

Jun 23rd, 8:50 AM - 9:35 AM

Plenary Speaker: The Evolution of Pro-Active Dam Removal in the US Over the Last Quarter Century

Laura Wildman
Princeton Hydro, LLC

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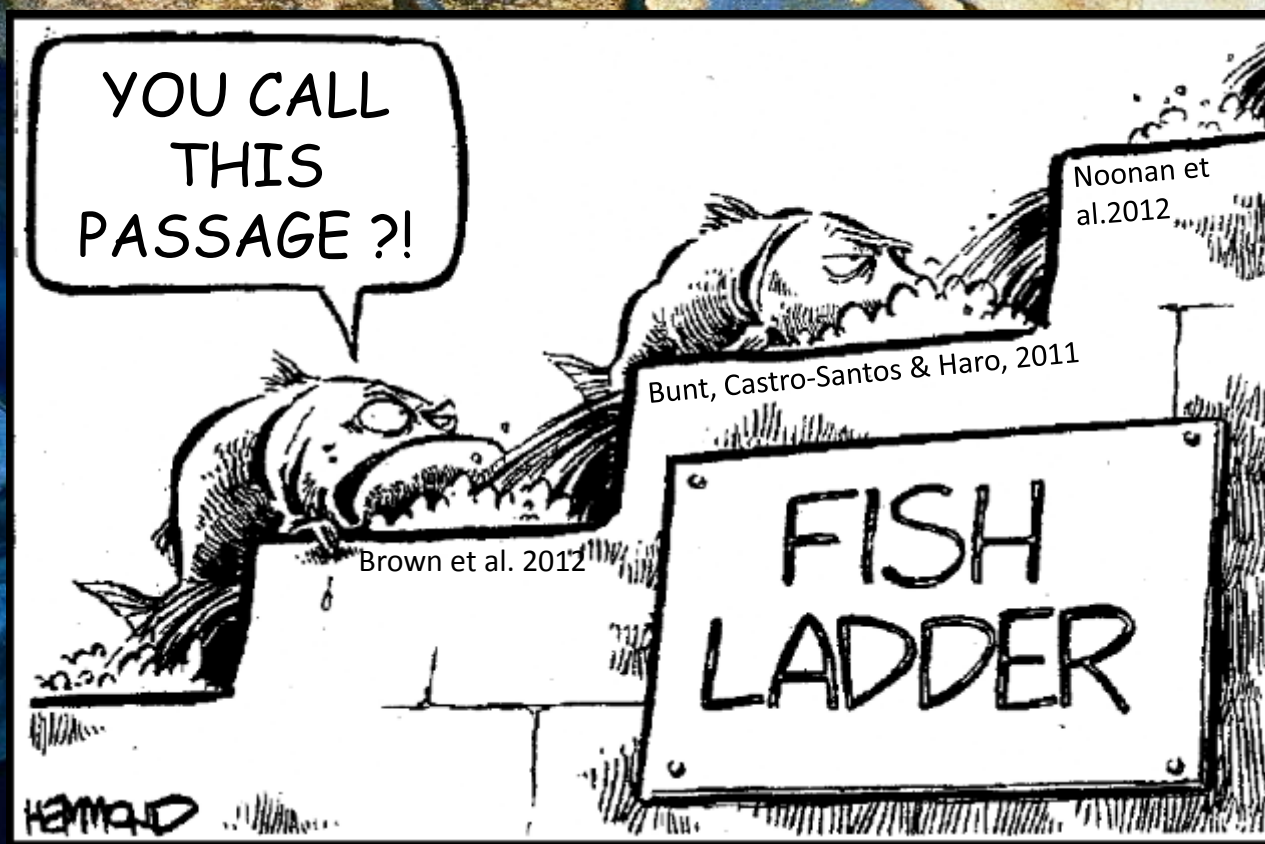
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The Evolution of Pro-Active Dam Removal in the US Over the Last Quarter Century



◀ The Factors that Instigated Evolution ▶



June 22-25, 2015 | Groningen (The Netherlands)

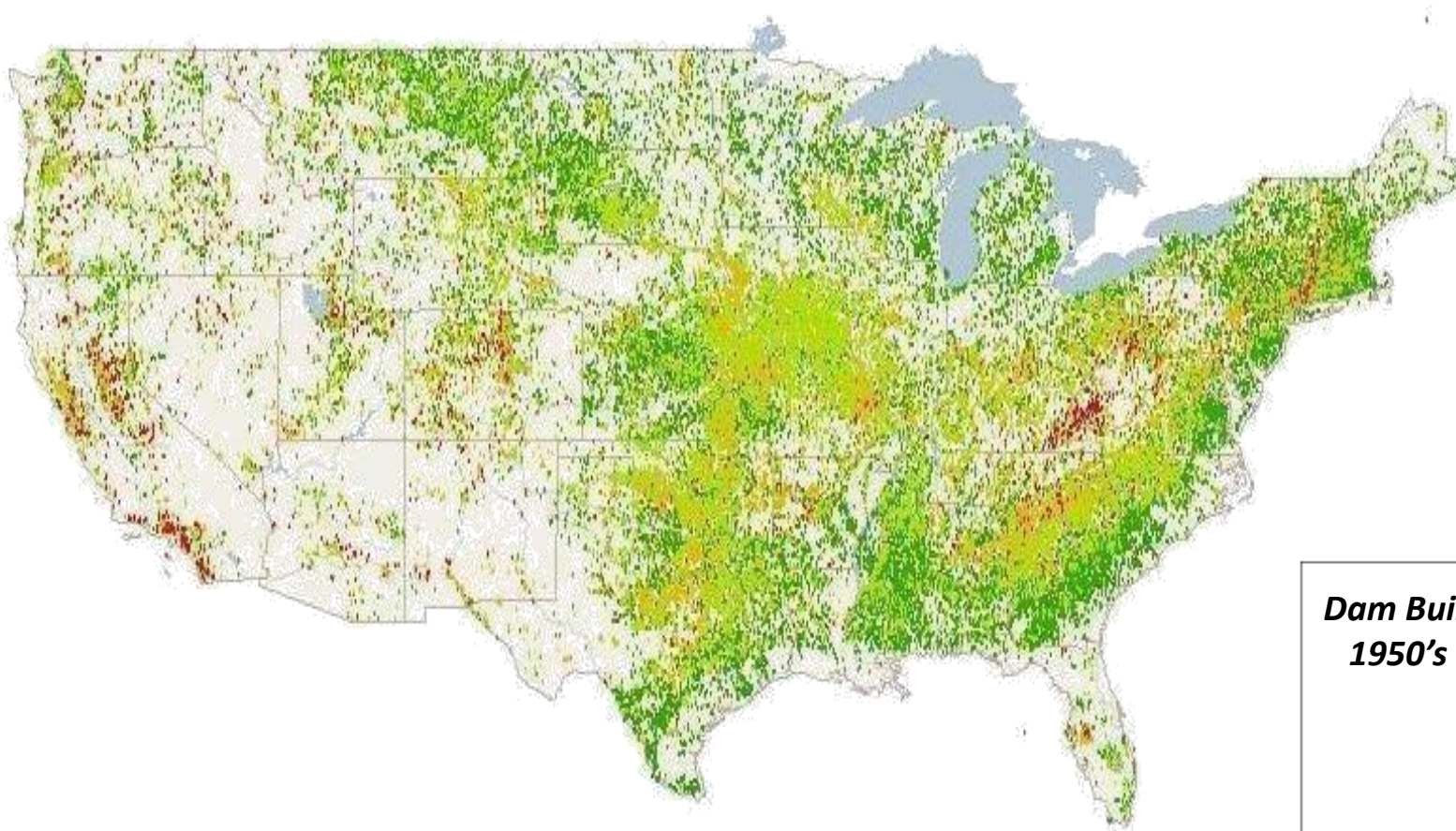
1. *Population*
2. *Natural Selection*
3. *Response to Changing Environment*
4. *Response to Beneficial Mutation*
5. *Sexual Selection*

Aerial photography - Iceland Rivers by Andre Ermolaev



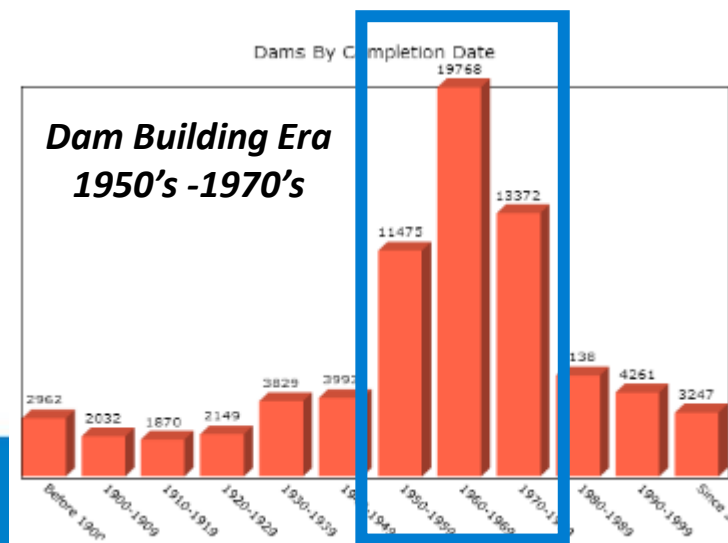
National Inventory of Dams

- >87,000 Dams >25 ft w/ 15ac-ft capacity or >6ft w/ 50ac-ft capacity
- ~99,000 Dams regulated by states & in the USFWS Barrier Database
- **Several Million Dams** Status Report on the Nation's Floodplain Management Activity, 1989 (includes an estimated 2.5 million NRCS dams built as of 1977)



