Making the sunken fleet at Bikini into a marine park carries with it two tenet concepts that are common to all park lands. One is to "preserve something of value for future generations" and the other is to create "pleasuring grounds" for the present. The values worth preserving in Bikini are tied to history and archeology and the natural diversity of life forms on the ships which now comprise artificial reefs in the lagoon. The ships' more immediate role as pleasuring grounds for recreation are due to their dramatic appeal as diving attractions for use by a large and growing international population of scuba divers. Additionally, they have educational value as the focus for an interpretive program aimed at the full spectrum of potential park visitors—divers and nondivers.

There are two reasons that Great Lakes parks have focused on shipwrecks in advance of most marine areas. First, the cold fresh water preserves both metal and wooden vessel fabric much better than does salt water. Second, there are no dramatic natural resources to compete for diver's attention as is the case in coastal marine parks. The State of Vermont with similar resources in Lake Champlain has likewise developed an underwater preserve system oriented to shipwrecks.

There is precedent in Micronesia for World War II period shipwrecks serving as stimuli for economic growth. Truk Lagoon is by far the most dramatic example, although significant visitation also occurs for purposes of wreck diving at Guam and Palau. In the latter cases, however, the shipwrecks in Apra Harbor and the lagoon at Palau are secondary to the excellent reef diving which is the primary attraction for sport divers.

Other parts of the world have capitalized on shipwrecks for recreation attributes, including the Great Lakes region of North America. Fathom Five Provincial Park in Tobermory, Ontario (now a federal park), was one of the first to focus specifically on shipwrecks as a diving attraction. Others in the Great Lakes include Isle Royale National Park, a natural area (a part of the U.S. National Park System) in which shipwreck sites were inadvertently included when the offshore boundaries were established. These sites have become the focus of much attention from divers, and a sophisticated program of custodianship for the shipwrecks as resources was put into effect by park managers. Other shipwrecks have become important to the local economy of certain Great Lakes communities. The State of Michigan in particular has been very active in establishing state bottowards preserves to ensure that a degree of protection and control be accorded shipwrecks.

There are two reasons that Great Lakes parks have focused on shipwrecks in advance of most marine areas. First, the cold fresh water preserves both metal and wooden vessel fabric much better than does salt water. Second, there are no dramatic natural resources to compete for diver's attention as is the case in coastal marine parks. The State of Vermont with similar resources in Lake Champlain has likewise developed an underwater preserve system oriented to shipwrecks.
Underwater visitation by nondivers is one of the greatest areas of potential growth in marine parks. Forty passenger submarines have been found commercially viable in several parts of the world; this particular one is in Guam. (NPS, Joe Stynowski)
significance. It is rare to have several warships within range of divers, let alone ships as historically significant as *Arkansas* and *Nagato*.

The U.S. battleship *Arkansas*, two submarines, the badly damaged remains of two U.S. destroyers, two transports, and a floating drydock, a yard oiler, and several landing craft round out an unparalleled underwater museum of WW II relics.

Most of these sites are at depths that are at the outer limits for safe sport diving. They are not, however, undivable and are certainly within ranges that the advanced diving community of ardent wreck divers would find extremely attractive. Although *Arkansas* sits on the lagoon bottom at 180 feet, it is important to note that the flight deck is at only 100 feet and many fascinating dives can be made to its island, reached at depths as shallow as 70 feet. *Porpoise* and *Apogon*, Balao-class submarines, may be the focus of a thrilling overnight dive which does not exceed 150 feet. In many other locations each would be considered a main attraction in its own right. The beached LCT-1175 would make a good snorkel or shallow-water dive for novices.

Besides the unique shipwreck population, Bikini has an appealing coral reef environment which has had little disturbance since the testing, making it unusually intact compared to many places in Micronesia. Even the large numbers of sharks outside the reef may be a draw to certain advanced divers and underwater photographers.

Other aspects of Bikini which make it appealing as a dive site are the proximity of all the sites to each other and the fact that they are all within a 15-minute boat ride from Bikini island in a relatively protected lagoon. If there were a commercial diving facility on the island, it is hard to imagine a more logistically feasible diving resort. There is not a great deal at this point to hold the attention of the nondiving public, but that might be remedied by extending the interpretive efforts on the whole island to a nuclear theme. Many pioneer studies have been conducted on Bikini regarding radioactivity, and there are few other places in which as much has been learned about living with the nuclear age, as opposed to dying with it. An interpretive center or museum which included artifacts from the ships and others brought from abroad could capitalize on that theme. If the physical remains of the blockhouses and experimental agricultural stations are preserved, they could be a focus of interpretation efforts by Bikini Park Rangers or commercial tour guides.

**PARK PROTECTION**

One of the most critical aspects of park management is protection of the resources which form the basis of the park. For our purposes, these can be divided into the natural, cultural, and scenic values associated with the shipwrecks of Bikini. These include systemic factors such as the ecological health of the lagoon, which should be the focus of ongoing environmental monitoring. They also include the specifics of visitor use of the dive sites, which is the focus of our present discussion.

The most effective tools for site protection are the right balance of education and enforcement. Most attrition to the underwater environment of Bikini can be mitigated simply by ensuring that visitors are aware they are in a marine-protected area. Because a large percentage of the potential visiting public comes from nations that have been exposed to marine park concepts, education will be an especially important part of the resource protection process. Sport divers visiting Bikini should know that they are in a park, that there exist clear enforceable regulations, and that they are expected to live by them.

The other necessary part of the equation is enforcement of these regulations when any flagrant violations occur. It is important that an enforcement officer is available to the
It is critical that removal or disturbance of artifacts on the ships is prohibited. It seems strange to think of "disturbing" ships that have been the target for atomic bombs, but what is really being preserved is not the ship but rather a historic scene, i.e., the shipwreck. It is possible in very short time to remove much of the magic and ambiance of a shipwreck with crowbars and hammers.

