

**Archaeological Vandalism
and
An Analysis of Damage Assessments in the Southwest**

Martin E. McAllister

**Martin E. McAllister
Archaeologist
Archaeological Resource Investigations
Route 1, Box 240
Laona, Wisconsin 54541**

INTRODUCTION

The subject of this paper is archaeological vandalism, the malicious destruction of the prehistoric and historic sites and artifacts that are the cultural heritage of this nation. Archaeological vandalism takes place in two forms. One form, corresponding to other more commonly known types of vandalism, is the willful damage or defacement of archaeological resources for the intrinsic purpose of destroying public or private property. The other form of archaeological vandalism also involves willful damage of archaeological resources, but is carried out to loot the artifacts which prehistoric and historic sites contain. The looting of archaeological sites is done either to enhance personal collections of artifacts or to obtain pieces for sale. Unfortunately, a well-established national and international market exists for artifacts, particularly certain types, such as elaborately decorated prehistoric pottery and prehistoric baskets, which often sell for staggeringly high prices (Bassett 1986; Goodwin 1986).

The vandalism of any archaeological resource must be viewed as an extremely serious problem because the property affected cannot be replaced. Prehistoric and historic sites and artifacts are unique links with past cultures and people that when destroyed are lost forever. In some cases of damage or defacement, restoration is possible, but too often this type of vandalism causes total or near total destruction.

EXTENT, FREQUENCY AND DISTRIBUTION OF ARCHAEOLOGICAL VANDALISM

The extent and frequency of archaeological vandalism in the United States today increase the seriousness of this problem. Although the number of archaeological resources lost to vandalism before the 1980's will never be known with certainty, there has been some progress toward quantification of the current situation.

For example, a regional study conducted for Congress by the General Accounting Office (1987) between 1985 and 1987 found that vandalized sites constituted an estimated 32 percent of the total number of recorded sites on National Park Service, Bureau of Land Management and Forest Service lands in the Four Corners states of Arizona, New Mexico, Colorado and Utah. The condition of another 33 percent of the sites was reported as unknown and thus potentially affected by vandalism. Only 35 percent of the total were listed as undisturbed. In Utah alone an estimated that 50 percent of the recorded sites on these lands were vandalized.

The GAO also found that 1,222 documented instances of archaeological vandalism occurred on the three agencies' lands in the Four Corners states between October 1, 1980 and March 31, 1986. This is an average of about 222 incidents per year or between 18 and 19 per month. In another recent study (1988) dealing with fiscal years 1985 and 1986, the Archeological Assistance Division of the National Park Service has documented an increase of 42 percent,

from 432 to 615, in the number of incidents of archaeological vandalism reported by federal land managing agencies nationwide.

Statistics such as these for all parts of the country will be refined as better data gathering techniques are developed, as more archaeological sites are recorded and as previously recorded sites are rechecked for vandalism. The need for additional statistical analysis may leave some room for optimism but at this point it seems likely that more accurate figures will reflect higher rather than lower levels of vandalism.

Also discouraging is the current widespread distribution of archaeological vandalism demonstrating that it is a national problem and not confined to the southwestern United States as some have thought. In addition to Arizona, New Mexico, Colorado and Utah, serious incidents have been reported since 1979 in Alaska, California, Oregon, Idaho, Wyoming, Minnesota, Arkansas, Illinois, Kentucky, Virginia, South Carolina, Florida and the District of Columbia.

LEGAL STATUS OF ARCHAEOLOGICAL VANDALISM

Archaeological vandalism is illegal under most circumstances in the United States. It is strictly prohibited on federal lands and most states and some municipalities have laws protecting archaeological resources on lands under their jurisdiction. Vandals who damage archaeological resources on private property without the permission of the owner may be subject to prosecution

for violating general property protection statutes, including those prohibiting trespass, malicious mischief or vandalism, and, in some cases, theft.

