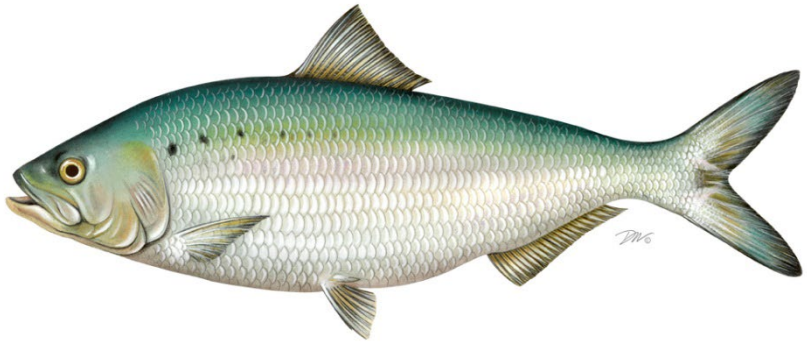
Shad Habitat Plan Updates



ASMFC Shad and River Herring Management Board

October 19, 2021

Background

- Amendment 3 requires all states and jurisdictions to submit a habitat plan for American shad
  - summary of current and historical spawning and nursery habitat, threats to those habitats, and habitat restoration programs
- In February 2020, the Board asked states to update/submit habitat plans for shad rivers in their state
- The Board has approved 12 plans/updates since then
  - ME, NH, MD, NC, Savannah River, GA, MA, RI, CT, Delaware Basin, SC, and FL

Plan Updates for Board Consideration

- September 2021: 2 habitat plan updates and 1 new plan were evaluated by TC and submitted for Board consideration:
  - VA
  - DC
  - Hudson River
- **The TC recommends approval of all plans and updates**

Habitat Plan Updates

Virginia Habitat Plan Update

- The Plan covers the James, York, and Rappahannock Rivers
- This 2021 report updates information on existing habitat threats recorded within the 2014 report, and identified the following additional threats
  - *In river construction and blockage to migration*
    - Projects such as bridge and tunnel construction and maintenance, dredging, and others, have the potential for disruption of American Shad migration from both direct (e.g., acoustic interference) and indirect (e.g., habitat alteration) factors.
  - *Agricultural/Industrial Water Intakes and Discharge*
    - Systems used by American Shad are subject to significant withdrawals with effects to spawning and nursery habitat no well understood

DC Habitat Plan Update

- The DC Plan covers the portions of the Potomac and Anacostia Rivers which fall within the borders of the District of Columbia.
- Updates from the previous plan include:
  - The completion of a dredging/channelization project associated with the runway extension at Reagan National Airport
  - Over 1000 stomachs have been collected from invasive blue and flathead catfish as part of a diet study to determine the effects of predation on resident anadromous species, including shad

NY Hudson Plan

- **Habitat Assessment**
  - American shad currently have access to 91% of historical mainstem Hudson River habitat from the mouth up to Troy Dam
  - Conversion of habitat during the dredging and channelization of the upper portion of the estuary resulted in a loss of preferred habitat.

NY Hudson Plan

- **Threats Assessment**
  - The Plan identifies threats to American shad spawning and nursery habitat including:
    - Water Withdrawals
      - Data show that impingement and entrainment mortality of American shad at various power generating facilities may have resulted in year class reductions ranging from 16 to 52% during the period of 1974 to 1997
    - Anthropogenic Habitat Changes
      - Dredging/channelization of the mainstem Hudson River and adjacent land use changes have resulted in the change and degradation of preferred habitat used by American shad including the loss of 57% of the intertidal shallow water habitat found north of the City of Hudson during the middle of the 19th century.
    - Climate Change
      - The Hudson River stock will be vulnerable to climate change due, in part, to changes in water temperatures, water quality, and lost nursery habitat as storm intensity and frequency carry sediments that hinders the growth of submerged aquatic vegetation
    - Invasive Species
      - Over the past century invasive species have entered the Hudson River that threaten the American shad recruitment through predation from invasive fish species and loss of nursery habitat as a result of invasive plant species such as water chestnut

