

Project Title

Assessing the bait pathway risk for introducing Viral Hemorrhagic Septicemia in Maryland waters.

Project Principal Investigators

Joseph W. Love, Statewide Operations Manager, 580 Taylor Avenue, B-2, Annapolis, MD 21401

Dan Goetz, Regional Operations Manager, 10932 Putman Road, Thurmont, MD 21788

Jay Kilian, Resource Assessment Service, 580 Taylor Avenue, C-2, Annapolis, MD 21401

Barbara Johnston, DNR Laboratory Director, Cooperative Oxford Laboratory, 904 South Morris Street, Oxford, MD 21654

Project Start Date

10/1/2025

Project End Date

09/31/2026

Project Title

Testing fish bait for Viral Hemorrhagic Septicemia to prevent its introduction to Maryland

Project Summary

A recent report provided by Upstream Aquatic Institute indicated that bait fish from seven of nine stores in Delaware, tested positive for Viral Hemorrhagic Septicemia virus (VHSv). This potentially devastating virus has not been identified from wild fish in Delaware or Maryland, which shares waters. The pathogen is categorized with an unknown level of concern in Maryland's Aquatic Nuisance Species Plan because it has not been discovered in Maryland. The implication that bait stores of Delaware have established a supply chain with vendors providing bait carrying VHSv suggests bait stores in Maryland may have done the same. In 2022, research by Maryland Department of Natural Resources demonstrated 16 of 67 stores sold live fish as bait, and five of those sold bait from out-of-state suppliers. Because of avid and widespread use of live fish bait for fishing tidal and non-tidal areas in Chesapeake Bay watershed, and limited regulations governing supply chains for bait stores, the Maryland Department of Natural Resources seeks to replicate the study in Delaware and test bait fish for the occurrence of VHSv with the intention of disrupting this potential pathway of introduction into Maryland and neighboring jurisdictions.

Project Objectives

1. Purchase bait (minnows, Cyprinidae, Cyprinodontidae; sunfishes, Centrarchidae) from five bait stores in Maryland in fall 2025 for the purpose of testing up to 30 fish/species and two species/store for VHSv in spring 2026.
2. For vendors with bait testing positive for VHSv, identify supply sources and create and target outreach to vendors to disrupt the pathway of introduction by 2026.

Project Narrative

Project Description—Viral Hemorrhagic Septicemia virus (VHSV) can cause significant bleeding in the eyes, skin, gills, fin bases, and skeletal muscles, possibly leading to widespread fish mortality by its virulence. Bleeding occurs externally and internally (Figure 1) and can lead to death.



Figure 1. Disease caused by Viral Hemorrhagic Septicemia (VHS) virus can lead to bleeding externally (left photo) or internally (lower photo).



Affecting over 140 marine and freshwater fish species, VHSV may be one of the world's most widespread viruses (Escobar et al. 2018). First discovered on the Pacific west coast in coho salmon (*Oncorhynchus kisutch*) and chinook salmon (*O. tshawytscha*) in 1989, it was thought to be potentially harmful to the salmon industries. Fish may not display symptoms at low levels of infection, but as infection increases, bleeding throughout the body, including external and internal parts, becomes evident to the naked eye.

The virus is native to Europe and Asia and was possibly introduced to North America as part of culturing rainbow trout (*O. mykiss*) or brown trout (*Salmo trutta*). The virus discovered in 1988 in North America was distinctly different from the European strain (Meyers and Winton 1995), suggesting adaptive evolution of the virus in North America. Meyers and Winton (1995) reported that the virus was particularly virulent for Pacific herring (*Clupea harengus pallasii*). However, the virus affects not only salmonids, such as brook trout and rainbow trout or herring but also non-salmonids (Meier et al. 1994). When introduced to the Great Lakes region, the virus killed several hundred tons of freshwater drum, muskellunge, and round gobies in Lake Ontario in 2005.