INTERPRETIVE/EDUCATIONAL DEVICES

A basic tenet of park management is that the visitor experience can be significantly enhanced with an imaginative interpretive program. Educational devices also help protect the resources because informed visitors tend to be more respectful of resources they understand.

Among the devices that have been most successful in underwater parks are brochures that explain the nature of the resource and messages that help alert the diving public to what they are seeing and why it is significant. This may include large-format line drawings of shipwreck sites and plasticized schematics for use underwater. These orient divers (thereby also increasing the safety factor) and help them comprehend what can be an overwhelming number of visual stimuli on a complex underwater wreck site.

Exhibits in a visitor center can be useful for interpreting shipwrecks to nondivers or preparing divers for visits to sites.

Short, edited video tapes of each site with a narrative lasting 5-10 minutes can also prepare visitors and raise expectations of what may be seen on the dive. It also permits the narrator to relate to the actual experience of seeing a shipwreck, which can be quite overwhelming and confusing. Similarly, audio recordings of scuba divers from a depth of about 100 feet are often employed in educational programs to provide a more personal and detailed understanding of what is being seen.

Underwater monuments are appropriate in some cases. The underwater monuments are often used to mark significant areas of a shipwreck, such as the engine room or the bridge, and are designed to be viewed underwater by divers. These monuments can include items such as plaques, statues, or sculptures that depict important events or people associated with the shipwreck.

In summary, interpretive and educational devices play a crucial role in enhancing the visitor experience, protecting resources, and ensuring the safety of divers. By providing informative and engaging content, these devices help visitors gain a deeper understanding of the history and significance of shipwrecks and their surroundings.
the opportunity to identify hazards or point out fragile features which should not be disturbed.

A visitor center which housed both a museum of nuclear testing and various exhibits should not be prohibitively expensive and would enable tourists to understand the full significance of what transpired at Bikini. Part of it should be devoted to the portrayal of the traditional pre-test Bikinian lifestyle and the subsequent plight of the displaced population. This may also be attractive as a mechanism for preserving local knowledge of traditions which may be easily lost. Although the personal recollections of older generations of Bikinians are the greatest repository of these folkways, there exist a number of anthropological studies that may also provide some help in this regard.

It would be an intriguing challenge for an interpretive program to convey to the visitor a multifaceted experience—one in which they had some feeling for what traditional Bikinian lifestyle was like in contrast to what happened during the period Bikini played a part in an international postwar political theater.

Though billed as an "experiment," it is clear that Crossroads was also a "statement." How the tests were viewed initially by Americans, Japanese, Europeans, and the developing Soviet block nations provides fascinating subject matter for an interpretive program.

It is important too that the full significance of the testing is apparent to both diving and nondiving visitors. Part of this can be accomplished by a diorama of the lagoon showing the ships in place on the bottom and "play-on-demand" historical footage that shows how they got there.

Lastly, firsthand visits by nondiving visitors should be seriously considered. The use of submarines for transport of visitors in a tour bus arrangement has been commercially successful in recent years in Guam, Culebra Islands, Hawaii, and Saipan, among other places. The protected nature of the lagoon and the presence of such dramatic historical remains would make this a potentially lucrative enterprise in Bikini. It has the important aspect of being attractive to the large population of visitors who do not dive or in which only one member of the family dress.
DIVING SAFETY/LIABILITY

It should be understood at the outset that diving is not a risk-free activity. Diving on deep shipwrecks is especially risky and penetrating them at depth offers another magnitude of hazard. This report is not designed to begin to address the legal complexities of liability, claims, etc., that might devolve from visitor injury on a shipwreck at Bikini. We can only offer some observations on how to make this as safe an experience as possible, and leave legal advice to legal experts. Assuming that a decision has been made to offer the ships as a diving attraction, it is then the responsibility of the Bikini Council to inform the visitor of hazards, provide reasonable and prudent recourse to a person who has been injured, and to recover the remains of a victim of a fatal diving accident.

Anyone diving in the park should sign a registration and release form which ensures that they have been warned of the risks and understand what risks they must abide by to afford the greatest degree of protection to others. This includes conduct on the surface in boats as well as on the dive.

Perhaps the most problematic area comes in trying to evaluate the competence of visiting divers, and it is strongly recommended that no attempt be made to do this by the management agency beyond the most standard practices. The latter would include asking to see a valid diver certification card and having the card number recorded on the registration form. Attempts at trying to evaluate visitors' equipment, decompression protocols, etc., are not recommended. Divers adhere to widely differing philosophies and approaches, which are difficult to evaluate. Assuming direct oversight of their activities could only increase whatever degree of liability that may exist while doing little to increase visitor safety, possibly even hampering it.

The most critical area of interaction for the site managers would be in the area of accident management. It should be mandated that all boats have radio contact with a shore facility which is constantly monitored and that first aid

The National Park Service is experimenting with special earphones that visitors could use which allow them to hear underwater communications from a guide in the water or in a boat on the surface. (1976, Larry Murphy)
and oxygen administration equipment are available on all craft. The maintenance of a recompression facility on the island would be ideal; however, it may also be unrealistic because such facilities take considerable maintenance and are useless without trained operators in continual radio contact with medical professionals. It may be more realistic to develop a reliable air evacuation program with the military at Kwajalein and negotiate a protocol for access to their recompression facilities.