NY Hudson Plan

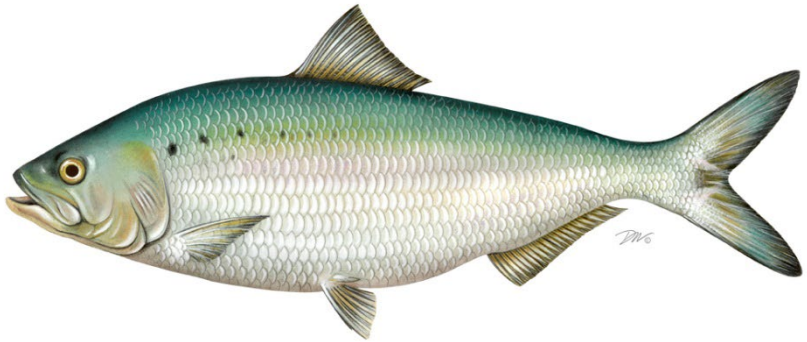
- Habitat Restoration Programs
  - Within the Hudson River system there are significant and ongoing efforts to understand and reduce the impacts of threats to American shad and shad spawning and nursery habitats identified in the Plan
  - Restoration efforts include:
    - The removal of 9 dams within the Hudson River estuary since 2016
    - Managing water intakes to reduce entrainment and impingement mortality of shad eggs and larval American shad
    - Restoring vegetated shallow water and intertidal habitats including a side channel restoration project completed in July 2018 at Gay's Point (km 196), near Coxsackie, NY
    - Invasive species monitoring and management
    - Monitoring climate change impacts to the Hudson River and American Shad to identify and implement opportunities to adaptively manage and minimize adverse impact

Next Steps

- *Today:* Consider approval of the 3 plans presented today

Questions?

Technical Committee Task: Methods to Evaluate Bycatch in Mixed-stock Fisheries in State Waters



Presented by Brian Neilan (TC Chair, NJDEP)

ASMFC Shad and River Herring Management Board

May 5, 2021

Outline

1. Background
2. Data Assessment
3. Methods to Evaluate Mixed-Stock Catch
4. TC Recommendations

Background

- In August 2020, the Board tasked the TC with "identifying potential paths forward to improve shad stocks along the coast considering the assessment results."
- System-specific TC recommendations presented at February 2021 meeting.
- TC identified need to understand and reduce impacts to external stocks of directed mixed-stock fisheries (e.g. Hudson river shad caught in Delaware Bay)
- TC tasked with "developing methods to evaluate bycatch removals in directed mixed-stock fisheries in state waters in order to understand and reduce impacts to stocks outside the area where directed catch occurs"

Task Roadmap

- Define goals and expectations
- Identify known or potential mixed stock fisheries
- Collect available data on mixed stock harvest and composition
  - Past and present DNA studies, tagging data, and commercial and recreational harvest data to determine where mixed stock harvests occur and to what degree
- Determine feasibility of developing modeling methods to estimate composition of mixed-stock fisheries
- Evaluate novel and/or existing methods of reducing or eliminating mixed-stock harvest
- ***Develop recommendations for the Board on reducing or eliminating mixed-stock harvest or recommend research priorities going forward to address this task.***

Data Assessment

- Data Collection
  - The task group received fishery dependent and independent data sets from multiple states and agencies
  - The tagging studies and genetic analysis provided proved useful for identifying mixed stock shad fisheries within the Delaware Bay & Winyah Bay.
- The Delaware Bay fishery was evaluated given the quantity and quality of data available from this fishery
  - Data from the Delaware system available to the task group included:
    - Commercial landings (1988-2019)
    - Tagging studies (1995-2019),
    - DNA analysis, (multiple single year and short term analyses)
    - Long term general abundance surveys, including ones from out of basin stocks (NY)

Tiered Approach For Evaluating Potential Methods

- The working group took a tiered approach to evaluating the data and methods available
- Three tiers were developed based on:
  - Quantity and quality of data currently available
  - Data that could reasonably be collected without a significant changes in near term effort
  - Ideal data collection efforts that would provide the information necessary to support more robust modeling efforts, such as a statistical catch at age model