The virus had been isolated from more than 25 fishes from Lake Michigan, Lake Huron, Lake St. Clair, Lake Erie, Lake Ontario, and the Saint Lawrence River, as well as inland lakes of New York, Michigan, and Wisconsin. Species reportedly killed by VHSv in the Great Lakes region include: black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), smallmouth bass (*Micropterus dolomieu*), gizzard shad (*Dorosoma cepedianum*), lake whitefish (*Coregonus clupeaformis*), northern pike (*Esox lucius*), rock bass (*Ambloplites rupestris*), yellow perch (*Perca flavescens*), and walleye (*Sander vitreus*)(Figure 2).

The virus has not been identified from wild fish in Maryland, but testing has been limited. A recent report by the Upstream Aquatic Institute in 2024 demonstrated that seven of nine bait shops in Delaware sold live baitfish that tested positive for VHSv (DeRooy and Hansen 2024). Their conclusion implicated a supply chain with a contaminated source from outside of Delaware. The bait pathway, which is of concern to Maryland Department of Natural Resources because of the potential introduction of non-native fishes and crustaceans, could now result in the introduction of VHSv in Maryland's waters. Because these waters share resources with neighboring jurisdictions, work in Maryland has regional implications. These potentially impacted jurisdictions include Delaware, Pennsylvania, Virginia, Washington D.C., and West Virginia. Determining the risk of the bait pathway to introduce VHSv and reducing risk of introduction along that pathway, could help prevent this virus from becoming introduced to shared waters of these neighboring jurisdictions.

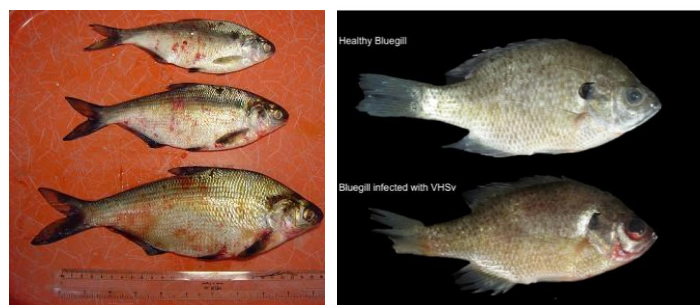


Figure 2. Disease caused by Viral Hemorrhagic Septicemia (VHS) virus has been found in gizzard shad (*Dorosoma cepedianum*)(above, left), sunfish and temperate bass (*Centrarchidae*)(above, right), and perch-like fishes (*Percidae*)(below).

Objectives—Our primary objective is to purchase and test the occurrence of VHSv for up to 30 individuals for each of up to two species of live fish bait (e.g., sunfishes, minnows, suckers) from five



bait shops in Maryland that sell bait from out-of-state suppliers by 2026. The secondary objective of this work will be to provide outreach to each of the five vendors, as well as others (see Outreach Plan), for the purpose of disrupting the pathway of introduction and preventing introduction of VHSv, should tests be positive.

Benefits or Results Expected—The expected results of this work will be to determine the percentage of bait shops that test positive for VHS virus and the percentage of composite samples per bait shop. As part of a survey plan for each of the shops, we will note the origin of the bait fish or the supplier. The expected benefits from this project are to ascertain the probability of introduction of VHSv via the bait pathway and to disrupt this pathway to prevent introduction of VHSv.

Our study objectives align with several MAPAIS priorities including: 1) to conduct research on aquatic invasive species issues in the region related to prevention and early detection; 2) to continue to develop vector management strategies for states and the region including improved management of live bait; and 3) to develop outreach and educational materials for classrooms and specific populations to prevent the introduction and spread of AIS. Although VHSv has been detected in waters of the Great Lakes in Pennsylvania and New York, this invasive species is not yet prevalent in most of the Mid-Atlantic region. Results of the proposed bait fish testing will provide an important assessment of the risk posed by the live bait fish industry as a potential vector of introduction to Maryland and adjacent jurisdictions. Additionally, outreach materials developed by Maryland Department of Natural Resources as part of this project will be disseminated from the principal investigators to other regional resource management agencies for use by the MAPAIS member states.