Inventories:

- Certain states don't regulate certain types of dams like mine tailing dams
- Alabama has not Dam Safety Program





1972 - Buffalo Creek Valley, WV

Coal-waste impoundment failure; **125 lives**; over **\$400 million** in damage; destruction of over 500 homes



1972 – Rapid City, SD

Canyon Lake Dam failure; **33 to 237 lives**; over **\$60 million** in damages; destruction of 1,335 homes



1976 – Teton, ID

Teton Dam failure; **11 lives**; over **\$1 billion** in property damage



1977 – Laurel Run, PA

Laurel Run Dam failure, over **40 lives**; over **\$5.3 million** in damages

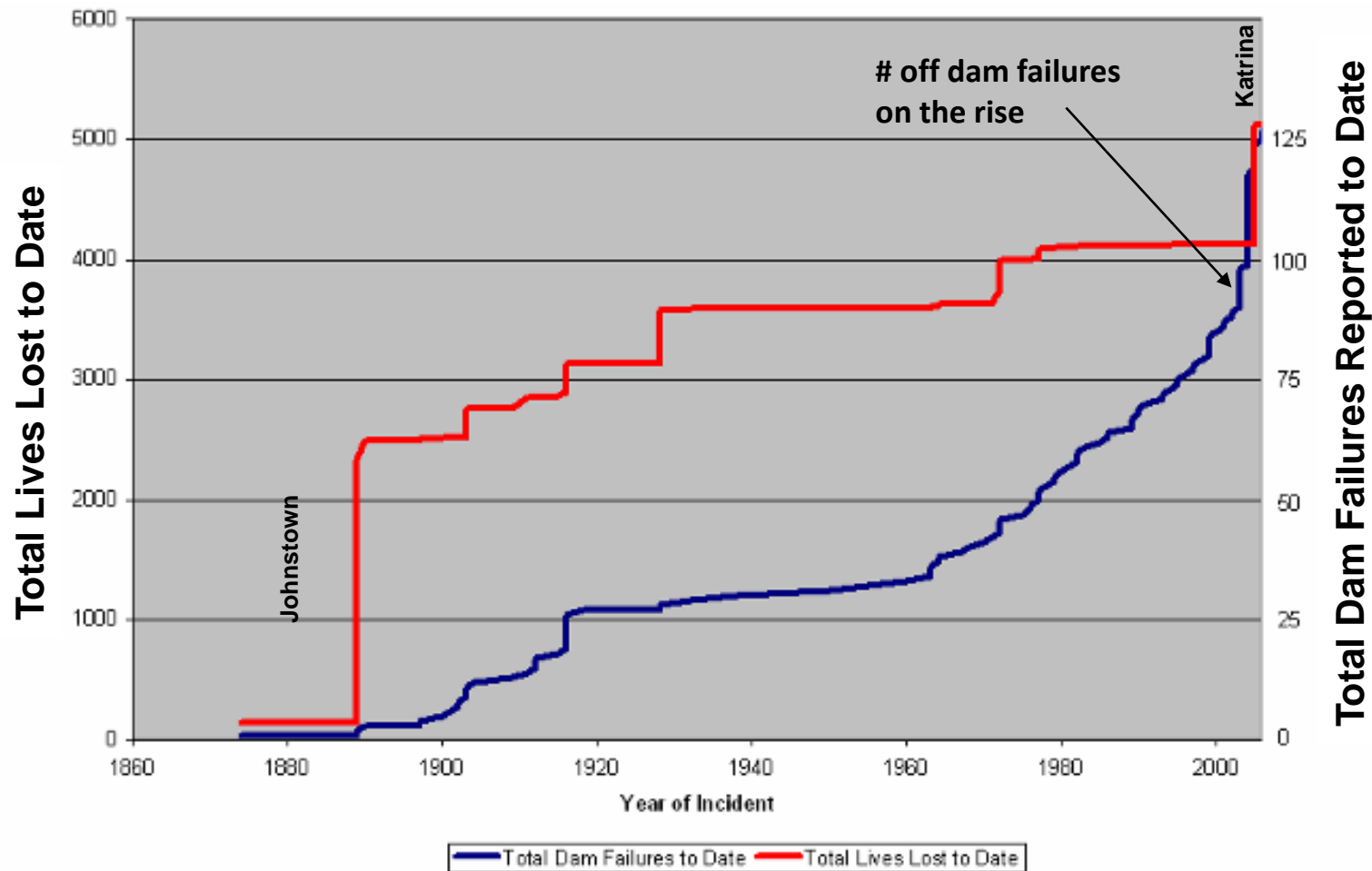


1977 – Toccoa Falls, GA

Kelly Barnes Dam failure; **39 students and college staff killed**; approx. **\$2.5 million** in damages



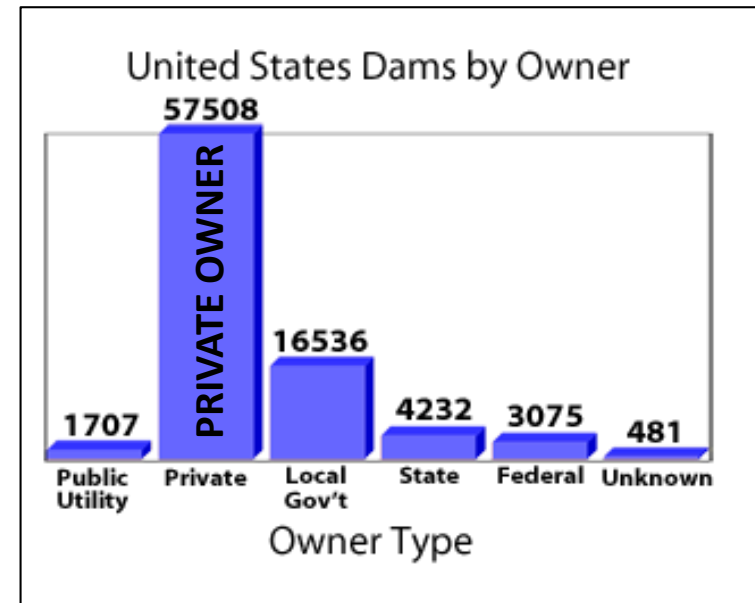
Dam Failures on the Rise in the US



Update: 2005-2013, 173 dam failures and 587 "incidents" reported
Source: ASDSO



Dams Are Aging & Maintenance Costs Are Rising



- # of deficient dams is increasing faster than repairs
- \$57 billion needed to repair dams (2013 Dam Report Card ASDSO)

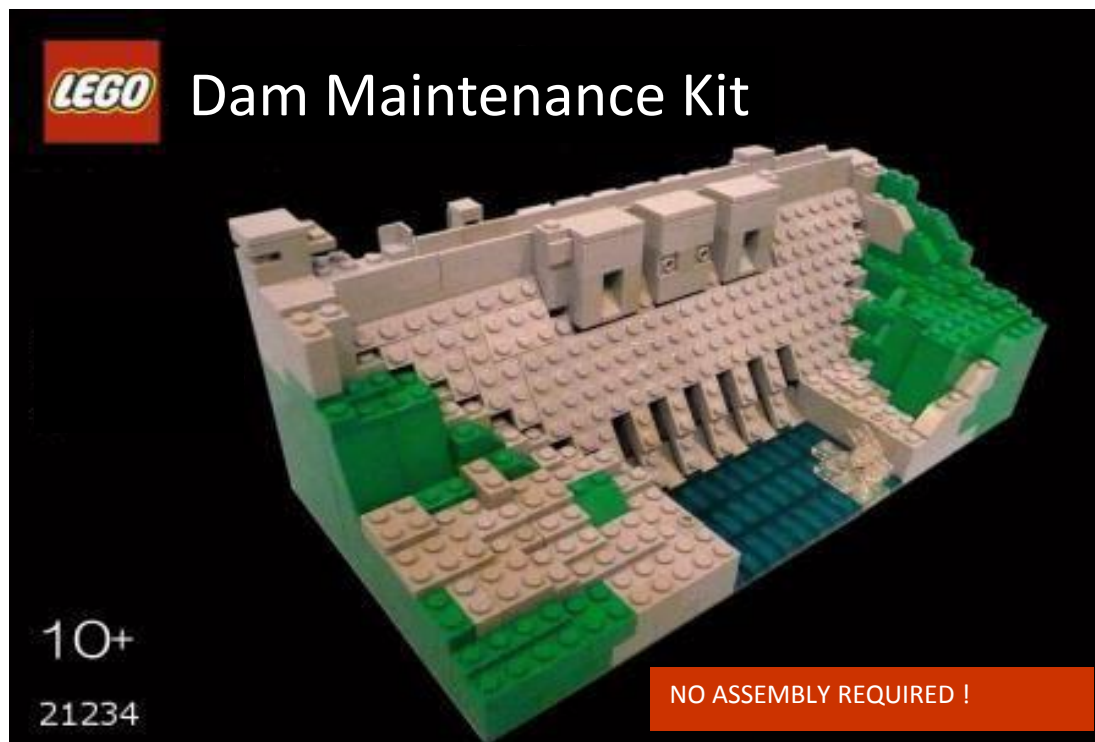
Source: Association of State Dam Safety Officials from *The Cost of Rehabilitating Our Nation's Dams: A Methodology, Estimate, and Proposed Funding Mechanism* and <http://www.infrastructurereportcard.org/dams/>



No one wants to maintain a dam:

“Infrastructure is like Legos, building is fun, destroying is fun, but a Lego maintenance set would be the most boring #\$\$%^@! toy in the world.

