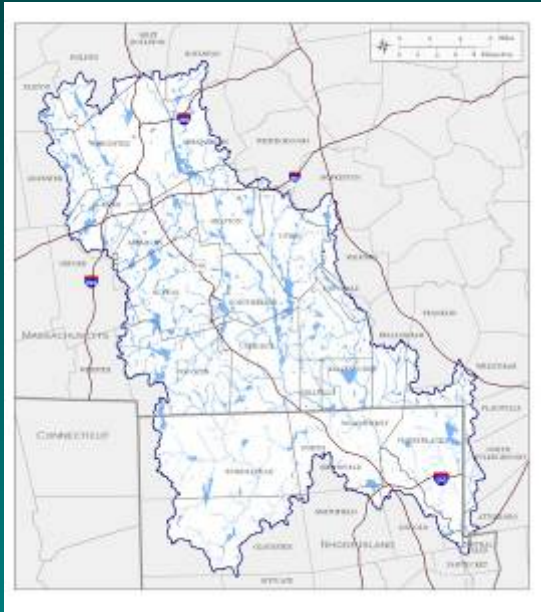


Dams, Renewable Energy, and Aquatic Habitats in Rhode Island

Kate Giorgi & Andrew Lipsky

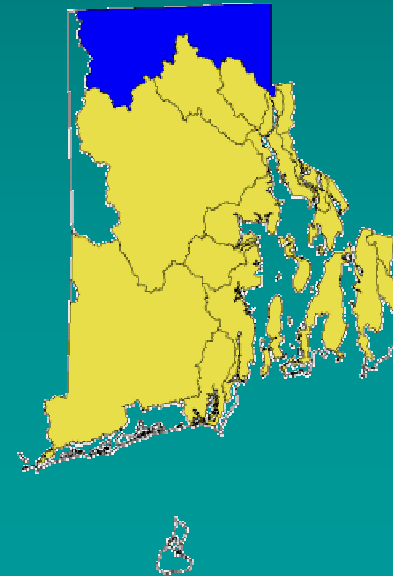
USDA Natural Resources Conservation Service





The Blackstone River

- Largest tributary of Narragansett Bay and a major component of the bay ecosystem
- Drains a watershed of 475 sq miles, of which roughly 30% is in RI



Damming the Blackstone

- Settlers first started damming the river in the early 1700's and by the mid-1800's with the Industrial Revolution in full force, there was a dam for every mile along both the main stem and its tributaries.
- These dams were critical for providing the hydropower needed to run the mills which fueled the economy of the area at the time & ultimately changed the world.

Today there are many hydropower dams in RI and throughout the United States located on many of our most important rivers and streams. These dams can create pollution-free energy, but ...





Buckie's Run - The Falls 1910



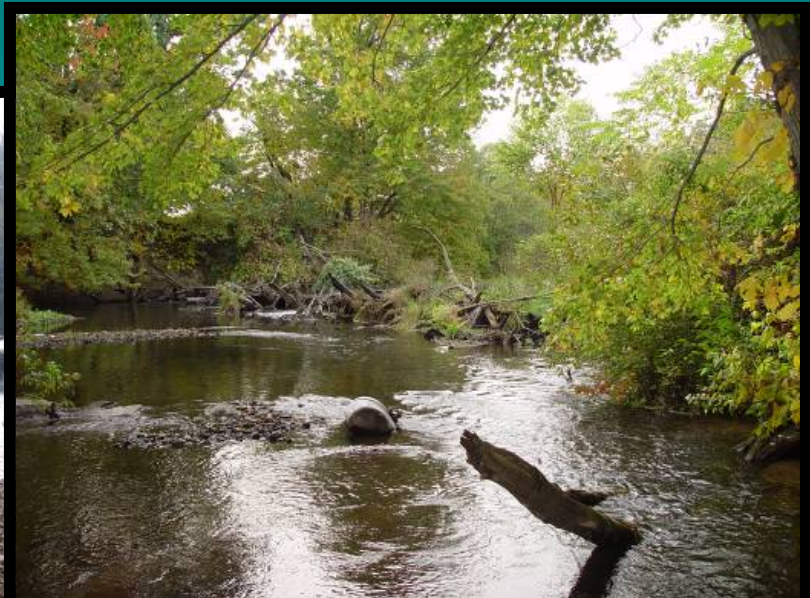
dams can also produce significant adverse impacts on fish and wildlife and other resources.



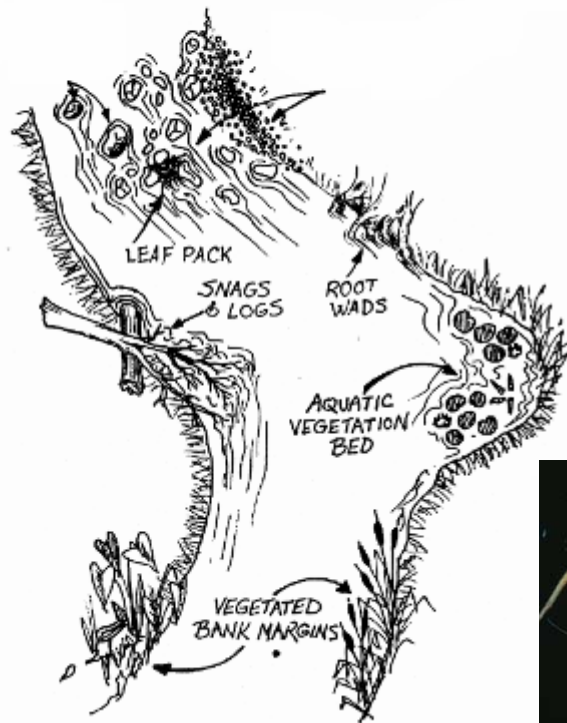
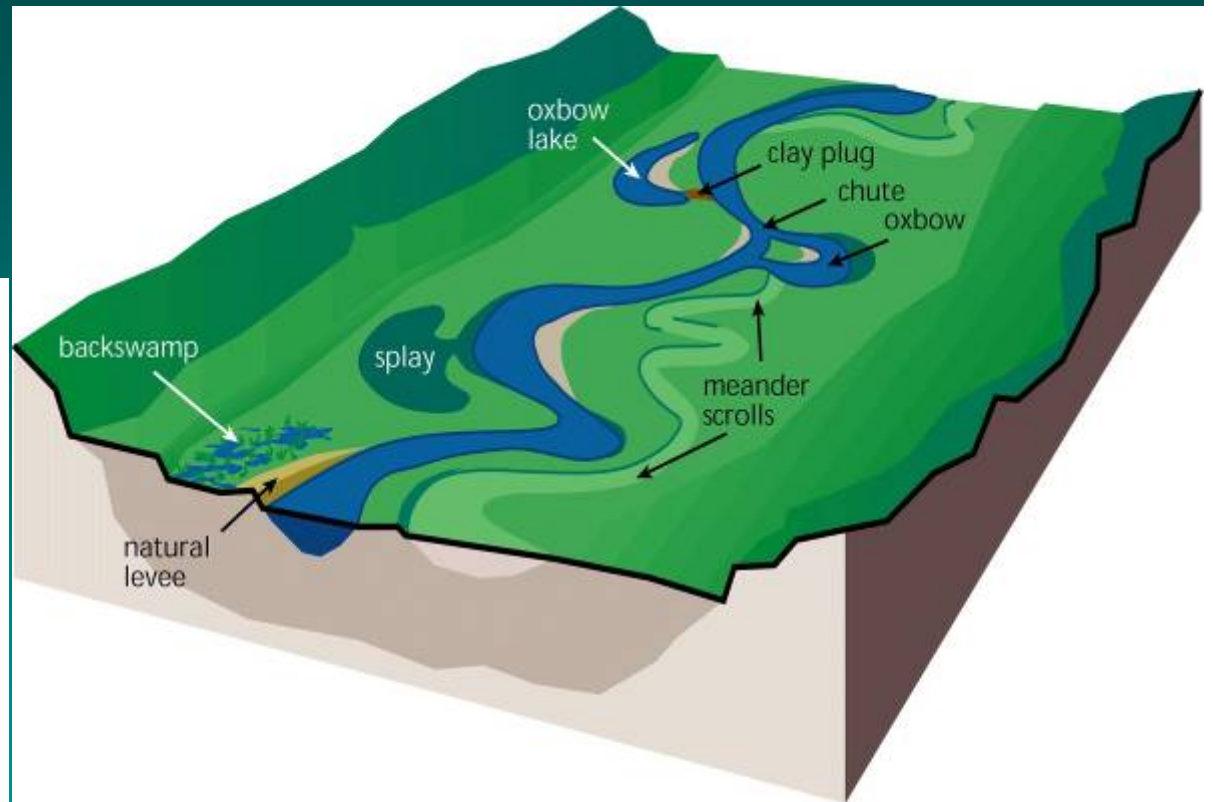
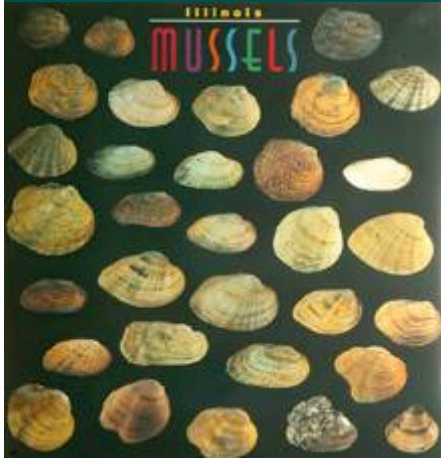