Outreach Plan—Outreach following results of our work will be developed with the department's Office of Communication team for vendors and those in the supply chain. Reports will also be provided to leadership within Maryland Department of Natural Resources: Director of Freshwater Fisheries and Hatcheries, the Associate Director of Fishing and Boating Services, the Chair of the Invasive Species Matrix Team, and the departmental liaison to the Mid-Atlantic Panel of Aquatic Invasive Species.

Project Timeline (deliverables)

Project Sampling Plan	October – November 2025
Contract development for VHSv testing	October – December 2025
Bait purchase and processing	March – April 2026
Lab processing for VHSv (testing)	May – July 2026
Result and report development	August 2026 (deliverable)
Outreach development and distribution	August 2026 (deliverable)
Final report	September 2026 (deliverable)

Previous MAPAIS funding—No previous funding has been received by the principal investigators from MAPAIS.

Literature Cited

DeRooy, V. and A. Hansen. 2024. Detection of major pathogens in Delaware's live bait supply. Report by Upstream Aquatic Institute 1-15.
 Meier, W., M. Schmitt, and T. Wahli. 1994. Viral hemorrhagic septicemia (VHS) of nonsalmonids. Annual Review of Fish Diseases 4:359-373.
 Meyers, T.R. and J.R. Winton. 1995. Viral hemorrhagic septicemia virus in North America. Annual Review of Fish Diseases 5:3-24.

Budget Table

2026	Description	Budget
	Regular Personnel	\$0
	Contractual Personnel	\$0
	Total Regular & Contractual Personnel	\$0
	Fringe Benefits	\$0
	Total Salary & Fringe Benefits	\$0
Indirect Cost Rate		
17.11%	Indirect Costs	\$0
In State Travel		\$560.00
Equipment		\$0
Supplies		
Bait Fish (30 fish x 2 species x 5 stores x 1.00/fish)		\$300.00
VHS Testing (5 stores x \$250/store)		\$1,250
Printer paper, ink		\$200
Contractual		\$0
Construction		\$0
Other		\$0
	Total Direct Charges-Non-Salary	\$2,310.00
	Total Direct Charges-Salary & Fringe Benefits	\$0
	Total Direct Charges	\$2,310.00
	Total Indirect Costs	\$0
	Grand Grant Total	\$2,310.00

Budget Justification

Travel costs are requested in the amount of \$560.00. We will drive to each of five bait stores and transport samples to the Cooperative Oxford Laboratory and Maryland Department of Natural Resources Aquatic Animal Health Laboratory (Oxford, MD). Total estimated miles from bait stores to Oxford sum to 1,600. At the half-rate expense allowed by the department (\$0.35/mile), we estimate a total travel budget of \$560.00. All salary to support time for collection, data collection, and processing of samples will be provided from other funding sources. Supply costs include those for purchasing bait fish, printer paper, and printer ink. We estimate spending \$1.00 per bait fish, resulting in 30 fish per species, up to 2 species per store, for five stores, resulting in a need of \$300 for bait fish. Bait fish will be stored in cooled ice chests and transported in vehicles maintained and owned by the department. We request \$200 to purchase a pack of paper and printer ink to print reports and outreach for each of the bait stores, suppliers, and other stakeholders, as needed. In-kind match of computers and printers will be provided by the department for creating outreach needed to achieve the department's outreach plan.

Curriculum vitae

Joseph W. Love, Ph.D.

Maryland Department of Natural Resources
Fishing and Boating Services, Monitoring and Analysis Division Annapolis, MD 21401
Secretary's Star Award (2018)
Employee of the Year (Fishing and Boating Services; 2015)
Employee of the Year, nominated (Department of Natural Resources; 2011, 2015)
e-mail joseph.love@maryland.gov; office: 410-260-8257

EDUCATION

Doctor of Philosophy. Mississippi State University, Mississippi State, Mississippi.

December 2004. Best Teaching Assistant (2002-03). Dissertation advisor: Dr. Christopher M. Taylor.

Dissertation title: Assemblage variability, source-sink dynamics, and genetic structuring of populations from intermittent streams in the Ouachita Highlands.

Master's degree of Science. University of New Orleans, New Orleans, Louisiana.

May 2001. Thesis advisor: Dr. Robert C. Cashner.

