

MARYLAND - VIRGINIA  
*"Potomac River Compact of 1958"*

## Potomac River Fisheries Commission

222 Taylor Street

P.O. BOX 9

Colonial Beach, Virginia 22443

TELEPHONE: (804) 224-7148 · (800) 266-3904 · FAX: (804) 224-2712

# Potomac River Fisheries Commission's American Shad Sustainable Fishery Management Plan

Submitted to the  
Atlantic States Marine Fisheries Commission

Prepared by Ingrid Braun

May 17, 2023

## **1. Sustainable Fishery Plan**

In accordance with the guidelines provided in Amendment 3 to the Interstate Fishery Management Plan (IFMP) for Shad and River Herring, the Potomac River Fisheries Commission's (PRFC) first American Shad Sustainable Fishery Plan (SFP) was accepted by the Atlantic States Marine Fisheries Commission (ASMFC) Shad and River Herring Management Board in 2012 (2012 SFP), and an updated plan was approved by the Board in 2017 (2017 SFP). The Potomac River Fisheries Commission submits the following updated plan for the next five-year term.

### **1a. Request for Fishery**

The PRFC requests that the Shad and River Herring Management Board consider this request to continue a limited commercial by-catch allowance of American shad in the portion of the Potomac River under PRFC jurisdiction (Figure 1). Accordingly, the PRFC justifies this request based on the fact that the Board accepted the 2007 Shad Stock Assessment which established a benchmark goal for American shad recovery in the Potomac River and required the PRFC to continue monitoring the pound net fishery's by-catch allowance of American shad, including discards. The Stock Assessment stated "to continue stock rebuilding, there should be no new expansion of the fishery until the benchmark is reached". The benchmark goal identified in the 2007 Stock Assessment was approved as a restoration target and has been exceeded each year since 2011 (Figure 2).

### **1b. Definition of Sustainability**

Amendment 3 to the IFMP for Shad and River Herring defines a sustainable fishery as one that will not diminish potential future stock reproduction and recruitment. The PRFC proposes to continue with the mandatory daily harvest reporting program with the fishermen on the Potomac River, in which they record daily harvest, effort and discard data. The continuation of this data collection enhances the long-term data set that the PRFC maintains, updates and utilizes to monitor the progress of the American shad stock rebuilding and recovery in the Potomac River. The long-term American shad juvenile abundance index (JAI) for the Potomac River is provided by Maryland Department of Natural Resources (MD DNR) and will continue on an annual basis (Figure 3).

### **1c. Summary of current stock status**

The Potomac River has been closed to the commercial and recreational directed harvest of American shad since March 1, 1982. The only allowable commercial harvest since then has been via a pound net by-catch provision that allowed up to two percent by volume of the total catch in possession to be American shad. Starting in 1996, the pound net by-catch provision was further limited to two percent by volume, but could not exceed one bushel per day per licensee. In 2004, a one-bushel limit of American shad by-catch for the gill net fishery was approved by the ASMFC Shad and River Herring Technical Committee and Board, and established by the PRFC. In 2012, ASMFC approval was obtained to increase the by-catch limits from one bushel to two bushels per day per licensee for pound nets and gill nets. Currently in the Potomac River, all directed commercial, recreational and charter boat fisheries for American shad remain closed.

#### **1d. Benchmark goals and objectives or restoration goals/targets**

In the 2007 ASMFC Shad Stock Assessment (SSA), a benchmark for American shad in the Potomac River was defined as the geometric mean (GM) CPUE of pound net landings reported in Walburg and Sykes (1957) for the years 1944 to 1952, or 31.1 pounds per net-day. It was concluded in the assessment that among Chesapeake Bay stocks of American shad, the Potomac River population showed the most promising signs of recovery. The gill net index, the pound net index, and the JAI depicted strongly increasing trends in relative abundance. To continue stock rebuilding in the Potomac River, it was recommended that there should be no new expansion of the fishery until the benchmark goal is reached, and that this requires continued monitoring of the pound net fishery, including discards. However, the 2020 SSA identified a mortality benchmark for American shad stock as 1.07. In the most recent assessment, it was found that the Potomac River American shad stock was found to be experiencing unsustainable female mortality based on the three-year average in 2017 of 1.1. Additionally, the stock's juvenile mortality status and abundance status is unknown. There have been no trends in the young-of-year (YOY) abundance or adult abundance since 2005.

The ASMFC Shad and River Herring Management Board accepted the 2007 Shad Stock Assessment Report, which included the Potomac River benchmark. This benchmark goal of 31.1 became the restoration target for the Potomac River and was approved by the ASMFC Shad and River Herring Technical Committee. The GM was calculated for CPUEs of total pound net data (catch + discards) and the GM exceeded the benchmark goal and restoration target in 2011 with a value of 32.0 pounds per net-day (Figure 2). The GM has increased every year since 2002, so achieving the target in 2011 was not unexpected; however, we have continued to exceed the restoration target each year. The PRFC has reported this information in their annual compliance report.

#### **1e. Proposed time frame for achievement**

The benchmark goal identified in the 2007 Stock Assessment and approved as a restoration target was first exceeded in 2011, and continues to be exceeded each following year.

#### **1f. Discussion of management measure(s) to be taken if sustainable target is not achieved within indicated timeframe**

The restoration target in the Potomac River was achieved in 2011, and continues to be exceeded during each of the following years. The PRFC will continue monitoring the total pound net CPUE data as well as the MD DNR survey data.

If the GM for CPUEs of the total pound net data (catch + discards) drops below the restoration target for three consecutive years, then the PRFC will consider potential restrictions including: reducing or eliminating the two bushel by-catch allowance for pound nets and gill nets; and limiting or restricting the take of broodstock/egg collections by other agencies for shad restoration projects.