It comes built and then you maintain it, and if you do it right nothing happens and eventually you die.” *John Oliver, Last Week Tonight*





But unfortunately we don't have a giant bored child watching over all of our dams





Changing Legislation

King's Gap

12th Century Statute in England - River shall be kept free of obstructions so that a well-fed 3yr old pig could stand sideways in the stream without touching either side.



◀ RESPONSE TO BENEFICIAL MUTATION ▶



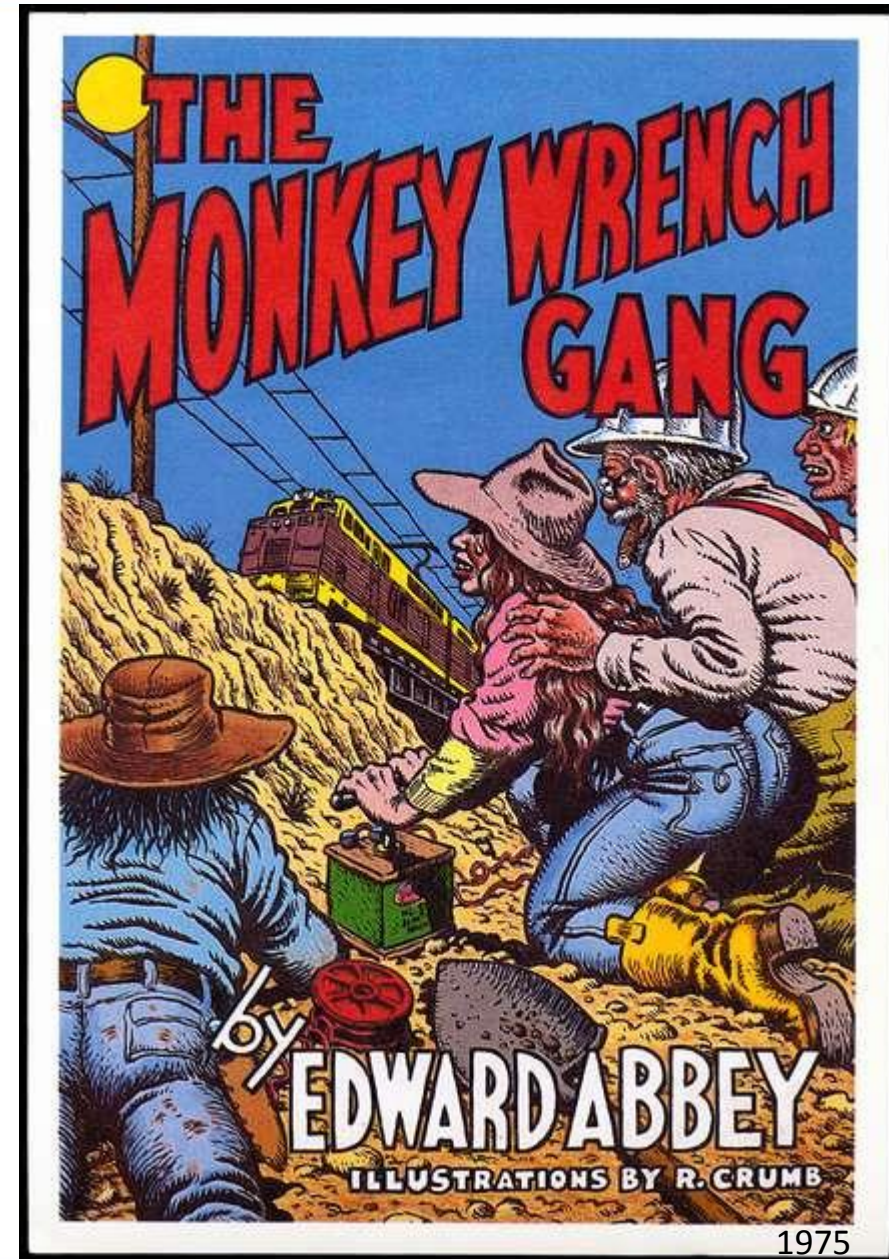
June 22-25, 2015 | Groningen (The Netherlands)

Started as a Mutation – “Crazy Talk”

But it made economic and dam safety sense, as well as environmental sense, so the dam removal movement started to evolve based in part on this beneficial mutation



John Muir's quote placed on the O'Shaughnessy Dam in 1987

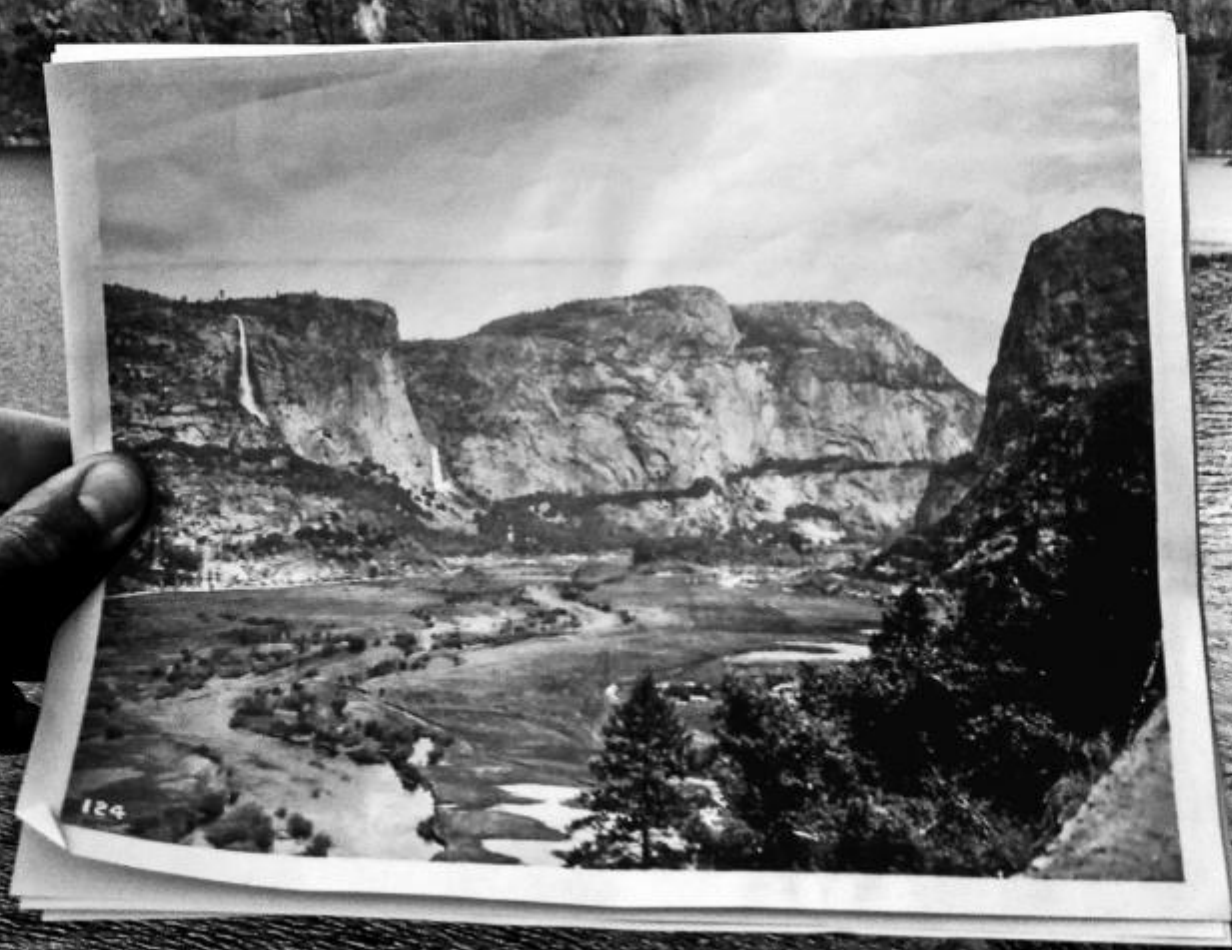


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*Hetch Hetchy Dam Controversy, CA: 1882-1923,
reportedly caused John Muir to die of a broken heart
“... no holier temple has ever been consecrated by the heart of man.” - John Muir*





The Billerica Dam

Concord River, Billerica, MA

- Constructed in 1710
- Controversy since day one
- 1st Law Suit in 1711
- Followed by multiple law suites, dam removals, different uses, repairs, reconstructions, raising, lowering, and fishways



Henry David Thoreau was the surveyor for the farmers for the 1861 court case trying to remove the dam

"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 1861

Poor shad! where is thy redress?
When Nature gave thee instinct,
gave she thee the heart to bear
thy fate? Still wandering the sea
in thy scaly armor to inquire
humbly at the mouths of rivers if
man has perchance left them
free for thee to enter.Armed
with no sword, no electric shock,
but mere Shad, armed only with
innocence and a just cause, with
....scales easy to be detached. I
for one am with thee, and who
knows what may avail a crow-bar
against that Billerica dam?
Thoreau 1839