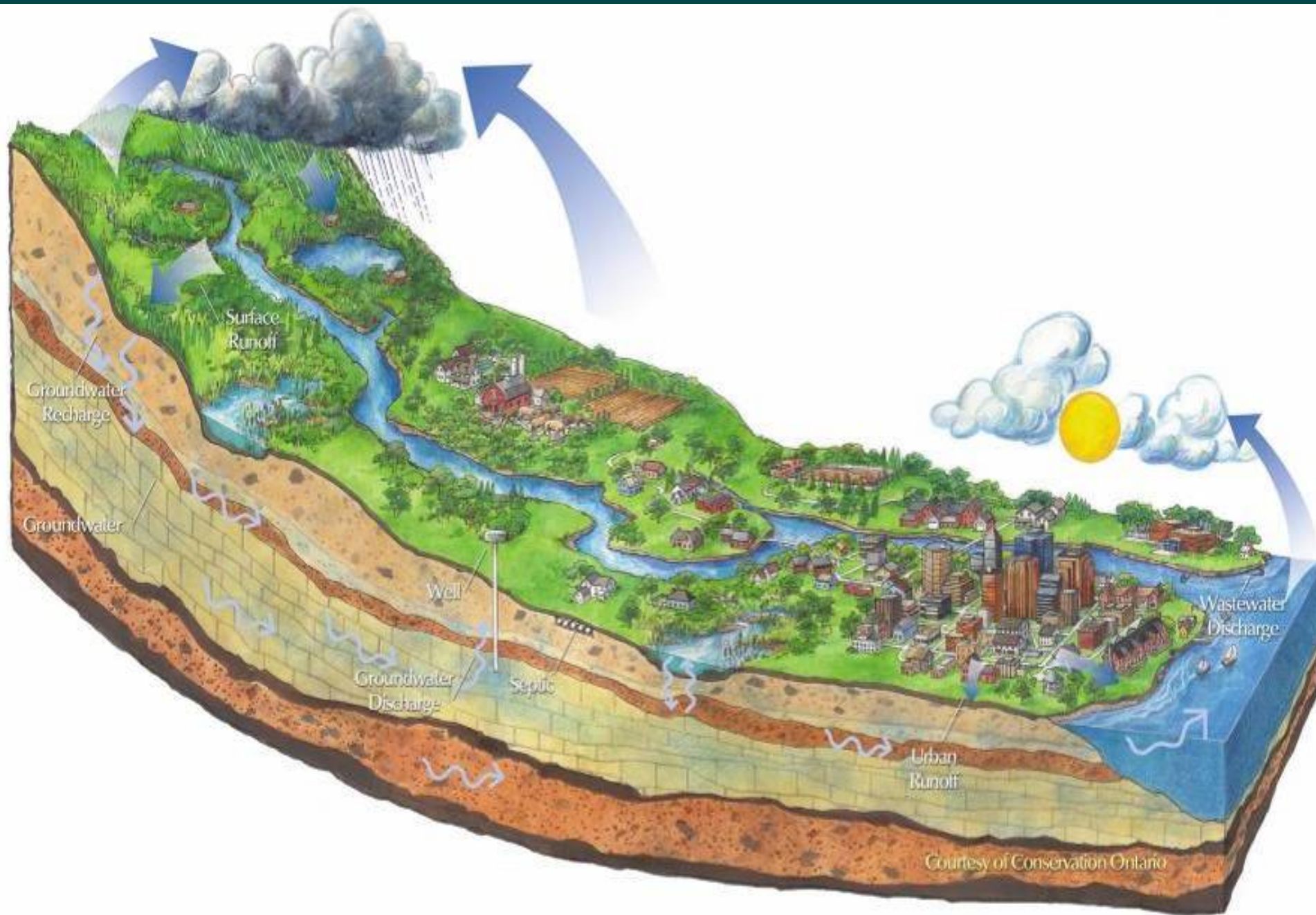
Historically, at least 45 runs existed in the Narragansett Bay watershed.

The Atlantic salmon fishery was lost by 1870. The river herring harvest was significantly depleted by 1930.



Hydrologically Un-altered Rivers





Watershed Materials

Sediment, Wood, and Water

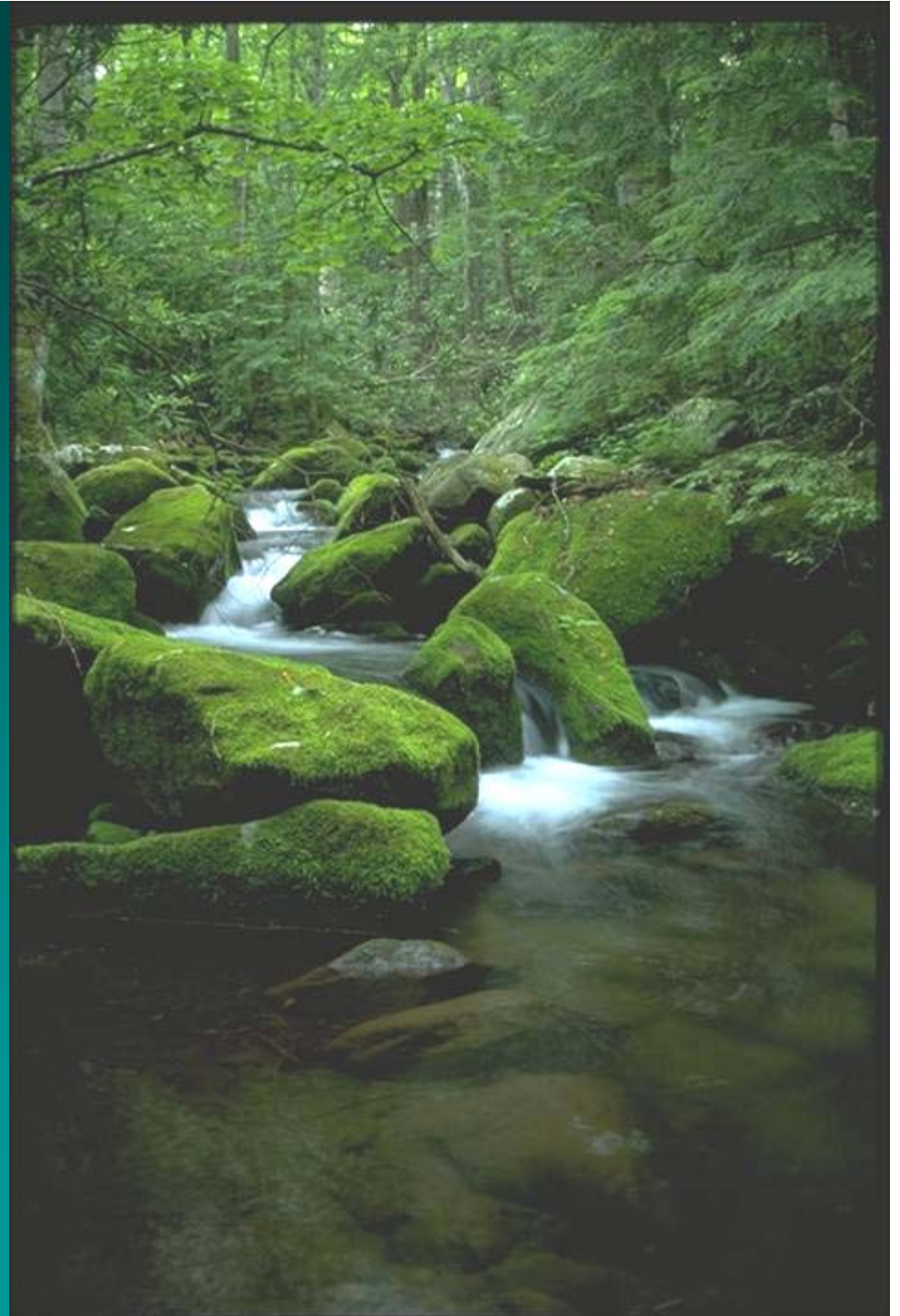


Aquatic Habitats – formed by the free movement of water and materials, during high flows