## **2. Stock Monitoring Programs**

### **2a. Fishery Independent**

American shad have been taken from the Potomac River as brood stock for hatchery production by several agencies under special collection permits issued by the PRFC since 1995. The Interstate Commission on the Potomac River Basin (ICPRB) participated in the Potomac Restoration Stocking Program for American shad from 1995 – 2002, at which time recovery was considered sufficient for natural reproduction. In 2003, restoration stocking of the Rappahannock River started using Potomac River origin eggs through a partnership between ICPRB, the Virginia Department of Wildlife Resource (DWR), and the U. S. Fish & Wildlife Service (USFWS) Harrison Lake National Fish Hatchery. Stocking of the Potomac River continues, but now as “replacement stocking” to account for the Potomac shad sacrificed for another river system. Since 1995, the ICPRB has released over 22 million fry into the Potomac. ICPRB continues to collect some American shad each year from the Potomac River for their schools and educational components, and incorporates significant public involvement into this project with a “Schools-in-Schools” partnership. In 2022, volunteers helped over 550 students from 12 Washington metropolitan area schools hatch shad in their classrooms and stock them in the Potomac and Anacostia Rivers. The students’ efforts to help replenish American shad populations are notable, but more important is the link between students, volunteers, the river, watermen, biologists and our shared fishery heritage.

Several agencies, such as the MD DNR (since 2001), DWR (2003 – 2009, and 2017), the USFWS (since 2004) and the District of Columbia’s Fisheries and Wildlife Division of the Department of Energy and Environment (DOEE) (2005-2018) have all collected American shad for brood stock under special collection permits issued by this Commission. The PRFC’s Scientific Collection Permits require data reports and scale/otolith samples of ten percent of the “kept” American shad for analysis, together with their length, weight and sex. In addition, ten to fifteen percent of all shad fry resulting from the use of this permit are to be restocked in the Potomac River as close to the capture site as is feasible.

The MD DNR began replacement stocking in 2007, and has released about 1.4 million fry into the Anacostia River, a tributary of the Potomac River in Washington D.C. and 3.3 million fry into the Potomac River (Table 4). The DOEE has released approximately 7.6 million fry and 50,000 eggs into the Anacostia River (Table 5). The DWR reported a total of 6.2 million fry stocked in the Potomac, and the USFWS reported 902,000 fry stocked in the Potomac River as mitigation for egg collections (Table 2). In addition, the USFWS released approximately 2.25 million viable eggs back into the Potomac River for mitigation (Table 2). The Potomac River has been the egg source for the majority of Maryland’s shad restoration projects, Virginia’s shad restoration program in the Rappahannock River, as well as the Susquehanna River (MD/PA) and some of Delaware’s rivers since 2002.

#### **i. Juvenile abundance indices**

Maryland is required to provide an American shad juvenile index for the Potomac River and several other river systems throughout its portion of the Chesapeake Bay. The annual juvenile abundance survey has been conducted since 1954, with American shad data collected from 1959 to present. Fixed stations and some auxiliary stations are used each year for a beach haul seine survey in

which the juveniles of all species encountered are identified and recorded. The American shad juvenile index for the Potomac River is derived from the Maryland DNR state wide annual young of the year survey as geometric mean CPUEs (Figure 3). The 2022 value of 2.45 was significantly lower than the 2015 value of 19.81, which was a record high value (Figure 3).

## ii. **Adult stock monitoring**

Durell and Weedon (2022) report that Maryland DNR has conducted a Striped Bass Spawning Stock Survey since 1985, using multi-panel drift gill nets in the Potomac River. Since 1996, adult American shad that were incidentally caught were processed to obtain length, sex and age (scale samples) and repeat spawning determination (Figure 4).

## 2b. **Fishery Dependent**

### i. **Commercial Fishery**

The non-directed Potomac River pound net by-catch harvest in 2021 consisted of 11,331 pounds of American shad (Table 1). The PRFC's mandatory commercial daily harvest reporting system is the source of these data, collecting harvest as well as discards or released fish. The 2021 discards/released by-catch of American shad in excess of the daily landing limit from pound nets was 3,500 pounds. The 2021 pound net harvest data was combined with the 2021 pound net discard data to identify the total CPUE. There were 408 pounds of American shad reported as harvested by gill nets and no gill net discards in 2021.

Pound net effort is expressed as "pound net fishing day" which is one net fished one time. During 2021, one hundred pound nets were licensed in the Potomac River. The pound net fishery is a 'limited entry' fishery capped at 100 licenses (each net is licensed separately). Effort included 202 pound net fishing days for the American shad by-catch harvest.

**Regulation effective January 1, 2011** – all pound nets in the Potomac River must have at least six PRFC approved fish cull panels properly installed in each pound net to help release undersize fish. This regulation will have a beneficial impact on the release of river herring, but will not be effective in the release of adult shad. These fish cull panels were being used for by-catch reduction by some pound netters on a voluntary basis prior to 2011; they are now mandatory.

### ii. **Recreational Fishery**

The Potomac River, under PRFC jurisdiction, recreational and charter boat fisheries for American shad remained closed in 2023. The American shad fishery has been closed since 1982 in this portion of the Potomac River. We are unaware of any historical or current recreational activity within the PRFC's jurisdiction. A historical recreational fishery existed in the D.C. portion of the Potomac River, but that fishery is now closed.

