SURVEY AND EXCAVATIONS IN
JOSHUA TREE NATIONAL MONUMENT

Report of the 1985 Joshua Tree Road Improvements Project

By
Richard G. Ervin

Western Archeological and Conservation Center
National Park Service
U.S. Department of the Interior

Publications in Anthropology No. 32
SURVEY AND EXCAVATIONS IN
JOSHUA TREE NATIONAL MONUMENT

Report of the 1985 Joshua Tree Road Improvements Project

By
Richard G. Ervin

Contributions by
James M. Bayman
Lisa W. Huckell
Marilyn B. Saul

November 1985

Western Archeological and Conservation Center
Tucson, Arizona

Publications in Anthropology No. 32
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>FIGURES</th>
<th>TABLES</th>
<th>ACKNOWLEDGEMENTS</th>
<th>ABSTRACT</th>
<th>Chapter 1. INTRODUCTION</th>
<th>Chapter 2. PHYSICAL ENVIRONMENT</th>
<th>Chapter 3. PREVIOUS ARCHEOLOGICAL WORK AND ITS RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Colorado Desert</td>
<td>Previous Investigations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mojave Desert</td>
<td>Prehistory of Joshua Tree</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fauna.</td>
<td>Early Man</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Habitats</td>
<td>Fluted Point Tradition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oasis</td>
<td></td>
<td></td>
<td>Desert Wash</td>
<td>Desert Archaic Cultures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Desert Wash</td>
<td></td>
<td></td>
<td>Pinyon-juniper Woodland</td>
<td>Early Archaic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chaparral</td>
<td></td>
<td></td>
<td>Yucca</td>
<td>Middle Archaic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Desert Grasslands</td>
<td></td>
<td></td>
<td>Desert Grasslands</td>
<td>Late Archaic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cholla Cactus</td>
<td></td>
<td></td>
<td>Cholla Cactus</td>
<td>Patayan Sequence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sand Dune</td>
<td></td>
<td></td>
<td>Rocky Canyons</td>
<td>Ethnohistory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rocky Canyons</td>
<td></td>
<td></td>
<td>Climates</td>
<td>Serrano</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Climates</td>
<td></td>
<td></td>
<td></td>
<td>Cahuilla</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chemehuevi</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Historical Summary</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cattle Raising</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mining</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ix</td>
</tr>
<tr>
<td>xi</td>
</tr>
<tr>
<td>xiii</td>
</tr>
<tr>
<td>xv</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>14</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>17</td>
</tr>
<tr>
<td>17</td>
</tr>
<tr>
<td>17</td>
</tr>
<tr>
<td>17</td>
</tr>
<tr>
<td>23</td>
</tr>
<tr>
<td>23</td>
</tr>
<tr>
<td>26</td>
</tr>
<tr>
<td>27</td>
</tr>
<tr>
<td>29</td>
</tr>
<tr>
<td>31</td>
</tr>
<tr>
<td>33</td>
</tr>
<tr>
<td>34</td>
</tr>
<tr>
<td>36</td>
</tr>
<tr>
<td>38</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>41</td>
</tr>
<tr>
<td>43</td>
</tr>
<tr>
<td>45</td>
</tr>
<tr>
<td>47</td>
</tr>
<tr>
<td>47</td>
</tr>
<tr>
<td>48</td>
</tr>
</tbody>
</table>
## CONTENTS (continued)

<table>
<thead>
<tr>
<th>Chapter 4. METHODS OF INVESTIGATION</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Methods.</td>
<td>51</td>
</tr>
<tr>
<td>Survey.</td>
<td>51</td>
</tr>
<tr>
<td>Investigations at 4-SBR-4208.</td>
<td>52</td>
</tr>
<tr>
<td>Test Excavations at 4-RIV-1961.</td>
<td>52</td>
</tr>
<tr>
<td>Research Problems.</td>
<td>53</td>
</tr>
<tr>
<td>Prehistory.</td>
<td>54</td>
</tr>
<tr>
<td>Chronology</td>
<td>55</td>
</tr>
<tr>
<td>Typology</td>
<td>55</td>
</tr>
<tr>
<td>Adaptation of People to the Desert</td>
<td>55</td>
</tr>
<tr>
<td>Interregional Contact</td>
<td>57</td>
</tr>
<tr>
<td>Demography</td>
<td>58</td>
</tr>
<tr>
<td>History</td>
<td>58</td>
</tr>
<tr>
<td>Lifestyles</td>
<td>58</td>
</tr>
<tr>
<td>Social Network</td>
<td>59</td>
</tr>
<tr>
<td>Mining Technology</td>
<td>59</td>
</tr>
</tbody>
</table>

| Chapter 5. FIELD INVESTIGATIONS                                  | 61   |
| Survey                                                          | 61   |
| Fiscal Year 1985                                                 | 61   |
| Fiscal Year 1986 and Later                                       | 68   |
| Investigations at 4-RIV-1961                                     | 72   |
| Site Description                                                 | 72   |
| Field Procedures                                                 | 77   |
| Ceramic Assemblage                                               | 82   |
| Groundstone Assemblage                                           | 84   |
| Flaked Stone Assemblage                                          | 85   |
| Retouched Pieces                                                 | 85   |
| Debitage Analysis                                                | 87   |
| Discussion                                                       | 93   |
| The Anaconda Mine Site, 4-SBR-4208                               | 97   |
| Introduction                                                     | 97   |
| Field Procedures                                                 | 100  |
| Area 1                                                           | 102  |
| Area 2                                                           | 106  |
| Area 3                                                           | 111  |
| Discussion                                                       | 120  |
| Summary                                                          | 122  |

| Chapter 6. MANAGEMENT RECOMMENDATIONS.                           | 123  |
| Fiscal Year 1985 Construction                                     | 123  |
| Fiscal Year 1986 Construction                                     | 125  |
## CONTENTS (continued)

<table>
<thead>
<tr>
<th>Chapter/Appendix</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 7</td>
<td>SUMMARY AND CONCLUSIONS</td>
<td>129</td>
</tr>
<tr>
<td>Appendix 1</td>
<td>ANALYSIS OF CERAMIC ARTIFACTS FROM THE JOTR 85A PROJECT by James M. Bayman</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td>Colorado River Buffware</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>Pyramid Gray</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td>Parker Buff.</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td>Tizon Brownware</td>
<td>136</td>
</tr>
<tr>
<td></td>
<td>Discussion</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>References</td>
<td>138</td>
</tr>
<tr>
<td>Appendix 2</td>
<td>ANALYSIS OF OSTEOLOGICAL REMAINS FROM 4-RIV-1961 by Marilyn B. Saul.</td>
<td>141</td>
</tr>
<tr>
<td></td>
<td>References</td>
<td>144</td>
</tr>
<tr>
<td>Appendix 3</td>
<td>ARCHEOBOTANICAL REMAINS FROM 4-RIV-1961 by Lisa W. Huckell</td>
<td>145</td>
</tr>
<tr>
<td></td>
<td>Introduction</td>
<td>145</td>
</tr>
<tr>
<td></td>
<td>Methods</td>
<td>145</td>
</tr>
<tr>
<td></td>
<td>Results</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>References</td>
<td>151</td>
</tr>
<tr>
<td>Appendix 4</td>
<td>RESULTS OF RADIOCARBON ANALYSIS</td>
<td>153</td>
</tr>
<tr>
<td>Appendix 5</td>
<td>RESULTS OF X-RAY FLUORESCENCE ANALYSIS OF OBSIDIAN ARTIFACTS</td>
<td>155</td>
</tr>
<tr>
<td>REFERENCES</td>
<td></td>
<td>159</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Figure 1</td>
<td>Southern California, western Arizona and northern Baja, showing the location of Joshua Tree National Monument and other areas described in text.</td>
<td>2</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Joshua Tree National Monument and surrounding area, showing major roads and route numbers, important geographical areas, and water sources.</td>
<td>3</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Cottonwood Pass, showing the main area of Fiscal Year 1985 (Phase II) construction.</td>
<td>62</td>
</tr>
<tr>
<td>Figure 4</td>
<td>The Indian Cove campground area, showing two relocated sites originally discovered during 1967 survey.</td>
<td>64</td>
</tr>
<tr>
<td>Figure 5</td>
<td>A portion of the Cottonwood Spring Road (Route 204), showing the three artifact scatters found around the NPS housing and maintenance.</td>
<td>65</td>
</tr>
<tr>
<td>Figure 6</td>
<td>The area around the Twentynine Palms entrance to the monument, showing archeological site 4-SBR-4208 (the Anaconda Mine), JOTR 85A-8, and the Pinto Wye borrow area.</td>
<td>67</td>
</tr>
<tr>
<td>Figure 7</td>
<td>The Queen Valley area, showing the main portion of Fiscal Year 1986 (Phase III) construction.</td>
<td>69</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Flaked stone artifacts recovered during archeological surveys.</td>
<td>71</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Contour map of 4-RIV-1961, showing the relationship between cultural materials and the existing road alignment.</td>
<td>73</td>
</tr>
<tr>
<td>Figure 10</td>
<td>Photograph of 4-RIV-1961, looking southwest.</td>
<td>74</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Rock alignment of unknown function (Feature 5) found at 4-RIV-1961.</td>
<td>80</td>
</tr>
<tr>
<td>Figure 12</td>
<td>Primary cremation (Feature 6), showing the pit outline.</td>
<td>81</td>
</tr>
<tr>
<td>Figure 13</td>
<td>Partially reconstructed jar found in the cremation pit.</td>
<td>82</td>
</tr>
<tr>
<td>Figure 14</td>
<td>Flaked stone artifacts recovered during excavations at site 4-RIV-1961.</td>
<td>86</td>
</tr>
<tr>
<td>FIGURE</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Figure 15.</td>
<td>Histogram showing the distribution of measured values of whole flake thickness.</td>
<td></td>
</tr>
<tr>
<td>Figure 16.</td>
<td>Plane table map of 4-SBR-4208, the Anaconda Mine site</td>
<td></td>
</tr>
<tr>
<td>Figure 17.</td>
<td>Photograph of 4-SBR-4208, the Anaconda Mine site, looking northwest.</td>
<td></td>
</tr>
<tr>
<td>Figure 18.</td>
<td>Photograph of Feature 30, a mine adit.</td>
<td></td>
</tr>
<tr>
<td>Figure 19.</td>
<td>Photograph of Feature 29, a structural feature of unknown function</td>
<td></td>
</tr>
<tr>
<td>Figure 20.</td>
<td>Tape map of Feature 29, a structural feature of unknown function</td>
<td></td>
</tr>
<tr>
<td>Figure 21.</td>
<td>Tape map of Feature 1, a cleared area probably used as a tent platform.</td>
<td></td>
</tr>
<tr>
<td>Figure 22.</td>
<td>Tape map of Feature 39, platform supported by a retaining wall of dry-laid rock.</td>
<td></td>
</tr>
<tr>
<td>Figure 23.</td>
<td>Tape map of Feature 3, tent platform</td>
<td></td>
</tr>
<tr>
<td>Figure 24.</td>
<td>Tape map of Feature 33, a structure of dry-laid rock</td>
<td></td>
</tr>
<tr>
<td>Figure 25.</td>
<td>Tape map of Feature 4, which includes a structural foundation, depressions, and possible tent platform</td>
<td></td>
</tr>
<tr>
<td>Figure 26.</td>
<td>Tape map of Feature 35, a structure platform</td>
<td></td>
</tr>
<tr>
<td>Figure 27.</td>
<td>Tape map of Feature 5, a pair of dry-laid rock walls associated with a bedrock outcrop.</td>
<td></td>
</tr>
<tr>
<td>Figure 28.</td>
<td>Tape map of Feature 7, a depression and associated earthen berms.</td>
<td></td>
</tr>
<tr>
<td>Figure 29.</td>
<td>Engineering drawing showing the portion of site 4-SBR-4208 that will be affected by roadwork</td>
<td></td>
</tr>
<tr>
<td>Figure 30.</td>
<td>A portion of the Cottonwood Spring Road, showing cultural resource areas near NPS housing and maintenance facilities</td>
<td></td>
</tr>
<tr>
<td>Figure 31.</td>
<td>Archeological site 4-RIV-1961, showing centerline of proposed alignment of Route 12 in relation to site boundaries.</td>
<td></td>
</tr>
</tbody>
</table>
TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1.</td>
<td>Construction phases of package 173, reconstruction of unsafe and deteriorated roads, Joshua Tree National Monument</td>
<td>4</td>
</tr>
<tr>
<td>Table 2.</td>
<td>Precipitation in selected areas of Joshua Tree National Monument</td>
<td>12</td>
</tr>
<tr>
<td>Table 3.</td>
<td>Comparison of different temporal schemes proposed for the Patayan sequence.</td>
<td>39</td>
</tr>
<tr>
<td>Table 4.</td>
<td>Frequencies of ceramic artifacts in assemblages from Joshua Tree National Monument sites.</td>
<td>76</td>
</tr>
<tr>
<td>Table 5.</td>
<td>Frequencies of artifact types from sites in the Mojave Desert.</td>
<td>88</td>
</tr>
<tr>
<td>Table 6.</td>
<td>Material types from 4-RIV-1961 and the Oasis of Mara.</td>
<td>88</td>
</tr>
<tr>
<td>Table 7.</td>
<td>Frequencies of cortex on flakes from 4-RIV-1961.</td>
<td>89</td>
</tr>
<tr>
<td>Table 8.</td>
<td>Frequencies of cortex on flakes of given raw material types.</td>
<td>89</td>
</tr>
<tr>
<td>Table 9.</td>
<td>Correlation between flake size (broken flakes) and material type.</td>
<td>90</td>
</tr>
<tr>
<td>Table 10.</td>
<td>Frequencies of platform types for recent projects in California.</td>
<td>92</td>
</tr>
<tr>
<td>Table 1.1</td>
<td>Ceramic counts from JOTR 85A project by provenience</td>
<td>133</td>
</tr>
<tr>
<td>Table 1.2</td>
<td>Frequencies of ceramic types from previous projects in Joshua Tree National Monument</td>
<td>134</td>
</tr>
<tr>
<td>Table 2.1</td>
<td>Nonfeature osseous remains from 4-RIV-1961.</td>
<td>142</td>
</tr>
<tr>
<td>Table 2.2</td>
<td>Inventory of human osseous remains from Feature 6, 4-RIV-1961.</td>
<td>143</td>
</tr>
</tbody>
</table>
TABLES (continued)

Table 3.1 Volumes of charcoal samples by screen size class recovered from Level 5, Feature 6, 4-RIV-1961, Joshua Tree National Monument ............... 146

Table 3.2 Charcoal species identifications from Feature 6, 4-RIV-1961, by screen mesh size ............... 148
ACKNOWLEDGEMENTS

The JOTR 85A project was directed by Keith M. Anderson, Chief of the Division of Archeology, Western Archeological and Conservation Center. I would like to thank him for his help throughout the project.

Jim Bayman and Teri Cleeland assisted me during the fieldwork. I am grateful to them not only for their hard work and good spirits, but for their helpful advice throughout the field season. I would especially like to thank Teri for sharing her expertise in matters of historical archeology during the investigations at the Anaconda Mine.

The JOTR 85A project was the second time that I have worked in Joshua Tree National Monument, and I would once again like to express my appreciation for the hospitality and congeniality of the Joshua Tree staff. I would especially like to thank the following people for providing help throughout the field season, as well as during the subsequent analysis and writeup: Superintendent Rick Anderson, Pete Fielding, Pat Flanagan, Aleta McCardle, Bob Moon, Bill Truesdale, and Alice Turner.

I would like to thank Jim Bayman for his analysis of the ceramic assemblage. In addition, Jim and I would like to extend our appreciation to Robert Euler and Michael Waters, who graciously consented to examine and identify some of the ceramic materials. The ceramic analysis benefited from their expertise. Halley Eisner cheerfully carried out the tedious laboratory processing. Lisa Huckell is to be thanked for her expert identification of the botanical remains. The excellent illustrations in the report can be attributed to Ken Rozen, who produced the artifact drawings, and Ron Beckwith, who drafted the maps. Marilyn Saul identified the bone material. Richard Hughes performed the X-ray fluorescence analysis of the obsidian artifacts, and John Sheppard of the Washington State University Radiocarbon Dating Laboratory performed the radiocarbon analysis. Carol Heathington deserves credit for her excellent editorial job.

John Latschar and Jake Hoogland of the Denver Service Center handled compliance procedures. Roger Kelly, Regional Archeologist, also provided support.
The hard work of many members of the Western Archeological and Conservation Center (WACC) staff also contributed measurably to the JOTR 85A project. George Teague provided advice and council on many occasions. Invaluable support was given by Beverly Mohler throughout the project. Vonna Lou Mason typed the manuscript. I would also like to thank Loyal Enz, Gloria Fenner, Dick Horn, Jill McCreary, Mary Jo Mills, and Mary Sisko. In addition, my appreciation goes to my colleagues at WACC for their helpful support: Lisa Huckell, Anne Trinkle Jones, Marty Tagg, and Sue Wells.
ABSTRACT

In the spring of 1985, archeologists from the Western Archeological and Conservation Center (WACC) conducted archeological investigations at Joshua Tree National Monument in southern California. This undertaking, which was designated project JOTR 85A in WACC files, was carried out in response to plans for repairing and widening the system of roads in the monument (Package 173). The JOTR 85A project was specifically connected to Phases II and III of the road repair project. Road construction for these phases will be carried out in Fiscal Years 1985 and 1986, respectively.

The JOTR 85A project involved archeological work ranging from the preliminary survey of several areas in the construction right-of-way, to test excavations at a previously recorded archeological site. Surveys were carried out in eight campgrounds that had not been investigated as part of the original archeological clearance project conducted in 1979 (Simpson 1981). A proposed materials borrow pit along the Pinto Wye Wash was also surveyed. Cultural resources found in the survey areas consisted of eight artifact scatters or features. No further archeological work is recommended for these resources, all of which either lie outside the construction areas or can be easily avoided during construction.

Archeological investigations were also carried out at the Anaconda Mine (Site 4-SBR-4208), an historic period gold mine located in an area that may be affected by Fiscal Year 1985 construction. The site was carefully mapped using a plane table and alidade. The boundaries of the site were accurately delineated, and 77 cultural features were identified. Information about these features was recorded, and each was photographed. Selected features were mapped, and collections were made at those features where artifacts were present. Three clusters of features were identified. One consisted of mining features (prospects and shafts), the second was made up of mining features and structural features (tent platforms), while the third area contained the remains of several habitation or office structures. Because the area to be affected by road reconstruction contains no significant cultural features or artifact concentrations, it is recommended that no further
archeological work be carried out at 4-SBR-4208 in connection with Package 173 road construction.

Archeological investigations were also carried out at a prehistoric site, 4-RIV-1961. A contour map of the site was made, using a plane table and alidade. The limits of the artifact scatter were then delineated, and seven test pits were dug. One of the test pits exposed a Native American cremation, which was reburied. Charcoal from the feature dated to 200 B.P. ± 90, calibrated to A.D. 1485 to A.D. 1950, or about A.D. 1720 ± 230. Moderately dense concentrations of flaked stone artifacts were also found at 4-RIV-1961, but relatively few ceramic artifacts were present. It is thought that 4-RIV-1961 represents a limited activity, special-purpose site that was intermittently occupied. Part of the occupation dates to the ceramic period, and it is thought that another part of the assemblage may date to the Archaic period. Although no further archeological work is recommended for site 4-RIV-1961, precautions must be taken while rebuilding the road segment in the vicinity of the site, so as to avoid damaging significant cultural resources.
Chapter 1
INTRODUCTION

Between April 2 and May 2, 1985, WACC archeologists James Bayman, Teri Cleeland, and Richard Ervin conducted archeological surveys of several localities in Joshua Tree National Monument, as well as preliminary investigations at two previously documented archeological sites. This was designated project JOTR 85A in the WACC files, and was undertaken in response to planned construction work in the monument.

Joshua Tree is located in southern California about 140 miles (225 km) east of Los Angeles (Fig. 1). The monument was created in 1936 to protect a portion of California's deserts, as well as to preserve the unique geological formations found in the area. Joshua Tree is currently engaged in a road rehabilitation project designated Package 173 (Fig. 2). The project, as shown in Table 1, will be carried out over seven separate construction phases, each corresponding to a different fiscal year (U.S. Department of the Interior 1985; Ervin 1985a, 1985b). The Federal Highway Administration (FHWA) is engaged in planning and design of the project. In 1979, the Western Archeological and Conservation Center (WACC), National Park Service (NPS), conducted an archeological survey of most of the monument's system of roads (Simpson 1981); another section of road had been surveyed in 1975 (U.S. Department of the Interior 1975). These surveys located a number of archeological sites in the vicinity of the existing roads.

Phase I of road reconstruction, involving the area between Pinto Wye and Fried Liver Wash, has already been completed. The JOTR 85A project was connected with Phase II of construction, which began in the fall of 1985. The Western Archeological and Conservation Center had previously been requested to conduct archeological investigations in the areas of Phase II construction in order to provide archeological clearance. However, the short interval between the archeological fieldwork and the planned start of construction would have allowed little time for any mitigative actions that might have been required to protect cultural resources. Therefore, WACC archeologists also carried out investigations associated with Phase III construction during the 1985 field season. This will provide more time for mitigative
Figure 1. Southern California, western Arizona, and northern Baja, showing the location of Joshua Tree National Monument and other areas discussed in the text.
Figure 2. Joshua Tree National Monument and surrounding area, showing major roads and route numbers, important geographical areas, and water sources.
**Summary of Major Recommendations**

<table>
<thead>
<tr>
<th>Route Number</th>
<th>Route Name</th>
<th>Road Segment</th>
<th>Milepost to Milepost</th>
<th>Length (miles)</th>
<th>Functional Classification</th>
<th>Roadway Width</th>
<th>Estimated Project Cost</th>
<th>Combined Cost</th>
<th>Type of Improvement</th>
<th>Environmental Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>North-south highway 4</td>
<td>Cottonwood visitor center to south boundary</td>
<td>29.85-35.65</td>
<td>5.80</td>
<td>class I</td>
<td>24</td>
<td>$2,435,000</td>
<td>reconstruct (grade, drain, pave) and construct low-water crossings</td>
<td>CE or EA</td>
<td></td>
</tr>
<tr>
<td>20-4</td>
<td>Cottonwood Spring 1</td>
<td>Cottonwood Spring</td>
<td>0.00</td>
<td>1.30</td>
<td>1.30</td>
<td>class I</td>
<td>24</td>
<td>480,000</td>
<td>rehabilitate</td>
<td>CE or EA</td>
</tr>
<tr>
<td>20-4</td>
<td>Cottonwood Spring 2</td>
<td>maintenance/hauling and campground</td>
<td>0.86</td>
<td>0.86</td>
<td>class VI &amp; V</td>
<td>NA/18</td>
<td>147,800</td>
<td>rehabilitate</td>
<td>CE</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>East-west highway 1</td>
<td>various</td>
<td>0.30</td>
<td>1.10</td>
<td>0.50</td>
<td>class I</td>
<td>2</td>
<td>$187,000</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>212</td>
<td>Indian Cove road 1</td>
<td>one location</td>
<td>0.90</td>
<td>0.20</td>
<td>class I</td>
<td>24</td>
<td>90,200</td>
<td>rehabilitate</td>
<td>CE</td>
<td></td>
</tr>
</tbody>
</table>

*Priority Group I (FY 85)*

<table>
<thead>
<tr>
<th>Route Number</th>
<th>Route Name</th>
<th>Road Segment</th>
<th>Milepost to Milepost</th>
<th>Length (miles)</th>
<th>Functional Classification</th>
<th>Roadway Width</th>
<th>Estimated Project Cost</th>
<th>Combined Cost</th>
<th>Type of Improvement</th>
<th>Environmental Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>East-west highway 2</td>
<td>Pinto Wye to Junct 13</td>
<td>4.65-15.05</td>
<td>10.40</td>
<td>class I</td>
<td>26</td>
<td>$3,889,600</td>
<td>rehabilitate</td>
<td>CE</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>Split Rock road 1</td>
<td>route 37 to end</td>
<td>0.00</td>
<td>0.60</td>
<td>0.60</td>
<td>class I</td>
<td>20</td>
<td>129,600</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>203</td>
<td>Jumbo Rocks road 1</td>
<td>route 12 to end</td>
<td>0.00</td>
<td>1.40</td>
<td>1.40</td>
<td>class II &amp; III</td>
<td>24-20/12</td>
<td>240,800</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>211</td>
<td>Sheep Pass group campground</td>
<td>route 12 to end</td>
<td>0.00</td>
<td>0.50</td>
<td>0.50</td>
<td>class II</td>
<td>20</td>
<td>125,000</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>901</td>
<td>Ryan Mountain trailhead</td>
<td>milepost 13.05 on route 12</td>
<td>NA</td>
<td>0.10</td>
<td>0.10</td>
<td>class III</td>
<td>NA</td>
<td>100,000</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>None</td>
<td>Turtle Rock climbing parking area</td>
<td>milepost 13.30 on route 12</td>
<td>NA</td>
<td>0.01</td>
<td>0.01</td>
<td>class III</td>
<td>NA</td>
<td>100,000</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
</tbody>
</table>

*Priority Group II (FY 86)*

<table>
<thead>
<tr>
<th>Route Number</th>
<th>Route Name</th>
<th>Road Segment</th>
<th>Milepost to Milepost</th>
<th>Length (miles)</th>
<th>Functional Classification</th>
<th>Roadway Width</th>
<th>Estimated Project Cost</th>
<th>Combined Cost</th>
<th>Type of Improvement</th>
<th>Environmental Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>East-west highway 3</td>
<td>Pinto Wye to Junct 13</td>
<td>15.05-19.55</td>
<td>4.50</td>
<td>class I</td>
<td>26</td>
<td>$1,683,000</td>
<td>rehabilitate</td>
<td>CE</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Keys View road 1</td>
<td>route 12 to end</td>
<td>0.00</td>
<td>5.50</td>
<td>5.50</td>
<td>class I</td>
<td>24</td>
<td>1,932,000</td>
<td>rehabilitate</td>
<td>CE or EA</td>
</tr>
<tr>
<td>207</td>
<td>Hidden Valley campground</td>
<td>route 12 to end</td>
<td>0.00-1.03</td>
<td>1.03</td>
<td>class II &amp; III</td>
<td>24/12</td>
<td>218,400</td>
<td>rehabilitate</td>
<td>CE</td>
<td></td>
</tr>
<tr>
<td>208</td>
<td>Hidden Valley picnic roads 1</td>
<td>route 12 to end</td>
<td>0.00-0.71</td>
<td>0.71</td>
<td>class II &amp; III</td>
<td>22/12</td>
<td>150,600</td>
<td>rehabilitate</td>
<td>CE</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Cap Rock trailhead</td>
<td>milepost 0.28 on route 101</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>class III</td>
<td>NA</td>
<td>100,000</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
</tbody>
</table>

*Priority Group III (FY 87)*

<table>
<thead>
<tr>
<th>Route Number</th>
<th>Route Name</th>
<th>Road Segment</th>
<th>Milepost to Milepost</th>
<th>Length (miles)</th>
<th>Functional Classification</th>
<th>Roadway Width</th>
<th>Estimated Project Cost</th>
<th>Combined Cost</th>
<th>Type of Improvement</th>
<th>Environmental Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>North-south highway 2</td>
<td>Gold Point to Sand Hill</td>
<td>7.40</td>
<td>10.95</td>
<td>class III</td>
<td>14</td>
<td>$3,717,800</td>
<td>rehabilitate</td>
<td>CE</td>
<td></td>
</tr>
</tbody>
</table>

*Priority Group IV (FY 88)*

<table>
<thead>
<tr>
<th>Route Number</th>
<th>Route Name</th>
<th>Road Segment</th>
<th>Milepost to Milepost</th>
<th>Length (miles)</th>
<th>Functional Classification</th>
<th>Roadway Width</th>
<th>Estimated Project Cost</th>
<th>Combined Cost</th>
<th>Type of Improvement</th>
<th>Environmental Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>East-west highway 1</td>
<td>north boundary to Pinto Wye</td>
<td>0.00-4.65</td>
<td>4.65</td>
<td>class I</td>
<td>24</td>
<td>$1,735,000</td>
<td>rehabilitate</td>
<td>CE or EA</td>
<td></td>
</tr>
<tr>
<td>212</td>
<td>Indian Cove road 1</td>
<td>park boundary to milepost 2.00</td>
<td>0.00</td>
<td>2.00</td>
<td>2.00</td>
<td>class I</td>
<td>24</td>
<td>576,000</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>212</td>
<td>Indian Cove campground</td>
<td>campground/picnic loops</td>
<td>2.00</td>
<td>3.00</td>
<td>3.00</td>
<td>class III</td>
<td>14</td>
<td>636,000</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>213</td>
<td>49 Palms Canyon road 1</td>
<td>park boundary to trailhead</td>
<td>0.00</td>
<td>0.50</td>
<td>0.50</td>
<td>class III</td>
<td>20</td>
<td>103,200</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>214</td>
<td>Black Rock road 1</td>
<td>park boundary to campground</td>
<td>0.00-1.97</td>
<td>1.97</td>
<td>1.97</td>
<td>class III</td>
<td>12</td>
<td>338,800</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>210</td>
<td>Covington Flats road 1</td>
<td>park boundary to end</td>
<td>6</td>
<td>1.10</td>
<td>1.10</td>
<td>class III</td>
<td>18</td>
<td>85,000</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>300</td>
<td>Geology tour road 1</td>
<td>route 12 to Squaw Tank</td>
<td>3.8-5.55</td>
<td>1.75</td>
<td>1.75</td>
<td>class III</td>
<td>18/14</td>
<td>290,000</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>None</td>
<td>Indian Cove ranger station and maintenance area</td>
<td>visitor center access and parking</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>class III</td>
<td>NA</td>
<td>100,000</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
<tr>
<td>900</td>
<td>29 Palms visitor center</td>
<td>1</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>class III</td>
<td>NA</td>
<td>100,000</td>
<td>rehabilitate</td>
<td>CE</td>
</tr>
</tbody>
</table>

| Total Improvement Costs | $123,544,300 |

1. Roadway width includes both the traveled way and shoulders with a paved surface.
2. Costs are based on 1984 dollars and will need to be revised to account for any inflation by the time of implementation.
3. CE - Categorical exclusion.
4. EA - Environmental assessment.
5. Also proposed at the time of construction is the installation of utility lines beneath the roadway from the south boundary to the Cottonwood Spring development.

Table 1. Construction phases of package 173, reconstruction of unsafe and deteriorated roads. Joshua Tree National Monument.
archeological work or modifying the construction design) during future phases of construction, should archeological resources prove to be threatened.

Prior to the start of fieldwork, a project scope of work (Ervin 1985a) and addendum (Ervin 1985b) were submitted for the approval of the California Office of Historic Preservation. Compliance actions were handled by the Denver Service Center. A preliminary summary of the results of the investigations was prepared after the completion of fieldwork (Ervin 1985c). All artifacts, field notes, maps, photographs, and archival material associated with the JOTR 85A project will be stored at the Western Archeological and Conservation Center, Tucson.