Relative F with Currently Available Data

- First Tier
  - Relative F with static genetic proportion (limit relative F to a level established post-hoc, non-biological rationale)
    - Harvest/Relative Abundance Index
    - In the case of the Delaware system, a static % of total catch was assigned to Hudson stock fish based on tagging and genetic data
    - This Hudson harvest total from the Delaware system was compared to an adult abudnace survey from the Hudson River
  - From here an average relative F for the time series can be generated and benchmarks and triggers can be developed based time series when harvest levels are deemed appropriate

Relative F + Some Extra Effort

- Second Tier
  - Relative F with time-varying stock composition
    - Same general method as previous tier but **would require regular genetic sampling or tagging studies** to better inform the yearly out of basin composition within the mixed stock fisheries
    - The previous method relies on average composition over a time series or small single year/multi-year genetic analyses from the past
  - More consistent sampling would allow for year on year specific stock composition assignment of catch, which likely fluctuates on a yearly basis

Ideal Methods for Evaluation

- Third Tier
  - Bycatch Impact Analysis or Statistical Catch at Age Model
  - Requires a significant increase in FI and FD sampling effort to meet the data needs of either method
  - While the third tier methods would provide the most robust analysis of mixed stock fishery impacts, the required increase in data collection and sampling efforts could not practically be completed by the agencies involved in mixed stock fisheries without a significant increase in staff time and resources.

TC Recommendations

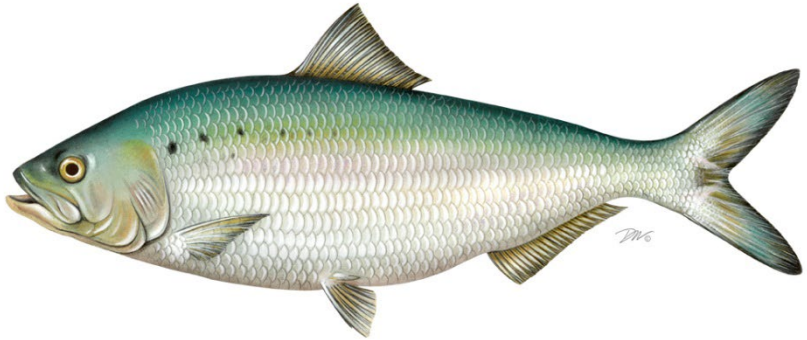
- The TC recommends that the second-tier method be used for evaluating bycatch removals in directed mixed-stock fisheries
  - This tier involves developing a Relative F index based on increased genetic sampling and/or tagging efforts which can provide annual stock composition of mixed stock landings
  - This method is preferable to the current first-tier methods of applying a historical average to stock assignment based on past tagging and DNA studies as regular DNA analysis can account for yearly fluctuations in stock composition of the harvest.
- States with mixed stock fisheries would develop management strategies based on these methods to reduce impacts of out of basin harvest in mixed stock fisheries
  - These strategies should be incorporated into current SFPs when developed

Next Steps

- If the Board agrees with the TC recommendation, it can recommend that the DE River Basin Coop SFMP incorporate the recommended methods
  - E.g., SFMP could establish a management threshold based on relative F

Questions?

Technical Committee Progress on Shad Passage Prioritization Task



Presented by Brian Neilan (TC Chair, NJDEP)

ASMFC Shad and River Herring Management Board

May 5, 2021

Outline

1. Background
2. Progress on Task
3. Next Steps

Background

- August 2020: Board tasked TC with "identifying potential paths forward to improve shad stocks along the coast considering the assessment results."
- TC recommendations presented at February & May 2021 meetings.
- In May of 2021 the Board followed the TC recommendation that the Commission send letters to the agencies with relevant authorities to request prioritization of these actions when considering licensing/permitting of projects that might impede access to spawning grounds and out-migration.
  - The TC was tasked with prioritizing systems for shad recovery and developing an inventory of available data that would support the development of fish passage criteria

