

Restoration of American Shad in the Potomac River

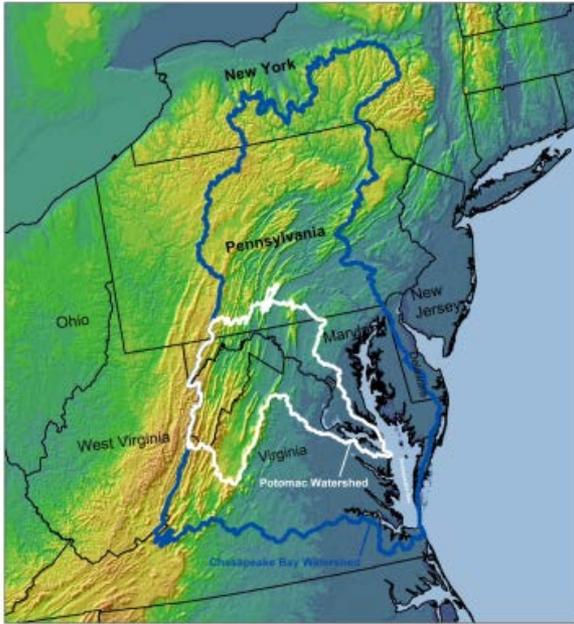
Delivered to **the 21st Annual Shad Teacher Training**
 March 12, 2016

by Jim Cummins (301-274-8106)

The Interstate Commission on the Potomac River Basin

This talk and other resources are available at our website "potomacriver.org"
 Click "Focus Areas," then "Aquatic Life," then go to American Shad Restoration"

THE POTOMAC RIVER WATERSHED
AND THE CHESAPEAKE BAY WATERSHED



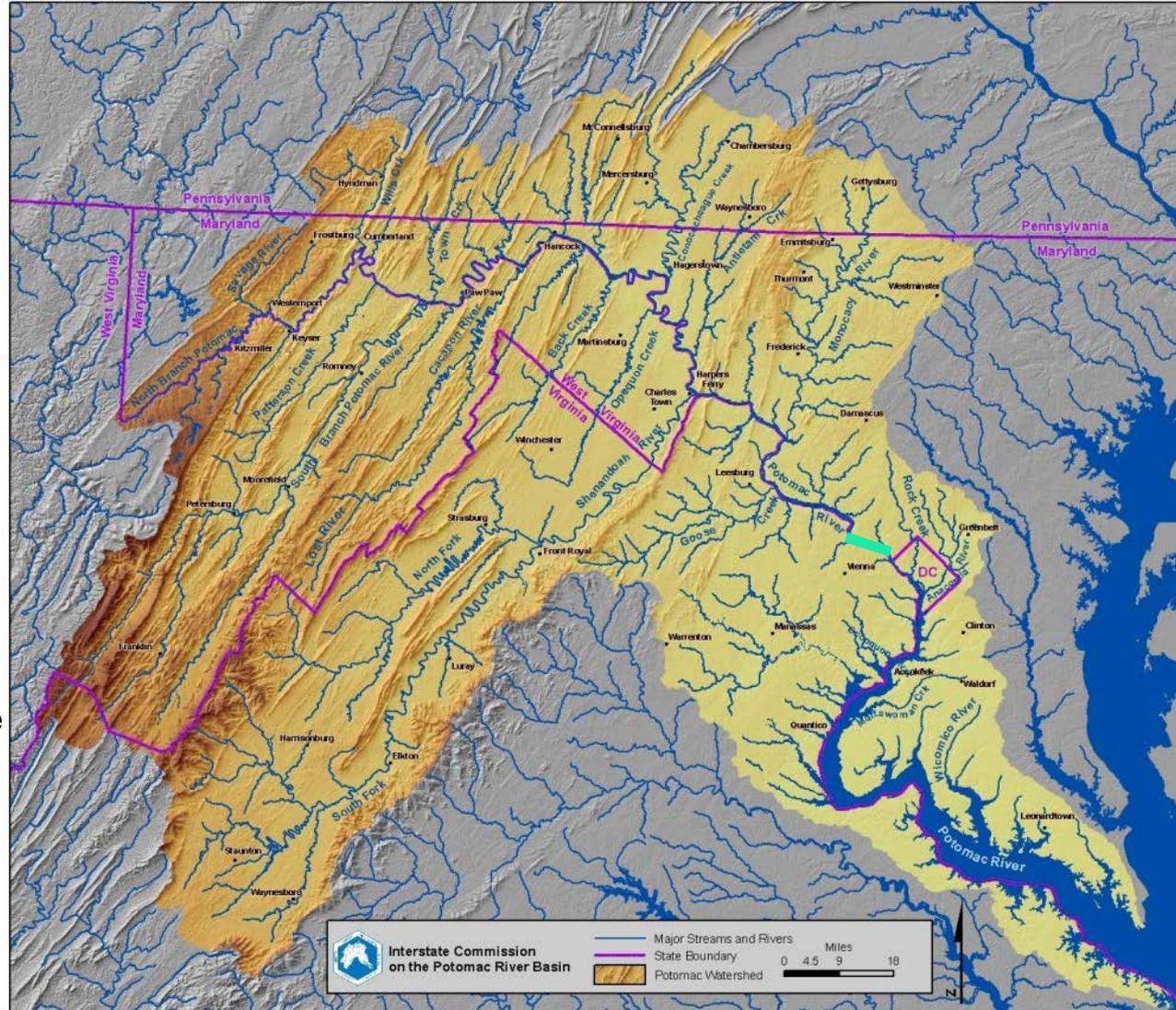
Interstate Commission on the Potomac River Basin

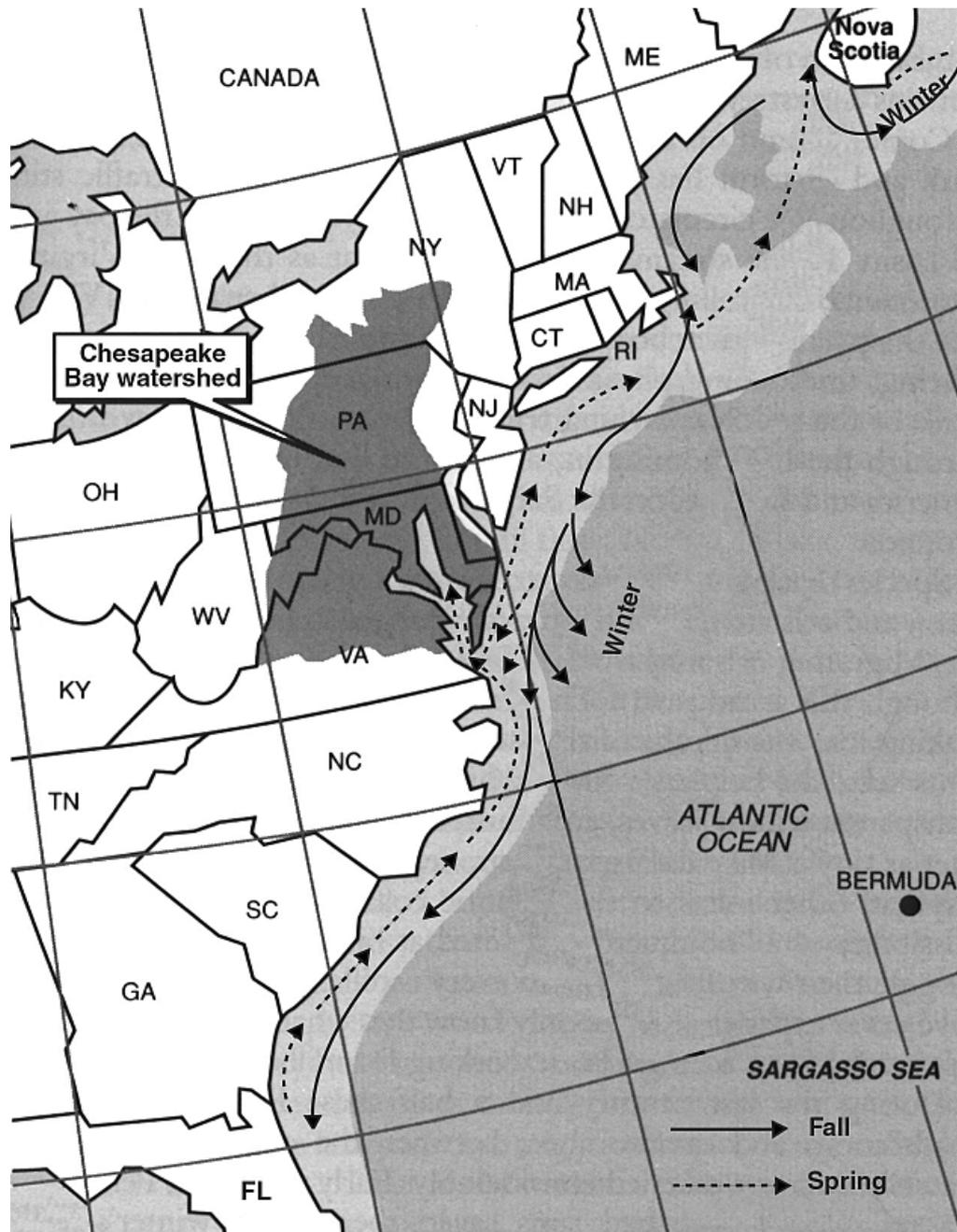
The Potomac Watershed

At 14,640 square miles, the second largest river in the Chesapeake Bay, fourth largest river on the east coast. Home to 6.1 million people, of which 80% live in the greater Washington metropolitan area, most of whom rely on the Potomac mainstem as their drinking water source.

The Potomac mainstem is 383 miles long, generally flows from west to east.

American shad have access to the first 120 miles, 110 miles of which are tidal waters. Great Falls is the natural upstream barrier to their migration, so only 10 river miles of non-tidal, see blue-green bar, all upstream of Washington, DC..





The American shad: A Forgotten Fish

The world's largest herring.

The beautiful fish makes a 12,000 mile journey.

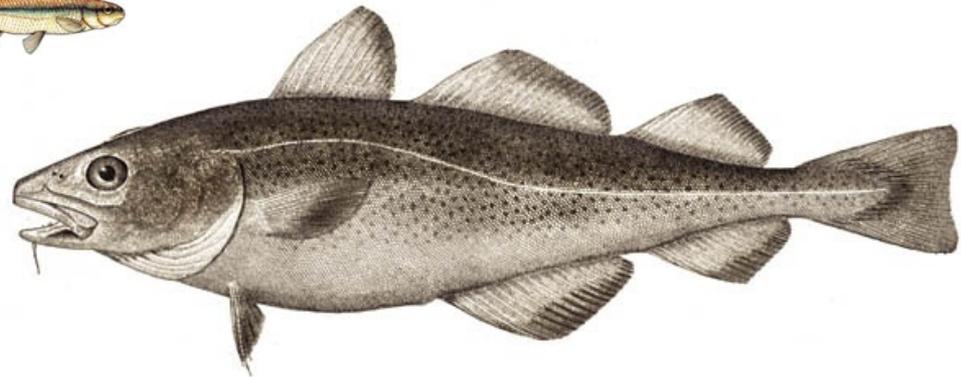
Summers in Canada, Winters near Florida.

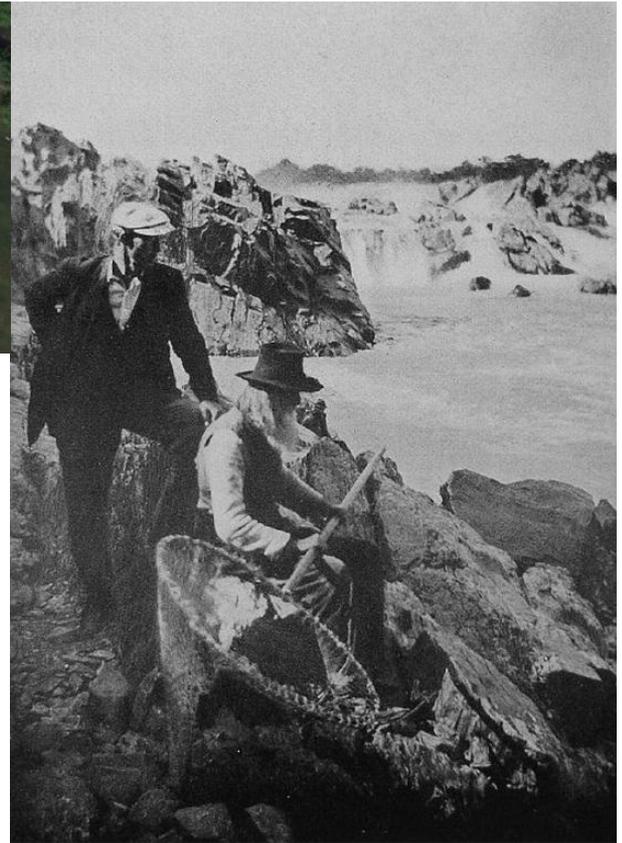
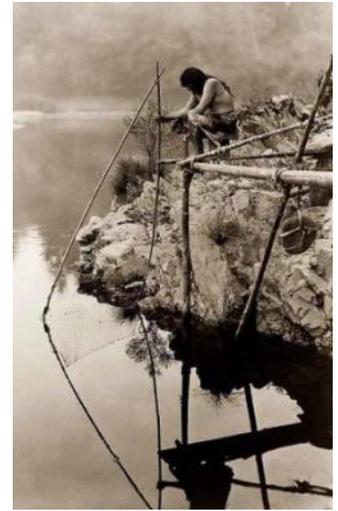
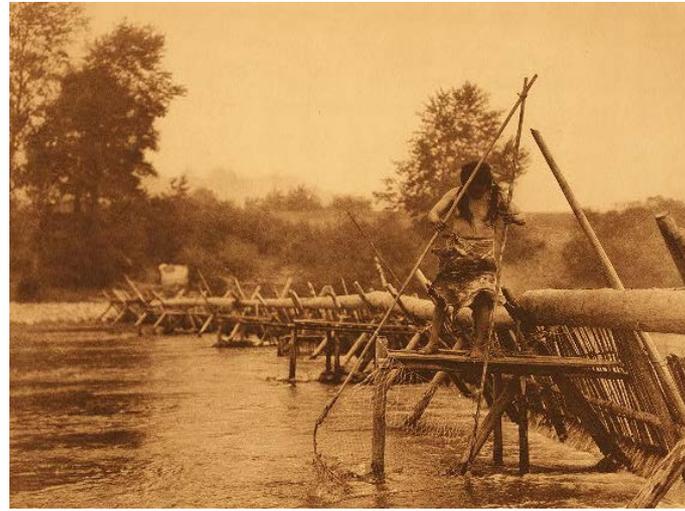
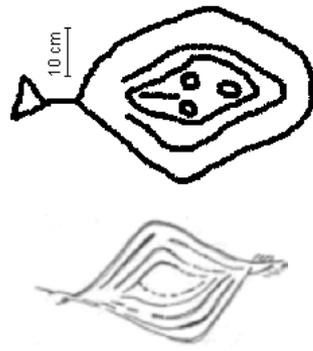
Overall, a pretty good strategy.



Throughout their journey, shad are important to the ecosystem - food for a lot predators.

In rivers they are especially important, as a “clock-spring species,” powering the system.