The remainder of this report consists of six chapters. Chapter 2 is a description of the physical environment, with emphasis on aspects of the environment that relate to human use of the area. Chapter 3 provides a summary of previous archeological research in and around the monument, and briefly describes what is known of the prehistory, ethnography, and history of the area. The next chapter describes the field methods that were used, as well as the research problems that the project was designed to address. Chapter 5 describes the results of the investigations, and is divided into three parts: survey results, and the results of investigations at two archeological sites, 4-RIV-1961 and 4-SRB-4208. Chapter 6 contains recommendations for the management of archeological resources in the project areas, and the final chapter summarizes the results of the project and presents the conclusions that were reached. Included among the appendixes at the end of the report are a ceramic analysis by James Bayman, an analysis of osteological remains by Marilyn Saul, and a botanical analysis by Lisa Huckell.
Chapter 2
PHYSICAL ENVIRONMENT

Joshua Tree National Monument is situated in the southern California deserts, inland from the transverse and peninsular ranges of the Pacific coast. The monument's over 2,000 square kilometers (500,000 acres) cover several interesting mountain chains, low desert basins, and high desert valleys. The mountains are composed largely of monzogranite (formerly described as quartz monzonite), a granitic rock which fractures along perpendicular planes and weathers into masses of rounded boulders. This monzogranite is part of a large, Mesozoic-age batholith that intruded earlier deposits such as Precambrian Pinto gneiss and Paleozoic and early Mesozoic marine sediments. These marine sediments, being relatively soft, have largely eroded away, exposing the granitic batholiths to weathering. After emplacement of the batholiths, volcanic dikes cut through the several earlier rock types.

Joshua Tree straddles the boundary between the Colorado Desert subdivision of the Sonoran Desert, and the Mojave Desert (these are sometimes referred to as the Low Desert and High Desert, respectively). Elements of each desert are included within the monument's borders. The two deserts occupy different drainage basins, with the Colorado Desert largely draining into the Colorado River and the Mojave Desert into the Mojave River; however, the most important differences are based on elevation.

Both of the California deserts lie within the Basin-and-Range physiographic province, an area which has been shaped largely by Cenozoic faulting. This faulting has produced a landscape consisting of sets of rugged mountain ranges separated by downfaulted, sediment-filled basins. Colorado Desert basins are generally lower in elevation than their counterparts in the Mojave Desert. For instance, the lowest part of the Salton Trough, located south of Joshua Tree, lies below sea level. The Pinto Basin, located in Joshua Tree itself along the Mojave Desert boundary, ranges in elevation from 1,000 feet (300 m) above sea level at the lower end, to 2,000 feet (600 m) at the transition zone between the high and low deserts. By contrast, Mojave Desert basins
(such as the Twentynine Palms Valley immediately north of the monument) generally lie above 2,000 feet, or 600 m.

There are also elevational differences between the mountain ranges of the two deserts. The Colorado Desert mountain ranges found in the Joshua Tree area include the Coxcomb Mountains (3,000 to 4,000 foot peaks, or 900 to 1,220 m) and the Eagle Mountains (3,000 to 5,300 foot peaks, or 900 to 1,600 m). By contrast, mountain ranges considered to be part of the Mojave Desert include the Pinto Mountains (3,200 to 5,600 foot peaks, or 975 to 1,700 m), the Hexie Mountains (3,800 to 4,800 foot peaks, or 1,140 to 1,450 m), and the Little San Bernardino Mountains (4,000 to 5,600 foot peaks, or 1,220 to 1,700 m). These elevational differences control the amount of rainfall that the two deserts receive, which in turn affects the vegetation communities characteristic of each. The Colorado and Mojave deserts will now be discussed in turn.

**Colorado Desert**

The Sonoran Desert, of which the Colorado Desert is a part, lies mostly south of Mexican border, in the area surrounding the Gulf of California. This includes much of the state of Sonora and the Baja peninsula. In the United States, it extends westward from southeastern Arizona as far as the Palm Springs, California, area, and north to Needles, California. The area west of the Colorado River, extending southward down the east coast of Baja for the upper third of its length, is referred to as the Colorado Desert subdivision of the Sonoran Desert. Although much of the Sonoran Desert is relatively lush, the Colorado Desert subdivision is quite arid. The Pinto Basin receives only about 2 inches of rainfall yearly (Joshua Tree National History Association 1974). Such modest precipitation supports only sparse vegetation cover in the Colorado desert, and the Pinto Basin is characterized by a creosote bush scrub plant community. Dominant species in this community are creosote bush (*Larrea tridentata*) and bur sage (*Ambrosia dumosa*). The Pinto Basin is further characterized by a low diversity and density of plant life, including few species other than the two listed above (Leary 1977:21). Occasional examples of sweetbush (*Bebbia juncea*),
indigo bush (Dalea Schottii), silver cholla (Opuntia echinocarpa), pencil cactus (Opuntia ramosissima), and milkweed (Asclepias subulata) were observed during Leary's (1977) vegetational analysis of the monument. A few desert willow (Chilopsis linearis) and smoke tree (Dalea spinosa) were noted along the Pinto Wash. In addition, spatially limited but dense stands of cholla (Opuntia bigelovii) and ocotillo (Fouquieria splendens) are present on the western (upper) end of Pinto Basin, near the transition to the Mojave Desert.

A yucca (Yucca schidigera)-bur sage (Ambrosia dumosa) community is found in the Cottonwood area, extending north into the Smoke Tree Well area (where it picks up a creosote bush component), then north and east along the base of Eagle Mountain (Leary 1977:24). This yucca-bur sage community is a transitional association, and includes a rich composition of plant species in different ecotonal settings (Leary 1977:24). These include brittle-bush (Encelia farinosa), Mormon tea (Ephedra nevadensis), buckwheat (Eriogonum fasciculatum), wolfberry (Lycium andersonii), cheesebush (Hymenoclea Salsola), beavertail cactus (Opuntia basilaris), silver cholla (Opuntia echinocarpa), bladder sage (Salazaria mexicana), and engelm (Tetracoccus Hallii).

The lower slopes of the Eagle and Coxcomb mountains support a pure Ambrosia community, interspersed in areas with vegetation associated with underlying granitic bedrock. An extensive plant association of the latter type is found in the upper elevations of the Coxcomb Mountains (Leary 1977:22).

A riparian community is found in Colorado Desert drainages such as Cottonwood Canyon, Smoke Tree Wash, and Pinto Basin Wash. This community includes willow (Salix spp.), mesquite (Prosopis juliflora), smoke tree (Parosela spinosa), desert willow (Chilopsis linearis), catclaw (Acacia greggii), and palo verde (Cercidium floridum).

The Salton Basin is located south of the monument proper, but is discussed here because geomorphological events associated with the basin may have affected the prehistory of the surrounding region, including the monument. The Salton Basin is a low trough extending northwest from the upper reaches of the Gulf of California. The trough was formed by downfaulting of a section of the earth's crust (Jaeger 1957:81), and is part of the same geological structure as the Gulf of California.
Although the Salton Basin has a minimum elevation of 273 feet below sea level, it is not occupied by marine waters because the Colorado River deposited an extensive delta at the head of the gulf during the Middle Pleistocene. This formation has a minimum elevation of about 40 to 47 feet above sea level (Wilke 1978:19; Arnal 1961:445; Van de Kamp 1973) and acts as a natural dike, keeping out seawater.

The Salton Basin has been the site of a number of freshwater lakes, as demonstrated by the presence of freshwater shells, wave-cut shorelines, and travertine deposits (Oakeshott 1971:343). These lakes were formed during periods when the flow of the Colorado River was diverted into the low-lying basin. After the basin had filled, silt deposits eventually rebuilt the natural levees of the Colorado River, diverting the flow back into the gulf. Deprived of its source of water, each lake slowly desiccated through evaporation. It is not known how many times the basin has been filled with water during the Holocene, but Wilke (1978) presents evidence suggesting that three lakestands have occurred in the last 2,000 years: the first from around the time of Christ to A.D. 600, the second between A.D. 900 and 1250, and the third from A.D. 1300 to A.D. 1500. The most recent lakestand is marked by a shoreline 12 m above the floor of the Salton Basin, and Patayan archeological sites are found in association with this shoreline (Waters 1982a). The lake had apparently dried up prior to A.D. 1540, the date of the first accounts of early Colorado River explorers. The desiccation of the lake is thought to have dispersed the large population that had developed along the shore, forcing them to emigrate into the surrounding areas (Rogers 1945; Waters 1982a). Such population displacements should be recognizable in the archeological record of Joshua Tree. A substantial population increase does seem to have occurred during the ceramic period (T. F. King 1975:64, 67), although this event is poorly dated at present.

Study of the geological history of the Pinto Basin has produced differing interpretations. Scharf (1935) hypothesized that the now barren area was inhabited in the past because of the presence of a slow moving river or lake ("Pinto River") in the basin. The presence of this body of water was suggested by the presence of a set of outer terraces located well outside those formed by cutting of the present channel of
the wash. Scharf stated that cultural deposits occurred only above these outer terraces, not within the outer channel that the terraces flank (Scharf 1935:18). Jefferson (1973:2), who reexamined the archeological remains and geological features of the Pinto Basin, claims that some cultural materials (apparently referring especially to Site 4-RIV-520) do occur below the upper terraces. Jefferson believes that the archeological materials were deposited after the formation of the present topography (that is, after the desiccation of any slow-moving river or lake that might have occupied the channel formed by the outer terraces; 1973:2). An analysis of "midden-bone" recovered from archeological sites (distinguished from associated Pleistocene bone presumably on the basis of observed "preservational differences" [Jefferson 1973:3]) showed a fully modern assemblage, of which all taxa are present today somewhere in Joshua Tree National Monument. Jefferson notes that "a very minor increase in effective precipitation" would account for the presence of these taxa in the Pinto Basin area. Although Jefferson's conclusions seem to be well supported by the available evidence, it is difficult to explain why a number of Pinto phase occupation sites are located in this arid basin, even though the higher elevation Mojave Desert portions of the monument (which are today both cooler and wetter) have yielded no remains attributable to this time period.

**Mojave Desert**

The Mojave or High Desert occupies southern Nevada and that part of southeastern California north of the San Bernardino, Little San Bernardino, and Pinto mountains. High desert basins are characterized by the presence of numerous playas, or dry lakes. During the Pleistocene these lakes held substantial bodies of water, but today they hold water only after heavy rains.

The relatively higher elevation of the Mojave Desert results in somewhat higher annual rainfall, as much as 38 cm (15 inches) in some locations. Precipitation at Twentynine Palms, just north of the monument, averaged 10.64 cm (4.2 inches) annually between 1936 and 1959 (Leary 1977:5). Precipitation in the higher-altitude valleys at
the western end of the monument range between 11 cm and 19 cm (4.3 and 7.5 inches) annually (measured over the course of a single year; see Table 2). Precipitation occurred most frequently in December/January and July/August, with little rainfall between April and June. The winter wet period is due to eastward-moving storm systems coming from the Pacific, while summer precipitation results from sporadic but heavy tropical storms originating to the south.

Table 2

<table>
<thead>
<tr>
<th>LOCALITY</th>
<th>ELEVATION</th>
<th>PRECIPITATION</th>
<th>YEAR</th>
<th>REFERENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>FW.</td>
<td>CM</td>
<td>IN.</td>
</tr>
<tr>
<td>Twentynine Palms</td>
<td>600</td>
<td>1,970</td>
<td>10.5</td>
<td>4.2</td>
</tr>
<tr>
<td>North Entrance</td>
<td>900</td>
<td>2,950</td>
<td>9.1</td>
<td>3.6</td>
</tr>
<tr>
<td>Berdoo/Rockhouse Canyon</td>
<td>1,200</td>
<td>3,940</td>
<td>14.0</td>
<td>5.5</td>
</tr>
<tr>
<td>Lost Horse Mine</td>
<td>1,500</td>
<td>4,920</td>
<td>19.1</td>
<td>7.5</td>
</tr>
<tr>
<td>Lost Horse Valley</td>
<td>1,320</td>
<td>4,330</td>
<td>13.6</td>
<td>5.4</td>
</tr>
<tr>
<td>West Entrance</td>
<td>1,080</td>
<td>3,540</td>
<td>7.1</td>
<td>2.3</td>
</tr>
<tr>
<td>Eureka Peak</td>
<td>1,620</td>
<td>5,310</td>
<td>13.8</td>
<td>5.4</td>
</tr>
<tr>
<td>Upper Covington Flats</td>
<td>1,500</td>
<td>4,920</td>
<td>14.4</td>
<td>5.7</td>
</tr>
<tr>
<td>Covington Flats Entrance</td>
<td>1,260</td>
<td>4,130</td>
<td>11.0</td>
<td>4.3</td>
</tr>
<tr>
<td>Lost Horse Entrance</td>
<td>1,320</td>
<td>4,330</td>
<td>15.8</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kritzman (1967)</td>
</tr>
</tbody>
</table>

Most of the Twentynine Palms Valley, including the area bounded on the south by the Pinto Mountains, on the north by the Bullion Mountains, and on the west by the northern San Bernardino Mountains, is higher than 2,000 feet (600 m). As is typical of Mojave Desert basins, a number of playas are located in Twentynine Palms Valley, including Dale Lake, Mesquite Lake, and Emerson Lake. The dominant plant community around Twentynine Palms is the creosote-bur sage community, but elements typical of the Mojave Desert (such as Mojave yucca and Joshua tree) appear to the west as the elevation of the valley increases.
The western half of the monument itself also lies within the Mojave Desert, but is significantly different from the Twentynine Palms Valley. This area consists of a series of high valleys (greater than 3,600 feet, or 1,100 m) in the midst of several mountain ranges. These valleys, including Queen Valley and Lost Horse Valley, form a high "plateau" bordered by the little San Bernardino Mountains on the south, the Pinto Mountains on the north, and the Hexie Mountains on the east. The valleys formed not by downfaulting, but by differential erosion of less resistant rock types.

Pleasant Valley, located in the southern portion of this area, is the location of the only playa in this region. Unlike the valleys immediately to the north, Pleasant Valley was created by faulting and subsidence.

Elevation of the valley floors in this area ranges from 3,600 to 4,000 feet (1,100 to 1,220 m), and precipitation is greater here than at Twentynine Palms. Winter precipitation sometimes occurs in the form of snow in this area.

The vegetation communities found in the area of these high valleys include the Joshua tree woodland and blackbrush communities. The Joshua tree (Yucca brevifolia) is codominant in different areas with Mojave yucca (Y. schidigera), galleta grass (Hilaria rigida), and hop-sage (Grayia spinosa) (Leary 1977). Mojave yucca (Y. schidigera) was found to be codominant with bur sage (Ambrosia dumosa) in parts of the western end of the monument. Examples of the blackbrush community include the blackbrush (Coleogyne ramosissima)-Mojave yucca association, the blackbrush-Mojave yucca-juniper (Juniperus californica) association, and the blackbrush-Mojave yucca-Joshua tree association (Leary 1977).

Parts of the mountainous areas of the western monument are characterized by the pinyon-juniper woodland community, which includes pinyon pine (Pinus monophylla), scrub oak (Quercus turbinella), and juniper (J. californica) as codominants. In the monument, examples of this community included relatively few junipers, resulting in more of a pinyon-scrub oak than a pinyon-juniper community (Leary 1977:30). Another common community observed in the mountainous areas is the bur sage (Ambrosia dumosa)-mixed shrub association, found mostly in the Little San Bernardino Mountains. Canyons on the south flank of the
Little San Bernardino Mountains had a transitional juniper-mixed shrub association (Leary 1977:31).

**Fauna**

A wide variety of wildlife is found in the Joshua Tree area, and the species present are most similar to the fauna of the Mojave and Colorado deserts, with lesser similarities to coastal southern California (Miller and Stebbins 1964:44). Coastal elements have access to the area along the Little San Bernardino Mountain chain.

Sixty taxa of birds are recorded for the monument area, exclusive of migratory species (Miller and Stebbins 1964). Raptors are the most numerous, with 11 separate taxa residing in the area, including owls, hawks, eagles, and vultures. Finches and sparrows are well represented by eight native species. Six taxa of jays and the related titmice are resident. Orioles and their allies are represented by five separate taxa, as are the flycatchers. Mockingbirds and related thrashers as well as the wrens, are both represented by four taxa. In addition, quail, doves, gnatcatchers, shrikes, swifts and hummingbirds, nighthawks and whippoorwills, roadrunners, vireos, larks, swallows, and woodpeckers are recorded (Miller and Stebbins 1964).

Miller and Stebbins (1964) also recorded 41 mammalian taxa residing in the monument area, the most numerous of which are the rodents. Twenty-two species were recorded, including seven pocket mice and related forms, seven white-footed mice and allies, four taxa of squirrels, two woodrats, pocket gophers, and voles. Nine varieties of bats (one of which is a migrant) have been recorded in the monument. Seven taxa of carnivores are present, including the coyote, two genera of foxes, bobcat, mountain lion, raccoon, and badger. Mule deer, jackrabbit, and cottontail are common in the monument, and bighorn sheep are present in the mountainous areas. Pronghorns reportedly inhabited the basins in the late 19th century (Walker 1931:14), but are no longer present.

Thirty-six reptilian taxa and four native amphibians have been recorded for the monument (Miller and Stebbins 1964). The latter, including species of both frogs and toads, are found in and around the
several springs and oases in the area. Twenty varieties of snakes inhabit the area, including six species of rattlesnake (one recorded since Miller and Stebbins' work; see Moore 1973). Lizards are represented by 16 taxa, including the chuckwalla. The desert tortoise is also found throughout the monument area.

**Habitats**

Miller and Stebbins (1964) define a series of nine distinct habitats in the Joshua Tree area; these environmental zones are characterized by specific vegetational, soil, and drainage features. Viewing the environment of the area in terms of these habitats provides a clearer understanding of the way the inhabitants of the area made the best use of scarce desert resources.

**Oasis**

The oasis habitat is perhaps the most important environment in the Joshua Tree area from the perspective of human habitation. Oases not only provided abundant and dependable supplies of water, but also supported a host of important plant and animal resources that supplied the inhabitants of the area with food and other resources. Four of the monument's oases supported stands of native California fan palms (*Washingtonia filifera*) prehistorically: Twentynine Palms or the Oasis of Mara, Fortynine Palms, Lost Palm Canyon, and Munsen Canyon. These and other oases in the area (including Cottonwood, Little Morongo Canyon, and Sweetwater Canyon) are also natural habitats for stands of water-loving plants such as cottonwood, mesquite, willow, sedges, rabbit-brush (*Chrysothamnus* spp.), arrow-weed (*Pluchea sericea*), seep-weed or "inkweed" (*Suaeda ramosissima*), and many tuberous plants such as desert-lily (*Hesperocallis undulata*) and arrowhead (*Sagittaria latifolia*). A number of other small springs are also present in the monument area. These higher elevation water sources have little associated tree growth, but would still have provided important sources of water. In addition, natural tanks in the granite outcrops held water for significant periods after rains. A number of prehistoric archeological sites are associated with these water sources, and they
were also important to miners and cattle ranchers who later used the area. The locations of some of the oases, springs, and natural tanks in the monument are plotted on Figure 2.

**Desert Wash**

The desert drainages of the monument carry water only during periods of heavy rain, but provide a significant source of moisture just under the ground. Palo verde, mesquite, and desert willow grow in the moister washes, and smoke tree is present in those with less moisture.

**Pinyon-Juniper Woodland**

This habitat was especially important to the Native American inhabitants as a source of a variety of foods. In addition to pinyon nuts, economically important plants such as mountain mahogany (*Cercocarpus* spp.), manzanita, and scrub oak are found in this habitat. In addition, mule deer are plentiful in this zone.

**Chaparral**

Limited areas of chaparral (consisting of dense stands of manzanita and scrub oak) are found in the monument area, though growth is less dense here than in communities located closer to the coast. In addition to plants that provide important sources of nuts and berries, mule deer are common in this habitat.

**Yucca**

Within the yucca belt are found such plants as Joshua tree, mojave yucca, juniper, blackbrush, ephedra, and buckwheat. Many of these plants were used as sources of food by the Native Americans.

**Desert Grasslands**

High valleys in the western plateau area of the monument, such as Pleasant Valley and Queen Valley, support stands of short grass and annuals after seasons of good rain. In the late 1870s, several years of higher than average precipitation stimulated especially heavy grass cover in Lost Horse, Queen, and Pleasant valleys (Greene 1983:63).
Cholla Cactus

Limited areas of the Pinto Basin support dense stands of cholla that might have been used prehistorically. In other places, cholla are sparsely mixed throughout creosote-bur sage and yucca communities.

Sand Dune

Limited areas of the Pinto Basin are also characterized by sand dunes or flat sandy stretches. Few resources of importance to the Native American or Euro-American inhabitants of the area are found in this habitat.

Rocky Canyons

This habitat is one of steep, rocky slopes with a very sparse vegetation cover. It is mostly found above about 3,000 feet (910 m) in elevation, in the yucca or pinyon-juniper belts. Although barren, this habitat is inhabited by mountain sheep, which were a prized game animal.

Climatic Change

A number of diverse sources provide information relevant to the study of past climatic fluctuations in California. These include sedimentary sequences, fossil packrat middens, pollen data, pluvial lake chronologies, and sequences of tree rings from both upper and lower forest boundaries.

In an attempt to arrive at a synthesis of these and other sources of information, Moratto and others (1978) compared several paleoclimatic sequences for the California area. They found a number of points of agreement among data derived from these diverse sources, allowing them to construct a climatic sequence composed of alternating periods of relatively cool/wet and warm/dry conditions throughout the Holocene (1978:149). This composite sequence may not accurately reflect climatic conditions in the desert, however, since much of the information on which it was based was derived from the Sierra Nevada of central California. Methods of paleoclimatic reconstruction that may be more applicable to the Joshua Tree area include sedimentary stratigraphy, the
analysis of packrat middens, pollen analysis, and playa lake fluctuations.

The study of alluvial stratigraphy has demonstrated a close correspondence between sedimentary sequences throughout the Southwest. The stratigraphic similarities are great enough to indicate "a similar and synchronous sequence of deposition, soil formation and erosion" throughout the Southwest (Haynes 1968:613), demonstrating a corresponding synchronicity in climatic events. Hayne's summary of the alluvial sequence shows that the earliest deposit (Unit A; pre-11,500 B.P.) was laid down by large, late Pleistocene streams during a period of greater moisture, when the vegetation cover had a more arboreal character than today. Unit A is overlain by spring and stream deposits (Unit B1; 11,500 to 11,000 B.P.) that correspond to the last glacial advance, during which time vegetation was only slightly more mesic than today. Between 11,000 and 7100 B.P., these streams and springs had slowly desiccated into wet meadows, as shown by eolian silt deposits (Unit B2, corresponding to Antev's Anathermal) representative of decreased soil moisture and a more xeric vegetation cover. Fully xeric conditions and channel cutting are indicated by a significant erosional unconformity that separates B2 from overlying eolian sand dune deposits (Unit C1) or sand and gravel channel deposits (Unit C2). This period of drought corresponds to Antev's Altithermal, and dates to between 7100 and 5800 B.P. Channel filling (which deposited Unit C2) occurred between 5800 and 4000 B.P., and a soil developed under somewhat moister conditions between 4500 and 3500 B.P. This is overlain by thick alluvial deposits (Unit D) that date to between 4900 B.P. and 1900 B.P. Within Unit D and at its top, minor erosional unconformities and weakly developed soils indicate periods of slightly drier conditions. Additional alluvial sediments (Unit E) were deposited between 1500 B.P. and the late 19th century A.D., when modern arroyo cutting began. These last two units correspond to Antev's Medithermal, and represent vegetational and climatic conditions similar to the present.

To summarize, the alluvial chronology shows a period of significantly greater moisture at the end of the Pleistocene, followed by increasingly less mesic conditions through the Anathermal. Soil weathering and channel cutting over a period of 1,300 years indicate
that xeric conditions prevailed during the Altithermal. A period of
greater available moisture (comparable to present conditions) followed,
during which alluvial deposition resumed. Arroyo cutting during the
historic period indicates a return to drier conditions.

The study of fossil packrat (Neotoma spp.) middens supports
some aspects of the alluvial chronology. Prior to 11,000 B.P.,
pinyon-juniper woodlands were found in elevations now occupied by
desertscrub. By 10,000 years ago pinyons had retreated to higher areas,
but juniper (and sometimes oak) woodlands remained in desertscrub areas
until 8000 B.P. After this time, no records of vegetation different
from those of today are known. Van Devender and Spaulding (1979)
suggest that essentially modern vegetational patterns were established
by 8000 B.P., with little change since that time. Very few packrat
middens from the last 8,000 years have been dated, however, even though
they are quite common (Van Devender and Spaulding 1979:204), and it may
be that significant fluctuations within the post-8000 B.P. period have
been overlooked.

Past fluctuations in the levels of Great Basin playa lakes also
yield information on paleoclimates. Benson (1977) concludes that high
stands of pluvial Lake Lahontan occurred between 13,600 and 11,000 B.P.,
corresponding to the end of the Wisconsin glaciation. Lake water levels
then declined rapidly, resulting in a Holocene low stand between
9000 and 5000 B.P. Since 5000 B.P., the levels of modern Walker and
Pyramid lakes have been rising slightly. Evidence from the Carson Sink
also suggests a long dry period before 4000 B.P. (Morrison 1964).
Information from playa lakes thus suggests increasing aridity throughout
the early and middle Holocene. It also suggests an increase in
available moisture since 5000 B.P.

Palynological evidence provides conflicting views of Holocene
climatic variation. The paleoenvironmental record from Black Lake,
north of the Owens Valley, has been interpreted as providing evidence
for a mid-Holocene period of decreased moisture. Conditions drier than
the present are indicated during the period from 8000 to 4500 B.P., with
the most xeric interval between 7000 and 6000 B.C. (Batchelder 1970a,
1970b). This corresponds closely to evidence derived from the
sedimentary record.
Other pollen studies suggest a different sequence of climatic events. Martin (1963) identified three major climatic periods within the Holocene. Between 10,500 and 8000 B.P., conditions were relatively arid, similar to the present. The succeeding period, from 8000 to 4000 B.P., is characterized by greater summer precipitation than the present. This period corresponds to Antev's Altithermal. The period from 4000 B.P. to the present was again arid, with conditions resembling the present.

Pollen sequences that support Martin's scheme include one from Osgood Swamp in the Sierra. The evidence shows two periods of relatively dry conditions between about 9000 and 2900 B.C., separated by an intervening wet period around the time of the deposition of Mazama Ash, or about 6900 B.P. (Adam 1967). Evidence for the intervening wet period is equivocal, however (Adam 1967:289-290). Several taxa represented in the pollen sequence may be indicative of drier conditions, while others indicated increased moisture. Adam believes the weight of evidence supports the latter interpretation.

The pollen record from O'Malley Shelter in southeastern Nevada also supports Martin's climatic sequence. It shows drier conditions that the present between 5200 and 3900 B.P., following a moist period between 7000 and 5200 B.P. (Madsen 1972).

Martin's reconstruction has been questioned because his soil columns were reconstructed not from a single core, but from samples gathered at a number of localities. Thus, Martin's pollen curves may be indicative not of climatic change, but of differences in pollen preservation, transportation, and deposition in different geomorphological settings. Moreover, according to Antevs (1962) the Altithermal is not represented in Martin's pollen sequence, because this was a period of erosion and arroyo cutting, with no sedimentary deposition (and hence no pollen deposition). Increased summer rainfall, which was postulated by Martin for the period between 8000 and 4000 B.P., should have increased vegetation cover, resulting in less erosion, not more. The sedimentary record, however, clearly shows that erosion increased during this period.

To conclude, paleoclimatic reconstructions relevant to the southern California deserts agree that the early Holocene was somewhat wetter
than the present. Some evidence also suggests that the middle Holocene was marked by a period of greater aridity than today. Evidence suggesting the existence during the Holocene of a substantially wetter period than the present, such as might have caused the formation of a lake or slow-moving stream in the Pinto Basin, is inconclusive.
Chapter 3
PREVIOUS ARCHEOLOGICAL WORK AND ITS RESULTS

This chapter consists of two parts. The first describes previous archeological investigations in the southern California deserts, with special reference to Joshua Tree National Monument. The second part summarizes our knowledge of the Joshua Tree cultural sequence, including the prehistoric, protohistoric, and historic periods.

Previous Investigations

Malcolm Rogers was one of the first archeological investigators to work in the southern California deserts. Beginning in the 1920s, he conducted extensive surveys of the area and published the first chronological sequence for the California deserts (Rogers 1939). Rogers' sequence, from earliest to latest, consists of: the Malpais industry; the Playa industry (equivalent to the Lake Mojave complex); the Pinto-Gypsum complex; Amargosa I (characterized by Elko Corner-notched points), and Amargosa II (with both Elko and Rose Spring series points). He also defined two more recent point styles, which he refers to as Desert Mojave points (Cottonwood and Desert Side-notched) and historic period Paiute and Shoshone points. Rogers' age estimates for these periods were very conservative, but his sequence nonetheless forms the basis for currently used chronologies. Rogers later concerned himself with the Patayan ceramic sequence (1945), establishing three phases, Yuman I, II, and III. These are now referred to as Patayan I, II, and III to avoid confusion with the historic Native American group referred to as the Yumans. Each ceramic period is characterized by specific types of lower Colorado buffware pottery, which are distinguished on the basis of surface treatment, vessel form, and rim form; tempering material was used as a secondary attribute (Waters 1982a:281). Such attributes are not always easily identified on fragmentary specimens, and those traits present are open to various interpretations by different researchers. Moreover, few stratigraphic or radiocarbon dates are available for Patayan ceramic types. As a
consequence, both Rogers' typology and his chronology (which have been championed recently by Waters) have been called into question.

Elizabeth and William Campbell also worked extensively in the southern California deserts at an early date, and much of their work was conducted in the Joshua Tree area. Beginning in 1929, the Campbells scoured the desert in an effort to salvage some of the many ceramic vessel caches that were hidden in the area's rock outcrops (for instance, see Campbell 1931). The Campbells collected materials from 31 archeological districts that they defined for the area, and kept voluminous notes on their collections. Unfortunately, they did not attempt to record their information on available maps, which, despite the inaccuracy of the early maps, would have provided a wealth of additional information.

The Campbells were also interested in discovering evidence of early man, and conducted excavations at the Pinto Basin Site in the pursuit of this interest (Campbell and Campbell 1935). Later, they worked at Lake Mojave, to the north of the Joshua Tree area (Campbell and others 1937). Most of the Campbells' large collection now resides at either the Southwest Museum or Joshua Tree National Monument.

During World War II, little archeological work was conducted in southern California, but investigations resumed after the war. Harrington (1957) carried out excavations at the Stahl Site, a large village site with an important Pinto component as well as earlier materials. Smith (1963) conducted archeological surveys in the Mojave River area for the San Bernardino County Museum.

The first postwar work in the monument itself was that of avocational archeologists Johnston and Johnston, who studied both the aboriginal trail system of the area (1957) and rock art. At the same time, Wallace began a long period of archeological investigations in the Death Valley area north of Joshua Tree. Based on this work, he constructed a cultural sequence for Death Valley that has been applied to the southern California deserts as a whole.

Wallace also conducted a number of more limited archeological projects in Joshua Tree National Monument. Wallace and Taylor (1959) carried out archeological survey and test excavations in the Deep Tank-Squaw Tank area, where 23 sites were found. Salvage excavations
were carried out at one site threatened by vandalism (Wallace and Desautels 1959), and an assemblage of late prehistoric artifacts was recovered. Wallace also surveyed the area around Sheep Pass (1961, 1964), and students of his surveyed the Indian Cove area (Krltzman 1967).

Working through the University of California at Riverside, O'Neil conducted a survey of the area around Barker Dam (O'Neil 1968). Twenty archeological sites were located, all apparently dating to the late prehistoric Period (O'Neil 1968:27). In 1969, an "Archeological Resource Management Plan" was prepared for the monument (Wildesen 1969). This document briefly outlines the state of archeological research in Joshua Tree, suggests future research goals, and discusses interpretive activities related to archeology. This was followed by a more extensive archeological overview of the monument (T. F. King 1975), which contains more detailed information on both previous research in the monument and future research needs.

