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Economic Effects of Declining Water Levels at Lake Mead and Lake Powell

What is the Issue?

Lake Mead and Lake Powell, located along the Colorado River in Arizona, Utah, and Nevada, are popular attractions for outdoor recreationists. In fact, in 2019 the Lake Mead National Recreation Area (NRA) (Lake Mead) and Glen Canyon NRA (Lake Powell) ranked 6th and 19th nationally in recreation visits among all National Park Service sites. The lakes serve as important drivers of tourism in nearby communities. Meanwhile, water levels at Lake Mead and Lake Powell have recently fallen to historic lows, triggering water cutbacks in Colorado River Basin states. Changes in lake levels are influenced by drought, climate change, and overallocation of Colorado River water among its many users. The Colorado River Drought Contingency Plan (DCP) is an agreement among Basin states to voluntarily conserve water in an effort to avoid lake levels falling to elevations that trigger additional water cutbacks under current law. A benefit of avoiding further lake level declines is the outdoor recreation and associated economic activity that those higher lake levels support.

Lower lake levels can impact access to recreation sites such as boat launch ramps and marinas and may make navigation in certain areas dangerous or impossible. This may have negative impacts on recreation visitation, with economic implications for local gateway communities that depend on outdoor recreation tourism.

This study estimates the effects of changes in lake levels on recreation visits to Lake Powell and Lake Mead and the resulting economic effects of reduced visitor spending in nearby communities, including regional economic impacts. The study also estimates the changes in consumer surplus, or recreationist benefits.

Figure 1. Effects of Lake Levels on Regional Economy

What Did the Study Find?

- Visits to Lake Mead and Lake Powell have decreased as lake levels have fallen.
- Changes in access to key recreation sites at both lakes are associated with changes in visitation – as launch ramps, marinas, and navigational access points are closed, visitation tends to decrease.
- Visitation to Lake Powell appears more sensitive to lake levels than for Lake Mead, perhaps because Lake Mead is close to the Las Vegas metropolitan area, where local visitors may be less deterred by changes in lake levels.
- Declining lake levels are estimated to result in negative regional economic impacts ranging from $3 million to $16 million at Lake Mead and $23 million to nearly $30 million at Lake Powell, under various lake level scenarios. These impacts occur as a result of changes in visitation and total visitor spending.
- The losses in economic benefits to recreationists range from a low estimate of $4.5 million at Lake Mead to a very high estimate of $83.6 million at Lake Powell.
- Policies and programs to keep the lakes at levels that avoid cutbacks, such as the DCP, can provide additional economic benefits to recreationists and to recreation-dependent local economies.

Figure 2. Lake Mead Monthly Surface Elevation 1979-2021 & Key Recreation Access Levels

