



Moody's Mega Math Challenge 2011

A contest for high school students

SIAM
Society for Industrial and Applied Mathematics
3600 Market Street, 6th Floor
Philadelphia, PA 19104 USA
M3Challenge@siam.org
M3Challenge.siam.org



Colorado River Water: Good to the Last Acre-Foot

Lake Powell, the second largest reservoir in the United States, is a source of power generation, a water storage system, and a recreational area. The lake was at 97% of its full capacity near the end of 1999, but a long term drought reduced the lake to about 60% of capacity at the end of 2010. Estimates of future Colorado River inflows to Lake Powell vary between a low of 39% of average to 137% of average, with 83% being most likely. The average inflow rate is approximately 12.0 million acre-feet per year.

The Department of the Interior has asked your team to develop a mathematical model to estimate the impact of the current drought on Lake Powell. Based on this model, you are to prepare a report on the likely implications of the current drought on Lake Powell, in light of the Colorado River Compact of 1922, which prescribes the distribution of water from the Colorado River. Your report must address the impact on Lake Powell over the next five years, assuming that the inflow predictions above persist for the next five years, and provide estimates, based on low, high, and most likely inflows, of Lake Powell's percentage of capacity at the end of the five year period.

Lake Powell feeds the Lower Basin of the Colorado River, including Lake Mead and Hoover Dam, which is a major supplier of electrical power. The Lower Basin is also experiencing significant drought.

- Using your model, estimate the effects on the water supply and the economy of the Lower Basin, including the impact on power generation.
- Discuss how small changes in the assumed inflow rates affect your model and these estimates.
- Make recommendations on potential reductions to the amount of water that might be removed from the Colorado River in order to maintain a minimal capacity in Lake Powell.

You may find the following references of interest:

<http://www.usbr.gov/uc/feature/drought.html>

<http://lakepowell.water-data.com/>

<http://www.usbr.gov/uc/lrm/crsp/gc/faq.html>

<http://www.usbr.gov/lc/region/g4000/AOP2010/AOP10.pdf>