Background

- The Commission sent a letter in June of 2021 to the USFWS supporting the Service's efforts to require fish passage during relicensing of hydropower projects and ensure that performance standards of fishery related license conditions are met
- The Service responded favorably in August

Progress on Task

- The TC was tasked with prioritizing systems for shad recovery and developing an inventory of available data that would support the development of fish passage criteria
- Task Group acquired a table of the expected FERC relicensing projects for the Atlantic Coast for FY2020-2030 representing 150+ projects
- TC members from each state were asked to decide whether a project in their state was a priority based on
  - Does the system have an Existing Recovery Plan?
  - Does the system have exisiting Performance Standards?
  - Does the system have exisiting Upstream Fish Passage?
  - Does the system have exisiting Downstream Fish Passage?
  - Is Alosine Passage Needed?
  - Is the system a state priority?

Progress on Task

- The 150+ total projects have been narrowed down to 36 priority systems along the Atlantic Coast
- TC is reviewing the list of priorities and providing information on available data that could be used to support passage criteria

Next Steps

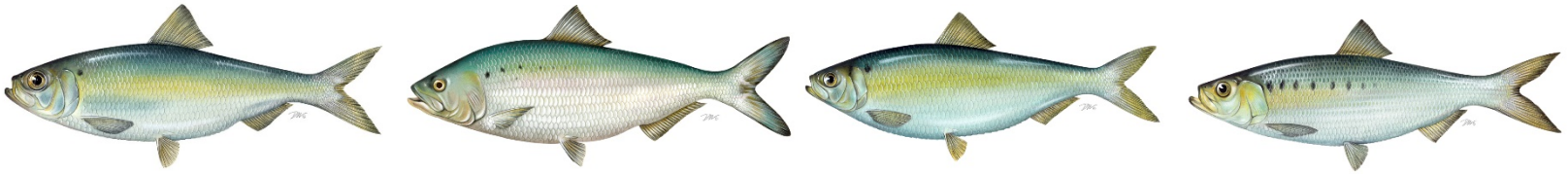
- TC will finalize the list of priority projects and the inventory of available data
- Final report to Board at next meeting

Questions?

USGS
science for a changing world

USGS Eastern Ecological Science Center- ASMFC Partnership

Collaborative research for alosine management



Tom O'Connell
Center Director, USGS Eastern Ecological Science Center
Presentation to the ASMFC Shad and River Herring Management Board
October 19, 2021

U.S. Department of the Interior
U.S. Geological Survey

Tom O'Connell

- USGS Eastern Ecological Science Center, Director (September 2016 – Present)
- Ocean Conservancy, Fish Conservation Director (June 2016 – Sep 2016)
- Earth Resources Technology, Inc., State Fisheries Liaison to NOAA Fisheries (August 2015 – July 2016)
- Fisheries Service, Maryland Department of Natural Resources Fisheries Service, Director (May 2008 – May 2015)

USGS

USGS & the Eastern Ecological Science Center

- **USGS is the primary science agency** within the Department of Interior and uniquely positioned to deliver ASMFC the actionable science required by the **Atlantic Coastal Fisheries Cooperative Management Act of 1993**.
- In 2020, the USGS Patuxent Wildlife Research Center and Leetown Science Center merged to create the EESC.
- **EESC's vision** is to be recognized as a world leader in fish, wildlife, and ecosystem science through scientific excellence and responsiveness to society's needs.
- **EESC's goals** are to align scientific capabilities with conservation and management challenges, emphasize partner relationships, and be recognized as a 'go to' organization for delivering actionable science.

USGS

Eastern Ecological Science Center

- **Main Locations**
  - Leetown Research Lab, Kearneysville, WV
  - Patuxent Research Refuge, Laurel, MD
  - S.O. Conte Research Laboratory, Turners Falls, MA
- Eight Field Stations

EESC's S.O. Conte Research Laboratory in Massachusetts allows biologists, hydraulic and civil engineers to design and test fish passageways tailored to specific species and river systems.

