



# Economics and Invasive Species

2024 Potomac River Conference: Reeling in the Challenge of Invasive Species

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October 17, 2024



Blue Catfish

2023

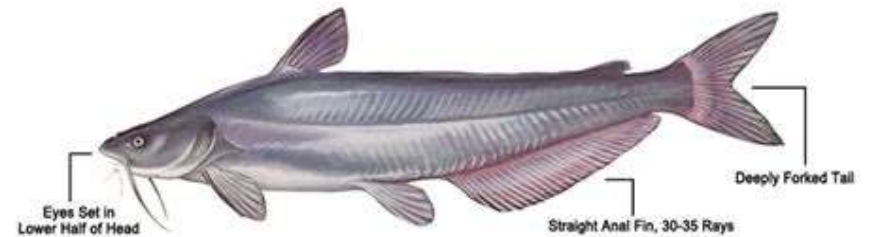
n/a

2020

n/a

2018

n/a



# Topics

- Economic dimensions of the problem
- Economic tools
- Information and research needs

# Invasive species issues in economic terms

- How economists think about economic value
- Invasive species problems have aspects of public goods problems
- Typically involves bargaining and cooperation across political jurisdictions

# How economists think about value

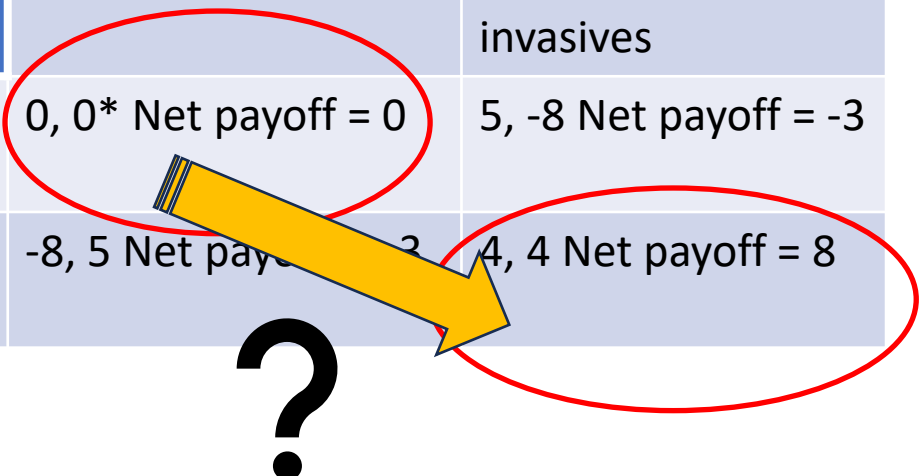
- Economists view the environment as an asset that provides a variety of services. The Potomac River, for example, provide aesthetic, ecological, recreational, industrial, and life-sustaining services.
- The value of a wetland to a biologist might be its benefit to the reproductive capacity of fish. A hydrologist might measure a wetland's value by its ability to recharge groundwater. To an economist, a wetland's value relates to the extent to which people benefit from its goods and services. This economic value then likely includes its roles as a nursery for fish and as a groundwater recharge zone, but only to the extent that people realize these benefits.
- To measure the economic value of a resource, economists observe human preferences — and, when possible, the behavior resulting from those preferences.
- **WTP as a measure of value.**
- Economic value is measured in terms of tradeoffs and based on human preferences and, if possible, on human behavior. Such value is added up across individuals to obtain a measure, most often in dollars, of aggregate value represented by consumer well-being.