◀ RESPONSE TO BENEFICIAL MUTATION ▶



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Children's Children Cursed

with Strife and Contention




Winnemem Wintu Tribe war dance to protest Shasta Dam





DAMS STOP FISH FROM HAVING SEX



Oh well, I guess
I'm not getting
lucky this year



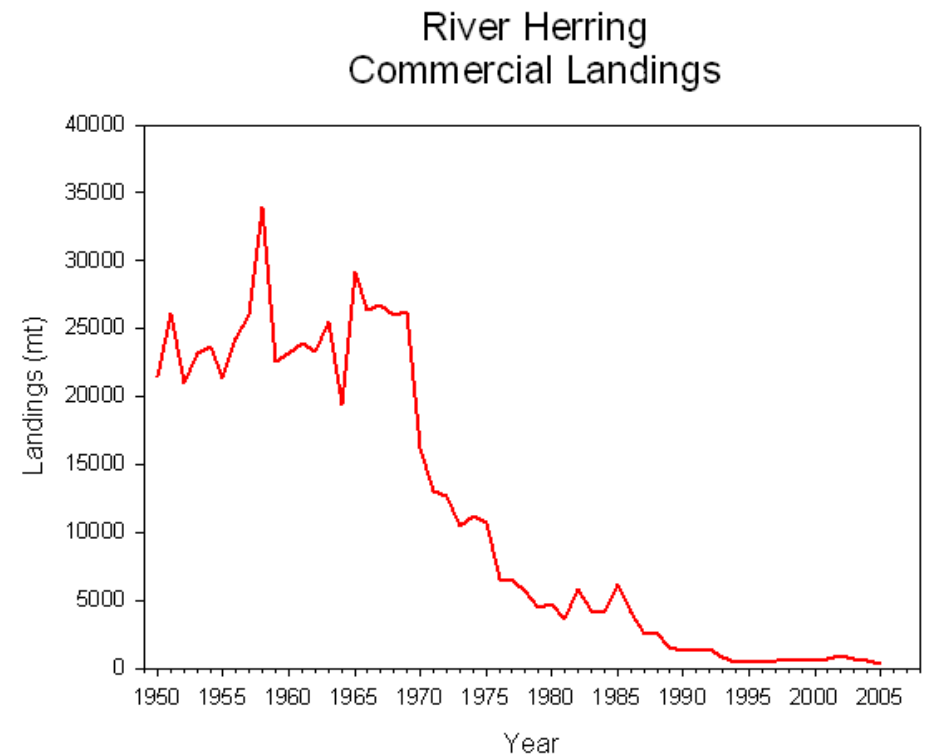
Less Fish Sex = Decline of Fisheries in the US



Herring photo source: Doug Watts

“Herring once numbered in the millions. Populations along the East Coast started to decline during colonial times, with overfishing, pollution, and the damming of rivers.”

Source: USFWS



Commercial landings of River Herring, 1950-2005.

Many dams removed for safety & economic reasons since dam building began

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by Rachel Carson

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Early California – 47 Dams Removed between 1922-1998 (Source: Winter)

- 1946-50 Two Salmon River Dams Removed
- 1946-47 Three Indian Creek Dams Removed
- 1969 Sweasey Dam Removal – due to fisheries and flooding concerns if dam breached
- 1946-51 Five Trinity River Dams Removed
- 1987-89 Lost Man Creek, Upper Dam Removed - because it “conflicts with NPS Management Policies which call for the restoration and preservation of natural resources of the park”
- 1992 Two Wildcat Creek Dam Removals
- 1993-1998 Five Butte Creek as part of CALFed Settlement



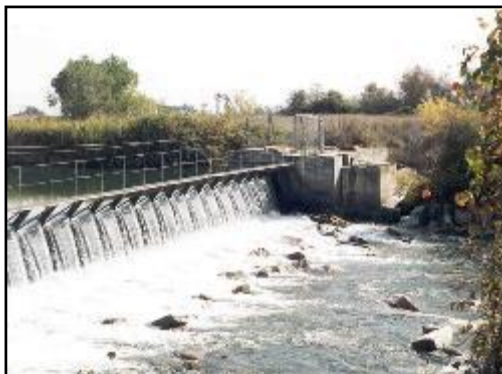
McPherrin Dam



1998 - immediately following removal



2008 – 10yrs post removal



McGowan Dam



1998 - immediately following removal



2008 – 10yrs post removal

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Mid 1980s Elwha Dams
The push for removal starts



Elwha & Glines Canyon Dam Removals

- 1968 Tribe slowly gained political power and won federal recognition, began to protest the loss of the fishing rights promised to them by federal treaty in the mid-1800s.
- 1979 Supreme Court ruled that Washington tribes were entitled to half the salmon catch in the state. Tribes began to fight for the protection and restoration of salmon runs
- Mid-1980s Tribe & environmental groups started to push for the removal of the Elwha and Glines Canyon Dams
- 1992 Congress authorized purchase of the two dams
- 1996 Env. Impact Study



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greatly increased importance of environmental considerations and role of State and Federal fish and wildlife agencies

1986 Cadillac Desert

1987 O'Shaughnessy Dam graffiti

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“dams that were clearly justified for their economic value gradually gave way to projects built with excessive taxpayer subsidies, then justified by dubious cost/benefit projections.”

US Secretary of State Bruce Babbitt



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The push for removal starts



Wisconsin Takes the Lead – Headed by a strong Dam Safety Program and the Rivers Alliance of Wisconsin



Woolen Mills Dam



Franklin Dam



Orienta Dam 2001



Mounds Dam 1998



Oak Street Dam



Waterworks Dam 1997

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1988 Federal
Power Act
Section 10
Requires
consistency w/
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Plans

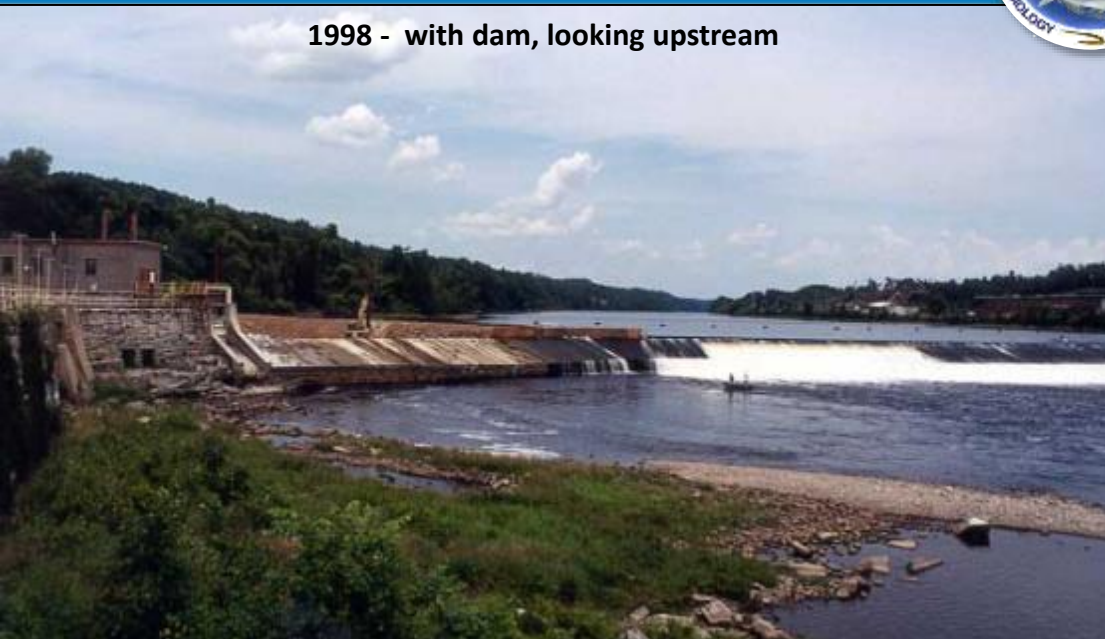
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seeks relicensing

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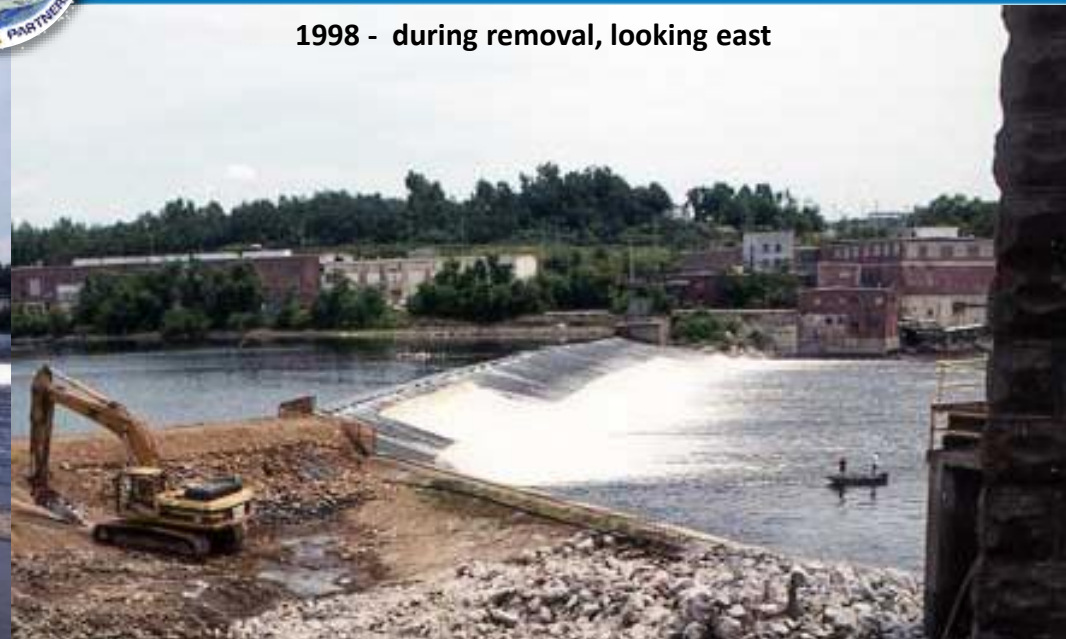