USGS

Partnering with ASMFC

- EESC is **aligning USGS investments with ASMFC management needs** to produce **actionable science**.
- In the past three years, the USGS Ecosystem Mission Area has provided **$100,000 to EESC to conduct science in support of ASMFC-managed species**.
- EESC has leveraged this funding into more than **$2 million and over 20 research projects**.
- Providing **complimentary science support** to other federal and state agencies.
- **Close coordination** with ASMFC and partners

USGS

Additional USGS Science Support to ASMFC

- Participation (EESC and CRUs) on ASFMC science and technical committees:
  - Horseshoe Crab Stock Assessment Committee
  - Delaware Bay Ecosystem Technical Committee
  - Atlantic Sturgeon Stock Assessment Committee
  - Fish Passage Working Group, Habitat Committee
  - Atlantic Coastal Fish Habitat Partnership Steering Committee
  - Cobia Stock Assessment Committee
- New MOU to formally recognize USGS roles

USGS

EESC's Alosine Science *for Managers*

Population Dynamics

- Genetic Stock Identification & Tissue Repository
- Examining Temperature and Diet Impacts on River Herring
- Investigating Novel Hepatitis B Virus in River Herring

Passage / Habitat

- Alosine Fish Lift Design
- Optimizing Fish Ladders for Alosines & other Atlantic Species
- Alosine Passage at Barriers (fishways, culverts, and tidegates)
- East Coast Fish Passage Structure Database
- Next Generation of Fish Passable Stream Gauging Weirs
- Chesapeake Bay Fish Habitat Assessment
- Assess movements of Alosines in Undammed Delaware River

USGS

Project Highlights (Genetics)

Alosine Genetic Stock Identification & Tissue Repository

- Genomic markers for American shad, blueback herring, and alewife provide enhanced resolution of stock structure, greater repeatability, and cost savings over previous genetic analyses using microsatellite markers
- Distinguishing among alosine populations is a critical component of ASMFC's Shad and River Herring FMP
- To participate, contact Miluska Olivera Hyde at mhyde@contractor.usgs.gov

Fields in blue are the minimum information we would like to have for each sample where possible	
Field	**Description**
Tube ID	Number on vial provided by USGA (e.g.,
Other ID	Provided by agency or collector in
Spot color	Applies if the vials were sent by the USGS. It can be "Blue", "Green",
Preservative	Type of preservative used (RNAlater, Qiagen Cell Buffer Lysis, Ethanol, FTA
Collector	Who collected the fish? (Last name,
Collector Email	Email address of collector (for questions
Collector Phone Number	Phone number of collector (for
Species	American shad, Alewife, or Blueback
Tissue type	Fin clip, etc.
Sampling location (river)	Where was the fish collected? E.g., river name, off the coast of [state],
State	In what State in the USA or Canada the
Latitude	Latitude of collection (decimal degrees)
Longitude	Longitude of collection (decimal
Collection date (MM/DD/YY)	Date sturgeon tissue sample was
Total length (mm)	Total length of fish measured in
Fork length (mm)	Fork length of fish measured in
Sex	Female or Male
Comments	Enter any special notes about the fish

Sample information spreadsheet.

USGS

Project Highlights (Passage)

Passage of Anadromous Shad and River Herring at Barriers

- Statistical modeling methods inform passage evaluations, often forming the foundation for FERC licensing requirements
- Alosine physiology, energetics, behavior, ecology, and life-history applied to migratory and passage performance at barriers (fishways, culverts, and tidegates)

Fish elevator entrance at Holyoke Dam, Holyoke, CT. Credit: A. Miehls.

USGS

Project Highlights (Passage)

Development of a Novel D-cylinder Fish Ladder

- Many historic Atlantic & Gulf Coast fish ladders were designed for Pacific salmonids
- Developing new fish ladder design targeted to alosines and other Atlantic species (ex. eels and lampreys)
- Incorporates swimming performance and behavior