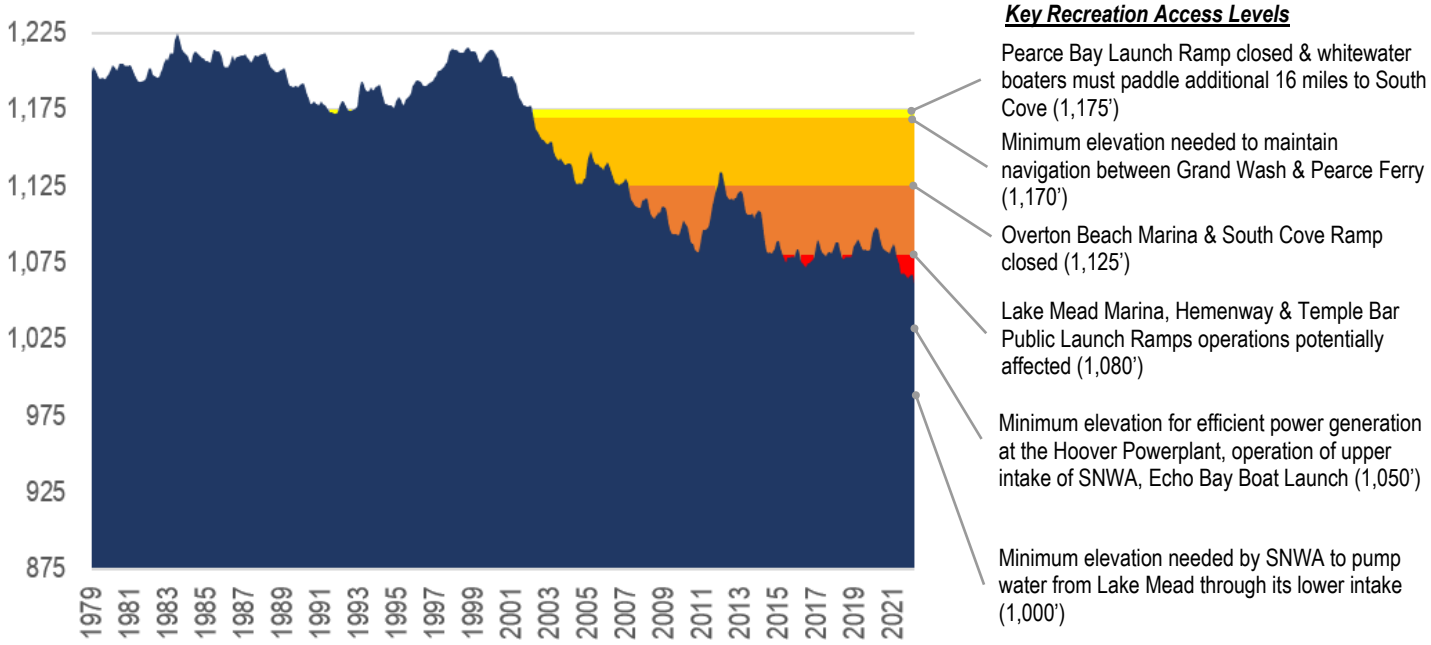
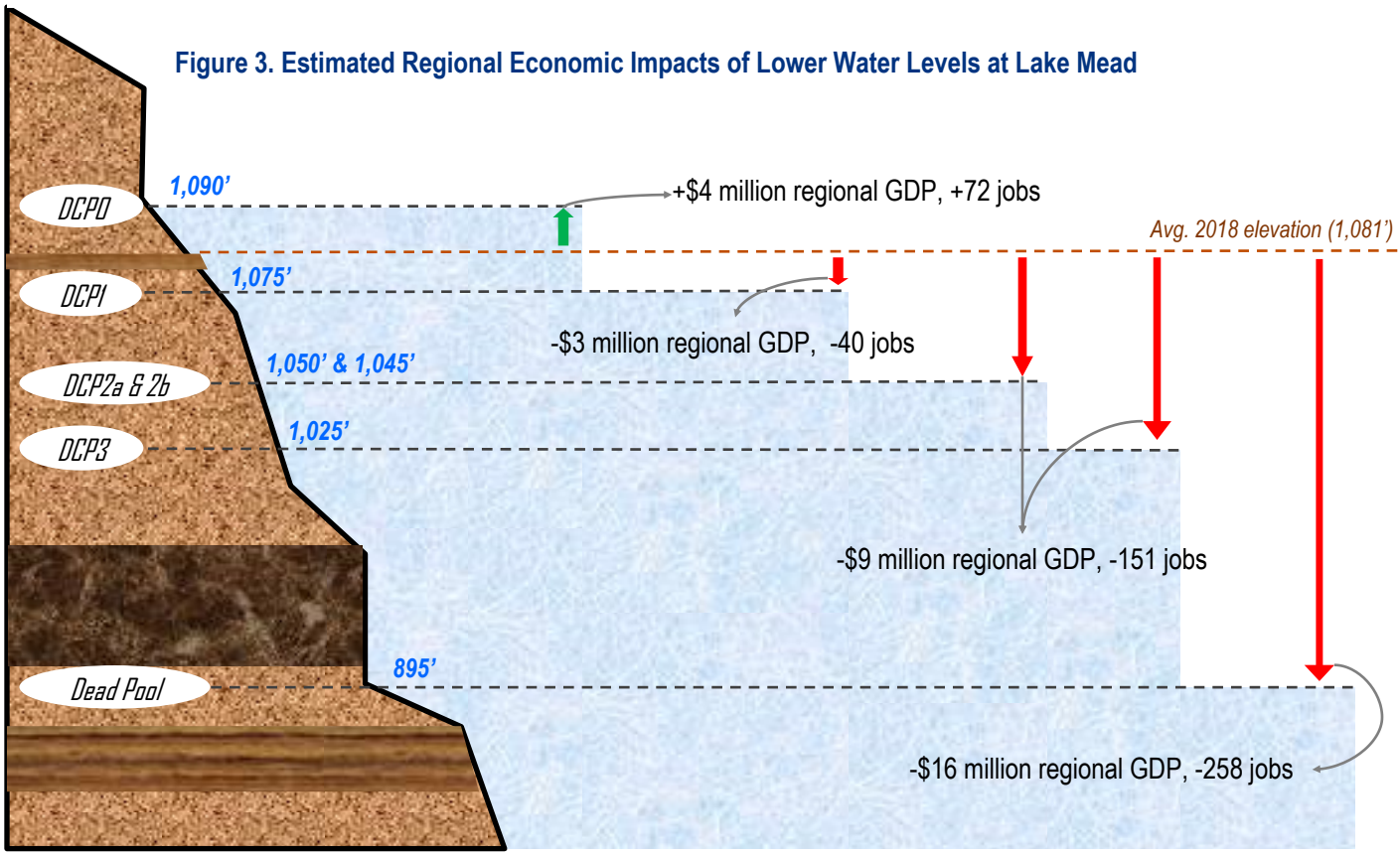


