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Competitive Exclusion of Cyanobacterial Species in Great Salt Lake

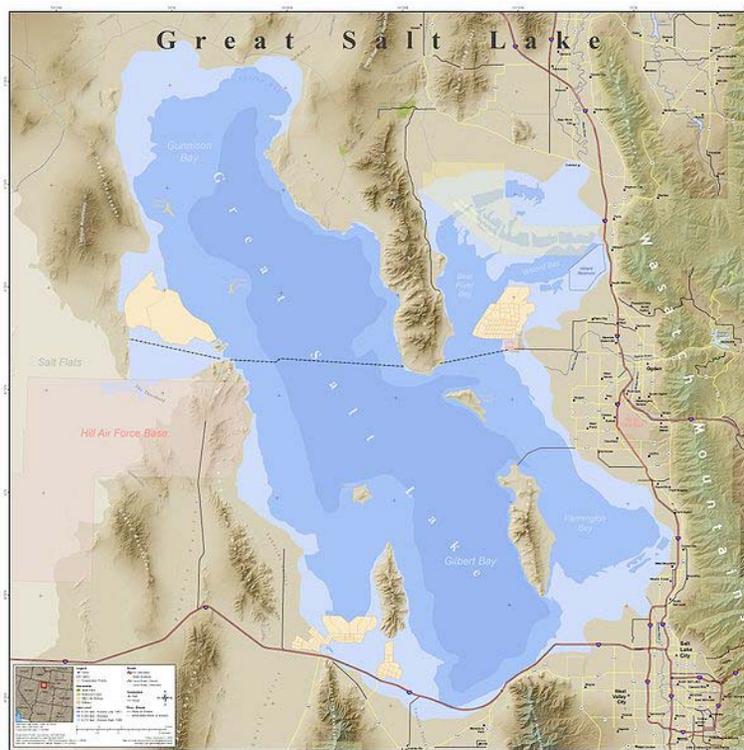
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The division of the waters of Great Salt Lake by a rail and vehicular causeway into different regions of salinity and color variation represents a natural experiment that permits examination of competitive exclusion of cyanobacteria. Cyanobacterial distributions partially follow the salinity, with *Aphanothece halophytica* proliferating in the North Arm and *Nodularia spumigena* being prominent in the South Arm. I hypothesized that cyanobacterial species abundant north of the railway causeway are competitively excluded from the south by other species, and that cyanobacterial species that thrive and bloom south of the Antelope Island causeway cannot grow in the high salinity of the north. To test this hypothesis, 129 flasks of autoclaved water from the north and south sides of each causeway were inoculated with Great Salt Lake water samples from the north and south sides of the causeway.

Four genera of cyanobacteria, *Aphanothece*, *Oscillatoria*, *Phormidium*, and *Nodularia* were identified and counted from the culture flasks using comparative differential interference contrast, fluorescence, and scanning electron microscopy. The relative abundance of cyanobacterial species was determined and differences were tested for statistical significance. *Aphanothece halophytica* was found in all inocula, but its growth was suppressed in the presence of *Nodularia spumigena*, while *N. spumigena* was found only in inocula from the less saline waters in the south, and apparently cannot survive in the extremely saline waters of the north.

These analyses suggest that both abiotic and biotic factors influence the distribution of cyanobacteria in Great Salt Lake. *Nodularia* is excluded from the north by high salinity, but *Aphanothece* is outcompeted in the south by *Nodularia*.



Map of the Great Salt Lake, Utah, showing predominant features. Created December 2008 by Justin Morris & Greg Fryer using ArcGIS.