



Aquatic Invasive Species (AIS) Control Plan:

Viral Hemorrhagic Septicemia (VHS)

This control plan is a living document and will be updated, as needed, to reflect the status of the virus in Pennsylvania.

Natural History

Overview: A disease affecting fish which is caused by the Viral Hemorrhagic Septicemia virus. This disease was discovered in the Great Lakes region in 2005, with review of historic specimens revealing it occurred as early as 2003.

Taxonomy: The genotype of this *Novirhabdovirus* virus currently identified in the Great Lakes region is Type IVb. A similar strain (IVa) was found in the Pacific Northwest in the late 1980s (Batts et al. 2020).

Description: Viral Hemorrhagic Septicemia (VHS) infects both freshwater and marine fish. The disease is caused by a rhabdovirus (rod or bullet-shaped), appropriately named Viral Hemorrhagic Septicemia Virus (VHSV). The disease was first identified in rainbow trout in Europe where it has caused significant economic loss in commercial aquaculture. Infected fish may exhibit varying degrees of hemorrhaging, but typical external symptoms include

hemorrhaging and redness at the base of fins, around the eyes, red patches of skin on or near the head and a swollen abdomen (Figure 1). Internally, the spleen, liver and kidneys may exhibit swelling and/or hemorrhaging. The infection typically results in a disruption of the fish's osmotic balance and affects operation of the swim bladder. In severe cases, death occurs between 2 and 30 days, often preceded by swimming in circles, and a failure to maintain an upright swimming position. VHS is a colder water disease, which affects susceptible fish at water temperatures primarily between the 37 and 54 °F. Hence, it is most often seen in the mid-to-late spring



Figure 1. Fish infected with Viral Hemorrhagic Septicemia. (Photo: David Kenyon, MI DNR). and is dependent on water temperature.

Origin: Type IVa is known to occur in the Pacific Northwest, and Type IVb has been found in Atlantic Canada in New Brunswick and Nova Scotia and since 2003 in the Great Lakes region. Other closely related types have been found in Europe and Asia and are



likely the source of the disease which is believed to have mutated into the Type IVb strain.

aquaculture, the bait fish industry, use or transfer of fish eggs or roe as bait, and research activities.

Species affected; Up to 28 species of freshwater and marine fishes are documented as being susceptible to this disease. Additional testing leads to new species being added to the list. The most current list is available on the APHIS website at:

https://www.aphis.usda.gov/animal_health/downloads/animal_diseases/Species_Previously_Regulated_by_APHIS_for_VHS_2014.pdf

Historic Vectors: Unknown; however, ballast water exchange from trans-Atlantic ship traffic to the Great Lakes and stocking of infected fish Great Lakes are suspected.

Current Pathways/Vectors:

Accidental inter-basin and intra-basin transfers via recreational boating fishing activities, and through manmade waterways connected to the Great Lakes. One of the most likely pathways is through the transportation of live or improperly disinfected baitfish. Emerald shiners are collected from the Great Lakes in large numbers and sold live or preserved for use as bait. Historically, these shiners were transported for use as bait in some inland waters adjacent to the Great Lakes. Transfers may be facilitated by bait-buckets, residual water in boat hulls, and boat/trailer nooks and crannies. Other potential vectors exist via

Distribution and Status

Distribution: Great Lakes drainage - IL, IN, MI, MN, NY, OH, PA, WI, Ontario and Quebec, Canada. Since first being detected in the Great Lakes, VHS has been detected several times in the PA waters of Lake Erie. Several of the VHS detections in PA were associated with diseased fish while others were the result of routine monitoring. VHS has also been detected in several of the inland waters of NY which are connected to the Great Lakes via the Erie Canal.

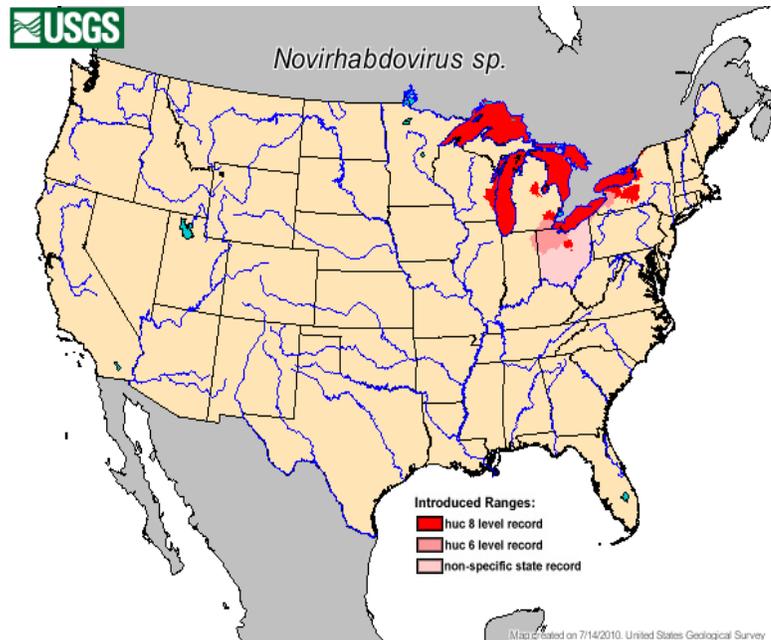


Figure 2. Distribution of Viral Hemorrhagic Septicemia in the United States. Source: USGS.