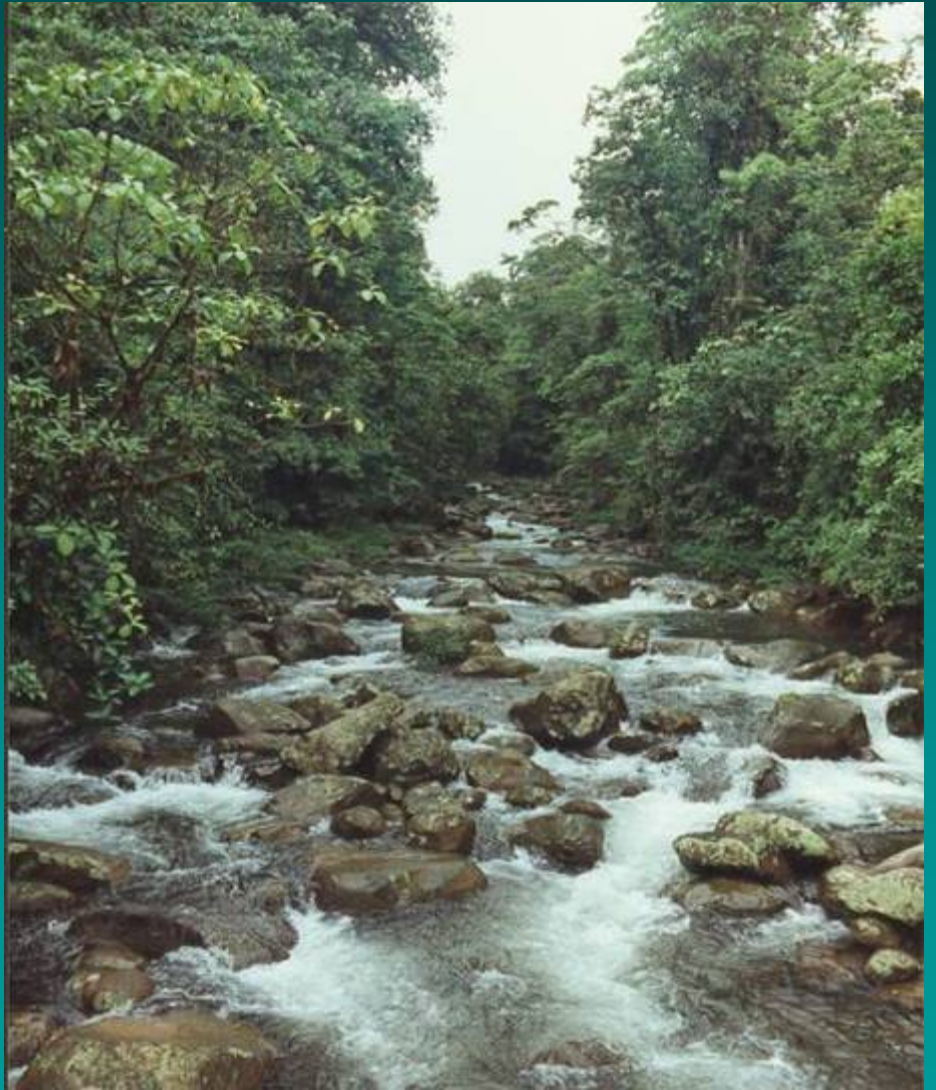
Pools

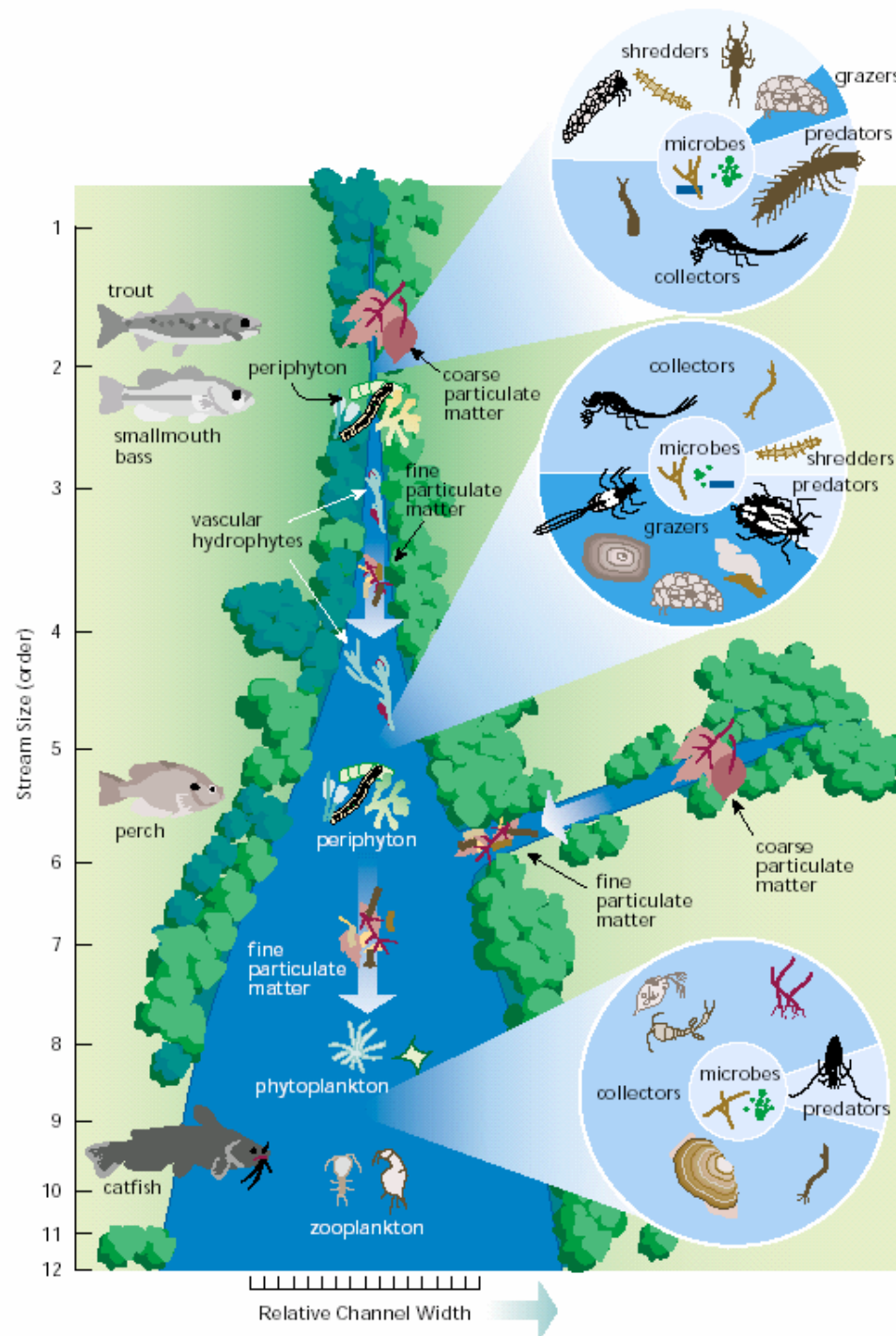
- Refuge for fish during low flow, drought periods
- Resting and feeding area
- Refuge from predators



Riffles

- Higher Dissolved Oxygen
- Diverse substrate size and turbulence offers cover
- Conditions favored by macroinvertebrates and coldwater fish such as brook trout





Migratory Fish Species of Concern



Alewife *Alosa pseudoharengus*

“River
Herring”



Blueback *Alosa aestivalis*



American shad *Alosa sapidissima*



Brook trout *Salvelinus fontinalis*

Other Target Species:

Atlantic Salmon

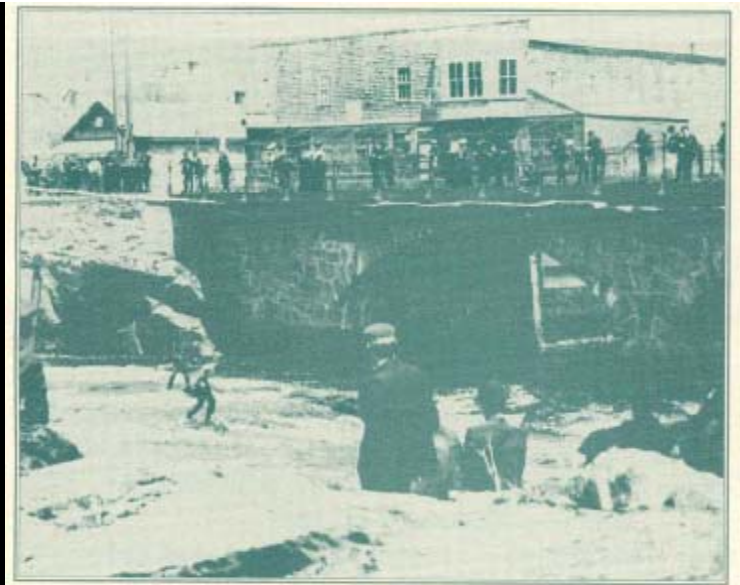
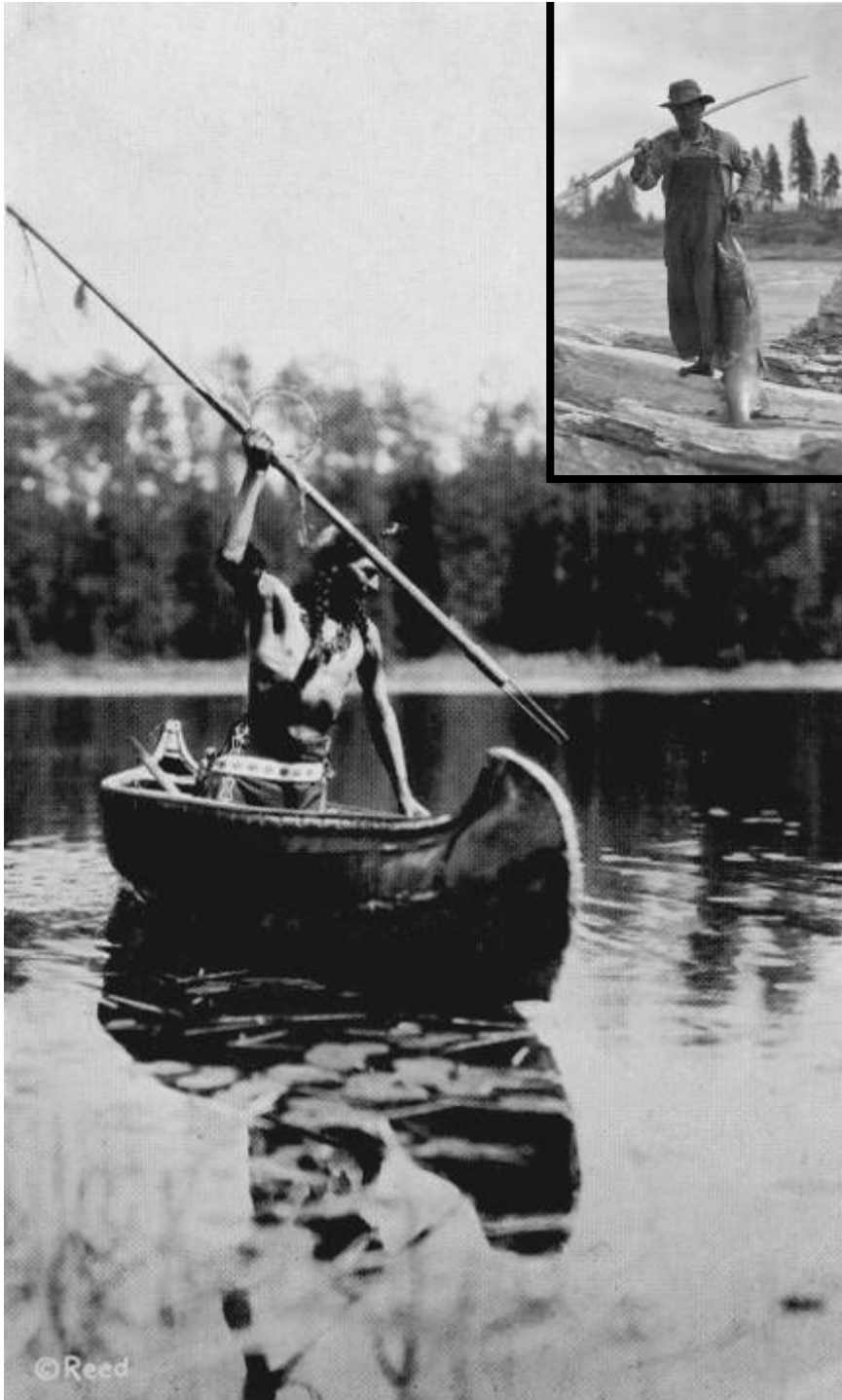
Atlantic Sturgeon
(NMFS T&E candidate)

American Eel

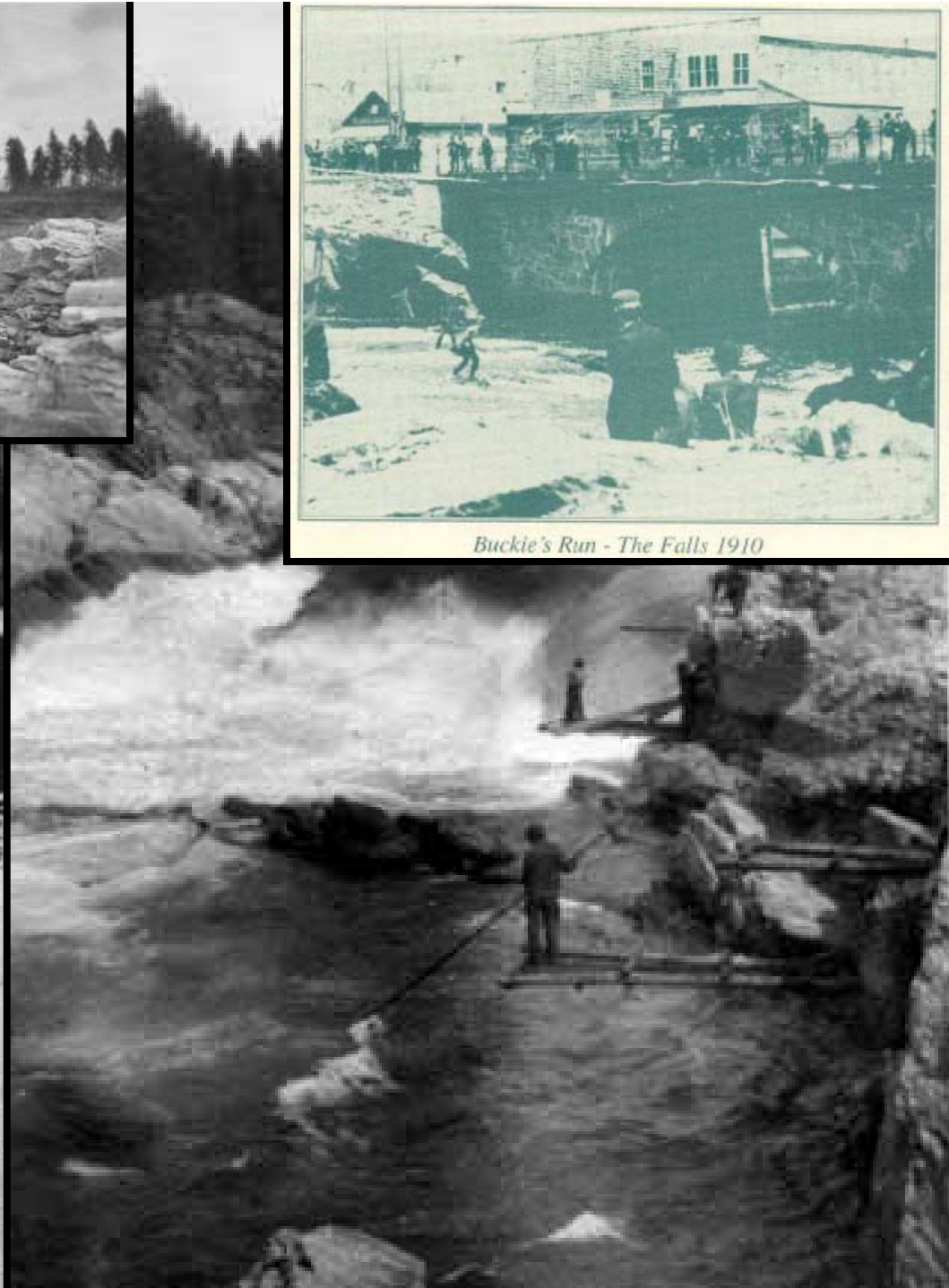
Rainbow Smelt

Salter Brook Trout

Sea run Brown Trout



Buckie's Run - The Falls 1910



What are the negative impacts dams can have on the ecosystem and why do they occur?

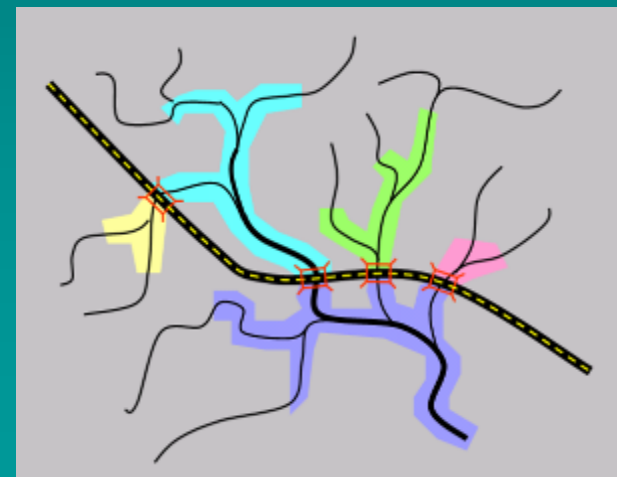
Can we still reap the benefits of hydropower without the negative ecological impacts?