This is why providing “goods” such as invasive species control is hard....the prisoner’s dilemma!

|                |                             | Jurisdiction B        |                             |
|----------------|-----------------------------|-----------------------|-----------------------------|
|                |                             | Limited control       | Robust control of invasives |
| Jurisdiction A | Limited control             | 0, 0* Net payoff = 0  | 5, -8 Net payoff = -3       |
|                | Robust control of invasives | -8, 5 Net payoff = -3 | 4, 4 Net payoff = 8         |

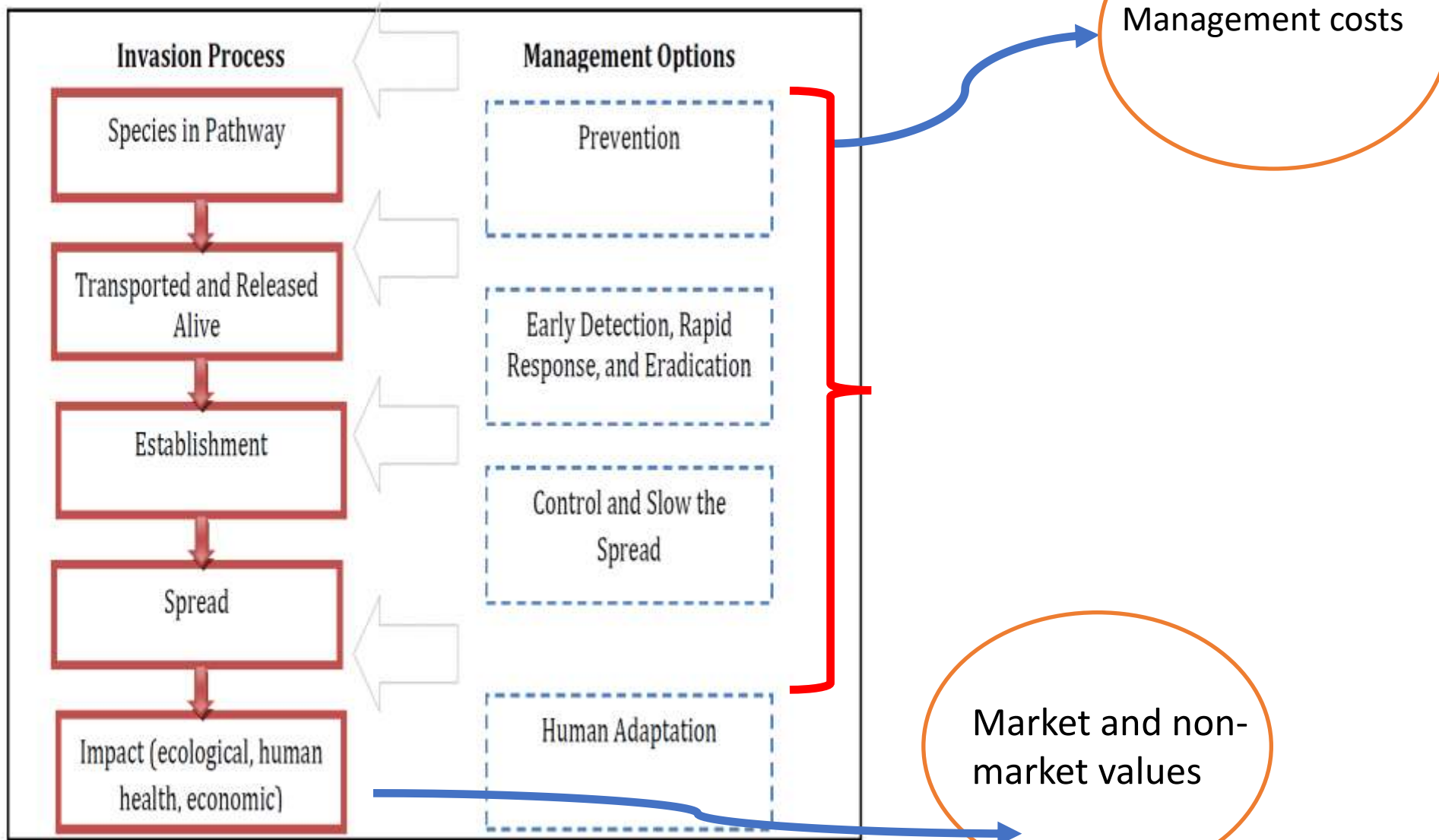
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- Maybe we don't have a PD game!
- Because the players can communicate, benefits to each player may change over time, and thus the players' strategies might change over time.
- one or a group of users are eventually better off investing in even if others continue to free ride
- remedial and preventative measures are often delayed due to uncertainty about changes in the underlying resource or the possibility that other actors will take on
- responsibility. As the resource degrades, risks become more apparent or the resource suffers a sudden rapid deterioration and one or more parties eventually takes on the costs and responsibilities of more sustainable practices.
- Fancy technical term: interconnecting across temporally evolving games