Figure 3. Estimated Regional Economic Impacts of Lower Water Levels at Lake Mead



* Impacts are estimated based on lake levels identified by the Drought Contingency Plan (DCP).
** At DCP0 (elevation 1,090 ft) the elevation of Lake Mead is higher than the average 2018 elevation. This scenario represents an increase in water levels and the resulting economic impacts.

Figure 4. Lake Powell Monthly Surface Elevation 1979-2021 & Key Recreation Access Levels

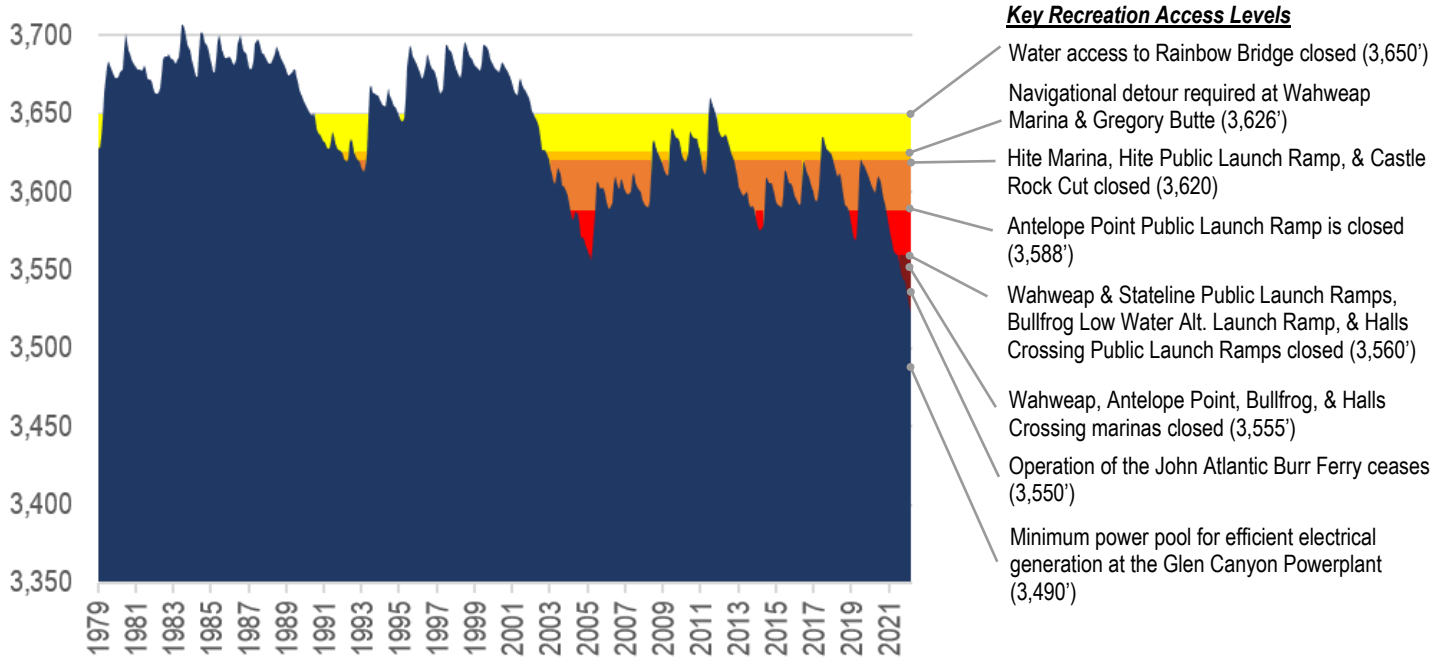
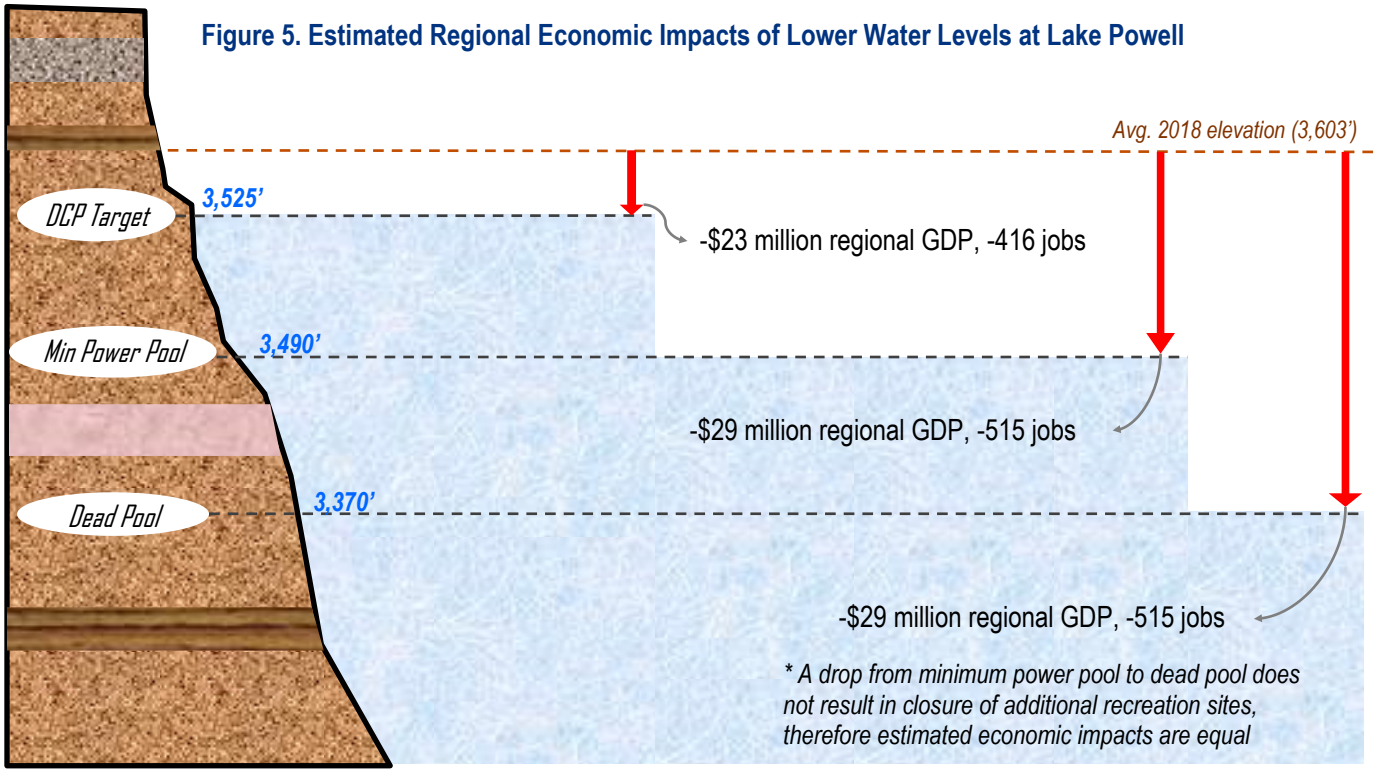


