

April 15, 2018

To: Sabrina Colias, Solano County Water Agency  
Chris Lee, Solano County Water Agency

From: Ken W. Davis, Aquatic Biologist

Regarding: Lake Berryessa Eurasian Mussel Surveys - 2018 - Q1

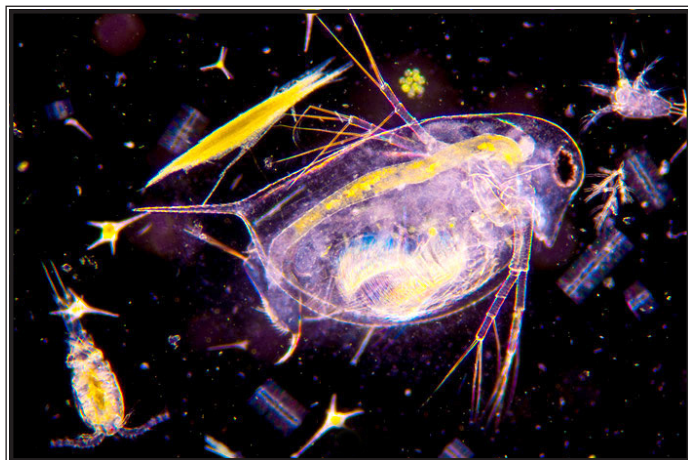
### Executive Summary

All surveys undertaken during the first quarter of 2018 were **NEGATIVE** for any sign of Eurasian Mussels. The Eurasian Mussel designation includes Quagga Mussels (*Dreissena bugensis*), Zebra Mussels (*Dreissena polymorpha*) and Golden Mussels (*Limnoperna fortunei*). The following description outlines the comprehensive surveys conducted in the Solano Project (Lake Berryessa) for Eurasian Mussels. Surveys include plankton examination, colonization devices, visual infrastructure surveys, and close examination of bank side materials. Sites surveyed are listed at the end of this document.

### Plankton Surveys



Plankton net used off the dock at the Capell Public launch ramp.



Typical plankton collection from Lake Berryessa. Both cross-polarization and darkfield microscopes are used to examine plankton samples.

All surveys in Lake Berryessa are conducted using EPA approved 64 micron plankton nets. Collections are made at sites considered high-priority for the introduction of mussel veligers or attached adults. Those sites include launch ramps, boat docks, with an emphasis on specific areas such as docks with gas pumps. Plankton collections at marinas are more effective than collections made from boat tows. Via extensive experience with plankton collection and discussions with other plankton experts (Claudi 2010) we believe it is more effective and logical to take plankton collections off marina docks rather than boat tows. Nets are easier to control off a dock, collection depths are identical, and it is logical that a mussel infestation would initially occur at points of entry (launch ramps and marinas). Thus, it is logical that surveys be conducted at points of entry.

Although the standard recommendation for plankton collection is 500 Liters (Mackie 2010, Wong 2015), we typically filter 1500 - 2000 Liters per collection. In plankton-rich reservoirs such as Lake Berryessa, the extra collection will certainly not have a detrimental impact on the plankton community. The added volume allows for additional tows.

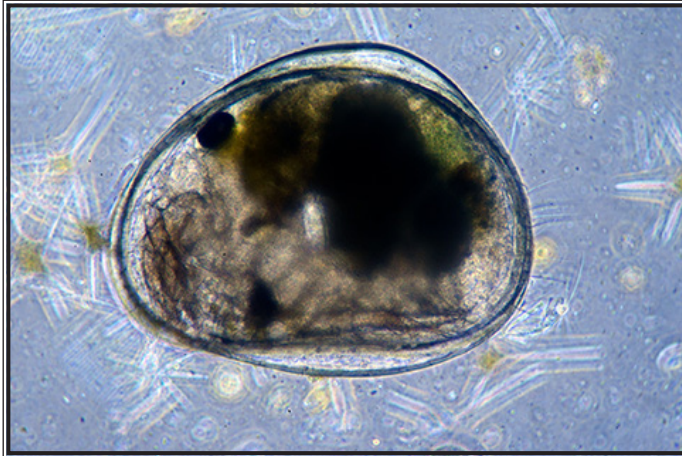
**Plankton Image Library:** Species occurring in the Lake Berryessa plankton community have been photographed since the initiation of the project in 2005. This action is important due to the occurrence of false-positives (other states) by inexperienced microscopists and poorly designed quality-assurance and rapid-response plans.