Thesis title: Some life history aspects of spotted gar, *Lepisosteus oculatus* (Winchell), from the Lake Pontchartrain estuary, Louisiana with comparisons to a population from Mingo Swamp, Missouri.

Bachelor's degree of Science. Southeastern Louisiana University, Hammond, Louisiana.

May 1997. *Magna cum laude*. *Gamma Beta Phi*. Undergraduate advisor: Dr. Robert Hastings

Undergraduate project: Effect of various salinities on survival and reproductive behavior of the mosquitofish, *Gambusia affinis*.

RESEARCH EXPERIENCE (August 2004 to Present)

Invasive Species Ecology - As an active member of the department's Invasive Species Matrix Team and main author of the state's Aquatic Nuisance Species Plan, along with its grant manager, I manage the budget and help direct and/or assist research with invasive species research in the state.

- Research interests for two invasive fishes in Maryland, blue catfish and northern snakehead.
- Work with USGS to assess an eDNA invasive species detection project for the state.
- Create and disseminate novel outreach and website content regarding invasive species.
- Initiate and conduct harvest-oriented annual fishing programs for the general public to educate on invasive species and help control their spread.

BUDGET AND PERSONNEL MANAGEMENT

I have served as a grants manager since 2004, managing small grants while working my Ph.D. until present while managing research programs. Purchasing (16 years of experience purchasing supplies with department credit cards, 10 years of experience completing corporate card logs to track spending for the state). Purchase Orders, Bidding Process (over 10 years of experience with complexing purchase order paperwork and finding competitive bids for services or supplies). Memoranda of Understanding (5 years + of experience drafting MOU's and working to ensure fulfillment with other units within the

department). GrantSolutions, TRACS (3 years + of experience with reporting results from proposed projects using GrantSolutions and/or TRACS, specialized training in TRACS). Over 15 years of experience with reporting work to funding partners and stakeholders). Personnel evaluations, hiring (over 15 years of experience with evaluating personnel and employees, motivating work, specialized training in leadership, and hiring).

PARTNERS (selected): U.S. Geological Survey (eDNA invasive species detection, invasive species reporting via Non-indigenous Aquatic Species database). U.S. Fish and Wildlife Service (northern snakehead research, refuge research at Blackwater Wildlife Refuge, upper Chesapeake Bay). National Oceanographic and Atmospheric Administration (multiple research projects that include coastal and estuarine fishes). Maryland Department of Environment (fish consumption advisories, fish kills). Northern snakehead Taskforce (U.S. Fish and Wildlife Service, Virginia Department of Wildlife Resources, Delaware Department of Environment and Control, D.C. District of Environment).

PEER-REVIEWED PUBLICATIONS (selected): Love, J.W. and P.G. Genovese. (2019). Fishing for an Invasive: Maryland's Toolbox for Managing Northern Snakehead Fisheries. J. Odenkirk and D. C. Chapman (editors) in Proceedings of the First International Snakehead Symposium, American Fisheries Society, Bethesda, Maryland. Love, J.W., J.J. Newhard, and B. Greenfield. (2015). A geospatial approach for estimating suitable habitat and population size of the invasive northern snakehead. *Journal of Fish and Wildlife Management* 6:145-157. Love, J.W., J.J. Newhard, and M. Groves. (2015). Risk of population decline for largemouth bass in a Potomac River fishery (USA): Effects from invasive northern snakehead. *American Fisheries Society Symposium* 82:207-221

CONFERENCE PRESENTATIONS (selected): Love, J.W.*, J.J. Newhard, and M. Groves. 2015. Why we should care about snakeheads: Myth vs. Reality. Maryland Water Council Meeting. Love, J.W.*, J.J. Newhard, and M. Groves. 2013. Risk of population decline for a population of largemouth bass (*Micropterus salmoides*): effects of northern snakehead (*Channa argus*). Southern Division, American Fisheries Society, Nashville, MD.