A little history and background on shad fishing in the Potomac. Images, clockwise from above left:

Petroglyph of shad at Great Falls, artist rendering top, Spanish cave art below

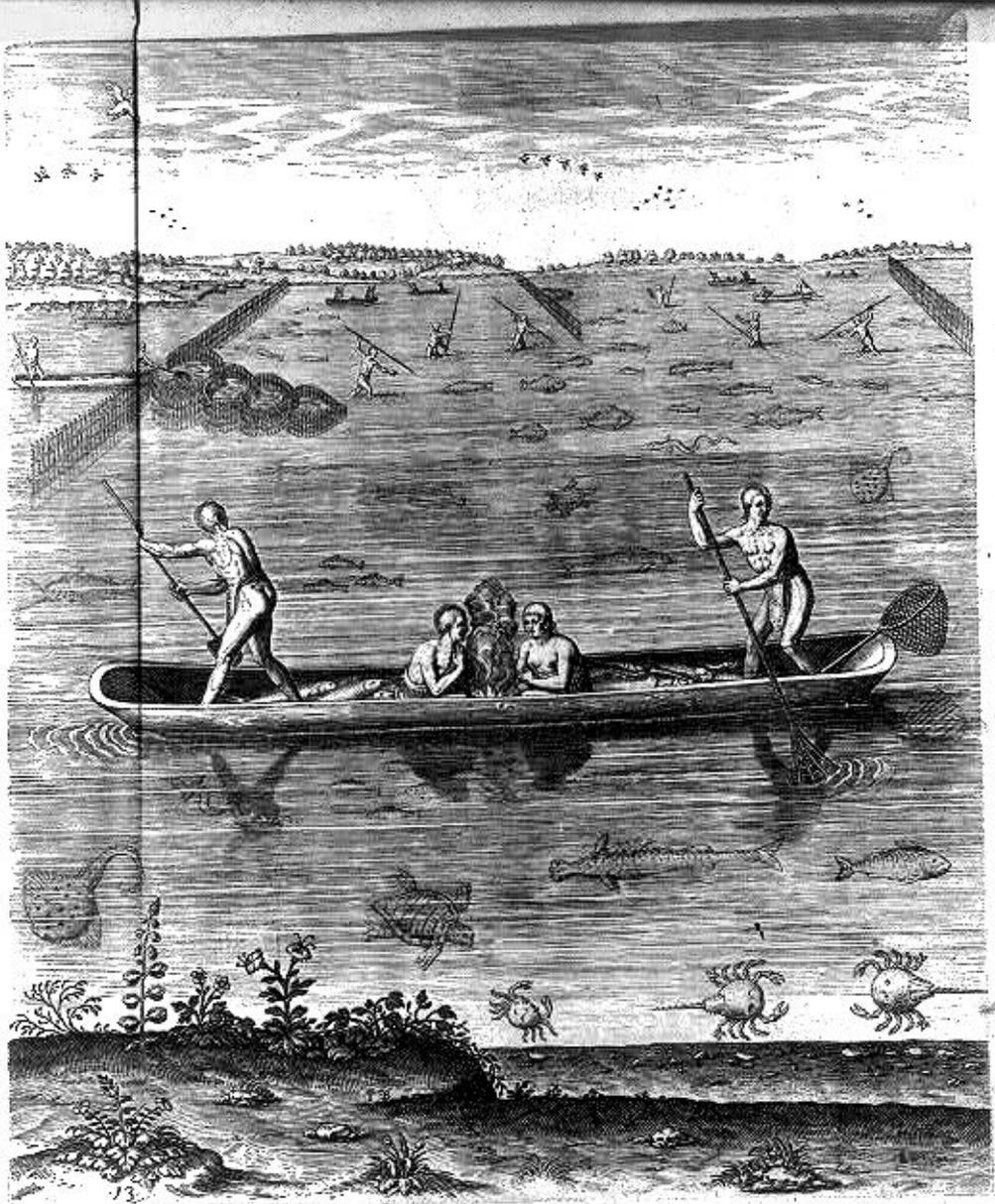
Hupa Indians, Trinity River, CA, bow-netting at weir and on rocks (by E.S. Curtis) - techniques like these were used on the Potomac.

Shad dippers at "Shad Rock," 1912.

Remains of fish weirs "close" to Little Falls.

Lithograph of **fishing at Great Falls**, 1801 (Library of Congress).

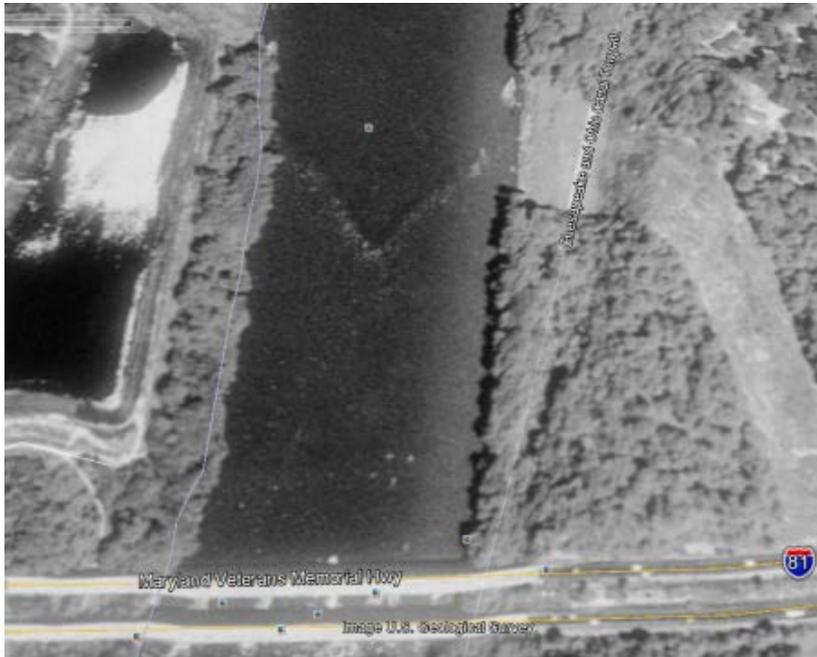
Indian Fish Weirs: Tidal pound nets, left, seen in the upper left of John White's 1585 drawing of coastal North Carolina. On the right are stone (and wood) weirs as generally constructed in the non-tidal rivers. Many of the Potomac's weirs were maintained by subsequent landowners into the early 1900s.



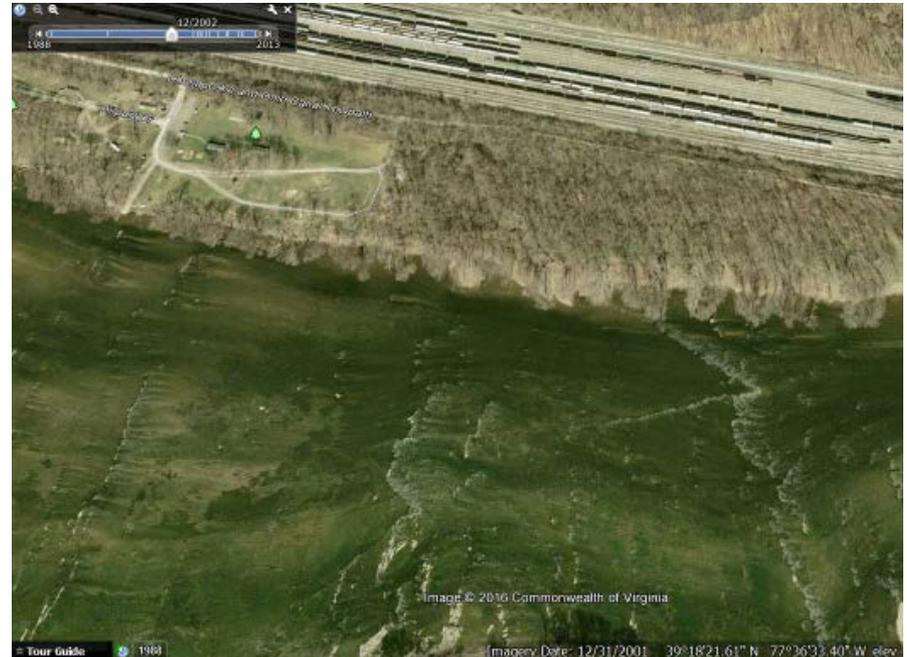
1768 - the Maryland General Assembly ordered Potomac fish weirs that were obstructing navigation to be destroyed. Virginian George Washington was very concerned about them as they impeded the Pawtawmack Company's boats..

In the late 1800s they were seen as detrimental to sports fishing. The 1926 Black Bass Act made commercial sale of bass illegal and forced the end of the use of these Potomac weirs. Weirs which had been fished for hundreds of year were systematically destroyed with dynamite by the young Maryland Fish Commission.

Thirty-six stone weirs have been documented in the 12 mile section of the Potomac River between Point of Rocks, Maryland and Harper's Ferry, West Virginia (Strandberg and Tomlinson 1969; Strandberg 1962)



Fish weir on Potomac mainstem upstream from I-81



Fish weir near Brunswick, MD, which was once called "Eeltown."

Prehistoric Fishweirs in Eastern North America, 1992, By Allen Lutins (SUNY Masters Thesis,)

Strandberg, Carl H., 1962: Ancient Indian Fishtraps in the Potomac River. Photogrammetric Engineering 28(3):476-478.

Strandberg, Carl H. and Ray Tomlinson, 1969: Photoarchaeological analysis of Potomac River fish traps. Am. Antiq. 34:212-219.

The remnants of a very large (900') double fish weir located a few miles upstream from Chain Bridge. Given its location, this weir was likely used to collect American shad. A village or at least a seasonal occupation site was likely very close-by.





Shad were important to new Americans. George Washington had a shad fishery at Mount Vernon. In 1778, shad saved the starving Continental Army at Valley Forge (See "The Valley Forge Fish Story" at http://www.cbr.washington.edu/shadfoundation/shad/JOURNAL4.2/vol4n2.htm#_Hlk475790295)

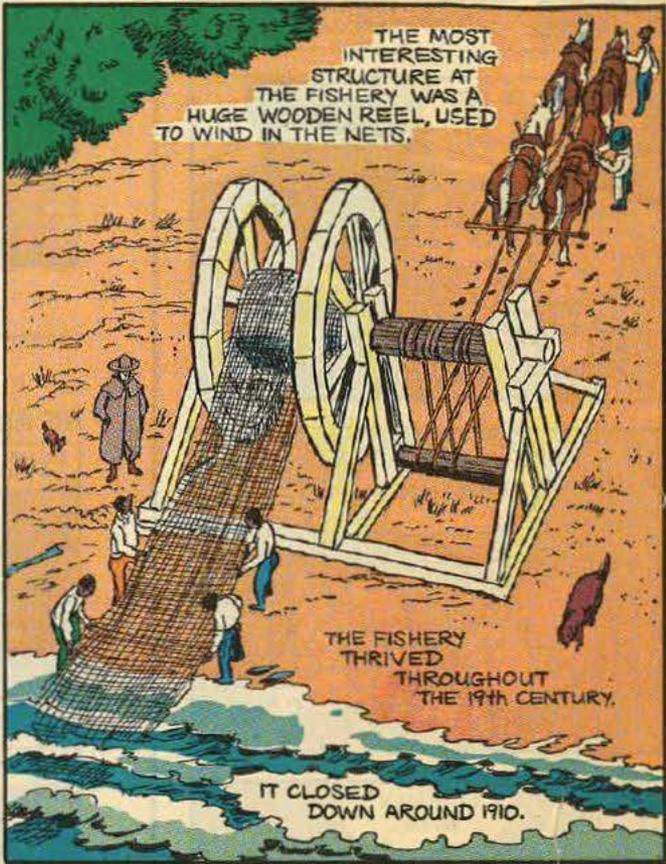
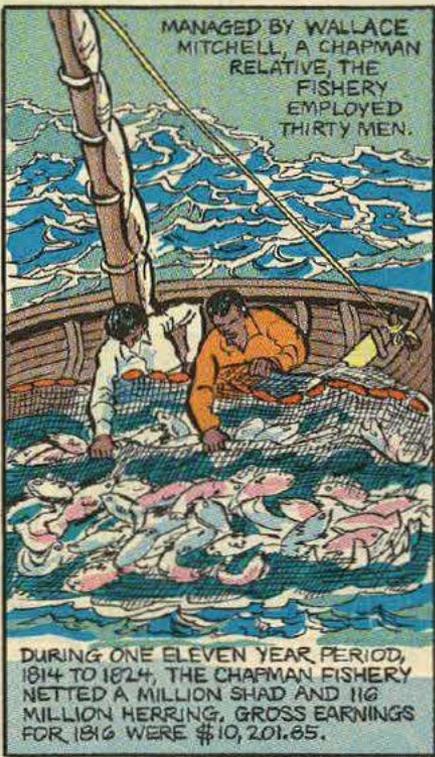
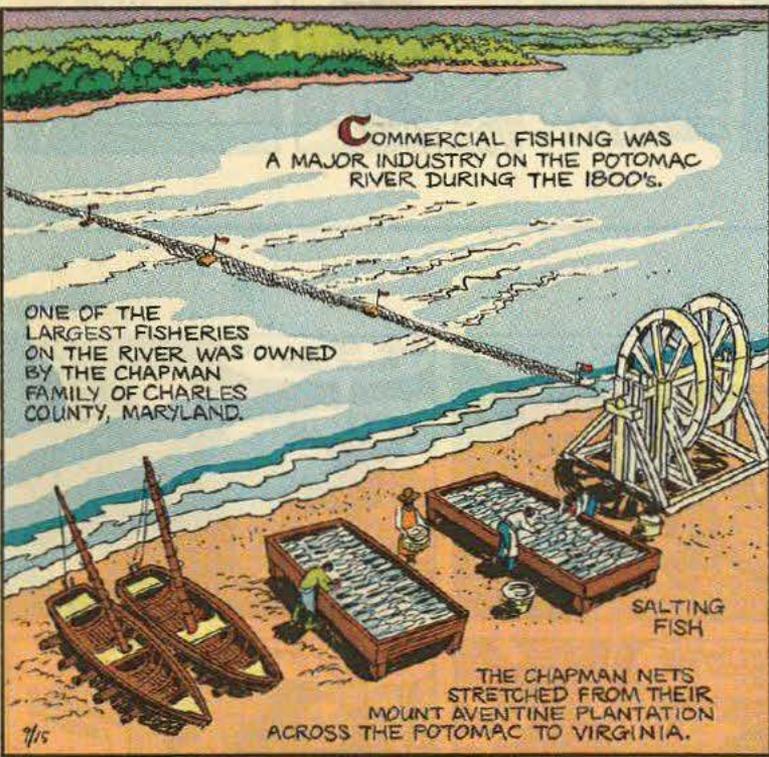
Commercial fishing, with the American shad the Potomac River's and Chesapeake Bay's most economically important fish, grew in complexity with the onset of the industrial revolution and increasing human demand. The Chapman fishery, illustrated below, was located in Maryland across the river from the Mason Neck area of Virginia, another site of large-scale commercial fisheries.

FLASHBACKS

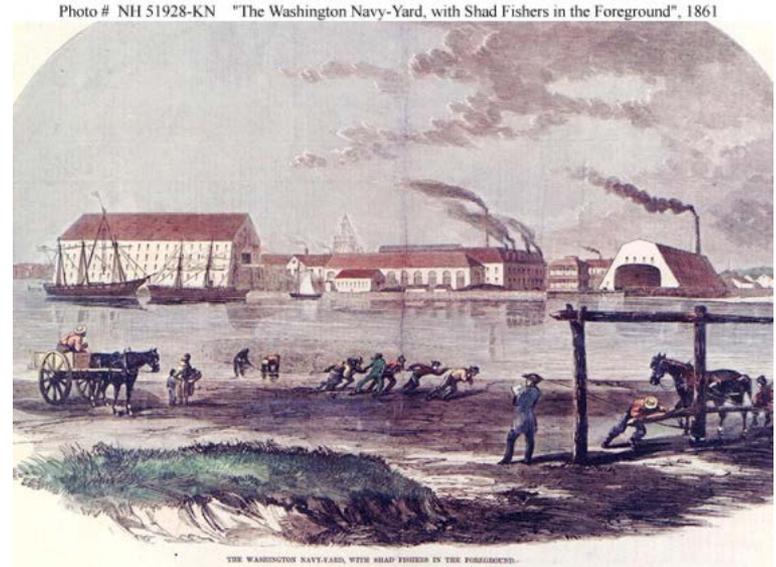
by Patrick M. Reynolds

Gone Fishing

Wash Post 9-15-96 Section 2



Traditional Shad Fisheries on the Potomac River, circa 1861 to early 1900s.



Shad Fishery
Commencing to boat seine.
Stony Point
Potomac River



Black History:

Black watermen are abundant in the photographs or art of historic shad fisheries of the Potomac and other mid-Atlantic rivers.



A similar story for the Delaware - Thomas Eakins' from Shad Fishing Gloucester DE, 1881



**If you are interested in more information on black watermen, please see my presentation entitled
“American Shad and Black Watermen: A Heritage Nearly Forgotten**

**Available at the ICPRB website “potomacriver.org”
Click “Focus Areas,” then “Aquatic Life,” then go to American Shad Restoration”**

The American shad was once remarkably, even outstandingly, abundant in the Potomac River.

