

Science and Management Partner to Prevent & Control Aquatic Invasive Species in the Lake Tahoe Basin

Establishment of aquatic invasive species (AIS) is of great concern due to their adverse impacts to Lake Tahoe. Invasive aquatic plants and animals cause decreased water quality, algal blooms, fouling of beaches, health and safety concerns for swimmers, threats to native species, interference with watercraft function and marina operations, and economic impacts due to reduced recreation quality, decreased property value, and the high cost of control actions.

Key Management Questions

Over the last decade, the size of the areas affected and the scale of the ecological impact of AIS infestations has increased dramatically.

Key questions for scientists and managers include:

- How extensive are AIS infestations and what impacts do they have on aquatic resources?
- Which control methods are most effective and affordable?
- Which species pose the greatest risk for invasion in the future?
- What management actions are needed to prevent, detect and respond to future AIS?

Science Investments to Address Key Management Questions

The spread of invasive species into Lake Tahoe has prompted agencies to invest in science to understand AIS distribution and ecology, factors regulating colonization and growth, and options for removal. Research activities include:

- Lake-wide survey for Asian clams to study distribution and population structure
- Use of bottom barriers as a control strategy for Asian clams
- Lab experiments to determine risk of quagga mussel invasion
- Studies of the ecological response to removing non-native warmwater fishes (initiated in 2011)
- Modeling risks of introducing new AIS to Lake Tahoe as a result of boat movement between waterbodies in the region
- Testing and evaluating suction removal, hand-pulling, bottom barriers, and chemicals to treat rooted aquatic plants
- Studies on how resident AIS may facilitate new invaders
- Estimates of the economic impact of AIS invasions
- Development of cost effective prevention and control strategies for all invasive species

Key Science Findings

- Rubber bottom barriers result in 100 percent Asian clam mortality. This technique was successfully transferred to Lake George, New York where a recent invasion has occurred.



Photo courtesy: Tahoe Daily Tribune. Boat inspection station on road entering the Tahoe Basin.



Photo courtesy of Phil Caterino. Algal bloom in Emerald Bay.

- Asian clams have a reduced reproductive capacity with spawning dependent on changes in water temperature.
- Calcium levels in Lake Tahoe are similar to those required for quagga and zebra mussel growth. Evidence of the presence of these species in the lake has not been observed, but the possibility of mussel survival and reproduction cannot be ruled out.
- Changing ecological conditions due to climate combined with the destruction of natural habitats may make the lake more vulnerable to future AIS invasions.
- The AIS aquatic plant, Eurasian watermilfoil, has been found in the Tahoe Keys and in more than 30 other locations lake-wide and its population is expanding annually; a more aggressive plant, curlyleaf pondweed, is expanding in the southern part of the lake.
- Smallmouth bass, a fish predator that prefers cooler water, has been confirmed in the lake and is expected to inhabit a larger portion of the lake than other fish invaders.
- Estimates of the economic impact of AIS in Lake Tahoe are as high as \$22 million/year.

Management Actions Taken

Research has helped guide the implementation of effective management strategies and effective treatment options including

- The Lake Tahoe Region AIS Management Plan
- The Watercraft Inspection Program
- Lake-wide AIS monitoring surveys
- Quagga and zebra mussel plankton monitoring to assist in early detection and rapid response
- Control programs for Asian clams, aquatic weeds and warmwater fish
- Public outreach and education



<http://tahoeboatinspections.com>

Next Steps

Recent gains in the AIS prevention and control program in Lake Tahoe rely on close cooperation between scientists and managers. Future work includes

- Expanding the number of control programs and lake-wide surveys to increase areas treated and evaluate program effectiveness
- Increasing our knowledge of AIS currently or potentially infesting the Lake Tahoe Basin to develop new cost-effective treatment methods and control strategies
- Expanding Early Detection and Rapid Response for new AIS
- Determining the impact of climate change on the spread of AIS
- Developing new proactive management strategies that shift from detecting and treating existing invasions to anticipating, preparing for, and preventing future invasions

Where to go for more information



More information on Tahoe AIS can be found at:

<http://www.cabnr.unr.edu/chandra/> and at

<http://terc.ucdavis.edu/research/aquaticinvasives.htm>