A Novel Shade Dome to Reduce Water Evaporation in the Great Salt Lake

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Utah’s Great Salt Lake (GSL) is facing a critical situation, with projections indicating its potential disappearance within five years. This could cause an unprecedented environmental, health, and social crisis. This project optimizes a floating device designed to mitigate water evaporation rates without harming the lake's ecosystem, particularly the brine shrimp population. Existing floating shade sphere products have multiple problems that are directly addressed and solved by this new design. Four 3D-printed prototypes of a translucent polycarbonate device were developed. Each iteration incorporates improvements based on the measured performance of the previous model against predefined success criteria. The final design, Prototype 4, features a novel dome shape comprising a hollow hemisphere, a hollow cylinder, and a floor wall, providing optimal surface area coverage and stability without the need for water inside the device. Extensive testing was conducted, including over 300 hours of evaporation tests in Logan, Utah, and on the GSL shoreline, an 8-week ecological test with brine shrimp to assess the device's impact on the ecosystem, and 3 months of environmental tests to evaluate material durability under ultraviolet radiation and freezing temperatures. Evaporation rates were reduced by an average of 50%, without adversely affecting the brine shrimp's growth and reproduction. The recommended future implementation involves deploying shade domes, produced from recycled polycarbonate, over a selected 800 km² of GSL, at an estimated cost of $5.6 billion, potentially conserving 760 billion gallons of water over the lifespan of the domes. This would prevent billions in healthcare spending and economic disaster.