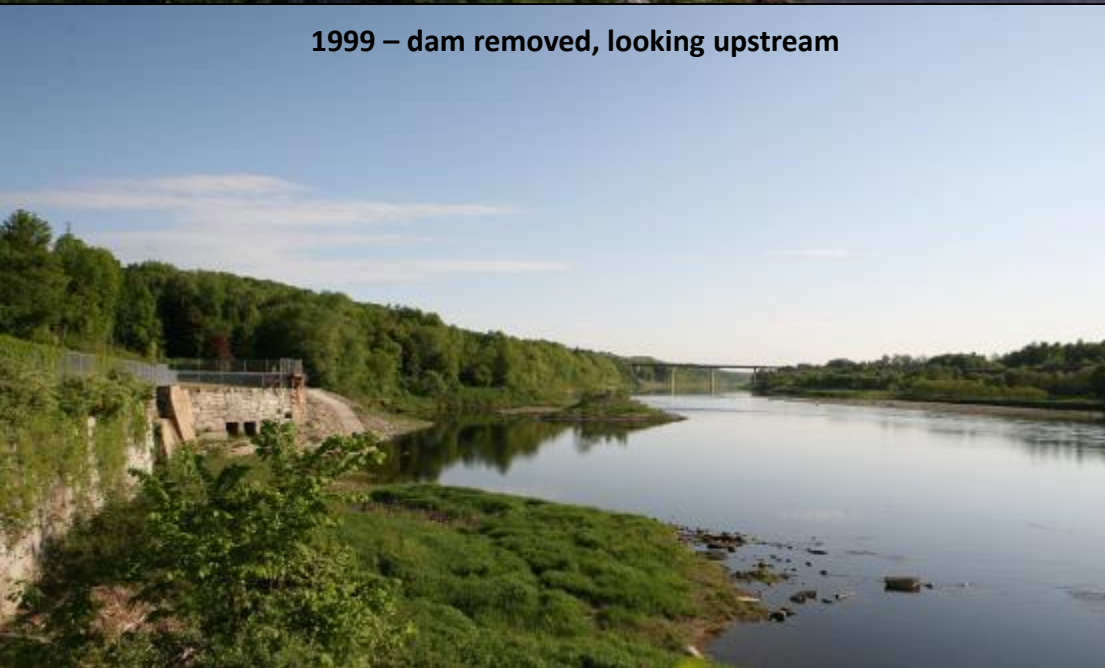
1998 - with dam, looking upstream



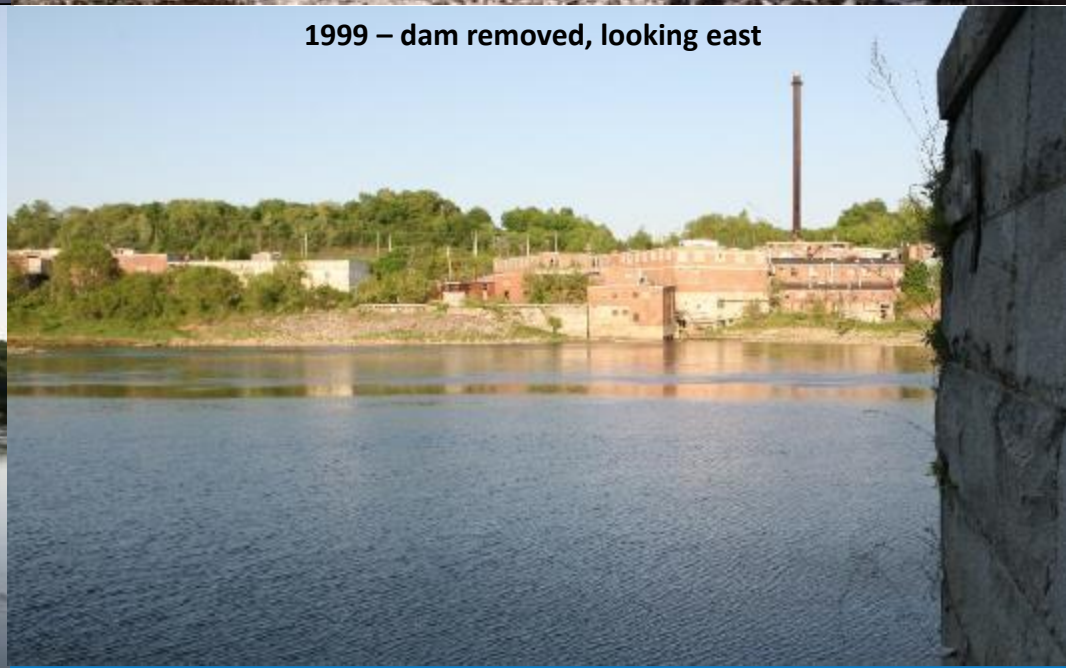
1998 - during removal, looking east



1999 – dam removed, looking upstream



1999 – dam removed, looking east



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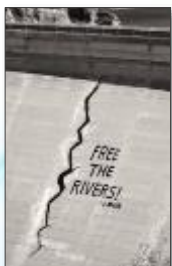
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1993-2001 Bruce Babbitt is Secretary of the Interior

1997-2000
Naugatuck River Dam Removals



1998 Babbitt hoisted a sledgehammer to mark the removal of four dams, opening 160 miles of the Menominee River as part of a comprehensive relicensing settlement



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Chase Brass

height = 5-ft length = 160-ft



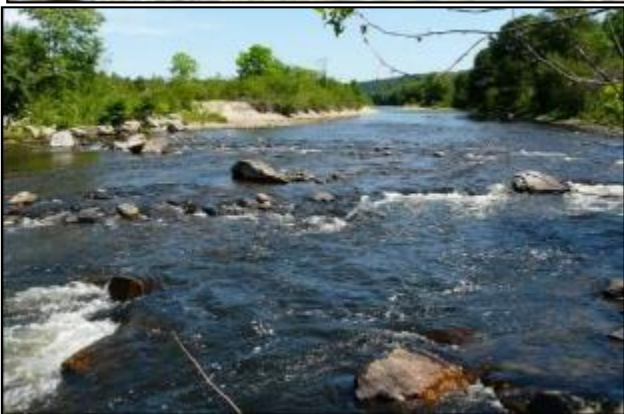
Platts Mill

height = 10-ft length = 231-ft



Anaconda

height = 11-ft length = 327-ft



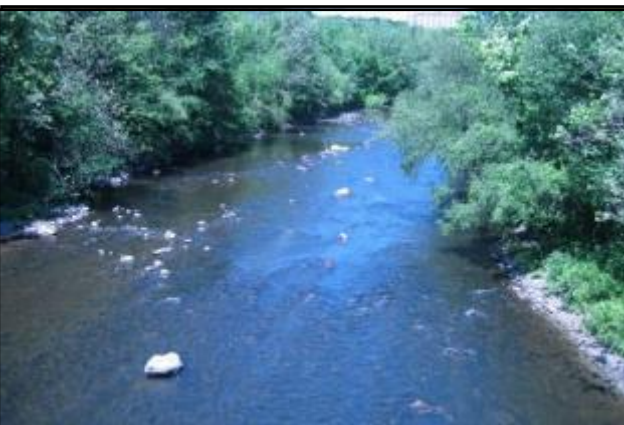
Union City

height = 7-ft length = 190-ft



Freight Street

height = 4-ft length = 158-ft



Tingue

height = 20-ft height = 270ft



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1989 *Edwards Dam* seeks relicensing

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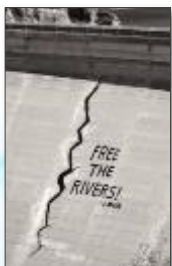
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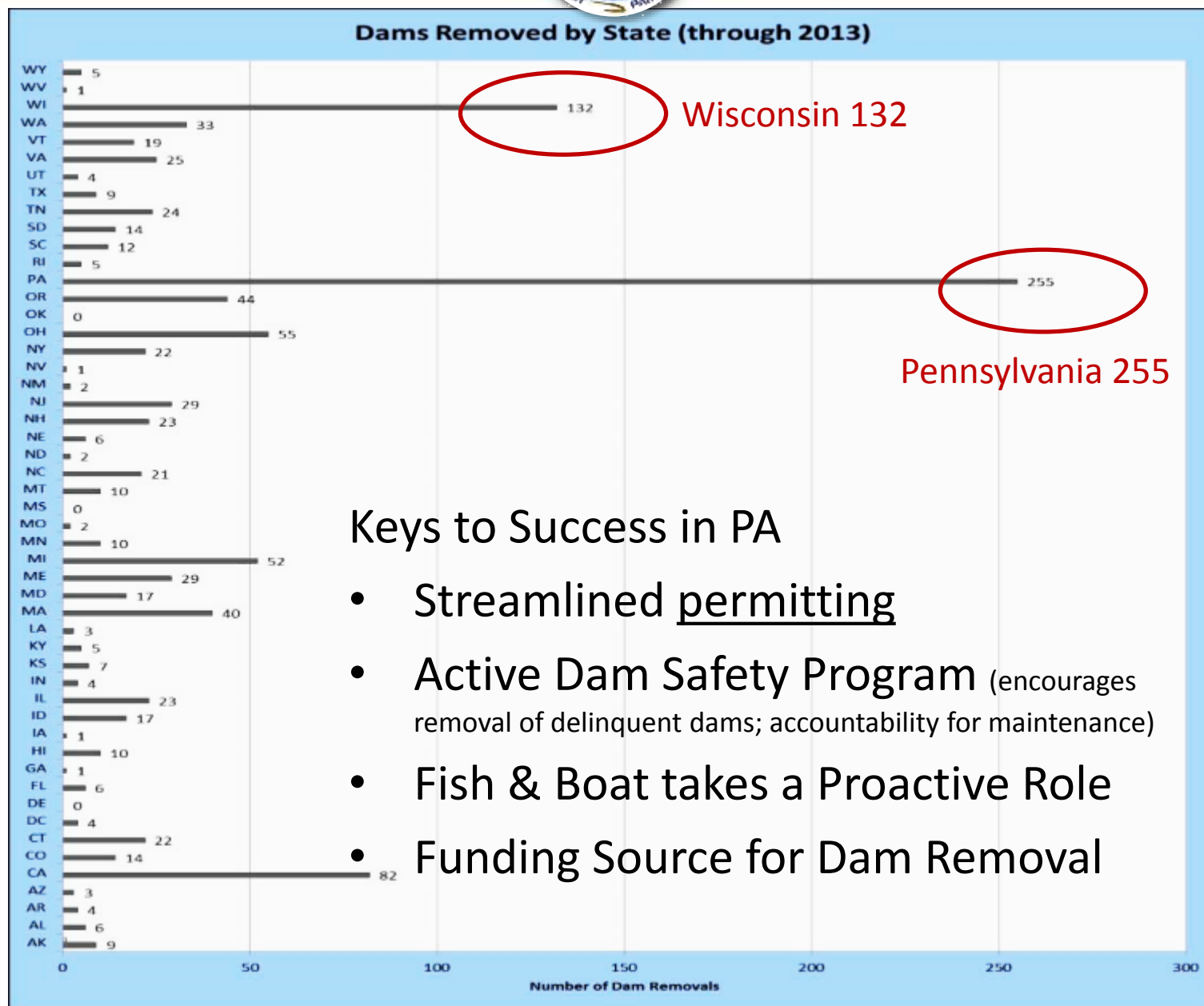
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Dam Removals

