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MICHIGAN UNIV ANN ARBOR COASTAL ZONE LAB  
PILOT STUDY PROGRAM, GREAT LAKES SHORELAND DAMAGE STUDY. APPEND--ETC(U)  
MAY 76 J M ARMSTRONG, M R MCGILL

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APPENDIX VIII

COMPARISON OF FIELD DATA COLLECTION  
TO DATE COLLECTED USING STUDY  
INSTRUMENTS IN MUSKEGON AND MANISTEE COUNTIES,  
MICHIGAN

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COASTAL ZONE LABORATORY  
UNIVERSITY OF MICHIGAN  
ANN ARBOR, MICHIGAN

Dr. John M. Armstrong, Associate Professor  
of Civil Engineering, Director

Michael R. McGill, Research Associate  
Project Coordinator

Jacques F. Gillette, Research Assistant

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Coastal Zone Laboratory conducted tests in Muskegon and Manistee Counties to compare homeowner perceptions reflected in the self-administered damage assessment with independent measurements. Data was collected and compared from a sample of homeowners in the following categories: present property worth, bluff height, and the distance from the bluff edge to the foundation of the house. These parameters were chosen because they typify homeowners perceptions of monetary value, vertical distance, and horizontal distance. ↗		

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- Main Report Summary Report of the Pilot Study Program, Great Lakes Shoreland Damage Study.
- Appendix I Great Lakes Shoreline Damage Survey; St. Louis County, Minnesota
- Appendix II Great Lakes Shoreline Damage Survey; Brown, Douglas, and Racine Counties, Wisconsin.
- Appendix III Great Lakes Shoreline Damage Survey; Muskegon, Manistee, Schoolcraft, Chippewa, Alcona, and Huron Counties, Michigan.
- Appendix IV Contract for a Damage Survey of Oswego County, New York
- Appendix V Shoreline Damage Survey: An Appraisal with Recommendations
- Appendix VI Engineering - Economic Analysis of Shore Protection Systems: A Benefit/Cost Model
- Appendix VII Measurement of Coastal Bluff Recession from Aerial Photographs, Muskegon County, Michigan
- Appendix VIII Comparison of Field Data Collection to Date Collected Using Study Instruments in Muskegon and Manistee Counties, Michigan

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As a part of the Great Lakes Shoreline Damage Survey for the U.S. Army Corps of Engineers, data was collected by means of two survey tools: a mailed self-administered assessment and personal interviews. Information collected included shoreland homeowners' perceptions of (1) physical property measurements and (2) monetary values of (a) property worth and (b) damage incurred due to flooding and erosion. In order to assess how accurately the property owner could estimate physical and financial parameters, independent measurements were made to compare with the results provided by respondents.

Data was collected in the following categories: present property worth, bluff height, and the distance from the bluff edge to the foundation of the house. These parameters were chosen because they typify homeowners' perceptions of monetary value, vertical distance, and horizontal distance, respectively.

The present property worth was evaluated by a local realtor, who was only able to make his assessment of the property value by looking at the exterior of the home and the grounds. It is not known how much the estimations made by the realtor are affected by not viewing the interior, although it is felt that these appraisals are reasonably accurate.

Both vertical and horizontal distances were measured at the site. Vertical distance was not measured directly, but was calculated from the distance measured from the bluff edge to the beach and the slope of the bluff face.

The data was compiled for each county and paired with the corresponding respondent to the self-administered assessment, and separately paired with the appropriate personal interview.

Each paired set of data was then analyzed statistically using two different methods. The first method is a pairwise t-test, where the null hypothesis is that the mean difference between the two sets of data is zero. If this was true, it would mean that the information provided by the respondent was statistically equivalent to the measured values, and therefore could be used as accurate information. The requirement for the use of this test is that the differences have a normal distribution. Since the data sets were not necessarily normally distributed, a second method of testing was used. This was the Wilcoxon rank-sum test for matched pairs, and is the non-parametric equivalent of the first test. Instead of using mean differences, this method tests the hypothesis that the median difference is zero. It does not require that the differences be normally distributed, but is not as powerful a test. Consideration should also be given to the effect of sample size on the power of this test. The smaller the sample size, the less powerful the test, as there is more room for error.

To interpret these tests, the use of the significance level is employed. The significance level is generally interpreted as the probability of rejecting the null hypothesis when the null hypothesis is true. In the context of this report, if we hypothesize that the mean difference of the reported values and the measured values is zero (null hypothesis), the significance level will indicate what the probability is of being wrong if the hypothesis is rejected. For a suitable criterion, the controlling significance level of .10 has been chosen. For significance levels of less than .10 there is less than a ten percent probability that a rejection of the null hypothesis is in error. If the level of significance is greater than .10, then the null hypothesis is not rejected. In such instances, support is given to the hypothesis that values given by the respondents do not differ significantly from the measured values.

The measured data were compared to the corresponding self-administered assessment data and the data from the personal interviews using both of the above tests. Tables J-I and J-II show the relative values for the parameters used in analysis in Muskegon and Mainstee Counties. It should be noted that the mean of independent measurement values for the same variable may differ in the table. This difference is due to the size of the randomly generated sample. For example, in Table J-II of the mean bluff to foundation distance is 70.3 which was obtained by using independent measurements for a random sample of 23. The mean for the same variable is 59.7 using an independent measurement for a random sample of 13. The statistical tests described above "adjust" for differences in mean values based on sample size. Tables J-III and J-IV indicate the results of the statistical analysis performed on each paired set. The following paragraphs contain the results of these tests for both Muskegon and Manistee Counties.

