How Low Can It Go?

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Lake Mead's delta area, 1999 (left) and 2004 (right). Photos from the U.S. Bureau of Reclamation.

The Colorado River Basin is in the midst of a multi-year drought. Water year 2004, which ended on Sept. 30, 2004, marked the fifth consecutive year with below-average inflow into the major Colorado River reservoirs. Inflow into Lake Powell adjusted for the effect of upstream reservoirs was 62, 59, 25, 51, and 51 percent of average in water years 2000 through 2004, respectively. Inflow in 2002 was the lowest on record, and without doubt this drought represents the worst five-year period in the past 100 years. Although we are unable to definitively determine where in the drought cycle we may be, the drought is clearly impacting many aspects of the system.

Effect on Reservoir Storage

The effect of the drought is immediately evident in reservoir storage. In 1999, reservoirs on the Colorado River collectively were more than 90 percent full. Today the system-wide storage is about 50 percent, a decrease in volume of some 25 million acre-feet of water. Although the situation is very serious, the reservoir system is clearly doing its job, as about 30 million acre-feet of water remain in storage, or nearly two full years of average inflow into the system.

Currently, the two largest reservoirs, Lake Powell and Lake Mead, stand at 35 percent and 59 percent full respectively (U.S. Bureau of Reclamation, 2005). On Feb. 10, the water surface elevation at Lake Powell was 3,561 feet above mean sea level (amsl), more than 130 feet below full. Lake Mead's elevation is 1,1338 feet amsl, some 82 feet from the top of the spillway gates.

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Have these lakes been this low in the past? As shown in the charts above right, Lake

Powell has not been this low since 1969 when it was initially filling. Lake Mead has not been this low since 1967, also during the filling of Lake Powell. Prior to that, Lake Mead's elevation was lower than at present for several years in the 1950s due to drought in that decade.

Although the major reservoirs in the system were constructed for multiple purposes, providing water supply is foremost. In the past decade, the population of the seven basin states that rely on the waters of the river has grown by nearly 11 million, an increase of approximately 25 percent (Griles, 2004). Even with increased demand, most delivery obligations have been met throughout the basin despite the drought, primarily due to the relatively large inflows of the late 1990s, when significant amounts of water could be stored. Conservation efforts throughout the basin have also helped. For example, the Southern Nevada Water Authority (2005) estimates that Las Vegas area water use has decreased some 50,000 acre-feet since 2002, due to the implementation of a drought plan and the Water Smart Landscape program, which provides a $1 rebate per square foot of grass replaced by xeriscape.

In some parts of the Upper Basin where shortages have occurred, confrontation has been avoided through shortage-sharing agreements. Such an agreement established on the Gunnison River requires water users to adopt plans to share shortages when reservoir storage at Blue Mesa Reservoir is below 400,000 acre-feet, as occurred during the particularly severe drought of 2002.

Effect on Other Resources

Declining reservoir levels have affected other resources, including power production and recreation. The amount of energy produced at a hydroelectric plant depends upon the rate of flow through the turbines and the height of the water behind the dam: as lake level declines, the capacity for generation decreases. At Hoover Dam, generation capacity has been reduced 20 percent since 1999. If lake

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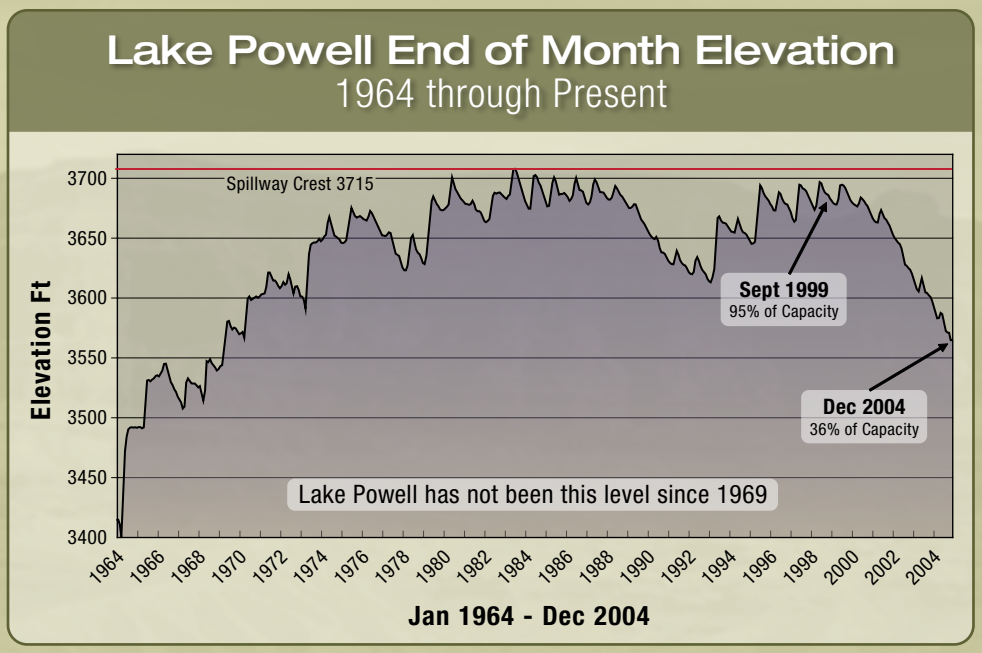