SPECIAL DIVING HAZARDS: EXPLOSIVES AND RADIATION

The special risk areas for diving that need to be addressed at Bikini are those related to live ordnance and radiation. There is no question that various types of bombs and projectiles are still intact on the vessels, and that radiation was a serious problem on the ships shortly after the tests. The issue at hand is how much of a hazard these factors now present a visiting sport diver. The U.S. Navy Explosive Ordnance Disposal (EOD) experts who have examined some of the most accessible and obvious bombs and projectiles felt there was indeed some risk, but that it was not excessive. It was their opinion that if someone tried hard enough at Bikini, he or she could hurt themselves, for example, by intentionally disturbing some of the items that they personally observed in the hangar deck of Saratoga.

There is some question after consulting the archives that entire explosive trains were left intact, i.e., that either the initiating charge or major working charge was left inert in many cases. Whether or not this is true, the potential for injury of an individual is still present because even an armed initiating charge can be lethal if discharged in the vicinity of the diver.

It was the opinion of the National Park Service diving team after consulting with the Navy experts that there is an acceptable level of risk involved in the ordnance at Bikini from a park management perspective. Although live ordnance is present and could possibly be activated by vigorous intentional disturbance, it is unlikely to be a problem to any but the most reckless of park visitors. Any situation in which inadvertent disturbance might cause a
Detonation would be considered an unacceptable risk, but that prospect appears very unlikely. The EOD experts did safe one bomb which they felt presented an unreasonable hazard. EOD operations at Bikini are discussed further in a 1990 internal U.S. Navy report by Lt. David Rattay.

The question of radiation on the ships is going to be a major concern in the mind of any rational sport diver who first considers the possibility of diving Bikini. This is an area in which myth can be as powerful an instrument to behavior as reality, since most societies are far from having come to any sense of resolution over this issue. Suffice it to say that it was not the least area of concern for the NPS team when it conducted its own risk assessment before going to Bikini.

Again, from the perspective of nonspecialists who are called upon to interpret the findings of specialists, it is our opinion that external radiation is not a significant hazard on the ships at Bikini. The NPS team carefully scrutinized tests conducted by Holmes and Narver, read the assessment by Lawrence Livermore Labs, and personally took beta and gamma detection instruments on several dives through the ships and to the sediments in the bottom of the lagoon. There were never any signs of radiation danger past what one might expect from living day-to-day in most parts of the continental United States. (A very concise and authoritative document by W. L. Robison comprises Appendix III of this report; it is recommended to any reader interested in further information on this subject.)

ENVIRONMENTAL HAZARDSPOSED BY SHIPS

The threat of pollution from a massive release of fuel oil is an area of concern expressed by the Bikini Council, particularly in the event of structural collapse of the ship's bunkers. The problem should probably be seen as follows. We can assume in the worst case that there are significant quantities of oil present in some of the ships—indeed some is visibly seeping slowly from Saratoga and other vessels in the lagoon. The question of how much is more problematic. Although we may know original fuel loads, we do not know how much was lost in the wreck event. One must therefore assume the worst case until proven wrong.

This leaves the option of recovering the ships, recovering the oil, stabilizing the oil so it cannot come to the surface, or no action. Probably the worst option would be the attempt to salvage the ships. Besides being enormously expensive, the attempt would almost certainly cause a massive release of any fuel present because of the deteriorated condition of the vessels. It would also result in destruction of a major historical (and economic) resource for the Bikiniites. Recovering the oil through "hot-tapping" may be possible but carries some risk of incurring a major spill and would be moderately expensive at the least.

MOORING SYSTEMS

One important element in any diving park is a mooring system for dive boats. This enables the managing agency to increase safety by controlling points of access to the wreck sites and natural attractions while diminishing impacts from anchor dragging.

A good moor is essential to a safe dive in deep water. It also establishes a physical presence on the site by the managing authority and helps orient the visitor by ensuring that he or she begins their dive at a known point. The buoy attachment also provides a reliable line to follow back to the dive platform and may serve as a stable reference point for decompressing divers.

Regulations as to how many boats may attach to one mooring cable, how they are "rafted off" to each other, etc., also allows the Bikiniites to indirectly establish preferred carrying capacity of the site.

CONCLUSIONS AND RECOMMENDATIONS

To responsibly assess park values at Bikini, we have had to scrutinize carefully the negative aspects, including any hazards to users. It is clear that Bikini offers far greater rewards and somewhat greater risks to the diving public.
Management control of underwater sites can be enhanced by installing mooring buoys with appropriate visitor use guidelines. (NPS)

than most diving attractions. They are by no means unmanageable risks, however, and there is no expectation that outdoor parks be sanitized, risk-free environments. Should a diving oriented marine park be established, it is important to be clear and honest about both the rewards and dangers and to provide as controlled an environment as possible for the divers to enjoy this experience.

There are several important benefits to a marine-park-based tourist economy. It is nonconsumptive of resources, but does not necessarily preclude multiuse concepts where, for instance, traditional fishing practices could still occur in most portions of the lagoon. It is environmentally sound if support bases on land are engineered correctly and the development of park cultural interpretive programs would provide another motive for reestablishing traditional lifeways. Besides being informative to visitors, a living history approach might help the youth of Bikini better understand their own heritage and present them with additional options for personal lifestyles.

If such a focus is adopted in a resettlement program, it should be done with great forethought and planning. Assistance should be requested from agencies and institutions that specialize in marine park planning from the nations most likely to form the reservoir of potential visitors. The following procedures are recommended:

1. Establish a park concept development committee which includes park professionals from other nations and concession managers. Include American, Japanese, and Australian tourism specialists.

2. Follow this up with a park planning group to operationalize whatever concepts are decided upon.

3. Develop a dependable corps of Bikinian rangers or wardens.

4. Send Bikinian ranger trainees to American and Canadian marine parks which manage shipwrecks for periods of intensive training so they can learn techniques and options for protection, interpretation, and diving accident management. Possible candidates are Fort Jefferson National Monument in Florida, Tobermory in Canada, Isle Royale National Park in Michigan, and Channel Islands National Park in California.