The only exception to this legally protected status is that private landowners may do as they wish with archaeological resources on their property, including personally carrying out or allowing their destruction, providing that their actions do not require federal assistance or authorization and that they do not violate any general state or local laws, such as those prohibiting grave robbing. In a recent case in Kentucky, 10 individuals were indicted under a state statute prohibiting desecration of burials for allegedly digging an estimated 400 holes and disturbing 1,000 to 1,200 Native American graves in an archaeological site on private property that they had openly leased from the owner for this purpose (Ellers 1988).

Antiquities Act

Legal protection for archaeological resources located on federal lands began with the passage of the Antiquities Act of 1906. The act prohibits unauthorized appropriation, excavation, injury or destruction of prehistoric or historic ruins, monuments or objects of antiquity located on federal lands and provides a misdemeanor penalty of not more than a \$500.00 fine or not more than 90 days in jail or both for violators.

Despite its milestone status, the Antiquities Act was not extremely effective in the prevention of archaeological vandalism. During the 73 years between 1906 and 1979 there were fewer than 20 cases under the act in the United States and less than 10 resulted in convictions. The most significant acquittal was in the Diaz case of 1973 in which the act was ruled unconstitutionally vague by the United States Court of Appeals for the Ninth Circuit because of its use of the term "object of antiquity". Given the extent of the Ninth Circuit and the fact that several other circuits subsequently adopted this ruling, the legal usefulness of the Antiquities Act as an enforcement tool against archaeological vandalism was increasingly questioned after the Diaz decision. As a result, a movement was initiated to enact a new federal archaeological protection law.

Another apparent problem with the Antiquities Act also was identified in the 1970's. This was the assumption that the misdemeanor level penalties of the Antiquities Act were no longer an effective deterrent to the vandalism of archaeological sites on federal lands because of modern artifact values (Collins and Green 1978). Although the deterrent effect of more severe legal sanctions was never fully investigated by proponents of a stronger archaeological protection law, this argument became an important factor in the lobbying movement.

With the legal status and the deterrent effect of the Antiquities Act both in question, an attempt was made in Arizona in 1978 to

prosecute an archaeological vandalism case under the general federal statutes prohibiting malicious mischief against government property and embezzlement and theft of such property (McAllister 1980). When the charges in this case were initially dismissed in federal district court in a judgment that argued for the need to amend or replace the Antiquities Act, efforts to enact a new law began in earnest.

Archaeological Resources Protection Act

On October 31, 1979, the Archaeological Resources Protection Act (ARPA) became law. ARPA prohibits unauthorized excavation, removal, damage, alteration or defacement of archaeological resources on federal or Indian lands and also the trafficking of artifacts excavated or removed illegally from such lands. Those who knowingly violate these prohibitions or counsel, procure, solicit or employ others to do so may be found guilty of either a felony or a misdemeanor, depending on whether the amount of damage is greater than or less than \$5,000.00 respectively. Determination of the monetary figure is based on an assessment of the archaeological value or commercial value and the cost of restoration and repair of the resources involved. Under the provisions of the law, determination of the monetary figure is based on one or the other of two sets of values and costs: (1) commercial value and cost of restoration and repair; or (2) archaeological value and cost of restoration and repair. (No definitions of these terms are provided in the act.)

Commercial value - In ARPA's Final Uniform Regulations (Department of the Interior and others 1984), the commercial value of an archaeological resource is defined as, ". . . its fair market value." An additional condition is that, "Where the violation has resulted in damage to the archaeological resource, the fair market value should be determined using the condition of the archaeological resource prior to the violation, to the extent that its prior condition can be ascertained."

Archaeological value - The ARPA regulations define archaeological value as ". . . the value of the information associated with the archaeological resource." Instructions for the determination of archaeological value are as follows in the regulations: "This value shall be appraised in terms of the costs of the retrieval of scientific information which would have been obtainable prior to the violation. These costs may include, but need not be limited to, the cost of preparing a research design, conducting field work, carrying out laboratory analysis, and preparing reports as would be necessary to realize the information potential."