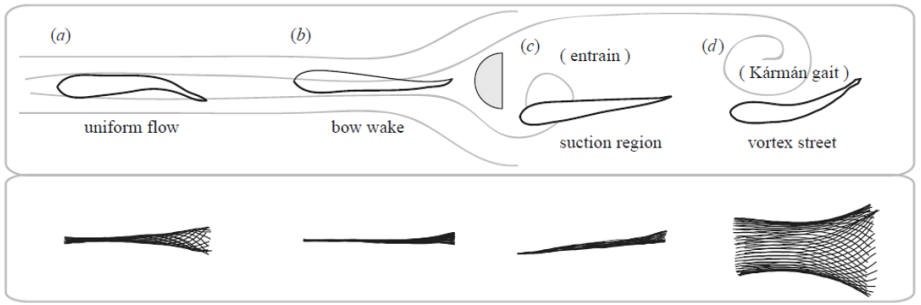


Figure 1. Schematic showing the anatomy of the flow around a D-cylinder and the positions and associated fish swimming midlines from approximately one tail-beat cycle [17].

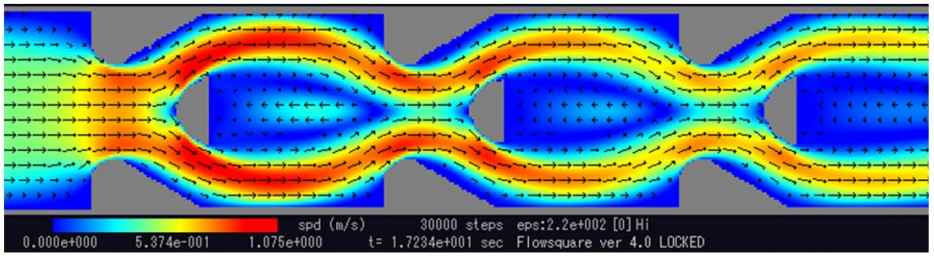


Figure 2. Plan view of proposed fish ladder initial concept showing two-dimensional flow pattern.

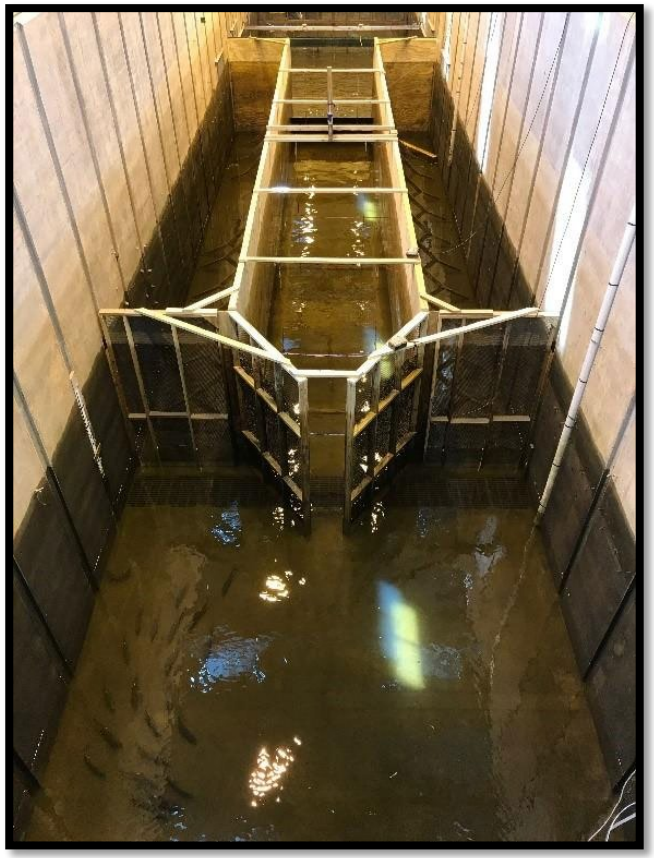
USGS

Project Highlights (Passage)

Applied Research on Fish Lift Entrances for Alosines

EESC scientists are improving fishway designs to:

- Increase migrating alosines passage
- Reduce the amount of time it takes for a fish to pass a fish ladder
- Increase survival of upstream and downstream migration