In order to address some controversial aspects of the Campbell's work in Pinto Basin, Jefferson conducted an archeological and geological reexamination of several Pinto complex sites in the basin. A brief report on this work (Jefferson 1973) concludes that the remains of Pleistocene fauna are not related to the Pinto period sites, and that there is no evidence that a lake or slow-moving river existed in the basin during the Holocene, when the Pinto complex sites were occupied. Thomas F. King (1975) reported the discovery of a postcontact period Native American ceramic and metallic vessel cache in the Cottonwood area. Douglas later conducted an archeological survey in the Cottonwood area, and recorded 20 archeological sites (Douglas 1978a). Controlled surface collections were carried out at six of the sites, which were dated to the late prehistoric and historic periods. Douglas used these data as the basis for a master's thesis that related the increase in the number of late prehistoric sites in the area to the desiccation of Lake Cahuilla (1979). Douglas also conducted a small survey in the Pleasant Valley area (1978b).

McCarthy prepared a short paper describing several styles of rock art in the Joshua Tree area (1977).
In 1979, an archeological crew from the Western Archeological and Conservation Center surveyed 55 linear miles of road corridor within the monument in relation to the Joshua Tree road reconstruction plan (a 10 mile road segment had previous been surveyed, but no sites were found). Twenty-nine archeological sites were recorded, 14 dating to the prehistoric period and 11 to the historic period. Most of the prehistoric sites were late in age, dating to the ceramic period, although one flaked stone site yielded an Archaic period projectile point and three other sites had assemblages consisting mostly of flaked stone artifacts (including Site 4-RIV-1961, investigated as part of the JOTR 85A project). Historic period sites included trash scatters, mines, and graves.

Most recently, Tagg conducted test excavations at the Oasis of Mara (Twentynine Palms Oasis) in the Twentynine Palms Valley (1983). The excavations revealed late prehistoric period artifact scatters and a roughly circular rock alignment of possible prehistoric cultural origin. Historic period materials of various kinds were also found, including trash scatters, a structure foundation, and a depression possibly representing a well.

**Prehistory of Joshua Tree**

The archeological research described above has provided important information, but our knowledge of the prehistory of the area remains incomplete. Past archeological work in the monument itself has often been of a limited nature, due both to the purpose of the work (which was usually to provide management information) and the stated policy of the National Park Service to preserve cultural resources from all sources of disturbance, including archeological excavations. While numerous sites have been located, excavations have been conducted at only a few, and were usually limited in scope. We have as yet an imperfect understanding of the sequence of occupation of the area, with considerable uncertainty as to the exact placement of specific cultural units in time. Still less is known of more complex subjects such as settlement patterns, subsistence activities, social organization, and interregional exchange and contact. Despite these shortcomings, our
knowledge of the prehistory of the area is growing. A summary of that information is presented below.

**Early Man (prior to 9500 B.C.)**

The California deserts have been the focus of considerable activity on the part of proponents of early man in the New World, that is, occupations predating 11,500 B.P. Although numerous claims of great antiquity have been advanced, only selected instances will be discussed here.

The Calico Hills Site, one of the better known localities purportedly representing the activities of early man, is only about 75 miles northwest of Twentynine Palms. Geological estimates of the age of the site range between 70,000 and 500,000 years before the present (Moratto 1984:47). Even the youngest of these dates is considerably older than traditionally accepted estimates for the antiquity of man in the New World. Careful excavations at the site since 1964 have produced numerous chert pieces claimed to be the product of human activity (Leaky and others 1968, 1969). Chert occurs naturally in the alluvial fan deposits that make up the site matrix. The wide range of grain sizes within the deposits and lack of sedimentary structures suggest that the deposits represent mudflows (Haynes 1973:306), and it has been suggested that a certain percentage of naturally flaked pieces resembling artifacts should be expected in such deposits (Haynes 1973:304-308). Chert pieces identified as artifacts make up a small proportion of all fractured chert pieces. Moreover, the chert pieces found during excavation seem to represent a continuum, ranging from naturally broken cobbles to possible artifacts, probable artifacts, and a few select pieces identified as most likely to be of human origin. The lack of qualitative differences between artifacts and nonartifacts is again suggestive of natural rather than human origin.

The investigators of Calico have cited other factors as proof of their claims, yet these too have alternate explanations. Exotic materials such as moss agate, jasper, and crystalline quartz are all types of chert, and they may occur naturally in the Calico Mountains (the source of the materials that make up the site matrix). Blade-like flakes that have a positive percussion bulb on the interior surface,
superimposed upon a negative percussion bulb on the exterior surface, can be produced by a single blow (Jelenik and others 1971), and are not necessarily the product of sequential flake removal. Similarly, the reported hearth may be the product of natural forces such as lightning or wildfires. In short, the excavations at Calico have not yielded indisputable evidence of human activities. Many researchers feel that such indisputable evidence must be presented before the hypotheses of the Calico investigators can be accepted, because the logical corollary to these hypotheses is that Neanderthal-like hominids were present in the New World. The weight of evidence presently available to the archeological community is strongly against this proposition.

Great antiquity (on the order of 17,000 to 40,000 years) has also been proposed for artifacts found in desert pavements in southern California, Baja, and adjacent desert areas (Hayden 1976). Hayden refers to these manifestations as the Malpais complex, a term originally used by Rogers (1939) to refer to materials of considerably less antiquity. Because all known occurrences of Malpais artifacts are from surface contexts, conventional chronological techniques cannot be used to date these materials, and the accuracy of dates based on the accumulation of desert varnish on artifacts is as yet unproven.

China Lake, which is located about 110 km (70 miles) north of Twentynine Palms, is also the site of putative early man finds. Based on material found on the surface, four cultural stages prior to Clovis have been defined. Davis (1975) estimates that the earliest of these stages began about 45,000 B.P. Evidence of the antiquity of this material is based on the degree of weathering and technological attributes of the artifacts. The fallacy of assigning very early dates to artifacts based on their supposed lack of technological sophistication is a common problem in the study of early man in the New World. It apparently originated early in the history of New World archeology, when comparisons with Old World Paleolithic assemblages were used as a basis for assigning antiquity (for example, see Abbot 1872 for a discussion of supposed paleolithic tools in New Jersey). Frequently, crude assemblages consisting of unifacial and bifacial cores and large cortical flakes, but lacking refined bifacial implements, have been cited as evidence of early man. Such assemblages often prove to be the
products of lithic reduction activities, however (as in the cases of the Mannix Lake industry, the Farmington complex, and the Tennessee Hand Axe Tradition). The technological crudity of artifacts is in no way connected with their age, at least in the New World. Similarly, the degree of weathering displayed by artifacts is not necessarily directly correlated with age. There is no evidence that the extensive weathering displayed by some of the China Lake artifacts could not have been produced by sandblasting since the end of the Pleistocene. Further, the differential weathering of the artifacts can be explained as the result of differential exposure to the elements. Those artifacts that have been buried for appreciable periods since they were produced would show less severe weathering. Interestingly, published maps of the China Lake localities show deposits of sand covering portions of the sites (Davis 1975:48). Eroded surfaces on which artifacts are found are overlain in places by these sand deposits, which would have protected underlying artifacts from the effects of sandblasting. If only recently exposed, such artifacts would be relatively free of weathering.

To summarize, the investigation of early man sites in the southern California deserts has so far produced no conclusive evidence of great antiquity. In cases where the age of the reported artifacts is firmly established, serious questions have been advanced concerning the supposed human origin of the material. In other cases, where the artifacts are indisputably of human manufacture, firm evidence of the age of the materials is lacking.

Fluted Point Tradition (ca. 9500-9000 B.C.)

A number of sites in southern California have produced specimens similar to Clovis fluted points, which have been firmly dated at a number of sites in the western United States to between 11,500 and 11,000 B.P. None of the California specimens have been associated with material suitable for radiocarbon dating, but on typological grounds these artifacts are believed to represent the western limits of the late Pleistocene Llano complex. China Lake, discussed above, has produced at least 10 surface localities where fluted points were found (Davis 1975: Moratto 1984:85). The remains of extinct Pleistocene megafauna are also found scattered over the ground surface. Because of the
distinctive formal attributes of fluted points (which, when found in datable contexts, represent the terminal Pleistocene period), there seems to be little doubt that China Lake was occupied during the late Pleistocene when a pluvial lake filled the basin.

Numerous Clovis-like fluted points have also been found on the surface at the Witt Site, along the Pleistocene shorelines of Lake Tulare at the southern end of the Central Valley (Riddell and Olsen 1969). Eight of the specimens have been bifacially fluted, and 12 have been fluted on one face; 7 of the points are unfluted (Riddell and Olsen 1969). Although the site is not independently dated, typological evidence again suggests that the site was occupied during the late Pleistocene.

An isolated projectile point was also found in the Tehachapi Mountains, located between the Central Valley and the southern deserts (Glennan 1971). The form of this fluted, basally ground point closely resembles the Clovis type.

Several artifacts described as "Yuma-Folsom" points were found around Pleistocene Lake Mojave, but of eight specimens reported by Amsden (1937), none appear to have been fluted. These points may represent the Middle Horizon (approximately 1500 B.C. to A.D. 500), which is characterized by well-flaked, lanceolate points superficially resembling those of the Paleo-Indian period. Simpson (1947) reports the discovery of a "classic Folsom" point at Lake Mojave, but its small size (3/8 inch wide, or 9.5 mm) argues against its being either Folsom or Clovis. This specimen may be a fragment of a Humbolt Concave Base point, which are characteristically very narrow, and which are sometimes basally thinned. More recently, two fluted projectile points found along the Pleistocene Lake Mojave shore were illustrated by Davis and Shutler (1969:163). In contrast to the specimens described above, these points appear to be typologically similar to the Clovis type.

Amsden (1937:85-88) also described several "Yuma-Folsom" points from other areas of southern California. One of these is fluted on both faces, and does appear to be a Clovis point. It came from a Pinto site at Pilot Knob Valley, 55 miles northwest of Lake Mojave (1937:85, Plate XLVc). A second point that reportedly has a channel flake scar
extending one-third of the length of one face (Plate XLVd) came from another Pinto site in the same valley.

A third specimen described by Amsden, from the Owens Valley, is unfluted (1937:Plate XLVa) and thus may not be a Paleo-Indian type, but two points described by Davis (1963:205) from Owens Valley are fluted. In addition, Campbell and Campbell (1940; Campbell 1949) report the discovery of a fluted point site in the Owens Valley. Eleven points are illustrated, many of them fluted, and the material appears to fall well within the range of variation of the Clovis type (Wormington 1959:60).

Davis and Shutler (1969) illustrated a fluted point, probably Clovis, from the Tiefort Basin, some 125 km (80 miles) north-northwest of Twentynine Palms. They also illustrate a remarkable fluted point of clear quartz crystal, which was turned in to the San Diego Museum of Man by a person who reported that it had been found at an unidentified pass in Cuyamaca Park (Davis and Shutler 1969:157). Cuyamaca Rancho State Park lies about 145 km (90 miles) southwest of Twentynine Palms.

One other specimen of interest is a "Yuma-Folsom" point illustrated by Amsden (1937:Plate XLVb). This badly broken specimen of coarse-grained red jasper is reported to be fluted on one face, with evidence of an unsuccessful fluting attempt on the other (1937:Plate XLVb). It was found at the Pinto Basin site in Joshua Tree National Monument by Campbell and Campbell (1935:Plate 14e).

Three areas in southern California have thus produced fluted point sites: China Lake, Tulare Lake, and the Owens Valley (Borax Lake in the North Coast Ranges is the location of another important fluted point site; see Harrington 1948). Isolated points have been found in several other localities, including a possible specimen from the Pinto Basin. Although southern California does not appear to have been densely populated during the Pleistocene, there is increasing evidence that small groups of people related to the Llano culture were scattered throughout the area.

Desert Archaic Cultures

Over much of North America, early Holocene artifact complexes differ significantly from the preceding fluted-point assemblages. These
Holocene peoples have been characterized as nomadic hunter-gatherers who made use of diverse resources, leading to the definition of the Archaic way of life (Ritchie 1944). In the west, the concept of the Desert Culture was developed to refer to these Archaic hunter-gatherers (Jennings and Norbeck 1955). This concept describes a lifeway of cyclical wandering for small groups that relied on seed crops and other vegetal foods, as well as hunting.

Cultural differences between the makers of fluted points and early nonfluted points are less clearly defined in southeastern California than in other areas, for several reasons. First, little is known of the organization or lifestyle of the fluted point-making people who occupied the area; their subsistence and settlement systems may not have been identical to those of Paleo-Indian hunters of the plains. Further, the adaptive strategies of the early nonfluted point-making peoples of southeastern California are almost as poorly understood. Traditionally, the Lake Mojave complex has been seen as one of the earliest manifestations of the Desert Culture, but recent studies have suggested that it represents a specialized hunting tradition distinct from later Desert Culture hunter-gatherers (Warren 1967), or represents a specialized aspect of the tool kit of lanceolate point-making Paleo-Indian groups (Davis 1975). It is not possible to evaluate these alternate views with our present knowledge. Instead, the conventional conception of the Desert Culture is briefly summarized below. Following this, alternative interpretations will be mentioned as appropriate, within the specific discussions of each temporal subdivision of the Archaic.

The traditional view holds that all nonfluted point, preceramic assemblages are part of the Desert Culture. According to this view, the inhabitants of the southeastern California deserts were organized into small bands of people practicing a lifestyle of seasonal transhumance (Davis 1963; Thomas 1973). These people relied on a range of subsistence activities centered on gathering vegetal foods. In southeastern California, periods of increased aridity may have caused abandonment of substantial portions of the desert, except for limited areas favored with reliable sources of water (Wallace 1962; Warren 1984). It has been suggested that the Desert Archaic inhabitants of
southeastern California became more fully adapted to their desert environment through time, gradually acquiring the ability to exploit important new resource types (Warren 1984).

**Early Archaic (ca. 8000 to 5000 B.C.).** Early Archaic occupation of southeastern California is represented by the Lake Mojave complex (originally called the Lake Mojave Culture [Campbell and others 1937]), characterized by stemmed points of the Lake Mojave and Silver Lake types. Since the Lake Mojave site was described in 1937, similar assemblages have been designated by various names, including Death Valley I (Wallace 1958), Playa (Rogers 1939), San Dieguito II and III (Haury 1950:193), and San Dieguito (Warren 1967). Materials diagnostic of the Lake Mojave complex have been found throughout the southeastern California deserts, in apparent association with high stands of pluvial lakes. For example, Lake Mojave assemblages at the type locality are closely associated with the 186 m to 188 m lakeshore. Brainerd (1953) presents a strong argument tying the Lake Mojave complex materials to the overflow level of the lake; that is, to the level when the lake basin was filled to its maximum limit. Based on this evidence, Lake Mojave materials have been estimated to date to the early Holocene. Warren and DeCosta (1964) dated freshwater mollusk shell from the Lake Mojave high stand to 9640 ± 200 B.P. Meighan (1965) obtained a radiocarbon date of 9630 ± 300 years B.P. on the pluvial shoreline of Lake Cahuilla. Finally, Warren (1967) has obtained dates ranging from 8490 ± 400 to 9030 ± 350 B.P. on charcoal and carbonaceous earth from the C. W. Harris Site, the type site for his San Dieguito complex.

Warren (1967) argued that the early Archaic peoples of southeastern California were hunters living in a nondesert environment. This argument is based on several factors. First, he notes the lack of milling stones from both the C. W. Harris Site and the Lake Mojave type assemblage. Instead, there is a preponderance of large knives, scrapers, and projectile points suggestive of hunting game larger than "rabbits and rodents" (1967:182). Climatic evidence suggests that the area was not as arid as today, but was made up instead of grassland. Warren believes that the Lake Mojave complex derived from early cultures
of the Columbia Plateau to the north, and may eventually have given rise to the Desert Culture.

Some of these same ideas are embodied in the concept of the Western Pluvial Lakes tradition (Bedwell 1970). According to Bedwell, the inhabitants of a large area stretching south from southern Oregon along the east side of the Sierra Nevada and into southeastern California practiced a similar adaptation to the lakes and marshes of a grassland environment. This way of life lasted from the end of the Pleistocene, about 11,000 B.P., to 7000 or 8000 B.P., when an increasingly arid climate gave rise to adaptations better suited to desert conditions.

Davis (1975) has developed a somewhat different interpretation of the Lake Mojave complex, but one that is again based on the perception that Lake Mojave represents a hunting way of life. Surface sites around China Lake have yielded Lake Mojave points in apparent association with lanceolate, sometimes fluted points and the remains of Pleistocene fauna. Because of this apparent association, she believes that Lake Mojave points are actually special-purpose tools within the local Paleo-Indian artifact assemblages. There is no stratigraphic evidence to support this notion, however, and if Pleistocene lakes remained at high levels into the early Holocene, one would expect to find assemblages dating to different periods in the same locations.

Middle Archaic (ca. 3000 to 700 B.C.). The next most recent occupation of southeastern California is represented by the Pinto complex (Campbell and Campbell 1935). Diagnostic artifacts of this complex are the Pinto Basin projectile points, of which five styles have been defined. Also found are "keeled" scrapers, manos, milling stones, and occasional foliate bifaces. The presence of grinding equipment sets the Pinto complex apart from the earlier Lake Mojave complex, which lacks such implements. It suggests that new adaptive strategies had been developed to better utilize the limited resources available in the desert environment. The mortars and pestles characteristic of later periods are not part of the Pinto tool kit, however, leading Warren (1984) to suggest that they had not developed the technology needed to process mesquite beans, an important subsistence product of the later inhabitants of the desert.
The Pinto complex is represented by the Pinto Basin type site, the Stahl Site (Harrington 1957), Salt Spring (Rogers 1939), the Rose Spring Site (Lanning 1963), and sites in Death Valley (Wallace 1977). No radiocarbon dates are available for the Pinto occupation of the Mojave Desert, but two different temporal schemes have been proposed for the Pinto Complex, based on chronological information from other areas (Warren 1980). The short chronology, based on a series of radiocarbon dates from Great Basin sites, places this material between about 5000 and 2700 B.P. (Heizer and Hester 1978). According to the long chronology, however, the Pinto complex dates to the period between about 7000 and 4000 B.P. (Warren 1980). Compounding this temporal uncertainty is the typological controversy surrounding the Pinto point (Warren 1980; Huckell 1984). Five different formal variants were defined at the Pinto Basin type site. These may represent distinct temporal forms; alternatively, this variation may be the result of breakage and reworking. In addition, the smaller variant of the Pinto point found at the Stahl Site, the Rose Spring Site, and Gatecliff Shelter (Thomas 1981) is perceived by some to be distinct from true Pinto points. New type names have been proposed for the smaller variant (Lanning 1963; Thomas 1981), which is thought to be later in age.

Controversy also surrounds postulated environmental conditions of the Pinto period. Campbell and Campbell (1935) argued that the Pinto Basin type site was occupied during a period of significantly greater moisture than the present, when a shallow lake or slow-moving river existed in the basin. Subsequent work has revealed no geological evidence for the existence of a lake in Pinto Basin since the Pleistocene (Jefferson 1973); however, current researchers have generally presumed that a period of increased moisture marked the Pinto occupation of the southeastern deserts. Mehringer (1977) identified the period from 3000 or 4000 to 2000 B.C. as one of increased moisture in the Great Basin. This corresponds to some of the earlier radiocarbon dates from Great Basin Pinto period sites, as well as to the proposed long chronology.

Even if it is eventually accepted that the Pinto period was a time of relatively greater effective moisture, it is still difficult to explain why several sites are located in the Pinto Basin, while there
are none known from the higher elevation valleys in the western part of the monument. Increased moisture should also have made this area more attractive to the inhabitants of the region. The high valleys would presumably have been more hospitable than the Pinto Basin, and it is difficult to conceive that this area would not also have been occupied. It is possible that Pinto sites remain undiscovered in the western part of the monument, although previous work in the area suggests otherwise.

**Late Archaic (2000 B.C. to A.D. 1100).** The Late Archaic period can be divided into two parts, the earliest of which is characterized by sites of the Gypsum complex (Harrington 1933). The Late Archaic has also been referred to as Amargosa (Rogers 1939). The Gypsum complex is marked by a greater diversity of projectile point styles than before, with diagnostic points including the Gypsum Cave, Elko Eared and Corner-notched, and Humbolt Concave Base styles. Radiocarbon dates on the Humbolt type, which is dated in the Great Basin to between about 4000 and 1100 B.C. (Heizer and Hester 1978), overlap with the preceding Pinto period, but Humbolt is usually assigned to the Gypsum complex (for example, see Warren 1984:414). Moreover, Gypsum assemblages are frequently found together with those of the Pinto period, leading earlier researchers to define a Pinto-Gypsum complex. Despite the temporal overlap between the two complexes, they are currently viewed by most researchers as distinct entities.

In addition to the projectile point types described above, the Gypsum complex artifact assemblage includes flake scrapers, foliate and square-based bifaces, T-shaped drills, and grinding implements. These latter include not only manos and metates, but also mortars and pestles, suggesting an increasingly more sophisticated and efficient adaptation to available desert resources (Warren 1984).

The chronological placement of the Gypsum complex is better understood than is the earlier part of the Desert Archaic sequence. Radiocarbon dates on sites with Gypsum and Elko series points range between about 2000 B.C. and A.D. 400 (Heizer and Hester 1978). Gypsum complex sites include Gypsum Cave (Harrington 1933), Newberry Cave (Davis and Smith 1981), Rose Spring (Lanning 1963), the Willow Beach
Site along the Lower Colorado River (Schroeder 1961), and Indian Hill Rockshelter in Anza-Borrego State Park (Wallace and others 1962).

Following the Gypsum period is the more recent of the two Late Archaic complexes, called by Wallace (1977) and Warren (1980, 1984) the Saratoga Springs period. This period is marked by projectile points of the Rose Spring and Eastgate series (hereafter referred to jointly as the Rose Spring series; see Ervin 1984:160), which date in the Great Basin to between A.D. 600 and 1100 (Heizer and Hester 1978). In other respects the artifact assemblage is similar to that of the preceding Gypsum period (Warren 1980:420-421), but the Saratoga Springs period is one of important changes. For the first time, the influence of Anasazi and Patayan peoples is recognizable in the archeological record of the northern and southern Mojave Desert, respectively. Early intrusive ceramics found at Saratoga Springs sites are indicative of interregional contacts. At a later date, groups in southeastern California themselves begin manufacturing pottery, as outlined below in the section on the Patayan sequence. The acquisition of pottery apparently had little effect on the lifestyles of these people, who continued to practice a hunting and gathering way of life. One change that did have an important effect on their lifestyles was the exploitation of new resources. In the Owens Valley, pinyon nuts were first exploited on a large scale by groups using Rose Spring series points (Bettinger 1976). In the central valley of California, widespread reliance on acorns probably began even earlier, during the Middle Horizon (about 1500 B.C. to A.D. 500). Both of these areas border the California deserts, and similar subsistence shifts may have occurred in the desert areas. Previous researchers have explained the population increase noted in the western portion of the monument (where both pinyon and scrub oak occur) during the ceramic period as a result of the desiccation of Lake Cahuilla (Jefferson 1971) or to population budding (Jefferson 1971; T. F. King 1975). In the future, the exploitation of an expanded set of resources should also be considered as a possible factor contributing to the ceramic period population increase in Joshua Tree and elsewhere in the California deserts.
**Patayan Sequence (ca A.D. 750 to A.D. 1900)**

Although the appearance of Lower Colorado Buffware and Tizon Brownware ceramics marks an important point in the archaeological sequence, little change in the lifestyle of the inhabitants of the region apparently took place. Except in the areas close to the Colorado River (where agriculture may have been practiced, especially late in the prehistoric sequence), the people continued to practice an Archaic way of life, with subsistence based on hunting and plant gathering. Cottonwood Triangular points were probably introduced prior to ceramics in some areas (Warren 1984), while Desert Side-notched points appeared somewhat later.

The term Patayan (roughly equivalent to the term "Yuman" used by Rogers 1939, and the term "Hakatayan" used by Schroeder 1957) designates the late prehistoric, buffware and brownware pottery-making peoples of the lower Colorado River. The upland Patayan manufactured Tizon Brownware, for which very little chronological information is available. The lowland Patayan manufactured a series of wares designated Lower Colorado Buffwares. Somewhat more typological and chronological information is available about the buffwares, although the interpretation of these data is controversial.

The earliest radiocarbon dates for Patayan ceramics are 1125 ± 80 B.P. (A.D. 825), 1090 ± 85 B.P. (A.D. 860) and 1030 ± 85 B.P. (A.D. 920) from two sites west of Phoenix, Arizona (Waters 1982a:285). Along the Colorado River, Patayan ceramics (Tizon Brownware sherds) were recovered from the Willow Beach Site in levels dated to before A.D. 750 on the basis of intrusive Anasazi sherds of the type Lino Black-on-gray (Schroeder 1961; Warren 1984:392). Ceramics reached the areas west of the Colorado River in the following centuries, and were dated to sometime after A.D. 960 at a site in the Peninsular Ranges (May 1976) on the western margin of the California deserts.

The earliest work on Patayan ceramics was carried out by Rogers, but he never published full descriptions on his ceramic typology. His preliminary publication (1945) and unpublished notes show that his typology was based on differences in vessel shape, rim form, and surface treatment (Waters 1982a:277). Rogers did, however, develop a tripartite chronological sequence for the Patayan. Patayan I (called Yuman I by
Rogers) was characterized by buffware vessels, some with distinct shoulders not unlike the Gila shoulder of the Hohokam Classic period, and redware vessels. Rogers dated the Patayan I phase to between A.D. 800 and 1000 (Table 3), well before the Hohokam Classic period. A sharp transition marks the inception of the Patayan II phase; neither shouldered vessels nor redwares continue to be made. Both Patayan II and III are characterized by buffware pottery types.

Table 3
COMPARISON OF DIFFERENT TEMPORAL SCHEMES PROPOSED FOR THE PATAYAN SEQUENCE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Patayan III</td>
<td>Contact - Present</td>
<td>1500 - 1900</td>
<td>post 1150</td>
<td>Moon Mountain 1300 - 1700</td>
</tr>
<tr>
<td>Patayan II</td>
<td>1050 - Contact</td>
<td>1000 - 1500</td>
<td>900 - 1150</td>
<td>Bouse II 1000 - 1300</td>
</tr>
<tr>
<td>Patayan I</td>
<td>800 - 1050</td>
<td>700 - 1000</td>
<td>contemporary to Classic Hohokam</td>
<td>Bouse I 800 - 1000</td>
</tr>
</tbody>
</table>

All dates in years A.D.

Based on later work in the lower Colorado area, Schroeder (1952) published a classificatory scheme and chronological sequence that differed substantially from those of Rogers. Schroeder's typology was based on different criteria, focusing especially on tempering material; however, where Schroeder felt there to be a correspondence with types defined by Rogers in unpublished notes, he used names proposed by Rogers. Even so, the two classificatory schemes are substantially different. Schroeder also revised Rogers' chronological sequence, dropping the Patayan I phase altogether, since he believed that the redwares and shouldered vessels were contemporary with the later Hohokam Classic period (Table 3). Waters (1982a) has taken strong exception to Schroeder's work, which he believes misrepresents Rogers' original typology. Waters has published type descriptions that follow Rogers' original categories (1982b), and has presented evidence supporting Rogers' chronological scheme. The chronological evidence comes from excavations at two stratified sites where Patayan I redwares and shouldered vessels were associated with or found in levels overlain by
Hohokam ceramics of the Santa Cruz phase (at SDM C-1 investigated by Rogers [Waters 1982c] and at the Bouse Site [Harner 1958], respectively). The evidence from the Bouse Site, however, has yet to be adequately published.

Additional evidence on the Patayan sequence was found at a site on the Luke Range in western Arizona. Huckell (1978) found a Colorado Redware vessel, and a second vessel typed by Michael Waters as Colorado Beige (both Patayan I types) at a site that also had Classic period Hohokam ceramics. This supports Schroeder's contention that the so-called Patayan I types are contemporary with the Classic Hohokam.

At this time, it is not possible to resolve the Patayan controversy, since too few data are available to address the many difficult questions that have been raised. Moreover, some of the work that is most frequently cited in support of particular schemes has been inadequately reported. These problems can be resolved only through further research.

Ethnohistory

The Yuman peoples who inhabited the southern part of the California deserts at the time of contact are ethnically distinct from the Uto-Aztecans (Shoshonean) groups who occupied the northern portion of this same area. At the time of contact, Yuman groups (including the Mojave, Halchidona, and Quechan) occupied the Colorado River Valley, as well as the area south of the central portion of the Salton Basin (where lived the Tipai, or Kamia, and the Ipai, or Diegueño). However, much of the northern Salton Basin and southern Mojave Desert were inhabited by three Uto-Aztecans groups after the time of contact, the Chemehuevi, the Serrano, and the Cahuilla. These groups are thought to have entered the area from the north as part of the Numic spread, pushing the ancestral Yuman peoples farther to the south (Rogers 1939; Waters 1978). Moratto (1984:570) dates the linguistic divergence (and hence, the migration) of the Chemehuevi to about 400 years before the present, and the Serrano and Cahuilla are thought to have entered the area even earlier.
Patayan pottery is distinct from Paiute-Shoshone types, which include Owens Valley Brownware, Southern Paiute pottery, and Shoshone pottery. The Serrano, Cahuilla, and Chemehuevi, however, are known to have manufactured Patayan-type pottery, probably as a result of contact with Yuman groups (Rogers 1939). For this reason, it is not known whether Patayan sites that are located in areas recently occupied by Uto-Aztecan peoples can be attributed to earlier Yuman inhabitants, or to Shoshonean immigrants who were manufacturing Patayan ceramics.

Ethnographic information on the Serrano, Cahuilla, and Chemehuevi is presented below. Much of what follows about the Serrano was obtained from Bean and Smith (1978). Bean (1978) provided most of the data on the Cahuilla, and Laird (1976) was the major source of information on the Chemehuevi.

Serrano

The Serrano inhabited the San Bernardino Mountains, from Cajon Pass eastward as far as Twentynine Palms, as well as parts of the high desert region north of the mountains (that is, the Twentynine Palms Valley as defined in Chapter 2). Their territory probably included parts of the higher elevation, western portion of Joshua Tree National Monument (the area northeast of the crest of the Little San Bernardino Mountains). A Serrano village was located at the Oasis of Mara (Twentynine Palms Oasis) at the time of contact, but it is difficult to be sure how much of the monument was within Serrano territory, because of their sociopolitical organization (Bean and Smith 1978:570). Although the autonomous, lineage-based villages of the Serrano recognized the area in the immediate vicinity of each settlement as being part of their territory, areas farther removed from the villages were not specifically claimed.

The Serrano were divided into two nonterritorial exogamous moieties, the Wildcat and the Coyote. These were further broken down into a number of exogamous clans, each made up of several patrilineages. The head of the clan, who controlled ceremonial and religious affairs, was called the ki·kaʔ. The ki·kaʔ resided in a "big house," a ceremonial structure where all ceremonies took place. The Serrano were unique in that the paxaʔ, who assisted the ki·kaʔ in ceremonial affairs
and controlled the sacred bundles, was required to come from a specific clan from within the opposite moiety. It is not clear whether this is a result of disruption of Native American lifeways, or whether this was a device to ensure ceremonial cooperation between pairs of clans that had close marriage ties (Bean and Smith 1978:572).