From Spencer F. Baird, left, first Director of the US Fish Commission*, in their report for 1886:

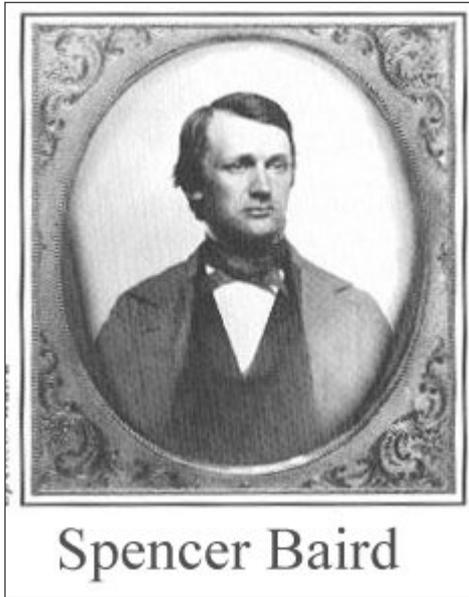
“No better illustration of the numbers in which anadromous fish enter the rivers can be given.... than a presentation of the case as it relates to the Potomac River in the short distance between its mouth and the Great Falls of the Potomac, only twelve miles above Washington.”

An estimated 22,500,000 shad (110,000,000 lbs) were harvested from the Potomac River in 1832. = 50,000 tons = 1/10 of all fish and shell fish currently harvested in North America.

“Approximately 995,000 barrels of salt were used to cure them.”

That many barrels would make a pyramid with a base the size of a football field from endzone to endzone and a height of 300’.

One barrel of salt is used to make 5 barrels of shad/herring, so the shad-barrel pyramid [Δ] is 5X larger!



*Appointed in 1871, Baird was also the Smithsonian's 1st Curator (apt: 1850) and 2nd Secretary (appt:1878).

Preparing shad and other herrings were substantial industries, employing over ten thousand on the Potomac alone.

They were smoked, then salted in barrels.

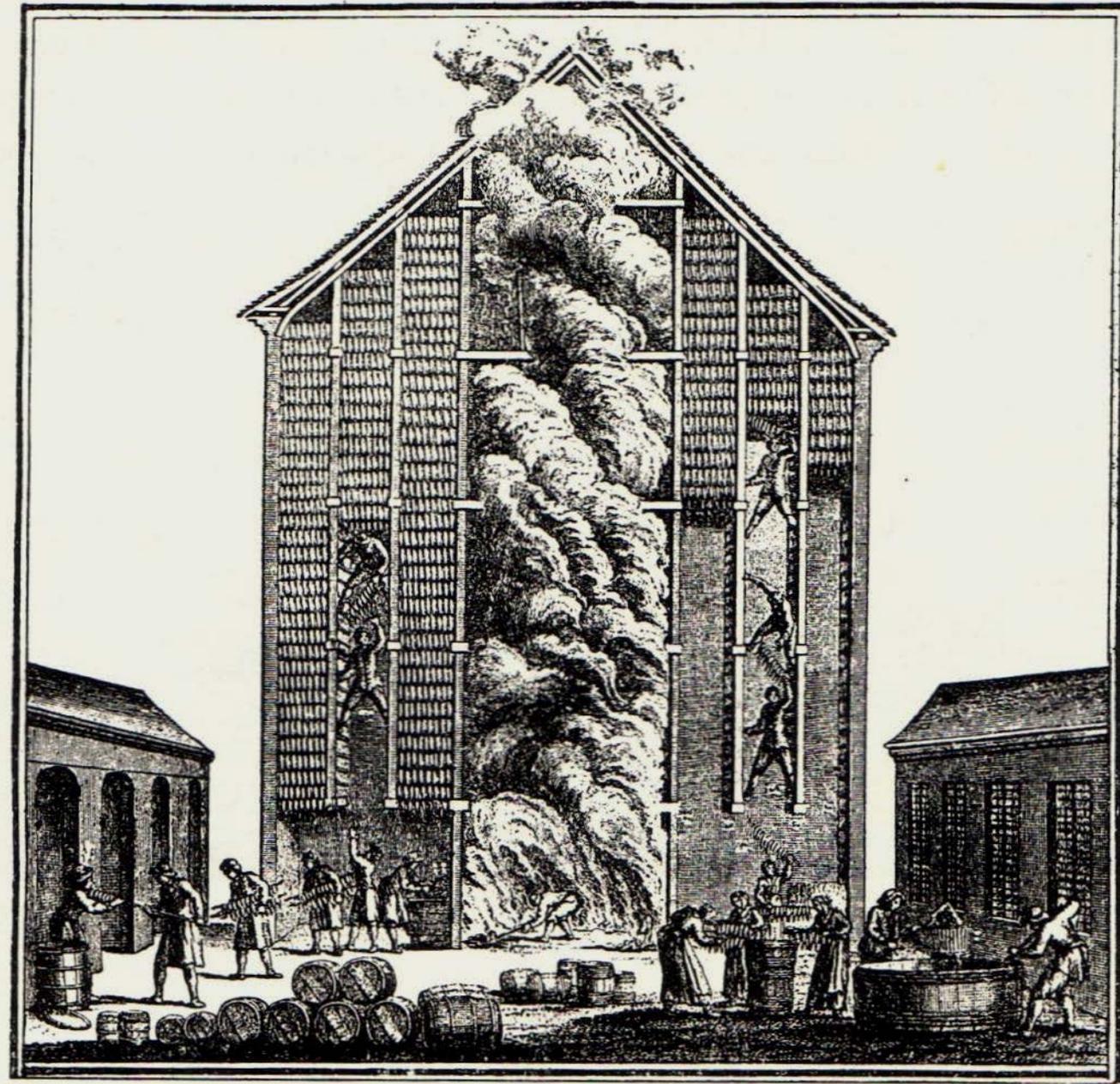
How many fish in the smoker? Approximately 1500 fish could be in the visible layer alone.

There is no way to tell the length of the building. If it was 30' long, with 1 layer/foot, it could hold 45,000 shad.

That's a smoker!

Image is from Singer, Charles, 1958.
A History of Technology, 1750-1850.

Volume IV, p. 49.



Shad planking is a cooking technique where shad are slowly baked on wooden blanks before a bonfire. Shad plankings were big events along the Potomac as early as 120 years ago.

Right: Marshall Hall, MD 1893 (Lib. Of Congress)

Below Top: Annual Shad Plank, DC Bar 1916. Bottom: Marshall Hall, MD 1924 .



**“Largest seine
in the world”**

**At Stoney Point,
Mason Neck VA,
Potomac River,
c 1890s.**

**The seine net was
6 miles long!
(32,000 feet)**

**They caught 5,000
shad in one haul.**

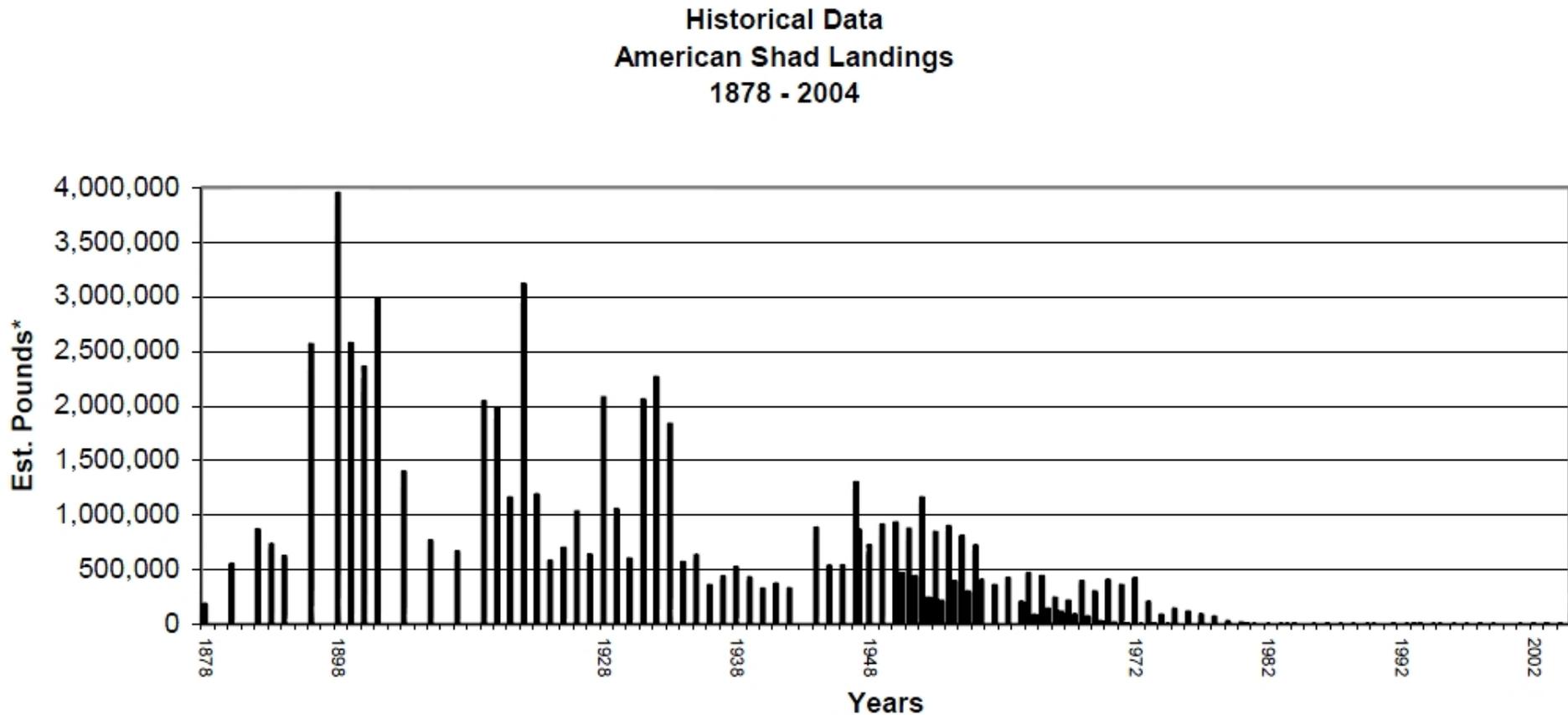
**Not surprisingly, shad
started to disappear.**



Largest seine in the world. This seine, operated for shad and alewives at Stoney Point, Virginia, on the Potomac River, was the longest net of the kind. The net proper was 9,600 feet in length, and the hauling ropes at the ends were 22,400 feet long, giving 32,000 feet as the total sweep of the seine, only one end of which shows in the illustration. The seine was hauled by steam power and the labor of 80 men, and was drawn twice daily, at ebb tide, throughout the season. As many as 3,600 shad were taken at one haul, and 126,000 in one season, and 350,000 alewives were caught at one time. Recently the season's yield of shad fell to 3,000, and the fishery was consequently discontinued in 1905 after having been carried on for a century. This seine was a source of eggs for the Bureau's shad hatchery on this river. (See p. 1399.)

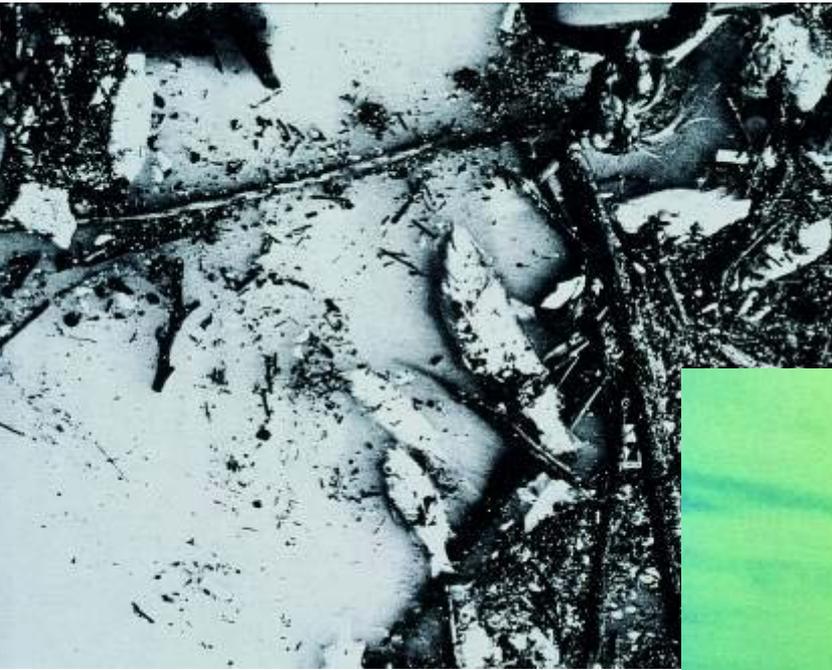
Shad Landings in the Potomac River

Figure 2. The 1878- 1956 Potomac landings are from *Chesapeake Fisheries*. The 1964-2004 landings are from PRFC data. (PRFC)



However, the decline in shad was not due solely to over-fishing. Like other east-coast rivers, there are three main reasons for their decline in the Potomac, each had significant impacts:

- 1) Over-fishing (as shown and discussed),
- 2) Pollution, and
- 3) Loss of Spawning Habitat
(primarily due to dams).



Pollution: The Potomac River was once synonymous with water pollution. Huge fish kills which occurred during the 1960s, especially during Spring spawning runs, led President Johnson to declare the Potomac River “a disgrace.”



↑ Dock at Mount Vernon, 1972.

Our nation’s founders would have been shocked about the state of the beloved Potomac.

←Virginia (Private lands)

Dams: there are two at Little Falls

Maryland (& C&O Canal NP) →

They blocked fish migrations until a fishway was constructed near the Virginia shore in 2000.
Inset at lower left shows the natural channel visible on the Virginia side during low flow (1999).