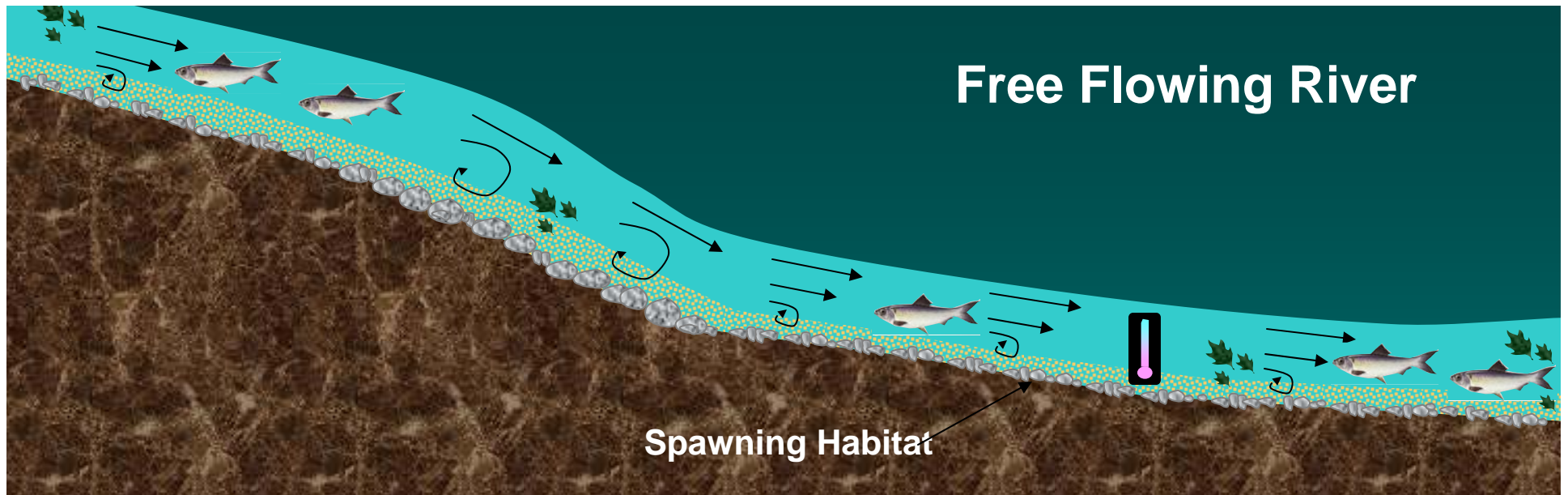
What are the negative impacts dams can have on the ecosystem and why do they occur?

Impacts of River and Stream Dams/Crossings

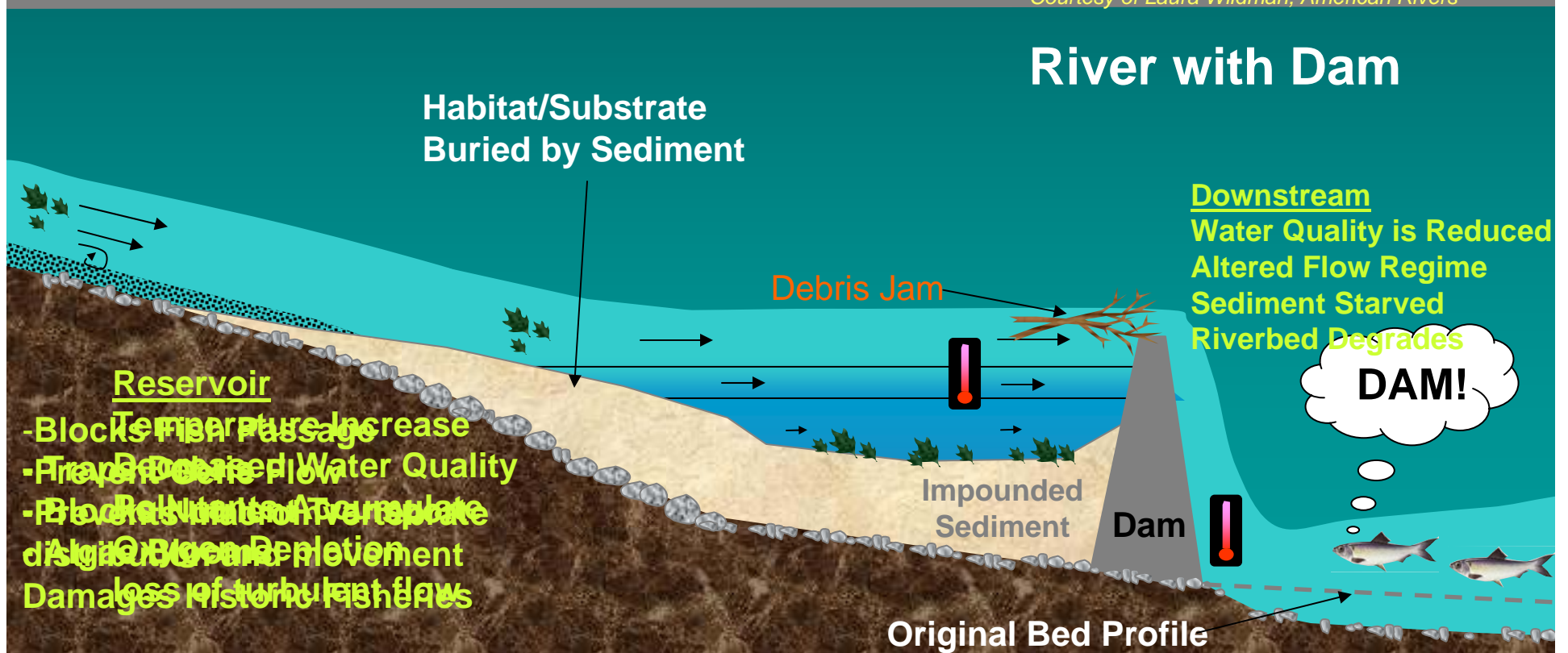


- Habitat loss and degradation
- Alteration of Ecological Processes
- Population fragmentation & isolation
- Reduced access to vital habitats
- Disruption of processes that maintain regional populations

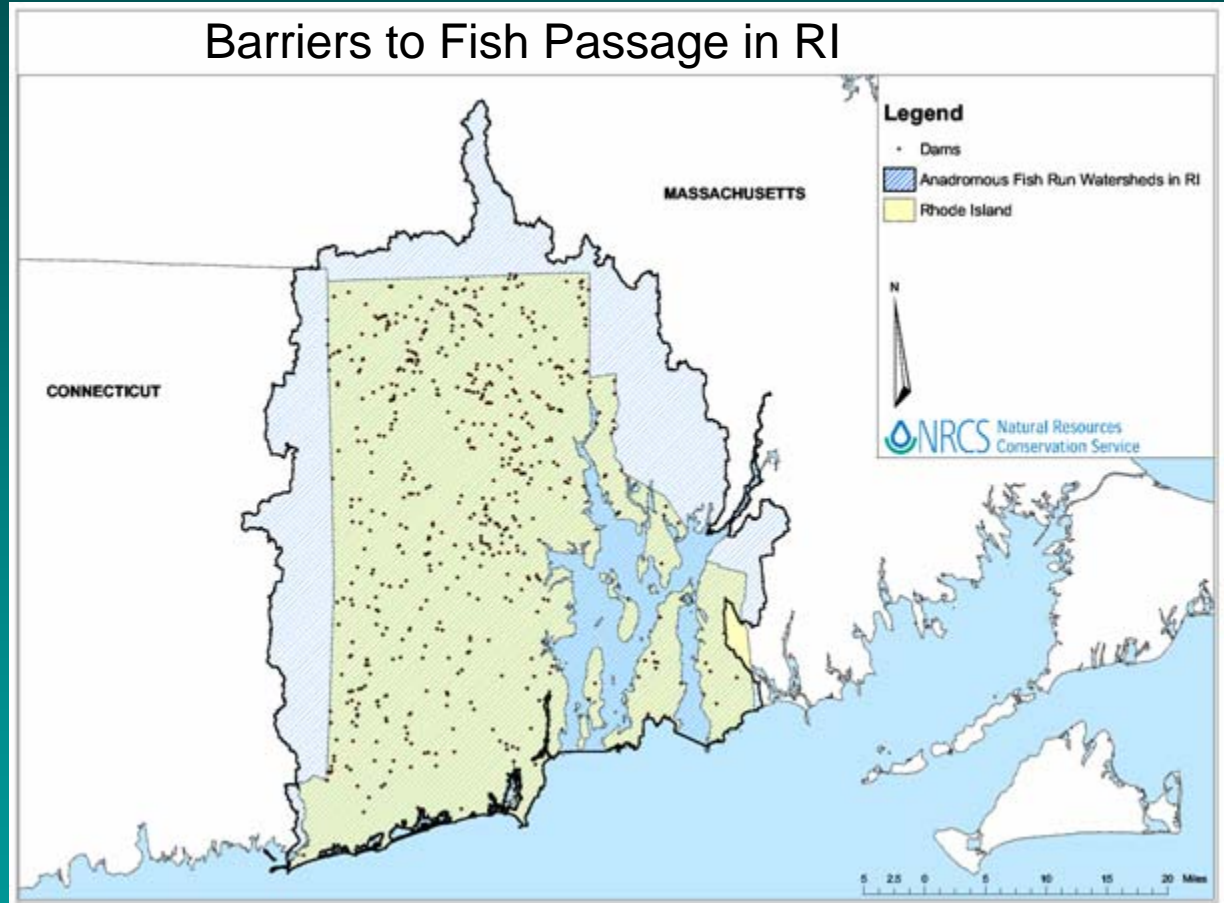
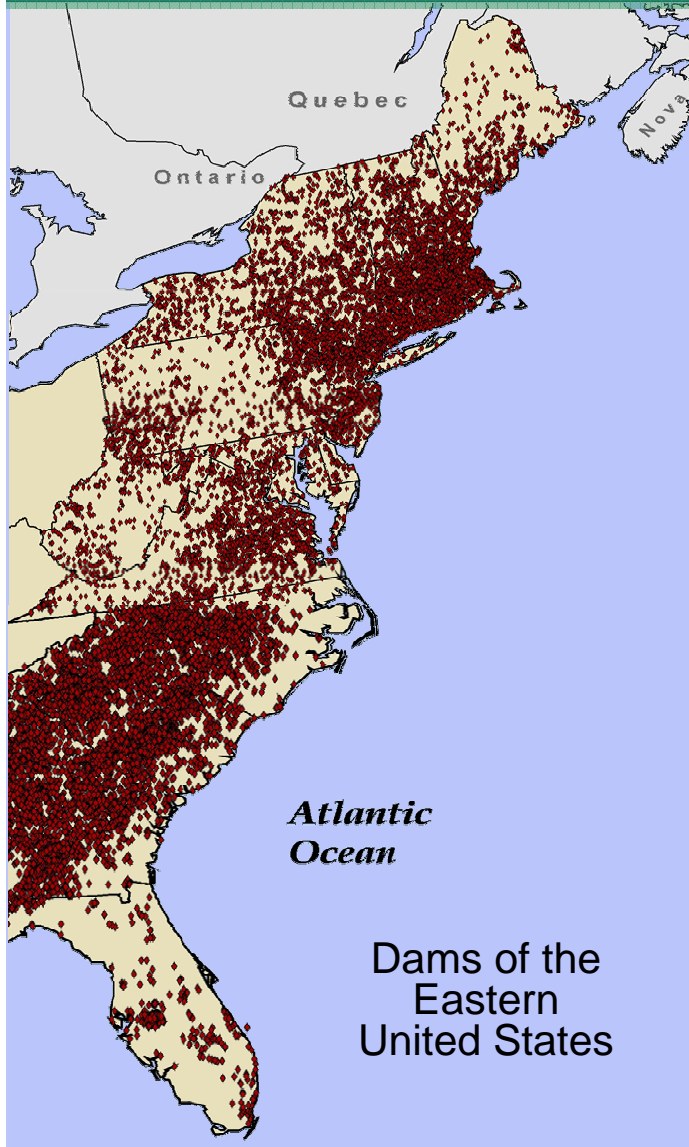