The Serrano patrilineages each inhabited a given village, although all the lineages of a given clan owned their land jointly. Villages or hamlets were usually located in the foothill Upper Sonoran life zone, although some were either located near permanent water sources in the desert, or in the higher elevation woodlands (Bean and Smith 1978:570). A reliable supply of water was the most important factor determining the location of the village (Benedict 1924:368). The Serrano subsisted by hunting and gathering, and seasonal forays were made into different ecological zones to exploit diverse resources (Benedict 1924; Strong 1929). Important foods included acorns and pinyon nuts, mesquite, yucca and cactus fruits, roots and bulbs of yucca and other plants, berries, and seeds (including chia, Salvia columbariae, and various grasses). Animals taken in the hunt included rabbits and other rodents, lizards, deer, various birds (especially quail), antelope, and mountain sheep.

Serrano villages were usually small, and included a ceremonial structure (big house), family dwellings, granaries, and sweathouses. Domestic structures were circular, domed buildings of wood frame construction covered by tule thatch (Bean and Smith 1978:571). A firepit was usually located in the center of the dwelling. Most daily activities (besides sleeping) took place outside the dwelling. Sometimes ramadas were constructed to provide shade. The semisubterranean sweathouses were more substantial than the family dwellings. They were circular in shape, excavated partly below the ground surface, and topped by an earth-covered, wood-frame superstructure. A fire was built in the center of the sweathouse.

Although no doubt affected by the Spanish settlement of California, the Serrano maintained their way of life without catastrophic disruption until 1819. In that year, an asistencia was built near Redlands. Most of the western Serrano were removed to missions between 1819 and 1834, but the areas northeast of San Gorgonio Pass maintained their ancestral lifeways more successfully. In 1825, and again in 1863, smallpox
epidemics hit the Morongo Basin, forcing the residents of the village of Mara to temporarily leave the area. In 1867, a group of Chemehuevi seeking refuge from the Mojave Indians settled at the oasis, and were accepted by the original Serrano occupants. A reservation had been established for the inhabitants of the village of Mara as early as 1856; however, surveying errors kept the boundaries of the reservation in dispute for many years. Eventually, the Twentynine Palms Reservation was determined to consist only of a quarter section of rocky ground well to the south of the oasis where the village was located. After 1909 the village of Mara was abandoned (Tagg 1983:315). Some members of the Serrano tribe eventually went to the Morongo Reservation, which had been established near present-day Banning.

**Cahuilla**

The Cahuilla occupied the area south of the Serrano, including the San Jacinto Plain near Riverside, the Santa Rosa and San Jacinto mountains, the northern portion of the Salton Basin, and the southwest flank of the Little San Bernardino Mountains. Their territory also extended for an unknown distance to the east, perhaps as far as the Chocolate Mountains. The Cahuilla may have used both the area around Cottonwood Canyon at the southern extremity of the monument, and the higher-elevation valleys in the western part of the monument. They certainly made regular forays into the Little San Bernardino Mountains along the southwestern portion of the monument.

Like the Serrano, the Cahuilla were divided into two exogamous, nonterritorial moieties, the Coyotes and the Wildcats. Within each moiety were clans composed of 3 to 10 patrilineages, one of which was seen as the founding lineage. The several lineages of a clan engaged in cooperative activities, including ceremonies, food-gathering expeditions, and defense against hostile groups. The clan was recognized as the land-holding unit, and all lineages within a clan had equal rights to the clan's territory. The head of the clan was called the net, an ascribed position passed from father to son, and he was assisted by a pākaʔ. The net was the ceremonial leader of the clan, and acted both as an arbitrator of disputes and as the manager of the group's resources (Bean 1978:580). The net resided in the ceremonial
The Cahuilla, like the Serrano, occupied semipermanent villages from which they made seasonal resource-gathering trips. The largest of these was the acorn harvest, which lasted for several weeks. Preferred village locations are said to have been canyon bottoms or alluvial fans near water sources (Cottonwood Canyon, incidentally, fits this description closely). The Cahuilla followed a hunting and gathering life style, although some agriculture was also practiced. A wide variety of resources were available, due to the diversity of habitats within the Cahuilla territory. The most important plant foods were acorns, mesquite beans, screw-beans, pinyon nuts, cactus fruit, seeds, berries, tubers, roots, and greens. Animals that were taken included rabbits, various rodents and other small mammals, lizards, deer, and bighorn sheep. Domesticated crops included corns, beans, squash, and melons.

Villages consisted of a ceremonial structure or great house, as well as domestic dwellings, granaries, and men's sweat houses. The clan leader usually lived in the largest dwelling, located near the ceremonial house. Dwellings varied from brush shelters to dome-shaped or rectangular structures.

The Cahuilla maintained a hostile attitude towards the Spanish settlers of the area, forcing the latter to rely on sea routes to California. Asistencias were established near San Bernardino, Santa Ysabel, and Pala in 1819, greatly increasing contact between the Cahuilla and Euro-Americans. Although becoming increasingly acculturated (including being employed in seasonal wage labor, practicing agriculture and cattle raising, and adopting Catholicism), the Cahuilla maintained their autonomy into the period of political control by the United States. The smallpox epidemic of 1863 left the Cahuilla unable to resist further encroachment and dominance by Anglo-Americans. The Cahuilla now live on a number of reservations, including Morongo, Agua Caliente, Soboba, Los Coyotes, and Torres-Martinez.

44
Chemehuevi

Very little ethnographic information is available on the Chemehuevi. An informal ethnography based on the memories of 20th century informants has recently been published (Laird 1976). This work was written "outside the world of academic scholarship" (Laird 1976:viii), however, and no formal anthropological treatise has yet been prepared.

The Chemehuevi were closely related to the Southern Paiute, especially the Las Vegas branch, and apparently moved into their ethnographically defined territory relatively recently (Parker 1980). This territory lay to the northeast of the Serrano, and included a portion of the Mojave Desert that ran from Death Valley southeast to the edge of the Colorado River Valley. During the historic period, the Chemehuevi began to settle along the Colorado at the invitation of the Mojave, who already inhabited the river valley. There the Chemehuevi began to practice part-time agriculture, but they led a nomadic hunter-gatherer existence prehistorically. They apparently followed a seasonal round similar to the Great Basin Shoshoni groups (T. F. King 1975), living in impermanent settlements that may or may not have been occupied for more than one season (Laird 1976). While living along the Colorado, their settlement pattern was centered on winter villages, and other seasons were spent in the hills on hunting and gathering expeditions (Laird 1976). The winter settlements known from historic accounts were important as agricultural villages, however, and it is not known whether the same pattern was followed before the adoption of agriculture.

The political organization of the Chemehuevi is poorly known. During the historic period they were divided into three branches: the southern and northern branches, living along the Colorado River, and the desert branch, living in the hinterland to the west. These territorial divisions are obviously a product of the historic period occupation of the Colorado River Valley, and probably do not represent prehistoric patterns.

The Chemehuevi were composed of two clans, the Mountain Sheep and the Deer, that may represent moieties. The Mountain Sheep and Deer clans each had hunting rights to separate parcels within the Chemehuevi
The political leaders of the Chemehuevi were high chiefs (tivitsitog) and lesser chiefs (mi° aupitog). The lesser chiefs were the spokesmen for individual bands, while the high chiefs were the heads of each of the three territorial branches. This political structure contrasts with that of both the Serrano and Cahuilla, whose chiefs were the heads of kinship groups (clans) rather than territorial groups, a situation that may be the result of postcontact changes in Chemehuevi society. Another important figure in Chemehuevi society was the shaman (puh agant4), who acted as a healer. Malevolent shamans had the power to induce illness.

The Chemehuevis claim to be a recent offshoot of the Las Vegas Paiute (Parker 1980), a branch of the Southern Paiute. After moving into the Mojave Desert from the Great Basin, they allied themselves with the Mojave, Quechan (Yuma), Yavapai, and Kamia against the Serrano, Cahuilla, and others (King 1975). Between 1820 and 1840, they moved to the Colorado River to occupy the former territory of the Halchidoma, who had been driven out of the area by the Mojave. In 1867, a group of Chemehuevi moved to the Oasis of Mara (then temporarily vacated by the Serrano as a result of a smallpox epidemic) after losing a battle to the Mojave. Other Chemehuevi remained along the Colorado River, although reports of crop raiding by the Mojave suggest that relations between the two groups were not always amicable (Laird 1976:23).

Although the Chemehuevi were never subjugated by the Spanish, their agricultural lifestyle predisposed them to take wage labor employment from Euro-Americans after the United States gained political control of the region. This led inexorably to acculturation of the Chemehuevi and modification of their native lifestyle. By the late 19th century at least some Chemehuevi were apparently dependent on the Euro-American economy for their livelihood (Parker 1980).
Historical Summary

The history of the monument and the surrounding region has been summarized by Greene (1983) and Parker (1980). Other historical works bearing on the monument include O'Neal (1957), Miller (1965), and Bagley (1978). A brief summary of important historic events will be provided here.

Cattle Raising

Some of the earliest Anglo-American settlers in the monument area were cattlemen. In 1873, the de Crevecoeur brothers ran cattle and sheep in Morongo Valley. In 1884, Mark Warren took over their ranch and excavated a well that served as an important focus of cattle operations for a number of years. In the monument itself, Bill McHaney began running cattle in 1879, and with the help of his brother reportedly operated a lucrative cattle and horse rustling ring. In 1905, C. O. Barker (shortly joined by partner Shay) began grazing in the western monument, using the area as winter range until 1923. William Keys homesteaded in the area of the McHaney ranch, filing for the land in 1916. He had begun working at the Desert Queen Mine as early as 1910, and took over the property in lieu of back pay in 1917. He also ran a small herd of cattle in the high valleys of the western monument.

About 1920, the Talmadge brothers also ran cattle in the western end of the monument, buying out Barker and Shay in 1925. The brothers were in turn bought out in 1926 by Katherine Barry, who ran cattle through 1936 (the year Joshua Tree National Monument was created). Several people continued to run cattle in the monument until 1940, when stockraising was eliminated within the monument boundaries (Keys continued to run cattle illegally, however). For a short time during World War II, grazing was again allowed for the war effort, but by the 1950s, population growth made it financially unfeasible to continue to raise cattle.
Mining

The first mining claim in the area was filed in 1865, but it was not until 1873 that mining began in earnest. The Oasis of Marah at Twentynine Palms was a center of mining activity because of its abundant supply of water. By 1873 two arrastra had been built near the oasis to process ore, and a stamp mill was opened in 1874. Most of the early mining claims were in the vicinity of the oasis, and were made part of the Twentynine Palms Mining District. The brief boom lasted until 1883, when finds in the Pinto Mountains drew miners eastward. The Dale Mining District was later formed in that area, and several important and lucrative mines were developed there. Mines in the Twentynine Palms District continued to be developed, and productivity was high during the 1890s and early 1900s. Sometime during this period the Anaconda Mine was developed. This mine, designated archeological site 4-SBR-4208, was investigated as part of the JOTR 85A project, so a more detailed account of its history of operations will be provided below. By about 1915, the increased cost of labor and materials made it less profitable to operate the mines. During the 1920s operating costs continued to increase while the price of metals was low; however, the Great Depression spurred mining activities during the 1930s, with reduced operating costs and a higher gold price. In 1936 the monument was created, and although no new claims could be filed, existing operations continued to operate. In 1942, all gold mining in the country was halted as part of the war effort. After World War II a few mines in the monument area reopened, but for most the expense proved to be too great, due to the high costs of rehabilitating and operating the mines, and a stable gold price. Despite this, much of the land containing mineral deposits was deleted from the monument when the boundaries were changed in 1950. Illegal uranium prospecting in the monument during the early 1950s proved unsuccessful.

The Anaconda Mine, part of the Twentynine Palms Mining District, was first documented in 1907, but "considerable work" had already been done on the mine by that date (Greene 1983:95), so it apparently was opened some time earlier. Bill McHaney told an interviewer (Joshua Tree National Monument Fact Files) that the mine was first worked by a person named Drinkwater, who was a member of the party that surveyed the San
Bernardino base line in 1855. This story may be the source of reports that the Anaconda was the first mine to be worked within the monument boundaries (Siebecher 1981; Joshua Tree National Monument Fact Files), but there are no documentary records of the Anaconda’s operation during the early period of mining in the Twentynine Palms District (that is, before the early 1880s; see Parker 1980, Table 1). In the same interview, McHaney stated that the Anaconda was later owned and worked by a man named Parks. The first documentary reference to the Anaconda was a 1907 article in the San Bernardino Daily Sun, which states that the mine was then owned by the Taylor-Sullivan Mining Company (Greene 1983:95). At the time, the owners were preparing to lease the claim to Edward MacDermott (of the Mohawk-Herald Mining Company) for a period of 5 years. Included in the lease were three mine claims, three mill sites, and a well. The same article states that a small two-stamp quartz mill was once present on the mine site. By 1908 a quartz mill was built at Twentynine Palms and was being managed by the Mohawk-Herald Company. This was described as a Bryan Roller Mill, and plans called for the addition of a cyanide leaching capability in 1910 (Greene 1983:95; see photo on page 99 of Greene’s report). This may be the Nissen and Bryan Roller Mill (with a water tower and cyanide tank) described by Tagg (1983:42), which was still standing in the 1920s.

By 1910 the Anaconda Mine had a 100-foot-deep shaft. E. J. Hunt, in a March 24, 1981, interview (Joshua Tree National Monument Fact File 1981) said that he was working at the Anaconda in 1910 when Edward McDermott was run out of town (Cripple Creek) for selling nonexistent mine stock.

Ownership of the mine apparently changed hands a number of times over the following years. In 1921, J. P. Rasmussen and Harry Thompson are listed as owners (Tucker 1921:345), but Sullivan seems to have regained title, as he is listed as owner in 1930 (Tucker and Sampson 1930:222). In 1953, E. N. Reimiller of Twentynine Palms is listed at the owner (Wright and others 1953:58).

In 1919, the Anaconda was visited by J. Smeaton Chase, who describes the "grouped shanties of a small mine." Water was obtained at Twentynine Palms, and the mine was being worked by two shifts, each comprised of three men. In 1922, the Anaconda Mine is described as
having an old shaft 185 feet deep, and 185 feet of tunnel (Newman 1923:265). At the same time, the Anaconda Gold Mine Company had been issued a permit to sell almost $12,000 worth of stock; however, by 1930 the mine was idle. Phil Sullivan, the mine's owner, had four claims on the property, with two shafts. The deepest was 185 feet, and the other was 100 feet deep. Apparently, the mine was reopened after 1930, because a 1953 report describes shafts with depths of 100 feet and 212 feet (Wright and others 1953:58; see also Simpson 1981:44). By 1953, the mine was again idle. In September of 1978, because of the hazards posed by the open shafts, the National Park Service filled the shafts with rubble and built a steel grate over one shaft at the northeast corner of the site.
Chapter 4
METHODS OF INVESTIGATION

Field Methods

The field methods used during the 1985 Joshua Tree Roads Testing and Survey Project were tailored to the specific types of resources under investigation during each phase of the project. The project was made up of three phases. The first phase included archeological survey of several previously unsurveyed areas, including roads, campgrounds and a proposed materials borrow pit. In the second phase, the historic period Anaconda Mine Site, 4-SBR-4208, was thoroughly recorded and sampled. Finally, test excavations were carried out at a prehistoric site, 4-RIV-1961. The methods used during each part of the investigations will be discussed in turn.

Survey

Archeological surveys were carried out in eight areas that are scheduled to be affected by construction. These included six campground areas, one unsurveyed road segment, and a washbed that is scheduled to be used as a materials borrow pit. These surveys consisted of close visual inspection of the ground surface by three archeologists walking parallel transects, 15 to 17 m apart, resulting in coverage of an approximately 50-m wide transect with each pass. Along the Indian Cove Campground access road, a 100-m wide transect on each shoulder of the road was examined. For all other roads, a 50-m wide area along each side was covered. Campgrounds were also surveyed using the roads as baselines: a 50-m wide transect on either side of each road within the campgrounds was examined. Finally, the materials borrow area in Pinto Wash was surveyed by examining a 50-m wide transect along each bank of the wash. Borrow activities may increase erosion, possibly affecting sites located within this zone.

When cultural material was found, the immediate area was carefully scrutinized to determine the extent and density of the remains. Isolated artifacts were not collected, except in the case of functionally or temporally diagnostic pieces. Artifact scatters.
features, and sites were recorded on appropriate forms, and diagnostic material was collected.

Investigations at 4-SBR-4208

Archeological site 4-SBR-4208, the Anaconda Mine, was investigated by thoroughly recording and mapping the features and artifact concentrations present on the site surface. First, an accurate plane-table map of the entire site was drawn in order to record the positions of archeological features and their relative locations. Next, each individual feature was recorded on a feature form, a process which included describing the attributes of the feature and those of any associated artifacts. In addition, each feature was mapped (using tapes) or photographed, or both. Finally, diagnostic material was collected from those features which had associated artifacts. No test excavations were carried out because the portion of the site to be affected by road reconstruction was found to lack significant artifact concentrations or features.

Test Excavations at 4-RIV-1961

Archeological site 4-RIV-1961 is a prehistoric site located on a knoll adjacent to Route 12. The present road cuts through the northeast portion of the site. Flaked stone debitage is abundant on the surface of the site. Manos, metates, and bone fragments were also found. Sherds were present, but they were confined to one small (8 m by 15 m) area of the site, which covers a total of approximately 15,000 square meters.

The first step in the investigations was the careful inspection of the northeast shoulder of the road. Close attention was paid to this area because road widening will be limited to the northeast shoulder, away from the main site area.

Next, an accurate map of the site was made using a plane table and alidade. Included on the map were elevational contours, the boundary of the artifact scatter, and the locations of the test pits that were eventually dug (see below). In addition, all artifacts found along the northeast shoulder of the road were plotted on the map, as were all ceramic artifacts recovered.
In order to gain a better understanding of the nature of the subsurface deposits, especially in the area adjacent to the road, a series of seven test pits was excavated at the site. One of these units measured 1 m by 2 m in size; the remaining test pits measured 2 m by 2 m. The locations of most of the test pits were randomly chosen, within certain constraints. Test Pit 1 was placed judgementally. The locations of Test Pits 2 and 3 were chosen randomly within a 10-m strip along the northeast shoulder of the road. Test Pit 4 was placed over bone and charcoal found on the surface. The locations of Test Pits 5 and 6 were randomly chosen to represent the dense, east-central portion of the site (Test Pit 5 was chosen from the area within grid coordinates N100 to 150, and E100 to 200; Test Pit 6 was chosen from between coordinates N150 to 200, and between grid line E100 and the road). The location of Test Pit 7 was chosen randomly to represent the western portion of the site, between grid coordinates N100 to 200, and E50 to 100. Test pits were excavated in quarters; unit levels were 10 cm in depth. All soil was screened through 1/8-inch-mesh screens, and given artifact classes (flakes, sherds, bone, and botanical remains) from each level were collected and bagged together. Features were mapped and photographed where encountered in test units, and soil samples were recovered for flotation.

Research Problems

Some of the research problems that guided the JOTR 85A investigations are outlined in an addendum to the project scope of work (Ervin 1985b). Because the extent of the ceramic period occupation of 4-RIV-1961 was not known prior to excavations, research problems specific to the ceramic period occupation of the southern California deserts were not included in that document. Therefore, research problems that are relevant to that topic have been added to the following discussion.

The purpose of the JOTR 85A project was twofold. First, it was necessary to determine the significance of the archeological resources that might be affected by construction. Significance is judged according to the criteria for nomination of properties to the National
Register of Historic Places (36 CFR Part 60), and is assessed in terms of the potential of a site to provide information important to prehistoric or historic archeological research. Second, it was necessary to evaluate the possible affects of construction activities on the resources. To do this, the site boundaries and the nature of the archeological resources had to be accurately determined. These data were then compared to information on the location and nature of the proposed construction activities. In short, the project was designed to provide management information to NPS personnel, and to project planners and designers working for the FHWA. This information will enable managers to make informed decisions in cases where cultural resources might be affected by road reconstruction.

In addition to providing management information, it is important that any information gained during the investigations be related to pertinent archeological research topics. Although nondestructive and minimally destructive methods of investigation were used whenever possible, the investigations necessarily resulted in some damage to the cultural resources. It is therefore imperative that all data derived from the investigation be applied to research topics relevant to the archeology of the southern California deserts. In order to do this, a series of research problems were delineated prior to data analysis. Although some degree of overlap exists, research problems can be separated into two groups dealing with prehistoric and historic archeological sites, respectively.

Prehistory

Five general prehistoric archeological research themes were abstracted from the archeological literature of the area. Within each theme, a number of specific research problems have been discussed in the literature. These five themes are: chronology, typology, adaptation of peoples to the desert environment, interregional relationships, and demography. Each will be discussed in turn.

Chronology. Despite the fact that archeological work has been carried out in the southern California deserts for over 50 years, we have as yet an imperfect understanding of the general sequence of
cultural occupation of the area. This is due in part to the fact that much of the archeological work was carried out long before the advent of radiocarbon dating, but may also be attributed in part to the nature of the archeological resources. Geomorphological conditions in the area have produced relatively few buried or stratified sites, and much of the previous archeological work in the area has involved surface manifestations, which are often extremely difficult to date. For these reasons, the precise temporal placement of specific cultural phases is uncertain, although for the most part, the relative sequence of phases is known.

Controversy has developed over the relative placement of the three ceramic period phases at the late end of the sequence. Specifically, the position of shouldered and redware vessels in the Patayan sequence is uncertain.

**Typology.** A number of typological issues have yet to be resolved. For instance, five distinct projectile point styles have been defined for the Pinto complex, yet we do not know whether these represent distinct temporal periods, regional variants, stylistic differentiation, or simply breakage and resharpening of points.

Typological problems also beset the study of the ceramic period assemblages of the area. Two separate typologies have been proposed to classify the Lower Colorado Buffwares, the first initially proposed by Rogers (1939, 1940) and refined by Waters (1982a), and the second proposed by Schroeder (1958). These typological problems are compounded by the chronological difficulties mentioned above.

**Adaptation to the Desert Environment.** Although our ability to accurately address basic chronological and typological issues remains limited, research into other areas of study has begun. The adaptation of cultural groups to the desert environment is a theme that frequently recurs in the archeological literature of the southern California deserts. Several specific research topics are subsumed under this general problem area, one of which is the study of prehistoric subsistence patterns.
Warren (1984:413, 419) has pointed out differences between the tool assemblages of early and late Archaic occupants of the desert, suggesting that the inhabitants of the area gradually developed more efficient technological means for exploiting desert resources. Through time, local populations came to rely more heavily on seeds and beans that required relatively sophisticated processing technologies.

The above approach uses indirect means to determine the subsistence patterns of prehistoric groups. Questions about subsistence could also be addressed directly, through the study of carbonized botanical remains. These might be recovered by flotation of soil samples from archeological features or from general midden contexts.

Another related topic is that of settlement patterns. For instance, many Pinto complex sites are small in size and include a limited range of artifact types. The Stahl Site, by contrast, has a deep midden deposit and is characterized by a wide variety of artifacts. It has been suggested that these differences may be due to functional variation between sites (with different activities being performed at different types of sites), although the observed pattern may also result from regional differentiation, or to mixture of earlier or later deposits with the Pinto material (Warren 1984:413). In Death Valley, Wallace (1977) describes both large campsites in lower-elevation areas and small sites at higher elevations during the subsequent Gypsum period. This pattern provides evidence for the scheduling of seasonal movements to exploit specific types of resources (Wallace 1977:121; Warren 1984:419). Questions about settlement patterns and adaptive strategies are pertinent because of known differences in these areas between the more nomadic Chemehuevi groups and the more sedentary Serrano and Cahuilla peoples. Moreover, the small testing or survey projects frequently carried out on NPS properties lend themselves to the study of site distributions.

Questions of environmental adaptation are often tied to evidence of past climatic fluctuations. Although our knowledge of the climatic sequence of the area (as discussed in Chapter 2) is imprecise, some hypotheses about the effect of specific climatic events on the area's human occupants have been developed. For instance, it has been proposed that the arid regions of southern California were (at least in part)
abandoned during the Altithermal (Wallace 1962), a period of relatively hotter and drier climatic conditions than today, which lasted from 7,100 to 5,800 years ago (Haynes 1968). Few well-dated sites are available to evaluate this proposal, which seems to have been based more on logical considerations than on substantive evidence (which was then and is still scarce).

Another important event in the region's climatic history was the desiccation of Lake Cahuilla, which occurred most recently at about A.D. 1500. Lake Cahuilla was a large body of freshwater that formed during periods when the Colorado River flowed into the Coachella Valley. The lake then dried up whenever the influx of water was interrupted. It has been suggested that the A.D. 1500 desiccation would have caused lakeside populations to disperse into the surrounding areas, a pattern which should be visible archeologically as an increase in population in the deserts. Again, archeological surveys like those often undertaken on NPS properties lend themselves to answering questions about dramatic changes in population through time.

Interregional Contact. A number of researchers have investigated the relationship between the southern California deserts and adjacent regions (see T. F. King 1975:35 for a brief summary). Contact with the west coast is seen in the presence of Haliotis and Olivella shell beads and ornaments. The presence of split-twig figurines at sites in the California desert also suggests that there was some kind of contact with the Southwest. White (1974) discussed political confederations between Native American groups inhabiting the California deserts and those in western Arizona. Other researchers have compared sites in the southern California deserts with those in the Great Basin and the Southwest with similar cultural assemblages; however, as Warren (1984:412) has noted, such comparisons are not necessarily valid, and relationships should be demonstrated rather than assumed.

Demography. The final prehistoric research topic that will be addressed is the study of demographic patterns. As mentioned above, the archeological record from the Joshua Tree area suggests a substantial increase in population some time after A.D. 1000. Jefferson (1971)
describes two processes that he feels may explain this expansion of population: (1) population growth along the coast, and budding of subpopulations into the deserts; and (2) the desiccation of Lake Cahuilla. Thomas F. King (1975:67) has proposed another model in which a period of relatively cooler and wetter climatic conditions before A.D. 550, together with an increasing reliance on acorns as a staple crop, resulted in sedentary village life and an increase in population, spreading eventually into the margins of the desert. The ensuing period of relatively hotter and drier conditions postulated by Bettinger (1975) would have induced these marginal populations to reorganize into smaller, nomadic groups, some of which would have moved into the deserts proper.

History

A series of research topics related to the investigations at the historic period Anaconda Mine were also established. These were abstracted from Teague (1980), Parker (1980), Greene (1983) and Simpson (1981). First, the age of historic features or materials will be ascertained, if possible. Also, the way in which sites are laid out in space and the functions of particular features will be established. Once these objectives have been accomplished, the information obtained can be used to address more involved topics, as described below.

Lifestyles. Artifacts associated with historic sites can be studied to obtain information about the lifestyles and economic patterns of the occupants. Such artifacts can yield information not normally available from historic records, and can tell us not only how early miners made a living, but also can be used to determine what kinds of food they ate, and some of the recreational activities that they favored. The study of internal site organization can also yield information on the lifestyles of the inhabitants.

Social Network. The kind of social network in which the site's inhabitants participated is another topic of interest. Specifically, it would be useful to try to determine the extent to which the inhabitants were part of contemporary urban society, or part of the frontier
society. One avenue by which this question may be approached is to examine the extent to which the occupants of a site were dependent on the outside world. Some equipment or supplies could only be obtained from elsewhere, whereas other resources were locally available.

A related question is the way in which occupants of historic sites were tied to the outside world. The Anaconda Mine is located only 5 miles from Twentynine Palms. Records indicate that miners relied on Twentynine Palms and other towns not only to refine the ore, but also for water, food, equipment, and other supplies. The relationship between the mine and local towns is an important research problem. The growth of the town of Twentynine Palms in relation to the Anaconda Mine, the procurement of supplies, and the extent of reliance on local versus imported resources are possible areas of investigation (Parker 1980: 39-72, 118; Greene 1983). A study of the assemblage of glass and metal food and beverage containers found on the site might yield information on sources of supply, as embossed markings sometimes record the place of manufacture of the artifact.

Mining Technology. Information on technology and technological change will also be explored, where possible. Changes occurred in mining technology between the turn of the century and World War II, and different areas within the Anaconda Mine site may reflect those changes. Associated diagnostic artifacts found in different site areas could be used to date specific features, so that possible technological changes could be explored.
Chapter 5
FIELD INVESTIGATIONS

This chapter describes the field investigations carried out as part of the 1985 Joshua Tree Road clearance project. The chapter is divided into three parts. The first is a description of several small archeological surveys that were carried out in areas to be affected by construction. The second section of the chapter recounts the test excavations at 4-RIV-1961. In the third section, the investigations at the Anaconda Mine Site, 4-SBR-4208, are described.

Survey

Archeological surveys were carried out at several campgrounds and along sections of secondary roads that were not surveyed as part of the 1979 road project (Simpson 1981). No archeological sites were found, although several artifact scatters and features were located. Surveyed areas may be affected by one of several phases of construction, as outlined in Table 1. The following section organizes the archeological surveys according to construction phases planned for specific fiscal years.

Fiscal Year 1985

Five areas were investigated as part of Fiscal Year 1985 road construction. One of these areas is a series of three hazardous curves along Route 12, just south of the Twentynine Palms entrance, where the road cuts through the Anaconda Mine, 4-SBR-4208. The investigations associated with this site are described later in this chapter. The second area investigated was a 9.3-km (5.8 miles) stretch of Route 11 between the Cottonwood area and the south entrance (Fig. 3). This area was surveyed in 1979, resulting in the discovery of two archeological sites within the proposed construction right-of-way (4-RIV-1949 and 4-RIV-1951; Simpson 1981). These two sites were reexamined during the 1985 project. The remaining three areas--Indian Cove Campground, the Cottonwood Campground, and the Pinto Wye Wash--had
Figure 3. Cottonwood Pass, showing the main area of Fiscal Year 1985 (Phase II) construction. Note the locations of archeological sites 4-RIV-1949 and -1951, artifact scatters 85A-4 through 85A-7, and materials borrow area.
not been previously surveyed. The Pinto Wye Wash, also known as the County Wash, will be used as a materials borrow source.

Fiscal Year 1985 roadwork will include straightening an unsafe curve along the Indian Cove Campground road, Route 212 (Fig. 4). The campgrounds proper and the remainder of Route 212 will be reconstructed as part of Fiscal Year 1990 roadwork. As part of the 1985 Joshua Tree road clearance project, all of Route 212 (including both the access road and the roads within the campgrounds) was inspected. The areas along the road were surveyed using the methods outlined in Chapter 4, with one exception; along the main access road, a second transect was walked adjacent to the first, so that a corridor measuring 200 m wide by 3.2 km long was surveyed (100 m on each side of the road). A corridor 5.8 km long was surveyed within the campground proper. A total of six person-days were spent surveying the Indian Cove area. Although occasional isolated artifacts were noted, no new archeological sites were found, but several sites originally found during a 1964 survey of the Indian Cove Campground area were relocated (Fig. 4).

The Cottonwood Spring Road, the road to the Cottonwood maintenance area and NPS housing facilities, and the Cottonwood Spring Campground (all designated Route 204) will also be rebuilt as part of Fiscal Year 1985 construction (Figs. 3 and 5). A corridor measuring 100 m wide was surveyed along the 1.6-km-long (1 mile) Cottonwood Spring Road. A 0.3-km-long corridor of the same width was surveyed along the road to the maintenance/housing area, and a corridor measuring 0.5 km long was inspected along the roads within the Cottonwood Spring Campground. Two person-days were spent surveying this area. A number of isolated artifacts were noted in different portions of the survey area, and four small artifact scatters were discovered. One of these (JOTR 85A-4), located in the campgrounds, appears to have been redeposited by slopewash. As such, it is of minimal significance and can add little to our understanding of area prehistory. The second locality (JOTR 85A-6) is a moderate-density scatter of cortical flakes and cores on a ridge near the maintenance yard. Ten of 12 flakes observed have cortex on the exterior surface. All are large (more than 5 cm in maximum dimension) and are composed of materials available in the immediately vicinity.
Figure 4. The Indian Cove campground area, showing two relocated sites originally discovered during 1967 survey (Kritzman 1967).
Figure 5. A portion of the Cottonwood Spring Road (Route 204), showing the three artifact scatters found around the NPS housing and maintenance area.
such as quartzite, rhyolite, and quartz. This scatter probably represents lithic resource procurement activities.

