Understanding the economic impact of recreation at rivers and lakes is important to all who live, work, and play around these waters. One way of investigating the real value of public recreation areas to recreators is based on travel costs (Hotelling, 1947). Travel costs to and from each recreational site serve as a proxy for the site's price in determination of the relationship between price and quantity. Quantity demanded versus a "price" provides a traditional demand relationship, and with it a value for the consumer's net benefit. This net benefit is called consumer surplus. Currently, public recreation areas in the Walker River Basin do not charge a market price for admission. Hence, assessing the real value of these public recreation areas to recreators must be approximated through their recreational behavior.
A survey of 487 Walker River Basin recreators conducted in 1996 included a section of questions designed to gauge contingent behavior. Specifically, respondents were asked how their trip-taking behavior would change contingent upon a change in site characteristics. Would, for example, a respondent take more or fewer trips to a lake or river if the water level were much higher or lower than at present?

To address this question in the Walker River Basin, surveys included computer enhanced pictures of Walker Lake representing the lake at approximately 20 percent higher and 20 percent lower than base 1996 levels. Considering the altered lake levels, recreators were asked: Would trips to Walker Lake increase, decrease, or stay the same? Would trips to waters directly upstream from Walker Lake, such as Walker River, Twin Lakes, Topaz Lake, Weber and Bridgeport Reservoirs increase, decrease, or stay the same?

Approximately 56 percent of the respondents surveyed said their number of trips to Walker Lake would increase with higher water levels while 53 percent would decrease their trips with lower lake levels. More than half of the respondents said that their number of trips to upstream sites would stay the same in the event of higher or lower lake levels at Walker Lake.

Results from the survey of 487 Walker River Basin recreators were used to approximate recreational demand for Walker Lake and Topaz Reservoir. The results indicate that a hypothetical ten percent decrease in water levels over all seasons at Walker Lake would decrease the original number of trips taken by the sample population by 31 percent or from 1483 to 1029 total trips. This estimate suggests that the demand for lake recreation at Walker maybe price elastic with respect to water levels. That is, recreators surveyed would likely substitute some of their trips to Walker Lake with one of the other water sites upstream or in the surrounding area.

An economic modeling process was used also to estimate "welfare loss." This measure reflects how much the average recreator in the sample would be willing to pay per trip to prevent complete elimination of the option to recreate at that site or to prevent lower water levels by ten percent across all three seasons at the site.

If Walker Lake were eliminated, the average welfare loss is $50 per trip. For Topaz, the loss is $20 a trip. The average annual loss per individual in the sample varied from about $210 at Walker Lake to around $40 at Topaz Reservoir.
A separate model was used for Bridgeport Reservoir due to sparse mail survey data. The model indicated a welfare loss of approximately $56 per trip if Bridgeport and Twin Lakes were eliminated.

The total welfare loss to the 467 sample recreators if Walker Lake recreation were eliminated in 1996 would have ranged from $56,000 to $100,000 depending on the type of model used. Similarly for Topaz Lake, the total annual loss for the sample would range from $17,000 to $24,000.

Additionally, the model was used to estimate recreation value per acre-foot at different sites and seasons. This was done by using phone survey estimates of total trips to the sites and assuming that the sample population represents general recreators to the sites.

**Annual Per Acre-foot Value**

Estimates of total trips were multiplied by the average welfare loss under a hypothetical 20 percent loss of water volume, then dividing by 20 percent of the volume at Walker. This resulted in an annual per acre-foot value for water at Walker Lake of $18 per acre foot, or less when evaporation is taken into account.

Using the same technique to measure recreation value per acre-foot at Topaz resulted in a much higher value, $180 per acre-foot. The reason the value per acre-foot is so much higher at Topaz is because a similar amount of recreation takes place at Topaz despite it being a much smaller body of water. These estimates are derived from biased sample data, however, and should be considered provisional.

Estimates of value of water for recreation versus varying water levels at Walker Lake are complicated when considering the possibility of a corresponding major change in habitat for fish and birds. If due to lower lake levels the fishery were on the verge of being completely lost, the value of the water that it would take to prevent such a loss might be quite a bit higher than the values reported above. This is because total recreation value would be influenced by the possible welfare losses that would correspond with the site elimination scenario rather than the water level reduction scenario.

Suppose nearly all the recreation value of Walker Lake is connected to the fishery and bird habitat. If, say 70,000 extra acre-feet prevent this loss, this water could have a value to recreators of as much as $100 per acre-foot.

**Special Considerations**

It should be noted that the model uses biased sample data. That is, the data includes only recreators who were either intercepted at the sites or who reportedly frequented the sites. Still, the results indicate that availability of recreation at Topaz and Walker is of some estimated value to its recreators. Additionally, it indicates what recreators might be willing to pay to maintain recreation options in the Walker River Basin.

**Conclusions**

This study does not make a recommendation for whether water should be voluntarily transferred from one use to another. The information, instead, is intended to inform water users about the "value" water recreators attached to water sites in the basin in the 1996 year. It is a good idea to keep in mind that the welfare losses to recreators described above are for one year only. Policy decisions may affect recreation for many years and the impact on recreation is magnified if one looks at losses
over many years. Losses might be larger if changes that are difficult to reverse occur, such as a large change in the habitat for fish and birds at Walker Lake. If population increases over time in the region, this would quite likely increase the value of the recreation at the two sites.

The model used suggests that recreators may be sensitive to changes in water levels at recreation sites. The model suggests that trips to a site decrease and recreation value decreases as water level decreases from maximum level. It also suggests an estimate of what recreators might be willing to pay to maintain the option to recreate at these waters.

References