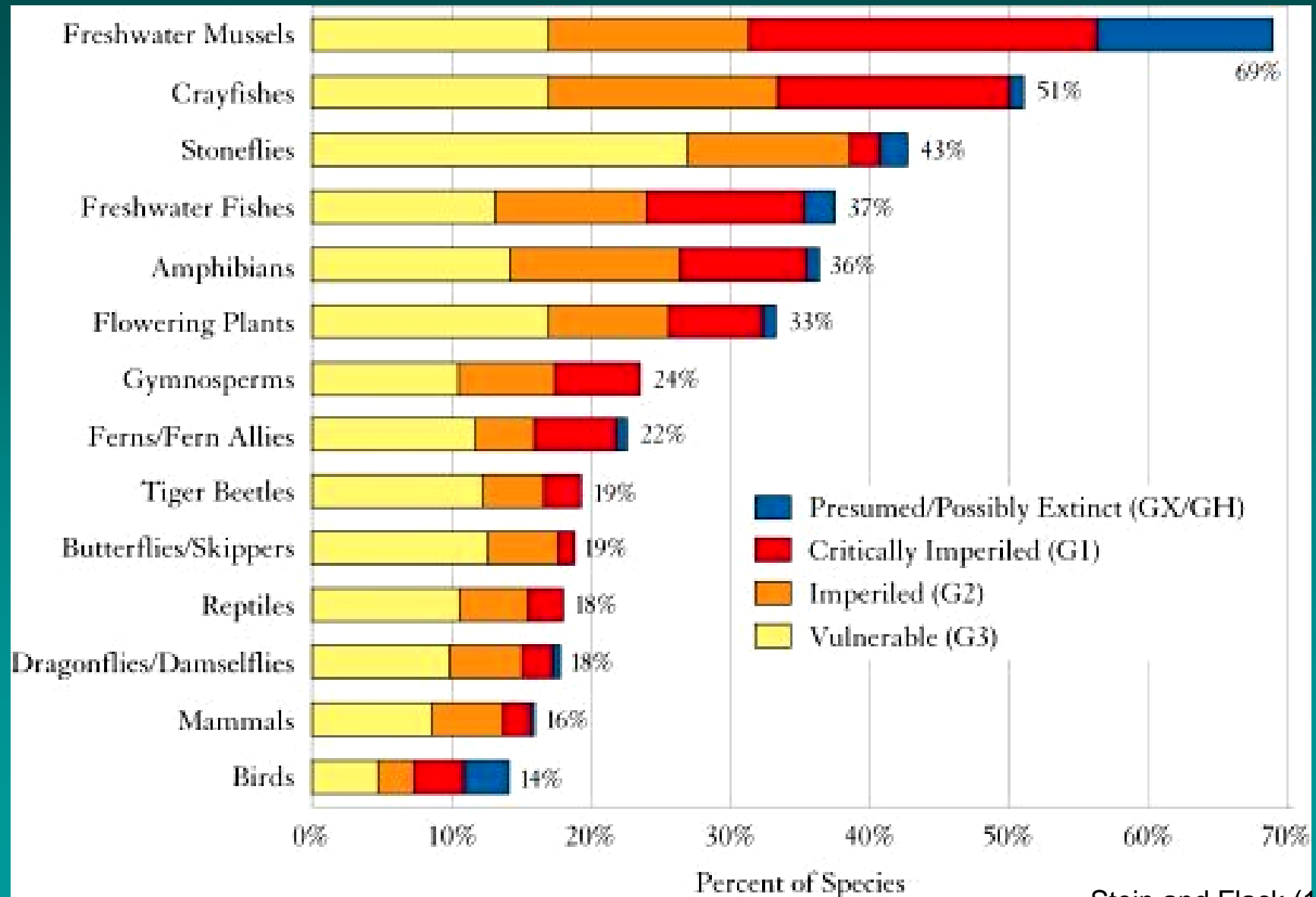
Courtesy of Laura Wildman, American Rivers



Barriers to Fish Passage-A regional and local perspective

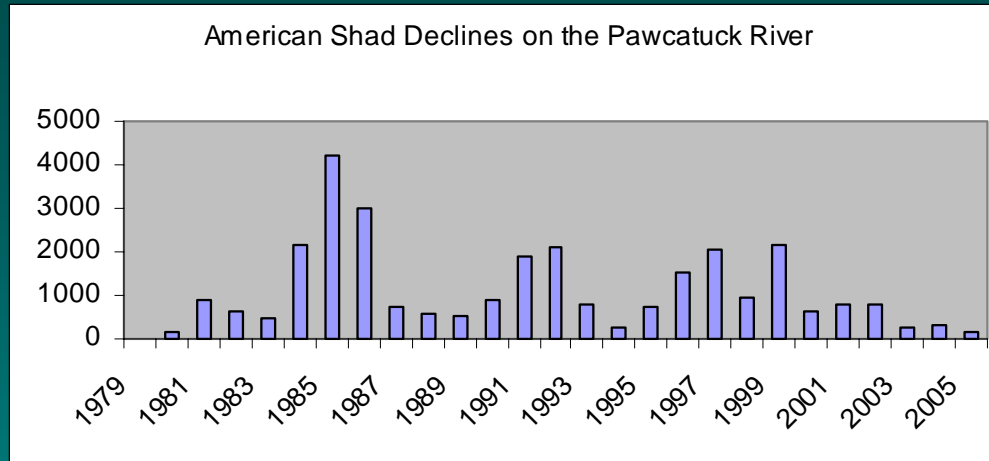


Aquatic Species Status

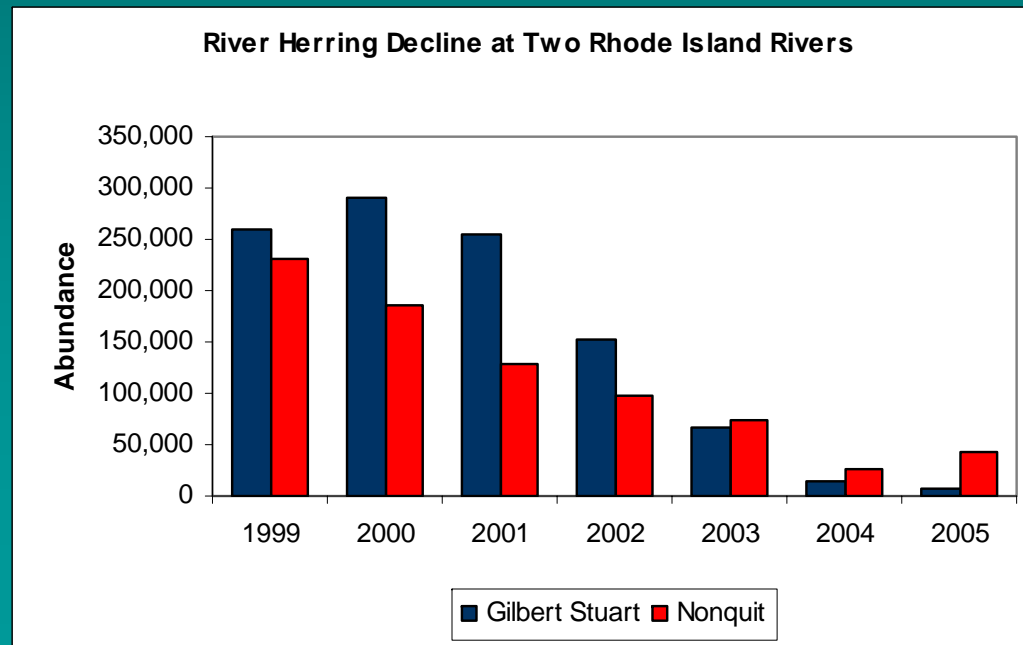


Stein and Flack (1997)