Several pieces of flaked stone debitage were found behind (south of) the southernmost structure within the NPS housing area. These artifacts are located on the floodplain of a tributary of the Cottonwood Spring drainage, in an area where housing construction has caused relatively severe erosion. Buried material is also present at this site, as demonstrated by the discovery of Tizon Brownware sherds in a garden plot. Although available information is insufficient to properly assess the significance of JOTR 85A-5, it is possible that more extensive buried deposits are present. Landscaping carried out during the construction of NPS housing may have destroyed some of the site. During landscaping, the area behind each structure was built up, creating terraces in each yard that are about 0.5 m high. Fill used to build up these platforms was probably scraped from nearby areas. In addition, ongoing erosion in the area east of the landscaped, turf-covered yards is a continuing source of disturbance.

The last archeological manifestation found in the Cottonwood area is a rock ring (JOTR 85A-7) located about 24 m west of the road leading to the NPS housing area. It is about 1 m by 2 m in size and is constructed of quartz and granitic cobbles. Several rhyolite flakes, all from the same core, were found within the ring.

Two localities will be used as materials borrow areas throughout the several phases of road reconstruction in Joshua Tree. One of these, Cottonwood Canyon, was intensively surveyed as part of the JOTR 79A project (Simpson 1981), and no additional survey was undertaken in this area. The second borrow area is a portion of the Pinto Wye Wash (also known as the County Wash), which runs north out of the Pinto Mountains, paralleling Route 12 (Fig. 6). This wash forms an alluvial fan that overlooks the Twentynine Palms Visitors Center and the Oasis of Mara. Both banks of the wash were surveyed for a distance of almost 3 km (1.5 miles). Three person-days were spent on the survey, and an historic period feature (JOTR 85A-8) was found. This rectangular rock feature, which measures 3 m by 4 m, may represent a tent platform (Fig. 6). Only two artifacts were present in the vicinity. The first is a small piece of galvanized sheet metal measuring 20 cm by 20 cm. The
Figure 6. The area around the Twentynine Palms entrance to the monument, showing archeological site 4-SBR-4208 (the Anaconda Mine), JOTR 85A-8, and the Pinto Wye borrow area.
second, which was collected, is a Snider's catsup bottle with a metal screw-on cap still in place. It was manufactured on a fully automatic bottle machine, as indicated by the screwtop finish and seams that extend to the lip. Fully automatic bottle machines were first patented in 1902, and by 1920 had taken over the bottling industry (Teague 1980). The bottle is sun-turned amethyst, demonstrating that manganese is present in the glass. This indicates a date of manufacture before about 1920, since manganese use was discontinued after shipments were embargoed by Germany during World War I. The bottle was thus manufactured between about 1902 and 1920.

The major portion of Fiscal Year 1985 road construction will be along Route 11 between the Cottonwood Visitors Center and the south entrance (see Fig. 3). Two numbered archeological sites are located adjacent to the road between these points, 4-RIV-1949 and 4-RIV-1951. Both of these sites will be affected by road reconstruction. On two separate occasions during the 1985 fieldwork, WACC archeologists walked over these sites. Only very sparse scatters of cultural material were observed; artifacts were found to be both few in number and widely scattered. At 4-RIV-1949, extremely low numbers of artifacts were found, estimated at one artifact every 200 to 300 linear meters. Somewhat greater numbers of artifacts were observed at 4-RIV-1951, but absolute artifact density is still very low (about one artifact every 50 linear meters, with a total of about a dozen artifacts observed over an area measuring about 500 m by 20 m). In both cases, the surface examination suggests that the artifacts have been redeposited from areas upstream. No evidence was seen at either site to indicate that the materials are in primary context, and they do not appear to represent cultural activities carried out within the defined site boundaries. As such, there is little likelihood that either site has the potential to yield significant information about the prehistory of the area. No subsurface investigations were undertaken at either locality.

**Fiscal Year 1986 and Later**

Archeological surveys were carried out in four areas that may be affected by Fiscal Year 1986 construction (Fig. 7). These include three campgrounds located along the portion of Route 12 that is part of the
Figure 7. The Queen Valley area, showing the main portion of Fiscal Year 1986 (Phase III) construction. Note the location of archeological site 4-RIV-1961, and artifact scatters JOTR 85A-1, -2, and -3.
planned construction (Jumbo Rocks Campground, Route 203; Sheep Pass Campground, Route 211; and Ryan Campground, Route 209) and the Split Rock Road (Route 200). In addition, two areas that were previously reconstructed as part of Fiscal Year 1984 roadwork, the White Tank Campground and Belle Campground, were briefly inspected. Finally, the Hidden Valley Campground roads, Routes 207 and 208, were surveyed. These roads will be rebuilt as part of Fiscal Year 1987 construction.

Along the Split Rock Road, a transect 25 m wide by 1 km (0.6 mile) long was inspected on either side of the road. The survey took about 0.1 person-day and no cultural material was found.

A corridor with a width of 100 m was surveyed at the Jumbo Rocks, Sheep Pass, and Ryan campgrounds. Two artifact scatters were located.

JOTR 85A-3 is a scatter of five Lower Colorado Buffware sherds found within the traffic circle at the center of the Sheep Pass Campground. All of the sherds were collected. Four of the five have mopped surfaces, and they may represent a single vessel. The sherds are tempered with subangular quartz fragments averaging about 0.5 mm in diameter. Michael Waters and Robert Euler each identified the sherds as examples of Parker Buff.

JOTR 85A-2 is a scatter of several flakes and a potsherd found in the Jumbo Rock Campground. No artifacts were collected. The scatter is located in a heavily used portion of the campground, and has probably been extensively disturbed by camping activities. The highly accessible location of JOTR 85A-2 also makes it vulnerable to relic hunting, which may have affected the surface artifact density.

Several isolated artifacts were also observed at Jumbo Rocks Campground, including two projectile point tips that were both collected (Fig. 8a, b). The point tips were both found in flat, sandy areas between the dense rock outcrops, and their presence suggests that hunting was one activity conducted in and around the monzogranite boulder outcrops in the Joshua Tree area.

Several other campgrounds were also surveyed for cultural material. The areas alongside the Belle and White Tank Campground roads (which were already resurfaced as part of Fiscal Year 1984 construction) were briefly inspected. A very low density artifact scatter was found at
Figure 8. Flaked stone artifacts recovered during archeological surveys. (a) Isolated chert projectile point tip found at the Jumbo Rocks Campground; (b) isolated quartzite projectile point tip found at the Jumbo Rocks Campground; (c) jasper projectile point tip found at historic period site 4-SBR-4208; (d) obsidian Humbolt series projectile point, possibly Humbolt Basal Notched, which was found at site 4-RIV-1964 during the 1979 survey (Simpson 1981); this point was found to be manufactured of obsidian from the Coso Hot Spring source, located south of Owen's Lake (see Appendix 5); (e) chert side-notched projectile point fragment found at historic period site 4-SBR-4208 during the 1979 survey (Simpson 1981); and (f) chert biface fragment found at the White Tank Campground, part of artifact scatter JOTR 85A-1.
White Tank (JOTR 85A-1). This scatter consists of a chert biface fragment (Fig. 8f), two quartz flakes, and a possible glass scraper.

Hidden Valley Campground was also inspected. The Hidden Valley Campground roads, Routes 207 and 208, will be reconstructed as part of Fiscal Year 1987 construction work. No cultural material was found there. At this point, only one campground within Joshua Tree National Monument remains unsurveyed: Black Rock Canyon, at the western end of the monument.

Investigations at 4-RIV-1961

Site Description

Archeological site 4-RIV-1961 is located along the portion of Route 12 scheduled for Fiscal Year 1986 constructions (Figs. 7, 9, and 10). It is a moderate-sized scatter of mostly lithic artifacts, located on the gently sloping side of a low, sandy hill. The elevation is about 1,360 m (4,460 feet) above sea level. The site is at the northern end of Queen Valley, which is one of the higher-elevation valleys at the western end of the monument, lying between the Little San Bernardino and Pinto mountains. As previously noted, Queen Valley was formed by the erosion of less resistant rock formations, not by faulting. The underlying bedrock is the White Tank monzogranite, a granitic batholith that formed when subsurface molten rock solidified. When exposed to weathering, the monzogranite decomposes to quartz sand, leaving a thin layer of sediments overlying the bedrock.

Queen Valley is a pediment, a gently sloping surface formed by erosion and exposure of bedrock (rather than by deposition of sediments). To the south and west of the site, the terrain of Queen Valley proper is relatively featureless. The gently undulating plain is broken only by low, sandy hills and small rock outcrops (inselbergs), and the valley floor is covered with a thin sandy mantle of decomposed granite. In contrast to this, a series of boulder outcrops make up the terrain immediately to the east of the site. These outcrops, which rise sharply above the valley floor, mark the northeast edge of Queen Valley. They too are composed of monzogranite, but with fewer of the joints that allow water to seep in and begin the process of weathering.
Figure 9. Contour map of 4-RIV-1961, showing the relationship between cultural materials and the existing road alignment.
These infrequent joints have formed large rectangular blocks of monzogranite, the corners of which weather smooth, leaving stacks of rounded boulders piled atop one another.

The site is thus located in an area of geological transition. On the site proper, and to the south and west, is the gently sloping pediment of Queen Valley. Just a short distance east of the site is an area of greater relief. Here, low bedrock ridges outcrop, and gullying has cut channels between the outcrops. Half a kilometer farther east, the bedrock rises up to form low hills. The channels cut across the hills and into a lower elevation valley to the east, where the Pinto Wye is formed by the intersection of Routes 11 and 12.

The vegetation community in the site area is the Southwestern Desertscrub formation, also classified as the Lower Sonoran life zone under Merriam's (1898) system. More specifically, it is part of the Joshua tree association-type. Leary (1977) mapped a Mojave Yucca-Joshua tree-Blackbush (Yucca schidigera-Y. brevifolia-Coleogyne ramosissima) association in the locale encompassing the site. Subdominant taxa in the area include California juniper (Juniperus californica), creosote bush (Larrea tridentata), scrub oak (Quercus turbinella), saltbush (Atriplex canescens), Mormon tea (Ephedra nevadensis), buckwheat (Erogonum spp.), Haplopappus spp., galleta grass (Hilaria rigida),

Figure 10. Photograph of 4-RIV-1961, looking southwest.
cheesebush (*Hymenoclea salsola*), ratany (*Krameria* spp.), wolfberry (*Lycium andersonii*), various cacti (*Opuntia* and *Echinocereus* spp.), bladder-sage (*Salazaria mexicana*), and cottonthorn (*Tetradymia spinosa*). Pinyon pine (*Pinus monophylla*), although not found in the immediate vicinity, does occur in the mountains a short distance to the north.

Site 4-RIV-1961 is a moderate-density scatter of mostly lithic artifacts. It is situated on a low ridge of eroded monzogranite, and covers an area of about 16,000 square meters (Figs. 9 and 10). A light scatter of artifacts is present on the ridge crest, extending down the northwest flank of the ridge, but most of the artifacts are concentrated in a hollow on the southeast flank. A mantle of light brown sand up to 50 cm deep covers much of the site. In the central portion of the site the soil appeared to have a slightly higher organic content than the natural desert soil, but the differences were too slight to call this a midden soil. Erosion has stripped away the soil from the portion of the site that lies between Test Pits 5 and 7 on Figure 9. Erosion has also exposed previously buried cultural material in this area, so there is a higher density of artifacts here than in other portions of the sites. The artifacts exposed in this area are larger on average than those found elsewhere on the site; the smaller pieces (those less than about 5 cm in maximum dimension) have apparently been removed by sheetwash and gullying.

Almost all artifacts on the site are pieces of flaked stone, only a few of which are retouched. The debitage is composed of a wide variety of material types, including quartzite, quartz, chert, jasper, chalcedony, and igneous materials. The abundance of quartz, which is somewhat unusual, is explained by the fact that this material outcrops near the site as part of the monzogranite formations.

Only 16 sherds were found on the site surface, 15 of which were part of a single Parker Buff potbreak (the remaining sherd could not be identified as to type because of its eroded condition). In contrast, pieces of flaked stone on the surface numbered in the hundreds. Although an exact count of lithic artifacts was not made, it is estimated that 500 to 1,000 flakes were present. Ceramic artifacts are therefore estimated to constitute no more than about 3 percent of the total surface assemblage.
The low relative frequency of sherds is in marked contrast to the surface assemblages at most of the other archeological sites in the monument, which are commonly dominated by ceramic artifacts. Of 13 prehistoric sites found on the 1979 survey, only three others had assemblages with less than 65 percent ceramic artifacts (Table 4).

Table 4
FREQUENCIES OF CERAMIC ARTIFACTS IN ASSEMBLAGES FROM JOSHUA TREE NATIONAL MONUMENT SITES

<table>
<thead>
<tr>
<th>SITE</th>
<th>RELATIVE</th>
<th>ABSOLUTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-RIV-1959</td>
<td>74</td>
<td>17/23</td>
</tr>
<tr>
<td>4-RIV-1938</td>
<td>100</td>
<td>15/15</td>
</tr>
<tr>
<td>4-RIV-1960</td>
<td>1</td>
<td>2/152</td>
</tr>
<tr>
<td>4-RIV-1961</td>
<td>0</td>
<td>0/14</td>
</tr>
<tr>
<td>4-SBR-4208</td>
<td>94</td>
<td>30/32</td>
</tr>
<tr>
<td>4-RIV-1964</td>
<td>5</td>
<td>3/65</td>
</tr>
<tr>
<td>4-RIV-1954</td>
<td>100</td>
<td>13/13</td>
</tr>
<tr>
<td>4-RIV-1944</td>
<td>65</td>
<td>55/85</td>
</tr>
<tr>
<td>4-RIV-1945</td>
<td>81</td>
<td>22/27</td>
</tr>
<tr>
<td>4-RIV-1947</td>
<td>73</td>
<td>40/56</td>
</tr>
<tr>
<td>4-RIV-1940</td>
<td>6</td>
<td>5/80</td>
</tr>
<tr>
<td>4-RIV-1950</td>
<td>71</td>
<td>125/175</td>
</tr>
<tr>
<td>4-RIV-1963</td>
<td>100</td>
<td>5/5</td>
</tr>
</tbody>
</table>

Of these, one (4-RIV-1960) is a small lithic scatter located several hundred meters north of 4-RIV-1961, and probably related to it. Another site, 4-RIV-1964, yielded an obsidian Humbolt series projectile point (Fig. 8d) diagnostic of the preceramic Gypsum period. The third site, 4-RIV-1940, is a small scatter of predominantly lithic artifacts in the Hidden Valley area. The distinct artifact assemblages of these four sites may be indicative of either specialized activities, or of occupation largely during the period predating the appearance of ceramics.
Groundstone artifacts were also noted on the surface at 4-RIV-1961. Two metate fragments and a mano were observed during the JOTR 85A project (only the mano was collected). Two other complete grinding slabs and a metate fragment were found during excavations. Members of the 1979 survey crew reported five whole and fragmentary metates at the site.

Bone fragments are scattered in small quantities across the site surface. Most of the 10 fragments collected from the surface could not be identified, but several were complete enough to be recognized as the remains of (nonhuman) animals of unknown taxa (Appendix 2). Unidentified bone fragments (some of them again from unknown faunal species) were later found in two of the test pits.

The osteological analysis also established that several bone fragments found on the surface were human (Appendix 2). An excavation unit placed in the area of these bone fragments revealed a pit that was eventually determined to be a primary cremation, associated with a partially reconstructable Lower Colorado Buffware vessel. Other features identified at the site were a small cluster of cobbles found on the surface and an enigmatic rock feature of unknown age, which will be described more fully below.

Field Procedures

The first step in the investigations was to establish a grid system at the site. The grid system was aligned towards magnetic north. Using an engineer's transit, north-south and east-west grid lines were laid out, with steel reinforcement bars set into the ground every 20 m.

After establishing the grid, a plane table and alidade were used to accurately map the site. Elevational contours were plotted using a contour interval of 0.5 m. The road (Route 12) that cuts across the northeast edge of the site was also mapped. Next, the approximate limits of the slightly more organic soil in the central portion of the site were added to the map. Finally, the limits of the artifact scatter were defined. A small number of artifacts were observed beyond the limits plotted on Figure 9, but these are few in number and widely scattered.
While defining the artifact scatter, special attention was paid to the area northeast of the road, as this area will be affected to a greater extent by the proposed construction work. Here, surface artifacts were first located by the archeologists, who walked parallel to the northeast shoulder of the road at an interval of 5 m to 7 m. All artifact locations were plotted on the site map before they were collected. The artifact density was less on this side of the road than in the main site area. All ceramic artifacts found on the surface were also point-provenienced and collected (see Fig. 9).

The next step in the investigations was the excavation of a series of seven test pits. These excavations were designed to provide information on the nature and depth of the cultural deposits. The first test pit, 1 m by 2 m in size, was judgamentally located in the area northeast of the road. The other six test pits were all 2 m by 2 m in size. The locations of five of these were randomly chosen (see Chapter 4), while the remaining test pit was judgamentally placed over a concentration of bone and charcoal.

Three test pits were excavated northeast of Route 12, in the area that will be affected by the proposed construction work. This area is dissected by numerous small wash channels, separated by low outcrops of granitic rock. Test pits were excavated down to bedrock, which occurred from 6 cm to 33 cm below surface. Subsurface artifact densities were low in this area, substantiating the impression given by surface observations. Cultural materials from these three test pits include one flake found in Test Pit 3 and six flakes found in Test Pit 2. No artifacts were recovered from Test Pit 1.

Four additional test pits were excavated southwest of the road. The locations of three of these units were randomly chosen, using the procedure outlined in Chapter 4. The fourth test pit was placed over what turned out to be a cremation, described below. Relatively high densities of lithic artifacts were found in two of the three random units. The third test pit (Test Pit 7), located at the northern end of the site, was very shallow and yielded only a few flakes before reaching bedrock. It also produced two complete grinding slabs, possibly cached there by former inhabitants of the site.
Excavations were also carried out around a cluster of large (15 cm to 40 cm) granite cobbles called Feature 5, which was found northeast of the road, outside the limits of the artifact scatter (Figs. 9 and 11). The rock feature seems to be of human origin, since the sandy soil in the area does not normally contain loose cobbles, but its function could not be determined. The area around the rocks was excavated to expose the feature, and the soil was screened, but no artifacts were found. For this reason, it is not known whether the feature is part of the Native American occupation of the site, or whether it is an historic period Euro-American feature that postdates the main occupation of the site. This feature might represent rocks placed around the foot of a small structure or windbreak, but its irregular shape argues against this interpretation. It is also possible that the feature is analogous to an intaglio (although it is not made on a desert pavement surface), but its shape is not suggestive of either naturalistic or zoomorphic forms, common subjects of intaglios in southeastern California.

Another feature, a small rock cluster about 50 cm in diameter, was found on the surface near the site center. The rock cluster may represent the remains of a small hearth.

Test Pit 4 was located over what turned out to be a cremation. Situated in the central portion of the site, Test Pit 4 was placed in an area where charcoal and burned bone were exposed on the surface. Excavation of the test pit showed that this material had been brought to the surface by a burrowing rodent. The source of the charcoal and bone was an oval pit, 120 cm long by 90 cm wide, which was subsequently determined to be a primary cremation (this feature was not recognized as a human interment while excavations were in progress). The south half of the excavation unit contained burned bone, charcoal, sherds, and lithic artifacts in substantially higher concentrations than the north half, but no pit outline could be discerned during excavation of the first three levels (from 0 cm to 30 cm below surface). In Level 3 a large sherd was found, part of a subsequently-restored Patayan vessel, and bone fragments became more common. When excavations reached 40 cm below surface, a distinct difference was noted in the soil, which changed from a tan sand (indistinguishable from the surrounding matrix, except for the presence of occasional charcoal and bone fragments) to a
Figure 11. Rock alignment of unknown function (Fea. 5) found at 4-RIV-1961. (a) Pre-excavation photo showing sediment accumulation and vegetation covering the feature; and (b) rock alignment after excavation.
dark gray ash (Fig. 12). The edge of the pit could be delineated by a ring where the sand had been burned to a brick red color.

![Image of pit outline](image)

**Figure 12.** Primary cremation (Feature 6), showing the pit outline.

Initially, it was thought that the bone fragments recovered from the pit represented the remains of a large animal, possibly a mule deer; however, during excavation of Level 4 (30 cm to 40 cm below surface), a number of burned teeth were recovered. These teeth appeared to be human, so excavation of the feature was halted. After mapping and photographing the pit, the unit was backfilled.

Analysis of the bone material recovered from the pit showed that most of it is human (see Appendix 2). It represents the remains of a single adult individual cremated within the pit. Several fragments from at least two desert tortoise shells were also placed within the crematory pit, perhaps as an offering. Although no evidence of modification was seen, it is possible that the shells were used as rattles. A small ceramic vessel (Fig. 13) was also broken and placed in the pit. A few of these sherds were burned, but the majority were not,
suggesting that it was broken and thrown into the pit after the fire had died down.

Ceramic Assemblage

The vessel from Feature 6 is a small jar, about 14 cm in diameter. It was tempered with large particles of subangular, white and gray quartz sand, with pieces of biotite mica. The paste is granular in texture and is a reddish-orange color. A small proportion of the temper particles protrude through the surface of the vessel. The surface is tan in color and is covered with a scum, which in places is exfoliating. No striations due to mopping are present on the surface. The vessel walls are quite thin toward the base (about 3 mm), but are considerably thicker around the neck (up to 6 mm). A single recurved rim sherd appears to be part of the same jar, although it did not fit onto the reconstructed vessel.

A total of 47 sherds was recovered from Test Pit 4. Thirty-two were pieced back together to form the reconstructed buffware vessel. The remaining 15 could not be attached, but similarities in temper and surface treatment show that they are part of the same vessel.

Robert Euler examined the vessel and identified it as Pyramid Gray (Colton 1939). This type, although classed by Schroeder (1958) as one
of the Lower Colorado Buffwares, is thought to have been centered in the Barstow area, about 120 km (77 miles) northwest of Twenty-nine Palms, and well outside the Colorado River Basin. It was dated to between A.D. 900 to 1150 at the Willow Beach Site (Schroeder 1961), and Waters (1982b) places his synonymous type Topoc Buff between A.D. 1000 and A.D. 1400.

Michael Waters also examined the vessel, but came to a different conclusion. Waters reported that it resembles brownware ceramics recovered from sites around La Quinta in the Coachella Valley. Factors cited in this identification include the presence of a granular paste typical of upland clays of granitic origin, and the use of tempering material characteristic of granitic areas. Waters classes these ceramics as a type of Tizon Brownware, although he notes that this type is thinner and harder (and was fired at a higher temperature) than typical examples of Tizon Brownware.

A sample of wood charcoal from the cremation pit was sent to Washington State University for radiocarbon assay, and dated to 200 years B.P. ± 90: WSU 3266 (A.D. 1750 ± 90). When calibrated by means of the procedure outlined in Klein and others (1982), this yields an interval of A.D. 1485 to 1950, or about A.D. 1720 ± 230 at the 95 percent level of probability. This is considerably more recent than anticipated, since Pyramid Gray is alternately dated to between A.D. 900 and 1150 (Schroeder 1958), or A.D. 1000 and A.D. 1400 (Waters 1982b; dates for Topoc Buff). The date suggests either that Pyramid Gray was manufactured for a longer period than previously believed, or that the vessel is not Pyramid Gray, but is a brownware manufactured into the historic period.

As previously mentioned, 16 other sherds were recovered from the surface of 4-RIV-1961. Fifteen of these (as well as two sherds found during the 1979 survey) were recovered from an area measuring 10 m by 25 m, and were part of a single vessel identified as Parker Buff. Most of the sherds (9 of 16) have prominent striations from mopping the surface. Color ranges from buff to gray, and temper particles are subangular grains of translucent white quartz sand.

The remaining sherd found on the surface of 4-RIV-1961 is badly eroded and could not be identified as to type. The temper particles
are subangular to angular grains of feldspar, opaque white granitic quartz, and a black mineral, possibly hornblende. Size of the particles varies widely, ranging from 0.2 mm to 2.5 mm.

Groundstone Assemblage

Three groundstone artifacts were recovered during excavation at 4-RIV-1961: two grinding slabs from Test Pit 7, and a grinding slab or metate fragment from Test Pit 4. A two-sided mano was collected from the surface, and two other groundstone artifacts, a whole and a fragmentary grinding stone, were observed on the site surface. Members of the 1979 survey crew recorded five metates or metate fragments. One of these appears to be the whole grinding slab observed during the 1985 field season. Four were not relocated, and they may have been moved or illegally collected.

The two whole grinding slabs from Test Pit 7 are both unshaped, tabular pieces of rock with light to moderate grinding on a single surface. One of the slabs, which is about 2.5 cm to 5 cm thick, is made of granodiorite. Outcrops of the Gold Park diorite, which may be the source of this piece, are located to the north and east. This specimen exhibits light grinding on one surface. The second slab is a piece of monzogranite about 3 or 4 cm thick. Grinding has formed a shallow depression on one surface. The grinding slab or metate fragment from Test Pit 4 is a thick (7 cm) chunk of monzogranite with grinding on both surfaces.

The mano found on the surface is a two-sided mano measuring 5 cm in thickness. It is circular in outline (measuring 10-cm by 11-cm in diameter), and appears to have been shaped to a limited extent. Moderate to heavy grinding is present on both surfaces.

The groundstone assemblage from 4-RIV-1961 resembles those from both the Pinto Basin Site (Campbell and Campbell 1935) and the ceramic period Squaw Tank Site (Wallace and Desautels 1959). The groundstone assemblages of all three sites include milling stones made of natural slabs of locally available materials, with lightly to moderately ground surfaces. Most handstones from the Pinto Basin and Squaw Tank sites are stream cobbles with a convex, ground surface on one face, but a few bifacial handstones were also found at both of these sites.
Flaked Stone Assemblage

Flaked stone artifacts make up the majority of the assemblage from 4-RIV-1961. A total of 216 lithic artifacts was recovered by excavation. Fourteen pieces of debitage found on the surface were also included in the lithic analysis, as they were collected without bias as part of a 100 percent sample of artifacts from the northeast side of the road.

The lithic analysis was patterned after a procedure developed by Rozen (1979, 1981) and Sullivan (Sullivan and Rozen 1985). A simplified version of the procedure was used for the JOTR 85A project. In this version, the first attribute recorded for each piece was artifact type, for which six categories were established. These are whole flakes, proximal fragments, distal or medial fragments, shatter, cores and retouched pieces. Next, the size of the artifact was calculated. Length, width, and thickness were measured on whole flakes. For all other artifact types, an estimate of the area was obtained by comparing the artifact to a series of nested squares representing consecutive size classes (Huckell 1984:96). Material type was recorded for all artifacts. Striking platform type was recorded for whole flakes and proximal fragments, as were the presence or absence of grinding on the striking platform, and the presence or absence of lipping. Finally, the presence or absence of cortex, patination, and microflaking were recorded. Artifacts with flaking along the margins were separated and subjected to additional observations as part of the retouched piece analysis. Attributes observed during this stage of analysis included material type and retouch type. Based on formal attributes of the artifacts, they were then assigned to one of several categories of retouched piece type.

Retouched Pieces. Only nine retouched pieces were recovered from 4-RIV-1961 during the JOTR 85A project. Three of these are quartz biface fragments, which are very crude, but which exhibit unmistakable signs of bifacial reduction (Fig. 14a-c). All three appear to have been broken in manufacture, and they were probably never used.
Figure 14. Flaked stone artifacts recovered during excavations at site 4-RIV-1961. (a) Quartz biface fragment from surface; (b) quartz biface base fragment from surface; (c) quartz biface fragment from surface; (d) jasper biface fragment from surface, possibly point base or ear fragment; (e) silicified limestone projectile point tip found during 1979 survey (Simpson 1981); (f) chert scraper from Test Pit 4, Level 4; and (g) quartzite unifacial core or scraper plane from surface.
A jasper biface fragment (Fig. 14d) was found on the surface, about 40 m east of the boundary of the artifact scatter as shown in Figure 9. This may be a projectile point fragment, possibly a point ear or base fragment, but it is too small to be positively identified.

Another biface fragment was found on the surface of 4-RIV-1961 by the 1979 survey crew (Fig. 14e). This is a biface tip of black silicified limestone, possibly a fragment of a projectile point.

A chert scraper was the only retouched piece recovered from below the surface (Fig. 14f). It was found in Test Pit 4, Level 4, and may be associated with the cremation feature. It has been retouched around the entire perimeter.

A rhyolite flake found on the surface has unifacial damage along one margin. Two episodes of edge damage are present, one on the interior flake surface and one on the exterior surface. The damage could be due to use, intentional retouch, or to accidental factors such as trampling.

The remaining two pieces that exhibited flake removal scars are cores. The first is a unifacial core of quartzite (Fig. 14g). Some researchers have referred to artifacts of this kind as scraper-planes. The second is a quartzite core fragment.

**Debitage Analysis.** Information on the characteristics of the flaked stone assemblage from 4-RIV-1961 is presented below. In order to provide limited comparative data, information from several other archeological sites in California is also presented. The latter sites were chosen because they were investigated using the same standards that guided the JOTR 85A artifact analysis, and can be easily compared to the data from 4-RIV-1961.

Table 5 shows the frequencies of the various artifact types from 4-RIV-1961 and several other sites. The low proportion of cores and retouched pieces is immediately apparent. Only four such artifacts are part of the randomly collected assemblage (the remaining five retouched pieces were nonrandomly collected). Given the hundreds of pieces of flaked stone debitage littering the surface of the site, the proportion of retouched pieces is extremely low.

Table 6 lists the frequencies of material types found at 4-RIV-1961. Quartzite is the most common material, and
Table 5
FREQUENCIES OF ARTIFACT TYPES FROM SITES IN THE MOJAVE DESERT

<table>
<thead>
<tr>
<th>ARTIFACT TYPES</th>
<th>WHOLE FLAKES</th>
<th>PROXIMAL FRAGMENTS</th>
<th>DISTAL/MEDIAL FRAGMENTS</th>
<th>SHATTER</th>
<th>CORE</th>
<th>RETOUCHED PIECE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-RIV-1961</td>
<td>28% (63)</td>
<td>25% (56)</td>
<td>43% (96)</td>
<td>4% (8)</td>
<td>1.0% (2)</td>
<td>1% (2)</td>
<td>227</td>
</tr>
<tr>
<td>OASIS OF MARA</td>
<td>25% (60)</td>
<td></td>
<td>65% (153)*</td>
<td>1.0% (2)</td>
<td>10% (23)</td>
<td></td>
<td>238</td>
</tr>
<tr>
<td>(Tagg 1983)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEATH VALLEY</td>
<td>15% (340)</td>
<td>32% (709)</td>
<td>43% (969)</td>
<td>0.2% (4)</td>
<td>10% (219)</td>
<td></td>
<td>2,241</td>
</tr>
<tr>
<td>(Tagg 1984)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Proximal fragments were not separated from distal/medial fragments in this study.