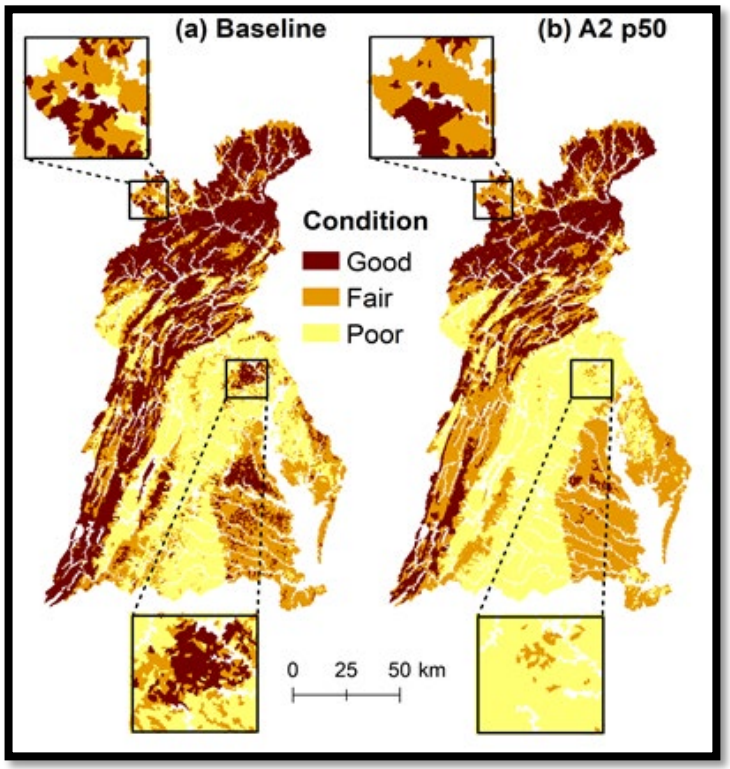
Schooling American shad at the flume facility at EESC's S.O. Conte Research Laboratory. This experiment was designed to study the effect of different fishway entrance designs. Credit: Kevin Mulligan.

USGS

Project Highlights (Habitat)

Chesapeake Bay Habitat Assessment

- Complementary assessments by EESC (freshwater habitats) and NOAA (tidal river and estuary habitats)
- Inform management at fine special scales, identify drivers and stressors of habitat change, and forecast future conditions



Maps showing NHDplusV2 catchments predicted to be in Poor, Fair, or Good condition under baseline conditions (a) versus A2 land-use p50 CMIP5 climate 2090 projections (b). Upper focus area centers on region near Hornell, NY, lower focus area centers on region near York, PA, and Bel Air, MD. Credit: K. Maloney.

USGS

Thank you!

Tom O'Connell
Center Director, USGS Eastern Ecological Science Center
toconnell@usgs.gov

USGS

Project Highlights (Passage)

Development of an East Coast Fish Passage Structure Database

- Integrate revised fishway data and metrics into a GIS database
- Data and metrics will also be integrated into the American Eel GIS Habitat Assessment Database
- Oline mapping tool for querying fishway data and metrics is under development

Turners Falls, MA, hydroelectric project gatehouse fish ladder. Credit: A. Miehls.

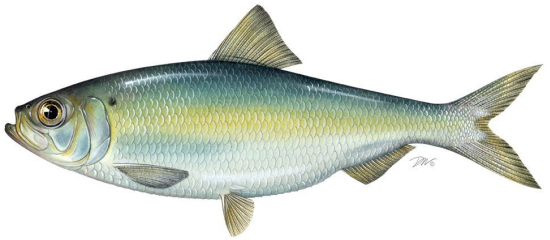
USGS

Project Highlights

Investigating Novel Hepatitis B Virus in River Herring

- Request from NJ Div. of Fish & Wildlife for EESC to identify a novel hepatitis B-like virus in alewife collected from the Maurice River in New Jersey
- Molecular diagnostic tools developed to screen for virus, next generation sequencing methods utilized to evaluate viral diversity
- Involvement of virus in overt alewife disease not well understood and the prevalence is unknown
- Established precedent for virus biosurveillance in migratory alewife stocks

NEW JERSEY DIVISION OF
Fish and Wildlife



USGS