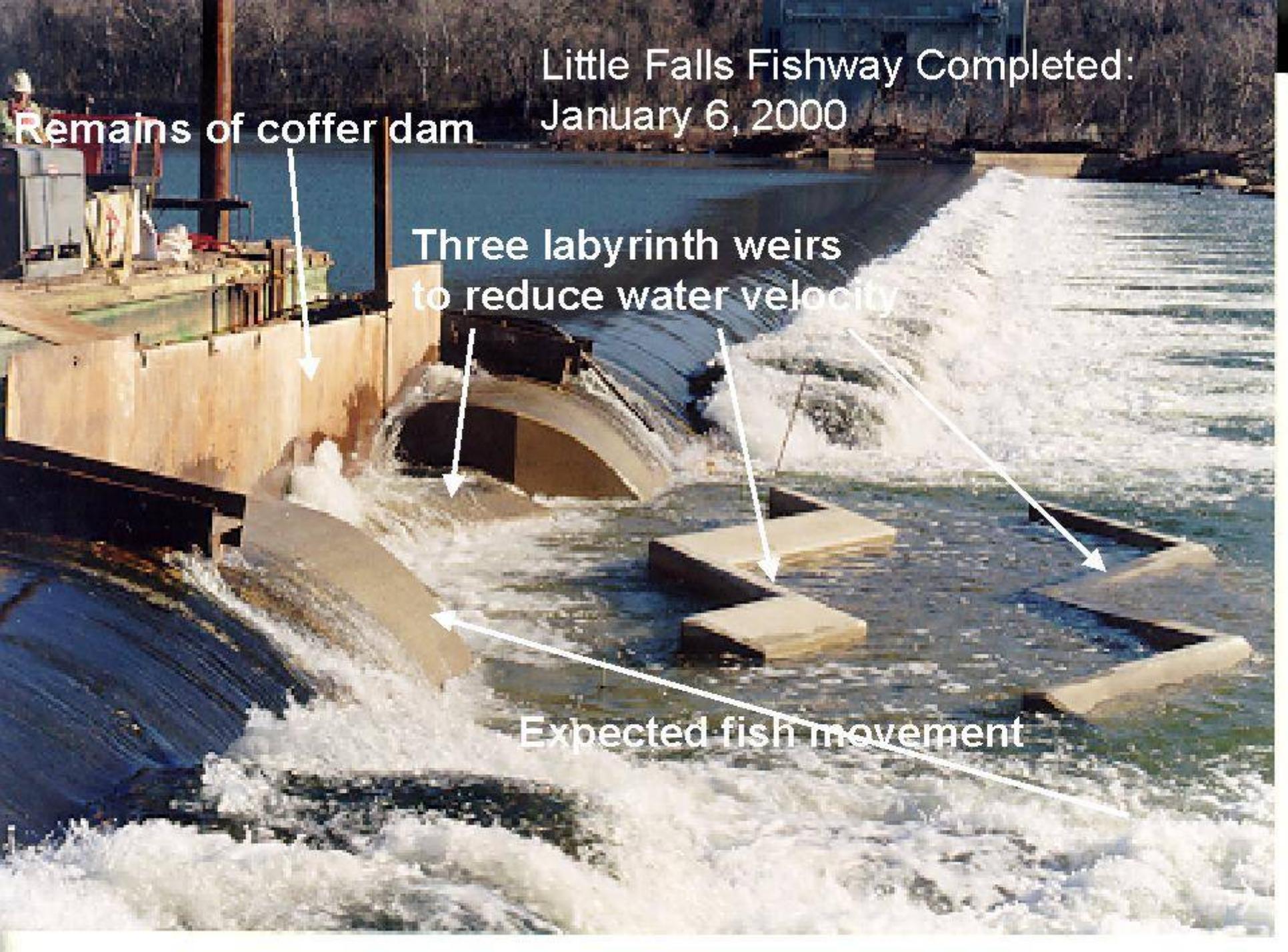


Little Falls Fishway Completed:
January 6, 2000

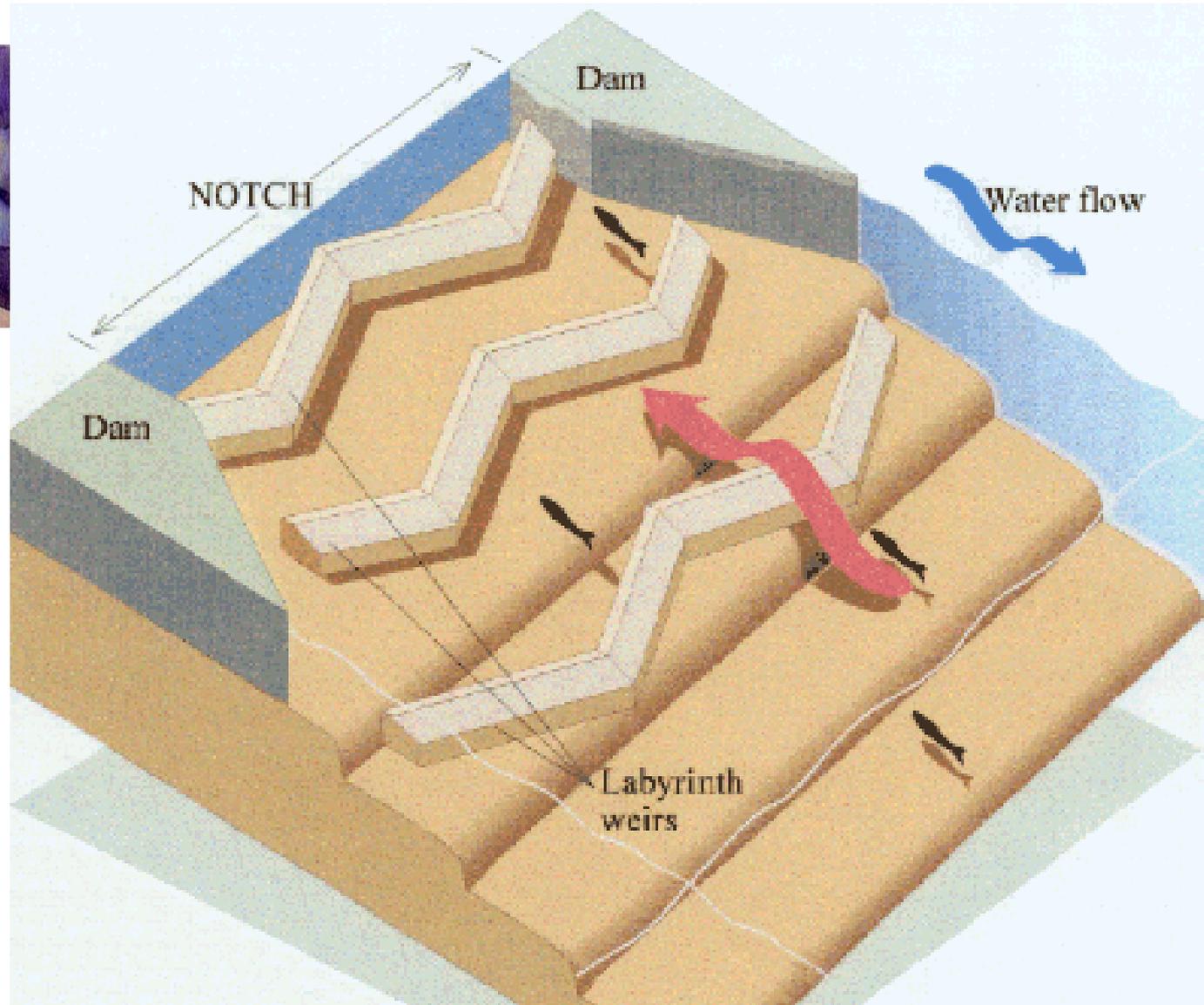
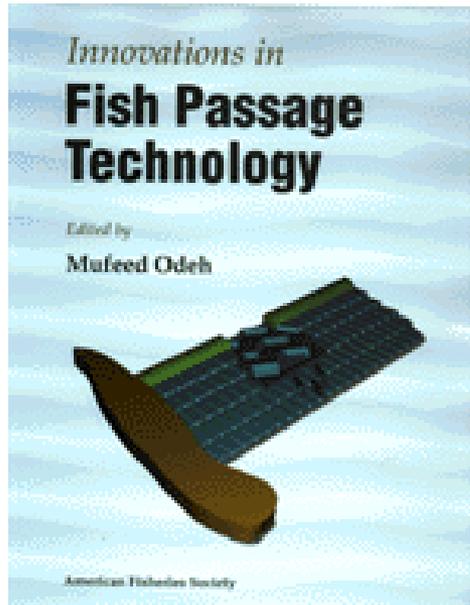
Remains of coffer dam

Three labyrinth weirs
to reduce water velocity

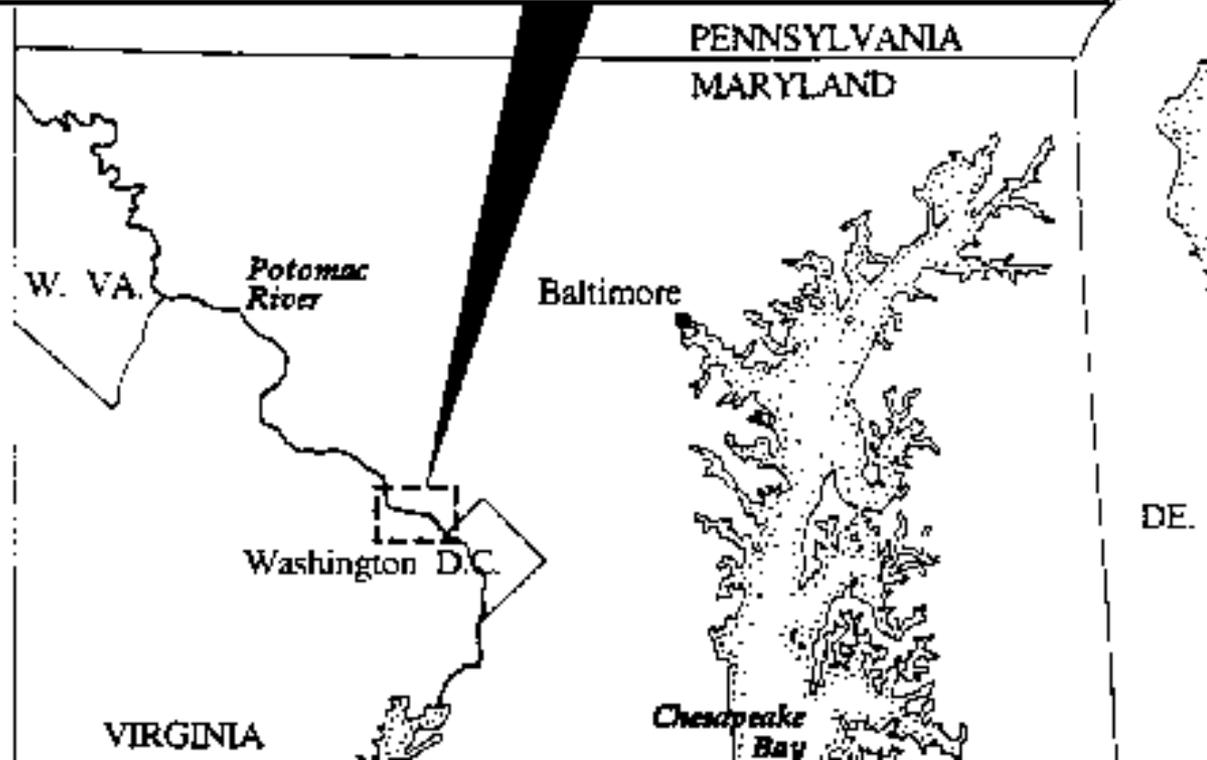
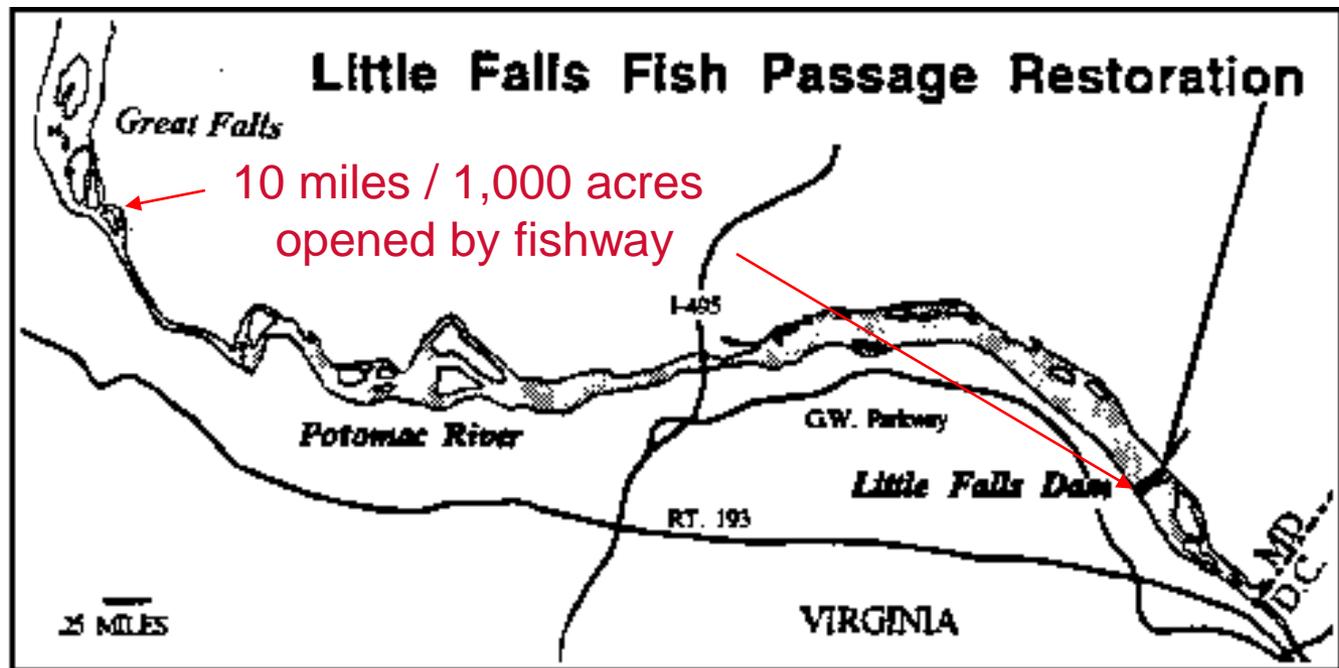
Expected fish movement



The fishway notch uses a new design with three labyrinth weirs.



Fishway
location



Providing fish passage alone is not enough.

A program to stock American shad fry upstream of Little Falls was initiated in 1995 with the purposes of imprinting them to the historic waters and to help rebuild the shad population.

However, with the population so low, where do you go and how would you capture spawning adults for brood stock?

It is best to use experience, but the fishery closed in 1982.

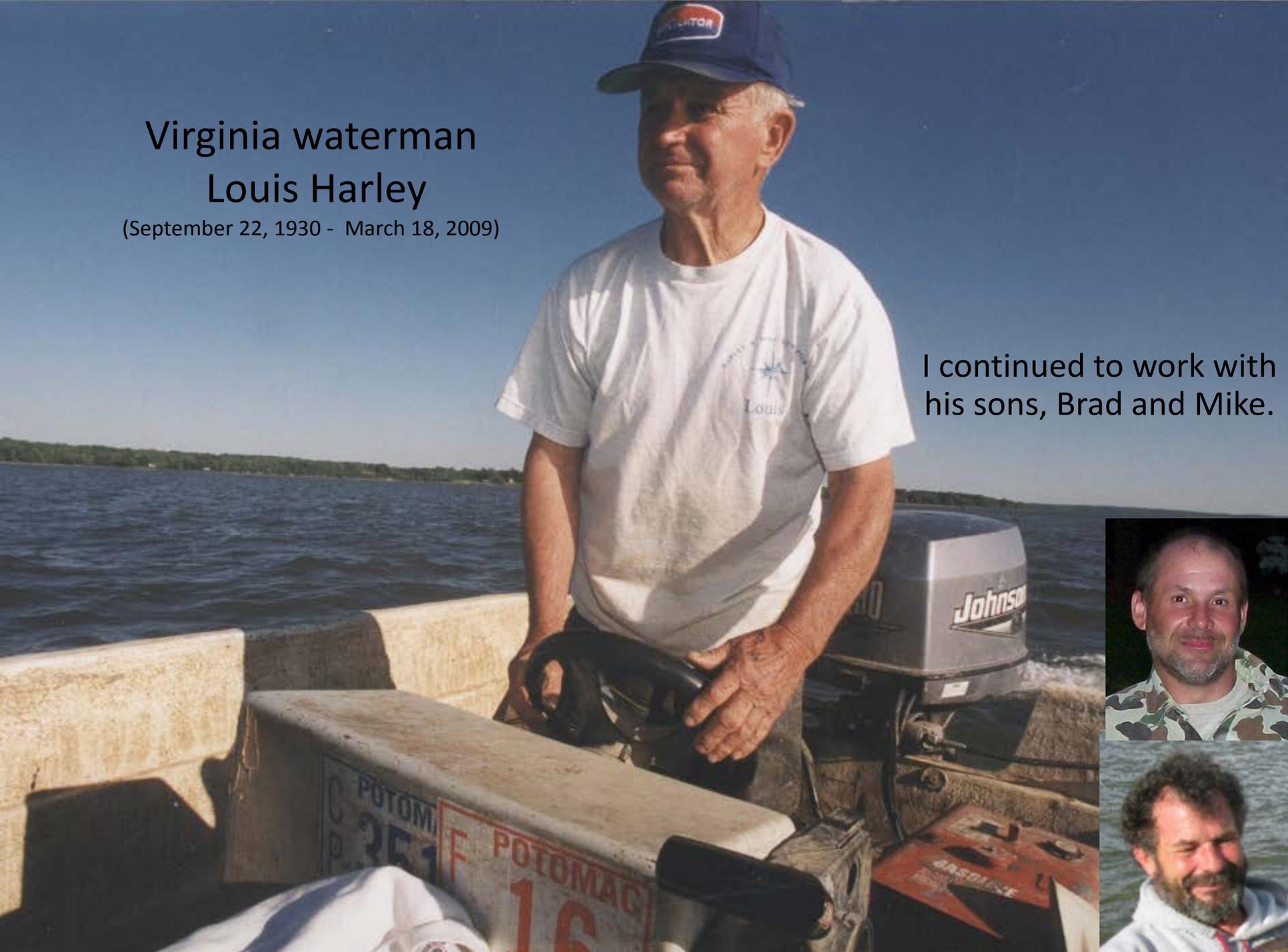
Where could we find experience?

Right: Drift Gill-netting for American Shad in the Potomac River, near the mouth of Dogue Creek, off of Fort Belvoir and Mount Vernon, VA



Virginia waterman
Louis Harley

(September 22, 1930 - March 18, 2009)



I continued to work with
his sons, Brad and Mike.



Hundreds of volunteers have helped over the years - on many damp and chilly nights.



Eggs and milt are field stripped and the fertilized eggs are hardened for approximately one hour before transport .



The fertilized eggs are transported to the USFWS's Harrison Lake National Fish Hatchery. Dave Petersen* loads a new batch into a hatching jar. The eggs hatch in about 4-5 days and then swim into the larger blue holding tank.

*Dave was instrumental in developing a scaled-down egg chamber used by the schools.



