

## Summer and Clear Lake, a function of water, weather and wind

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Water conditions in Clear Lake during the summer months can be exasperating for those who want to enjoy the lake. The weeds and blue-green algae (cyano-bacteria) affect boaters, swimmers and lake users during the time of year when folks are looking for relief from the heat.

The science clearly tells us what is happening on the lake but that doesn't mean short-term "fixes" are readily available. The lake's summer condition is a product of the "3 – Ws", water, weather and wind.

The available data clearly shows that Clear Lake has been getting steadily clearer since the late 1960s. Clear water allows sunlight to penetrate deep into the water column. Clear Lake is relatively shallow. The sunlight can penetrate to the bottom of the lake allowing rooted plants to germinate, grow and reach the top of the water to produce seeds for next year's crop of weeds.

The water has gotten clearer over the years because of the efforts to reduce nitrogen input into the lake. Nitrogen is the primary source of "cloudy" water when green algae blooms and blocks out the sun. This was the case in the late 1950s until the 1970s when weeds were not present in the lake. Nitrogen reduction was accomplished by addressing malfunctioning septic systems, reduction in agricultural run-off, and better erosion controls. As the nitrogen was reduced, green algae has become less abundant in the spring thereby limiting the ability of green algae to cloud the water. The clear water has allowed weeds to become established over time.

The second "W", weather, affects plant response as well. This past month has been unseasonably warm. Clear Lake's water temperature is near 80 degrees. As most plants, the cyano-bacteria (blue-green algae) responds to the warm conditions. This last week we saw an eruption of Lyngbya, the nuisance blue-green that is now beginning to form the surface scum. This bloom is a direct result of the warm weather and the clear water. Lyngbya starts growing on the bottom of the lake, a direct result of the clear water, the cells of the plant explode in growth, a direct result of the energy provided by the warm water and then pieces break off and float to the top. As of this writing, the entire lake is showing evidence of producing Lyngbya. The species is suspended throughout the water column in all parts of the lake evidence that the entire lake is supplying the bloom.

Lyngbya, like other cyano-bacterias, obtains its nitrogen from the atmosphere. In a study published in the 1970s it was estimated that Clear Lake cyano-bacteria was sequestering 550 tons of nitrogen during the summer months. These species literally get "their food" from the air.

The last "W", wind, directs and pushes the floating blue-greens into the scum layers now being seen throughout the lake. The wind can change water conditions in a matter of hours. A section of the lake can be free of scum in the morning but with the afternoon winds the same area can be a putrid mess by evening. We see this happening throughout the summer. Unfortunately, some sections of the lake receive the bulk of the wind driven scum creating a perpetual nuisance.

Clear Lake is 44,000 surface acres. The sheer volume of cyano-bacteria biomass being produced at this time of the year simply overwhelms the system and makes “management” of the situation virtually impossible. We see temporary booms being deployed, weed harvesting boats, other boats trying to break up the scum mats, and folks using personal pumps and sprayers to keep the scum mats from forming.

Right now the water and weather is producing aquatic plants and blue-green algae (Lyngbya) and the wind is directing where it settles. Understandably people are extremely frustrated but short-term options are very limited at this time. Clear Lake is a domestic, agricultural, recreational and ecological water source limiting the chemical options that can be considered to constrain plant growth. Unfortunately, short-term options are limited to those mentioned but are limited to small portions of the lake at any one time.

Long-term solutions are difficult to identify at this time. That doesn't mean people are not exploring ideas and options. Newly obtained satellite imagery is providing insights that may lead to long-term approaches to lake management. But the sheer size of Clear Lake and the ecological services it's expected to deliver (domestic, agricultural, recreational and ecological expectations) challenges and constrains what can be considered and employed.

Clear Lake is a complex system that is further complicated by past human decisions and present expectations. I invite people to search the newly released Clear Lake Web page to learn more about the lake and the research that has been published to better understand what we know about California's oldest and biggest lake. <http://ucanr.edu/sites/ClearLakeAquaticWebsite/>