## **Literature Cited**

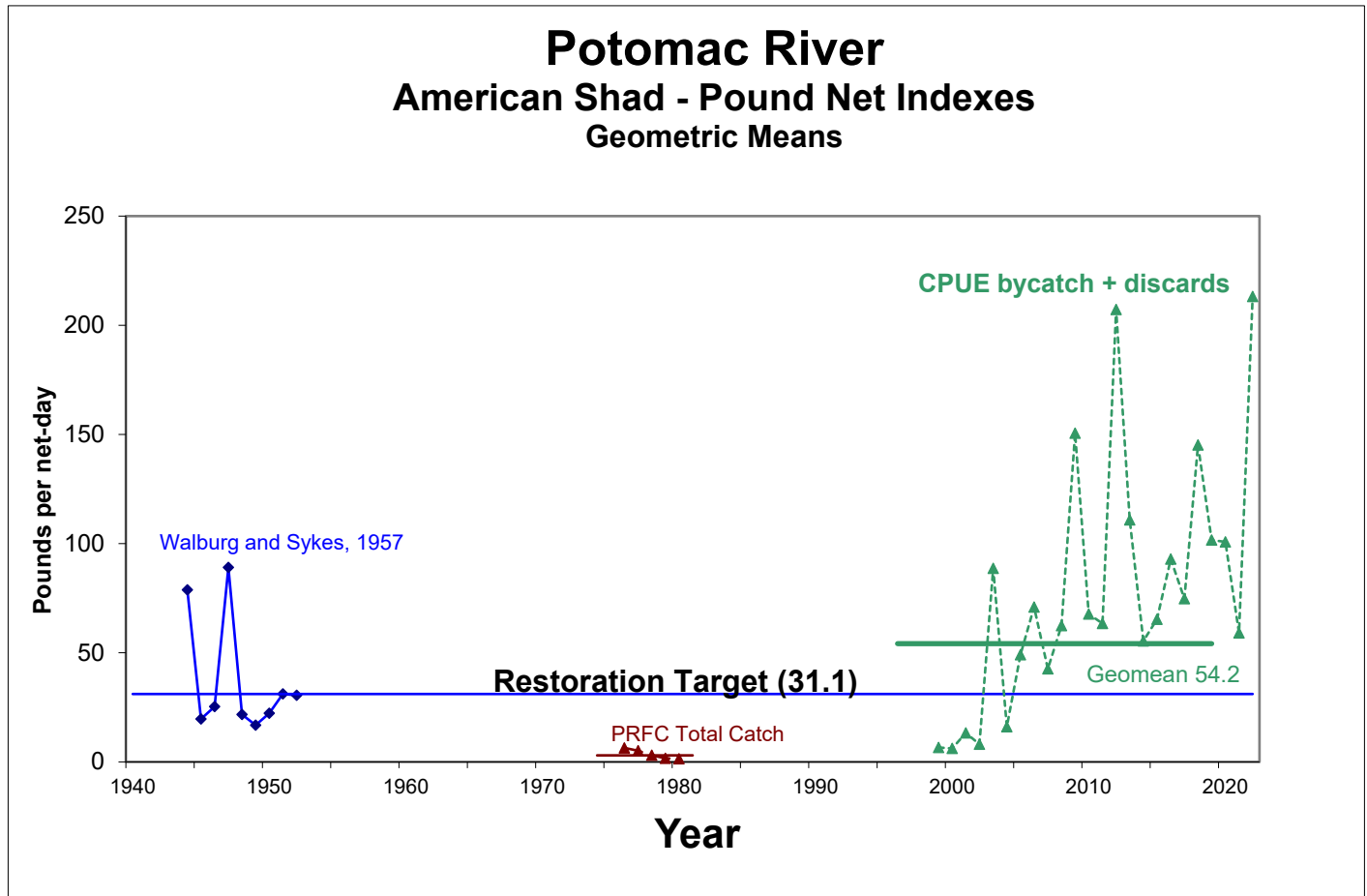
Durell, E. Q. and C. Weedon. 2022. Striped Bass Seine Survey Juvenile Index Web Page. <http://dnr2.maryland.gov/fisheries/Pages/juvenile-index.aspx>. Maryland Department of Natural Resources, Fisheries Service.

Walburg, C. H. and J. E. Sykes. 1957. Shad fishery of Chesapeake Bay with special emphasis on the fishery of Virginia. U.S. fish Wildlife Service, Research Report 48, 26 p.