5. Establish a visitor center/contact station which orient newcomers to the park theme and regulations.

6. Explore the range of options for interpretation, including a model of the lagoon bottom with ships, graphic displays of the wrecks using line drawings, photos, and videotape programs in the visitor center.

7. Ensure that Bikinian culture is given a prominent role in the interpretive prospectus and that the history and significance of the Bikinian nuclear
experience is not memorialized from only an American perspective. Living history programs should be considered.

6. Contact commercial tours to submarine specialists and discuss what would be involved in establishing a submarine commission at Bikini. Consult with U.S. National Park Service concessionaire specialists for advice on setting up contracts for such services.

9. Consider a 3D video viewing center for nondivers. Request assistance from National Geographic Society and others in the technical aspects of obtaining footage and setting up a viewing center.

10. Explosive Ordnance Disposal teams should be requested to continue examining the sites for any ordinance that presents exceptional hazards to visiting divers.

11. Contact experts in industry and government who have knowledge of petroleum products' potential for pollution after long-term immersion in order to explore possible means of stabilization or control.

12. Develop dialogue between Bikinians and parks and recreation programs affiliated with universities.
### APPENDIX I: TARGET VESSELS AT BIKINI AND THEIR DISPOSITION

#### Carriers

<table>
<thead>
<tr>
<th>Name</th>
<th>Fate and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independence</td>
<td>Sunk as target off San Francisco, California, January 27, 1951.</td>
</tr>
<tr>
<td>Saratoga</td>
<td>Sunk by BAKER at Bikini, July 25, 1946.</td>
</tr>
</tbody>
</table>

**Total:** 2

#### Battleships

<table>
<thead>
<tr>
<th>Name</th>
<th>Fate and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas</td>
<td>Sunk by BAKER at Bikini, July 25, 1946.</td>
</tr>
<tr>
<td>Nagato (Japanese)</td>
<td>Sunk by BAKER at Bikini, July 29, 1946.</td>
</tr>
<tr>
<td>Nevada</td>
<td>Sunk as target off Peal Harbor, July 31, 1948.</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>Sunk as target off Kwajalein, February 8, 1948.</td>
</tr>
</tbody>
</table>

**Total:** 5

#### Cruisers

<table>
<thead>
<tr>
<th>Name</th>
<th>Fate and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pensacola</td>
<td>Scuttled off the Washington Coast, November 10, 1948.</td>
</tr>
<tr>
<td>Print Eugen</td>
<td>Stranded and sunk at Kwajalein, December 22, 1946.</td>
</tr>
<tr>
<td>Sakawa (Japanese)</td>
<td>(New York Times article indicates December 16).</td>
</tr>
<tr>
<td>Salt Lake City</td>
<td>Sunk as target off San Clemente, California, May 23, 1948.</td>
</tr>
</tbody>
</table>

**Total:** 4

#### Destroyers

<table>
<thead>
<tr>
<th>Name</th>
<th>Fate and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson</td>
<td>Sunk by ABLE at Bikini, July 1, 1946.</td>
</tr>
<tr>
<td>Conyngham</td>
<td>Scuttled off California, July 1948.</td>
</tr>
<tr>
<td>Bogue</td>
<td>Sunk as target off Washington, October 16, 1948.</td>
</tr>
<tr>
<td>Larrabee</td>
<td>Sunk by ABLE at Bikini, July 1, 1946.</td>
</tr>
<tr>
<td>Meager</td>
<td>Sunk off Kwajalein, April 4, 1948.</td>
</tr>
<tr>
<td>Morton</td>
<td>Sunk off Kwajalein, March 15, 1948.</td>
</tr>
<tr>
<td>Ralph Talbot</td>
<td>Scuttled off Kwajalein, March 1948.</td>
</tr>
<tr>
<td>Starke</td>
<td>Scuttled off Kwajalein, March 22, 1948.</td>
</tr>
<tr>
<td>Tegler</td>
<td>Scuttled off Kwajalein, March 22, 1948.</td>
</tr>
<tr>
<td>Wainwright</td>
<td>Sunk as target off Kwajalein, April 24, 1948.</td>
</tr>
<tr>
<td>Wilson</td>
<td>Sunk as target off Kwajalein, April 24, 1948.</td>
</tr>
<tr>
<td>Wibben</td>
<td>Sunk as target off Kwajalein, July 5, 1948.</td>
</tr>
</tbody>
</table>

**Total:** 12
**Submarines**

Aragon (SS-308)  
Submerged by BAKER at Bikini, July 25, 1946.

Dreadnought (SS-325)  
Sent to West Coast, sold for scrap, January 20, 1949.

Parche (SS-384)  
Sent to West Coast, sold for scrap, July 1970.

Shrew (SS-396)  
Submerged by BAKER at Bikini, July 25, 1946.

Jolene (SS-305)  
Scuttled off California, September 11, 1948.

Shiplake (SS-305)  
Sunk by BAKER at Bikini, October 1, 1944.

Tuna (SS-203)  
Sunk as target off California, August 11, 1948.

**Total:** 8

**Attack Transports**

Banner (APA-60)  
Scuttled off Kwajalein, February 15, 1948.

Barrow (APA-61)  
Sent to East Coast, transferred to U.S. Maritime Commission, August 3, 1953.

Braden (APA-64)  
Scuttled off Kwajalein, March 30, 1948.

Bravo (APA-65)  

Bride (APA-66)  
Scuttled off Kwajalein, May 11, 1948.

Bust (APA-68)  
Scuttled off Kwajalein, May 12, 1948.

Catbird (APA-69)  
Sent to East Coast, transferred to U.S. Maritime Commission, March 31, 1948.

Carter (APA-70)  
Scuttled off California, October 5, 1948.

