



USDA Forest Service Research & Development

Science

Wildlife and Fish Strategic Program Area

*Advancing Knowledge to Address Regional
and National Aquatic Invasive Species Issues*

Background:

Aquatic invasive species have significantly impacted ecosystems in the United States, resulting in millions of dollars in damages and control efforts. Forest Service scientists help provide a small, but high-quality body of research to inform efforts to prevent and detect aquatic invasive species and to restore affected ecosystems.

The Forest Service advances in knowledge include: the role population size and genetic diversity play in invasive species' success; new sampling and monitoring techniques for aquatic invasive species; the effects of environmental characteristics (e.g., hydrologic regime, water temperature, land management, natural disturbance, and climate) on an invasive species' success; effects of invasive species on basal food sources and food web dynamics; and recovery of native riparian communities after invasive species control.



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Research Activities:

Understanding Limited Invasion Success: Molecular evaluations of successful invaders are common, but studies of introduced species that have had limited invasion or died out completely are rare. Forest Service scientists explored an introduced population of speckled dace in California that has remained relatively restricted. They observed a population response consistent with a bottleneck, which has rarely been documented, thus the introduction of speckled dace represents an important model system for future investigation.

Strengthening the Reliability of eDNA Testing: Forest Service scientists have developed markers and field and laboratory protocols for reliably detecting the presence of eDNA for invasive species in water samples. Their work will be expanded to test for additional invasives as well as threatened species, ultimately leading to lower cost sampling approaches.

Developing a New Approach to Large-Scale Fish Monitoring: Forest Service scientists have developed an alternative to laboriously counting fish that is both easier to use and provides more comprehensive results. By linking newly developed occupancy modeling approaches with genetic patterns to stream conditions and habitat, this new method is being utilized by a diverse set of federal, state, and local partners to determine which stream characteristics are the best predictors of robust and genetically intact fish populations.

Building Decision Support Tools: Models developed to understand how aquatic ecosystems will respond to forecasted climate changes and encroaching invasive plants are being incorporated into a new decision support tool. The tool will aid in the conservation or restoration of Pacific Island watersheds, streams, and water resources vital for humans, animals, and plants.

Informing Future Invasive Removal Efforts: Control efficacy studies typically measure the amount of the invasive Japanese knotweed, but not the plant community resulting after treatment. Forest Service scientists examined the recovery of the native plant community and found that removal of knotweed opened up riparian habitat for colonization by both native and exotic plants. Their work highlights the need monitor and control secondary invasive species soon after knotweed removal to help weed control groups prioritize areas for knotweed control or native re-plantings.

Supporting Decision-makers with Novel Web-based Wildlife Disease Surveillance: A handful of highly virulent multi-host pathogens, including the potentially deadly amphibian chytrid fungus (Bd) and Ranavirus (Rv), have had profound impacts on amphibians and the aquatic communities where they live. Forest Service researchers and partners have launched a world-wide effort to compile and map Bd and Rv occurrences. These tools will aid policy decisions with 'live' updates.