After hatching and OTC marking, the fry were stocked back in the Potomac River at Mather Gorge near Great Falls, the natural upstream boundary to shad migration, which is approximately 10 river miles upstream from Little Falls.

Over 17 million shad fry were stocked from 1995 to the conclusion of restoration stocking in 2002.

From 2002 until 2014 we supplied Potomac origin shad eggs to the Virginia Department of Game and Inland Fisheries for their Rappahannock River shad restoration. 48 million shad fry were stocked into the Rappahannock River and an additional 5 million into the Potomac River, the latter as “replacement stocking” (versus restoration stocking).

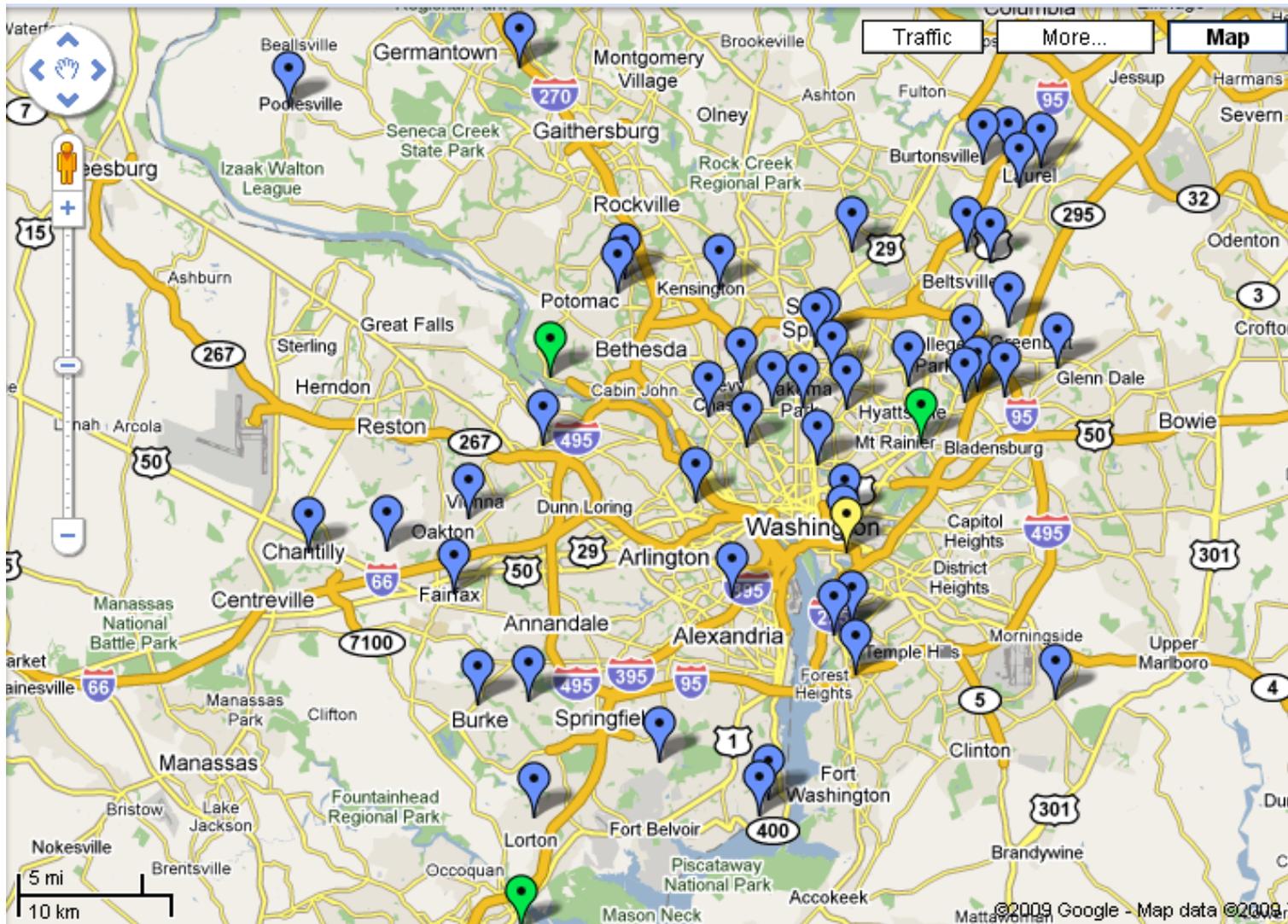


A by-product - Since 1996, tens of thousands of Washington area students have released almost 800,000 shad fry hatched in their classrooms.



Dozens of schools from around the metropolitan Washington area have been involved.

Hayfield Secondary and Walt Whitman Middle Schools



Many students joined us on the river.



Shad Set-up
Students sorting infertile eggs.
Sligo Creek Elementary, MD
Picture by Charles Gale –
Teacher -



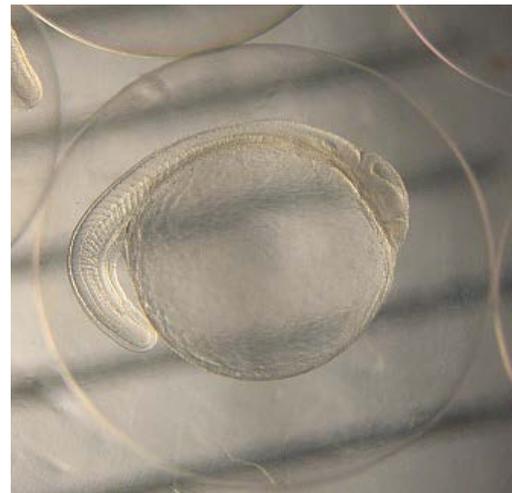
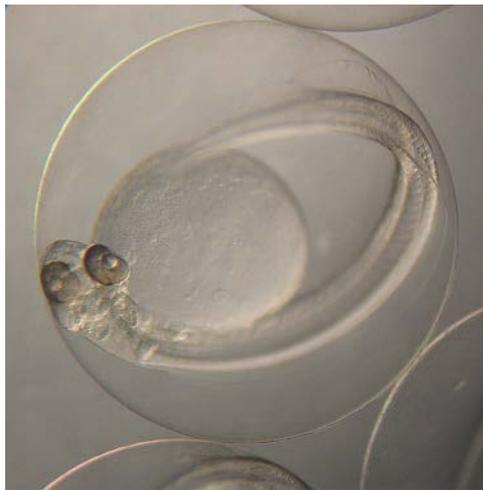
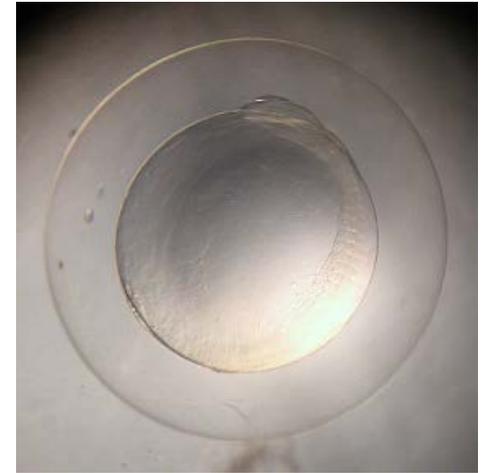
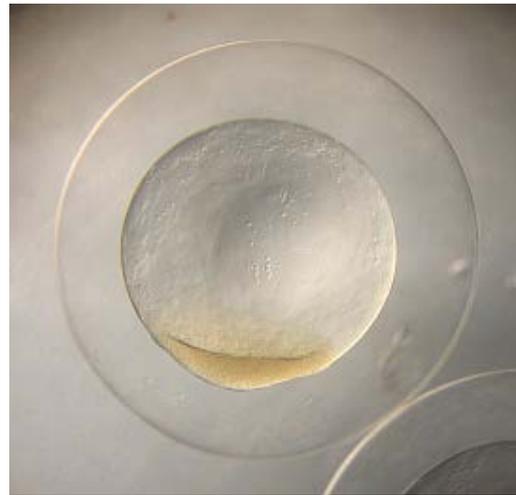
Students enjoy learning about shad. In the background, each of the shad “swimming” on the hallway wall at Westbrook Elementary, MD., contains student’s individual stories about shad.





Students become teachers.

Fifth graders teaching second graders about their American shad project.



Shad Development - Days 1 – 5
Picture by Charles Gale – Teacher - Sligo Creek Elementary School





**GOODBYE
WEST BROOK SHAD**



Handwritten signatures and notes on the banner.

Handwritten notes on the banner.

Ben Symons, a 5th Grader from Westbrook Elementary School, Montgomery County, Maryland, at the head table during the October 12, 1999, dedication ceremony for the fishway. Ben provided supporting remarks along with Secretary of Interior Bruce Babbitt, Md. Senator Paul Sarbanes, Md. Gov. Parris Glendening, Congresswoman Connie Morella, USCOE Brigadier General Stephen Rhoades and Col. Bruce Berwick.



Bethesda Chevy Chase High School, May 2007=>





**So what has happened to the
Potomac's shad population?**



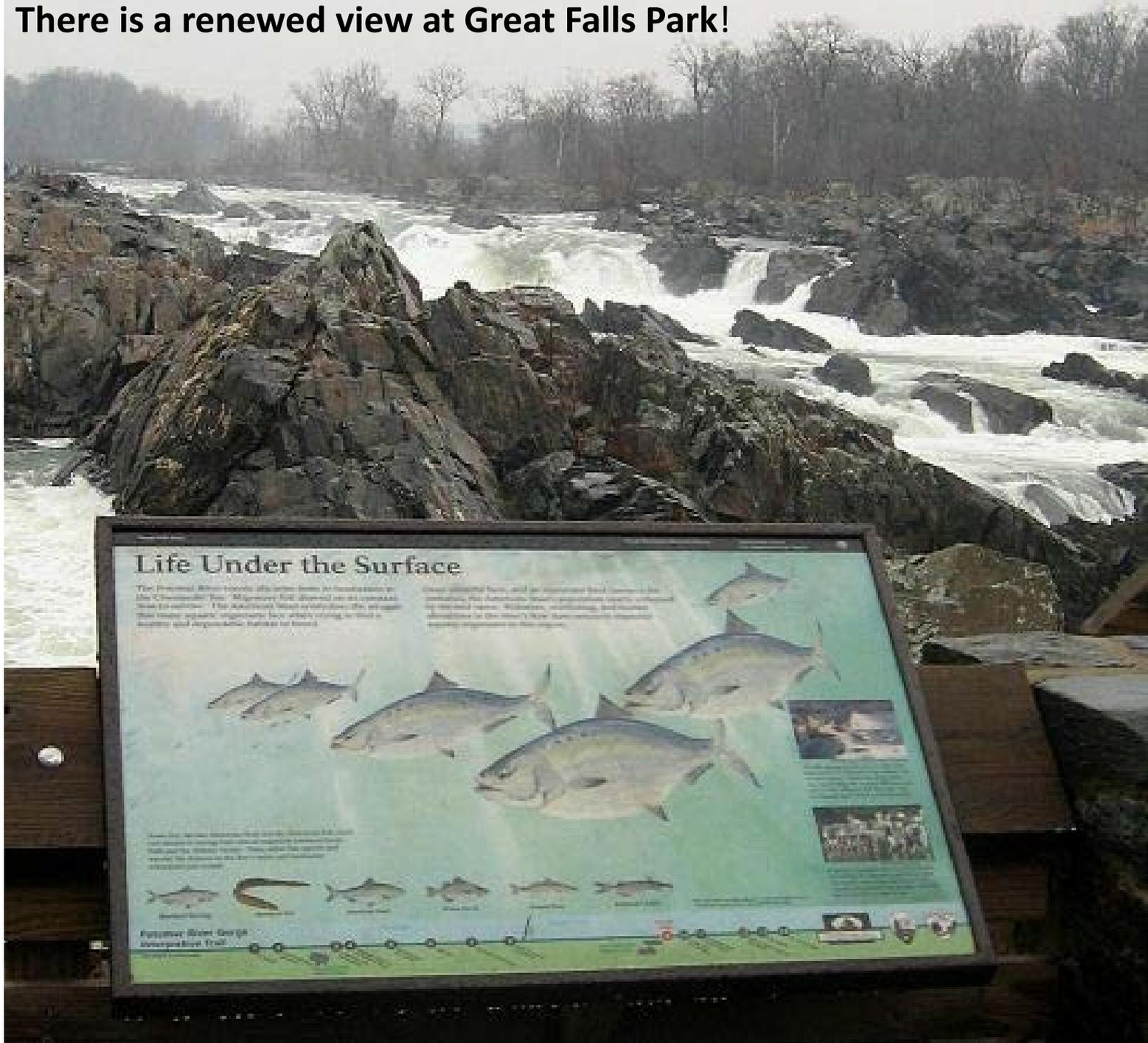
The fishway at Little Falls is working.

Mike Odom, USFWS, with one of the first shad captured at Great Falls after the fishway was opened in 2000. Mike is standing on "Shad Rock."

Year----# shad
2000 ---- 3
2001 ---- 12
2002 ----43



There is a renewed view at Great Falls Park!



Life Under the Surface

The Pennsylvanian River provides a unique habitat for several species of fish. The river's fast-moving water and rocky banks create a diverse and dynamic environment. The river's unique features, including its rapids and cascades, provide a natural habitat for many species of fish, including the American Shad, Rock Bass, and Rock Bass.

These different fish, and the unique habitat they inhabit, are part of the river's diverse ecosystem. The river's unique features, including its rapids and cascades, provide a natural habitat for many species of fish, including the American Shad, Rock Bass, and Rock Bass.



Pennsylvanian River Gorge
Interpretive Trail

"Anacostia Shad"

(1 of 4), in Melrose Skate Park, Rhode Island Ave, Hyattsville, MD; glass mosaic by Valerie Theberge, 2011. I love the Japanese stylized wave, and since the shad spends 9/10ths of its life in the ocean, returning to its natal river to spawn, its depiction amongst waves follows its lifecycle. Valerie's artwork tries to show Hyattsville's global linkage. This is a skate park, so hopefully such linkage expands the youths awareness. A little, but it all helps.



OUTDOORS

ANGUS PHILLIPS

Shad News for Local Anglers

Of all the fish that swim in the sea, few are as easy to catch as shad. That's because you don't have to go to sea to catch them. Each spring they come barreling back to the rivers where they were born to scatter eggs by the millions. Dangle a small lure or fly in front of them, and they'll smash at it, then leap and dance at the end of your line.

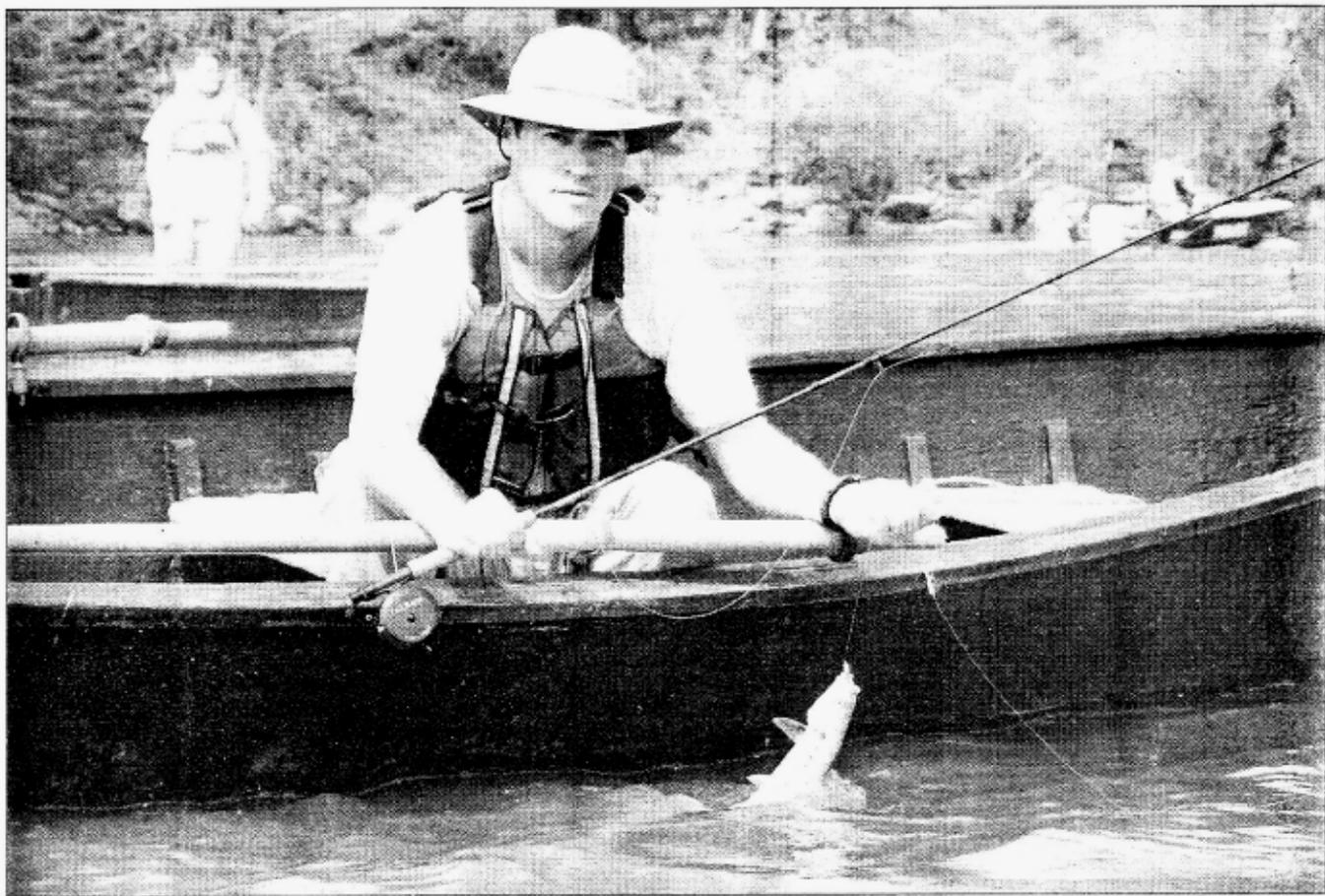
When is best? Right now. Where? Right here.