#### Muskegon County

Property worth--The independent measurements were first compared to the equivalent responses from the self-administered assessment, Using the t-test, with a sample size of 22, there appeared to be no difference between the two data sets, with a significance level of approximately .60. A check of the distribution of the differences indicates a reasonably normal curve. The non-parametric method yielded a significance level of .115, still greater than .10.

In comparison to the data from the personal interviews, for a sample size of 30, significance levels were again high. Both the parametric and non-parametric test indicated that the information supplied by the respondents was not significantly different than the independently measured value of property worth.

Bluff height--The significance levels for the tests on bluff height data show that the two t-tests indicated a rejection of the null hypothesis and therefore a difference in the means, while the non-parametric tests indicated no significant difference. Looking

at the histograms of the differences, it was found that no normal distribution occurred, thus invalidating the t-tests. Therefore, the evidence suggests the mean values are statistically not different.

Bluff to foundation distance--Both tests for the self-administered assessment data comparison show significance levels above .10, including no significant difference between these responses and the measured data. In both tests of the personal interviews, though, rejection of the null hypothesis is indicated, and therefore the means are different.

#### Manistee County

Property worth--In comparing the data from the self-administered assessment to the independent measurement, both the t-test and the rank-sum test rejected the null hypothesis, and concluded that the property values provided by respondents differed significantly from the realtor's estimates. The personal interview data was found not to be normal, so the t-test is invalid in this case. However, the non-parametric test also indicated a difference between respondents' and realtor's perception of the present property worth.

Bluff height--The distributions of the differences in bluff height values for both the assessment and personal interviews were not normal, so the t-tests are not a good indicator of statistical significance. The rank-sum tests for both comparisons indicated that the perceived bluff heights were significantly different from the measured bluff heights.

Bluff to foundation distance--Both t-tests examined in this category are not suitable, because normal distributions were not found. Therefore, the non-parametric evaluation can only be used. For both the assessment data and the personal interview data, comparisons with the measured data indicated rejections of the null hypothesis that the mean differences were zero, and therefore that the values provided by the respondents were not accurate.

TABLE I  
MUSKEGON DATA COMPARISON

Parameter	Sample Size	Mean	Mean Difference
Property worth-SAA*	22	32123	
Property worth-IM	22	35095	-2972.7
Property worth-PI	30	33720	
Property worth-IM	30	31507	-2213.1
Bluff height-SAA	18	79.2	
Bluff height-IM	18	37.8	+41.4
Bluff height-PI	35	50.4	
Bluff height-IM	35	40.9	+9.5
Bluff to foundation-SAA	16	70.6	
Bluff to foundation-IM	16	75.2	-4.6
Bluff to foundation-PI	25	24.4	
Bluff to foundation-IM	25	73.2	-48.8

\* SAA = Self-Administered Assessment  
 PI = Personal Interview  
 IM = Independent Measurements

TABLE II  
MANISTEE DATA COMPARISON

Parameter	Sample Size	Mean	Mean Difference
Property worth-SAA	22	71545	+27845
Property worth-IM	22	43700	
Property worth-PI	13	33346	+3469
Property worth-IM	13	29877	
Bluff height-SAA	23	50.7	+29.6
Bluff height-IM	23	21.1	
Bluff height-PI	14	41	+17.4
Bluff height-IM	14	23.6	
Bluff to foundation-SAA	23	32.7	-37.6
Bluff to foundation-IM	23	70.3	
Bluff to foundation-PI	13	68.4	+8.7
Bluff to foundation-IM	13	59.7	

TABLE III  
MUSKEGON DATA ANALYSIS

Parameter	Comparison	Type of Test	Significance
Property worth	SAA/IM	t-test*	.605
Property worth	SAA/IM	r-s test	.115
Property worth	PI/IM	t-test	.475
Property worth	PI/IM	r-s test	.201
Bluff height	SAA/IM	t-test	.088
Bluff height	SAA/IM	r-s test	.144
Bluff height	PI/IM	t-test	.014
Bluff height	PI/IM	r-s test	.391
Bluff to foundation	SAA/IM	t-test	.782
Bluff to foundation	SAA/IM	r-s test	.077
Bluff to foundation	PI/IM	t-test	.0001
Bluff to foundation	PI/IM	r-s test	.003

TABLE IV  
MANISTEE DATA ANALYSIS

Parameter	Comparison	Type of Test	Significance
Property worth	SAA/IM	t-test	.0001
Property worth	SAA/IM	r-s test	.007
Property worth	PI/IM	t-test	.338
Property worth	PI/IM	r-s test	.039
Bluff height	SAA/IM	t-test	.014
Bluff height	SAA/IM	r-s test	.007
Bluff height	PI/IM	t-test	.013
Bluff height	PI/IM	r-s test	.013
Bluff to foundation	SAA/IM	t-test	.035
Bluff to foundation	SAA/IM	r-s test	.012
Bluff to foundation	PI/IM	t-test	.102
Bluff to foundation	PI/IM	r-s test	.023

\* t-test = pairwise t-test  
r-s test = Wilcoxon rank-sum test