



*Photo Courtesy of Bangor Daily News*

# Recirculating Aquaculture Systems Design

*USDA ARS National Cold Water  
Marine Aquaculture Center  
(Franklin, ME)*

**SUMMARY:** The National Cold Water Marine Aquaculture Center (NCWMAC) is a new research facility established by USDA ARS to improve the efficiency and sustainability of coldwater marine finfish farming. The initial focus of center research in Franklin is the development of an Atlantic salmon breeding program to improve fish growth and other economically important traits in stocks that are entirely composed of North American germplasm. Freshwater Institute staff completed production modeling and bioprogramming for the USDA in 2004 and the final design of the aquaculture systems in 2005. Facility construction began in 2006 and was completed in the spring of 2007.

**CHALLENGE:** Researchers wanted a flexible facility to raise Atlantic salmon from eggs to 4-year-old fish that met strict biosecurity standards. The nature of available water supply sources at the site necessitated the use of recirculation technologies. Additionally, all effluent from the facility had to be filtered, disinfected, and fish excluded prior to being discharged into the bay.

**SOLUTION:** Eight separate production systems were designed, enabling the facility to culture 200+ salmon families. Seven recirculating systems, ranging in size from 1,000 to 5,000 L/min, were designed for the salmon breeding program. A disinfected surface water source and three wells onsite provide makeup water at a range of salinities (0–35 ppt) to all systems, satisfying individual bioplan requirements. Recirculating systems include microscreen filtration, biological filtration, carbon dioxide removal, supplemental oxygenation, ozonation, and ultraviolet treatments. The wastewater treatment system designed for the facility includes solids filtration, thickening, and storage; fish and egg escapement prevention; and effluent disinfection.

**RESULTS:** Construction of the facility was completed ahead of schedule in the spring of 2007. The fish culture systems were subsequently stocked with fish that were being raised in temporary facilities.

## **SERVICES PROVIDED:**

- Program Planning
- Production Modeling
- Conceptual Design
- Final Design
- Construction Administration
- Operational Assistance