"They're thicker than fleas," said Mike Bailey, still slightly breathless after landing a six-pound American shad Thursday on the Potomac off Fletcher's Boathouse in the District.

"It ought to be right at the peak here by the end of the month," said Max Skelly of Havre de Grace, Md., just back from a midweek foray on Octoraro Creek off the Susquehanna River, where he caught 20 hickory shad in 40 minutes before reluctantly going to work. "They were all big fish, too," he said. "The Susquehanna is loaded right now."

"Fishermen were shoulder-to-shoulder at all the good holes on the Rappahannock when I crossed the Route 1 Bridge at Falmouth this morning," said Lt. Phil Parrish, a Virginia game warden who works the waters around Fredericksburg. (All eyes are on the Rappahannock this year after the dam above Fredericksburg was demolished in February, opening miles of new spawning waters to shad and other species).

Even George "Shad Pappy" Magaro, president of the Delaware River Shad Fisherman's Association, said he's landed 26 American shad in three trips around



BY ANGUS PHILLIPS FOR THE WASHINGTON POST

Washingtonian Kevin Barnes shows off a shad he snagged on the Potomac below Chain Bridge. Many shad are now coming up the Potomac to spawn.

Cummins captured American shad in the Potomac from 1995 to 2002, milked their roe and milt, grew fry in tanks and

fishing with enthusiasm. In my two trips to the Potomac this spring I've seen almost as many anglers waving the long wand as fishing

the boat. Since shad are filter feeders from the herring family, the ones hooked in the gills are unlikely to survive, Cummins said.

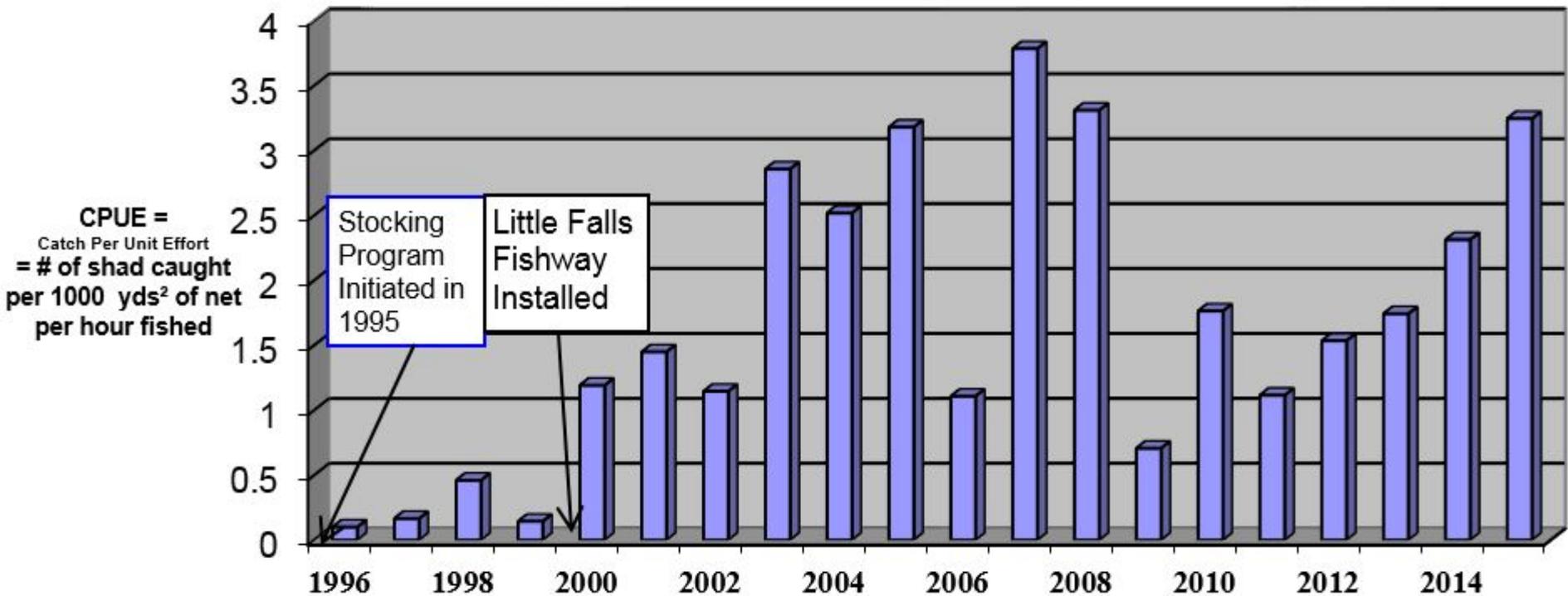


Shad plankings at Fletcher's Cove, 2000-2015

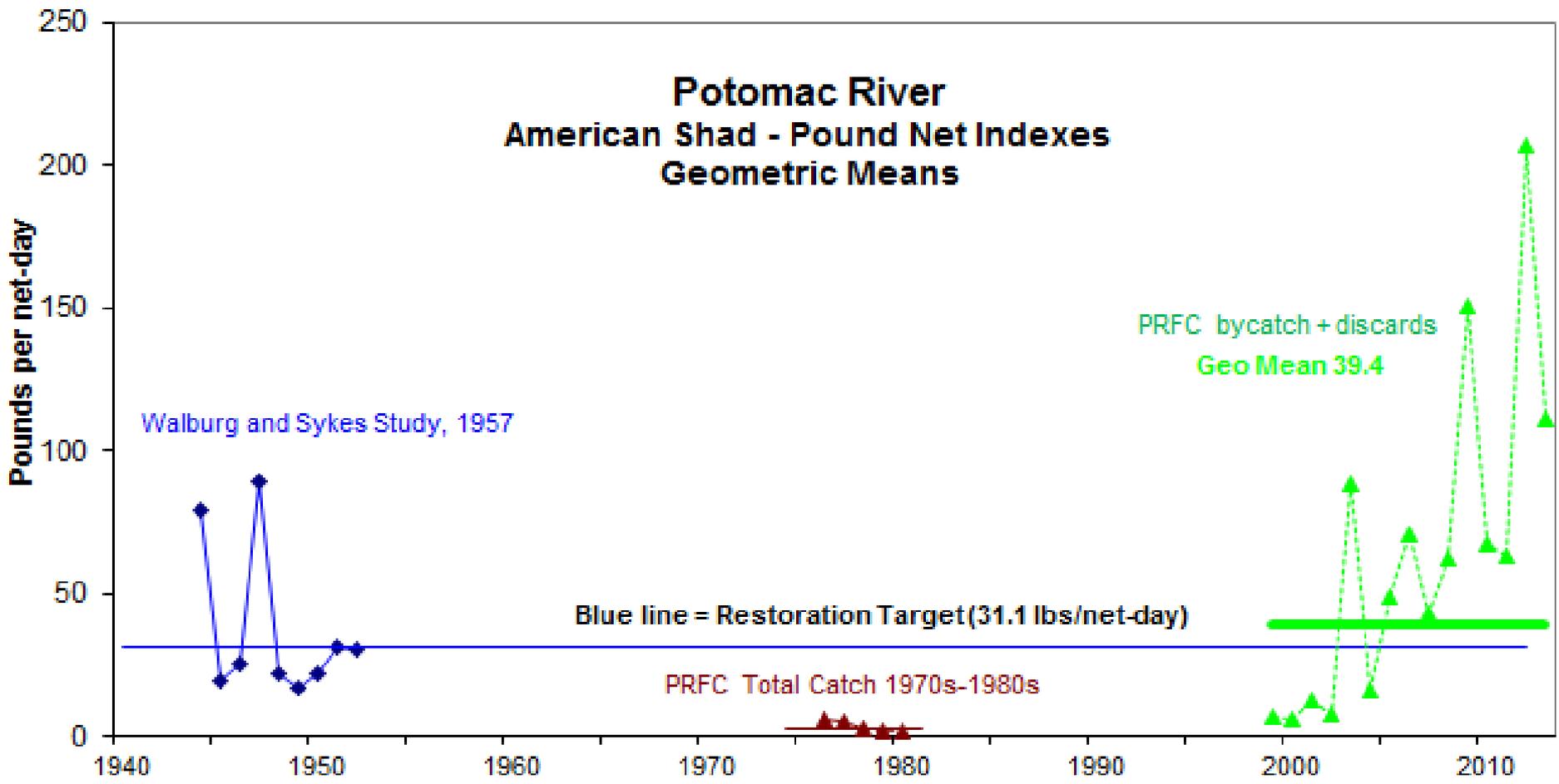


Returning adult numbers have increased significantly.

MD DNR Potomac River American Shad CPUE
during MD Striped Bass spawning stock survey (1996-2015)
(DataSource = Eric Durell, MD DNR, Chart = ICPRB)

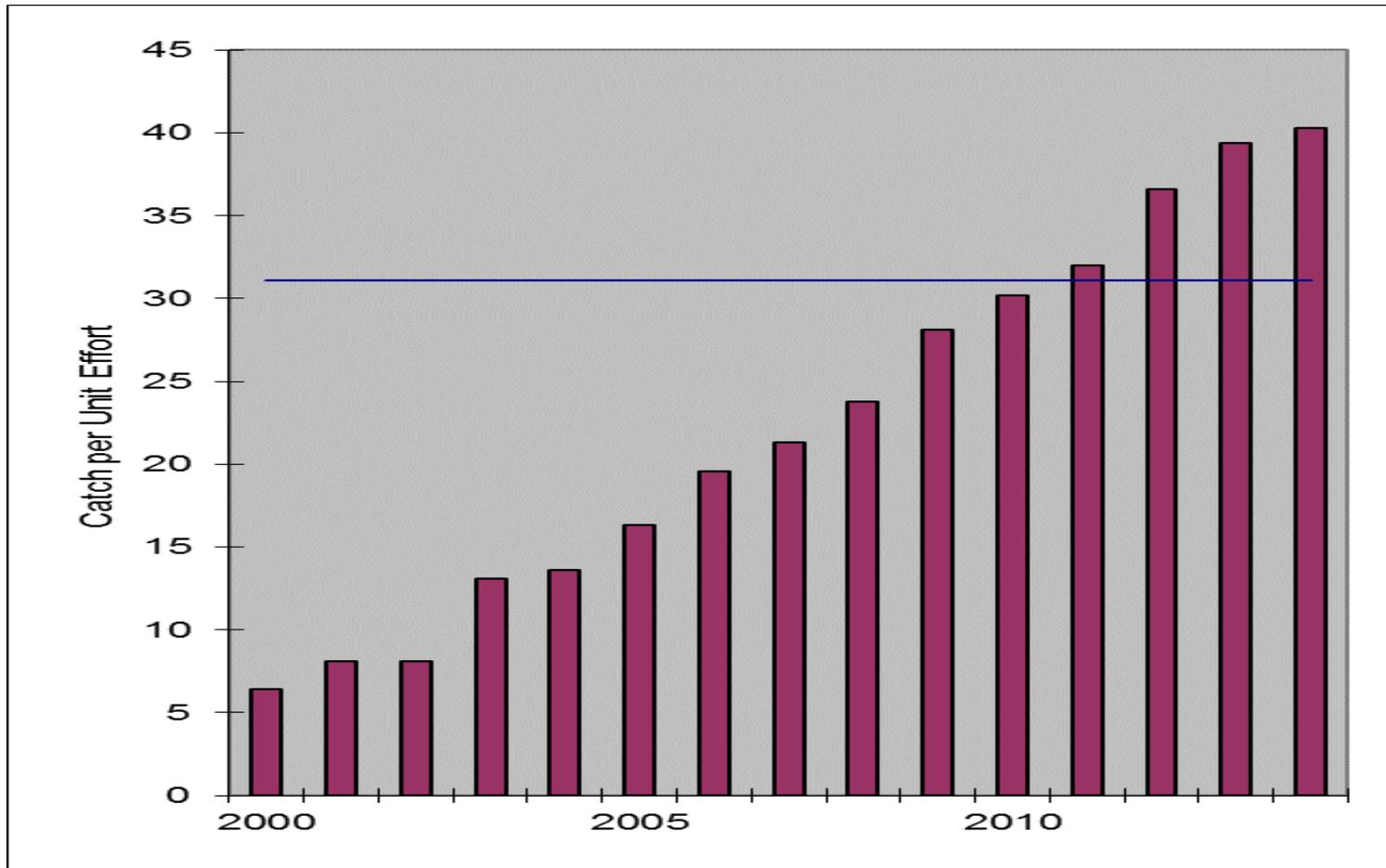


Commercial pound-net fisheries are used to gauge the recovery. In 2007, the Atlantic States Marine Fisheries Commission set the recovery threshold to be a geometric mean of 31.1 lbs/net-day for American shad captured as by-catch (i.e., from non-targeted gear) in the Potomac River. In 2011, that threshold was exceeded. In 2012, the Potomac American shad population was officially declared recovered and sustainable. (from the Potomac River Fisheries Commission (PRFC))



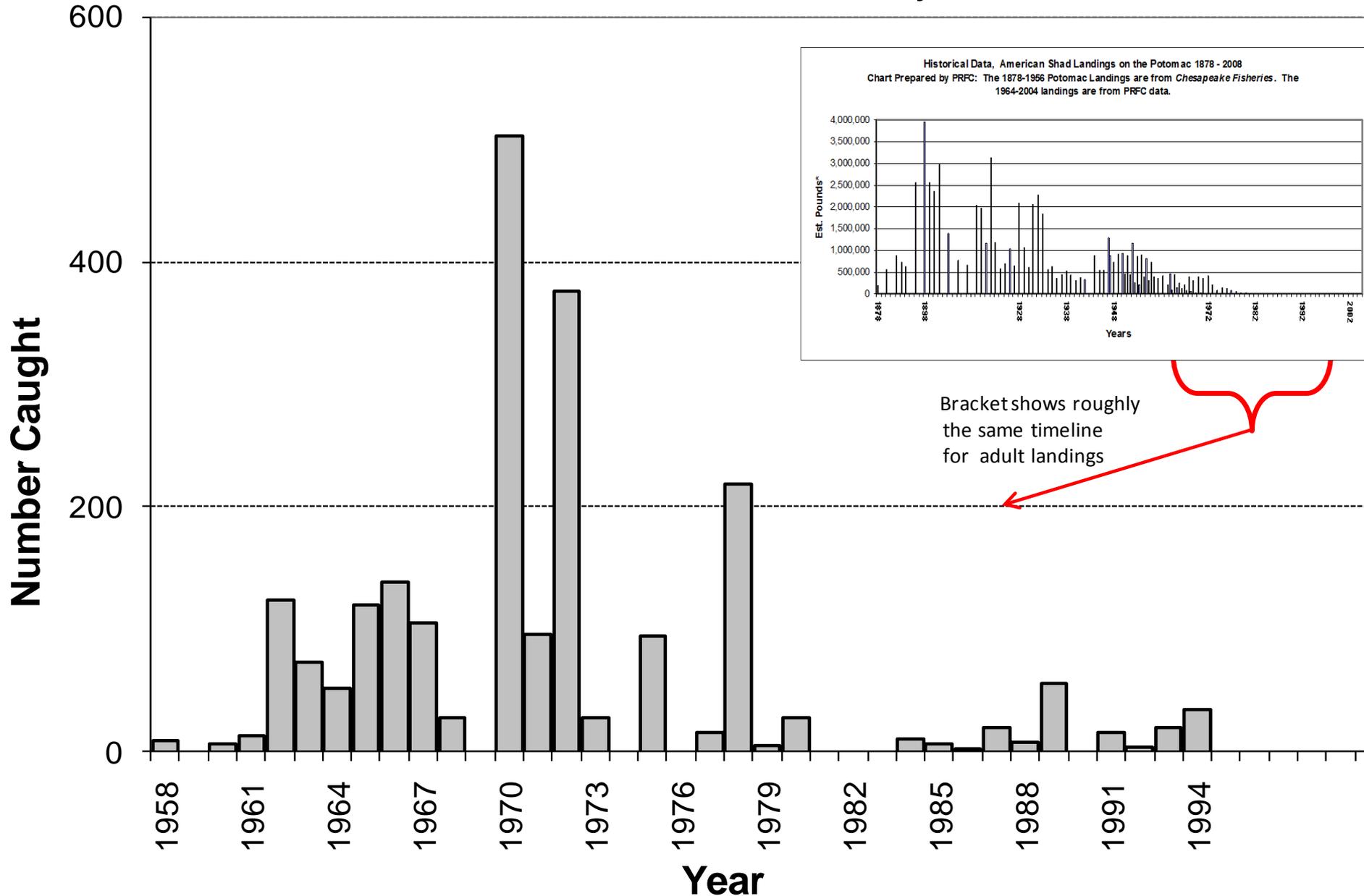
Commercial pound-net fisheries are used to gage the recovery. In 2007, the Atlantic States Marine Fisheries Commission set the recovery threshold to be a geometric mean of 31.1 lbs/net-day for American shad captured as by-catch (i.e., from non-targeted gear) in the Potomac River. That is the blue line. In 2011, that threshold was exceeded.