**Figure 1.** Potomac River – PRFC jurisdiction is the main stem of the Potomac River downstream of Washington, DC.



**Figure 2.** American shad pound net indexes using geometric means from reported bycatch and discards.



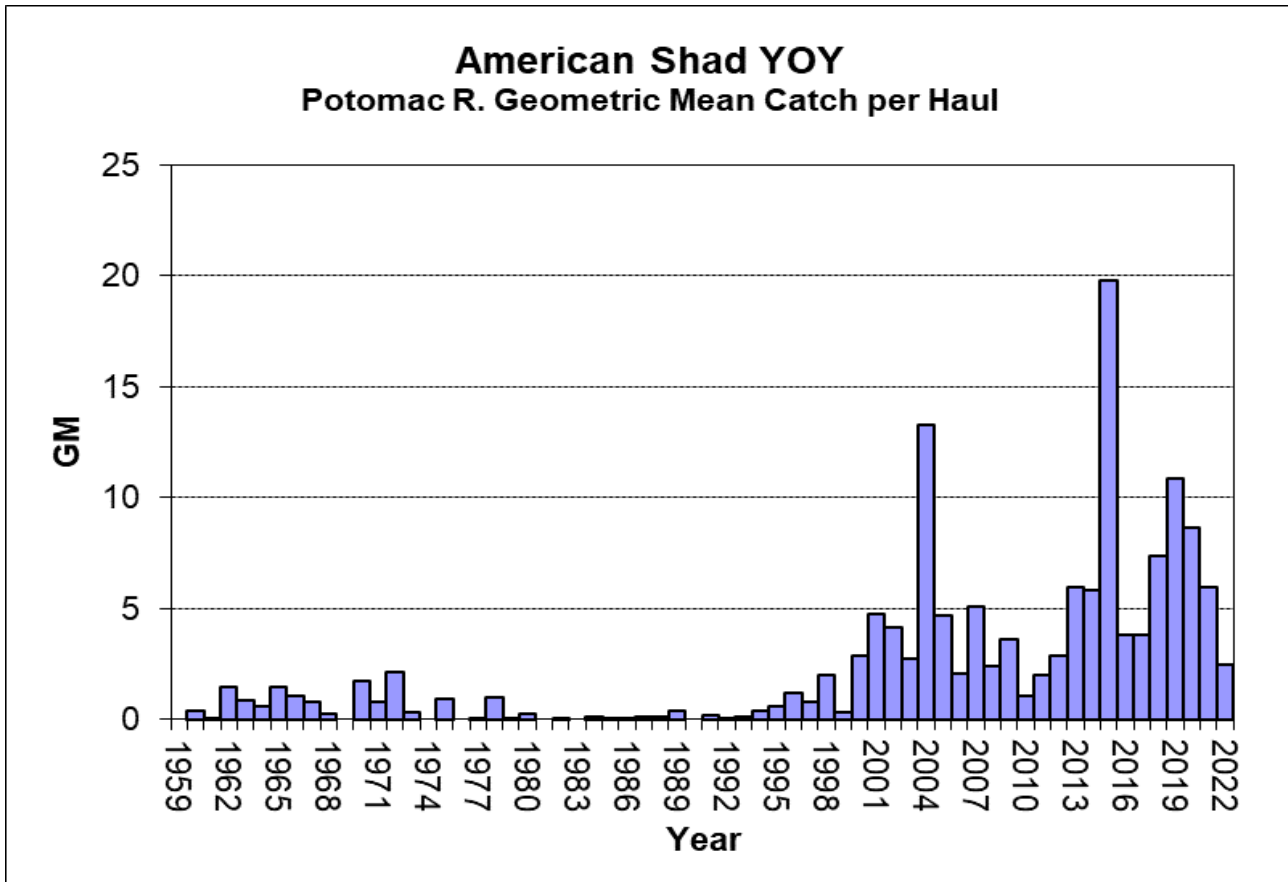
Source: PRFC

Geometric Mean (GM) of Pound Net CPUE Data												
Time Series	1944-1952	1976-1980	1999-2002	1999-2003	1999-2004	1999-2005	1999-2006	1999-2007	1999-2008	1999-2009	1999-2010	1999-2011
GM	31.1	3.0	8.1	13.1	13.6	16.3	19.6	21.3	23.8	28.1	30.2	32.0

Geometric Mean (GM) of Pound Net CPUE Data												
Time Series	1999-2012	1999-2013	1999-2014	1999-2015	1999-2016	1999-2017	1999-2018	1999-2019	1999-2020	1999-2021	1999-2022	
GM	36.6	39.4	40.3	41.4	43.3	44.6	47.3	49.1	50.7	51.0	54.2	

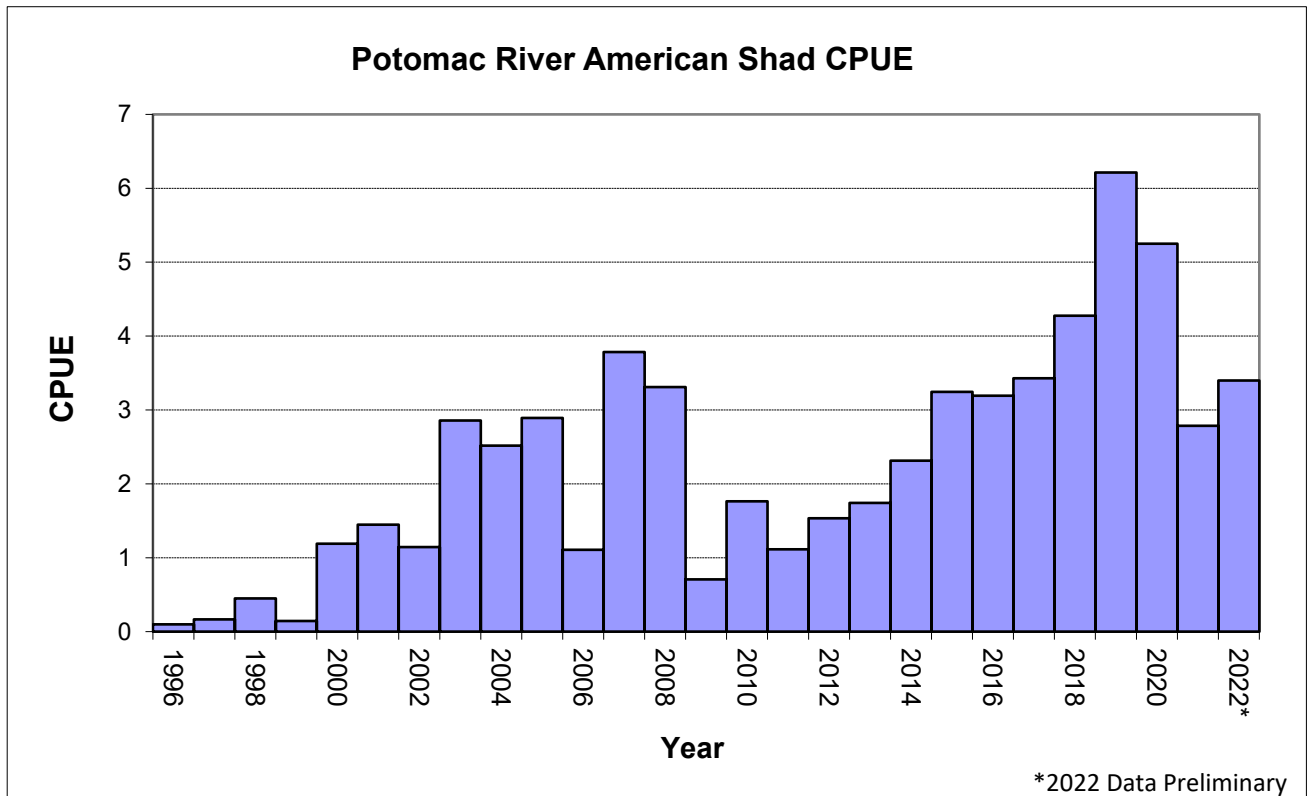


**Figure 3.** American shad juvenile index for the Potomac River from Maryland Department of Natural Resources.



Source: <https://dnr.maryland.gov/fisheries/pages/striped-bass/juvenile-index.aspx>

**Figure 4.** Effort corrected catch of American shad on the Potomac River during the MD DNR striped bass spawning stock survey. CPUE is standardized as the number of fish caught per 1000 square yards of drift gill net per hour.



