

**Delineation of the Asian Clam (*Corbicula fluminea*) Population
at Sand Harbor State Park, Nevada**

**Report to the Nevada Division of State Lands and the Tahoe Regional
Planning Agency**

Final Draft

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Introduction

Asian clam (*Corbicula fluminea*) underwent rapid population expansion following their introduction to Lake Tahoe in the early 2000s. Like most successful invasive species they rapidly colonized suitable available habitat. Within just a few years they had spread from the south side of Glenbrook Bay to Baldwin Beach along the south and southeast margin of the lake. Further natural range expansion appears to have been limited by the lake's steep bathymetry and prevailing currents.

Escapement beyond this area did not occur until 2010 when a satellite population was discovered on the sill separating Emerald Bay from the main body of Lake Tahoe. This was followed relatively quickly by another isolated population at the boat launch within Sand Harbor State Park (2014). The fact that these two populations lacked connectivity with other Asian clam populations indicated that some mechanism other than lake currents was responsible for emigration out of the south shore (Hoyer et al. 2015).

A 1988 report to the Nevada Department of Wildlife (Biocentric 1988) found Sand Harbor State Park and Emerald Bay State Park to be the two most popular boating locations on Lake Tahoe. With a strictly enforced boat inspection program in place, it is unlikely a new population of Asian clams from outside the Tahoe Basin arrived at either location. It is suspected that Asian clam veligers are being transported within the lake, beyond their natural range expansion, by previously inspected boats that have filled internal ballast tanks while in clam-infested areas of Lake Tahoe. The past five years has seen a large increase in wake sport activity on Lake Tahoe. Recreational boaters are now adding hundreds of gallons of lake water to onboard ballast tanks and later emptying them in other locations. Asian clam veligers are likely being moved to previously unavailable habitat with the ballast water.

Once a satellite population becomes established it can once again begin rapid range expansion to previously protected areas of the lake by taking advantage of local currents. For this reason the Asian clam population at Sand Harbor State Park posed a risk of infestation to the north shore beaches from the state park to Crystal Bay. A decision was made by the Nevada Division of State Lands and the Tahoe Regional Planning Agency to treat the satellite Asian clam population at Sand Harbor to prevent this potential range expansion.

During the spring of 2017 researchers from the UC Davis Tahoe Environmental Research Center (TERC) conducted scuba, snorkel, and wading surveys to determine if clams had already expanded their range to include suitable habitat outside Sand Harbor State Park (Allen and Senft 2017). Prior range expansion would have rendered the Sand Harbor treatment unnecessary. The survey effort did not find any clams outside the immediate vicinity of the Sand Harbor boat launch.

The lack of clams in the expanded survey area prompted the need for a more detailed survey in the vicinity of the boat launch. The known clam population was delineated in the spring of 2016 but left untreated through the summer reproductive season. A second delineation survey was conducted in the spring of 2017 immediately prior to treatment

with bottom barriers. This report details the methods and findings of those surveys and defines the area of infestation to be treated as of June 2017.

Methods

In June of 2016 TERC researchers conducted scuba surveys to delineate the area of clam infestation surrounding the Sand Harbor boat launch (Figure 1). No treatment was conducted during the summer of 2016 allowing unencumbered reproduction and expansion of the Asian clam population. In determining the new and potentially larger extent of the area in need of treatment, researchers used the previous boundary of clam infestation as a baseline making the assumption there was not a reduction in the populated area.

Scuba transects were swum along an east - west heading to the north of the previous population boundary until no clams were found on two consecutive transect lengths. The length of the transects was determined in a similar manner with approximately 30m traveled without encountering clams before the transect was ended. The same strategy was used along north - south transects moving lakeward (west) from the previous clam boundary.

During the winter of 2016-17 the lake surface elevation increased 7ft. This required additional surveys shoreward of the area defined in the 2016 survey as new wetted habitat was created where dry beach had been previously. Clams were not expected to be found in this area as the previous years reproductive season was completed before the lake levels rose. However, horizontal movement of existing clams could have lead to occupation of this area.

Divers used fine mesh sieves to scoop the substrate to depth of about 6 inches, filtering any clams greater than 5mm from the sand and silt (Figure 2). This method allows a large amount of substrate to be checked in detail while visually surveying the surface of the substrate for the presence of both live and dead clams. Due to the time consuming sieving process, this method works best when refining population areas where as hand flipping is most efficient when assessing large areas for presence absence.

Findings

Low densities of clams were found beyond the north and west sides of the 2016 infestation expanding the area to be treated to 5.5 acres (Figure 1). No clams were found in the newly wetted shorezone less than a depth of 6 ft.

Along the deepest transects (25 ft depth) outside the constructed rock pile breakwater, clam densities were very low. The diffuse population made it difficult to determine the outermost edge of the treatment area. Additionally this region will not be covered during the initial phase of the treatment (summer 2017) allowing for further colonization during the 2017 reproductive season. It is recommended that any additional barriers available during phase two of the treatment be placed in such a way as to expand the area delineated in this June 2017 survey.

References

Allen and Senft 2017. Nearshore Surveys to Assess the Presence or Absence of Asian Clams (*Corbicula fluminea*) Prior to a Proposed Treatment at Sand Harbor State Park, Nevada. Report to Nevada State Lands and the Tahoe Regional Planning Agency

Biocentric Inc. (1988). Boating in Nevada 1986-1988. Report prepared for Nevada Department of Wildlife, Division of Law Enforcement, Reno, Nevada.

Hoyer, A. B., Schladow, S. G. and Rueda, F. J. 2015. Local dispersion of a non-motile invasive bivalve species by wind-driven lake currents. *Limnology and Oceanography*, 60: 446-462.



Figure 1: Change in areal coverage of the Asian clam population in the vicinity of the Sand Harbor State Park boat launch June 2016 to June 2017.



Figure 2: Scuba divers sieved substrate along transects to locate clams buried below the surface.