Carnival (APA-71)  
Scuttled off Kwajalein, March 29, 1948.

Cortland (APA-75)  
Sent to East Coast, transferred to U.S. Maritime Commission, March 31, 1948.

Fallon (APA-81)  
Sent to East Coast, sold for scrap, November 2, 1956.

Gasconade (APA-85)  
Sunk by BAKER at Bikini, July 1, 1946.

Gilliam (APA-87)  
Sent to East Coast, sold for scrap, February 5, 1953.

**Total:** 19

**LSTs (Landing Ship, Tank)**

LST-52  

LST-125  
Sent to East Coast, sold for scrap, January 22, 1944.

LST-220  
Sent to East Coast, transferred to U.S. Maritime Commission, April 1, 1948.

LST-545  
Scuttled off Kwajalein, March 10, 1948.

LST-661  
Scuttled off Kwajalein, March 12, 1948.

**Total:** 6
LSMs (Landing Ship, Medium)

LSM-60 Completely destroyed by BAKER at Bikini, July 25, 1946.

Total: 1

LCTs (Landing Craft, Tank)

LCT-414 Scuttled by BAKER at Bikini, July 1946.
LCT-705 Scuttled off Kwajalein, September 1947.
LCT-746 Scuttled off Kwajalein, March 1947.
LCT-748 Scuttled by BAKER at Bikini, July 1946.
LCT-816 Scuttled off Kwajalein, June 1947.
LCT-820 Scuttled off Kwajalein, September 1947.
LCT-1132 Scuttled off Kwajalein, September 1947.
LCT-1134 Scuttled off Kwajalein, June 1947.
LCT-1136 Scuttled by BAKER at Bikini, July 1946.
LCT-1177 Scuttled by BAKER at Bikini, July 1946.
LCT-1187 Scuttled by BAKER at Bikini, July 1946.
LCT-1237 Scuttled by BAKER at Bikini, July 1946.

Total: 16

Auxiliaries

YO-160 Sunk by BAKER at Bikini, July 25, 1946.
YOG-83 Scuttled off Kwajalein, September 16, 1948.
ARDC-13 Sunk by BAKER at Bikini, August 6, 1946.

Total: 3

LCIs (Landing Craft, Infantry)

LCI-332 Scuttled off Kwajalein, March 16, 1948.
LCI-333 Scuttled by BAKER at Bikini, September 1947.
LCI-349 Sold to private party in California, August 19, 1949.
LCI-350 Sold to private party in California, August 19, 1949.
LCI-351 Scuttled off Bikini Lagoon entrance, August 10, 1946.

Total: 6

LCMs (Landing Craft, Mechanized)

[Note these craft, like the LCVP, did not ordinarily receive hull numbers. The numbers were provided by Joint Task Force One to facilitate damage reports.]

LCM-1 Fate unknown.
LCM-3 Fate unknown.
LCM-4 Sunk by BAKER at Bikini, July 25, 1946.
<table>
<thead>
<tr>
<th>LCMP</th>
<th>Fate</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCM-5</td>
<td>Fate unknown.</td>
</tr>
<tr>
<td>LCM-6</td>
<td>Sold for scrap in Guam, n.d.</td>
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**Total:** 6

**LCVPs (Landing Craft Vehicles, Personnel)**

<table>
<thead>
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<th>Fate</th>
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<tr>
<td>LCVP-7</td>
<td>Fate unknown.</td>
</tr>
<tr>
<td>LCVP-8</td>
<td>Fate unknown.</td>
</tr>
<tr>
<td>LCVP-9</td>
<td>Fate unknown.</td>
</tr>
<tr>
<td>LCVP-10</td>
<td>Sunk by BAKER at Bikini, July 25, 1946.</td>
</tr>
<tr>
<td>LCVP-11</td>
<td>Fate unknown.</td>
</tr>
<tr>
<td>LCVP-12</td>
<td>Fate unknown.</td>
</tr>
</tbody>
</table>

**Total:** 6

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Sources:

APPENDIX III: RELICS OF OPERATION CROSSROADS

The target ships of Operation Crossroads, even those that survived sinking at Bikini and those that also outlasted subsequent sinking, are now scrapped. This time holds true in large measure for the support fleet of ships. Nonetheless, four Crossroads veterans remain in active naval service as of 1990, and another one is preserved as a museum ship. In 1990, surviving vessels of Operation Crossroads are:

- **USS Conserver (ARS-39).** Attached to the repair and service group for Operation Crossroads, the Bolster-class salvage vessel Conserver is assigned to the Pacific Fleet and based at Pearl Harbor.
- **USS Fulton (AS-11).** Also assigned to the repair and service group for Operation Crossroads, the submarine tender Fulton is now attached to the Atlantic Fleet and based at Norfolk, Virginia.
- **USS Laffey (DD-724).** Attached to the support fleet for Crossroads, Laffey patrolled the seas outside the atoll. Preserved and open as a museum display vessel at Patriot's Point, Mount Pleasant, South Carolina, Laffey is one of five historic vessels there, including USS Yorktown (CV-5).
- **USS Preserver (ARS-8).** Attached to the repair and service group, this salvage ship is now assigned to the Naval Reserve Training Facility at Little Creek outside Norfolk, Virginia.
- **USS Reclaimer (ARS-42).** Attached to the repair and service group as its first assignment, this then-new Diver-class salvage ship later returned to Bikini in 1954 for the Castle-Bravo test. This vessel remains in active service at Pearl Harbor.