Alosids: Declining Populations



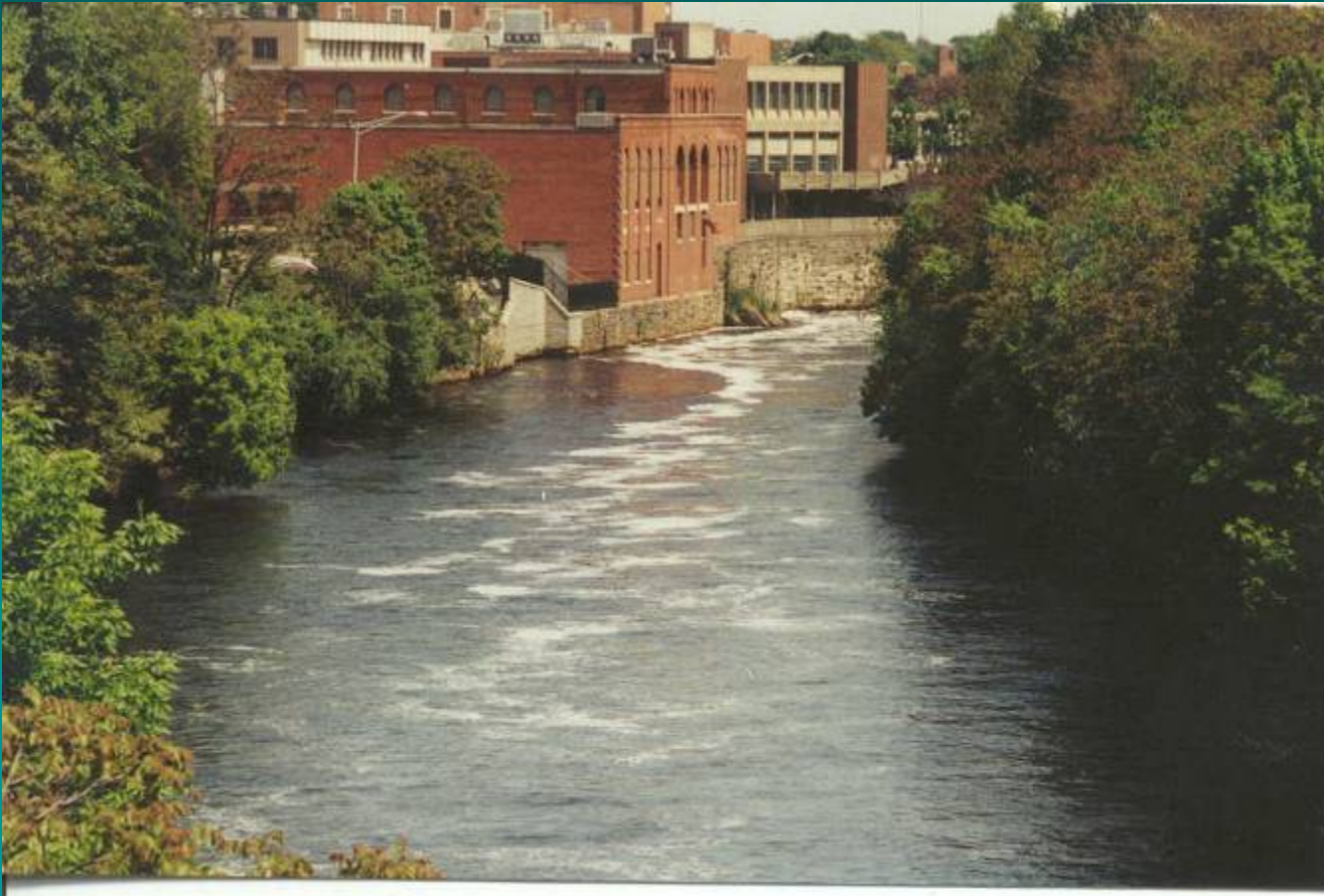
Current Commercial Shad Harvest 5% of Historic Catch



*Data provided by
RIDEM Fish &
Wildlife*

Can we still reap the benefits of hydropower
without the negative ecological impacts?

Pawtucket Project is First Hydro Project in Rhode Island to Earn Certification as Low Impact from the Low Impact Hydropower Institute



Pawtucket Project, Blackstone River

- Today the project operates two 1.9 meter full Kaplan turbines with total installed capacity of 1,300 kilowatts and average annual generation of 4,000 megawatt hours. The facility operates in run-of-river mode, with a small impoundment of approximately 1 acre in surface and 2 acre-feet in volume; the facility inundates less than 1/2 acre. Non-reservoir facilities occupy 1/2 acre