Source: MD DNR

**Table 1. Potomac River Commercial Harvest (lbs) for American Shad by gear type**

YEAR	HAUL SEINE	POUND NET	FYKE NET	GILL NET	MISC.	ROE SHAD	BUCK SHAD	LBS. LANDED IN		TOTAL
								MARYLAND	VIRGINIA	
1995*	-	2,638	3	-	-	1,458	1,183	324	2,317	2,641
1996	-	2,292	-	-	-	1,357	935	99	2,193	2,292
1997	120	5,083	3	-	-	2,773	2,433	98	5,108	5,206
1998	121	2,251	-	-	-	1,680	692	623	1,749	2,372
1999	-	1,966	-	-	-	1,049	917	44	1,922	1,966
2000	-	1,508	-	-	-	897	611	124	1,384	1,508
2001	-	4,882	-	-	-	3,390	1,492	794	4,088	4,882
2002	-	2,762	-	-	-	1,727	1,035	-	2,762	2,762
2003	-	8,141	93	-	407	7,229	1,412	2,916	5,725	8,641
2004	-	5,051	-	293	-	4,701	643	1,656	3,688	5,344
2005	-	6,019	-	801	-	6,044	776	2,972	3,848	6,820
2006	-	4,256	-	413	-	4,245	424	1,146	3,523	4,669
2007	-	6,604	-	2310	-	7,929	985	4,532	4,382	8,914
2008	-	6,815	-	160	-	6,470	505	5,115	1,860	6,975
2009	-	5,005	-	209	-	4,601	613	5,210	4	5,214
2010	-	3,885	-	31	6	3,821	101	1,350	2,572	3,922
2011	-	2,419	-	-	-	2,167	252	969	1,450	2,419
2012	-	4,119	-	623	-	3,105	1,641	4,173	569	4,742
2013	-	3,796	-	3	-	2,946	853	3,796	3	3,799
2014	-	4,003	-	10	-	2,832	1,181	4,013	-	4,013
2015	-	1,877	-	12	-	1,135	754	1,877	12	1,889
2016	-	1,145	-	4	-	560	589	1,145	4	1,149
2017	-	10,273	-	-	-	7,904	2,369	2,493	7,780	10,273
2018	-	18,146	-	374	-	15,870	2,650	7,101	11,419	18,520
2019	-	17,546	-	341	-	13,625	4,262	8,730	9,157	17,887
2020	5	12,310	-	4704	-	15,964	1,055	7,599	9,420	17,019
2021	-	10,923	-	408	-	10,332	999	7,338	3,993	11,331
2022	-	7,041	-	85	-	5,002	2,124	2,739	4,387	7,126

\* Moratorium adopted 1995 for all fisheries, except pound net by-catch provision

Source: PRFC

**Table 2.** Summary of American shad collected and eggs produced from the Potomac River by the USFWS and otolith age samples.

	2004	2005	2006*	2007*	2008*	2009*	2010*	2011*	2012*
# Females Caught			673	1,110	1,291	451	1,569	1,021	1,611
# Males Caught			117	272	284	510	1,196	404	475
Ripe Females	50			515	501	451	955	368	712
Ripe Males	39			271	284	510			
# Shad Released	125		395	596	790	787	614	652	899
Total Shad Kept	89		382	786	785	771	2,151	772	1,187
Total Shad Caught	214	296	777	1,382	1,575	1,558	2,765	1,425	2,086
Avg.CPUE (shad/hr/ft <sup>2</sup> )			0.001	0.002					
Volume(L) of Eggs			99.3	183.9	194.4	132.2	375.0	137.4	258.0
# of Eggs			4,511,426	7,488,716	8,503,709	6,380,784	17,843,432	6,216,484	11,183,457
Viable Eggs			2,003,222	2,875,455	3,491,069	1,885,500	6,874,612	2,714,435	5,664,920
Viability (%)			44%	42%	41%	30%	39%	44%	51%
# Fry stocked				259,119	188,739		365,000	90,000	
Viable Eggs stocked									670,292
	2013*	2014*	2015*	2016*	2017*	2018*	2019	2022*	<b>Totals</b>
# Females Caught	1,732	2,277	2,456	1,637	3,692	4,273	103	1,741	<b>25,637</b>
# Males Caught	266	758	284	331	1,000	641	1	272	<b>6,811</b>
Ripe Females	539	1090	793	702				673	<b>7,349</b>
Ripe Males									<b>1,104</b>
# Shad Released	1,193	1,187	1,663	935	2,280	2,517	64	1,105	<b>15,802</b>
Total Shad Kept	805	1,848	1,077	1,033	2,412	2,397	40	945	<b>17,480</b>
Total Shad Caught	1,998	3,035	2,740	1,968	4,692	4,914	104	2,013	<b>33,542</b>
Avg.CPUE (shad/hr/ft <sup>2</sup> )									
Volume(L) of Eggs	118.1	316.7	170.5	165.6	330.9	342.3	31.8	197.1	<b>3,053</b>
# of Eggs	7,512,761	14,407,614	8,850,523	8,385,914	14,438,781	16,494,265	1,424,675	9,327,441	<b>142,969,982</b>
Viable Eggs	1,603,498	5,671,992	2,044,013	2,138,510	4,264,317	3,301,728	426,130	2,166,773	<b>47,126,174</b>
Viability (%)	21%	39%	23%	25%	30%	20%	30%	23%	
# Fry stocked									<b>902,858</b>
Viable Eggs stocked	277,864	555,650	298,476	155,125	576,839	470,083	53,582	50,867	<b>3,108,778</b>

\* Scales &amp; otoliths taken on 5% of fish

No work was conducted in 2020 or 2021 due to the pandemic

**Table 2 (continued).** Summary of American shad collected and eggs produced from the Potomac River by the USFWS and otolith age samples.

American Shad Age, Length, and Weight Potomac River - 2022 (USFWS)					
Year Class	2015	2016	2017	2018	Total
Age	7	6	5	4	
<b>Males</b>					
Number		1	2	2	5
% by year class		20%	40%	40%	
Av. TL (mm)		462	489	422	
Av. Wt. (kg)		0.93	0.96	0.79	
<b>Females</b>					
Number	14	9	31	11	65
% by year class	22%	14%	48%	17%	
Av. TL (mm)	505	487	480	460	
Av. Wt. (kg)	1.14	1.08	1.04	0.98	
<b>Sexes Combined</b>					
Number	14	10	33	13	70
% by year class	20%	14%	47%	19%	
Av. TL (mm)	505	485	480	454	
Av. Wt. (kg)	1.14	1.06	1.04	0.95	

American Shad Age, Length, and Weight Potomac River - 2018 (USFWS)					
Year Class	2011	2012	2013	2014	Total
Age	7	6	5	4	
<b>Males</b>					
Number		5	4		9
% by year class		56%	44%		
Av. TL (mm)		478	462		
Av. Wt. (kg)		0.91	0.92		
<b>Females</b>					
Number	3	45	39	3	90
% by year class	3%	50%	43%	3%	
Av. TL (mm)	520	487	486	471	
Av. Wt. (kg)	1.27	1.16	1.1	1.17	
<b>Sexes Combined</b>					
Number	3	50	43	3	99
% by year class	3%	51%	43%	3%	
Av. TL (mm)	520	486	483	471	
Av. Wt. (kg)	1.27	1.14	1.09	1.17	