Figure 5. Estimated Regional Economic Impacts of Lower Water Levels at Lake Powell



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Economic Benefit Impacts

Consumer surplus measures the economic value of the benefit or "well-being" that recreationists get from visiting a site. For goods and services that are not bought or sold, in this case access to outdoor recreation opportunities at Lakes Mead and Powell, economic value is estimated as the difference between what someone would be willing to pay to visit the lakes and what they actually pay. Benefits are often measured in terms of the dollar value of economic benefit recreationists derive per trip. When people take fewer trips due to low lake levels, they get fewer benefits. This study estimates the changes in consumer surplus as a result of fewer recreation visits when lake levels fall. Based on a range of previous per-visit estimates, changes in the value of recreationist benefits range from -$4.5 million for lake levels dropping from 2018 levels to DCP Tier 1 at Lake Mead to -$83.6 million for lake levels dropping from 2018 levels to minimum power pool level at Lake Powell.

Table 1. Estimated change in user benefits with reductions in lake levels at Lake Mead & Lake Powell (millions)

Elevation (ft)	DCP Threshold	Low	Middle	High	Very High
Lake Mead					
1,081	Predicted 2018 Visits	—	—	—	—
1,075	DCP Tier 1	-$4.5	-$5.8	-$8.6	—
1,050	DCP Tier 2a	-$17.1	-$22.0	-$32.9	—
Lake Powell					
3,603	Predicted 2018 Visits	—	—	—	—
3,525	DCP target elevation	-$11.8	-$21.0	-$31.3	-$67.3
3,490	Minimum Power Pool	-$14.6	-$26.1	-$39.0	-$83.6

** Changes in user benefits are estimated at lake levels below the 2018 baseline.*

How Was the Study Done?

The regional economic impacts of declining lake levels at Lakes Mead and Powell are estimated using a three-step process (Figure 1). First, the effects of lake levels on visitation are estimated. Second, changes to visitation and total visitor spending are estimated using various lake level scenarios. Scenarios are based on lake levels identified by the Drought Contingency Plan (DCP). Finally, impacts to the regional economy are estimated using economic impact multipliers from the National Park Service.

Changes in user benefits also rely on estimated changes in visitation under DCP-based lake level scenarios. Benefit transfer is then used to estimate changes in user benefits, combining visitation estimates from this study with a range of existing water-based recreation use value estimates. Use values used in this study reflect low, middle, high, and very high estimates of economic value per trip for water-based recreation.

The full study is available here:

Dari Duval, Ashley K. Bickel, George B. Frisvold "Effects of Reservoir Levels on Arizona National Recreation Area Visitation, Visitor Spending, and Local Economies" Journal of the American Water Resources Association. https://onlinelibrary.wiley.com/doi/10.1111/1752-1688.12962