1997 *Guidelines*
For Retirement
of Dams and
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Keys to Success in PA

- Streamlined permitting
- Active Dam Safety Program (encourages removal of delinquent dams; accountability for maintenance)
- Fish & Boat takes a Proactive Role
- Funding Source for Dam Removal



PA requires posting of all low head dams
due to multiple deaths at small dams



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1992 Congress authorizes
purchase of Elwha Dams





The US Armed Forces Help to Remove Dams

- Cherry Hospital Dam, NC - 1998
- Billington Street Dam, MA - 2001
- Embry Dam, VA - 2004



"So what is it about the clang of sledgehammer on concrete that evokes such a response? I believe that huge public interest reflects a deep, widespread understanding that America overshot the mark in our dam building frenzy." Babbitt



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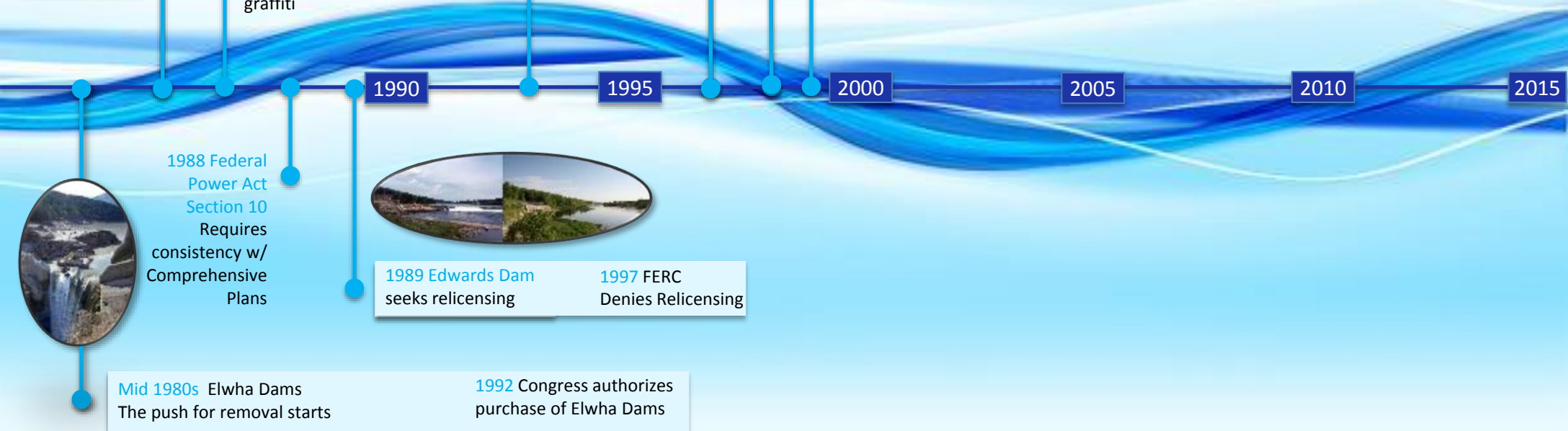
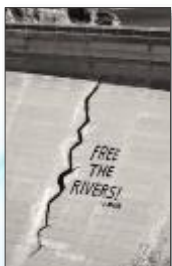
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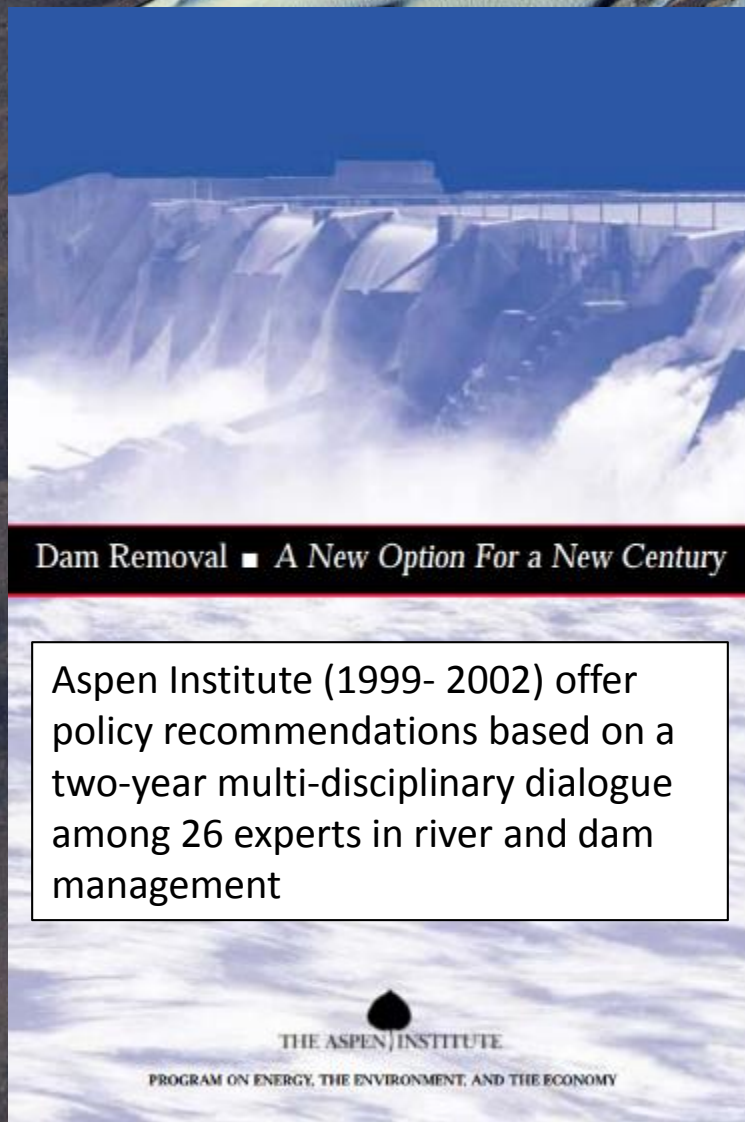


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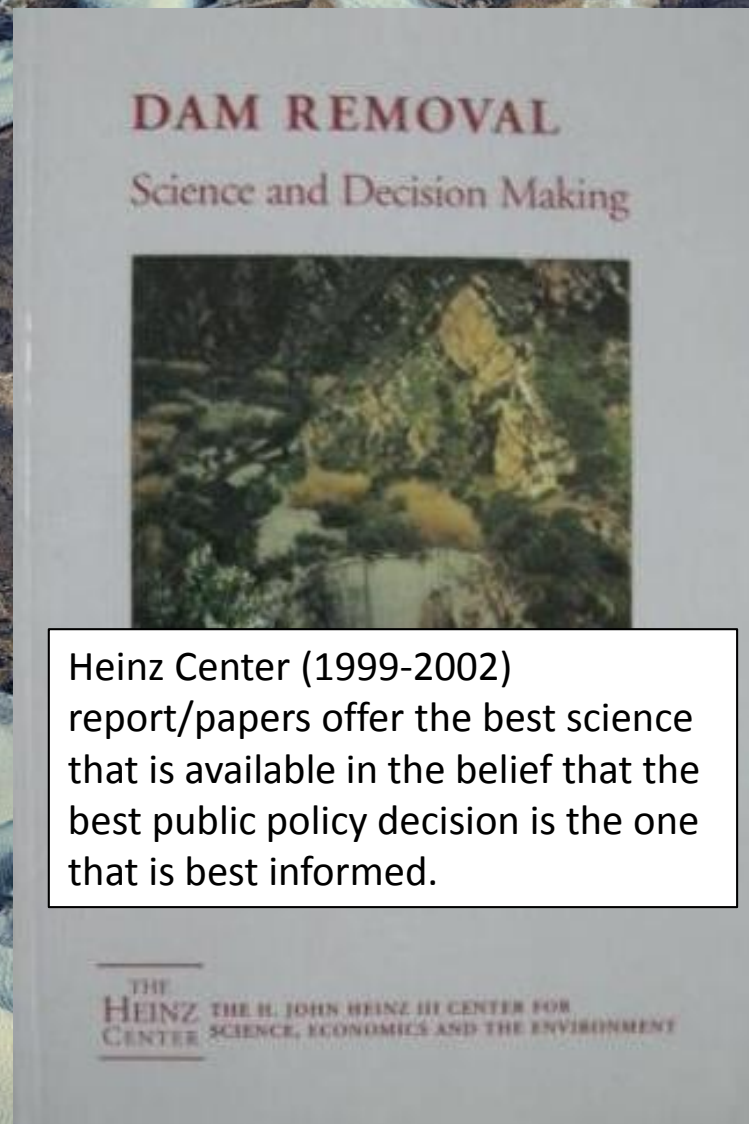
1999-2002
Aspen & Heinz





Dam Removal ■ A New Option For a New Century

Aspen Institute (1999- 2002) offer policy recommendations based on a two-year multi-disciplinary dialogue among 26 experts in river and dam management



Heinz Center (1999-2002) report/papers offer the best science that is available in the belief that the best public policy decision is the one that is best informed.

