An Economic Evaluation of Public Trust Resources of Mono Lake

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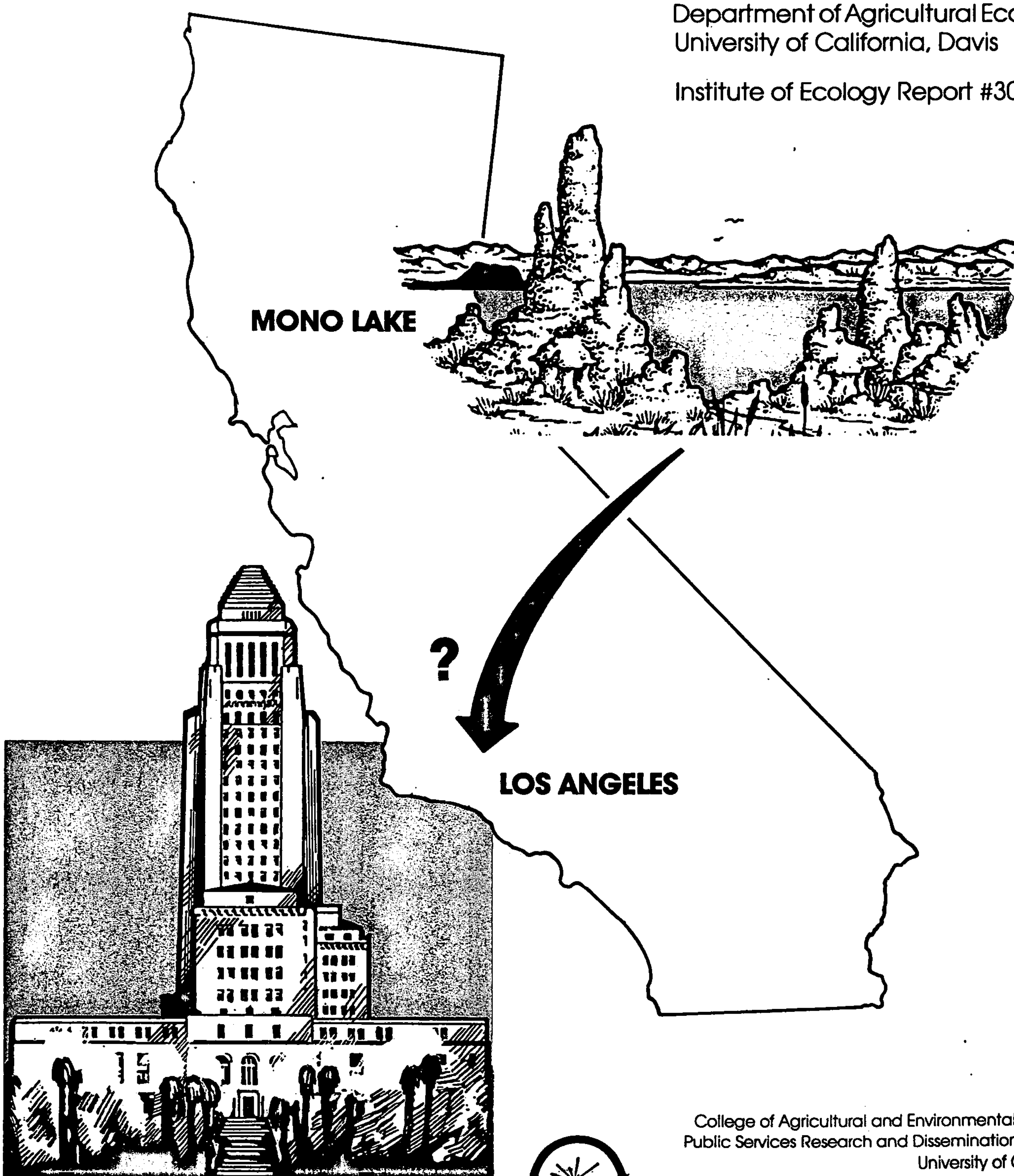

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CHAPTER III

CALIFORNIA HOUSEHOLD SURVEY RESULTS

REASONS FOR PROTECTING MONO LAKE

The relative importance of different reasons for protecting Mono Lake is presented in the Table 3. The most important reason was protecting quality of water, air and scenery, followed by protecting the habitat of bird populations and knowing that future generations will have Mono Lake as it exists today. This table presents the percentage of respondents checking each category. That is, 20.6% checked "protecting water, air and scenery at Mono Lake was somewhat important, while 72.1% checked it was very important.