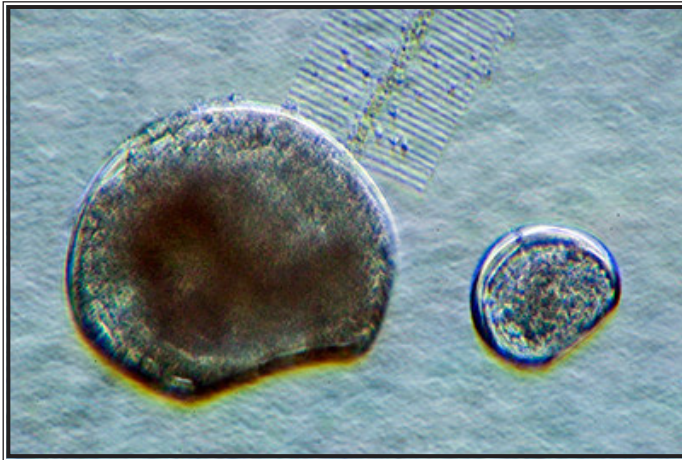
## Wildlife Survey & Photo Service

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## Lake Berryessa Plankton Surveys 2018 - Q1



Seed Shrimp (Ostracod), a common species in Lake Berryessa.



Veligers: Asian clam (Left) and Quagga Mussel (right)

### Lake Berryessa Plankton Image Library continued:

The image library is instrumental in comparing known organisms, such as Asian clam veligers, Seed Shrimp, and other organisms that might be similar to mussel veliger images.

All plankton samples are examined within twelve hours after collection using protocol defined by the USBR Laboratory (Denver).

## Colonization Devices



Colonization string used at Markley Marina.

Various colonization trees, including some manufactured specifically as colonization devices are used at Lake Berryessa Marinas. Each device is typically checked and cleaned once per month.





### **Colonization Devices - continued**



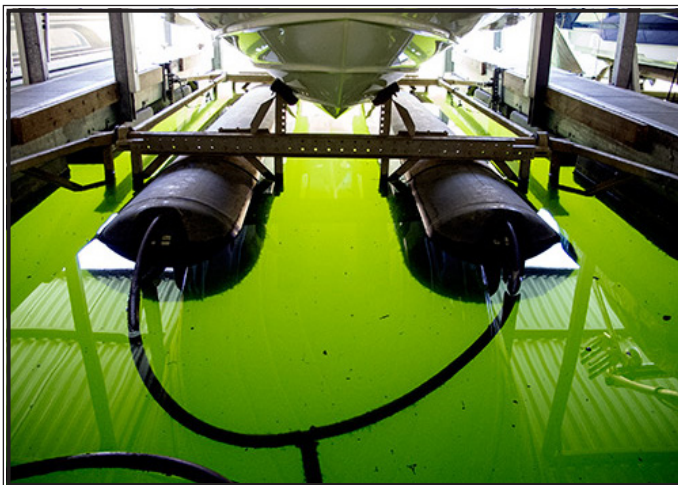
Manufactured colonization device used at Markley Marina.

### **Visual surveys - Marinas**



Hydrolifts are ideal colonization devices.

Plankton collection from marinas and public launch ramps (rather than boat tows) allow for the casual inspection of scores of watercraft, docks, hydrolifts, and cables.