Additionally, preserved portions of one target and one support ship survive as historic exhibits. The bridge of the target submarine Parche (SS-384), one of the nine vessels to survive the spate of post-Crossroads scuttlings, served as a Naval Reserve training boat at Mare Island, California, until November 1969. Sold for scrap in July 1970, portions of the submarine were saved and retained by the Navy. The bridge is on display at the Subase, Pearl Harbor, while the conning tower once inside the sail and bridge is displayed outdoors at the USS Bowfin Submarine Museum and Park at Pearl Harbor. The above-the-waterline portion of the bow of USS Fall River (CA-131), the target ship group flagship for Crossroads, was saved after the cruiser was stricken and scrapped in 1971. It is now on display at Battleship Cove, Fall River, Massachusetts, where the battleship Massachusetts, the destroyers Joseph P. Kennedy Jr. and Lionfish, and the submarine USS Scorpion are preserved.

At least one Crossroads aircraft survives as a museum exhibit. An F6F Hellcat used as a drone to sample the air after each burst is now at the National Air and Space Museum in Washington, D.C. The ARADO 196 spotting plane from Prinz Eugen that did not accompany the cruiser to Bikini is also owned by U.S. Navy, and is in storage.

Some of the items of “historical interest” removed from the Crossroads target ships are displayed at various memorials, sites, and museums. The ship’s bell of USS
Arkansas is the centerpiece of the Arkansas War Memorial in Little Rock, while the Governor's office retains the ship's silver service for use on ceremonial occasions. Saratoga's bell is displayed at the Naval Aviation Museum in Pensacola, Florida. The bell of USS Anderson is displayed at the Anderson, South Carolina, post of the Veterans of Foreign Wars (VFW). Lanwön's bell is displayed at the 9th Naval District Headquarters in Des Moines, Iowa. The U.S. Navy retains Prinz Eugen's bell, now in storage, as well as Lanwön's commissioning plaque in Washington, D.C. Ordnance items stripped from Prinz Eugen prior to Crossroads are now in the Navy's museum collections, and include a 30mm and 37mm antiaircraft gun. Flags flown from the ships at Bikini, including a Japanese Naval Ensign from Nagato, are in the Navy's collections.

Other artifacts from the target ships rest throughout the country in various museums and in private hands, and many are proudly displayed by the veterans of those vessels at their reunions—the last remnants in hand of the sunken fleet of Operation Crossroads.
APPENDIX III: Estimates of the Radiological Dose to People Living on Bikini Island for Two Weeks while Diving in and Around the Sunken Ships in Bikini Lagoon

W. L. Robison

Introduction

Bikini Island and Bikini Lagoon were contaminated by fallout from nuclear weapons tests conducted at the atoll by the United States from 1946 to 1958. The second test, Baker, of the Crossroads series was an underwater detonation in 1946 that sank several ships in the lagoon, including the USS Saratoga and the Japanese battleship Nagato.

The ships received high-intensity gamma-ray and neutron bombardment from the Baker test, which induced radioactivity in the metal structures. Some of the tests conducted after the Baker shot (there were 21 tests in all) injected contaminated carbonate particles into the air, some of which were deposited across the lagoon surface. Most of this contaminated soil then settled on the ships' decks and other structures and on the lagoon bottom.

These sunken ships provide an interesting location for divers. Recreational diving and swimming in and around the ships raises the question of the potential radiological dose from the radionuclides present in or on the ships and in the lagoon sediments.

In addition, radionuclides were deposited on the islands. We have spent several years evaluating the radiological conditions on Enewetok Island at Bikini Atoll and Engebi Island at Enewetok Atoll, and estimating the radiological dose people might receive living on these islands (1–8). As a result, we have the data to also evaluate the radiological dose people would receive if they were to live on Bikini Island for a two-week period while diving near the sunken ships in the lagoon.

The purpose of this paper, therefore, is to present an analysis of the potential radiological dose to persons who would dive near the sunken ships and live on Bikini Island for a short period of time.

The Radiological Dose while in the Lagoon and around the Ships

Radionuclides in the Sediment

Many of the radionuclides produced at detonation and induced in the ships' structure (by the resulting neutron flux) have very short half-lives, \( T_{1/2} \), ranging from seconds to a few weeks. Consequently, most of the radioactivity decayed away very early. Those radionuclides with half-lives in the range of several years or more are the only ones still present and that have the potential of causing exposure.

The estimates of the radiological dose will be calculated for 1990 which is 44 years after the Baker test and 32 years after the last test at Bikini Atoll. Any dose received after 1990 would be lower. The radionuclides currently present in the lagoon sediments and on the islands are Cesium-137 (\( ^{137}Cs \); \( T_{1/2} = 30 \) years), Strontium-90 (\( ^{90}Sr \); \( T_{1/2} = 28 \) years), Cobalt-60 (\( ^{60}Co \); \( T_{1/2} = 5.3 \) years), Plutonium-239 (\( ^{239}Pu \); \( T_{1/2} = 24,000 \) years), Plutonium-240 (\( ^{240}Pu \); \( T_{1/2} = 6537 \) years), and Americium-241 (\( ^{241}Am \); \( T_{1/2} = 432 \) years). We rarely detect other radionuclides in island soil; however, in lagoon sediments, we often detect one of the Europium nuclides or \( ^{207}Bi \). Moreover, even \( ^{90}Sr \) is found in very low concentrations because it has been through at least 6 half-lives from 1958 to 1990 and even more from 1946.
Gamma-Emitting Radionuclides (137Cs and 60Co)

The average 137Cs, 60Co, and 207Bi concentrations in the lagoon sediment around the sunken-ship area are between 0.1 and 1.0 pCi/g (for sampling locations see Figures 1–3). These unpublished data are from an extensive survey of the radionuclide concentrations in the sediments across Bikini lagoon conducted by Dr. Victor Noshkin of the Lawrence Livermore National Laboratory (LLNL) in 1979 and 1983. Additional sediment samples were collected between Bikini Island and the sunken ships in December 1983. The locations of the samples are shown in Figure 4. The results from the analysis of these samples are listed in Table 1. The concentration of 137Cs is below 0.2 pCi/g for all samples and below 0.1 pCi/g for most samples.