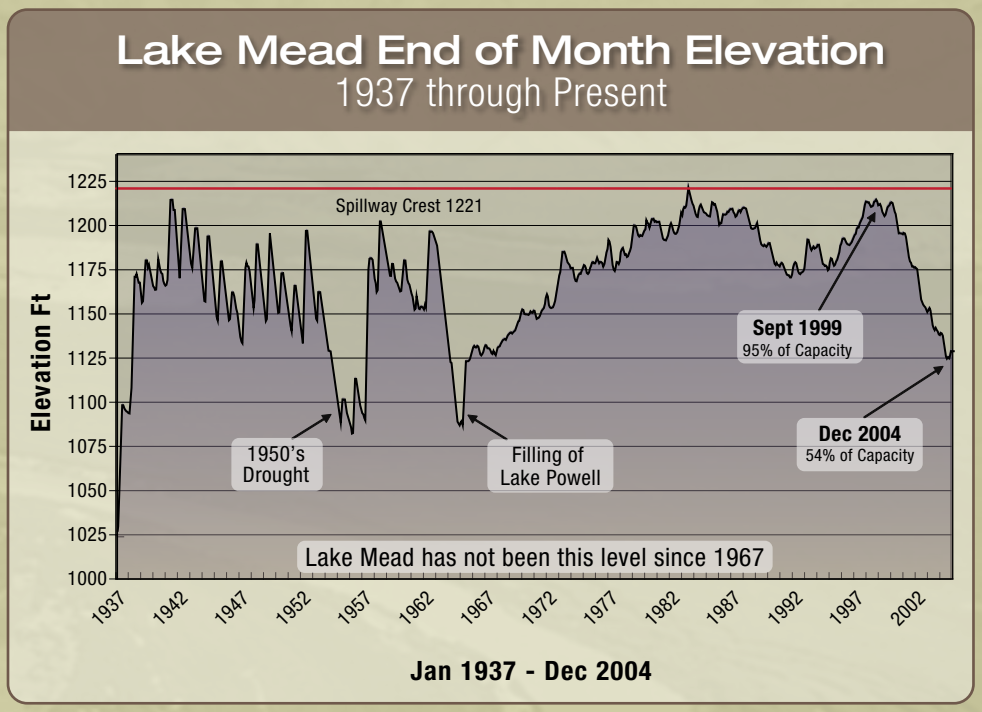

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levels continue to decline, the "minimum power pool," the level at which water can no longer flow to the turbines, could be reached. At Glen Canyon Dam, the minimum power pool is just 71 feet below the current elevation. Even at that level, the lake would contain nearly 4 million acre-feet of water that could be delivered downstream through the outlet works.

At Hoover Dam, water can be drawn into the turbines down to an elevation of 895 feet, at which point the remaining water could not be extracted by gravity flow. This water level is termed the "dead pool," and the nearly 2 million acre-feet of water remaining in the lake at this level is not included in reported reservoir storage. Even though water can reach the turbines down to the dead pool elevation, their design does not permit operation at that level. The costs and benefits of changing out the turbines at Hoover Dam as water levels rise and fall are being researched.

Declining reservoir levels have also affected recreation. The Hite Bay Marina at Lake Powell became inoperable in 2003. At Lake Mead, three public launch ramps have been closed and approximately $10 million has been spent to keep the remaining seven ramps open. Relocation of the Las Vegas Boat Harbor and Lake Mead Ferry Service is estimated to exceed $5 million. Further investments are anticipated to revamp water supply and wastewater systems.

Where Do We Go from Here?

Despite the precipitation seen in early 2005, it is unclear if this drought is nearing its end. History tells us it is not unusual to have wet years during an extended drought. Although the forecasted inflow into Lake Powell for the April through July runoff season is 98 percent of average at the time of this writing (Colorado River Basin Forecast Center, 2005), a similar forecast last year was radically altered when an abnormally dry and warm March vaporized the snowpack basin-wide. Although six consecutive years of below-average inflow has not occurred in the past 100 years, we should not bet on a turn-around. More likely, storage will continue to decline in the near-term and the system will take longer to recover than it did after previous droughts – largely because of greater demands today.

These increasing demands, including more use by the Upper Basin states as they develop their allocated shares of the river, will mean less water in storage, on average, than seen in the past, regardless of how long the current drought lasts. In recognition of this fact, the Department of Interior has actively encouraged the seven basin states to develop consensus management strategies to address water needs in the coming years. In December, the department announced plans to develop and institute formal shortage guidelines for the Lower Basin before 2008.

Technical studies to examine possible shortage strategies for the Lower Basin were initiated last year. All management options examined to date deal with the impacts and tradeoffs that will be required to maintain certain water levels at Lake Powell and Lake Mead. For example, given the current demands on the system, if no particular elevations are protected and the current drought continues, the lakes could be nearing their "dead pools" as early as 2008. Drawing the reservoirs down to those low levels is likely to further impact power production, recreation, and fish and wildlife resources. To protect the minimum power pools, water deliveries would have to be curtailed in the Lower Basin as soon as 2007 if the current drought continues. These are only examples of the potential trade-offs that will be considered when shortage guidelines are developed.

Despite the obvious difficulties in reaching these decisions, we must remain focused on the long-term picture of water management in the Colorado River Basin. We must prepare now to meet our water resource needs in the future.

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