Hydrolift at Markley Marina



### **Visual Surveys - Marinas**



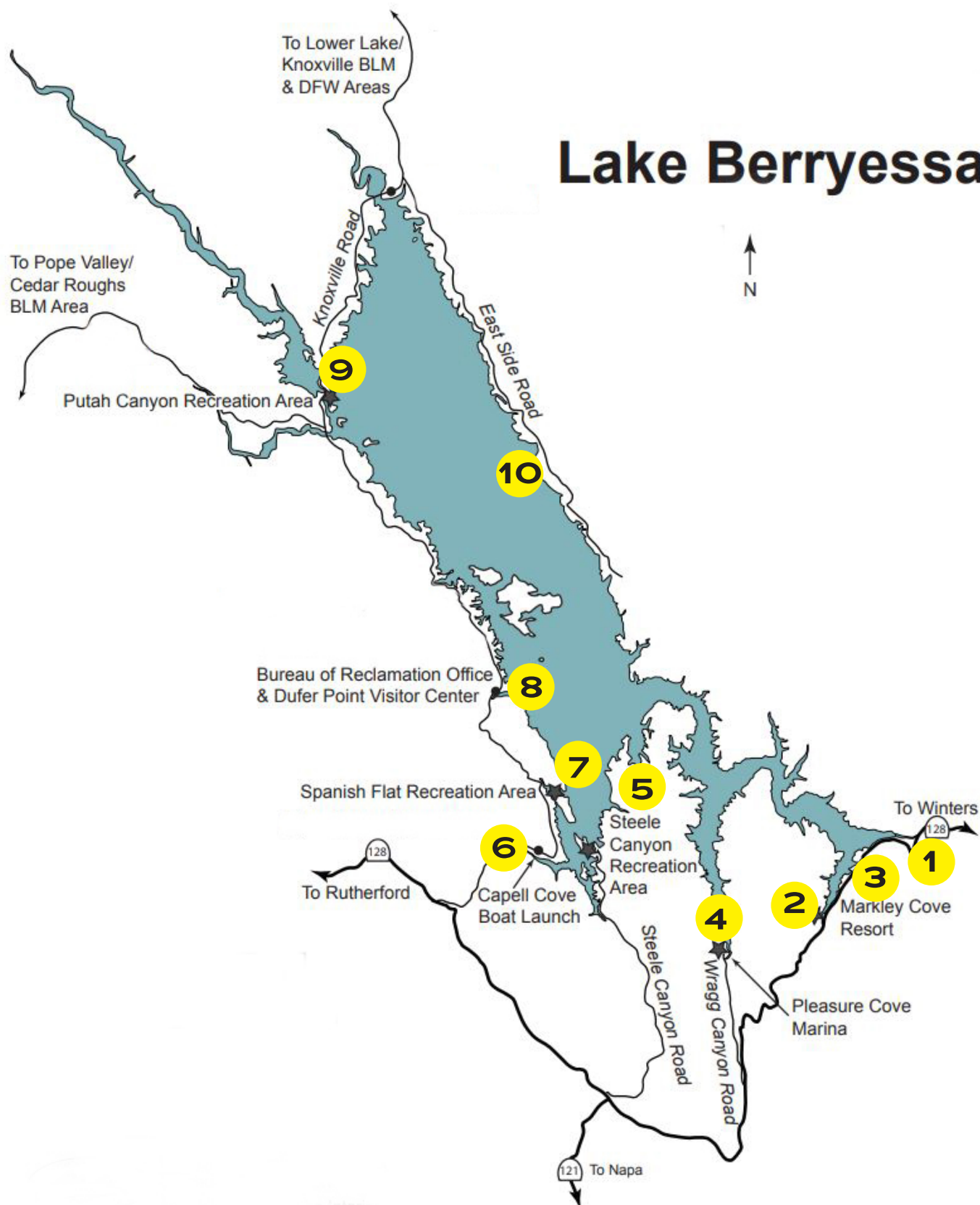
Markley Cove Marina dock used for plankton collection, visual surveys, and colonization devices. Using the marinas as the focus for plankton collection also allows for discussions with boaters about protecting Lake Berryessa from invasive species.

### **Visual Bank Survey**



Watercraft access to the Markley Cove launch ramp and gas dock. All watercraft entering the area must traverse through this section. The bank (right) and the marina itself are considered high-priority sites for mussel surveys.