In 2014 the 15 yr geometric mean of By-Catch Per Unit Effort = 40.3/Lbs/net-day, or 130% of the goal.



■ Potomac River

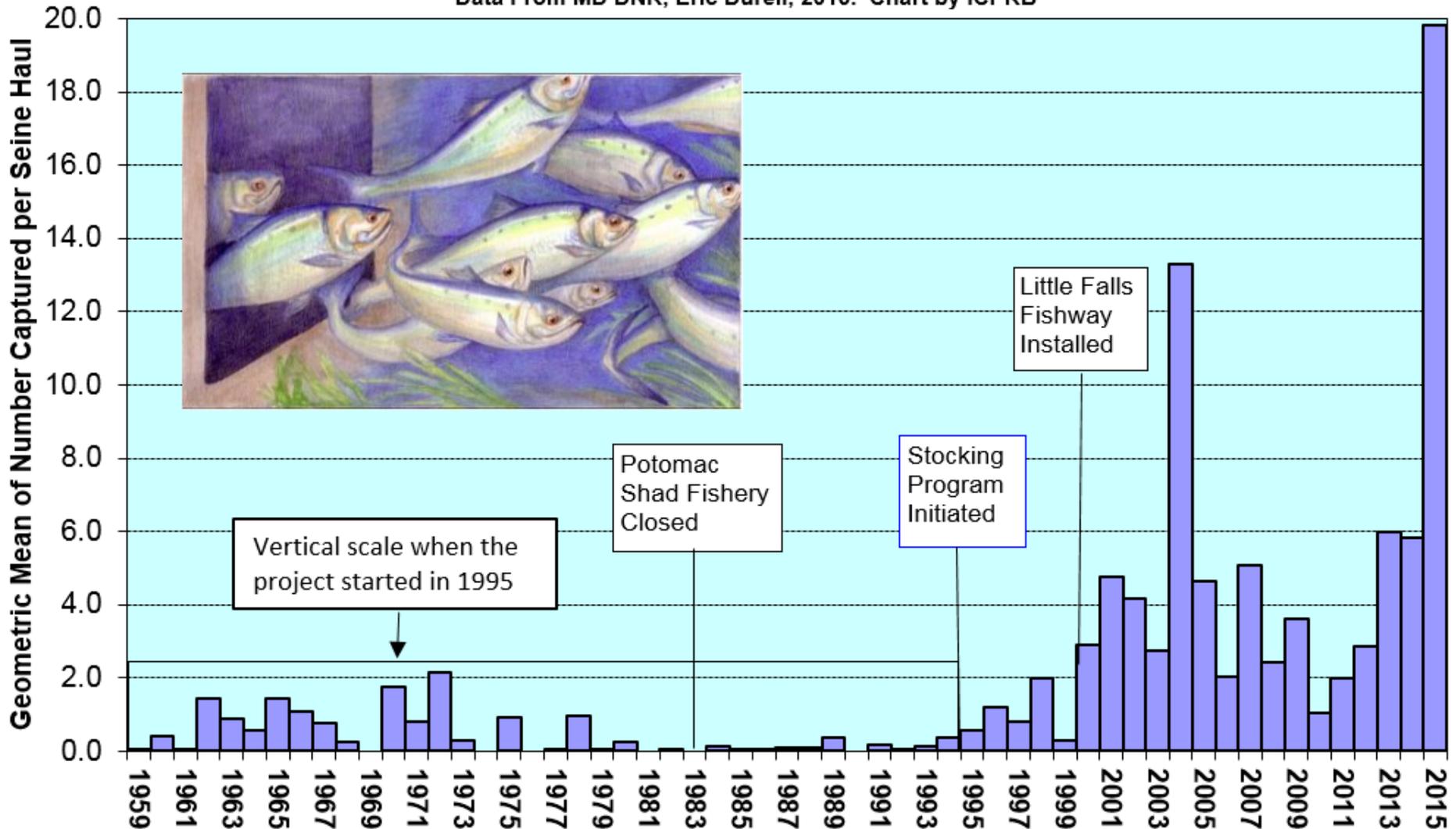
Juvenile (Young of Year) American Shad MD DNR Seine Survey 1958-1994



Juvenile abundances have increased dramatically, exceeding pre-moratorium's levels for 13 out of the last 16 years.

Juvenile American Shad Captured in the Potomac River by the Maryland Shore Haul Seine Survey - 1959-2015

Data From MD DNR, Eric Durell, 2015. Chart by ICPRB





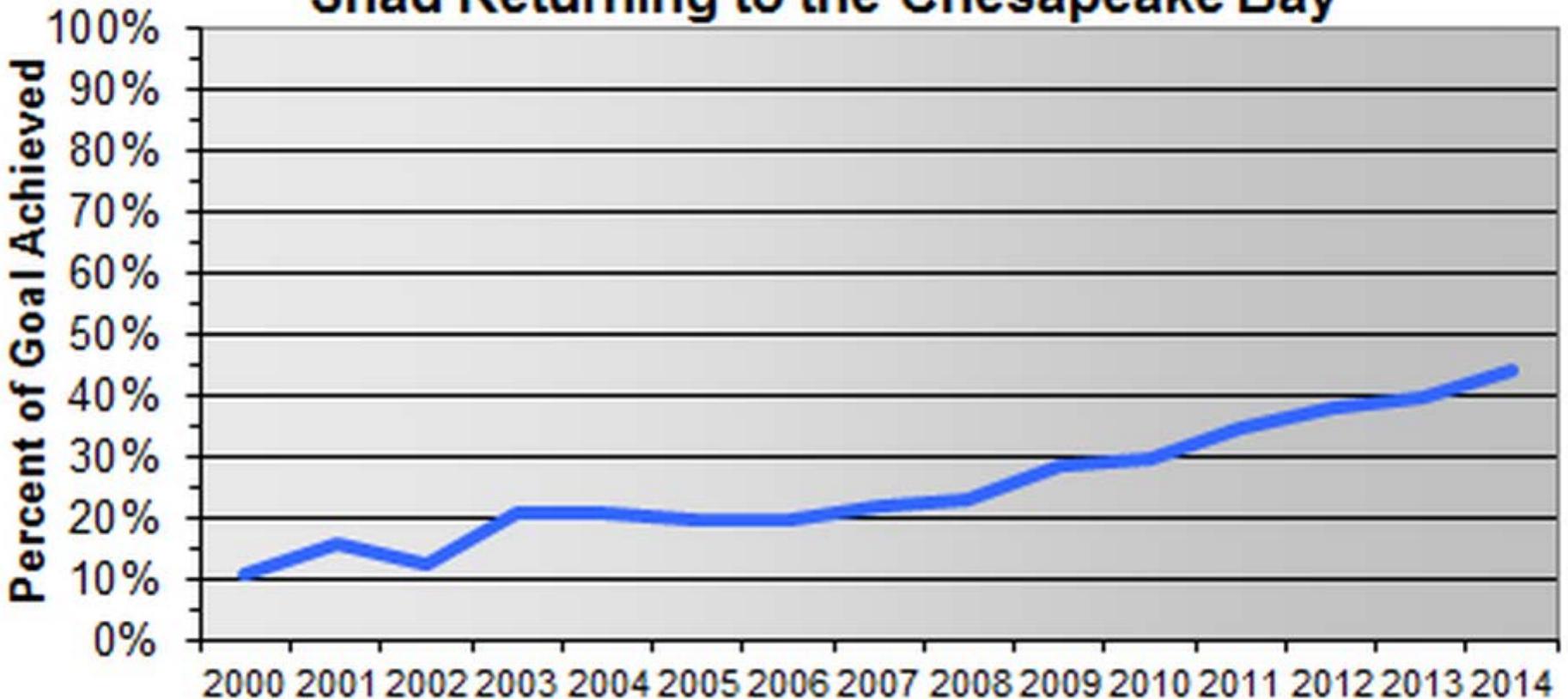
An end to the story?
No – The journey is long.
The Potomac’s shad population will never fully recover until the shad populations of other rivers also recover.

Chesapeake Bay Program's Bay-Wide American Shad Restoration

"The Bay Program tracks the abundance of American shad in the James, Potomac, Rappahannock, Susquehanna and York rivers as an indicator of watershed health. Collectively, these five waterways account for about 90 percent of the Bay's shad population, and each has its own population target.

Between 2000 and 2014, shad abundance in the Bay increased from 11 percent to 44 percent of the goal. The Potomac River has seen the most consistent rise in returning shad, but the Rappahannock has also seen notable highs."

Shad Returning to the Chesapeake Bay

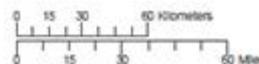
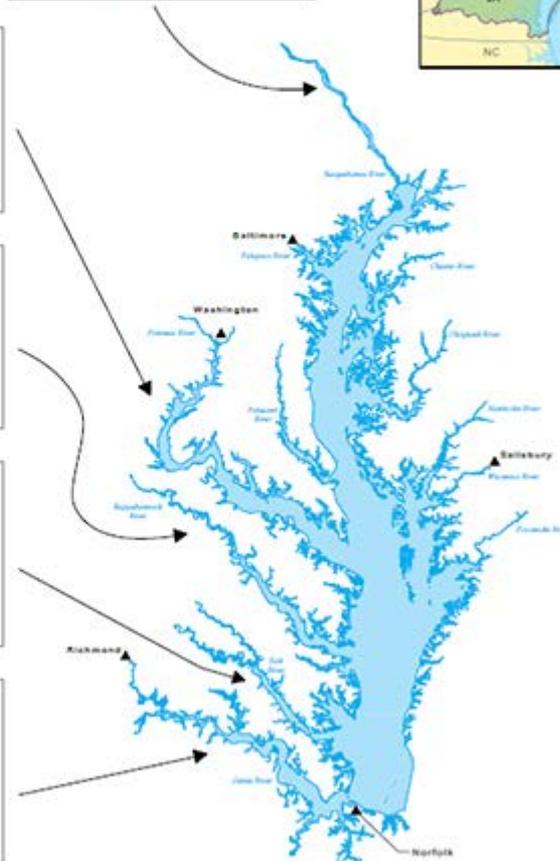
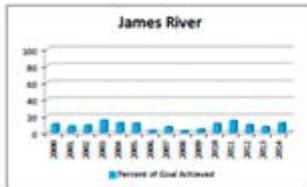
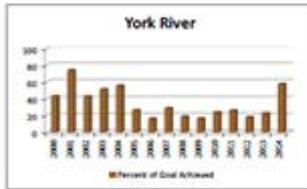
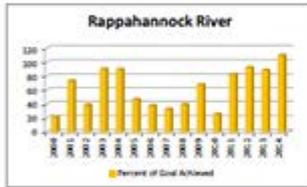
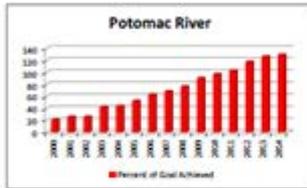
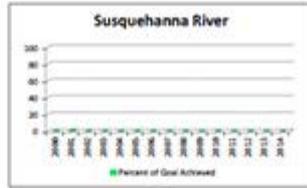


Shad Abundance (2014)

Ecosystem Health Assessment



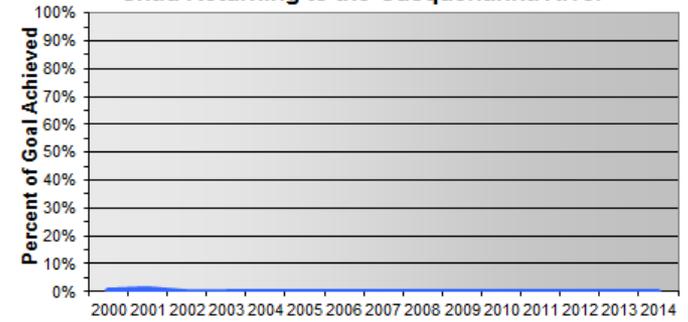
Chesapeake Bay and Tributaries



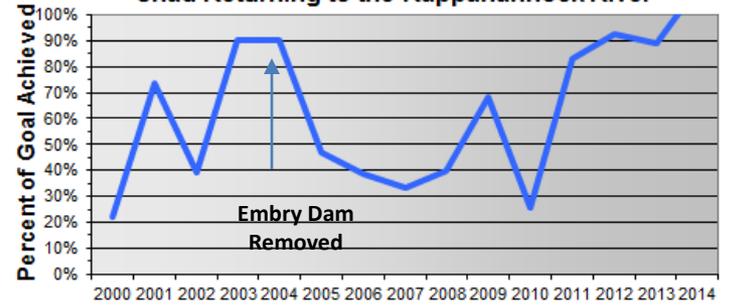
Note: The Y axis is not the same for all graphs.