Table 6
MATERIAL TYPES FROM 4-RIV-1961 AND THE OASIS OF MARA

4-RIV-1961

<table>
<thead>
<tr>
<th>MATERIAL TYPES</th>
<th>QUARTZITE</th>
<th>QUARTZ</th>
<th>CHERT</th>
<th>JASPER</th>
<th>CHALCEDONY</th>
<th>BASALT</th>
<th>RHYOLITE</th>
<th>OBSIDIAN</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>11</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>TP 2, 3, 7</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>TP 4</td>
<td>18</td>
<td>13</td>
<td>8</td>
<td>6</td>
<td>1</td>
<td>11</td>
<td>1</td>
<td></td>
<td>57</td>
</tr>
<tr>
<td>TP 5</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>3</td>
<td></td>
<td>10</td>
<td>1</td>
<td></td>
<td>34</td>
</tr>
<tr>
<td>TP 6</td>
<td>32</td>
<td>21</td>
<td>22</td>
<td>15</td>
<td>1</td>
<td>21</td>
<td>1</td>
<td></td>
<td>113</td>
</tr>
<tr>
<td>TOTAL</td>
<td>69</td>
<td>44</td>
<td>41</td>
<td>24</td>
<td>2</td>
<td>43</td>
<td>3</td>
<td>1</td>
<td>227</td>
</tr>
<tr>
<td>PERCENT</td>
<td>30.4</td>
<td>19.4</td>
<td>18.1</td>
<td>10.6</td>
<td>0.8</td>
<td>18.9</td>
<td>1.3</td>
<td>0.4</td>
<td>100</td>
</tr>
</tbody>
</table>

OASIS OF MARA
(Tagg 1983)

<table>
<thead>
<tr>
<th>MATERIAL TYPES</th>
<th>QUARTZITE</th>
<th>QUARTZ</th>
<th>CHERT</th>
<th>JASPER</th>
<th>CHALCEDONY</th>
<th>BASALT</th>
<th>RHYOLITE</th>
<th>OBSIDIAN</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent</td>
<td>19.8</td>
<td>6.7</td>
<td>26.9</td>
<td>10.9</td>
<td>13.9</td>
<td>0.4</td>
<td>5.5</td>
<td>0.4</td>
<td>100</td>
</tr>
</tbody>
</table>
cryptocrystalline silicates (cherts, jaspers, and chalcedonies) are also abundant. In addition, quartz and basalt are well represented, while rhyolite and obsidian are present in small quantities.

Cortex was found on only 11 percent of the artifacts (Table 7). Table 8 crosstabulates cortex and raw material type. Quartzite artifacts have the highest relative frequency of cortex (18 percent).

**Table 7**

<table>
<thead>
<tr>
<th></th>
<th>Cortex Absent</th>
<th>0-10% Cortex</th>
<th>11-50% Cortex</th>
<th>51-100% Cortex</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>203</td>
<td>10</td>
<td>12</td>
<td>2</td>
<td>227</td>
</tr>
<tr>
<td>Percent</td>
<td>89.4</td>
<td>4.4</td>
<td>5.3</td>
<td>0.8</td>
<td></td>
</tr>
</tbody>
</table>

**Table 8**

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Number of Flakes with Cortex</th>
<th>Total Flake Count</th>
<th>Percent of Flakes with Cortex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartzite</td>
<td>13</td>
<td>71</td>
<td>18.3%</td>
</tr>
<tr>
<td>Quartz</td>
<td>4</td>
<td>46</td>
<td>8.7%</td>
</tr>
<tr>
<td>Cherts*</td>
<td>4</td>
<td>65</td>
<td>6.2%</td>
</tr>
<tr>
<td>Basalt</td>
<td>4</td>
<td>44</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

* = includes cherts, jaspers, and chalcedonies.

Flake-size frequencies are illustrated in Table 9 and Figure 15. Table 9 presents the size distribution of flake fragments by material type for 4-RIV-1961. Figure 15 illustrates the distribution of whole flakes thickness for 4-RIV-1961 and several other recently investigated sites in California. Thickness is used because it has been found that there is less variance in this measurement than length or width (Rozen 1981). A comparison of the sizes of flakes from 4-RIV-1961 with those from other sites in the southern California deserts (see Fig. 15) shows that the assemblage from 4-RIV-1961 contains more very small flakes.
less than 2 mm in thickness) than assemblages from the Oasis of Mara and from Death Valley. These may represent retouch flakes, as described below.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>9</th>
<th>11</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartzite</td>
<td>14</td>
<td>20</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>47 (28%)</td>
</tr>
<tr>
<td>Quartz</td>
<td>2</td>
<td>21</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>33 (20%)</td>
</tr>
<tr>
<td>Chert</td>
<td>7</td>
<td>12</td>
<td>8</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>29 (17%)</td>
</tr>
<tr>
<td>Jasper</td>
<td>4</td>
<td>16</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22 (13%)</td>
</tr>
<tr>
<td>Basalt</td>
<td>5</td>
<td>24</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>32 (19%)</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 (2%)</td>
</tr>
<tr>
<td>TOTALS</td>
<td>33</td>
<td>94</td>
<td>27</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>167 (100%)</td>
</tr>
</tbody>
</table>

Flake Size Class 1 = 0.5 cm x 0.5 cm
2 = 1.0 cm x 1.0 cm
3 = 1.5 cm x 1.5 cm
4 = 2.0 cm x 2.0 cm
5 = 2.5 cm x 2.5 cm
6 = 3.0 cm x 3.0 cm
9 = 4.5 cm x 4.5 cm
11 = 5.5 cm x 5.5 cm
Figure 15. Histogram showing the distribution of measured values of whole flake thickness. (a) Measurements from 4-RIV-1961, tested as part of the Joshua Tree 85A project; (b) measurements from the prehistoric assemblage at the Oasis of Mara, tested as part of the JOTR 83A project; and (c) measurements from four sites in Wawona, central Sierra Nevada, tested as part of the Yosemite 83A project.
Table 10 presents information on the types of striking platforms on flakes from 4-RIV-1961 and the other sites used for comparison. Plain platforms predominated at 4-RIV-1961, as is the case with most assemblages. Of interest is the relatively high percentage of faceted platforms at 4-RIV-1961 (Types 3 and 4, totaling 18 percent), which are often produced during bifacial reduction. The frequency of faceted platforms at 4-RIV-1961 is intermediate between the Yosemite and Death Valley assemblages (both of which are postulated to represent biface reduction activities) on the one hand, and the Oasis of Mara assemblage on the other.

Table 10

FREQUENCIES OF PLATFORM TYPES FOR RECENT PROJECTS IN CALIFORNIA PARKS

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-RIV-1961</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plain</td>
<td>64</td>
<td>54.2</td>
<td>77.1</td>
<td>42.1</td>
<td>31.1*</td>
<td>24.0</td>
<td>92</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cortical</td>
<td>4</td>
<td>3.3</td>
<td>0.5</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dihedral</td>
<td>7</td>
<td>5.8</td>
<td>10.5</td>
<td>4.9</td>
<td>3.1</td>
<td>3.1</td>
<td>3.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multifaceted</td>
<td>15</td>
<td>12.5</td>
<td>23.2</td>
<td>8.2*</td>
<td>8.2*</td>
<td>8.2*</td>
<td>8.2*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crushed</td>
<td>14</td>
<td>11.6</td>
<td>16.6</td>
<td>9.8</td>
<td>9.8</td>
<td>9.8</td>
<td>9.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broken</td>
<td>2</td>
<td>1.6</td>
<td>5.1</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irregular</td>
<td>6</td>
<td>5.0</td>
<td>10.5</td>
<td>4.9</td>
<td>3.1</td>
<td>3.1</td>
<td>3.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground</td>
<td>7</td>
<td>5.8</td>
<td>8.2</td>
<td>4.9</td>
<td>3.1</td>
<td>3.1</td>
<td>3.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Dihedral and multifaceted platforms not distinguished in these studies.
Discussion

The artifact assemblage from 4-RIV-1961 consists primarily of flaked stone debitage, with a low frequency of flaked stone tools. Some grinding tools were also found. The debitage assemblage includes a wide variety of material types, some of which occur locally, while others were brought in from some distance away. The average flake size is relatively small, and faceted striking platforms are relatively abundant. Cortical flakes are not common. These attributes provide some information on which to base inferences regarding the activities that were carried out at the site.

First, the artifact assemblage seems to be representative of more than a single episode of occupation. There is a wide variety of exotic lithic materials in the assemblage, groundstone tools are present, and a cremation feature was found. Site 4-RIV-1961 was probably not used as a long-term campsite, however. The range of flaked stone tools found at the site is limited, and the overall artifact density at 4-RIV-1961 is low for a major habitation site. Instead, the site seems to have been a short-term, special-function occupation.

The presence of grinding implements at 4-RIV-1961 suggests that the procurement and processing of vegetal foods was one activity carried out at the site. Conversely, the low incidence of chipped stone tools suggests that activities requiring these implements, such as hunting and butchering animals, were not of major importance at 4-RIV-1961. In combination, these factors suggest that the site was occupied sporadically, perhaps on a seasonal basis, in order to exploit certain vegetal resources. It was probably occupied for limited periods at a time over a number of years, although there is no way of knowing whether these occupations occurred over the course of several decades or several centuries.

A second activity that seems to have been carried out at the site is lithic reduction. Quartz artifacts make up a significant portion of the lithic assemblage, and vein quartz of a material similar to some of the artifacts in the assemblage was noted in the vicinity of the site. These quartz veins occur commonly throughout the White Tank monzogranite. Although quartz is difficult to flake, and yields relatively crude products even in the hands of skilled knappers, the
inhabitants of the site were obviously attempting to work the material. Most likely, the majority of the quartz flakes (as well as the three crude bifaces that were recovered) represent attempts to assess the quality of the material. The quartz bifaces all appear to have been broken in manufacture, and were probably never used as tools. One reason that vein quartz was being utilized at all may have been that the occupants of the site were actually seeking deposits of high-quality crystalline quartz, but at the same time were also exploiting vein quartz as the opportunity arose. Unlike vein quartz, the crystalline variety fractures extremely regularly and is well suited to the manufacture of stone tools. Crystalline quartz is present in the debitage assemblage of 4-RIV-1961, constituting 3.8 percent of the excavated assemblage, which is a significant proportion for a material type that is usually quite rare. In addition, a number of other flakes of crystalline quartz were observed on the surface of the site, suggesting that its relative abundance is not due merely to sampling error. Although no deposits of crystalline quartz were observed in the immediate vicinity of the site, an outcrop of this material has been reported from Pleasant Valley, at a spot located only 6 km (4 miles) south of 4-RIV-1961.

Deposits of basalt are located in the Queen Valley area. Malapai Hill, located several miles south of 4-RIV-1961, is an outcrop of basalt that represents an old volcanic dome, and some of the basalt in the assemblage may have been obtained from this source. Some of the other igneous materials, such as rhyolite, may also have been obtained locally, since igneous dikes occur throughout the monzogranite formations in the area.

The other material types present in the assemblage were probably not obtained locally. Chert, jasper, chalcedony, quartzite, and obsidian are not known to occur in the immediate vicinity (although quartzite may well be available from nearby areas). The nearest source of cherts, jaspers, and chalcedonies is apparently near Amboy, some 40 air miles north of the site. The obsidian flake was found to have come from the Obsidian Butte (Salton Sea) source, located about 100 km (63 miles) south of the site (an obsidian flake found by Tagg [1983] at the Oasis of Mara came from the same source). Therefore, the presence
of these materials must be explained in some way other than as the result of local lithic resource exploitation. The evidence suggests that two mechanisms account for the presence of these materials.

First, some of the flakes may have been brought to the site to be used, without modification, for specific purposes. Some of the large quartzite flakes that are prevalent on the surface of the site may have been used as cutting tools, for instance. Such activities would leave little or no traces of use on the artifact.

Another portion of the debitage assemblage may represent advanced tool reduction. A significant part of the assemblage consists of very small flakes (less than 2 mm in thickness) with little or no cortex. This, coupled with the relatively high incidence of faceted platforms in the assemblage (see Table 10), suggests that advanced lithic reduction accounts for at least a part of the assemblage. The nature of the assemblage (with a wide variety of lithic material types, but a relatively low overall artifact density) is not suggestive of tool production on a large scale; however, it may reflect occasional tool resharpending. The reworking of flaked stone tools manufactured elsewhere and taken to the site for specific uses would produce an assemblage such as the one found at 4-RIV-1961. Overall, the low incidence of retouched pieces in the assemblage suggests that activities involving flaked stone tools were not as important as other activities, although tools were occasionally used and resharpended. The fact that these small flakes were recovered at all can be attributed to the use of a 1/8-inch-mesh screen, which greatly increased the recovery of small pieces of debitage, such as those produced by tool retouch (the same screen size was used at the Yosemite sites that are referred to in Table 9). Such flakes are probably present in even greater frequencies at sites where the use of flaked stone tools was of greater importance; however, they would not be recovered using standard 1/4-inch-mesh screen.

One important question regarding archeological site 4-RIV-1961 is difficult to answer: the date of its occupation. A sample of charcoal from the cremation pit yielded a date of 200 B.P. ± 90, calibrated to about A.D. 1720 ± 230 at the 95 percent confidence interval. In addition to the radiocarbon date, the presence of ceramic artifacts
shows that the site may have been used at any time since the beginning
of the ceramic period, but this use seems to have been limited in scope.
Aside from the funerary vessel, only 16 sherds were recovered from
4-RIV-1961, all from the surface of the site. Fifteen of these (and two
sherds found by the 1979 survey crew) came from one small area of the
site (which measures 10 m by 25 m) and probably represent a single
vessel. Aside from this potbreak and the cremation vessel, the site is
almost entirely aceramic, and the evidence suggests that 4-RIV-1961 was
occupied in part during the preceramic period. Several factors point to
this conclusion. First, the nature of the assemblage suggests that the
site represents more than an ephemeral occupation (although it is
equally clear that 4-RIV-1961 was not a major habitation either).
Groundstone artifacts, which are not readily portable, are present at
the site. One of the grinding slabs from Test Pit 7 is granodiorite,
which outcrops in several places in the area, all of which are at least
3.2 km (2 miles) distant from the site. In addition, given the near
absence of ceramics, it seems unlikely that the site could have been
occupied solely by ceramic period groups, even if 4-RIV-1961 was a
special-purpose site. This contention is supported by comparisons with
other sites from the monument. Most sites have assemblages made up of
more than 65 percent ceramic artifacts, while four others had
assemblages with less than 7 percent ceramic artifacts (see Table 4).
One of these four sites produced an Archaic period projectile point,
suggesting that they represent preceramic sites, rather than
special-purpose ceramic period sites at which pottery vessels were not
used.

In conclusion then, 4-RIV-1961 appears to represent a limited
activity, special-purpose site that was only occupied intermittently.
It is possible that a substantial portion of the assemblage represents
an Archaic period occupation, although this is far from certain. It is
known, however, that ceramic period people made use of the site. They
cremated and buried one of their number, leaving a ceramic vessel
as an offering. In addition, a cluster of sherds eroding out of the
sands onto the site surface represents a second vessel, possibly a
potbreak. Aside from these two features, the extent of ceramic period
use of the site is uncertain.
The Anaconda Mine Site, 4-SBR-4208

Introduction

The Anaconda Mine Site, 4-SBR-4208, is located along Route 12 about 1.1 road miles south of the north entrance to the monument (Figs. 6, 16. and 17). The mine is located near a sharp curve in the road, in an area that will be affected by hazard curve improvements. Most of the site lies on the west side of the road, but the artifact scatter also extends to the east side, where several features are also located. Investigations were undertaken at the site to assess the possible effects of construction on the cultural resources.

The Anaconda was a gold mine initially opened some time prior to 1907 and worked until the 1920s (Greene 1983:94-97). It was apparently reopened some time during the Depression. The mine is located about 7 km (4.4 miles) south of the Twentynine Palms Oasis, on a series of low outcrops of granitic rock. Immediately east of the mine is the floodplain formed by the Pinto Wye Wash (also called the County Wash), which runs north towards the oasis. This wash and its gentle alluvial slope form a natural pass from the oasis into the mountains that make up the monument. The area has therefore been a major route of travel.

The Anaconda Mine is on a mountain range designated on some maps as part of the Pinto Mountains; the Pinto Wye Wash divides this range from the Pinto Mountains proper, however, and on most maps the range is unnamed. The mine itself is located on a small outcrop of the White Tank monzogranite, which forms an outlier separated by several miles from the main body of the batholith to the south. Also outcropping in the immediate vicinity of the site are formations of the Pinto gneiss and the Queen Mountain monzogranite.

Two main areas of the Anaconda Mine have been worked in the past. On the western edge of the site, located along a low ridge, is a series of 16 mine shafts, adits, or mine test pits marked by a large spoils pile. The spoils pile apparently marks the location of a deep shaft. To the northeast of the first area, located atop a small knoll, is a second cluster of 10 adits, shafts, and prospects. A smaller spoils pile is located here. Several additional prospects are scattered along the ridge between the two main clusters.
Figure 16. Plane-table map of 4-SBR-4208, the Anaconda Mine site. Note the locations of archeological features in relation to ridgeline.
Figure 17. Photograph of 4-SBR-4208, the Anaconda Mine site, looking northwest. Note ridgeline and the prominent spoils pile on the left side of the photograph.
A number of other historical features associated with the mine were found on the floodplain below the rock outcrops on which the prospects and shafts are located. These include several structural features, trash scatters, and a system of old roads. In addition, a number of rock cairns are scattered around the site, apparently representing old claim markers.

Two shafts on the Anaconda Mine are reported to have reached depths of 65 m (212 feet) and 30 m (100 feet) below the surface (Greene 1983:97). These shafts may be the features marked by the two spoils piles mentioned above. Also, a small two-stamp mill was reportedly located on the site prior to 1907 (Greene 1983:95). Historical sources also contain brief mention of some of the other structures that were once present at the mine. Chase (1919:149) visited the mine while traveling to Twentynine Palms, and reported finding "the grouped shanties of a small mine. . . . I was welcomed heartily by the three men on the place. . . . Their supply (of water) must be replenished at Twentynine Palms, four miles away." Also at Twentynine Palms was a roller mill that processed ore for the Anaconda and other nearby mines.

It is not known when the Anaconda Mine was first opened, but Bill McHaney (who arrived in the Joshua Tree area by at least 1879) claimed that a person by the name of Drinkwater was the mine's first owner, followed by a man named Parks. Records indicate that it was owned by the Taylor-Sullivan Mining Company in 1907, by which time "considerable" work had already been done at the site (Greene 1983:95). In 1907, the mine was apparently leased for 5 years to Edward McDermott (Greene 1983:95). McDermott was reportedly run out of town at a later date for selling stock in nonexistent mines (Joshua Tree National Monument Fact File 1981).

By the fall of 1910 the Anaconda had a shaft measuring 100 feet in depth. By 1922 the main shaft was 185 feet deep, and by 1953 it had been excavated to a depth of 212 feet. A second shaft reached its maximum depth of 100 feet by at least 1930 (Greene 1983:95-96).

Field Procedures

Archeological investigations at 4-SBR-4208 included detailed recording and mapping of the numerous archeological features identified
at the site. No excavations were carried out because the portion of the site to be affected by construction included no features or artifact concentrations. Investigations began with the establishment of a grid line (oriented to true north) using an engineer's transit. Next, the site was mapped with a plane table and alidade. Features added to the site map include the present road and all archeological features observed in the area, including mine shafts or prospects, rock cairns, trash scatters, structural features, and old roads. Geomorphological features that were mapped include the crest of the ridgetop on which the mine shafts and prospects are located, and the base of this ridge, where the bedrock outcrops meet the alluvial floodplain sediments. Contour lines were not included, due to the large size of the site and the substantial relief in the site area.

After completing the site map, careful records were compiled for all cultural features other than mine prospects. Each feature was described, and associated artifacts were listed. All features except mine prospects and rock cairns were then mapped in detail. A photographic record was made of all features at the site, including those that were not separately mapped. Finally, a collection was made at each feature that had associated artifacts. All artifacts that might yield functional or temporal information were collected, in order to aid in interpreting the features.

Seventy-seven cultural features were identified at the Anaconda Mine Site. These include 34 mine shafts or prospects, 14 rock cairns, 6 road segments, 4 retaining walls, 3 depressions, 3 trash scatters, and 9 structures or possible structures. The latter include four probable tent platforms, one dry-laid cobble foundation showing evidence of a burned wooden superstructure, three dry-laid rock walls abutting bedrock outcrops, and a level area cut into the hillslope near the mine prospects that is associated with a number of concrete footings. Most of the features can be grouped into one of three distinct spatial clusters. The first of these, designated Area 1, includes the largest group of mine prospects and shafts. It is located on the western margin on the site on top of a low ridge, at the point where the ridge abuts the base of a large hill. From that point the ridge runs northeast for a distance of almost 0.5 km. At the far northeast end of the ridge is
the second cluster of features, designated Area 2, which also includes a large group of mine prospects and shafts. Between Areas 1 and 2 are a few other isolated mine prospected, as shown on Figure 16. The third cluster of features, Area 3, is located on the floodplain below the ridges. Many of the features in Area 3 seem to be the remains of structures of some kind.

A sparse scatter of prehistoric artifacts was also noted at 4-SBR-4208, including a sherd, a flake, and a biface tip (see Fig. 14c). The latter two artifacts were collected. During the 1979 survey, a probable projectile point fragment was also collected from 4-SBR-4208 (see Fig. 14e). These materials apparently represent sporadic Native American use of the area.

Area 1

Area 1 contains the largest cluster of mine features on the site. Sixteen prospects, adits, or mine shafts are located here, most of them at the southwest end of a relatively flat ridgecrest. In addition, several other features of various types are located in the same area. Thirteen of the prospects or shafts are oriented in a line running about 35° degrees west of true north. This linear pattern obviously follows the geological formation that contained the potentially rich body of ore. Two other prospects are located on the slope of the large hill that rises above the bench. The mine features vary in size from small prospects no more than 1.5 m in diameter to one example that is about 6 m in diameter. This pit, Feature 40, sits above a large spoils pile that is visible from the road. Feature 40 may thus represent one of the two deep shafts reported to have been excavated at the Anaconda Mine. The spoils pile is made up of material ranging in size from finely crushed rock to boulders. This may represent either overburden removed from the shaft and discarded on the spot, or mine tailings that were processed by the two-stamp quartz mill reported to have been in operation at the mine prior to 1907 (Greene 1983:95).

One of the mine features in Area 1 differs from the others on the site, which are vertically excavated prospects or shafts. Feature 30, by contrast, is a small adit, or horizontal tunnel, carved into a bedrock face near the base of the ridge (Fig. 18). It is not known
feature is completely artificial, or whether it is a natural crevice enlarged by the miners, but the walls were mechanically cut. Outside the adit, which measures 1.5 m in diameter and 3 m in length, is a gully flanked by a retaining wall. The gully may have served to drain excavation waste. The adit may have been excavated as a mine test, or perhaps to serve as a storage room.

Area 1 is serviced by an unpaved road that was obviously used for transporting ore and supplies. The road starts at the present Route 12 and runs west, crossing a wash channel and winding up the side of the ridge. The road then runs north along the ridgecrest for about 150 m, paralleling the alignment of mine features. At one point the road splits, and a raised ramp runs parallel to the road for about 60 m. The ramp then rejoins the road, which turns west and descends the ridge to the floodplain below, from there heading north and again intersecting Route 12.

Area 1 also includes a structural feature of unidentified function. Feature 29, which is located on top of the ridge close to the prospects, is a flat-bottomed niche that has been cut into the hillslope (Figs. 19, 20). The floor of the niche is at the same level as the unpaved road that crosses the ridge, but it lies about a meter in elevation below the upper ramp, which runs just upslope (southwest) of the niche.
Figure 19. Photograph of Feature 29, a structural feature of unknown function. Note concrete platforms, as well as rock retaining wall in foreground. Also note the large boulder within excavated niche, shown at upper right of the photograph.

A rock retaining wall is built into a portion of the back wall of the niche, and supports the ramp. The location of the niche below this ramp suggests that the latter may have functioned as a tipple, where material was dumped down into the niche. Two concrete slabs lie on the floor of the niche, and six segments of steel reinforcement bar protrude from one slab. A third concrete slab, from which reinforcement bar also protrudes, lies only a few meters to the northeast. These slabs apparently functioned as foundations for some kind of structure or machinery. It is possible that this bench was the location of the two-stamp mill reported to have been used at the Anaconda Mine prior to 1907 (Greene 1983:95), which would explain the presence of the tipple. It is equally possible that the bench was the location of some other kind of feature, perhaps a superstructure built over the mine shaft(s). The concrete slabs may then have provided the foundation for power generating equipment such as would have been needed to haul ore up the mine shaft.
Figure 20. Tape map of Feature 29, a structural feature of unknown function.
Other features that are part of Area 1 include three probable tent platforms and two dry-laid rock walls that abut bedrock outcrops. Two of the platforms are located on the hillslope above the bench (Features 1 and 39; Figs. 21 and 22). The Feature 1 platform is merely an area where the rocks have been cleared. Feature 39 is more elaborate. A rock retaining wall of granitic cobbles has been built up to protect a flat surface. Interestingly, there is a depression on the upslope part of the platform, the function of which is unknown. This may be a mining prospect, the overburden from which was later leveled out to create the platform.

The third tent platform in Area 1 is located on the slope leading down from the ridgetop (Feature 3; Fig. 23). A large platform measuring 10 m by 10 m was built up on a gently sloping alluvial fan surface. A one-course rock retaining wall of rounded cobbles protects the south side of the platform from erosion that might otherwise be caused by an adjacent gully. A small circle of stones, possibly the remains of a hearth, is located on the upslope (northwest) portion of the platform.

The two dry-laid rock wall features are also located on the slope of the ridge. Feature 2 is a group of rock walls set among bedrock boulders so as to create a small enclosure. A pair of walls several courses high joins two bedrock boulders to form an enclosure with an area of slightly over 1 square meter. A possible third wall, badly disturbed, lies about 8 m to the northeast. Feature 33 is an enclosure with a bedrock boulder forming one wall, and carefully constructed, dry-laid rock walls forming the remaining three sides (Fig. 24). The walls are made of angular granitic boulders stacked several courses high. The best preserved wall (on the northwest side) is about 0.7 m wide. The enclosure was about 1.1 m wide by 2 m long, and may have been used as a storage area.

**Area 2**

Area 2 is another cluster of mine prospects and shafts, located about 340 m (1,100 feet) northeast of Area 1, at the opposite end of the ridge. Area 2 covers a small knoll located at the end of the ridge, which then drops off sharply to the floodplain below. Ten prospects and shafts were identified in this area. One of these, Feature 69, is
Figure 21. Tape map of Feature 1, a cleared area probably used as a tent platform.
Figure 22. Tape map of Feature 39, platform supported by a retaining wall of dry-laid rock. This may have been used as a tent platform, although the function of the depression at the lower left side of the map is unclear.
Figure 23. Tape map of Feature 3, tent platform. Note the platform's proximity to Feature 30 (mine adit), from which a small channel originates.
Figure 24. Tape map of Feature 33, a structure of dry-laid rock.
adjacent to a small spoils pile. Feature 69 is covered by a metal grating set in cement, and the material that was used to fill it has settled several feet. These factors suggest that Feature 69 was one of the deep shafts that was excavated at the Anaconda Mine. The 10 prospects and shafts of Area 2 are again oriented in an alignment running about 35° west of true north, following the same strike as the Area 1 prospects.

Area 2 is also serviced by a system of unpaved roads. One road, designated Feature 19, ascends the ridge from the south, climbing up a small saddle from the floodplain before turning eastward towards the prospects. As in Area 1, this road also branches, although the two road spurs are at about the same elevation. The branch may therefore have served as a turn-around, or a place where vehicles could park in order to leave the main road clear. After the two branches rejoin one another, the road turns and heads north a short distance before ending abruptly. The end of the road is marked by a single-course retaining wall of angular granitic blocks, about 50 cm high. An alignment of small cobbles runs at an angle across the road at this point. Its function is unknown.

A second roadbed (Feature 74) is located below the retaining wall at the end of the Feature 19 road. The Feature 74 road runs to the east down the hill, along a moderate size gully. A carefully constructed retaining wall of dry-laid, angular granitic cobbles served to protect the north side of the road from erosion. The wall is now 13 m long, but was once several meters longer, before its downslope (eastern) end was disturbed. The roadbed consists of crushed rock, undoubtedly taken from the mines. Although the road has been washed out downslope (east) of the present end of the retaining wall, patches of this crushed rock are visible on the floodplain below, marking the former course of the road.

Area 3

Area 3 is a cluster of features located on the floodplain just east of Area 1. Unlike the two areas of the site described above, Area 3 includes no mine shaft or prospect features. Instead, there are a variety of features suggestive of residential or office structures. These include a cobble foundation with evidence of a burned wooden
superstructure, at least one tent platform, a pair of rock walls abutting a bedrock outcrop, three depressions, and three trash scatters. Several roads and probable roads crosscut the area.

Feature 4.1 is the most substantial structural feature on the site (Fig. 25). It is a roughly rectangular alignment of rounded cobbles that represents a foundation. The north and south walls of the cobble alignment sit atop slightly elevated berms, and the rectangular rock alignment is about 10 m long by 5 m wide. Charcoal fragments are scattered across the feature, possibly indicating that the structure burned, but it is also possible that the charcoal came from recent hearths. In two places within the feature, foundation stones have been arranged in circles and used as hearths (these hearths apparently postdate the main use of the feature). Artifacts associated with Feature 4.1 include over 300 wire nails, which were first introduced in the United States in the 1850s, but were not widely used in rural areas or in the west until after the turn of the century (Nelson 1968). Window glass was also common, and a range of artifacts representative of general household debris was present. These included bedsprings, clothes hangers, a caster, a spoon or fork fragment, cone-top metallic beverage cans, earthenware, porcelain, and bottle glass. Other artifacts for which dates are available include a telescoping tobacco tin (first manufactured about 1930), and flat-topped metallic beverage cans (introduced about 1935). No sun-turned amethyst glass was found, suggesting a post-1920 date for the artifact assemblage. Taken together, the information suggests that the artifact assemblage relates to the most recent period of activity at the mine (during the 1930s), as well as to more recent use of the area since the cessation of mining activities; however, it should be remembered that the domestic refuse assemblage probably dates the more recent use of the structure, not its initial construction.

Feature 35 is a rectangular raised earthen platform (Fig. 26). The presence of over 200 wire nails and a piece of milled lumber suggest that there was once a wooden structure on the platform. A sparse scatter of artifacts includes window glass fragments, recent brown bottle glass fragments, fragments of sun-turned amethyst bottle
Figure 25. Tape map of Feature 4, which includes a structural foundation, depressions, and a possible tent platform.
Figure 26. Tape map of Feature 35, a structure platform.
glass, milkglass, earthenware, porcelain, and terra cotta pottery fragments.

Also seen were a number of cartridges, including a .22 long or long rifle (with the headstamp "U." for the Union Metallic Cartridge Company), a .22 Winchester rimfire ("US"), a .32 Long Colt ("U.M.C. .32 L.C.F."), a .38 Long Colt ("UMC 38 Long"), and a .38 Smith & Wesson special ("REM-UMC 38 S & W SPL"). Also found was a 20-gauge shotgun shell ("1901/No 20/Repeater/W.R.A. Co./New NO 4").

Feature 4.4 is a flat, natural surface that appears to have been cleared, perhaps for use as a tent platform (see Fig. 25). A rocky L-shaped berm extending along two sides of the possible clearing looks as if it were artificially constructed. A moderately dense scatter of domestic artifacts is present, including tobacco tins, sanitary seal food cans, a hole-in-top rectangular meat tin, an "H. J. Heinz Co." bottle base (post-1920, based on the "H-over-A symbol of the Hazel-Atlas Glass Co.; see Toulouse 1972:242), milkglass fragments, white earthenware fragments, several wire nails, a 10-gauge shotgun shell ("WESTERN/MADE IN USA/NO. 20/XPERT") and a .22 short cartridge ("H").