American Shad Age, Length, and Weight Potomac River - 2017 (USFWS)					
Year Class	2010	2011	2012	2013	Total
Age	7	6	5	4	
<b>Males</b>					
Number		9	17	2	28
% by year class		32%	61%	7%	
Av. TL (mm)		482	457	432	
Av. Wt. (kg)		1.04	0.94	0.77	
<b>Females</b>					
Number	4	29	38	1	72
% by year class	6%	40%	53%	1%	
Av. TL (mm)	524	497	485	457	
Av. Wt. (kg)	1.36	1.23	1.23	1.02	
<b>Sexes Combined</b>					
Number	4	38	55	3	100
% by year class	4%	38%	55%	3%	
Av. TL (mm)	524	493	476	440	
Av. Wt. (kg)	1.36	1.18	1.14	0.85	

American Shad Age, Length, and Weight Potomac River - 2016 (USFWS)						
Year Class	2008	2009	2010	2011	2012	Total
Age	8	7	6	5	4	
<b>Males</b>						
Number		1	1	2	1	5
% by year class		20%	20%	40%	20%	
Av. TL (mm)		514	479	462	382	
Av. Wt. (kg)		1.04	0.88	0.52	0.46	
<b>Females</b>						
Number	1	5	11	17	1	35
% by year class	3%	14%	31%	49%	3%	
Av. TL (mm)	540	532	507	451	470	
Av. Wt. (kg)	1.34	1.23	1.18	1.02	0.96	
<b>Sexes Combined</b>						
Number	1	6	12	19	2	40
% by year class	3%	15%	30%	48%	5%	
Av. TL (mm)	540	529	505	452	426	
Av. Wt. (kg)	1.34	1.2	1.15	0.97	0.71	

**Table 3. MD DNR American Shad Mitigation Report – Potomac River**

<b>Year</b>	<b>Date</b>	<b>Stocking site</b>	<b>Number</b>	<b>Cultured By:</b>	<b>Stocked For:</b>
2007	5/15/07	Anacostia	200,000	DC Fisheries	MD DNR mitigation
2008	4/24/08	Anacostia	170,000	DC Fisheries	MD DNR mitigation
2008	5/12/08	Anacostia	30,000	DC Fisheries	MD DNR mitigation
2009	5/6/09	Anacostia	200,000	DC Fisheries	MD DNR mitigation
2010	5/5/10	Marshall Hall	100,000	MD DNR	USFWS mitigation
2010	5/12/10	Marshall Hall	100,000	MD DNR	USFWS mitigation
2010	5/18/10	Marshall Hall	100,000	MD DNR	USFWS mitigation
2010	5/25/10	Marshall Hall	60,000	MD DNR	USFWS mitigation
2010	5/25/10	Marshall Hall	5,000	MD DNR	USFWS mitigation
2010	n/a	Anacostia	400,000	DC Fisheries	MD DNR mitigation
2011	4/25/11	Marshall Hall	30,000	MD DNR	USFWS mitigation
2011	5/25/11	Marshall Hall	60,000	MD DNR	USFWS mitigation
2011	n/a	Marshall Hall	263,000	MD DNR	MD DNR mitigation
2012	4/16/12	Marshall Hall	165,000	MD DNR	MD DNR mitigation
2012	4/5/12	Anacostia	200,000	DC Fisheries	MD DNR mitigation
2013	5/1/13	Anacostia	200,000	DC Fisheries	MD DNR mitigation
2013	4/29/13	Marshall Hall	3,000	MD DNR	MD DNR mitigation
2013	5/10/13	Marshall Hall	220,000	MD DNR	MD DNR mitigation
2013	5/21/13	Marshall Hall	57,400	MD DNR	MD DNR mitigation
2014	4/14/14	Marshall Hall	10,300	MD DNR	MD DNR mitigation
2014	4/16/14	Marshall Hall	20,700	MD DNR	MD DNR mitigation
2014	4/23/14	Marshall Hall	10,300	MD DNR	MD DNR mitigation
2014	5/8/14	Marshall Hall	31,000	MD DNR	MD DNR mitigation
2014	5/16/14	Marshall Hall	20,700	MD DNR	MD DNR mitigation
2014	4/29/14	Marshall Hall	166,000	DC Fisheries	MD DNR mitigation
2015	4/24/15	Marshall Hall	10,800	MD DNR	MD DNR mitigation
2015	5/7/15	Marshall Hall	172,700	MD DNR	MD DNR mitigation
2016	4/13/16	Marshall Hall	30,800	MD DNR	MD DNR mitigation
2016	4/26/16	Marshall Hall	30,800	MD DNR	MD DNR mitigation
2017	4/10/17	Marshall Hall	15,800	MD DNR	MD DNR mitigation
2017	4/16/17	Marshall Hall	55,300	MD DNR	MD DNR mitigation
2017	4/20/17	Marshall Hall	47,400	MD DNR	MD DNR mitigation
2017	4/24/17	Marshall Hall	79,000	MD DNR	MD DNR mitigation
2017	4/25/17	Marshall Hall	31,600	MD DNR	MD DNR mitigation
2017	4/26/17	Marshall Hall	94,800	MD DNR	MD DNR mitigation
2017	5/9/17	Marshall Hall	20,000	MD DNR	MD DNR mitigation
2018	4/24/18	Marshall Hall	240,000	MD DNR	MD DNR mitigation
2018	4/27/18	Marshall Hall	16,000	MD DNR	MD DNR mitigation
2018	5/2/18	Marshall Hall	16,000	MD DNR	MD DNR mitigation
2018	5/3/18	Marshall Hall	16,000	MD DNR	MD DNR mitigation