# Invasion Process and Management Options



Source: Adapted from Lodge et al. (2006)



# The economist's toolbox...



## Cost effectiveness analysis

Compares the costs of alternative policies or approaches for achieving a certain goal.



## Benefit-cost analysis

Compares the economic costs and benefits of an action and is used to determine which alternative maximizes net benefits.



## Non-market valuation

Methods that estimate the value of goods and services that are not commonly bought and sold in markets (e.g., travel cost; hedonics; stated preference approaches).

| <b>Estimates of Invasive Species Damages by Type of Species</b>  |   |
|--|---|
| <b>Type of Species</b>   | <b>Potential Damages per Invasion per Year<br/>(Million 2010\$)</b> |
| Fish   | 0 – 161 <sup>a</sup>  |
| Mollusks   | 0 – 6,415 <sup>b</sup>  |
| Non-Mollusk Invertebrates  | 0 – 23.8 <sup>c</sup>   |
| Plants   | 0 – 36.9 <sup>d</sup>   |
| Pathogens  | 0 – 0.764 <sup>e</sup>  |
| <sup>a</sup> Ruffe (Leigh, 1998), adjusted to 2007\$ using CPI.<br><sup>b</sup> Zebra Mussel (Pimentel et al., 1999), adjusted to 2007\$ using CPI.<br><sup>c</sup> European Green Crab (EPA, 2008b).<br><sup>d</sup> Hydrilla (OTA, 1993), adjusted to 2007\$ using CPI.<br><sup>e</sup> Based on an outbreak of epidemic cholera (Lovell and Drake, 2007), adjusted to 2007\$ using CPI. |   |

Source: Regulatory Impact Analysis of the EPA Proposed Rulemaking for “Vessel Incidental Discharge National Standards of Performance”  
September 24, 2020

## Maryland wants invasive fish out of the water — and on your dinner table

As northern snakehead and blue catfish continue to proliferate, the state is trying to get more people to eat them.



Branson Williams feels the weight of his responsibilities. The 39-year-old Marylander is tasked with defeating an elusive and relentless enemy that shows no signs of weakening.

Failure in this war is not an option. But a complete and convincing victory is unlikely.

“I stay up late at night thinking about this,” Williams says. “Eradication is not possible at this point. Their abundance and densities are way too great. What we do hope is that we can prevent further spread.”

The menace causing Williams to lose sleep? Fish.

## Grand prize winner removed 20 Burmese pythons from the wild in Florida challenge

The winner of the Florida Python Challenge removed 20 Burmese pythons from the Everglades

» « □ ▢



FILE. A Burmese python is held during a public capture demonstration at a media event for the 2023 Florida Python Challenge, June 15, 2022, in Miami. AP Photo/Lynne Spang, file

By Stephen Motil | AP  
September 17, 2024 at 4:52 p.m. EDT

WEST PALM BEACH, Fla. — It's official, the Florida Python Challenge this year has a winner.

The \$10,000 grand prize went to Ronald Kiger, who removed 20 Burmese pythons from the Florida Everglades during the 20-day hunt, which was meant to bring awareness to the threat that these pythons pose to the ecosystem. Last year, he was the direct runner-up to the grand prize winner.