Cost of restoration and repair - According to the regulations, this, ". . . shall be the sum of the costs already incurred for emergency restoration and repair work, plus those projected to be necessary to complete restoration and repair." Restoration and repair of an archaeological resource is further identified as including, but not being limited to, eight types of activities:

(1) reconstruction; (2) stabilization; (3) ground contour reconstruction and surface stabilization; (4) research necessary to carry out reconstruction or stabilization; (5) physical protection necessitated by the disturbance; (6) examination and analysis necessitated by disturbance to salvage remaining values which cannot be otherwise conserved; (7) reinterment of human remains; and (8) preparation of reports.

IMPLEMENTATION OF THE ARCHAEOLOGICAL RESOURCES PROTECTION ACT

At the time of its passage, many archaeologists hailed ARPA as the beginning of the end of archaeological vandalism. Unfortunately, as is documented by the information presented above on the current magnitude of the problem, ARPA has not had the envisioned effect of stopping or substantially reducing archaeological vandalism on a nationwide basis.

The law's apparent lack of a general deterrent effect is probably attributable largely to its relatively poor enforcement record. For example, the National Park Service study cited above shows that of the 615 incidents of archaeological vandalism reported nationwide by federal land managing agencies for fiscal year 1986, only nine, or about one and a half percent, resulted in convictions under ARPA. Also reported in the study for the same time period were another 29 archaeological vandalism convictions under other federal laws and regulations, bringing the total number to 38 (approximately six percent of the 615 reported inci-

dents). This means that ARPA convictions accounted for only approximately 24 percent of the of the successful prosecutions in fiscal year 1986. In addition, it was not until November of 1987, eight years after ARPA became law, that the first felony conviction under the act by a jury took place (U.S. versus Cortiana).

Among several likely causes for the lack of more ARPA convictions, two are of interest here. One is the act's use of the monetary figure of \$5,000 as a measure of what constitutes a serious infraction. The other is its requirement to base the dollar amount of damage on archaeological value and cost of restoration and repair determinations, unless the alternative of commercial value and cost of restoration and repair can be utilized. Exact ARPA case statistics are not available, but a number of trial acquittals and prosecutions for misdemeanors rather than felonies are known to have resulted because judges and juries were not convinced of the validity of the monetary figures in the government's archaeological value and cost of restoration and repair determinations, particularly when they have exceeded \$5,000. (Commercial value as an alternative to archaeological value has been utilized in only one ARPA case to date, U.S. versus Cortiana.)

Various reasons can be suggested for the negative reactions to the damage figures in ARPA cases. There may be a feeling that the figures have been inflated in an attempt to guarantee felony

level penalties. This sentiment is likely to occur in cases in which the figure arrived at is only slightly over \$5,000. In addition, non-archaeologists may have difficulty understanding how the figures for archaeological value and cost of restoration and repair are calculated. Archaeologists are familiar with the preparation of budgets for projects involving data recovery, stabilization or restoration and the high costs involved, but the public generally is not. This is especially true since archaeologists have traditionally maintained that archaeological resources and their information content are priceless.

It also can be argued that archaeologists who have prepared damage assessments for ARPA cases have not been consistent and conservative in their approaches to archaeological value and cost of restoration and repair determinations. In a now rather well known case which took place in Oregon in 1983 (U.S. versus Jaques), the jury acquitted the defendant of both felony and misdemeanor violations of ARPA evidently due primarily to a dispute between government and defense archaeologists regarding the dollar value of the damage. The government's assessment of the archaeological value and cost of restoration and repair for less than one cubic meter of damage to the resource was approximately \$7,500, which was 2.1 times higher than the defense archaeologist's figure of approximately \$3,500 (Wildesen in press).

ANALYSIS OF DAMAGE ASSESSMENTS IN THE SOUTHWEST

To further evaluate the problem of damage assessments for ARPA

cases, 13 cases in Arizona and New Mexico were analyzed. All of these cases involved vandalism of prehistoric archaeological sites on National Forest lands in the two states between 1982 and 1987. Each case was analyzed in terms of eight variables pertaining to the determination of archaeological value and cost of restoration of repair. (The latter determination was prepared in only six of the cases.) The following variables were utilized.

