout populations remain

Connectivity and Climate Change

Dams, roads and development limit the ability for species to move.

Nearly half of the 496 animal species federally listed as threatened or endangered are freshwater species.

There are new restrictions on mobility of species, many living in isolated habitat “islands”

Species that are highly mobile will be less vulnerable to extinction

Economic Benefits of Dam Removal

- Removes safety hazard from potential failure
- Eliminates long-term repair and maintenance costs
- Removes “attractive nuisance” liability
- Brings new recreational opportunities

Removal is a one-time cost

Public Benefits of Dam Removal

- Improved public safety
- New fishing opportunities
- Paddling and boating
- Walking trails along river

Ecological Benefits of Dam Removal

- River habitat restored
- Improved water quality
- Connectivity restored
- Natural flow regime

Photo by
Tim Watts

Should we remove a dam?

Things to Consider:

- Current use of dam
- Condition of dam
- Community context, values
- Historical context
- Ownership: costs and liabilities

Focus on Perceived Benefits and Barriers within the Community

	Action: Remove Dam	Action: Fix Dam	Action: Do Nothing
Perceived benefits	• Cheaper than fixing it • Removes danger and liability • Good for habitat • May create impetus to remove other dams on the river and restore the fishery	• Keep the pond • Things stay the same • Maintain historical context • Aesthetics	• No effort • Cheap
Perceived barriers	• Fear of change • Loss of the pond • Change in wetland type • Difficulty due to permitting, costs, management • Mixed message from “experts”	• Expense • Who would own the liability • Long term maintenance • Town would need to assume responsibility	• May lose the pond •May face damage to downstream structures • Danger to life and property • Will be left with a failing structure that has no ownership

History of Decision Points

"…mere Shad, armed only with innocence and a just cause…I for one am with thee, and who knows what may avail a crow-bar against that Billerica dam?"

Henry David Thoreau 1839

"For generations, a painful and expensive controversy has existed in relation to [the Billerica Dam], and if [not removed now], the children and children's children of these parties will be cursed with strife and contention".

Henry French pleads with the Massachusetts Legislature, 1861

Billerica Dam
Concord River, MA

1710 – Constructed
1711 – 1st Law Suit
1722 – Dam Removed – Rebuilt –
Removed by Force - Rebuilt
1798 – Law Suit
1860 – Law Suit
2005 – Still Discussing the dam's fate.

Small Dam Removal vs. Repair Costs

- Repairing an aging dam has typically cost 3 - 5 times the cost of removal
  - Based on 31 cases
  - Including repair estimates to bring dam to modern safety standards or to provide effective fish passage

Woolen Mills Dam, Milwaukee River, WI

Projects in Rhode Island

- Pawcatuck River – Shannock and Kenyon Mills
- Pawtuxet River – Pawtuxet Falls
- Woonasquatucket River