



AP Human Geography

Shrinking White Bear Lake

Name:

Section:

Score: ____/5

Directions: Read the following article about the declining water levels of White Bear Lake in Minnesota and compare it to the case of

White Bear: Incredible shrinking lake:

These are difficult days for people who swim in White Bear Lake's usually cool waters and call its receding shoreline home. Plummeting water levels on White Bear may be part local geography, and part of a bigger trend on Minnesota's 10,000+ lakes. White Bear Lake has always had big fluctuations in lake levels. But the sustained drop in the water levels in excess of 5 feet on White Bear since 2003 may be a harbinger of things to come for Minnesota's Land of 10,000 lakes.

The plunge in water levels of White Bear and other Minnesota lakes, marshes and ponds mimic a shift to a warmer climate regime in Minnesota in the past decade. White Bear's unique geography and hydrology make it extra sensitive to changes in precipitation and increased evaporation rates associated with a warmer climate.

- White Bear's relatively small watershed makes it especially vulnerable to reduced winter snowfall and the spring runoff that feeds the lake. With less area for runoff into the lake, it takes more rain and snow to boost water levels in White Bear.
- Longer "ice free" seasons (by 2 to 4 weeks or more) open the lake surface to increased evaporation in spring and fall.
- Hotter summers, and warmer, longer spring and fall ice free periods each year mean more water is sucked from the surface of Minnesota's lakes than in decades past. Increased evaporation makes our lakes increasingly vulnerable to any reduction in annual rain or snowfall.



Increased Groundwater Pumping: Draining White Bear from below?

A very timely and in depth piece from The Freshwater Society highlights the threat to White Bear's water level from increased groundwater pumping below the lake.

Here are some excerpts from the Freshwater report.

From mid-2003 to the present, White Bear's water level dropped more than 5 feet. In late 2010, concern about the drop among citizens and officials in communities around the lake led to a \$200,000 research project conducted by the U.S. Geological Survey with assistance from the state Department of Natural Resources, the Pollution Control Agency, the Board of Water and Soil Resources and the Metropolitan Council.

The research, funded by the USGS, the state and a number of local governmental units, reinforced some old theories and produced some new evidence about the causes of the lake's decline.

The findings so far:

- White Bear drains a very small watershed and has always had big decreases in area and volume during extended dry periods when rainfall and melting snow do not keep up with evaporation.
- Chemical testing of water from wells around the lakes confirms that lake water is flowing out the bottom of the lake into groundwater aquifers that feed those wells.

-Pumping from high-capacity wells in suburban communities that mostly draw their water from those aquifers more than doubled over the last 30 years.

There are varying scientific opinions, but some believe as much as 25% of White Bear's water volume may have been lost from below due to increased groundwater pumping in the aquifer below the lake.

A regression model simulated the impact on water levels of the precipitation decline and the increased pumping. The pumping accounted for nearly four and a half feet of the water level decline between 2003 and 2011, according to the simulation. That four-and-a-half-foot difference across the lake equals a staggering 4.8 billion gallons – a loss of more than a quarter of the lake's previous volume.

Not everyone buys the notion that groundwater pumping around the lake has had that big an impact. "I accept that the added pressure from that municipal pumping on that aquifer had an effect," said Luke Michaud, the vice chair of the White Bear Lake Conservation District. "I'm skeptical of that four feet."

Huttner, Paul. "Land of 9,999 "shrinking" Lakes? Is White Bear Lake MN's "climate Change Canary in Coal Mine?." Updraft: Weather and Its Underlying Science. Minnesota Public Radio, 1 Oct. 2012. Web. 05 Jan. 2015.
<http://blogs.mprnews.org/updraft/2012/10/minnesota_land_of_9999_shrinki/>.

Municipal pumping from Prairie du Chien and Jordan aquifers
Values in millions of gallons per year

COMMUNITY	AVERAGE 1980-84	AVERAGE 2006-10	INCREASE
CENTERVILLE	0	97	97
HUGO	29	363	334
LINO LAKES	0	443	443
MAHTOMEDI	119	296	177
NORTH ST PAUL	483	469	-14
VADNAIS HEIGHTS	137	537	400
WHITE BEAR LAKE	723	952	229
WHITE BEAR TOWNSHIP	244	589	345
TOTAL	1735	3745	2010

Thought Questions:

- Compare the case of the shrinking of the Aral Sea to the case of White Bear lake and find similarities and differences in the following categories.

Similarities in Causes

Differences in Causes

Similarities in Impacts

Differences in Impacts

Similarities in Response

Differences in Response