Feature 5 consists of several man-made features associated with a boulder outcrop protruding from the floodplain sediments (Fig. 27). A pair of carefully laid, unmortared walls of angular stone abuts the boulder outcrop. The walls are about 5 m long, and each is about 1.5 m wide by about 0.4 m to 0.6 m high. There is no enclosing wall at either the northwest or southeast ends. The southeast end opens into a natural gap in the bedrock outcrop. Embedded in the bedrock boulders on either side of the southeast opening are ferrous metal strips, to which are attached "O" rings. Using these rings, an object such as a chain could have been suspended between the boulders. Two holes have been drilled into the south face of one of the other boulders in the outcrop. A sparse scatter of domestic artifacts was noted in the vicinity of Feature 5. These include a strip-key opened coffee can ("...BROS COFFEE"; possibly Hills Brothers); several square hole-in-top, strip-key opened meat tins (pre-1918), several sanitary seal cans, several steel beverage cans (punch opened), a bedspring, a whiteware pottery fragment, and recent (modern) brown glass container fragments. This artifact scatter is rather sparse, and those items that do not relate to
Figure 27. Tape map of Feature 5, a pair of dry-laid rock walls associated with a bedrock outcrop.
use of the area since closure of the mine have probably been transported here from other parts of the site (a large trash scatter is located a short distance upslope, to the south). The function of this enclosure is unknown. The lack of nails or window glass suggest that there was no superstructure over the stone walls.

Three depressions are located in Area 3. Their placement suggests that they may have been water-control features of some kind, but their precise functions are puzzling. Features 4.2 and 4.3 are depressions surrounded by earthen berms that were excavated across a small but well-defined wash (see Fig. 25). The washbed now consists of a 0.5 m deep arroyo channel which bisects the feature. It is not known whether the channel developed after the depressions were excavated, or whether the depressions were dug on either side of an existing channel. Small gullies enter both features on the ends opposite the wash. A wooden post is set into the ground where the wash enters the southeast corner of Feature 4.2, and a small retaining wall was built to protect the berm where the gully enters. This suggests that the depressions were built to impound water, an interpretation that assumes they are part of what was originally a single feature. Alternately, the feature may have been built to dam the flow of the wash.

The bottom of Feature 4.2 is filled with trash. Artifacts include a fragmentary liquid bleach bottle with the symbol of the Owens Illinois Glass Company embossed on the base, cone top cans, flat top cans, sanitary seal cans, a coffee can, evaporated milk cans, bedsprings, automobile parts, and crockery fragments. This assemblage is very similar to the one from adjacent Feature 4.1, and it is likely that the depression was used as a trash pit by those using the structure represented by Feature 4.1.

Feature 7 is another depression, 13 m long by 8 m wide (Fig. 28). It is about 1 m deep, and is flanked on either side by earthen berms that rise an additional 1 m above the surrounding area (maximum elevational difference between the top of the berm and the bottom of the depression is thus about 2 m). In contrast to Features 4.2 and 4.3, the long axis of Feature 7 parallels the drainage pattern. This suggests that the depression may have been intended to collect water. In the area downslope of the depression, soil has been pushed several
Figure 28. Tape map of Feature 7, a depression and associated earthen berms.
meters to the west, apparently by a blade (Feature 7.2). Two very low embankments oriented downslope appear to have been purposefully built, perhaps to channel overflow from the depression (Feature 7.3).

A low- to moderate-density scatter of artifacts surrounds the depression. About two dozen cans lie at the bottom of Feature 7.1. Modern clear and brown bottle glass fragments and aluminum-topped steel cans are scattered around the vicinity. In addition, a pry-lid rectangular steel can (embossed with the inscription "HERSHEYS COCOA"), a stovepipe elbow joint, and a motor oil can were found. The artifacts are probably not associated with the original use of the feature.

One other depression was also found in Area 3. Feature 6 is smaller than the other depressions, measuring 8 m long by 2 m wide. It is about 0.5-m deep, and is again flanked by earthen berms. Only a few artifacts are associated with it, including an evaporated milk can, a large (10-gallon) steel can, and recent (modern) steel and aluminum cans.

Three other features were identified in Area 3, all trash scatters. Features 21 and 22 are small trash dumps composed primarily of cans. Feature 21 consists of about 75 cans, and includes modern sanitary seal cans, drop-soldered double-seam cans, and the older hole-in-top cans. Feature 22 is a smaller concentration of about 20 cans and a few other artifacts (including a "BALL" canning jar fragment, an earthenware sherd, an aqua glass bottle fragment, and a barrel hoop). The cans again include both the modern double-seam type and hole-in-top cans.

Feature 26, by contrast, is a large but widely dispersed scatter of artifacts. These include a large number of white earthenware sherds (more than 100), many glass fragments (only a very few of which are sun-turned amethyst), wire nails, tobacco tins, crockery, wire, a .22 long cartridge (with the headstamp "U"), and a talcum powder or tooth powder top with a patent date of 1907.

A number of features occur separately in parts of the site away from Areas 1, 2, and 3. Eight of these are mine prospects, scattered on the ridgecrest between Areas 1 and 2. Thirteen are rock cairns, which probably represent mining claim boundary markers. Their form varies considerably, and includes several rock rings, several rock piles of varying sizes (some with metal pipes or wooden laths protruding), one
rock pile with a 65-cm-tall stone set vertically in the center, and one cairn of rocks within which two large (approximately 10-gallon) metal cans are embedded. The uppermost can is filled with rocks; the one on the bottom may contain papers associated with the claim.

One other feature of unknown function was found on the site. Feature 8 is a shallow depression with a discontinuous, one-course alignment of rounded cobbles on the west side. The feature is located next to a pair of large granitic boulders. A moderate-density artifact scatter is also present. This does not appear to represent a mine prospect, as the feature is located on floodplain sediments rather than on bedrock. It may represent the remains of some kind of structure, perhaps an outhouse. The artifacts, although few in number, include several hole-in-top cans and sun-turned amethyst glass fragments probably representative of the early period of use of the mine. A modern style crimped double-seam sardine can is also present.

Discussion

Some general conclusions can be reached concerning the site as a whole. A number of structures were located in Area 3, supporting documentary information that refers to "grouped shanties" at the Anaconda Mine (Greene 1983:95). Based on the investigations conducted to date, it is impossible to determine if the structures were contemporaneous. It is also uncertain whether these features represent different periods of activity at the Anaconda Mine, although the artifact analysis suggests this.

The artifacts from the various features consist mostly of domestic refuse, with some structural artifacts as well (primarily nails and window glass). The domestic refuse includes the remains of a wide variety of canned goods of a sort that one would expect to find at an isolated mining encampment. The sizes and shapes of cans include types normally used for preserving fruits and vegetables, meats, condensed milk, and powdered goods such as coffee and cocoa. One bottle base from the H. T. Heinz Co. probably represents pickles or other preserves. Beverage cans known to be of an old style include funnel top cans, often used for beer. Tobacco tins are very plentiful. Other domestic
products include a toothpaste tube, a talcum powder or tooth powder top, and a 1-gallon liquid bleach type bottle.

Ceramic artifacts are numerous, including whiteware and ironstone, earthenware, and some porcelain. Vessel types that could be identified include cups and saucers, plates, and large crocks. Glass is also plentiful, but sun-turned amethyst glass (dating to before 1920) is rare, except at Feature 35. Glass artifacts were extremely fragmented, so it was usually impossible to determine the container type, but glass fragments representing beverage bottles and glass canning jars were noted. Gun cartridges were numerous, as is to be expected. Calibers observed include .22, .30, .32, .38, and 9 mm, as well as 10- and 20-gauge shotgun shells. Several automotive vehicle parts were also found, including fragments of rubber apparently representing narrow tires. An air filter of a style probably representing a diesel engine, perhaps from a tractor, was also found.

Temporal information obtained from analysis of the artifact assemblage is mostly of a general nature. The Feature 35 assemblage included numerous sun-turned amethyst glass fragments, suggesting some use of the feature during the period prior to 1920. The artifact assemblages of the other features had much more clear glass, with low proportions of sun-turned amethyst. While this does not preclude the possibility that these other features were used during the early period of operation of the mine, the artifact assemblages apparently relate to the later period of use.

The assemblage of tin cans includes a substantial number of soldered-seam, hole-in-top cans. This method of canning was used in the United States from early in the 19th century until the development of modern style, open-top cans (that is, sanitary seal cans). These latter were first used in the United States around 1900, and had become "practically universal" by 1918 (Teague 1980:98; American Can Co. 1943). Thus, hole-in-top cans probably represent the earlier period of operation of the Anaconda Mine, during the early decades of the 20th century. These cans were found in Features 3 and 4.4 (tent platforms), 5 (rock wall enclosure), 8 (unknown feature type), 21 and 22 (trash piles). Assemblages made up mostly or entirely of modern, open-top cans were associated with Features 4.1, 4.2, and 4.3 (structure and
depressions) and Feature 7 (depression). Several telescoping tobacco tins, first manufactured about 1930, were also found around Feature 4.

A fragmentary 1-gallon brown glass jug (probably a liquid bleach container) from Feature 4.2 was probably manufactured in 1944. The date was derived from several pieces of information. On the base is embossed an Owen-Illinois Glass Co. trademark identified by Toulouse (1972:403) as one used between 1929 and 1954. The bottle was manufactured in Plant #4 (Clarkesburg, West Virginia), which was closed some time in the 1940s (Toulouse 1972:395). The bottle also bears the inscription "Duraglass," which has been in use since 1940 (Toulouse 1972:403). To the right of the trademark is the embossed numeral "4," which represents the last numeral of the manufacture date, apparently 1944. This date is somewhat later than is to be expected for operation of the mine during the depression years, since Greene (1983:30) notes that gold mining was halted in 1942 as part of the war effort. The bottle may therefore postdate operation of the mine.

**Summary**

Three concentrations of features were found at 4-SBR-4208, the Anaconda Mine. Two of these (Areas 1 and 2) are clusters of mine prospects and shafts, serviced by road systems. Structural features are present in Area 1, including several probable tent platforms (Features 1, 3, and 39), two rock wall enclosures (Features 2 and 33), and one structure probably related to the mining operation (Feature 29).

The third area of the site includes several features that probably represent domestic or office structures (Features 4.1, 24, and possibly 4.4) a rock-walled enclosure (Feature 5), three depressions (Features 4.2/4.3, 6, and 7), and three trash dumps (features 21, 22, and 26). Other types of features are scattered across the rest of the site, including isolated mine prospects and rock cairns.
Chapter 6
MANAGEMENT RECOMMENDATIONS

The JOTR 85A project consisted of archeological investigations relating to two separate phases of the Joshua Tree Road Rehabilitation Project (Package 173). Construction associated with these two phases is scheduled to be carried out in Fiscal Years 1985 and 1986. The archeological investigations provided information necessary for the proper management of the cultural resources located in the vicinity of construction work. Cultural resource management recommendations are presented below, and are divided into two sections based on the two phases of construction work.

Fiscal Year 1985 Construction

Archeological investigations included detailed recording and mapping at the Anaconda Mine (4-SBR-4208), surface inspection of two other numbered sites (4-RIV-1949 and 4-RIV-1951), and surface inspection of several previously unsurveyed construction areas. No further work is necessary in order to grant archeological clearance for construction in these areas: Route 11, between Mileposts 29.85 and 35.65; Route 204, between Mileposts 0.0 and 1.3, and along the maintenance/housing road; Route 12 hazard curve improvements at Mileposts 0.3, 1.1, and 1.9; and Route 212 hazard curve improvements at Milepost 0.9. Site 4-SBR-4208 is a significant archeological site, but construction plans show that areas of the site to be affected contain no significant features or artifact concentrations. However, in conjunction with the Route 12 hazard curve improvements, it is recommended that no vehicular traffic be allowed beyond the boundaries of the new road alignment within the area marked "Cultural Resource Area 3" on Figure 29. This figure is taken from a preliminary engineering drawing provided to WACC archeologists, entitled "Plan and Profile, Route 12 Hazard Curve Improvements, Joshua Tree, CA."

The localities designated 4-RIV-1949 and 1951 will also be affected by construction, but a careful surface inspection of both localities revealed only sparse scatters of artifacts that have probably been
Figure 29. Engineering drawing showing the portion of site 4-SBR-4208 that will be affected by roadwork. The site, which is the area within the dashed lines, should be avoided during construction (taken from drawing labeled Plan and Profile, Route 12 Hazard Curve Improvements, Joshua Tree, CA*).
redeposited from areas upstream. Thus, no significant archeological resources will be affected by construction.

Archeological surveys resulted in the discovery of five features or artifact scatters, but road reconstruction should not affect any of these archeological resources. Nonetheless, it is recommended that construction vehicles do not travel over the areas of JOTR 85A-5 and 85A-7 during reconstruction of Route 204. These areas are marked "Cultural Resource Area 1" and "Cultural Resource Area 2" on Figure 30, which is taken from engineering sheet 24 of 26, entitled "Route #1, Cottonwood Area" (Drawing No. 156-41008, USDI, NPS, Western Service Center, Office of Environmental Planning and Design).

Fiscal Year 1986 Construction

Road widening of Route 12 will affect 4-RIV-1961. In order to minimize damage to the site, it is recommended that road widening occur on the northeast shoulder of the road only, within the area marked "Cultural Resource Area 4" on Figure 31 (this figure is taken from a preliminary engineering drawing of the Fiscal Year 1986 construction area, entitled "Route #2, Cap Rock to Pinto 'Y,' Joshua Tree National Monument, California," Sheet 14 of 21). It is also recommended that the grade of this portion of the road should not be lowered by cutting. Instead, the grade should remain the same, or be raised by the addition of fill.
Figure 30. A portion of the Cottonwood Spring Road, showing cultural resource areas near NPS housing and maintenance facilities (JOTR 85A-5 to -7). These cultural resource areas should be avoided during construction. Taken from Sheet 24 of 26, entitled "Route #1, Cottonwood Area" (Drawing No. 156-41008, NPS, Western Service Center, Office of Environmental Planning and Design).
Figure 31. Archeological site 4-RIV-1961, showing center line of proposed alignment of Route 12 in relation to site boundaries (from preliminary engineering drawing entitled "Cap Rock to Pinto 'Y,' Joshua Tree National Monument, California," sheet 14 of 21, compiled by Benchmark Mapping Services, Denver, Colorado, for the Denver Service Center; No. 156/41,036).
Chapter 7
SUMMARY AND CONCLUSIONS

During the JOTR 85A project, investigations were conducted at two archeological sites, one a prehistoric encampment (4-RIV-1961) and the other an historic period mine (4-SBR-4208). Several small archeological surveys were also carried out in various parts of the monument, resulting in the discovery of eight artifact scatters, sites or archeological features.

The prehistoric manifestations investigated during the project were found to be small in size, and all appear to be representative of a limited range of activities. This parallels the observations of researchers who have worked in the monument previously. Although the JOTR 85A project was limited in scope, and the survey phase covered only a minute geographical area, archeological surveys were carried out within several important areas, including the Cottonwood area and Sheep Pass. Several observations can be offered about the results of the surveys.

First, the resources located within the Cottonwood area appear to be small, limited activity loci (it is difficult to evaluate JOTR 85A 5, however, because of the presence of a buried component of unknown size). This is somewhat surprising, as the Cottonwood Spring presumably would have been an important resource to the inhabitants of the area. On the other hand, more material was found in the Cottonwood area than in the other areas surveyed, and the small size of the narrow corridor that was examined may account for the discovery of limited cultural material. A thorough survey of the area might reveal more extensive evidence of habitation, although an archeological investigation conducted at the Oasis of Mara (Twentynine Palms Oasis) in 1983 also revealed relatively limited evidence of Native-American occupation. The Serrano are known to have inhabited the Oasis of Mara during the historic period (Tagg 1983), but their settlement is thought to lie to the west of the area investigated. Alluvial deposition and relic collecting might also account for the paucity of remains at the Oasis of Mara. In general, however, the limited evidence of occupation around some of the important water sources in the area suggests the possibility
that the prehistoric inhabitants of the area did not camp in the areas immediately surrounding watering holes, but instead lived a short distance away. This pattern of settlement is often used by hunting groups in order to avoid driving game from the water sources.

Surveys were also carried out in eight campgrounds, seven of which are located in or around granitic rock outcrops. Widely scattered cultural material was found in these areas, including several isolated artifacts and three small artifact scatters. Among the isolated artifacts recovered during these surveys were three biface fragments: two probable projectile point tips and a chert biface base (see Fig. 8a, b, and f). Two other bifaces have been found at the historic mine site, 4-SBR-4208. A side-notched projectile point fragment (see Fig. 8e) was found by the 1979 survey crew (Simpson 1981), and a probable projectile point tip was found on the surface during the JOTR 85A project (see Fig. 8c). Because only a few other scattered prehistoric artifacts were found at 4-SBR-4208, these two bifaces will be treated as isolated artifacts.

The presence of bifacial implements is suggestive of hunting activities and indicates that the monzogranitic boulder formations were one area frequented by prehistoric hunters. These formations represent favorable hunting spots because the rock outcrops provide abundant shelter for small animals. Moreover, in addition to the several large tanks located among the bedrock outcrops, there are many smaller cups and depressions that trap rainwater throughout these outcrops.

The relative abundance of biface fragments found on survey contrasts sharply with the lack of flaked stone tools in the assemblage of 4-RIV-1961. Only five biface fragments were found at the site, three of them crude quartz pieces and none found in the randomly collected sample. This, and the presence of a number of groundstone artifacts on the site, suggests that 4-RIV-1961 represents a special purpose encampment, possibly established for the purpose of gathering vegetal resources such as grass seeds.

Unfortunately, we have poor information on the period of occupation of 4-RIV-1961. A radiocarbon date of 200 B.P. ± 90 was obtained on charcoal from a cremation, suggesting historic period Native American use of the site. This cremation contained a small ceramic vessel, and
the remains of two others were found on the site surface. Their presence may indicate use of the site as early as the beginning of the ceramic period.

Site 4-RIV-1961 may also have been occupied during the preceramic period, although this inference is based on little concrete evidence. No artifacts diagnostic of the preceramic period were recovered; however, it is unlikely that even a small, specialized site could have been occupied by ceramic period people long enough to have produced a dense scatter of lithic debitage, without also leaving a significant number of sherds. Only three other sites found on the 1979 road survey have assemblages consisting of less than 65 percent ceramics. One of these, 4-RIV-1960, is a small scatter of flaked stone artifacts located only several hundred yards north of 4-RIV-1961, and the two sites may be related. Another site, 4-RIV-1950, is located in the Hidden Valley area. The third site, 4-RIV-1964, yielded a Humboldt series point (probably Humboldt Basal notched) diagnostic of the late Archaic Gypsum period (see Fig. 8d).

The investigations at the Anaconda Mine Site, 4-SBR-4208, revealed three clusters of cultural features. Areas 1 and 2 consist of mine prospects and shafts as well as service roads. Structural features, probably representing both habitation and mining structures, were also found in Area 1. Area 3 is a cluster of features that include two or three habitation or office structures, several depressions, and three trash dumps. The artifact assemblage at 4-SBR-4208 includes some structural artifacts (nails and window glass), a few artifacts relating to mechanical equipment (vehicular parts), and a wide range of domestic artifacts. Temporally diagnostic material includes some artifacts representative of the early period of operation of the mine (about 1900 to 1920), such as sun-turned amethyst glass (dating to before 1920) and hole-in-top cans (dating to before 1920). Other artifacts are probably associated with a later period of operation, during the mining boom of the 1930s and early 1940s. These artifacts include clear glass (which lacks manganese and thus dates to after 1920) and open-top cans (which came into use between 1902 and 1918).

Although there is no direct documentary evidence that the Anaconda Mine was operated at any time during the 1930 to 1942 period, there is
indirect evidence to that effect. A 1930 report by the California State
Mineralogist lists two shafts at the Anaconda, which were 100 feet and
185 feet deep at that time (Tucker and Sampson 1930; see Greene 1983:
96). In 1953, however, the two shafts were reported to be 100 feet and
212 feet deep, suggesting that one of the shafts was worked after
1930 (Wright and others 1953; see Green 1983:97). The discovery of
artifacts dating to after 1920 demonstrates one of the ways that
archeological investigations can complement and support historical
research.

The Anaconda Mine is an archeologically significant site. There is
a high probability that excavations at some of the structural features
would yield important information about their function and period of
occupation, despite some disturbance by relic hunters. This assessment
agrees with Simpson's (1981) evaluation of the site. On the other hand,
Greene (1983:102) concluded that the site lacked "historical integrity
and significance." These assessments reflect the different ways that
historians and archeologists view cultural resources. Greene was most
impressed by the disturbance to the site and the lack of standing
structures. As part of her study, Greene had investigated a number of
other mining sites that were not only more important historically, but
were in better states of preservation. On the other hand, archeologists
rarely have the opportunity to work with aboveground remains, and are
therefore methodologically and theoretically equipped to investigate
sites lacking physical structures. Although the Anaconda Mine may not
constitute an important historical resource, it does have the potential
to yield important archeological information and therefore has
archeological significance.

The JOTR 85A project was small in scope, but it provided a certain
amount of additional information about the prehistory and history of
Joshua Tree National Monument. While small projects by themselves may
not yield great quantities of new archeological information, they do
provide an important means to further our knowledge. Using data
collected from many such projects, we can continue to piece together the
archeology of areas like Joshua Tree, a process which will eventually
contribute to a fuller understanding of the prehistory and history of
the entire region.
Appendix 1

ANALYSIS OF CERAMIC ARTIFACTS FROM THE JOTR 85A PROJECT

by

James M. Bayman
Appendix 1
ANALYSIS OF CERAMIC ARTIFACTS FROM THE JOTR 85A PROJECT

by
James M. Bayman

A total of 75 sherds was recovered by surface collection and test pit excavations conducted at 4-RIV-1961, JOTR 85A-3, and JOTR 85A-4. Sherd counts by type and provenience from the JOTR 85A project are provided in Table 1.1. Table 1.2 compares the frequency of ceramic types found during the JOTR 85A project with frequencies from previous projects in the monument.

Table 1.1
CERAMIC COUNTS FROM JOTR 85A PROJECT BY PROVENIENCE

<table>
<thead>
<tr>
<th>Provenience</th>
<th>LCBW</th>
<th>LCBW</th>
<th>TIZON</th>
<th>UNIDENTIFIED</th>
<th>TOTAL</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-RIV-1961 - Surface</td>
<td></td>
<td>17*</td>
<td></td>
<td>1</td>
<td>18*</td>
<td>27.7</td>
</tr>
<tr>
<td>4-RIV-1961 - Feature 6 Reconstructed</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>4-RIV-1961 - Feature 6 Sherds</td>
<td>15</td>
<td>5</td>
<td></td>
<td>1</td>
<td>15</td>
<td>13.9</td>
</tr>
<tr>
<td>JOTR 85A-3</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td>5</td>
<td>5.2</td>
</tr>
<tr>
<td>JOTR 85A-4</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
<td>1.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>47</td>
<td>22*</td>
<td>5</td>
<td>1</td>
<td>75</td>
<td>49.2</td>
</tr>
</tbody>
</table>

LCBW = Lower Colorado Buff Ware
* = Includes two sherds recovered during 1979 survey (Simpson 1981)
# = Identified as either Pyramid Gray or a type of thin-walled brownware.

Sixty-three sherds, 84 percent of the ceramic assemblage, were obtained from Feature 6 (a cremation), and surface collections at 4-RIV-1961. Feature 6 produced 32 sherds of a partially restorable jar, either Pyramid Gray or an unidentified brownware. Pyramid Gray is a type of plainware within the Colorado Buffware ceramic tradition typical of the monument area and environs. Based on similarities in surface treatment and paste, 15 additional sherds from the feature are
Table 1.2
FREQUENCIES OF CERAMIC TYPES FROM PROJECTS
IN JOSHUA TREE NATIONAL MONUMENT (AFTER TAGG 1983:66)

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>REFERENCE</th>
<th>LOWER COLORADO BUFFWARE</th>
<th>TIZON BROWNWARE</th>
<th>NUMBER OF SITES</th>
<th>TYPE OF WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indian Cove</td>
<td>Kritzaan 1967</td>
<td>69 (58%)</td>
<td>49 (42%)</td>
<td>4</td>
<td>Survey</td>
</tr>
<tr>
<td>Deep Tank/Squaw Tank</td>
<td>Wallace &amp; Taylor 1959</td>
<td>416 (37%)</td>
<td>694 (63%)</td>
<td>22</td>
<td>Survey</td>
</tr>
<tr>
<td>Squaw Tank</td>
<td>Wallace &amp; Desautels 1959</td>
<td>276 (24%)</td>
<td>852 (76%)</td>
<td>1</td>
<td>Excavation</td>
</tr>
<tr>
<td>Barker Dam</td>
<td>O’Neil 1968</td>
<td>156 (29%)</td>
<td>(75%)</td>
<td>15</td>
<td>Survey</td>
</tr>
<tr>
<td>Sheep Pass</td>
<td>Wallace 1961</td>
<td>385 (71%)</td>
<td>(19%)</td>
<td>16</td>
<td>Survey</td>
</tr>
<tr>
<td>Cottonwood Spring</td>
<td>Douglas 1978a</td>
<td>156 (29%)</td>
<td>(75%)</td>
<td>20</td>
<td>Survey</td>
</tr>
<tr>
<td>1979 Roads Survey</td>
<td>Simpson 1981</td>
<td>385 (71%)</td>
<td>(25%)</td>
<td>15</td>
<td>Survey</td>
</tr>
<tr>
<td>Oasis of Mara*</td>
<td>Tagg 1983</td>
<td>20 (80%)#</td>
<td>5 (20%)</td>
<td>3</td>
<td>Excavation</td>
</tr>
</tbody>
</table>

* = 15% Unidentified
** = 1% Unidentified
\# = 47 sherds that were identified as either Pyramid Gray or a thin-walled brownware were not included here.

Sixty-nine of the sherds were Colorado River Buffware (92 percent of the ceramic assemblage). This pottery was produced by the Lowland Patayan of the lower Colorado and Gila rivers as early as A.D. 500 (Waters 1978:73). During the historic period, it was produced by the Yumans and Chemehuevi of the Lower Colorado River Valley (Rogers 1936).

During the later periods of its production, this ware was traded to groups from the southern tip of Nevada to the Gulf of California, and in the peripheral deserts of western Arizona and southern California.

Colorado River Buffware was manufactured by coiling and was shaped by paddle and anvil. Vessels were fired in a highly oxidizing atmosphere that resulted in a buff color ranging from tan to red and

* = 15% Unidentified
** = 1% Unidentified
\# = 47 sherds that were identified as either Pyramid Gray or a thin-walled brownware were not included here.
brown. Common tempering materials included crushed quartz, feldspars, hornblende, and mica. Methods of surface treatment included a stucco surface, red painted designs, and occasionally, thumbnail incisions. Seventeen types have been identified for the Colorado Buffware tradition. Two of these, Parker Buff and possibly Pyramid Gray, were found in the JOTR 85A assemblage.

**Pyramid Gray**

The 32 sherds of the partially restored, possible Pyramid Gray vessel, plus an additional 15 sherds of the same type, account for 62 percent of the assemblage. Pyramid Gray (Colton 1939) is synonymous with Topoc Buff (Rogers 1945; Waters 1982b:566). This type is characteristically well oxidized and surface color ranges from buff to slate gray (Waters 1982b:566). Temper consists of medium to large fragments of quartz and feldspars that are visible on the exterior surfaces of sherds. Occasionally, thumbnail incisions are apparent on the vessel necks, an attribute that was observed on the one Pyramid Gray rim sherd.

Pyramid Gray falls within the Patayan II period. Waters (1982b:566) believes that it was manufactured from about A.D. 1000 to A.D. 1400. Although this type is common to the Mojave Desert region, especially the area around Barstow, Waters (1982b:566) believes that it was manufactured in the area of sedimentary clay deposits of the Colorado River.

**Parker Buff**

Twenty-three of the sherds, or 30 percent of the assemblage, were identified as Parker Buff. Parker Buff is most prevalent in the Parker Valley, although it is common along the Colorado River from the Bill Williams River to Yuma, Arizona (Waters 1982b:567). It is associated with the Patayan II and III periods and dates from about A.D. 900 or 1000 to after A.D. 1900 (Schroeder 1958; Waters 1982b).

Parker Buff was made from sedimentary riverine clays and shaped by paddle and anvil. Firing in an oxidizing atmosphere produced surface colors of pink and gray. Temper consists of medium-to fine-grained, subangular to angular crushed white feldspar and quartz with hornblende.
Vessel surfaces are mopped, so that the temper is not visible on the vessel surface. Some specimens have a cream-colored scum coating.

Early vessels have roughly flattened and lipped rim margins, while later rims were refined and smoothed. Occasional specimens have reinforced rim bands. No specimens of Parker Buff are decorated.

**Tizon Brownware**

Six of the sherds (8 percent of the ceramic assemblage) were identified as Tizon Brownware, and Waters also believed that the jar from the cremation is a brownware type. Tizon Brownware was manufactured in prehistoric times by the Upland Patayan, whose range extended along the lower Colorado River, through the mountains of southern California, and into northwestern Arizona (Waters 1978:42). This was produced in historic times by several Shoshonean groups including the Cahuilla, Cupeño, and Luiseño in California (Rogers 1936). It was manufactured by the Yuman Hualapai and Havasupai in northwestern Arizona (Colton 1958). The earliest occurrence of this ware, at the Willow Beach Site (Schroeder 1961), has been dated to pre-A.D. 750 by association with Lino Black-on-gray, a member of the Tusayan graywares. The manufacture of Tizon Brownware continued into the later part of the last century.

Tizon Brownware was constructed by coiling and shaped by paddle and anvil. Temper includes subangular to rounded opaque quartz, feldspar, and occasionally mica flakes. Vessel surfaces are generally smooth except for interior anvil marks. Firing in a poorly controlled oxidizing atmosphere produced colors ranging from black to gray and red to brown. Although decorated vessels are rare, a few have black and red painted designs. None of the sherds in the JOTR 85A assemblage are decorated.

Seven types have been identified within this ware by Dobyns and Euler (1958). These are distinguished by minor differences in temper. Most recently, Waters (1978:42-43) has proposed that until more data are available, Tizon Brownware be viewed as one type.
Discussion

All of the pottery recovered is typical of desert areas peripheral to the Lower Colorado River. Thus far, Colorado Buffware types recovered from Joshua Tree include Topoc Buff (Wallace and Taylor 1959; Kritzman 1967; Wallace and Desautels 1959), Parker Buff (Simpson 1981), and the Parker Buff, Fort Mojave variant (Tagg 1983).

Although the ceramic assemblage recovered is quite small, the presence of Parker Buff, a riverine type, is further evidence of wide-ranging movement and trade during the Patayan II period. Pottery of this period has been recovered from Anasazi sites in southern Nevada and Sand Papago sites in northern Sonora (Waters 1982a:240).

A radiocarbon assay of wood charcoal associated with the restored vessel yielded a date of 200 years B.P. ± 90 (page 83, this report), producing an interval of A.D. 1485 to A.D. 1950. The cultural context of both the vessel and the charcoal is secure, so it may be inferred that either Pyramid Gray was manufactured for a longer period than previously had been believed, or that this vessel is not Pyramid Gray, but is a historic period type. In either case, the monument area was utilized by ceramic-producing groups well into the historic period.
REFERENCES

Colton, Harold S.

Dobyns, Henry F., and Robert C. Euler

Douglas, Ronald D.