Table 1. Concentrations of 137Cs (in pCi/g dry weight) for sediments collected near Bikini Island.

<table>
<thead>
<tr>
<th>Site No.</th>
<th>Core Depth (cm)</th>
<th>137Cs</th>
<th>Site No.</th>
<th>Core Depth (cm)</th>
<th>137Cs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0-25</td>
<td>0.05</td>
<td>8</td>
<td>0-10</td>
<td>0.13</td>
</tr>
<tr>
<td>2</td>
<td>0-25</td>
<td>0.04</td>
<td>2</td>
<td>10-20</td>
<td>&lt;0.08</td>
</tr>
<tr>
<td>3</td>
<td>0-25</td>
<td>0.03</td>
<td>5</td>
<td>20-30</td>
<td>&lt;0.07</td>
</tr>
<tr>
<td>6</td>
<td>0-25</td>
<td>0.08</td>
<td>9</td>
<td>30-40</td>
<td>&lt;0.08</td>
</tr>
<tr>
<td>7</td>
<td>0-25</td>
<td>0.09</td>
<td>1</td>
<td>40-50</td>
<td>0.13</td>
</tr>
<tr>
<td>4A</td>
<td>0-10</td>
<td>&lt;0.06</td>
<td>10</td>
<td>50-60</td>
<td>&lt;0.07</td>
</tr>
<tr>
<td>10-20</td>
<td>&lt;0.07</td>
<td>60-70</td>
<td>10-20</td>
<td>&lt;0.07</td>
<td>70-75</td>
</tr>
<tr>
<td>30-40</td>
<td>&lt;0.05</td>
<td>10-20</td>
<td>30-40</td>
<td>&lt;0.05</td>
<td>10-20</td>
</tr>
<tr>
<td>4B</td>
<td>0-10</td>
<td>0.16</td>
<td>10</td>
<td>10-20</td>
<td>&lt;0.08</td>
</tr>
<tr>
<td>10-20</td>
<td>&lt;0.08</td>
<td>30-40</td>
<td>10-20</td>
<td>&lt;0.08</td>
<td>40-50</td>
</tr>
<tr>
<td>30-40</td>
<td>&lt;0.05</td>
<td>50-60</td>
<td>30-40</td>
<td>&lt;0.05</td>
<td>50-60</td>
</tr>
<tr>
<td>5</td>
<td>0-10</td>
<td>&lt;0.07</td>
<td>10</td>
<td>60-70</td>
<td>&lt;0.08</td>
</tr>
<tr>
<td>10-20</td>
<td>&lt;0.07</td>
<td>70-80</td>
<td>10-20</td>
<td>&lt;0.07</td>
<td>80-90</td>
</tr>
<tr>
<td>30-40</td>
<td>&lt;0.05</td>
<td>90-100</td>
<td>30-40</td>
<td>&lt;0.05</td>
<td>90-100</td>
</tr>
<tr>
<td>40-50</td>
<td>0.14</td>
<td>50-60</td>
<td>40-50</td>
<td>&lt;0.04</td>
<td>50-60</td>
</tr>
<tr>
<td>50-60</td>
<td>&lt;0.06</td>
<td>60-65</td>
<td>50-60</td>
<td>&lt;0.06</td>
<td>60-65</td>
</tr>
</tbody>
</table>
Figure 1. Cesium-137 concentration contours in the lagoon surface sediments at Bikini Atoll in 1979.
Figure 2. Cobalt-60 concentration contours in the lagoon surface sediments at Bikini Atoll in 1979.
Figure 3. Bismuth-207 Concentration contours in the lagoon surface sediments at Bikini Atoll in 1979.
Figure 4. The locations of sediment areas collected in 1983 near Bikini and Enew Islands at Bikini Atoll.
Samples of sediment and algae plus rusty metal were collected from several of the sunken ships in 1989 by a Navy dive team. The samples were analyzed at LLNL and the results are listed in Table 2. The 137Cs, 60Co, 152Eu, and 207Bi concentrations are generally about a few tenths of a pCi/g; only two samples from the hangar deck of the Saratoga showed higher concentrations of 60Co and 207Bi.

Table 2  Analytical results for samples taken from the sunken ships in Bikini Lagoon