AWARDS AND GRANTS (selected): National Fish and Wildlife Foundation, \$77,000, fish passage and invasive fishes. United States Department of Agriculture, \$350,000, monitoring and incentivized harvest of blue catfish in Chesapeake Bay watershed; Aquatic Nuisance Species Task Force. \$50,000 - \$100,000, annually (projects vary annually). Atlantic States Marine Fisheries Commission, \$50,000, funding to support blue catfish research on Patuxent River. Maryland Artificial Reef Initiative and National Harbor, \$15,000 to establish a reef in Smoots Bay near National Harbor, MD.

PROFESSIONAL EXTRA-CURRICULAR ACTIVITIES (selected): Co-chaired symposium on eDNA use in invasive species detection, American Fisheries Society (Baltimore, 2021). Committee workgroup for HB860 legislation regarding the removal of organic debris from boats before their launch to state owned waters (2015). Development of the Maryland Aquatic Nuisance Species Plan (2014 - present). The Maryland Department of Natural Resources Fisheries Service representative with the Invasive Species Matrix Team for the Department (2013 - present). Taskforce participant for annual, interagency workgroup on northern snakehead matters (2011 - present).

Dan Goetz Curriculum Vitae

Education:

Mississippi State University, Mississippi State, MS, *December 2013*

M.S. Wildlife, Fisheries, and Aquaculture ,Statistics Minor

Mansfield University, Mansfield, PA, *December 2010*, B.S. in Fisheries Biology

Employment:

Regional Operations Manager, Maryland Department of Natural Resources, Jan 2024-Present

Supervise five fisheries managers and direct freshwater fisheries monitoring and management activities in Maryland's five freshwater management regions.

Serve as CoChair to Chesapeake Bay Program's Brook Trout Action Team

Statewide Operations Manager, Maryland Department of Natural Resources, Jan 2019-Dec 2023

Supervise four direct reports overseeing statewide tidal black bass program, brook trout program, and Sportfish Restoration Grant Administration staff

District Fisheries Biologist, Virginia Department of Wildlife Resources, Dec 2014-Jan 2019

Designed, implemented, and analyzed fisheries independent and dependent surveys to assess and manage freshwater resources on impoundments, large rivers, and trout streams

Assistant Fisheries Biologist, Virginia Department of Wildlife Resources, Jan 2014- December 2014

Assisted regional fisheries biologists and managers with all aspects of fisheries monitoring

Conducted large and small impoundment fisheries monitoring surveys

Operated boat, raft, barge and backpack electrofishers

Conducted statistical analysis for fisheries population assessments

Graduate Research Assistant, June 2011-2013

Investigated the differences in fish communities and water quality between deep and shallow oxbow lakes of the Yazoo River Basin, MS

Principal technician assessing nutrient and sediment reduction efficacy of agricultural runoff in drainage ditches fitted with low-grade weirs in the Mississippi Delta

New Jersey Department of Environmental Protection, Trenton, NJ June/August 2009

Publications

Goetz D. B, S. Owens, J. Williams, B. Fink (*In review*). Evaluation of Fish Size, Environmental Variables and Single vs. Multiple Day Electrofishing Catchability of Largemouth Bass (>199 mm) Relative to Mark Recapture Population Estimates Across Virginia Small Impoundments. North American Journal of Fisheries Management.

Bauerlien C. J., D. P. Crane, S. Smith, G. Palmer, T. Young, D. Goetz, J. Hansbarger, K. Hartman. 2022. Low catchability limits the effect of warm-water catch-and-release mortality on muskellunge. Fisheries Research.

Henesy, J., Goetz, D., & Mullican, J. E. 2022. Seasonal Movement Patterns and Summertime Use of Thermal Refuge Areas by Muskellunge *Esox masquinongy* in the non-tidal Potomac River, Maryland. North American Journal of Fisheries Management.