WILLINGNESS TO PAY ANALYSIS

The overall response rate after two mailings of 44%, is about average for mail CVM surveys. However, the sample had an average education level of 15.62 years compared to the California average (in 1980, however) of 12.24 years. The sample's average age was 47.51 years whereas the State average was 43 years. The sample income was $5,600 higher than the State population. These differences between sample and State characteristics may be related to the fact that published statistics on the state averages for these variables are several years behind the survey. If the differences are real they may be important

TABLE 3

REASONS FOR PROTECTING MONO LAKE

POSSIBLE REASONS FOR PROTECTING MONO LAKE	NOT IMPORTANT	SOMEWHAT IMPORTANT	VERY IMPORTANT	NO OPINION
Protecting water, air and scenery at Mono Lake	3.6%	20.6%	72.1%	3.7%
Protecting habitat of Mono Lake bird populations	4.4%	25.6%	66.3%	3.6%
Providing me with recreation such as birdwatching, picnics and canoeing	39.7%	33.8%	18.8%	7.8%
Knowing in the future I have the option to go there	17.3%	36.5%	42.4%	3.8%
Just knowing Mono Lake exists and is protected	10.6%	31.8%	52.2%	5.3%
Knowing future generations will have Mono Lake as it exists today.	6.2%	25.0%	64.2%	4.6%

particularly if the willingness to pay amounts are highly sensitive to these three variables. We now turn to assessment of this sensitivity. (Note: Readers not interested in the details of the statistical adjustments involved in generalizing the sample to the state population may wish to skip to Table 4 to view the results.)

<u>Approaches to Expanding Sample Estimates to General Population</u>
At one end of the spectrum of approaches to generalizing the sample to the population is the research of Walsh, et al. (1984) and Stoll and Johnson (1984). Walsh, et al., utilized a mail survey sent to a random sample of Colorado households to inquire about household's willingness to pay to preserve wilderness in Colorado. Their response rate was 41%. There was no statistical difference between early and late responses (Walsh, et al, 1984:19). Because the characteristics of the sample households appeared close to the characteristics of Colorado households, the authors generalized their samples values to the population of Colorado households. Stoll and Johnson's (1984) study of willingness to pay for preservation of whooping cranes at Arkansas National Wildlife Refuge resulted in a 36% response rate on the mail questionnaire to nonvisiting residents in Texas and other states. These authors also generalized their sample to the entire population (Stoll and Johnson, 1984:391).

This approach is contrasted to the approach of Bishop and Boyle (1985) in their study of willingness to pay for protection of Illinois Beach

State Nature Preserve. Using a mail questionnaire to the general population of nearby counties and the remainder of the State, they obtained response rates of 63.5% and 58%, respectively. These authors argue, that to be conservative they will treat nonrespondents as having a zero value, even though "Some, or even many, of these nonrespondents might place a dollar value on the Nature Preserve." (Bishop and Boyle, 1985:28).

Although computing aggregate benefit estimates using <u>both of these approaches</u> would bracket the true values, there are better methods for coping with the nonresponse bias problems than either of these extremes. That is, the researcher can compute a more precise range of benefits by adjusting the sample values to account for differences between the sample respondents and the general population.

Carson and Mitchell (1984) compute a weighted average to adjust for differences between their sample households' willingness to pay for clean water and the willingness to pay of all United States households. Sample observations were weighted to correct for the over-representation of women and under-representation of men in their sample (Carson and Mitchell, 1984:20). The resulting mean values could then be generalized to the entire U.S. population as characterized by the 1980 Census.

Schulze, et al. (1983), take an ordinary least squares (OLS) regression approach to adjust existence values of visibility at the Grand Canyon for differences in sample and population socio-economic differences. In particular, Schulze et al. (1983:169) estimate a regression equation which relates household willingness to pay to respondent's socio-economic variables such as income, age, race and distance from the Grand Canyon. By substituting State average values for income, age, race and distance "...the bid the state's average household would offer to preserve the visibility of the Grand Canyon could be estimated. Aggregate statewide benefits are then determined by multiplying this figure by the number of households in the state."(Schulze, et al., 1983:169). In general the regression seems the most defensible of the adjustment discussed above. As such the regression approach will be more fully developed below and compared to the other approaches.

OLS Regression Approach to Adjusting Willingness to Pay

a. Annual Payment into Trust Fund Payment Vehicle.