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166 Dams Removed
(source: American Rivers)

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1999 Dam Removal Track at the F & W Conf. in IL

2000 VT Dam Removal Workshop

2000 World Commission on Dams Report

2000 AR's Taking a Second Look Video

1999 *AR Dam Removal Success Stories*

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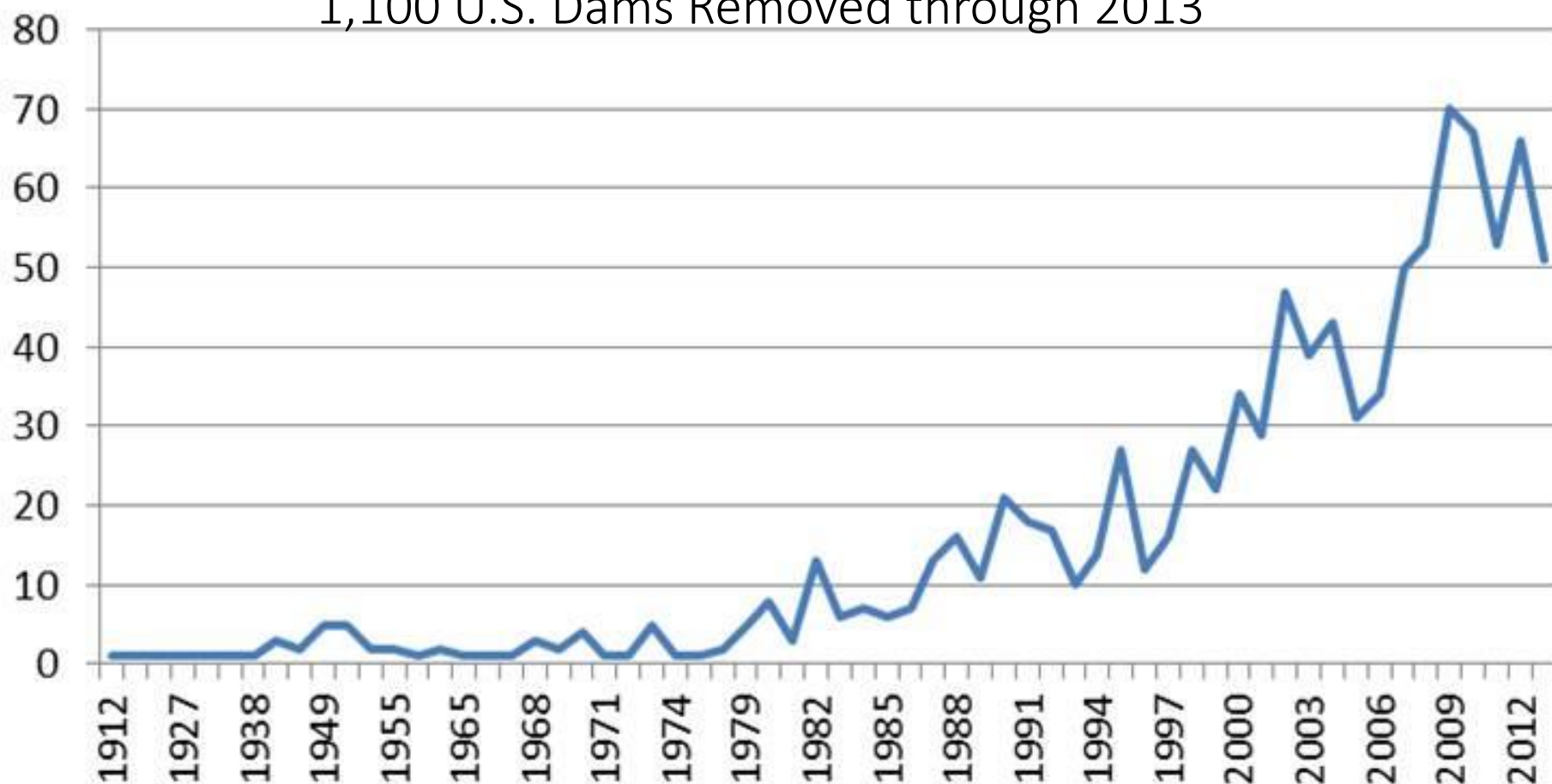


Carrier Task Force 2001-2008)



of Dams Removed

1,100 U.S. Dams Removed through 2013



www.americanrivers.org

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2000 *AR's Taking a*
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2005 *Taunton, MA*
Dam Breach Scare

2002
BioScience & Exploring
Dam
Removal

2000- 2015 AR Dam Removal Campaign (NE Stream Barrier Task Force 2001-2008)

1999 *AR Dam*
Removal Success
Stories

1989 *Edwards Dam*
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1999
Removed



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Oct. 2005 Whittenton Pond Dam Near Failure Town of Taunton, MA Evacuated



173-year-old unmaintained
12-foot-high concrete dam



2,000 PEOPLE EVACUATED

Lake Wyola Dam Near Failure Town of Shuetsbury, MA

Same Night

- 11' high earthen & stone Lake Wyola Dam comes within 1" of overtopping
- No one was evacuated
- Dam breach inundation zone mapping prepared following the crisis, found that 72 homes were within the dam breach inundation zone
- Flood wave would have been 12 ft higher than normal when it hit the first house
- None of the 72 home owners knew how close they came that night



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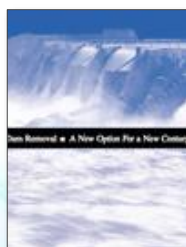
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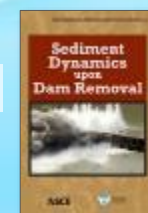
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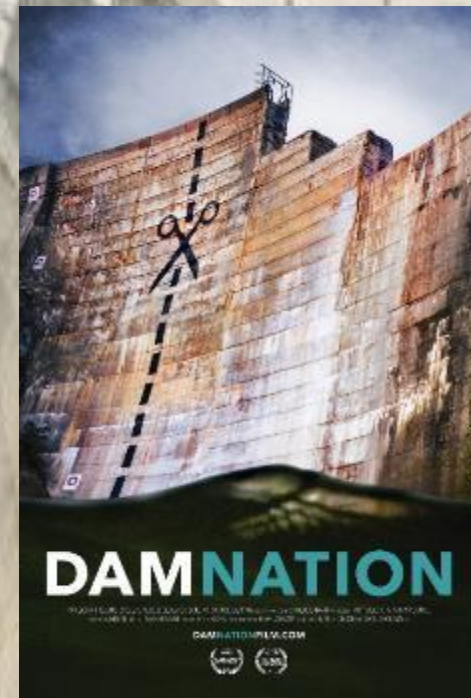
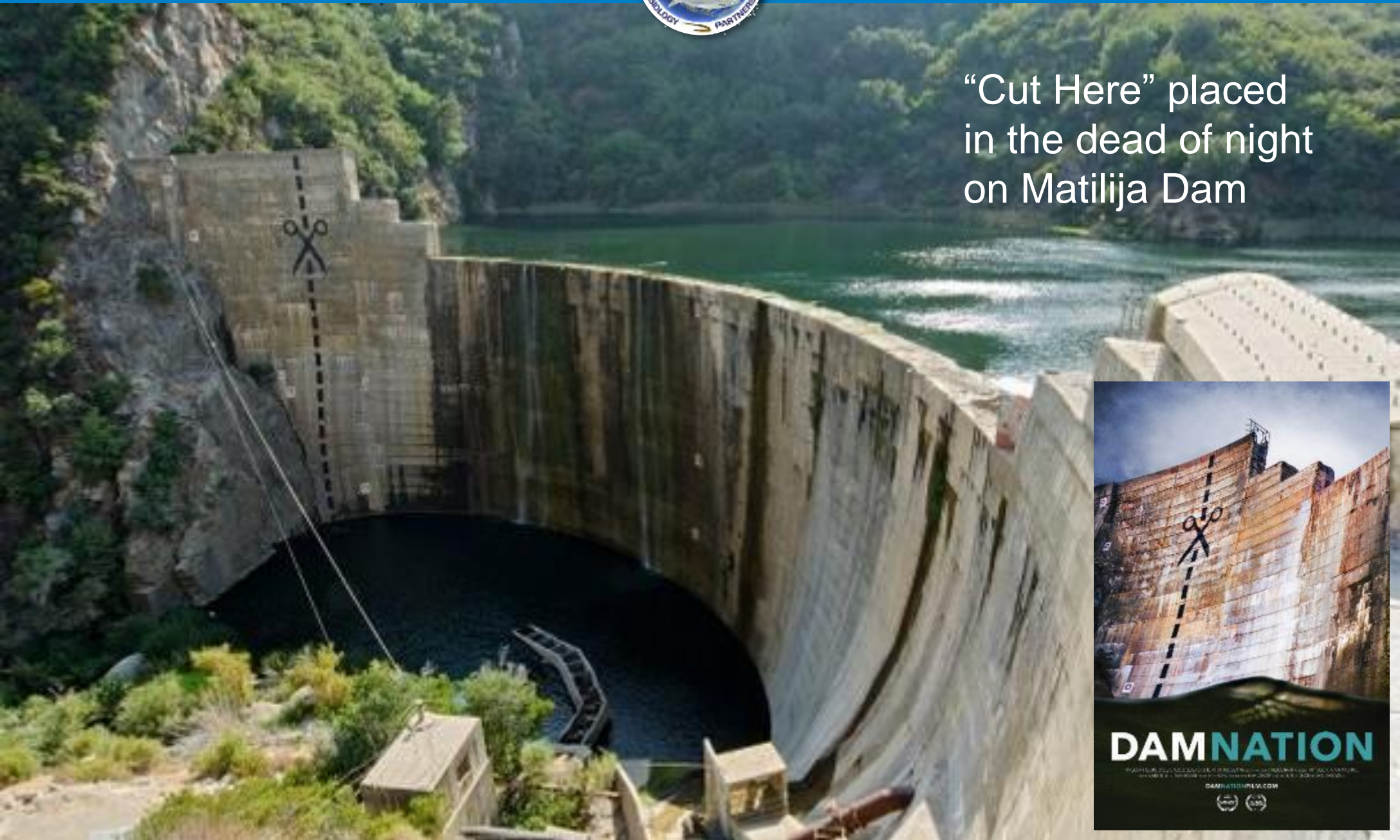
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“Cut Here” placed
in the dead of night
on Matilija Dam