- Bauerlien, C. J., Crane, D. P., Smith, S., Palmer, G., Young, T., & Goetz, D. B. 2021. Estimates of Abundance and Extreme Catch-and-Release Exploitation in a Southern Riverine Muskellunge Fishery. *North American Journal of Fisheries Management*, 41(5), 1602-1615.
- Goetz, D., Miranda, L. E., Kröger, R., & Andrews, C. (2015). The role of depth in regulating water quality and fish assemblages in oxbow lakes. *Environmental biology of fishes*, 98(3), 951-959.
- Andrews, C. S., Miranda, L. E., Goetz, D. B., & Kröger, R. (2014). Spatial patterns of lacustrine fish assemblages in a catchment of the Mississippi Alluvial Valley. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 24(5), 634-644.
- Goetz, D., Kröger, R., & Miranda, L. E. (2014). Effects of Smallmouth Buffalo, *Ictiobus bubalus* biomass on water transparency, nutrients, and productivity in shallow experimental ponds. *Bulletin of environmental contamination and toxicology*, 92(5), 503-508.
- Usborne, E.L., Kröger, R., Pierce, S.C., Brandt, J., Goetz, D. 2013. Preliminary evidence of sediment and phosphorus dynamics behind newly installed low-1 grade weirs in agricultural drainage ditches. *Water, Air, & Soil Pollution*. 224:1520 pp 1-11

Presentations

- D. Goetz, G. Yactayo. Evaluation of land use, habitat and water quality for modeling the distribution of brook trout in Maryland: A method for identifying restoration opportunities. 2021 AFS Meeting, Baltimore, MD.
- D. Goetz, A. Heft, M. Sell. A Conservation Framework to Increase the Resiliency of Brook Trout in Maryland Amidst an Uncertain Future. 2021 NEAFWA Conference.
- A Progressive Brook Trout Conservation Framework: Developing a Statewide Conservation Strategy to Ensure Restoration Efforts Have Long Lasting Effects towards Meeting Fisheries Management Plan and Chesapeake Bay Agreement Goals. MWRC 25th Annual Conference 2019.
- D. Goetz . Spring Flow Variability Associated With Muskellunge Recruitment on the Upper James River, VA. VA AFS 2016 Annual Meeting
- D. Goetz, R. Kröger, and L.E. Miranda. Effects of a native rough fish on water quality. 2013 Mississippi Water Resources Research Institute (MSWRRI) Conference, Jackson, MS
- D. Goetz, R. Kröger, and L.E. Miranda. The role of lake depth in regulating water quality and fish assemblages in oxbow lakes of the Yazoo River Basin. 2013 AFS Southern Division Conference Nashville, TN

Curriculum vitae

Barbara Johnston

Maryland Department of Natural Resources, Fishing & Boating Services

904 South Morris Street, Oxford MD 21654

Barbara.johnston2@maryland.gov| 443-258-6065

Experience:

PROGRAM MANAGER III (LABORATORY DIRECTOR, COOPERATIVE OXFORD LABORATORY)

STATE OF MARYLAND, DEPARTMENT OF NATURAL RESOURCES, FISHING & BOATING SERVICES

OCTOBER 1, 2021 - PRESENT

Serves as the MDDNR director at the Cooperative Oxford Laboratory (COL), a joint NOAA/DNR research and management facility, establishing laboratory goals and standards, supervising development and monitoring unit budget, personnel management and development, resource investigations, analysis, reporting, public communication, and representing the Department and laboratory to state and federal agencies and non-government organizations. Major programs include administrative and policy liaison with NOAA, aquatic habitat, climate, wildlife health, finfish and shellfish health, marine mammals and sea turtles, GIS support, and operation and management of the NOAA Research Vessel R5502. Responsible for a program staff of approximately 14 employees and budget more than \$1.5 million.

Leads all aquatic animal health initiatives for the Aquatic Animal Health Program including responsibility for developing and implementing aquatic animal health policy in collaboration with unit leadership. Serves as the Maryland Representative to the Northeast Fish Health Committee.