Data Sources: Chesapeake Bay Program
For more information, visit www.chesapeakebay.net
Disclaimer: www.chesapeakebay.net/termsandconditions.htm

Shad Returning to the Susquehanna River

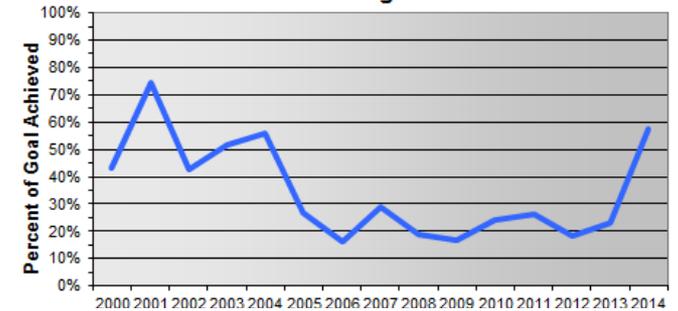


Shad Returning to the Rappahannock River

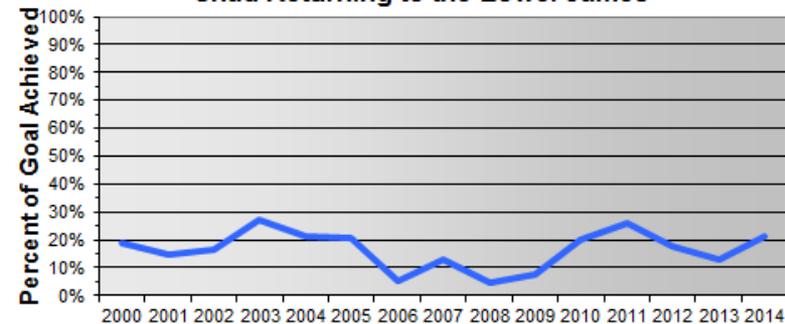


Embry Dam
Removed

Shad Returning to the York River



Shad Returning to the Lower James

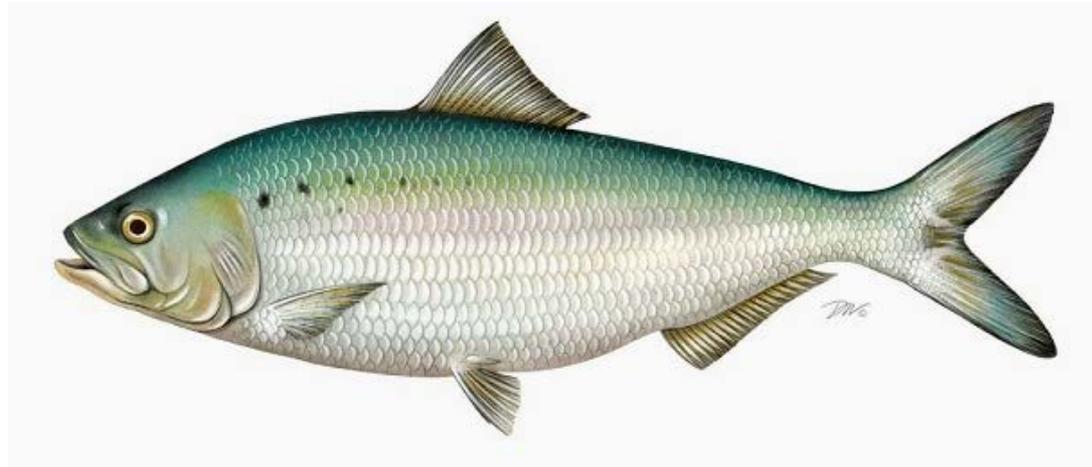


Even though the Potomac and Rappahannock Rivers' shad populations are doing pretty well, we need to be careful. The Potomac is the egg source for the Susquehanna River and all of Maryland's shad restoration rivers, as was so for the Delaware River. This requires a sacrifice from the Potomac's shad population because the shad used for egg collections do not recover from the handling required. Therefore replacement stockings are ongoing in the Potomac since restoration stocking was concluded in 2002. Roughly 10% of the Potomac-origin fry raised for each of these other rivers are returned to the Potomac to help replace the adult Potomac shad that were sacrificed to get the eggs.

Replacement stocking is how students are contributing. The student's efforts are helping the Potomac shad population, but importantly, because the Potomac is a major egg source for other rivers, they are also helping to ensure we can continue other river's shad restoration programs.



How are American shad doing along the East Coast?



**“American shad stocks are currently at all-time lows
and do not appear to be recovering.”**

from the Atlantic State Marine Fisheries Commission’s 2007 Report No. 07: American Shad Stock Assessment

American shad populations are struggling along most the east-coast in spite of many similarly rigorous restoration programs. Which begs the question.....



“Why are American shad doing well in the Potomac but not as well in other rivers?”

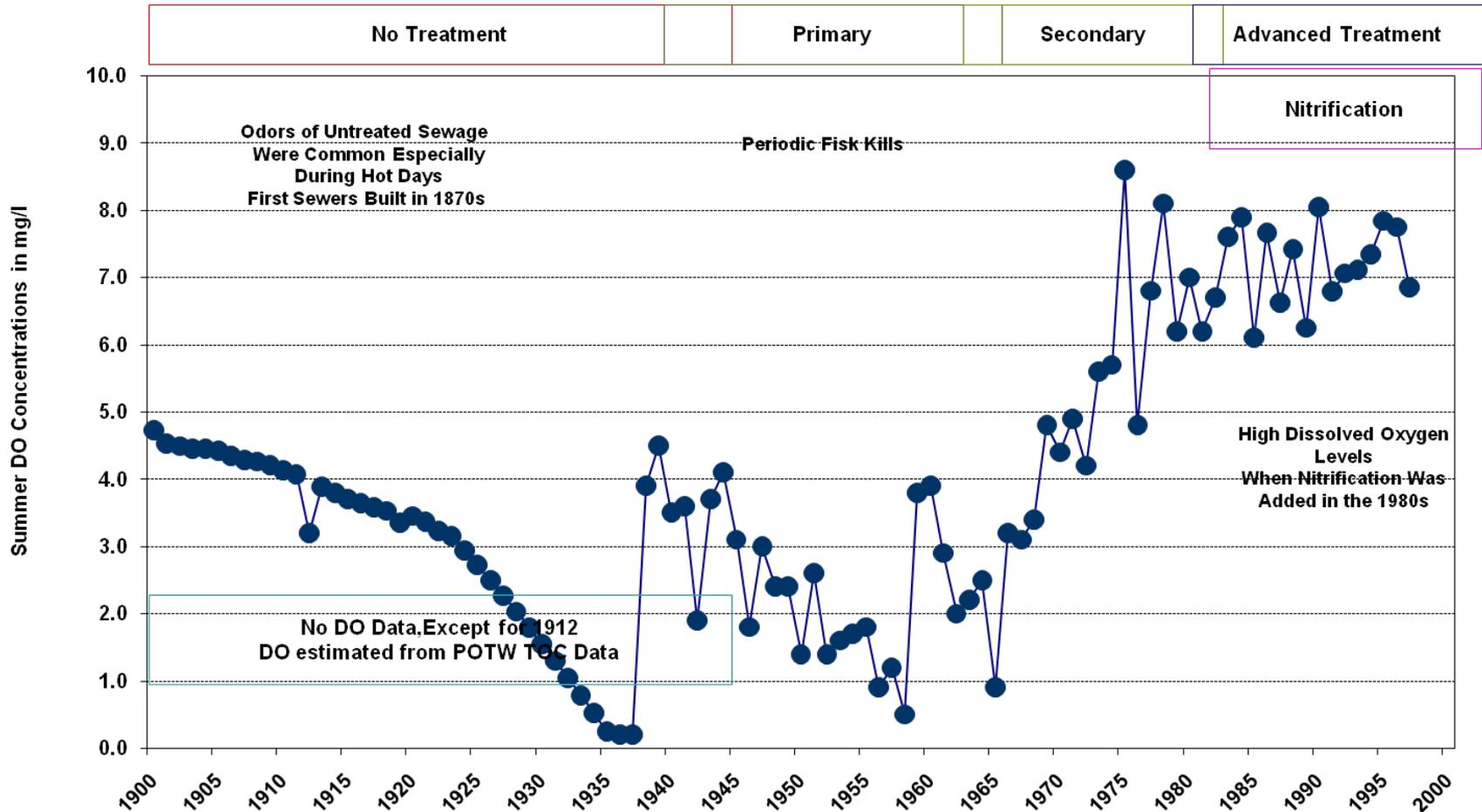
As with most trends in the natural world, the reasons are multiple.

First: The foundation - water quality improvements.

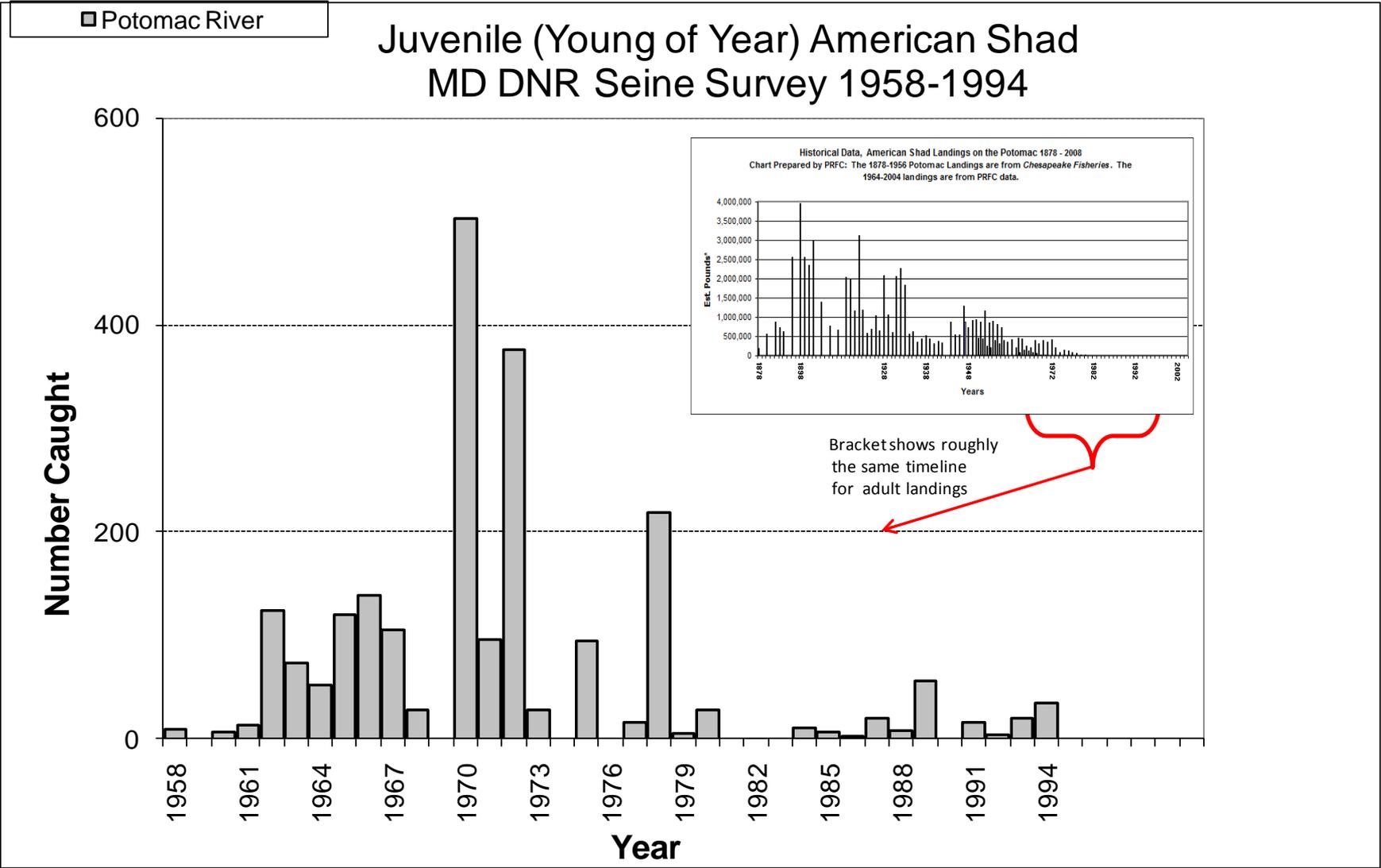
The Potomac River is one of the nation's best water quality restoration successes. Dissolved oxygen levels have remained good since the mid-1970s.

Potomac Estuary Wastewater Treatment
Summer Surface DO Concentrations
at W. Wilson Br. Station

From: Jaworski, N. 2007

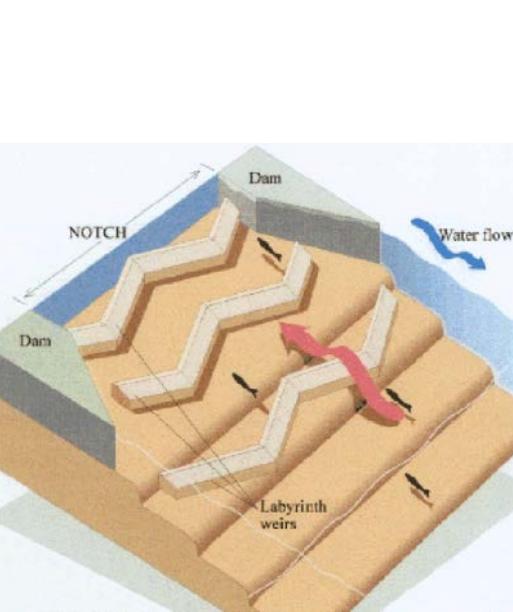


Second: Shad harvest moratoriums. Very necessary, But unlike the striped bass moratoriums which showed dramatic positive results within 5 years, shad harvest moratoriums were not producing the desired effect 13+ years after being placed in effect.





Third: Recovery of **submerged aquatic vegetation**, such as these beds just downstream from DC. The channel edges are good habitat for YOY shad. But they were there for over a decade with no increase in shad.



Fourth: The fishway at Little Falls.

This structure restored roughly ten miles of important spawning habitat. It is important because the gorge area upstream from Little Falls is a zone of high energy which does not support the high numbers of minnows (shad fry predators) that we find in the tidal portions. This was as true in the 1800s as it is today.

Fifth: The ICPRB/USFWS's shad stocking program.

Designed primarily to imprint shad to historic habitat, it also gave an extra shove, a jump-start, to a depressed, marginally self-sustaining shad population.

The stocking effort alone could not have restored the shad. Other improvements set the stage, the stocking program entered on cue.



OK, but many restoration programs have these same factors, or some subset of them. Is there more that set the Potomac apart? Yes, two major candidates:

- 1) The Little Falls fish passage opened a short (10 miles) but high quality stretch of spawning habitat - enabled a weak population to remain concentrated, thus contributing to quicker restoration success. In rivers where fish passage opens up long stretches of river, the remnant population gets more dispersed, impacting spawning and increasing predation on eggs and young.
- 2) The majority of the Potomac's juvenile habitat is in tidal freshwater -with plenty of food and abundant SAV beds which provide protective habitat.



Let the River Run Silver Again!

How One School Helped Return the American Shad to the Potomac River — And How You Too Can Help Protect and Restore Our Living Waters



2006
Honor Book
Green Earth Book Award

Project Recognition:

One of the project's star environmental educators, Sandy Burk, wrote this book about the project which became the Isaak Walton League's Conservation Book of the Year for 2005 and received the Green Earth Book Award for 2006.

-- Cited by the National Science Teachers Association as "one of the best available supplements for science teaching."

2004. For “Outstanding efforts on the Little Falls Fish Passage and Potomac River Shad.” Presented by Virginia Governor Mark Warner, Chesapeake Bay Executive Council, Chesapeake Bay Program.

The 2006 “Future of Fishing” award from the American Sportsfishing Association.

One of Field and Stream Magazine’s top six “Heroes of Conservation” projects.

The National River Restoration Science Synthesis Project ranked this as one of the nation’s top 25 restoration projects for its wide range of groups involved and for the monitoring used to assess its progress.

The National Fish Habitat Action Plan of the U.S. Fish and Wildlife Service and a host of partners, cites this project as a great example of the type of partnership they would like to see established across the country.

FIELD
& STREAM
Heroes
of CONSERVATION

The Shad Protector

JIM CUMMINS

DIRECTOR OF LIVING RESOURCES,
INFERSTATE COMMISSION ON THE POTOMAC
RIVER BASIN, BAKERTON, WEST VIRGINIA

Cummins has stocked more than 17 million American shad fry into the Potomac River’s depleted fishery. He also led the fight to open 10 miles of critical spawning habitat that had been blocked for over 50 years.

My dad was military, so we moved around a lot. I taught myself to fish. I was actually using a bent safety pin to catch bluegills before I figured out Eagle Claw made real hooks. Anyway, I’ve heard that in the 1800s, Congress would just about shut down during shad season because everyone was at the river catching the first fresh fish they’d had in six months. By the ‘70s, the fish were all but gone. In 1995, I started a coalition of agencies and nonprofits to restock shad and put a fish ladder in Brookmont Dam. The problem was I had no money, and the stocking programs in neighboring rivers were so skeptical of my plan, they wouldn’t give me any eggs. I hired a local waterman to net shad, and I learned to strip eggs from females, squeeze the milt from males, and mix them together with a shad tail. The thing is, shad survive by overwhelming predators with their sheer numbers, so you have to stock for years to get to that threshold. I was begging money, fighting to get the fishway built into the dam, and stocking fish. I was like Lucille Ball at the chocolate assembly line, going crazy trying to stay on top of what was coming at me. Finally, about the fifth year, the numbers started picking up as the young of the year began returning. We’ve turned the corner. Now we’re helping Virginia restock the Rappahannock River. You know what I dream of? The Potomac so full of shad that Congress has to shut down one day because everybody on Capitol Hill has gone fishing.



Take home lessons

- 1) Public involvement = public support.
- 2) Restore passage in increments.
- 3) Protect and restore aquatic vegetation.
- 4) “Endeavor to persevere” (Old Lodge Skins).
= have patience.

See you at the river! Thanks for having me.