Federal Legal Status: The United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) issued an emergency order on October 24, 2006 and amended it on November 14, 2006. The federal order required that VHS-susceptible species fish cannot be transported or exported from the aforementioned states unless they have first been tested and certified to be VHS free. The federal order was rescinded on June 2, 2014. APHIS decided that the federal order had become duplicative with current state regulations and the federal order was no longer needed as long as the current state regulations remained (Shea, 2015).

Pennsylvania Legal Status: The Pennsylvania Fish and Boat Commission promulgated specific VHS regulations under Chapters 71.8 and 73.3 (Title 58) of the Pennsylvania Code related to the transportation and introduction of fishes. The Pennsylvania Fish and Boat Commission also developed new regulations (Chapter 63.54) regarding the taking use and possession of fish eggs in response to VHS concerns in using eggs as bait. The Pennsylvania Department of Agriculture enacted a quarantine of licensed fish propagators and dealers in those portions of Erie, Crawford, and Potter Counties within the Lake Erie and Lake Ontario drainages.

Threats

Ecological: Within the Great Lakes, when a VHS fish kill occurs, thousands of fish from several species may succumb in localized areas. Gizzard shad are the most commonly

observed species in these larger incidents. The scale of these events thus so far has not reached levels that would affect this very abundant species at the population level. In some cases, highly desirable, trophy-size fish such as muskellunge have succumbed, and this could have an impact on species which are apex predators and highly desirable sport fish. Natural or human-assisted movements of this disease into smaller waterways could have greater ecological impacts as a relatively larger percentage of the local population could be affected.

Economic: To date, a VHS outbreak has not occurred within the confines of a hatchery system in the United States. In such conditions where large numbers of fish are reared together in close proximity, an outbreak could result in devastating losses. In addition, under APHIS policies, if VHS is discovered in a hatchery, total depopulation, and disinfection are a likely course of action. Thus, VHS presence or outbreak within a hatchery facility could lead to significant economic losses. The baitfish industry has been impacted by its decreased ability to ship live or uncertified baitfish to locations outside of the Great Lakes drainage. Public and private hatcheries have had to modify transportation practices to comply with federal and state orders. Additional costs have been incurred for testing and implementation of biosecurity protocols.

Health: VHS cannot be acquired by humans. There is no evidence to suggest that eating a fish carrying, or infected with, the VHS virus is harmful to humans.



Management

Management Goals: Prevent the spread of VHS beyond those waters where it has already been documented. Improve public awareness of VHS and its impacts and the risks associated with movement of fish, bait and transportation water within and between basins. Implement appropriate biosecurity measures to ensure containment and limit introductions to new waters.

Containment and Prevention Actions to Stop the Spread:

- Ensure compliance with PFBC regulations and PA Department of Agriculture quarantine.
- Provide outreach and education to anglers, bait dealers, sportfishing industry representatives, news media, and other regulatory agencies. Update websites, brochures, AIS species cards, provide public presentations to targeted groups.
- Ensure that the PFBC Administrative Policy for “*Biosecurity Measures for Commission Operations, Facilities and Equipment*” is followed by staff.
- Continue annual sampling of wild brood and hatchery production fish to monitor for VHS within the state fish hatchery system.
- Continue and expand use of iodophore disinfection of all fish eggs in the state fish hatchery system.
- Limit inbound fish transfers and require valid fish health certifications.

- Suspected cases can be reported to PFBC at:

<https://pfbc.pa.gov/forms/reportAIS.htm>

Rapid Response Options:

- Consult the Governor’s Invasive Species Council of Pennsylvania and implement the most current version of their rapid response plan for guidance on addressing VHS or AIS issues in PA waterways outside of fish hatcheries.
- Implement the “*Aquatic Invasive Species and Emergency Disease Response Plan for PFBC State Fish Hatcheries*” if VHS or an AIS is detected within the state fish hatchery system.

Resources: As this is an emerging issue, new information may become available on a daily basis. Therefore, links to the following websites will likely provide access to the most current information.

1. Animal and Plant Health Inspection Service: <http://www.aphis.usda.gov>
2. National Veterinary Services Laboratories: (to locate labs that can perform VHS testing) : <http://www.aphis.usda.gov/vs/nvsl/html/aquaapplab.html>
3. Great Lakes Fisheries Commission: <http://www.glfsc.org>
4. Great Lakes Fish Health Committee: <http://www.glfsc.org/boardcomm/fhealth/fhealth.php>
5. National Aquaculture Association: <http://www.nationalaquaculture.org/pages/issues.html>
6. PA Department of Agriculture, Aquaculture:



<http://www.agriculture.state.pa.us/agriculture/cwp/view.asp?a=3&q=129895>

Spring Research Station. State College, PA. 5 pp.

References

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