



## CASE STUDY

# Monitoring HABs and Invasive Mussels at Big Bear Municipal Water District

The Anabaena bloom with dead algal cells bleached out by the sun.

HABs can bloom to toxic concentrations in just a few hours. Prior to purchasing a FlowCam®, BBMWD's outsourced water quality analysis took up to one month to get results. Any impending HAB had already bloomed and wreaked havoc. With FlowCam, BBMWD receives results in minutes.



## THE CLIENT

Big Bear Municipal Water District (BBMWD) is a small water utility located in Big Bear, California. The MWD is responsible for the overall management of Big Bear Lake, one of Southern California's premier recreational lakes. BBMWD monitors Harmful Algal Blooms (HABs) and invasive quagga and zebra mussels. Maintaining healthy algae populations and preventing HABs are a priority for BBMWD. Foul odors, toxin releases, and wildlife deaths can drive visitors away, as well as restrict to the use of the lake for recreation during these blooms.

## THE CHALLENGE

BBMWD needed fast water analysis to be able to take action during developing, toxic algae blooms. In FlowCam®, they found their answer.

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### FROM MONTHS TO MINUTES

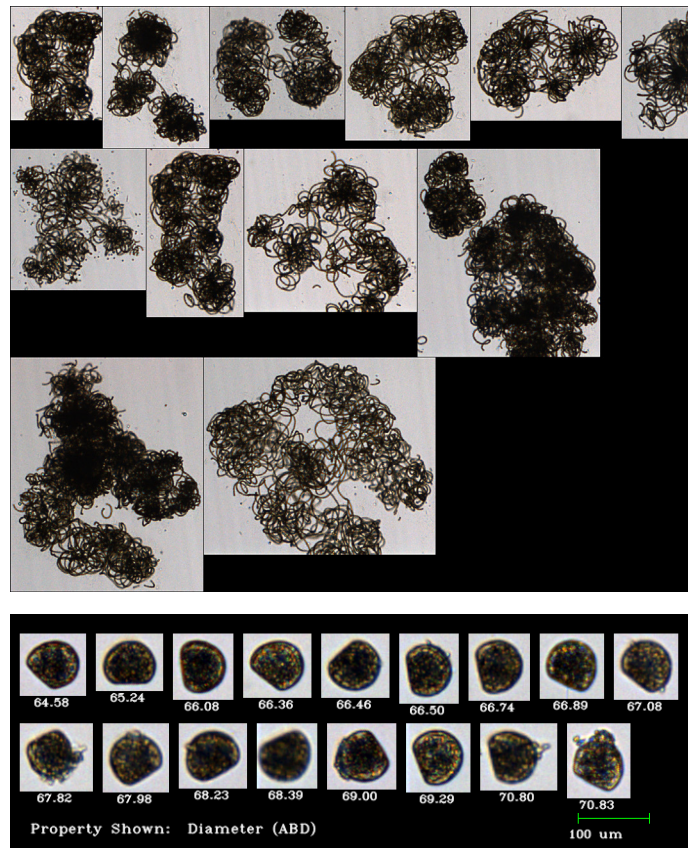
BBMWD collects water samples from three depths at each of the four locations to monitor the water column around the lake. Of the 12 samples, the majority are sent to the Department of Fish and Wildlife and a portion are analyzed for quagga and zebra veligers in-house using the FlowCam. The FlowCam is also used for analysis of algae and HAB monitoring.

“As the seasons change, it is easy to increase sampling frequency [with the FlowCam] to keep up with the increased likelihood of blooms,” says Lake Manager James Bellis. Visual inspections of the lake guide when and where testing should occur. Sampling and immediate results via the FlowCam have helped BBMWD maintain water quality throughout the bloom season.

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—James Bellis, Lake Manager  
BBLWD

BBMWD also uses the FlowCam to quickly answer the questions about algae from Big Bear Lake users. “It’s great that we can test the water and have confidence in the results,” Bellis says. The FlowCam helps him respond quickly and with confidence, and empowers staff to educate the lake’s users on environmental processes, algae types, and remediation.



ABOVE: Anabaena Cells as imaged by FlowCam.

BELOW: Mussel veligers have unique shell morphology, shape and size that helps to identify them. Consequently, when viewed by the FlowCam they are generally easier to identify.

This spring, recreational lake visitors noticed some strange, light blue algae on the lake surface. Upon imaging it with the FlowCam, BBMWD identified it as dead *Anabaena* sp. that had been bleached by the sun and therefore decided not to treat it. Dead algae have a higher risk of lysing or splitting open as it dries out on the lake surface. If the dead cells had been lysed during a mitigation effort, they could have released their toxins and posed a greater threat to the health of the lake.

The invasive quagga mussel threatens the health of fresh water bodies and any associated infrastructure (pipes, etc.) The quagga mussel was recently discovered in Lake Mead, Lake Havasu and other Southern California lakes. Quagga mussels (*Dreissena bugensis*) and zebra mussels (*Dreissena polymorpha*) are invasive, biofouling mollusks capable of causing severe economic and ecological harm to freshwater habitats. Detecting presence of the mussels as soon as possible after their arrival allows managers to implement responses that can reduce further spread, such as watercraft movement restrictions.

BBMWD has taken necessary steps to prevent the invasion of quagga mussels since 2007. Educating the public on this invasive species and enlisting their help in prevention has been essential to protect the lake from the devastating environmental, recreational, and economic impacts.

BBMWD received funding for the FlowCam through a grant from the California Division of Boating and Waterways to support the State’s efforts to manage and control HABs and invasive species like quagga and zebra mussels. The BBMWD is committed to improving early detection in conjunction with prevention and containment plans. They have created a strong program for educating the public around best practices to keep boats “Clean, Drained, and Dry!”