Volume of Damage

All of the cases analyzed involved some type of illegal excavation at an archaeological resource site so each damage assessment was based on the total volume of the area affected. This figure, in cubic units, is normally arrived at by measuring at least the width, length and depth of each damage area, calculating their individual volumes and totaling the results. In some cases, more complex measurements are required to accurately quantify volume. The total volume of the resource allegedly damaged in the case is critical because it serves as the basis for calculating the dollar figures for archaeological value and cost of restoration and repair.

Volume of Recovery

The ARPA regulations allow the appraisal of archaeological value in terms of the costs of scientific data recovery for the information which would have been obtainable prior to the violation. Determination of these costs obviously must be based on some

volume of data recovery, but the regulations do not specify how this figure is to be determined. The damage assessments in the cases analyzed employed two different approaches to arrive at the volume of projected data recovery.

The more conservative method is to use an amount equal to or less than the actual volume of damage. This guards against the charge that costs have been inflated. Alternatively, it can be argued that the value of the information lost as a result of the violation cannot be adequately assessed without projecting data recovery from a volume of the resource larger than that actually damaged in order to encompass its behavioral context. For example, for a hole affecting one part of a sub-surface feature, such as a house floor, scientific excavation of the entire remaining portion might be proposed to assess the information loss from the violation. Also, some increase in the data recovery figure over the volume of damage is sometimes attributed simply to the use of squared units in scientific excavations versus the irregular shapes of the holes resulting from illegal digging.

Recovery to Damage Ratio

For each damage assessment, the volume of recovery projected was divided by the volume of damage and the result expressed as a ratio. By adjusting for case specific variations in the amounts of damage and recovery, a comparison of this aspect of the damage assessments is possible.

Archaeological Value or Cost of Recovery

A dollar amount for archaeological value or cost of recovery was determined in the damage assessments for all of the cases analyzed. As is directed by the ARPA regulations, it includes all costs projected to be necessary to retrieve the scientific information which would have been obtainable prior to the violation. In most ARPA damage assessments the total figure is generated from a hypothetical budget analogous to one for actual costs in a project involving the proposed volume of data recovery.

Cost of Recovery per Unit of Damage and Cost of Recovery per Unit of Recovery

The figures for these two variables for each damage assessment were determined by dividing the dollar amount for archaeological value, which represents the projected cost of recovery, first by the number of cubic units in the volume of damage and then by the number in the volume of recovery. The resulting costs are dollar amounts per cubic unit of damage and per cubic unit of recovery. (Of course, when the damage and recovery volumes utilized are the same the costs for these two variables are equal.) The figures generated provide two additional sets of adjusted values for comparing the damage assessments.

Cost of Restoration and Repair

The damage assessments for six of the cases analyzed included a dollar figure for the cost of restoration and repair. Following

the ARPA regulations, the total figures are the sum of the costs for emergency restoration and repair work already carried out plus the costs for those activities projected to be necessary. The determinations are normally based on the volume of the resource damaged. Actual costs are utilized for the emergency work and a hypothetical budget is generated for the projected activities.

Cost of Restoration and Repair per Unit of Damage

This figure was determined by dividing the cost of restoration and repair by the number of cubic units in the volume of damage. The resulting dollar amounts per cubic unit of damage allow a final adjusted comparison of the damage assessments from which they were generated.

Results of the Analysis

The results of the analysis are presented in Tables 1 - 3. In these tables, the 13 cases analyzed are referenced by the numerical designations 1 - 13. The alpha-numeric designations in the tables (4a, 4b, etc.) derive from three instances in which two separate damage assessments were prepared for each case. (Basic case information for each numerical designation is provided in an appendix.)