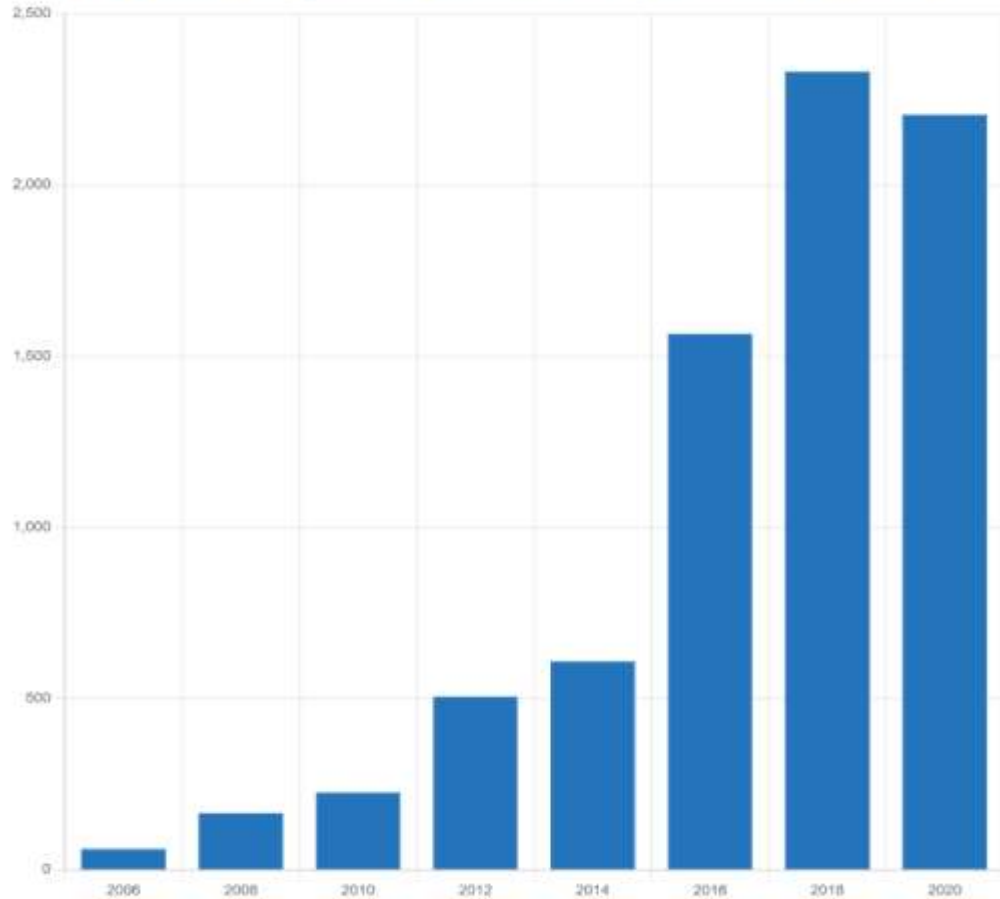
# Can we consume (harvest) our way out of invasive species problems?