Fish Passage Alternatives

FULL/PARTIAL DAM REMOVAL

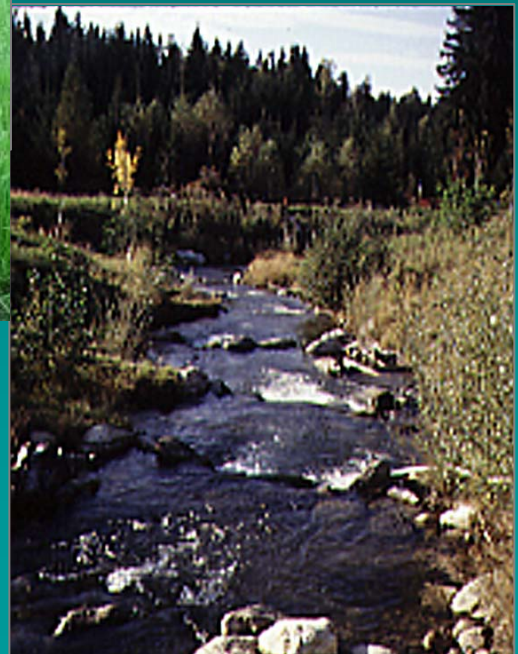


NATURE LIKE FISHWAYS

- **ROCK RAMP**
- **BYPASS**

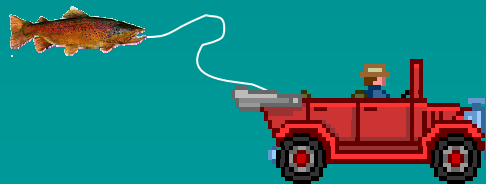


FISH LADDER



**COMBINATION
OF METHODS**

TRUCK AND HAUL



Options

Bypass Channels

Location:: Muhlenhagen

River: Goldbach

Type: step-pool bypass channel

Slope: 1:20

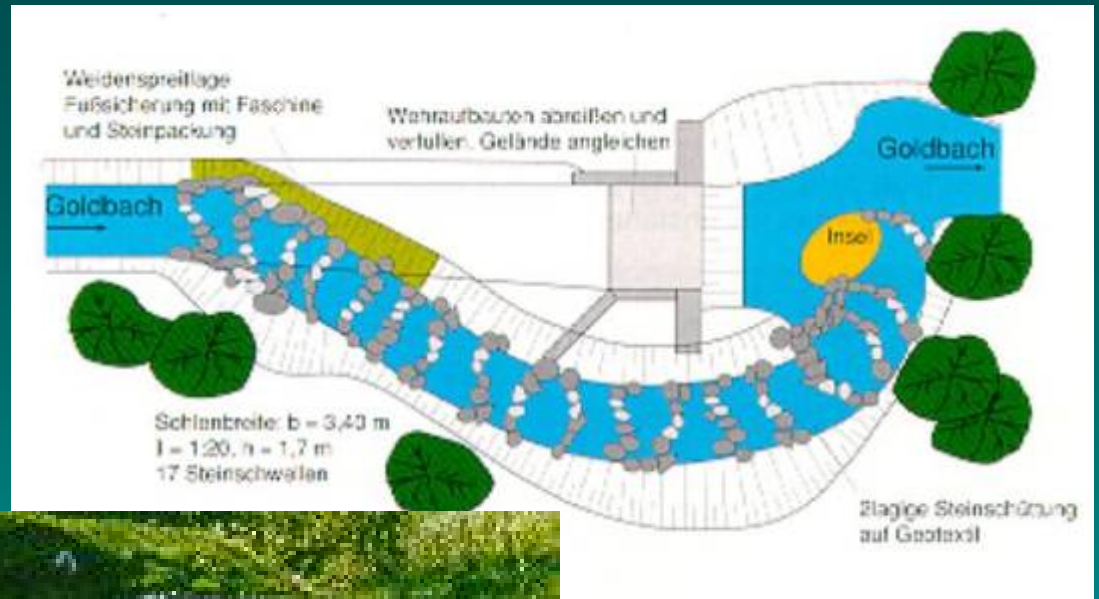
Headloss: 3.4 m high

Length: 38 m long

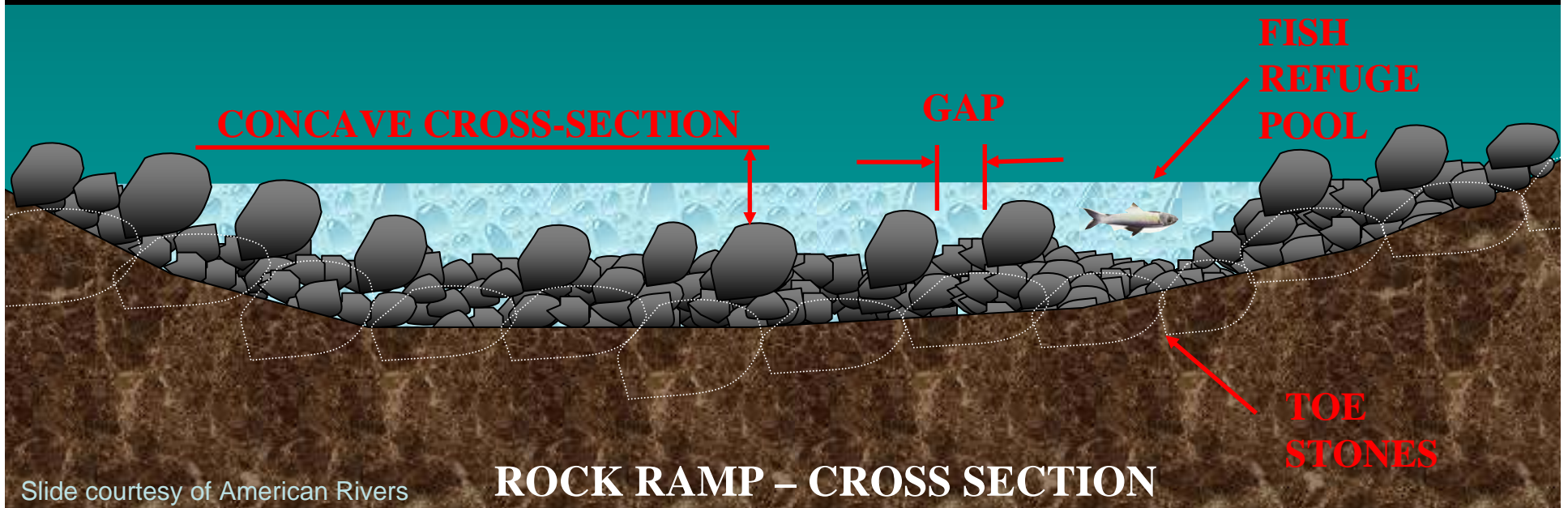
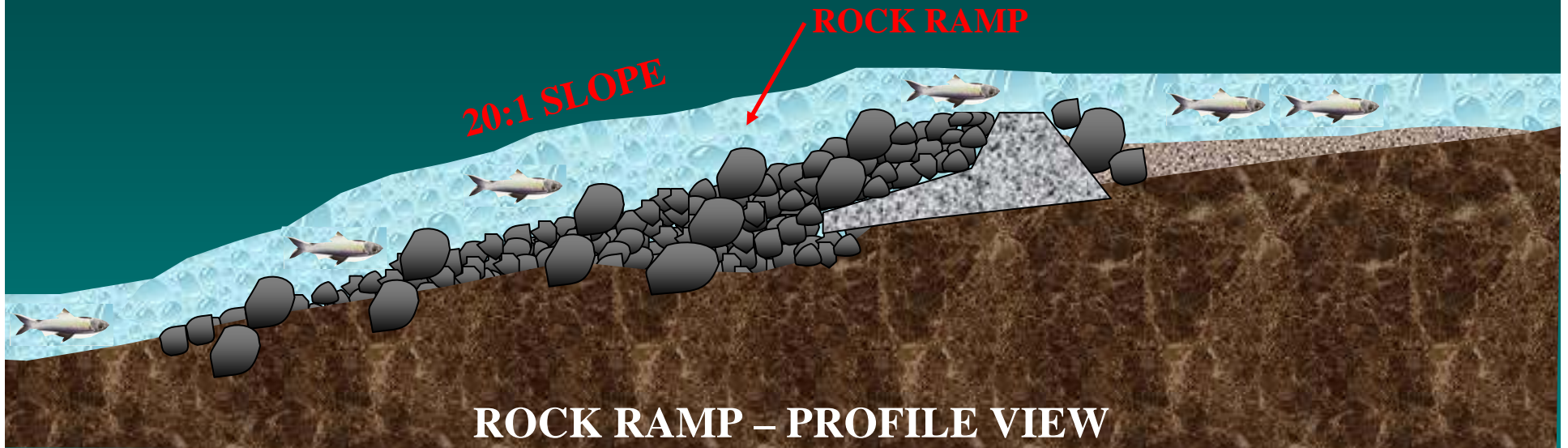
Flow: 2.8cms high flow

Designer:

Picture Source: Marq Redeker, Boyd Kynard



Rock Ramp Fishway

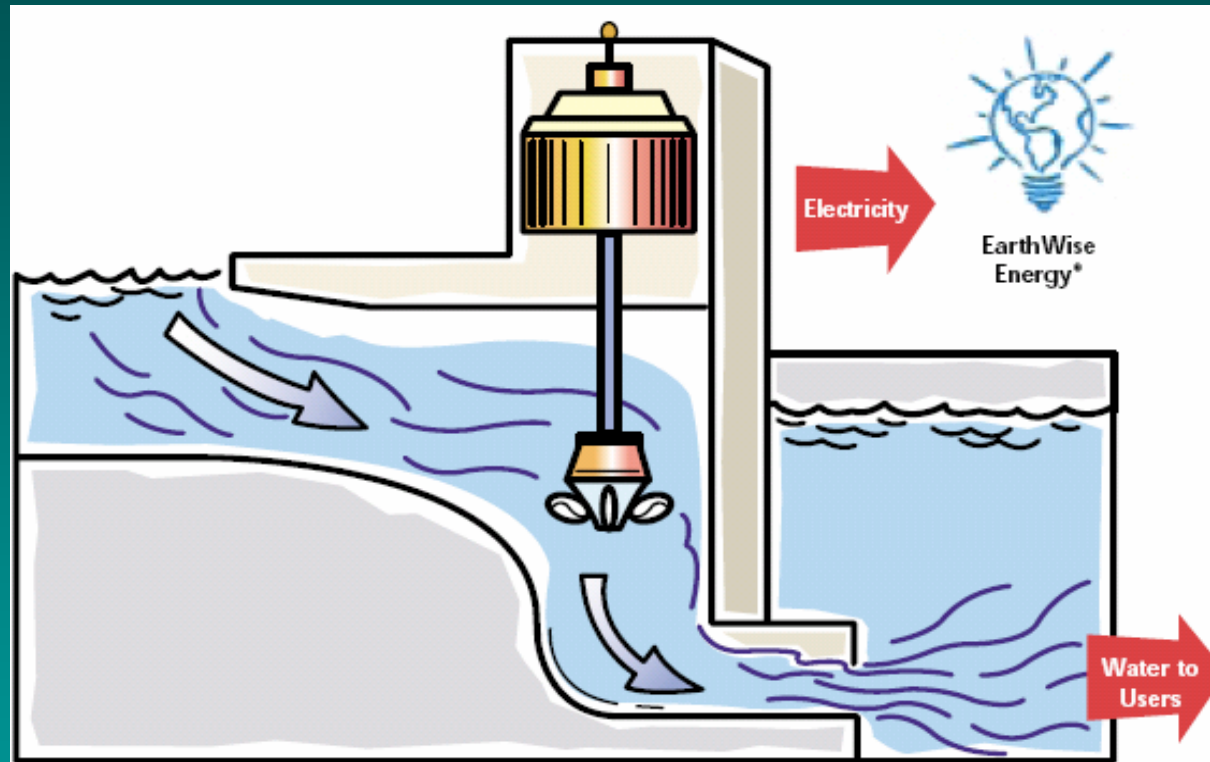


Options

Fish Ladders



Low impact Hydroelectric Power



Can use a stream's natural drop in elevation
requiring no dam or impoundment

- If no dam is needed, there is no major civil work to change the landscape.
- No toxic by-products produced in the generation of electric power
- Small life forms can pass unharmed through the slow turning runners, while large animals are diverted by screens.
- The system does not allow silt to accumulate on the river bed or ocean floor.

