

Relations between Surface Area and Volume in Lakes

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Excerpt

Radical changes in the top surface area of Utah's Great Salt Lake have been going on for thousands of years. The Utah Department of Natural Resources has records dating back to 1851 which show that between 1963 and 1986 the volume of the Salt Lake approximately tripled, while its top surface area approximately doubled. When this was reported in the news, we were intrigued, and wondered:

For what basins can this occur? In particular, is this possible for any familiar basins such as hemispheres, cones, or paraboloids?

Are there any basins such that a doubling of the area of the top surface always results in a tripling of the volume? And conversely, are there any basins where tripling the volume always results in a doubling of the area of the surface?

Given a lake, can we always extend the basin above the existing water level in such a way that if the volume is tripled, the surface area doubles?