## 2024 FWC Lionfish challenge breaks records

FWC: 31,773 invasive fish removed from Florida waters

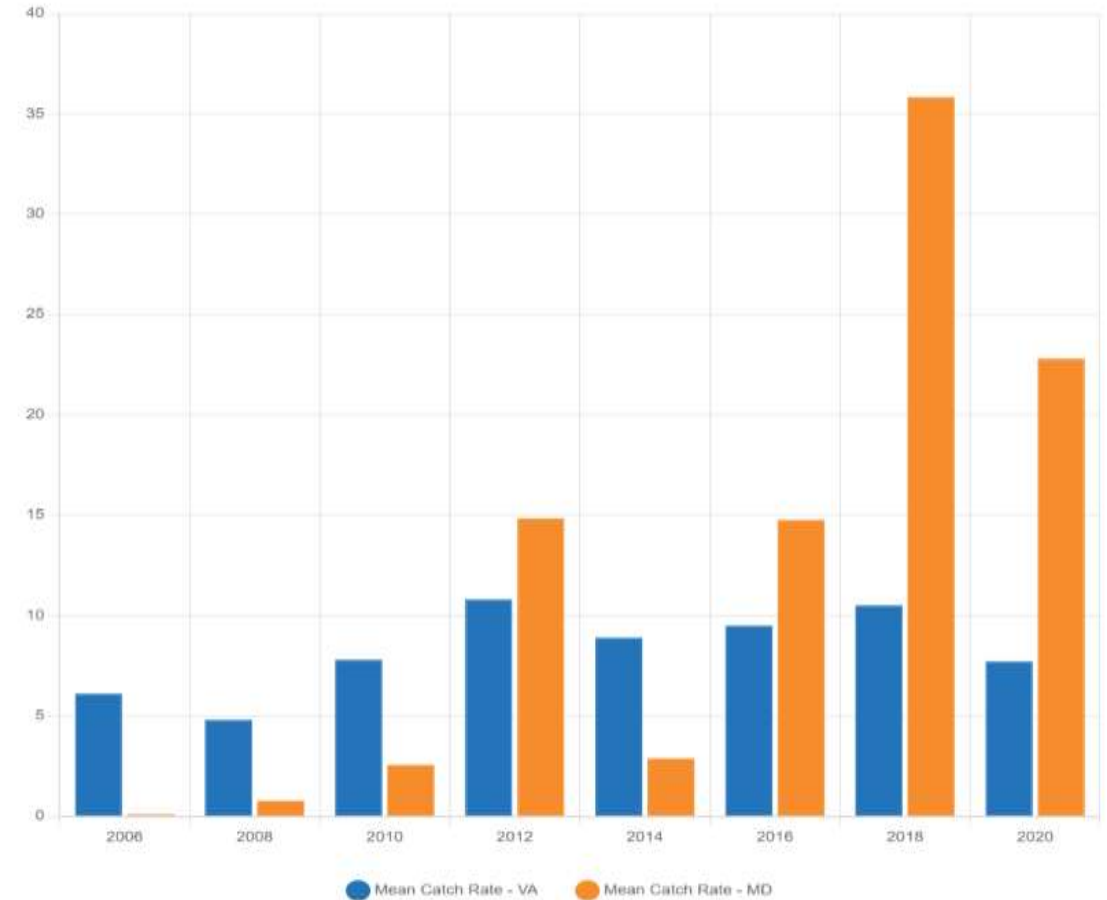
Commercial Landings from the Mainstem Potomac (thousands of pounds)



Blue Catfish

Source: Potomac River Fisheries Commission

Northern Snakehead: Relative Abundance in the Potomac, Mean catch rate (fish per hour)