**Table 3 (continued).** MD DNR American Shad Mitigation Report – Potomac River

<b>Year</b>	<b>Date</b>	<b>Stocking site</b>	<b>Number</b>	<b>Cultured By:</b>	<b>Stocked For:</b>
2018	5/6/18	Marshall Hall	16,000	MD DNR	MD DNR mitigation
2018	5/7/18	Marshall Hall	16,000	MD DNR	MD DNR mitigation
2018	5/21/18	Marshall Hall	32,000	MD DNR	MD DNR mitigation
2019	4/17/19	Marshall Hall	15,500	MD DNR	MD DNR mitigation
2019	4/22/19	Marshall Hall	15,500	MD DNR	MD DNR mitigation
2019	4/23/19	Marshall Hall	15,500	MD DNR	MD DNR mitigation
2019	4/24/19	Marshall Hall	77,500	MD DNR	MD DNR mitigation
2019	4/25/19	Marshall Hall	15,500	MD DNR	MD DNR mitigation
2019	5/1/19	Marshall Hall	15,500	MD DNR	MD DNR mitigation
2019	5/7/19	Marshall Hall	31,000	MD DNR	MD DNR mitigation
2019	5/8/19	Marshall Hall	15,500	MD DNR	MD DNR mitigation
2019	5/13/19	Marshall Hall	31,000	MD DNR	MD DNR mitigation
2019	5/17/19	Marshall Hall	77,500	MD DNR	MD DNR mitigation
2019	5/19/19	Marshall Hall	186,000	MD DNR	MD DNR mitigation
2021	5/3/21	Marshall Hall	41,600	MD DNR	MD DNR mitigation
2021	5/4/21	Marshall Hall	72,000	MD DNR	MD DNR mitigation
2021	5/17/21	Marshall Hall	145,000	MD DNR	MD DNR mitigation
2022	4/11/22	Marshall Hall	9,100	MD DNR	MD DNR mitigation
2022	4/13/22	Marshall Hall	36,500	MD DNR	MD DNR mitigation
2022	4/26/22	Marshall Hall	36,500	MD DNR	MD DNR mitigation
2022	4/28/22	Marshall Hall	82,100	MD DNR	MD DNR mitigation
2022	5/2/22	Marshall Hall	90,000	MD DNR	MD DNR mitigation

**Table 4.** Summary of American shad collected and eggs obtained from the Potomac River by MD DNR and scale age samples.

	2001	2002	2003	2004	2005	2006	2007	2008
# Ripe Females	298	568	458	231	561	472	567	401
# Green Females		205	351	276	446	314	438	405
# Spent Females		147	60	183	192	98	178	141
# Males	143	1083	490	286	385	223	213	476
Total Shad	441	2,003	1,359	976	1,584	1,107	1,396	1,423
Liters of Eggs	101.8	309.6	222.6	137.5	246	249	294.7	213.5
Total # of Eggs	3,906,375	11,501,975	8,337,225	5,742,950	9,514,400	9,350,900	10,222,090	7,918,150
Total Fertile Eggs	1,687,629	5,898,446	3,260,799	3,268,708	4,466,611	3,207,860	3,508,795	3,921,239
# Re-stocked Fry							200000	200000
	2009	2010	2011	2012	2013	2014*	2015*	2016*
# Ripe Females	425	599	304	1828	1168	579	569	947
# Green Females	277	288	355	1744	1199	1065	1482	907
# Spent Females	144	150	80	223	146	34	126	152
# Males	467	604	417	1250	354	1543	585	340
Total Shad	1,313	1,641	1,156	5,045	2,867	3,221	2,762	2,346
Liters of Eggs	205.5	299	168.5	619.5	441	180	174	372
Total # of Eggs	7,557,855	11,463,350	5,957,600	25,540,150	15,834,815	6,564,000	7,126,200	14,787,550
Total Fertile Eggs	4,554,483	7,882,600	3,964,097	11,294,187	8,306,826	3,346,406	3,199,264	6,502,012
# Re-stocked Fry	200000	400,000	263000	365000	480400	259000	183500	61600
	2017*	2018*	2019*	2021*	2022*	<b>Total</b>		
# Ripe Females	1050	1164	1050	249	463	<b>13951</b>		
# Green Females	2054	833	675	251	390	<b>13,955</b>		
# Spent Females	378	282	69	61	15	<b>2859</b>		
# Males	627	280	118	167	200	<b>10251</b>		
Total Shad	4,109	2,559	1,912	728	1,068	<b>41,016</b>		
Liters of Eggs	480	458	572	114	182	<b>6040.2</b>		
Total # of Eggs	15,924,350	14,494,200	17,444,400	3,866,925	10,483,600	<b>223,539,060</b>		
Total Fertile Eggs	7,546,119	7,829,522	7,254,283	2,556,016	6,547,051	<b>110,002,953</b>		
# Re-stocked Fry	343900	352,000	496,000	258,000	254,200	<b>3,916,600</b>		

\* Scales taken for age samples  
 No work was conducted in 2020 due to the pandemic



**Table 4 (continued).** Summary of American shad collected and eggs obtained from the Potomac River by MD DNR and scale age samples.

American Shad Age, Length, and Weight Potomac River - 2022 (MD DNR)					
Year Class	2015	2016	2017	2018	Total
Age	7	6	5	4	
<b>Males</b>					
Number	8	4	5	1	18
% by year class	44%	22%	28%	6%	
Av. TL (mm)	483	466	441	409	
<b>Females</b>					
Number	9	33	36	3	81
% by year class	11%	41%	44%	4%	
Av. TL (mm)	500	486	470	470	
<b>Sexes Combined</b>					
Number	17	37	41	4	99
% by year class	17%	37%	41%	4%	
Av. TL (mm)	492	484	467	455	

American Shad Age, Length, and Weight Potomac River - 2021 (MD DNR)				
Year Class	2016	2017	2018	Total
Age	7	6	5	
<b>Males</b>				
Number	11	12	6	29
% by year class	38%	41%	21%	
Av. TL (mm)	480	460	441	
<b>Females</b>				
Number	5	9	7	21
% by year class	24%	43%	33%	
Av. TL (mm)	512	481	471	
<b>Sexes Combined</b>				
Number	16	21	13	50
% by year class	32%	42%	26%	
Av. TL (mm)	490	469	457	