The willingness to pay equation estimated using OLS regression for Lake level Alternative #2 versus #3 is show below:

ATWTP23= -40.53 +5.57(ED) -.95(AGE) +43.62(AGREE) +.08(FEE)

T Values (-.96) (2.42) (-2.35) (2.84) (3.96)

Where:

ATWTP23 = Annual Willingness To Pay-Alternative #2 vs #3

ED = Education level in years

AGE = Age in years

AGREE= Dummy variable, equal to 0 if they would not agree to pay the initial membership fee and equal to 1 if they would agree to pay the initial membership fee.

FEE = initial membership fee, in dollars

The sample size was 109. The equation had an adjusted R^2 of .21 and an F statistic of 8.38. All of the slope coefficients are significant at the 95% level. The statistical significance of the initial membership fee amount (FEE) does indicate starting point bias is present in this OLS regression, although the magnitude of the effect is quite small here. The large coefficient on education (ED) indicates that willingness to pay is quite sensitive to education levels. However, age is negatively related to willingness to pay, and this has a countervailing effect on willingness to pay. Income was statistically insignificant whether education was included or omitted. The benefit estimates using this equation with state average education and age, are shown in Table 4.

The willingness to pay regression equation for Lake level Alternative #1 versus #2 is given in the equation below:

ATWTP12= 4.43+2.444(ED) -.525(AGE)+31.4688(AGREE)+.10758(FEE)

T Values (.163) (1.71) (-1.95) (3.81) (3.91)

Where the variables are the same as defined, except ATWTP12 which is annual willingness to pay into a trust fund for Lake level Alternative #1 versus #2. The sample size was 110. The equation had an adjusted R^2

of .28 and an F statistic of 11.64. The overall equation is significant at the 99% level. The individual coeficients are significant at the 90% level or better. The willingness to pay values using this equation with state average education and age are also shown in Table 4.

b. Payment in the form of an Increase in Monthly Water Bill

The willingness to pay equation for the "certainty water bill" is presented below:

ln(WB23)=-4.186+1.8597(lnED)-.85(lnAGE)+3.5(ln[AGREE+1])

T Values (-1.72) (2.74) (-2.39) (8.78)

+.62(lnFEE) + .437(ln[KNOW+1])

(7.03) (2.24)

Where:

WB23=monthly willingness to pay in the form of a higher water bill for Lake level #2 versus #3.

KNOW=number of sources of information a respondent had about Mono Lake.

All other variables are as described above.

The number one was added to the value of AGREE and KNOW because taking the natural log of zero is an undefined mathematical operation and the variable was originally coded as zero or one. Rather this simply recodes the variable from zero or one to one or two. Overall this double log equation was highly significant with an F statistic of 23.9 indicating significance beyond the 99% level. The equation had an adjusted R^2 of .457. All of the slope coeficients in the equation are significant at the 95% level or better. The sample size equals 137. The sample willingness to pay and the State average willingness to pay adjusted for State demographics is presented in Table 4.

The willingness to pay in the form of a monthly water bill for Lake Alternative #1 versus #2 is given below:

ln(WB12)= -2.54 +1.54(lnED) -.924(lnAGE)+3.527(ln[AGREE+1])

T Values (-1.13) (2.45) (-2.86) (10.77)

+.54(lnFEE) + .386(ln[KNOW+1])

(5.96) (2.16)

The double log equation had an adjusted R^2 of .515 and an F statistic of 32. The F statistic is significant at the 99% level. The slope coeficients are all significant at the 95% level or higher. The sample size was 137. The number one was added to each variable for the same reason described above.

TABLE 4

HOUSEHOLD SURVEY ANNUAL CALIFORNIA RESIDENT BENEFITS

Survey Format	Alternative	Sample Estimate	State Estimate WTP Equation
Trust Fund	#2 vs #3	$35.34	$20.40
Trust Fund	#1 vs #2	$27.99	$22.31
Total		$63.33	$42.71
Certainty			
Water Bill	#2 vs #3	$65.04	$51.36
Water Bill	#1 vs #2	$48.72	$43.32
Total		$113.76	$94.68
Uncertainty			
Water Bill	#2 vs #3	$84.48	$77.76

TABLE 5

TOTAL ANNUAL STATE BENEFITS FROM PRESERVATION OF MONO LAKE

Survey Format	Alternative	Total State Benefits
Annual Trust Fund	#2 vs #3	$201,716,400
Annual Trust Fund	#1 vs #2	$220,602,600
Total		$422,319,000
Certainty		
Mthly Water Bill	#2 vs #3	$507,850,700
Mthly Water Bill	#1 vs #2	$428,350,700
Total		$936,201,400