The critical variables for evaluating the conservativeness and consistency of the damage assessments are (3) the recovery to damage ratio, (5) the cost of recovery per unit of damage, (6)

the cost of recovery per unit of recovery, and (8) the cost of restoration and repair per unit of damage. The low or conservative values for the recovery to damage ratio are 0.2 to 1, 0.9 to 1 and 1 to 1. The high value for this ratio is 8.8 to 1 which is 44 times greater than the lowest value of 0.2 to 1. The range of the cost of recovery per unit of damage is from \$72.53 per cubic meter to \$6,584.61 per cubic meter. In this instance, the high figure is over 90 times greater than the low figure. The low figure for the cost of recovery per unit of recovery is \$104.68 per cubic meter. The high of \$2,469.00 per cubic meter is over 23 times greater than the low figure. Finally, the cost of restoration and repair per unit of damage varies from \$14.21 per cubic meter to \$866.00 per cubic meter. For this variable, the high figure is over 60 times greater than the low figure.

In addition to the range of values identified in the damage assessments analyzed, another informal evaluation of consistency was conducted based on the Jaques case in Oregon. From the earlier discussion of this case, it will be recalled that difficulties were created because the amount of the government's damage assessment was 2.1 times greater than an estimate from a defense archaeologist. By comparing the figures generated from the Southwestern damage assessments, it was found that a level of variance of 2.1 times was exceeded by 64 percent of the costs of recovery per unit of damage, 57 percent of the costs of recovery per unit of recovery and 78 percent of the costs of restoration and repair per unit of damage.

No formal statistical analysis was conducted, but from an empirical standpoint the variation seen here suggests there is a fairly substantial lack of consistency in the damage assessments for the cases analyzed. It also appears that some of the archaeologists who prepared these damage assessments may not have been as conservative as possible in their approaches to archaeological value and cost of restoration and repair determinations.

Interpretation of Results

The goal here is not to suggest that there is a right or a wrong approach to damage assessment in ARPA cases or that some single figure for cost per unit of damage or per unit of recovery is utilizable in every instance. Each case has unique circumstances which affect the archaeological value and cost of restoration and repair determinations. Costs per unit can be relatively high or low depending on a fairly large constellation of variables such as site type, site size, accessibility, amount of damage and so on.

It is also fairly common knowledge, in professional circles at least, that every archaeologist will approach the same site somewhat differently based on factors including their training, research interests and logistical skills. Consequently, in developing competing budgets for an actual project, archaeologists often arrive at total cost figures which vary to some degree. Certainly, the same situation can be expected to arise in the preparation of damage assessments for ARPA cases.

However, variation on the order of magnitude found here indicates something is probably wrong in the ARPA damage assessment process. It can be predicted that the public, including judges and juries, will probably react negatively, as they did in the Jaques case, when and if they learn that the archaeological value and cost of restoration and repair determinations prepared for ARPA cases have this potential range for the same amount of damage.

There are two solutions to this problem. First, the \$5,000 figure in ARPA needs to be reduced to an amount which will allow felony level damage assessments to be credible to non-archaeologists. Fortunately, the current movement to amend the law will probably have this result by lowering the figure to \$500 (Gejdenson Amendment, H.R. 4068). Second, as long as there is a legal requirement in ARPA to establish that a certain amount of loss in dollars has occurred as the result of a violation, archaeologists must be extremely reasonable in their damage assessments. If they are not, the poor conviction rate in ARPA cases will continue and there will be little legal deterrent to archaeological vandalism.

CONCLUSIONS

Archaeological vandalism continues to cause damage, destruction and loss of prehistoric and historic sites in the United States at an alarming rate. A certain percentage of these resources have been protected by various preservation strategies and some of those which are unprotected are not targets for vandals due to

factors such as inaccessibility and unobtrusiveness. However, it is possible that whole categories of valuable sites and artifacts may cease to exist in the public domain due to archaeological vandalism.

One way to prevent this loss is through better enforcement of ARPA and other federal, state and local laws which protect archaeological resources. The legal basis for archaeological protection and the need to increase the credibility of ARPA damage assessments as a means to enhance federal enforcement efforts have been emphasized in this paper. Until the enforcement record improves, many archaeological resource vandals will not be deterred.