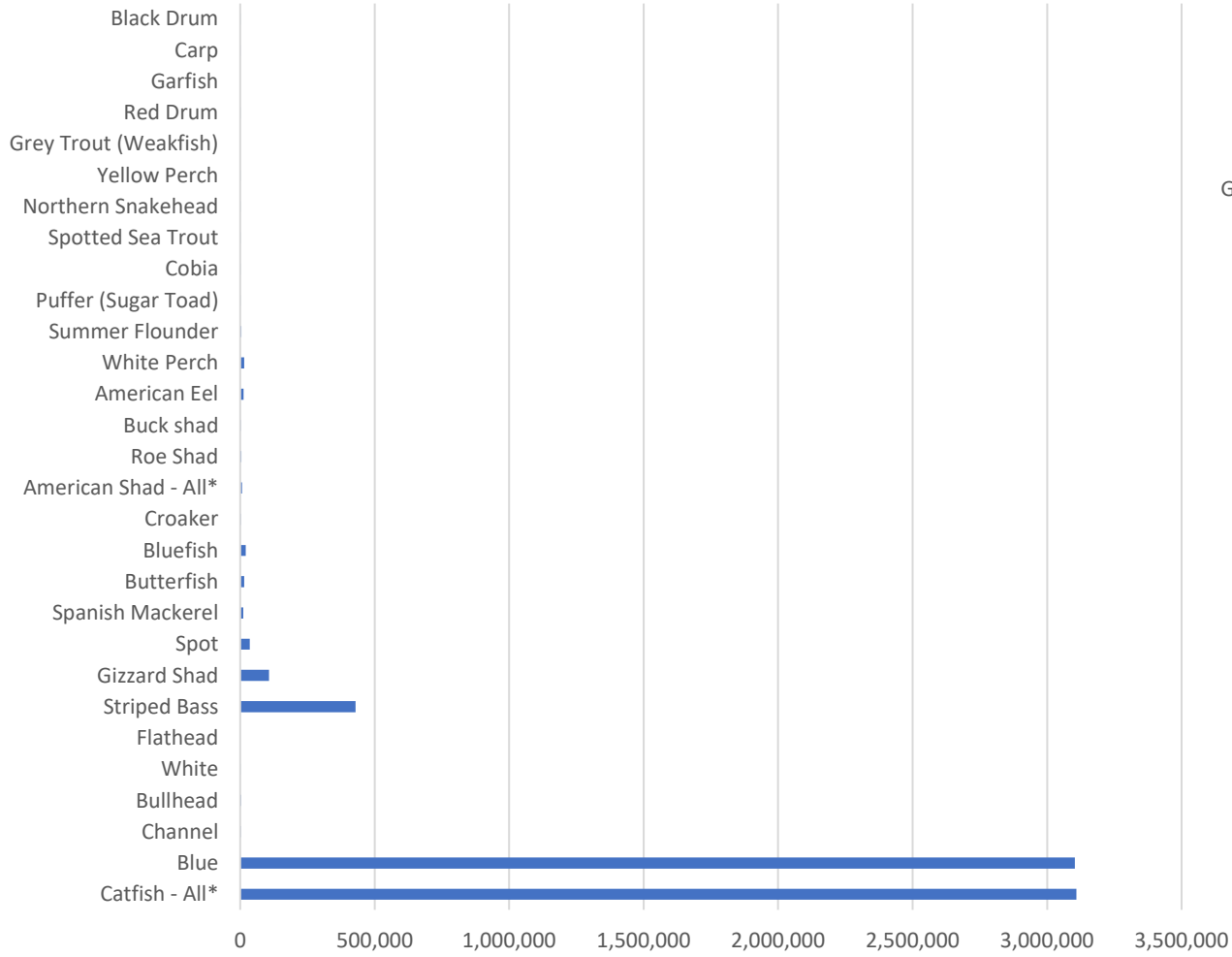


Northern Snakehead

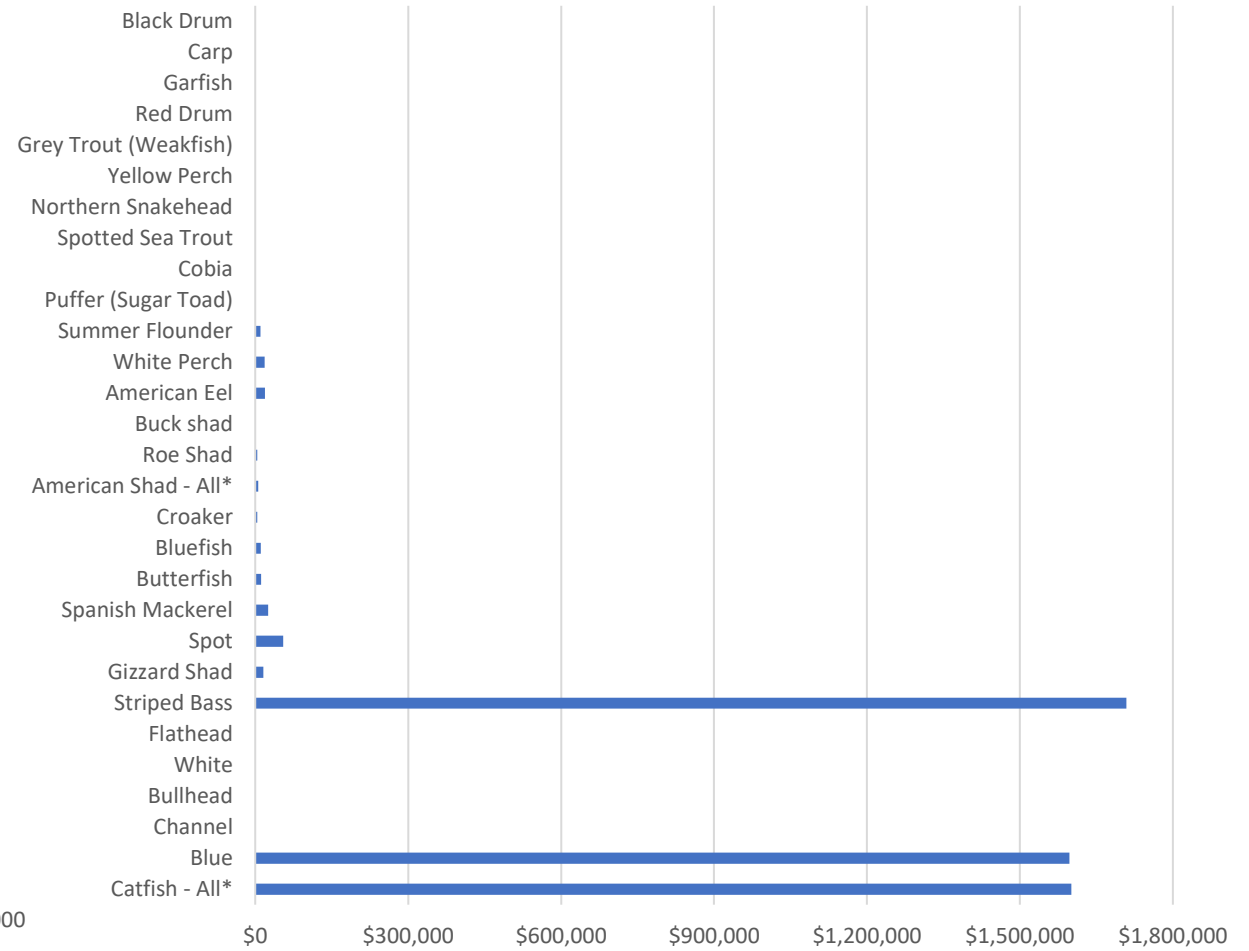
Source: Maryland Department of Natural Resources and Virginia Department of Game and Inland Fisheries

“We have learned that harvest by anglers can remove over 25% of the local population, which goes a long way toward reducing snakehead numbers. For this reason, we encourage anglers to target and harvest Northern Snakehead when captured. Although it is doubtful that complete eradication can be achieved, control efforts have been successful.” Source: Northern Snakehead Control and Management | U.S. Fish & Wildlife Service (fws.gov)

Potomac River Commercial Finfish Landings, 2022 (lbs)



Potomac River Commercial Finfish Landings, Dockside value 2022 (\$)



# Research needs

- Invasive species science has largely remained in the domain of natural sciences. Greater research in economics and other social sciences could help to better integrate governance and management policy, address the objectives of multiple stakeholders, account for risk perceptions, and promote bargaining and cooperative behavior among decision makers.
- Better understanding of the relationship between human behavior and the prevention, eradication, and control of invasive species.
- Benefit-cost analysis.
- Non-use economic costs.
- Regional damage estimates. To date, there has not been a comprehensive investigation of impacts from terrestrial and aquatic invasive species, including the full value of ecosystem services lost
- Climate change: implications for spread and control costs.
- Uncertainty.
- Validation of optimal management policies that have been developed.