PROGRAM MANAGER II (AQUATIC ANIMAL HEALTH PROGRAM MANAGER)

STATE OF MARYLAND, DEPARTMENT OF NATURAL RESOURCES, FISHING & BOATING SERVICES

MARCH 28, 2018 – SEPTEMBER 30, 2021

Led all aquatic animal health initiatives for the Aquatic Animal Health Program including responsibility for developing and implementing fish health policy in collaboration with unit leadership. Oversaw fish and shellfish health issues for imports and in-state movements in collaboration with other unit staff. Directed projects for wild fish health research and monitoring, shellfish health and disease research and monitoring, and the Cooperative Oxford Laboratory (COL) Aquatic Animal Health Lab, which provides services such as pathology, bacteriology, virology, histology, parasitology, in situ hybridization, and quantitative polymerase chain reaction (qPCR). Oversaw needs for histopathology, microbiology, immunoassay, and in situ hybridization assays and functions as the unit's fish health specialist. Developed protocols and lab capabilities to serve all fish health needs at fish culture facilities, including diagnostics, annual facility inspections and fish health certifications.

Prepared detailed research plans and funding proposals for independent research and collaborative Maryland DNR surveys, and prepared technical reports and manuscripts documenting results of those investigations. Maryland's representative as the fish health specialist on inter-jurisdictional fish health issues and committees, including the Northeast Fish Health Committee.

Developed budgets and oversee federally funded research. Supervised 3 Cooperative Oxford Laboratory Projects (Shellfish Health, Wildfish Health, and the Aquatic Animal Health Laboratory) and functioned as a certified Aquatic Animal Health Inspector and Pathologist.

**FISH & WILDLIFE SCIENTIST III (FISH HEALTH BIOLOGIST) STATE OF VERMONT,
DEPARTMENT OF NATURAL RESOURCES, FISH & WILDLIFE DEPARTMENT**

SEPTEMBER 25, 1990 – MARCH 27, 2018

Responsible for the operations of the Fish Health Lab including scheduling, supervision and training of seasonal employees, developing protocols and maintaining quality control standards to meet American Fisheries Society Bluebook Fish Health Guidelines for detection, identification, diagnosis and control of Fish Pathogens. Planned, implemented and coordinated statewide programs for fish culture and fish health such as the Vermont Natural Fish Population Fish Health Survey. Assisted in the planning, implementation and evaluation of statewide fish health inspection programs on State and commercial aquaculture facilities. Administered a fish health budget for the Fish Health program and laboratory. Completed Federal Aid Reporting for the Fish Health Program. Performed diagnostic investigation, vaccination, non-lethal sampling techniques on fish. Developed Fish Health and Disease Fact Sheets, responds to public inquiries, and questions. Responsible for the planning of a new Fish Health Laboratory to be built in the new State of Vermont Agriculture/Environmental Lab. Participated on committees and working groups such as the Fisheries Division's Public Outreach Team. Administered, evaluated and implemented the Children's Fishing Stocking Program.

Education:

UNIVERSITY OF MARYLAND, COLLEGE PARK, MD
B.S. NATURAL RESOURCES MANAGEMENT, 1988

UNIVERSITY OF MARYLAND GLOBAL CAMPUS, ADELPHIA, MD
M.S. ENVIRONMENTAL MANAGEMENT (on-going)

Professional Accomplishments:

American Fisheries Society Aquatic Animal Health Inspector

- Initial certification June 3, 1998, continuous through present

Northeast Fish Health Committee Representative

- Chair 2023 through 2024
- Vice Chair 2021 through 2022

Fish Health Management

- Two-year Course of Study with Michigan State University College of Veterinary Services – January 2015 Completion

Supervisor Training:

- Effective Supervision – June 11-12, 2003
- Supervising in State Government – February 2016

Vermont Certified Public Manager

- Completion June 2, 2000
- Two-year Public Manager Program

Jay V. Kilian

Program Manager – Maryland Biological Stream Survey
 Maryland Department of Natural Resources
 Resource Assessment Service
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 443-504-4565

Education

M.S. Wildlife/Fisheries Biology (2004)	Frostburg State University
B.S. Biology (1994)	Salisbury University
B.S. Environmental Marine Science (1994)	University of Maryland Eastern Shore

Professional Background

2021 – Present	Environ. Program Manager II	Maryland Department of Natural Resources
2015 – 2021	Program Manager	Maryland Department of Natural Resources
2001 - 2015	Natural Resource Biologist	Maryland Department of Natural Resources
1998 - 2001	Graduate Research Assistant	UMCES Appalachian Laboratory
1994 - 1998	Research Assistant	UMD Wye Research and Education Center
1993 - 1994	Research Supervisor	Salisbury University