Map No.	Date	Site	Protocol	Results
1	<b>Monticello Dam</b>			
	1/29/2018	Area downstream of Dam	Visual / Colonization	Negative
	3/12/2018	Area downstream of Dam	Visual / Colonization	Negative
2	<b>Markley Cove Marina</b>			
	1/11/2018	Markley Launch Ramp	Visual / Plankton	Negative
		Markley gas dock	Visual / Plankton	Negative
		Markley Houseboat Dock	Visual / Plankton	Negative
		Markley Dock - C	Visual / Plankton/ Hanger	Negative
	2/5/2018	Markley Launch Ramp	Visual / Plankton	Negative
		Markley Gas Dock	Visual / Plankton	Negative
		Markley Dock C	Visual / Plankton	Negative
		Markley Rental Dock	Visual / Plankton	Negative
		Dock side bank	Visual	Negative
	3/12/2018	Markley Launch Ramp	Visual / Plankton	Negative
		Markley Gas Dock	Visual / Plankton	Negative
3	<b>Markley Cove Arm (Lake Entry &amp; Exit)</b>			
	1/10/2018	East side Rip Rap / Bank (300 yds)	Visual	Negative
4	<b>Pleasure Cove Marina</b>			
	1/24/2018	Launch Ramp	Plankton / Visual	Negative
		Gas Dock	Plankton / Visual	Negative
		Houseboat Dock	Plankton / Visual	Negative
		West side Bank (500 yards)	Visual	Negative
	2/23/2018	Launch Ramp	Plankton / Visual	Negative
		Gas Dock	Plankton / Visual	Negative
		Houseboat Dock	Plankton / Visual	Negative
		Maintenance Dock	Plankton / Visual	Negative
		West Side Bank (100 yards)	Visual	Negative



4	3/12/2018	Pleasure Cove Launch Ramp	Plankton / Visual	Negative
		Houseboat Dock	Plankton / Visual	Negative
		Maintenance Dock	Plankton / Visual	Negative
		West side Bank (200 yards)	Visual	Negative
5	Steele Canyon Ramp			
	1/26/2018	Launch Ramp	Plankton / Visual	Negative
		Boat Dock	Plankton / Visual	Negative
		Banks (Cove)	Visual	Negative
	2/5/2018	Launch Ramp	Plankton / Visual	Negative
		Boat Dock	Plankton / Visual	Negative
		Bank (cove)	Visual	Negative
	2/24/2018	Launch Ramp	Plankton / Visual	Negative
		Boat Dock	Plankton / Visual	Negative
6	Capell Public Launch Ramp			
	1/24/2018	Launch Ramp / Dock	Plankton / Visual	Negative
		Bank (200 yards)	Visual	Negative
	2/5/2018	Launch Ramp / dock	Plankton / Visual	Negative
	3/8/2018	Launch Ramp / Dock	Plankton / Visual	Negative
7	Spanish Flats			
		Scheduled for April 2018		
8	Management Docks			
	2/5/2018	Sheriff's Watercraft / USBR Dock	Plankton / Visual	Negative
9	Putah Creek Campground & Ramp			
	2/5/2018	Launch Ramp	Plankton / Visual	Negative
		West side Bank (300 yards)	Visual	Negative
	3/8/2018	Launch Ramp	Plankton / Visual	Negative
		West side Bank (300 Yards)	Visual	Negative

10	East Side Wildlife Area (No Ramp)			
	1/24/2018	Bank Survey (wind blown debris)	Visual	Negative
	2/5/2018	Bank Survey (wind blown debris)	Visual	Negative
		Bank Survey	Plankton / Visual	Negative
	3/8/2018	Bank Survey (wind blown debris)	Visual	Negative

Submitted via e-mail on April 17, 2018:



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#### References:

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Wong, WH & S. Gerstenberger. 2015. Eds. Biology and Management of Invasive Quagga and Zebra Mussel in the Western United States. CRC Press. Boca Raton, FL.