The other long term solution to the archaeological vandalism problem is public action. Citizens must condemn acts of vandalism against their cultural heritage and to the greatest extent possible become actively involved in archaeological protection and preservation programs. To achieve this type of prevention partnership, professional archaeologists will have to continue to expand public education and involvement activities which make the average person understand that they have a personal stake in the future of archaeology.

Archaeological vandalism will not be eliminated until enforcement efforts and public action combine to create an effective anti-vandalism force. Much has been accomplished toward this end, but

much remains to be done as the information presented here demonstrates. Unfortunately, it is certain that many more archaeological resources will be lost to vandalism until the ultimate goal is achieved.

Literature Cited

- Bassett, Carol Ann. 1986. The culture thieves. *Science* 86. 7(6): 22-29.
- Collins, Robert Bruce; Green, Dee F. 1978. A proposal to modernize the American antiquities act. *Science*. 202: 1055-1099.
- Department of the Interior; Department of Agriculture; Tennessee Valley Authority; Department of Defense. 1984. Archaeological resources protection act of 1979; final uniform regulations. *Federal Register*, Friday, January 6, 1984, Rules and Regulations. 49(4): 1016-1034.
- Department of the Interior; National Park Service. 1988. Briefing statement. Archaeological Assistance Division. Washington, D.C. 12 p.
- Ellers, Fran. 1988. Search for Indian relics outrages archaeologists. *The Courier-Journal*. Louisville, KY. January 4; Sect. A: 1 (col. 1), 20 (col. 1).
- Goodwin, Derek V. 1986. Raiders of the sacred sites. *The New York Times Magazine*. December 7: 64-66, 84, 86, 88, 90.
- McAllister, Martin E. 1980. Smokey and the looters: the Jones-Gevara pothunting case. In Green, Dee F.; Davis, Polly, comps. *Cultural resources law enforcement: an emerging science*. Albuquerque, NM: U.S. Department of Agriculture, Forest Service, Southwestern Region. 116 p.
- United States General Accounting Office. 1987. Report to congressional requesters: cultural resources: problems protecting and preserving federal archeological resources. Washington, DC: General Accounting Office RCED-88-3. 131 p.

Wildesen, Leslie E. in press. ARPA in context: the process of justice. In Speser, Philip, ed. ARPA: case studies in enforcement and prosecution. Washington, DC: Foresight Science & Technology Incorporated.

Appendix

| Case No.: | Location: | Date: | Assessment Source: |
|-----------|-------------------------------|-------|-------------------------------|
| 1 | Coconino NF, AZ | 3/82 | Museum of Northern Arizona |
| 2 | Tonto, NF, AZ | 4/82 | Arizona State University |
| 3 | Apache-Sit- greaves NF, AZ | 7/82 | Tonto National Forest |
| 4 (a, b) | Coconino NF, AZ | 11/82 | Museum of Northern Arizona |
| 5 | Tonto NF, AZ | 1/83 | Tonto National Forest |
| 6 | Tonto NF, AZ | 3/83 | Tonto National Forest |
| 7 | Coconino NF, AZ | 9/83 | Coconino National Forest |
| 8 | Tonto NF, AZ | 11/83 | Tonto National Forest |
| 9 | Tonto NF, AZ | 3/84 | Tonto National Forest |
| 10 (a, b) | Tonto NF, AZ | 4/85 | Tonto National Forest |
| 11 | Lincoln NF, NM | 11/85 | Lincoln National Forest |
| 12 (a, b) | Santa Fe NF, NM | 5/87 | Santa Fe National Forest |

