



A Brief History of Burrowing Shrimp Management

Willapa Bay and Grays Harbor – two coastal estuaries in the southwest corner of Washington State – provide a substantial percentage of the nation’s oysters, and the shellfish industry is central to the local culture and economy of Pacific and Grays Harbor counties. The continuation of this 125-year-old industry in the Twin Harbors increasingly depends on developing an effective integrated pest management (IPM) approach for burrowing shrimp – native pests that cause oysters and clams to sink and suffocate. Shellfish growers have been experimenting with mechanical methods for managing burrowing shrimp since the 1940s or 1950s. But the history of state-led pest management can be divided into three overlapping phases: (1) carbaryl- based pest management, (2) pursuit of an IPM program, and (3) attempted IPM implementation with imidacloprid. Currently, state agencies and shellfish growers are still working to develop an effective IPM plan for burrowing shrimp.

Phase 1: Carbaryl-Based Pest Management

1960 — After burrowing shrimp remove over 15,000 acres of tideland from cultivation, the Washington Department of Fisheries (WDF) begins experimenting with several chemical control options.

1963 — Application of the pesticide carbaryl to commercial shellfish beds begins. Eventually permitting allows for application on up to 600 acres in Willapa Bay and 200 acres in Grays Harbor, for a total of 800 total acres on tidelands with burrow densities greater than 10 burrows per square meter.

1976 — Carbaryl application in Willapa Bay and Grays Harbor becomes subject to compliance with the State Environmental Policy Act (SEPA).

1981 — The U.S. Environmental Protection Agency (USEPA) imposes additional requirements for carbaryl application to limit potential impacts to other species, including mandatory buffers, active ingredient limits, and seasonal application windows.

1985 — WDF and Ecology (ECY) issue a Final Environmental Impact Statement (EIS) for the use of carbaryl on shellfish farms.

1992 — WDF and ECY issue a Supplemental Final EIS for the application of carbaryl, decreasing the allowable amount of active ingredient per acre, but increasing the total permitted treatment acreage.

Phase 2: Pursuit of an IPM Program

1991 — A Burrowing Shrimp Control Commission composed of agencies, legislators, tribes, and shellfish farmers is formed to pursue an IPM program and begins research on several potential mechanical control tactics.

2001 — Multiple constituents sign a memorandum of agreement committing to complete the burrowing shrimp IPM development process.

2002 — ECY begins requiring a National Pollution Discharge Elimination System (NPDES) permit for carbaryl application.

2003 — The IPM plan is submitted.

2003 — As part of a legal settlement, the Willapa-Grays Harbor Oyster Growers Association (WGHOGA) agrees to gradually phase out the use of carbaryl by 2012.

2007-2010 — The IPM plan is revised and updated twice.

2011 — After agreement between the settlement parties, ECY grants a temporary extension of the NPDES permit for carbaryl application until 2013.

2013 — The use of carbaryl to manage burrowing shrimp on commercial shellfish beds is discontinued.

Phase 3: IPM v. 1.0 - Attempted Use of Imidacloprid

2006 — After testing many potential biological, mechanical, cultural, and chemical management methods for burrowing shrimp, the insecticide imidacloprid is identified as the only viable candidate.

2007 — NuFarm Americas, Inc. agrees to produce *Protector*, liquid and granular formulations of imidacloprid for aquatic use to manage burrowing shrimp in Willapa Bay and Grays Harbor.

2008-2014 — Numerous small- and large-scale field studies are conducted to test for imidacloprid residues in oyster meat, and to determine the efficacy, fate and transport, and non-target impacts of imidacloprid.

2014 — The US EPA registers imidacloprid for use against burrowing shrimp in Willapa Bay and Grays Harbor, and includes several restrictions on use and application.

2015 — After ECY releases a Final EIS on the use of imidacloprid on commercial shellfish farms and issues WGHOGA an NPDES permit, several media reports are published and public opposition mobilizes. In response, WGHOGA cancels the permit.

2016 — WGHOGA reapplies for an NPDES permit for the use of imidacloprid for a subset of members on a reduced number of total acres and without aerial application.

2018 — In a Final Supplemental EIS, ECY concludes imidacloprid use could have negative impacts on benthic invertebrates and emphasizes the need for additional research. ECY denies WGHOGA's NPDES permit application for imidacloprid, and WGHOGA subsequently appeals the decision.

2019 — A settlement agreement between WGHOGA and ECY leads to the formation of a multi-constituent IPM working group and the appropriation of state funds to develop a new IPM plan.

Current Status: In Search of IPM v. 2.0.

Commercial shellfish farmers in Willapa Bay and Grays Harbor have been largely unable to manage burrowing shrimp on their farms since 2013. Pacific County declared an economic state of emergency for the oyster industry in 2018, and in the same year the Washington Department of Natural Resources' Rural Community Partnerships Initiative funded additional research on mechanical control methods.

Though shellfish companies have tried to adapt by shifting to new grounds or experimenting with new growing techniques, a subset of shellfish farmers reported in 2022 that over 1,400 acres of productive shellfish beds have been lost to burrowing shrimp infestation and 4 shellfish farms have either been sold or gone out of business.

Now in its fourth year, the IPM working group continues to pursue an IPM plan for burrowing shrimp that is effective, economically feasible, and ecologically sustainable.

Related research funds have supported 10 studies addressing multiple aspects of IPM program development, including:

- Improved burrowing shrimp monitoring techniques
- Shellfish industry best management practices related to IPM
- Efficacy, transport, and ecological impacts of alternative chemical management methods
- Effectiveness and non-target impacts of potential mechanical controls
- Collaborative approaches to IPM and ecosystem-based management