Kritzman, George
1967 An Archeological Reconnaissance of the Indian Cove Area, Joshua Tree National Monument, California. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

McGuire, Randall H., and Michael B. Schiffer

O'Neil, Dennis H.
1968 An Archeological Reconnaissance of the Barker Dam Region, Joshua Tree National Monument, California. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

Rogers, Malcolm J.


Schroeder, Albert H.

Simpson, Kay
1981 The Joshua Tree Road Improvement Project. MS, Western Archeological and Conservation Center, National Park Service, Tucson.
REFERENCES (continued)

Tagg, Martyn D.

Wallace, William J.
1961 The Archaeology of the Sheep Pass District in Joshua Tree National Monument. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

Wallace, William J., and Edith S. Taylor
1959 An Excavation of the Squaw Tank (J. T. 1) Site, Joshua Tree National Monument, California. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

Waters, Michael R.
1978 The Diagnostics and Distribution of the Lowland Patayan Buffware Ceramic Tradition. MS, Western Archeological and Conservation Center, National Park Service, Tucson.


Appendix 2

ANALYSIS OF OSTEOLOGICAL REMAINS FROM 4-RIV-1961

by

Marilyn B. Saul
Appendix 2

ANALYSIS OF OSTEOLOGICAL REMAINS FROM 4-RIV-1961

by

Marilyn B. Saul

The calcined remains of a single adult individual were recovered from Feature 6 at 4-RIV-1961. Accompanying the human remains were the calcined shells of at least two desert tortoises (Gopherus agassizii), and the articular portion of the right scapula of a cervid. This report will deal specifically with the human remains from Feature 6. Table 2.1 enumerates the additional human/nonhuman bone found in other proveniences at 4-RIV-1961.

Initially, the human remains were separated from nonhuman remains and categorized by element. Like elemental fragments were weighed and the degree of incineration noted. Pulverization was not assessed because the recovered osseous remains represented only part of the individual. Nonetheless, most skeletal elements were represented (Table 2.2).

The individual was identified as an adult, based on the presence of the lower third molars. More precise age determination was not possible. The gender of the individual could not be determined due to the fragmentary nature of the remains.

Incineration ranged from charred to hard white. This would suggest that the remains were not raked, but were left in situ during cremation, with some elements subjected to a reducing atmosphere while others were burned in an oxidizing atmosphere.

Feature 6 probably represents a primary cremation, one in which, after cessation of the cremation process, the remains were redistributed within the crematory pit (Heye 1919; Davis 1921; Spier 1978). The tortoise shells and cervid scapula were apparently included as funerary offerings. The shells may have been part of objects such as rattles, and the scapula could have served as a palette. However, no evidence of modification that might be indicative of the functions of the nonhuman bone material was observed.
Table 2.1

NONFEATURE OSSEOUS REMAINS FROM 4-RIV-1961

<table>
<thead>
<tr>
<th>BAG</th>
<th>COUNT</th>
<th>CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961-0-3</td>
<td>1</td>
<td>Awl fragment?</td>
</tr>
<tr>
<td>1961-0-4</td>
<td>1</td>
<td><em>Gopherus agassiz</em></td>
</tr>
<tr>
<td>1961-0-6</td>
<td>3</td>
<td>Indeterminate*</td>
</tr>
<tr>
<td>1961-0-7</td>
<td>1</td>
<td><em>Gopherus agassiz</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Unidentified faunal**</td>
</tr>
<tr>
<td>1961-0-37</td>
<td>4</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>1961-0-38</td>
<td>6</td>
<td>Unidentified faunal</td>
</tr>
<tr>
<td>1961-0-39</td>
<td>2</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>1961-0-40</td>
<td>4</td>
<td>Unidentified faunal</td>
</tr>
<tr>
<td>1961-0-42</td>
<td>2</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>1961-5-5</td>
<td>1</td>
<td>Unidentified faunal</td>
</tr>
<tr>
<td>1961-5-6</td>
<td>5</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>1961-5-11</td>
<td>1</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>1961-6-2</td>
<td>1</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>1961-6-3</td>
<td>2</td>
<td>Indeterminate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Unidentified faunal</td>
</tr>
<tr>
<td>1961-6-7</td>
<td>1</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>1961-6-8</td>
<td>4</td>
<td>Unidentified faunal</td>
</tr>
<tr>
<td>1961-6-13</td>
<td>1</td>
<td>Indeterminate</td>
</tr>
</tbody>
</table>

* = Too small to determine if human or nonhuman.
** = Too small to identify more specifically.
<table>
<thead>
<tr>
<th>COUNT</th>
<th>ELEMENT</th>
<th>INCINERATION</th>
<th>WEIGHT (gm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Occipital fragment</td>
<td>Black/gray</td>
<td>3.8</td>
</tr>
<tr>
<td>3</td>
<td>Maxilla fragments</td>
<td>Black/gray</td>
<td>5.5</td>
</tr>
<tr>
<td>7</td>
<td>Mandible fragments</td>
<td>Black/gray</td>
<td>11.6</td>
</tr>
<tr>
<td>1</td>
<td>Hyoid fragment</td>
<td>Black/gray</td>
<td>0.5</td>
</tr>
<tr>
<td>33</td>
<td>Unidentified cranial fragments</td>
<td>Black/gray</td>
<td>42.7</td>
</tr>
<tr>
<td>18</td>
<td>Dental root fragments</td>
<td>Black/gray</td>
<td>2.9</td>
</tr>
<tr>
<td>2</td>
<td>Dental cap fragments</td>
<td>Black/gray</td>
<td>0.3</td>
</tr>
<tr>
<td>7</td>
<td>Incisor fragments</td>
<td>Black/gray</td>
<td>2.7</td>
</tr>
<tr>
<td>2</td>
<td>Canines</td>
<td>Black/gray</td>
<td>1.4</td>
</tr>
<tr>
<td>2</td>
<td>Lower third molars</td>
<td>Black/gray</td>
<td>1.7</td>
</tr>
<tr>
<td>3</td>
<td>Lower molar fragments</td>
<td>Black/gray</td>
<td>1.8</td>
</tr>
<tr>
<td>1</td>
<td>1st cervical vertebral fragment</td>
<td>Black/gray</td>
<td>1.0</td>
</tr>
<tr>
<td>2</td>
<td>2nd cervical vertebral fragments</td>
<td>Black/gray</td>
<td>2.0</td>
</tr>
<tr>
<td>1</td>
<td>Cervical vertebral fragment</td>
<td>Black/gray</td>
<td>1.4</td>
</tr>
<tr>
<td>4</td>
<td>Thoracic vertebral fragments</td>
<td>Black/gray</td>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
<td>Lumbar vertebral fragments</td>
<td>Black/gray</td>
<td>2.2</td>
</tr>
<tr>
<td>9</td>
<td>Unidentified vertebral fragments</td>
<td>Black/gray to hard white</td>
<td>5.2</td>
</tr>
<tr>
<td>1</td>
<td>Unidentified vertebral fragment</td>
<td>Charred</td>
<td>0.5</td>
</tr>
<tr>
<td>3</td>
<td>Acetabular fragments</td>
<td>Hard white</td>
<td>5.3</td>
</tr>
<tr>
<td>1</td>
<td>Sciatic notch fragment</td>
<td>Hard white</td>
<td>6.4</td>
</tr>
<tr>
<td>27</td>
<td>Rib fragments</td>
<td>Charred</td>
<td>19.4</td>
</tr>
<tr>
<td>1</td>
<td>Femoral diaphysis fragment</td>
<td>Hard white</td>
<td>29.7</td>
</tr>
<tr>
<td>1</td>
<td>Fibula fragment</td>
<td>Hard white</td>
<td>3.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COUNT</th>
<th>ELEMENT</th>
<th>INCINERATION</th>
<th>WEIGHT (gm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Distal left ulna fragment</td>
<td>Charred</td>
<td>3.2</td>
</tr>
<tr>
<td>1</td>
<td>Left radius fragment</td>
<td>Charred</td>
<td>7.2</td>
</tr>
<tr>
<td>5</td>
<td>Radius fragments</td>
<td>Charred</td>
<td>10.7</td>
</tr>
<tr>
<td>4</td>
<td>Femoral/humeral head fragments</td>
<td>Black/gray to hard white</td>
<td>6.4</td>
</tr>
<tr>
<td>5</td>
<td>Unidentified diaphyseal fragments</td>
<td>Charred</td>
<td>20.4</td>
</tr>
<tr>
<td>9</td>
<td>Unidentified diaphyseal fragments</td>
<td>Black/gray</td>
<td>14.6</td>
</tr>
<tr>
<td>69</td>
<td>Unidentified diaphyseal fragments</td>
<td>Hard White</td>
<td>123.5</td>
</tr>
<tr>
<td>6</td>
<td>Possible human diaphyseal fragments</td>
<td></td>
<td>6.2</td>
</tr>
<tr>
<td>1</td>
<td>Right talus/calcaneous fragment</td>
<td>Black/gray</td>
<td>42.0</td>
</tr>
<tr>
<td>1</td>
<td>Left talus, calcaneous fragment</td>
<td>Black/gray</td>
<td>10.3</td>
</tr>
<tr>
<td>8</td>
<td>Unidentified talus/calcaneous fragements</td>
<td></td>
<td>11.0</td>
</tr>
<tr>
<td>2</td>
<td>1st metatarsal distal fragment</td>
<td>Charred</td>
<td>5.5</td>
</tr>
<tr>
<td>2</td>
<td>4th metatarsal proximal fragments</td>
<td>Black/gray</td>
<td>1.9</td>
</tr>
<tr>
<td>4</td>
<td>Unidentified metatarsal/carpal fragements</td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>6</td>
<td>Phalanx (hand) fragments</td>
<td>Charred</td>
<td>2.1</td>
</tr>
<tr>
<td>2</td>
<td>Phalanx (hand) fragments</td>
<td>Black/gray</td>
<td>0.6</td>
</tr>
<tr>
<td>1</td>
<td>Phalanx (hand) fragment</td>
<td>Hard white</td>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
<td>Pisiform</td>
<td>Black/gray</td>
<td>0.4</td>
</tr>
<tr>
<td>1</td>
<td>Tarsal fragment (2nd cuneiform?)</td>
<td>Charred</td>
<td>1.0</td>
</tr>
<tr>
<td>958</td>
<td>Unidentified fragments</td>
<td></td>
<td>174.7</td>
</tr>
</tbody>
</table>

1,220 TOTAL  598.8

161 Unidentified cranial fragments (human or nonhuman)
27 Unidentified diaphyseal fragments (human or nonhuman)
REFERENCES

Davis, Edward H.

Heye, George G.

Spier, Leslie
Appendix 3
ARCHEOBOTANICAL REMAINS FROM 4-RIV-1961,
JOSHUA TREE NATIONAL MONUMENT, CALIFORNIA

by
Lisa W. Huckell
Appendix 3
ARCHEOBOTANICAL REMAINS FROM 4-RIV-1961,
JOSHUA TREE NATIONAL MONUMENT, CALIFORNIA

by
Lisa W. Huckell

Introduction

The partial excavation of a human cremation, Feature 6, at 4-RIV-1961 produced a large quantity of associated wood charcoal from a portion of the pit fill. Six flotation samples were taken, the light fractions of which were recovered for analysis. Included with the flotation samples for identification was a single isolated carbonized plant macrofossil from Test Pit 6 at the same site.

Methods

The flotation samples were processed by passing each sample through a window screen placed over the water bath. All large charcoal pieces were removed from the screen and bagged prior to immersion of the sample. The remaining sediment was added to the water bath which, after gentle agitation, was skimmed with a large tea strainer bearing a mesh size of 6 per centimeter or 14.5 per inch to remove the buoyant carbonized plant parts. This light fraction was air-dried, bagged separately, and placed with the large charcoal portion of the sample.

In order to stay within the project budget and to avoid unnecessary duplication of effort, the Feature 6 charcoal was sampled. All six samples were collected at approximately the same excavation level (40 cm to 50 cm) in the pit, and were considered to be portions of one large sample. Half of the samples were selected, with two from the east half of the feature and one from the west half. Each was poured through a graded screen series that sorted the contents into six size classes: ≥9.5 mm, 7.95 mm to 9.5 mm, 4.75 mm to 7.95 mm, 2.0 mm to 4.75 mm, 1.0 mm to 2.0 mm, and <1.0 mm. The volume of each size class was recorded, and the results are summarized in Table 3.1. Ten fragments were
Table 3.1  
VOLUMES OF CHARCOAL SAMPLES BY SCREEN SIZE CLASS RECOVERED FROM LEVEL 5, FEATURE 6, 4-RIV-1961, JOSHUA TREE NATIONAL MONUMENT
(All figures in milliliters)

<table>
<thead>
<tr>
<th>SCREEN SIZE</th>
<th>SAMPLE NUMBER</th>
<th>TOTAL</th>
<th>SAMPLE CHOSEN FOR IDENTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 9.5 mm</td>
<td>700 300 100</td>
<td>1,100</td>
<td>10 random</td>
</tr>
<tr>
<td>7.95 - 9.5</td>
<td>30 40 30</td>
<td>100</td>
<td>10 random</td>
</tr>
<tr>
<td>4.75 - 7.95</td>
<td>100 200 110</td>
<td>410</td>
<td>10 random</td>
</tr>
<tr>
<td>2.0 - 4.75</td>
<td>175 400 300</td>
<td>875</td>
<td>10 random</td>
</tr>
<tr>
<td>1.0 - 2.0</td>
<td>25 60 65</td>
<td>150</td>
<td>10 random</td>
</tr>
<tr>
<td>&lt; 1.0 mm</td>
<td>20 25 20</td>
<td>65</td>
<td>not sampled</td>
</tr>
<tr>
<td>Flotation</td>
<td>122 286 242</td>
<td>650</td>
<td>10 ml</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,172 1,311 867 3,350</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

selected at random for identification from the first five size classes. The <1.0 mm class was eliminated from consideration, as it was largely composed of dust and fine sand and did not possess large enough charcoal fragments to display diagnostic features. It was felt that sampling each size class would greatly reduce the bias toward the selection of larger fragments during a random sampling of the unsorted samples. This helps ensure a more accurate representation of small wood elements or species included in the fire and takes into account the wide range of variable fracturing and burning qualities of woods.

Species identifications were made using an Olympus DHMJ incident light microscope with a magnification range of 50x to 750x that was made available by the Laboratory of Traditional Technology, Department of Anthropology, University of Arizona, Tucson. Specimens were split to produce fresh cross, radial, and tangential sections. Identifications were made using wood keys (Panshin and de Zeeuw 1980; Saul 1955) and were confirmed through comparison with modern wood and charcoal specimens in the author's collection.

The three flotation samples were also subsampled. A 10 ml sample was randomly taken from each and was then sorted using a stereozoom dissecting microscope with a magnification capability of 7x to 30x. Sample volumes are included in Table 3.1.
Results

The results of the charcoal analysis indicate the presence of three wood genera in the cremation pit. They are oak (*Quercus* sp.), juniper (*Juniperus* sp.), and mesquite (*Prosopis* sp.). The number of fragments of each genus found in each size class is presented by sample in Table 3.2.

Examination of Table 3.2 shows oak as the most abundant wood present in the samples, accounting for 73 percent (110 specimens) of the total. Cursory inspection of other large charcoal fragments, some of which reached 4 cm across, support this figure, as most were oak. Mesquite and juniper are relatively minor components of the assemblage at 14 percent (21 specimens) and 12 percent (18 specimens), respectively. A single piece of unidentifiable hardwood was also included in the sample. It exhibited a twisted, irregular appearance and had few visible vessels or characteristic cell patterns, making an identification difficult. The remarkably consistent species counts for the size classes suggest that oak was the primary fuel component of the cremation fire. However, it is important to bear in mind that upon discovery of irrefutable human remains in the pit fill, excavation was discontinued. As a result, the depth of the pit is unknown, and no comparable samples from other levels are available. It is therefore impossible to say whether the analysis results are an accurate depiction of the total pit contents or merely a reflection of wood placement at that level within the pit.

Of the three woods found in the pit, juniper (*Juniperus californica* Carr.) is readily available in the immediate site area today (Leary 1977:190-191). Oak, in the form of *Q. turbinella* Greene, presently grown within a mile or two of the site to the east (Leary 1977:247-248). Mesquite (*P. glandulosa* Torr. var. *torreyana* [L. Benson] M. C. Jtn.) is also present in the general vicinity, occurring in isolated localities in mountain ranges in the western portion of the monument. The closest source to the site would probably be the canyons or washes of the Pinto Mountains to the north and east (Leary 1977:242). All of these woods produce hot, lasting fires that would be well suited to the task for which they were gathered.
Table 3.2
CHARCOAL SPECIES IDENTIFICATIONS FROM FEATURE 6, 4-RIV-1961, BY SCREEN MESH SIZE

<table>
<thead>
<tr>
<th>SCREEN SIZE</th>
<th>1 - W3</th>
<th>2 - E3</th>
<th>3 - E3</th>
<th>SPECIES TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OAK</td>
<td>JUNIPER</td>
<td>OAK</td>
<td>JUNIPER</td>
</tr>
<tr>
<td>&gt; 9.5 mm</td>
<td>10</td>
<td>3</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>7.95 - 9.5 mm</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>4.75 - 7.95 mm</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2.0 - 4.75 mm</td>
<td>9</td>
<td>1</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>1.0 - 2.0 mm</td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>44</td>
<td>6</td>
<td>24</td>
<td>5</td>
</tr>
</tbody>
</table>
Because of the high probability that the flotation samples would be primarily composed of small charcoal fragments, 10 ml samples were examined from each to ascertain whether larger portions of the samples should be analyzed. The samples proved to consist almost entirely of charcoal, but also contained varying amounts of sand, ant exoskeleton fragments, fecal pellets, fragments of calcined bone, and rootlets.

The only two plant macrofossils recovered were found in the 1 mm to 2 mm size class of the screened samples. The first is a section of the internode of a small grass culm that measures 5.2 mm in length and 1 mm in diameter. The stem has been thoroughly burned and is blistered and cracked from the heat. It possesses numerous closely spaced vertical ribs and has a solid pith. No diagnostic features are present. The specimen comes from Sample 1. The second macrofossil appears to be a fragment of a seed. The specimen is irregularly semicircular in cross section, and measures 3 mm in length, 1.8 mm in width, and 1 mm in thickness. The smooth surfaces display an irregularly reticulate pattern. No hilum is discernible. The lack of diagnostic features makes an identification impossible. The specimen comes from Sample 2.

These items are probably incidental inclusions in the pit fill. Grasses are present in the site area; it is difficult to imagine that grass parts could escape inclusion during pit excavation, the cremation itself, or pit refilling. Dry grasses easily could have served as tinder as well. The absence of any plant parts in any quantity beyond charcoal suggests that plant food items were either not present in the pit or that they are not present in the unit of pit fill sampled.

The last item submitted for analysis is a single carbonized macrofossil from Level 4 (30 cm to 40 cm below surface) of the southwest quarter of Test Pit 6. The specimen measures 12.5 mm in length, 9.5 mm in width, and 2.5 mm in thickness. It is irregularly square in shape and is convex in cross section, evidently being a portion of a cylindrically shaped structure. The exterior surface is covered with closely spaced, rounded protuberances that are arranged spirally around what would have been the axis. The interior surface shows the diagonally oriented bases of the exterior projections. The small size and battered condition of the specimen make it difficult to determine its identity. It is very likely that a pith was present, although no
evidence for one exists today. The closely packed spirally arranged projects are suggestive of new, immature structures being formed by a meristematic area. It may be a portion of a stem, branch, or fruit apex. Its archeological significance is also uncertain, for the specimen was found isolated in the test pit fill unrelated to a cultural context. It is likely that the item is an artifact of a natural fire that passed through the area some time in the past.

Summary

The analysis of charcoal samples from a cremation pit at 4-RIV-1961 indicates that three wood species (oak, juniper, and mesquite) were used. Two unidentifiable macrofossils, a grass stem fragment and a possible seed fragment, were found in the charcoal samples. No evidence for the presence of food offerings was found, although with a portion of the pit left unexcavated, it is impossible to know if such items are truly absent. A single plant macrofossil from the fill of a test pit at the same site is too fragmentary to identify and cannot be tied to cultural activity at the site.
REFERENCES

Leary, Patrick J.

Panshin, A. J.

Saul, William E.
1955 A Descriptive Catalogue of the Trees and Larger Woody Shrubs of Utah Based on the Anatomy of the Wood. MS, doctoral dissertation, Department of Botany, University of Utah, Salt Lake City.
Appendix 4

RESULTS OF RADIONUCLEON ANALYSIS
Name of Submitter: Richard Ervin
Date Received:

Date Reported: September 16, 1985

Description of Sample:

<table>
<thead>
<tr>
<th>WSU Sample Number</th>
<th>Your Sample Number</th>
<th>¹¹⁴C age, years B.P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3266</td>
<td>#1961-TP4-50</td>
<td>200 ± 90</td>
</tr>
<tr>
<td></td>
<td>4-RIV-1961 40-50 cm</td>
<td></td>
</tr>
</tbody>
</table>

Sample Processed by: Welter
Sample Calculated by: Welter/Sheppard
Sample Reported by: Sheppard

Note: All analyses are based upon the Libby half-life (5570 ± 30 years) for radiocarbon. To convert ages to the half-life of 5730 years, multiply the age given above 1.03. Zero age date is A.D. 1950. (Reference: Editorial Comment, RADIOCARBON, Vol. 7, 1965.)
Appendix 5

RESULTS OF X-RAY FLUORESCENCE ANALYSIS OF OBSIDIAN ARTIFACTS
Mr. Richard G. Ervin  
Archeologist, Division of Archeology  
U.S.D.I., National Park Service  
Western Archeological and Conservation Center  
P.O. Box 41058  
Tucson, Arizona 85717

Dear Mr. Ervin:

Enclosed please find a xerox copy of a data sheet presenting the results of x-ray fluorescence analysis of three obsidian specimens from Joshua Tree National Monument, southern California. The artifact analyses were conducted pursuant to your letter request dated July 10, 1985, under Sonoma State University Academic Foundation, Inc. Account 6081-A1, Job X85-23.

Laboratory investigations were conducted at the Department of Geology and Geophysics, University of California, Berkeley, on a Spectrace™ 440 (United Scientific Corporation) energy dispersive x-ray fluorescence machine equipped with a 572 power supply (50 kV, 1 mA), 534-1 pulsed tube control, 514 pulse processor (amplifier), 588 bias/protection module, Tracor Norther 1221 100 mHz analog to digital converter (ADC), Tracor Northern 2000 computer based analyzer, an Rh x-ray tube and a Si(Li) solid state detector with 142 eV resolution (FWHM) at 5.9 keV in a 30 mm² area. The x-ray tube was operated at 30.0 kV, .40 mA pulsed, with a .04 mm Rh primary beam filter in an air path at 200 seconds livetime. All trace element values on the enclosed data sheet are expressed in parts per million (ppm) by weight, and these were compared directly to values for known obsidian sources that appear in Jack and Carmichael (1969: 27-28), Jack (1976: 203-204), Bacon et al. (1981: 10225-10228, 10234) and Hughes (1986: Figure 3).
Comparison of diagnostic trace element values (Rb, Sr, Y and Zr) for these three artifacts with values for known obsidian sources indicates specimen 13-4 (the large concave base point) was fashioned from obsidian of the Coso Hot Springs geochemical type, while the two obsidian flakes (nos. 12 and 7) both correspond to the trace element profile of Obsidian Butte (Salton Sea) volcanic glass.

I hope this information will help in your analysis of these site materials. Please contact me if I can be of further assistance.

Sincerely,

Richard E. Hughes, Ph.D.
Senior Research Archaeologist
Anthropological Studies Center
Sonoma State University
Rohnert Park, CA 94928

References Cited

Bacon, Charles R., Ray Macdonald, Robert L. Smith and Philip A. Baedecker

Hughes, Richard E.

Jack, Robert N.

Jack, R.N. and I.S.E. Carmichael
<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>CHSQ</th>
<th>Pb*</th>
<th>Th*</th>
<th>Rb*</th>
<th>Sr*</th>
<th>Y*</th>
<th>Zr*</th>
<th>Nb*</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-4</td>
<td>5.9</td>
<td>37.0</td>
<td>43.2</td>
<td>252.6</td>
<td>4.2</td>
<td>59.6</td>
<td>142.7</td>
<td>35.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 2.4</td>
<td>± 4.3</td>
<td>± 3.8</td>
<td>± 1.9</td>
<td>± 3.5</td>
<td>± 2.9</td>
<td>± 2.2</td>
</tr>
<tr>
<td>12</td>
<td>0.4</td>
<td>17.5</td>
<td>27.2</td>
<td>127.4</td>
<td>22.4</td>
<td>126.1</td>
<td>297.3</td>
<td>25.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 2.0</td>
<td>± 5.8</td>
<td>± 2.9</td>
<td>± 2.0</td>
<td>± 3.7</td>
<td>± 3.6</td>
<td>± 2.0</td>
</tr>
<tr>
<td>7</td>
<td>5.7</td>
<td>13.7</td>
<td>28.7</td>
<td>135.6</td>
<td>7.1</td>
<td>143.5</td>
<td>258.1</td>
<td>30.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 2.3</td>
<td>± 4.6</td>
<td>± 3.6</td>
<td>± 2.3</td>
<td>± 4.7</td>
<td>± 4.1</td>
<td>± 2.5</td>
</tr>
</tbody>
</table>

*All values in parts per million (ppm); ± = counting error uncertainty*


REFERENCES (continued)

Batchelder, George L. (continued)

Bean, Lowell J.

Bean, Lowell J., and Charles R. Smith

Bedwell, S. F.

Benedict, Ruth

Benson, Larry V.
1977 Fluctuation in the Level of Pluvial Lake Lahontan during the Last 40,000 Years. Quaternary Research 9(3):300-318.

Bettinger, Robert L.


Brainerd, George W.

Campbell, Elizabeth W. Crozier


Campbell, Elizabeth W. Crozier, and William H. Campbell
REFERENCES (continued)

Campbell, Elizabeth W. Crozier, and William H. Campbell

Campbell, Elizabeth W. Crozier, William H. Campbell, Ernst Antevs, Charles A. Amsden, Joseph A. Barbieri, and Francis D. Bode

Chase, J. Smeaton

Colton, Harold S.

Davis, C. Allan, and Gerald A. Smith

Davis, Edward H.

Davis, Emma Lou


Davis, Emma Lou, and Richard Shutler, Jr.

Dobyns, Henry F., and Robert C. Euler
REFERENCES (continued)

Douglas, Ronald D.

1978b Reconnaissance of Three Sites in Pleasant Valley, Joshua Tree National Monument, Riverside County, California. MS, Western Archeological and Conservation Center, National Park Service, Tucson.


Ervin, Richard G.

1985a Scope of Work: 1985 Test Excavations at Joshua Tree National Monument. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

1985b Addendum to Scope of Work: 1985 Test Excavations at Joshua Tree National Monument. MS, Western Archeological and Conservation Center, National Park Service, Tucson.


Glennan, William S.
1971 Concave-based Lanceolate Fluted Projectile Points from California. The Masterkey 45(1).

Greene, Linda W.

Harner, Michael J.
REFERENCES (continued)

Harrington, Mark R.

Haury, Emil W.

Hayden, Julian D.

Haynes, C. Vance, Jr.

Heizer, Robert F., and Thomas R. Hester

Heye, George G.

Hogan, James T.
1977 Ecology of the Joshua Tree in Joshua Tree National Monument, California. MS, master's thesis, Department of Biology, University of Nevada Las Vegas. Contribution No. 003/07. Cooperative National Park Resources Study Unit, University of Nevada, Las Vegas.

Huckell, Bruce B.
REFERENCES (continued)

Huckell, Bruce B. (continued)

Hughes, Richard E.

Jack, Robert N.

Jack, Robert N., and I. S. E. Carmichael

Jaeger, Edmond L.

Jefferson, George T.


Jelinek, Arthur J., Bruce Bradley, and Bruce Huckell

Jennings, J. D., and E. Norbeck

Johnston, Frank J., and P. H. Johnston
REFERENCES (continued)

Joshua Tree National Monument Fact File

Joshua Tree Natural History Association

King, Samuel A.

King, Thomas F.

King, Thomas J.

Klein, Jeffrey, J. C. Lerman, Paul E. Damon, and K. E. Ralph

Kritzman, George

Kroeber, Alfred L., and Michael J. Harner

Laird, Carabeth

Lanning, Edward P.

Leakey, Louis S. B., Ruth D. Simpson, and T. Clements
References (continued)

Leakey, Louis S. B., Ruth D. Simpson, and T. Clements (continued)

Leary, Patrick J.

Madsen, David B.

Martin, Paul S.
1963 The Last 10,000 Years, A Fossil Pollen Record of the American Southwest. Tucson: University of Arizona Press.

May, Ronald V.

McCarthy, Daniel F.

McGuire, Randall H., and Michael B. Schiffer

Mehringer, Peter J., Jr.

Meighan, C. W.

Merriam, C. Hart
REFERENCES (continued)

Miller, Alden H., and Robert C. Stebbins

Miller, Ronald D.

Moore, Jerry

Moratto, Michael J.

Moratto, Michael J., Thomas F. King, and Wallace B. Woolfenden

Morrison, Roger B.

Nelson, Lee H.

Newman, M. A.
1922 Los Angeles Field Division. Report XVIII of the State Mineralogist 18(6):264-266.

Newman, T. Stell

Oakeshott, Gordon B.

O'Neal, Lulu Rasmussen
REFERENCES (continued)

O'Neil, Dennis H.
1968 An Archeological Reconnaissance of the Barker Dam Region, Joshua Tree National Monument, California. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

Panshin, A. J.

Parker, Patricia

Riddell, F. A., and W. H. Olsen

Ritchie, William A.

Rogers, Malcolm J.


Rozen, Kenneth C.
REFERENCES (continued)

Rozen, Kenneth C. (continued)

Saul, William E.

Scharf, David

Schroeder, Albert H.
1952 A Brief Survey of the Lower Colorado River, from Davis Dam to the International Border. MS, National Park Service, Santa Fe.

Siebecker, Alice

Simpson, Kay
1981 The Joshua Tree Road Improvement Project. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

Simpson, Ruth D.
REFERENCES (continued)

Smith, Gerald A.

Spier, Leslie

Strong, William D.

Sullivan, Alan P., III, and Kenneth C. Rozen

Tagg, Martyn D.


Teague, George A.

Teague, George A., and Lynette Schenk

Thomas, David Hurst


Toulouse, Julian H.
REFERENCES (continued)

Tucker, W. Burling

Tucker, W. Burling, and R. J. Sampson

U.S. Department of the Interior

1985 Transportation Study, Road System Evaluation, Joshua Tree National Monument, California. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

Van de Kamp, P. C.

Van Devender, Thomas R. and W. Geoffrey Spaulding
1979 Development of Vegetation and Climate in the Southwestern United States. Science 204:701-710.

Walker, Edwin F.

Wallace, William J.


REFERENCES (continued)

Wallace, William J., and Robert J. Desautels
1959 An Excavation of the Squaw Tank (J. T. 1) Site. Joshua Tree National Monument, California. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

Wallace, William J., and Edith S. Taylor

Wallace, William J., Edith S. Taylor, and George Kritzman

Wanrow, Elden K.

Warren, Claude N.


Warren, Claude N., and John DeCosta

Waters, Michael R.
1978 The Diagnostics and Distribution of the Lowland Patayan Buffware Ceramic Tradition. MS, Western Archeological and Conservation Center, National Park Service, Tucson.


172
REFERENCES (continued)

Waters, Michael R. (continued)

White, C.

Wildesen, Leslie E.

Wilke, Philip J.

Wormington, H. Marie

Wright, Lauren A., Richard M. Steward, Thomas E. Gay, Jr., and George C. Hazenbush