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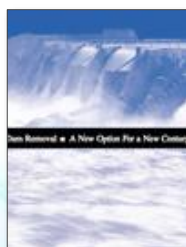
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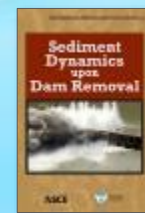
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Condit: An historic 1999 agreement between the Yakima Tribe, government agencies, conservation groups, and a dam-owner directs a 38- meter-high private hydropower dam to be removed at the owner's expense.



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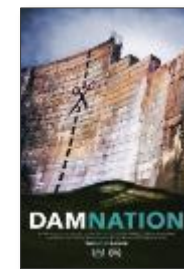
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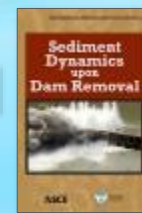


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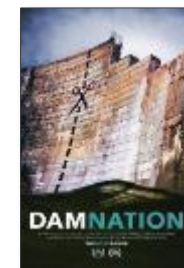
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Phoenix, Arizona Thursday, February 10, 1955

Rolland C. Baker, Phoenix Pioneer, Dies

Rolland C. "Rolly" Baker, 71, of 101 E. Palm Lane, died yesterday at his home. He was born in 1883 in Texas. He was a pioneer in the Phoenix area and was one of the first to settle here. He was a member of the Phoenix Rotary Club and the Phoenix Chamber of Commerce. He was a successful businessman and was one of the first to build a home in the Phoenix area. He was a pioneer in the Phoenix area and was one of the first to settle here. He was a member of the Phoenix Rotary Club and the Phoenix Chamber of Commerce. He was a successful businessman and was one of the first to build a home in the Phoenix area.

THE ROTARIAN November 17, 1941

THE "LOW DOWN" ON THE "HIGH UPS"



Rolly Baker

The average Rotarian who likes fishing gets out on the river three times a year and catches himself up in the undergrowth of the Valley Mountains, but the state of the valley, Roland Charles Baker, "Rolly," has shown, has probably caught more fish in more places than any other Phoenix Rotarian. He has fished practically every stream and lake in Arizona and knows just what to look for in each place, and how to catch 'em. When it comes to fishing Rolly is home Watson, Tom Sawyer and Huck Finn all rolled into one.

Born near Denton, Texas, January 29, 1883, Rolly moved among Texas with his parents, helping on a farm and another until 1891, when he "packed up" and headed west, passing through Phoenix on his way to Washington and Oregon. After a year in the west and top of the Northwest he began to grow tomatoes instead of wheat, and, remembering that he had seen one was growing in Arizona, promptly "reared" the main crop in Phoenix where he was now working in a Livestock Stable. He now remembers 1891 as the year he came to Phoenix.

After working for the company to make a dam site marked for several months, he went back to Phoenix, and he worked for some time as a fisherman with a partner, but a duty in the south and north, all over a part of the City.

During Rolly's partnership with Charley the place, then the Phoenix Wood and a full block along the bank on Third Avenue, the Phoenix wood was for him a block several years ago for \$15,000. The remaining half for \$15,000, and in place, but has plenty of the world's in North Central, and a fine wife and home, and a fine home and hard work. Anyway, Good in Large City. Rolly joined the and has been 100% ever since. "Rolly is a real 'guy' and a 'fella' with."

A geophar can up Rolly's pants leg the night, and it was at the wedding of John Brown and himself in 1911. (Included: So you see, he was 28 years old.)

1941 R. Gail Baker Rites

Services for R. Gail Baker, 47, a native of Phoenix, will be held at the Methodist Church, at which Mr. Baker was a member, will be held at the services in A. L. Moore and Sons Mortuary. Burial will be in Greenwood Memorial Park.



R. GAIL BAKER

Mr. Baker, of 101 E. Palm Lane, who was Phoenix city engineer 13 years, died yesterday at St. Whipple Veterans Hospital at Prescott. He served in the U.S. Army in 1913.

Between 1921 and 1930, as design engineer for the Salt River Valley Water Users Association, Mr. Baker had direct charge of the design and construction of Maricopa Flat Dam, Horse Mesa Dam, and Stewart Mountain Dam.

During this time he was the project's resident chief engineer and for one year he was superintendent of irrigation.

He held degrees from the University of Arizona and New Mexico, and was a member of the University of California, Berkeley, and was awarded an honor of the college of the University of California, Berkeley.

R. Gail Baker Dies, Well Known Engineer

R. Gail Baker, 47, designer and supervisor of the construction for Horse Mesa, Maricopa Flat and Stewart Mountain dams in the Salt River Project, died yesterday in Fort Whipple Veterans Hospital.

Mr. Baker, of 101 E. Palm Lane, retired in 1930 after a distinguished career that included 13 years with the Salt River Project, 12 years as City of Phoenix engineer and numerous years as a consulting engineer with various irrigation and power districts.

He was the consulting engineer for the Arizona Interstate Stream Commission in Colorado River matters.

His career also included several years as Public Works Administrator for the Pinal County Highway Department, retired in 1930.

Surviving are his wife, Mrs. Gail Baker; two daughters, Mrs. Chris Schaefer of Anaheim, Calif., and Mrs. Howard Morse of El Paso, Texas.

He was a veteran of World War I, and was awarded an honor of the college of the University of California, Berkeley.



Phoenix Pioneer 1868-1955
1893 on the first survey of the Roosevelt Dam site
"Rolly is a fella you can ride the river with"

Arizona Dam Engineer 1898-1965
Chief designer & construction supervisor on the Salt River Project
Fought Arizona's Colorado flow battle against California

Monday, October 4, 1999

CONNECTICUT

3A

Republican-American

\$8 million project aims to restore the Naugatuck River once among state's most polluted

The new cuts from Torrington, south through Waterbury, Naugatuck, Beacon Falls, Seymour, Ansonia and Derby, where it flows into the Housatonic River.

The plan to restore the river has begun more than 20 years as the Naugatuck River Authority's Fish Restoration Project. An estimated \$8 million project to restore the river to the pre-industrial state that nobody alive remembers.

When completed, the Naugatuck River will flow freely, and fish will begin spawning from the sea to spawn the river. In more than 200 years, project engineers never in either remove or bypass any man-made dams.

The project also involves replacing much of the river's corridor and should result in new life into the waterway.

The Naugatuck has been affected by industrialization more than any river in the state. It was one of the first to be dammed.

"It was certainly one of the most polluted rivers in the state of Connecticut," said Thomas Morley, a project director with the IJC. "We have studies back from the 1930s that said it was a potent, foul-smelling river that most people just wanted to get away from."

During periods of low flow, nearly half the water is treated sewage. But over the last 15 years, each of the seven sewage plants on the river at one time has been upgraded or is being upgraded.

Over the 150-million restoration of the Naugatuck project is completed, next year, the amount of sewage-treated pollution will drop to a 10th of what it once was.

After Baker's presence has the environmental group Trout Unlimited, said the river recovery has the makings of a major watershed.

There's a certain amount of irony in the fact that Rolly Baker, who was a fisherman, was one of the first to be dammed.

"You can follow the entire industrial revolution in the Naugatuck Valley, just in the history of these dams," he said.

Laura Wildman stands before the Naugatuck River in Waterbury Friday in the spot where the Ansonia Dam used to exist. Wildman is heading a major project to restore the Naugatuck River, a state-funded \$8 million project to restore it to the pre-industrial state that nobody alive remembers.

Engineer Specializing in Dam Removal & Fish Passage



River Connectivity:

*The light at the end of
the river.*