American Shad Age, Length, and Weight Potomac River - 2019 (MD DNR)							
Year Class	2010	2011	2012	2013	2014	2015	Total
Age	9	8	7	6	5	4	
<b>Males</b>							
Number	1		17	26	13	1	58
% by year class	2%		29%	45%	22%	2%	
Av. TL (mm)	519		474	467	448	400	
Av. Wt. (kg)	1.05		0.89	0.83	0.77	0.56	
<b>Females</b>							
Number		2	7	57	24	1	91
% by year class		2%	8%	63%	26%	1%	
Av. TL (mm)		506	499	491	483	471	
Av. Wt. (kg)		1.24	1.06	1	1	1.03	
<b>Sexes Combined</b>							
Number	1	2	24	83	37	2	149
% by year class	1%	1%	16%	56%	25%	1%	
Av. TL (mm)	519	506	481	483	471	436	
Av. Wt. (kg)	1.05	1.24	0.94	0.95	0.92	0.8	

American Shad Age, Length, and Weight Potomac River - 2018 (MD DNR)					
Year Class	2011	2012	2013	2014	Total
Age	7	6	5	4	
<b>Males</b>					
Number		4	2	2	8
% by year class		50%	25%	25%	
Av. TL (mm)		462	430	420	
Av. Wt. (kg)		0.91	0.78	0.66	
<b>Females</b>					
Number	9	59	63	8	139
% by year class	6%	42%	45%	6%	
Av. TL (mm)	509	501	482	486	
Av. Wt. (kg)	1.2	1.1	1.05	0.85	
<b>Sexes Combined</b>					
Number	9	63	65	10	147
% by year class	6%	43%	44%	7%	
Av. TL (mm)	509	499	481	473	
Av. Wt. (kg)	1.2	1.08	1.03	0.76	

**Table 5.** Summary of American shad collected and eggs produced from the Potomac River by DOEE and otolith age samples.

	2006	2007	2008	2009	2010	2012	2013	2014
# Ripe Females	19	148	65	151	158	177	203	103
# Green Females	8	348	80	158	170	337	189	160
# Spent Females	4	55	28	56	30	21	44	34
# Males	1	43	18	115	128	185	85	218
Total Shad	32	594	191	480	486	720	521	515
Liters of Eggs	4.3	64.75	34.75	81	87.5	102.25	94.5	42.75
Liters of Viable Eggs	3.4	46.2	14.8	41.1	60.3	64.9	59.8	27.4
Viable Eggs/Female	3,831	9,355	8,550	12,334	15,058	13,252	7,143	10,003
# Stocked Fry in Anacostia River	114,920	763,600	261,710	922,650	1,672,411	1,912,947	1,216,443	796,787
# Stocked Eggs in Anacostia River								
	2015*	2016*	2017	2018*	<b>Totals</b>			
# Ripe Females	71	244	0	75	<b>1414</b>			
# Green Females	115	213	0	-	<b>1778</b>			
# Spent Females	27	78	0	-	<b>377</b>			
# Males	51	55	0	104	<b>1003</b>			
Total Shad	213	590	0	179	<b>4521</b>			
Liters of Eggs	0	33	0	40	<b>584.8</b>			
Liters of Viable Eggs	0	0	0	-	<b>317.9</b>			
Viable Eggs/Female	0	0	0	-	<b>79,526</b>			
# Stocked Fry in Anacostia River	0	0	0	0	<b>7,661,468</b>			
# Stocked Eggs in Anacostia River				50,000	<b>50,000</b>			

\* Scales & otoliths taken on 5% of fish

No work was conducted in 2015 or 2016 due to filtration system failure

**Table 5 (continued).** Summary of American shad collected and eggs produced from the Potomac River by DOEE and otolith age samples.

American Shad Age, Length, and Weight Potomac River - 2018 (DOEE)						American Shad Age, Length, and Weight Potomac River - 2016 (DOEE)						
Year Class	2012	2013	2014	2015	Total	Year Class	2009	2010	2011	2012	2013	Total
Age	6	5	4	3		Age	7	6	5	4	3	
<b>Males</b>						<b>Males</b>						
Number	1	9	19	5	34	Number		1	3	5	4	13
% by year class	3%	26%	56%	15%		% by year class		8%	23%	38%	31%	
Av. TL (mm)	491	480	473	464		Av. TL (mm)		495	493	481	428	
Av. Wt. (kg)	0.89	1.01	0.96	0.91		Av. Wt. (kg)		1.00	0.96	0.89	0.70	
<b>Females</b>						<b>Females</b>						
Number		5	7	3	15	Number	2	11	15	15	4	47
% by year class		33%	47%	20%		% by year class	4%	23%	32%	32%	9%	
Av. TL (mm)		500	499	468		Av. TL (mm)	528	511	488	482	461	
Av. Wt. (kg)		0.93	1.24	1.01		Av. Wt. (kg)	1.27	1.18	1.1	0.95	0.96	
<b>Sexes Combined</b>						<b>Sexes Combined</b>						
Number	14	26	8	8	56	Number	2	12	18	20	8	60
% by year class	25%	46%	14%	14%		% by year class	3%	20%	30%	33%	13%	
Av. TL (mm)	491	487	480	465		Av. TL (mm)	528	510	489	482	444	
Av. Wt. (kg)	0.89	0.98	1.03	0.94		Av. Wt. (kg)	1.27	1.17	1.08	0.94	0.83	

American Shad Age, Length, and Weight Potomac River - 2015 (DOEE)						
Year Class	2008	2009	2010	2011	2012	Total
Age	7	6	5	4	3	
<b>Males</b>						
Number	1	7	4	3	1	16
% by year class	6%	44%	25%	19%	6%	
Av. TL (mm)	473	485	480	467	430	
Av. Wt. (kg)	1.05	1.09	1.05	1.03	1.03	
<b>Females</b>						
Number	1		11	6		18
% by year class	6%		61%	33%		
Av. TL (mm)	495		492	499		
Av. Wt. (kg)	1.42		1.33	1.29		
<b>Sexes Combined</b>						
Number	2	7	15	9	1	34
% by year class	6%	21%	44%	26%	3%	
Av. TL (mm)	484	485	489	488	430	
Av. Wt. (kg)	1.24	1.09	1.25	1.2	1.03	