13

-

Carson NF, NM

6/87

Carson

National Forest

- Table 1--Analysis; variables 1 - 3

| Case | Variables | | |
|------|------------------------|--------------------------|-----------------------------------|
| | 1 | 2 | 3 |
| | Volume of damage | Volume of recovery | Recovery to damage ratio |
| | <u>Cubic meters</u> | | <u>Ratio</u> |
| 1 | 7.0 | 18.0 | 2.6 : 1 |
| 2 | 11.5 | 101.6 | 8.8 : 1 |
| 3 | 0.8 | 3.0 | 3.8 : 1 |
| 4a | 8.8 | 24.0 | 2.7 : 1 |
| 4b | 19.4 | 36.0 | 1.9 : 1 |
| 5 | 18.7 | 39.0 | 2.1 : 1 |
| 6 | 10.5 | 28.0 | 2.6 : 1 |
| 7 | 20.5 | 5.0 | 0.2 : 1 |
| 8 | 1.5 | 2.0 | 1.3 : 1 |
| 9 | 1.8 | 3.0 | 1.7 : 1 |
| 10a | 58.0 | 58.0 | 1 : 1 |
| 10b | 211.6 | 211.6 | 1 : 1 |
| 11 | 1.7 | 1.7 | 1 : 1 |
| 12a | 12.8 | 12.8 | 1 : 1 |
| 12b | 17.0 | 17.0 | 1 : 1 |
| 13 | 3.5 | 3.2 | 0.9 : 1 |

Table 2--Analysis; variables 4 - 6

| Case | Variables | | |
|------|---|--|--|
| | 4 | 5 | 6 |
| | Cost of recovery (archae- ological value) | Cost of recovery per unit of damage | Cost of recovery per unit of recovery |
| | <u>Dollars</u> | <u>\$/Cubic m.</u> | <u>\$/Cubic m.</u> |
| 1 | \$ 6,594.00 | \$ 942.00 | \$ 366.33 |
| 2 | \$75,723.00 | \$ 6,584.61 | \$ 745.31 |
| 3 | \$ 2,982.00 | \$ 3,727.50 | \$ 994.00 |
| 4a | \$ 5,411.28 | \$ 614.92 | \$ 225.47 |
| 4b | \$ 7,492.82 | \$ 386.23 | \$ 208.13 |
| 5 | \$18,588.00 | \$ 944.01 | \$ 476.62 |
| 6 | \$13,595.00 | \$ 1,294.76 | \$ 485.54 |
| 7 | \$ 1,486.80 | \$ 72.53 | \$ 297.36 |
| 8 | \$ 4,938.00 | \$ 3,292.00 | \$ 2,469.00 |
| 9 | \$ 3,312.00 | \$ 1,840.00 | \$ 1,104.00 |
| 10a | \$ 9,295.00 | \$ 160.26 | \$ 160.26 |
| 10b | \$22,151.00 | \$ 104.68 | \$ 104.68 |
| 11 | \$ 1,558.40 | \$ 916.71 | \$ 916.71 |
| 12a | \$11,641.00 | \$ 909.45 | \$ 909.45 |
| 12b | \$12,864.00 | \$ 756.71 | \$ 756.71 |
| 13 | \$ 2,500.00 | \$ 714.29 | \$ 781.25 |

- Table 3--Analysis; variables 7 and 8

| Case | Variables | |
|------|--------------------------------------|---|
| | 7 | 8 |
| | Cost of restoration and repair | Cost of restoration and repair per unit of damage |
| | <u>Dollars</u> | <u>\$/Cubic m.</u> |
| 1 | -- | -- |
| 2 | -- | -- |
| 3 | -- | -- |
| 4a | -- | -- |
| 4b | -- | -- |
| 5 | -- | -- |
| 6 | \$ 1,278.00 | \$ 121.71 |
| 7 | -- | -- |
| 8 | \$ 1,299.00 | \$ 866.00 |
| 9 | \$ 703.00 | \$ 390.56 |
| 10a | \$ 1,048.00 | \$ 18.07 |
| 10b | \$ 3,006.00 | \$ 14.21 |
| 11 | \$ 75.92 | \$ 44.66 |
| 12a | \$ 7,777.00 | \$ 607.58 |
| 12b | \$ 9,274.00 | \$ 545.53 |
| 13 | -- | -- |