



# Determining Factors for Eurasian watermilfoil (*M. spicatum*) Spread in and around Lake Tahoe, CA-NV

Bruce Kendall<sup>1</sup>, Sally MacIntyre<sup>2</sup>

<sup>1</sup>Environmental Science and Management, <sup>2</sup>Ecology Evolution and Marine Biology  
University of California, Santa Barbara

Invasive aquatic species pose serious ecological and economic threats to lakes, reservoirs and rivers. This study investigates vectors of introduction of aquatic nuisance species in California and Nevada's water bodies. Our findings show that lakes and reservoirs in California and Nevada are connected by way of recreational and transient boating, which is a major source of non-native species introductions.

Rivers, lakes and reservoirs are among the most invaded environments in the world; recreational boaters are a major source of non-native species introduction both within and between fresh water bodies. Boaters use California's waterways intensely, and create significant potential for the spread of non-native species such as Eurasian watermilfoil (*Myriophyllum spicatum*). New aquatic nuisance species (ANS, such as the Quagga mussel) regularly appear in neighboring states, so California's waters are at constant risk of further invasion.

This research investigates patterns of Eurasian watermilfoil spread within Lake Tahoe, as well as to water bodies connected to Lake Tahoe via recreational boating. Lake Tahoe receives a high amount of boat traffic, and is centrally located in proximity to a number of popular lakes in California and Nevada. Eurasian watermilfoil is estimated to have arrived along the south shore of Lake Tahoe during the 1960's and has since spread to numerous locations around the lake.

We are exploring the following: (1) What are the processes of spread within a lake; i.e., is watermilfoil limited by available habitat or by dispersal mechanisms? (2) What other water bodies are Lake Tahoe boaters using? Do they act as potential sources of aquatic invasion? (3) Are there recognizable travel patterns for boaters in this region? What impact do these patterns have on

invasion risk? (4) Are boaters aware of damages associated with invasive species?

During the 2005-2006 boating seasons approximately 800 boater interviews were carried out at 7 Lake Tahoe boat launch facilities, collecting information regarding lakes visited before and after present use, travel within Lake Tahoe, invasive species awareness, boat cleaning habits, and vessel inspections for vegetation caught on boats

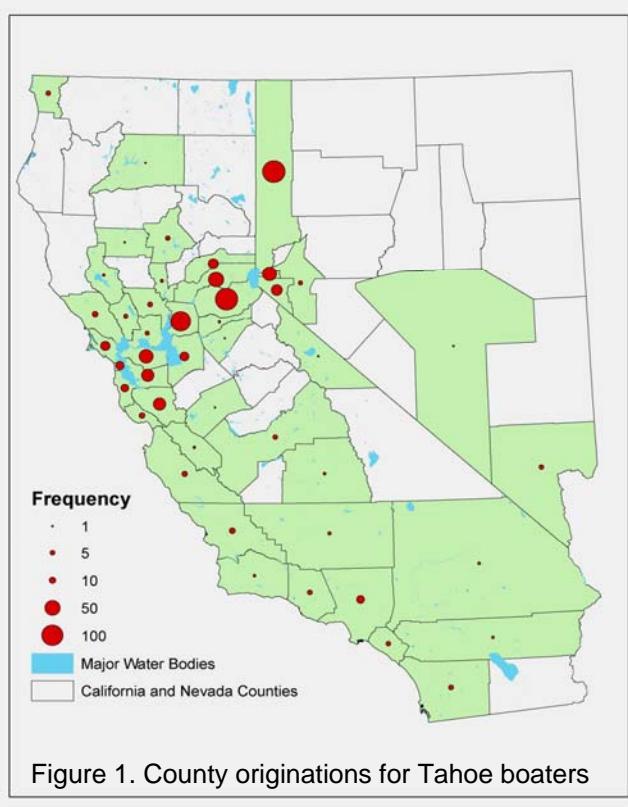


Figure 1. County originations for Tahoe boaters

and equipment. A survey of Lake Tahoe for Eurasian watermilfoil and Curly pondweed was carried out with the USDA Exotic and Invasive Plant Unit. Additionally, sediment and water quality testing of 13 popular boating destinations assessed habitat appropriateness for potential colonization. In 2007, similar sediment and water quality assessments were carried out at the top 10 visited water bodies in CA and NV as indicated by the 2005-06 boater interviews. These assessments also included surveys for other high risk invaders such as the New Zealand Mudsail, Quagga mussel, and Curly pondweed at lake access points.

Findings of these efforts include: Lake Tahoe boaters originate from a large geographic range (Figure 1), and have previous use in water bodies with known aquatic invaders, including Western reservoirs known to have established populations of Quagga mussel; 15% of boats leaving Lake Tahoe carry invasive plant species fragments on equipment; some habitats within Lake Tahoe may limit the establishment and growth of Eurasian watermilfoil because of wave action and sediment quality, other habitats in the lake are appropriate for Eurasian watermilfoil growth – suggesting that the invasion is still in progress; Eurasian watermilfoil and Curlyleaf pondweed continue to spread in Lake Tahoe; a majority of Lake Tahoe boaters *never* conduct visual inspection of boats or boating equipment for ANS; a number of California and Nevada lakes contain ANS that have not been previously reported.

## **Professional Presentations**

Wittmann, Marion, E., Pathways for Aquatic Invasive Species, Western Aquatic Plant Man. Society, Lake Tahoe CA, March 2008.

## **Collaborative Efforts**

Researchers from the USDA Agricultural Research Service assisted with this study: Bob Blank (Soil Science Lab) provides sediment quality analysis; Lars Anderson (Aquatic Plant Research Lab) has provided survey data and culture tanks. The UC Davis Tahoe Environmental Research Center provided data, facilities, field assistance, and instrumentation. University of Nevada, Reno researchers provided field assistance.

### **For further information please contact:**

**Bruce Kendall**  
[kendall@bren.ucsb.edu](mailto:kendall@bren.ucsb.edu)  
805-893-7539  
<http://www.bren.ucsb.edu/~kendall>

**Sally MacIntyre**  
[sally@icess.ucsb.edu](mailto:sally@icess.ucsb.edu)  
805-893-3951  
<http://www.lifesci.ucsb.edu>

**Marion Wittmann**  
[mwittmann@ucdavis.edu](mailto:mwittmann@ucdavis.edu)  
775-881-7560 x7402  
**Tahoe Environmental Research Center**  
**UC Davis**