More than 30 years of experience in the field of aquatic ecology, including four years as a research assistant (University of Maryland), three years as a graduate research assistant (UMCES Appalachian Laboratory/ Frostburg State University), and 24 years with a natural resources agency (MDNR). Currently the program chief of the Maryland Biological Stream Survey in the MDNR Resource Assessment Service. Currently oversees 12 professional scientists and several other seasonal technicians. Active member of the MDNR Invasive Species Matrix Team, Maryland Invasive Species Council, and Mid-Atlantic Panel on Aquatic Invasive Species. Served as Chair of the Mid-Atlantic Panel on Aquatic Invasive Species from 2018 – 2020.

Select Publications

Emmons, S., T. Woods, M. Cashman, O. Devereux, G. Noe, J. Young, S. Stranko, **J.V. Kilian**, K.

Hanna, and K. Maloney. 2024. Causal inference approaches reveal both positive and negative unintended effects of agricultural and urban management practices on instream biological condition. *Journal of Environmental Management* 361.

Cessna, J.F., R.L. Raesly, **J.V. Kilian**, and S.M. Klein. 2022. Population dynamics of an isolated population of blackbanded sunfish, *Enneacanthus chaetodon*, in Eastern Maryland. *Northeastern Naturalist* 29:73-81.

Nico, L.G., A.J. Ropicki, **J.V. Kilian**, and M. Harper. 2019. Asian swamp eels in North America

linked to the live-food trade and prayer-release rituals. *Aquatic Invasions* 14:775-814.

- Kilian, J.V.** and P.J. Ciccotto. 2014. Factors associated with the distributions and densities of three native and one non-native crayfish in streams of Maryland, USA. *Freshwater Crayfish* 20:41- 60.
- Stranko, S.A., M.J. Ashton, R.H. Hilderbrand, S.L. Weglein, D.C. Kazyak, and **J.V. Kilian**. 2014. Fish and benthic macroinvertebrate densities in small streams with and without American Eels. *Transactions of the American Fisheries Society* 143:700-708.
- Kilian, J.V.** 2014. A bait which will live in infamy...How non-native crayfish have invaded the Mid-Atlantic region and why you should be concerned. *Mid-Atlantic Fly Fishing Guide*, June 2014.
- Harbold, W., **J.V. Kilian**, G. Mack, J. Zimmerman, and M.J. Ashton. 2014. First evidence of *Elliptio complanata* (Bivalvia: Unionidae) from the Patapsco River, Maryland. *Northeastern Naturalist* 21:35-40.
- Cessna, J.F., R.L. Raesly, **J.V. Kilian**, D.A. Cincotta, and R.H. Hilderbrand. 2014. Rapid colonization of the Potomac River drainage by the Rainbow Darter (*Etheostoma caeruleum*) following introduction. *Northeastern Naturalist* 21:1-11.
- Kilian, J.V.**, R.J. Klauda, S. Widman, M. Kashiwagi, R. Bourquin, S. Weglein, and J. Schuster. 2012. An assessment of a bait industry and angler behavior as a vector of invasive species. *Biological Invasions* 14:1469-1481.
- Kilian, J.V.**, R.L. Raesly, S.A. Stranko, A.J. Becker, and E. Durell. 2011. The extirpation of Bridle Shiner (*Notropis bifrenatus*) from Maryland. *Northeastern Naturalist* 18:236-242.
- Kilian, J.V.** and P. Ciccotto. 2011. First record of the invasive *Orconectes rusticus* (Rusty Crayfish) from the Potomac River, Maryland USA.. *Southeastern Naturalist* 10:553-556.
- Stranko, S.A., S.E. Gresens, R.J. Klauda, **J.V. Kilian**, P.C. Ciccotto, M.J. Ashton, and A.J. Becker. 2010. Differential effects of urbanization and non-natives on imperiled stream species. *Northeastern Naturalist* 17:593-614.
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