<table>
<thead>
<tr>
<th>Type of Sample</th>
<th>Location of Sample</th>
<th>Radionuclide Concentration, pCi/g</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Co-60</td>
</tr>
<tr>
<td>Algae + Rust</td>
<td>Gilliam Stern</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Sediment</td>
<td>Gilliam Stern</td>
<td>0.78</td>
</tr>
<tr>
<td>Sediment</td>
<td>Gilliam Starboard Beam</td>
<td>0.69</td>
</tr>
<tr>
<td>Sediment</td>
<td>Gilliam Starboard Inboard Beam</td>
<td>0.17</td>
</tr>
<tr>
<td>Sediment</td>
<td>Gilliam Bow</td>
<td>0.67</td>
</tr>
<tr>
<td>Sediment</td>
<td>Gilliam Stern Outboard</td>
<td>0.26</td>
</tr>
<tr>
<td>Sediment</td>
<td>Gilliam Port Beam</td>
<td>0.44</td>
</tr>
<tr>
<td>Algae + Rust</td>
<td>Pilot Fish</td>
<td>0.36</td>
</tr>
<tr>
<td>Algae + Rust</td>
<td>FOD Collection Pilot Fish</td>
<td>0.27</td>
</tr>
<tr>
<td>Wood</td>
<td>Pilot Fish</td>
<td>0.11</td>
</tr>
<tr>
<td>Electric Wire</td>
<td>Electrical Wire from Pilot Fish</td>
<td>&lt;0.12</td>
</tr>
<tr>
<td>Algae + Rust</td>
<td>Carlisle Stern</td>
<td>0.49</td>
</tr>
<tr>
<td>Sediment</td>
<td>Carlisle</td>
<td>1.16</td>
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<tr>
<td>Sediment</td>
<td>Seneca Hanger</td>
<td>10.82</td>
</tr>
<tr>
<td>Sediment</td>
<td>Seneca Fight Deck</td>
<td>2.19</td>
</tr>
<tr>
<td>Algae + Rust</td>
<td>Seneca Hanger</td>
<td>0.20</td>
</tr>
<tr>
<td>Sediment</td>
<td>Arkansas Port Side</td>
<td>0.06</td>
</tr>
<tr>
<td>Sediment</td>
<td>Arkansas Bow</td>
<td>0.10</td>
</tr>
<tr>
<td>Algae + Rust</td>
<td>Arkansas</td>
<td>0.28</td>
</tr>
<tr>
<td>Sediment</td>
<td>Arkansas Starboard Midship</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>Sediment</td>
<td>Arkansas Port Bow</td>
<td>0.09</td>
</tr>
<tr>
<td>Sediment</td>
<td>Arkansas Stern Outboard</td>
<td>0.12</td>
</tr>
<tr>
<td>Sediment</td>
<td>Arkansas Stern Inboard</td>
<td>0.11</td>
</tr>
<tr>
<td>Algae + Rust</td>
<td>Nagato</td>
<td>0.41</td>
</tr>
</tbody>
</table>

185
The gamma-emitting radionuclide concentrations observed in the sediment samples from all of these sources are very low ranging between 0.03 and 1 pCi/g for 137Cs. For perspective, the average concentration of 137Cs in the surface soil across the United States due to world-wide fallout ranges from about 0.4 to 1.2 pCi/g. For additional perspective, the 137Cs concentration in lagoon sediment is much less than the 137Cs concentration in surface soil in the United Kingdom and Northern Europe from the Chernobyl accident (9).

In addition, the gamma rays associated with 137Cs, 60Co, and 207Bi are attenuated exponentially as they traverse through water. The half-thickness, i.e., the thickness of water that will attenuate half of the radiation, is about 10 cm (4 inches) of water (10). Consequently, the dose from 137Cs, 60Co and 207Bi in the sediments on the ships and in the lagoon bottom while swimming near the ships is so low that it is, for all practical purposes, zero. The dose to a person on land anywhere in the world for a specific period of time would be higher than the dose from swimming in the lagoon and diving near the ships for the same period of time.

Alpha, Beta, and Very Low Energy Gamma-Emitting Radionuclides

The concentration of 241Am in the sediments from the ships is higher than for the other radionuclides and ranges from 1 to 50 pCi/g. We have sufficient data on the ratios of 239+240Pu to 241Am at the atoll to know that the 239+240Pu concentration would be about 20% higher than the 241Am. The concentration of 90Sr in the lagoon sediment would be expected to be somewhat higher than the 137Cs concentration.

The other radionuclides found in the sediments are 240Am, 239+241Pu, 90Sr, and europium-155 (155Eu). The primary radiation from 90Sr and 155Eu is beta particles, which can only penetrate a few millimeters of water. Plutonium and 241Am are primarily alpha particle emitters and can only penetrate a few microns (1 micron = 0.0001 cm) of water. The x radiation or gamma radiation associated with these nuclides are so low energy that they too do not penetrate any significant distance in water. Consequently, radionuclides such as 239+240Pu, 241Am, 90Sr, and 155Eu do not contribute to underwater external exposure because the emanating radon gas is totally absorbed in a few millimeters of water and thus cannot expose people swimming nearby.

The primary potential route of exposure of people from alpha- and beta-emitting radionuclides is by inhalation; there is no chance of inhalation of these radionuclides while diving on the ships or swimming in the lagoon near the ships. The other potential route of exposure is ingestion and it is not as significant a pathway as inhalation; it is unlikely that a diver would ingest sediment. Even if small amounts of sediment could be ingested through the mask and regulator, the intake would not be significant and the very low transfer of plutonium and americium across the gut wall to the blood (fraction ingested transferred to blood = 0.001) would produce an insignificant dose.

Activation Products in the Ships

The activation products produced by the neutron flux from the Baker test interacting with the steel, iron, and other metals of the ships all have a short half-life. Most of the activation products have long since decayed and are no longer present. The major activation product that is still present is 60Co, with a half-life of 5.27 years. Consequently, the 60Co produced at the time of detonation in 1946 has decayed to 0.35% of its original value; in other words, it is also essentially gone or will be in very few more years. If diving does not begin at Bikini until 1995 or 1996, then 60Co will have decayed one whole half-life, or by 50%, from the values listed in Table 2. In the same time period, 137Cs will have decayed by another 13%. The 60Co observed in the samples listed in Table 2 are primarily the result of 60Co induced in the metal components of the ship and the subsequent deterioration and oxidation producing a fine, rusty material that spans from the metal surfaces and becomes mixed with the sediment and algae on the ships and lagoon bottom. The very short half-life associated with activation products has essentially eliminated them as an exposure source over the last 43 years. The small gamma flux still present is absorbed by the water as described in the previous section.
Summary of the Potential Radiological Dose while Swimming in Bikini Lagoon

The potential dose to a person swimming in the Bikini Lagoon around or through the sunken ships is so low from both the activation products originally induced in the ships and from radionuclides in the lagoon sediment that it can be considered essentially zero.

The Radiological Dose while Living on Bikini Island for Two Weeks

Inhalation Dose

The only radionuclides on the island that are of any significance via the inhalation pathway are 239+240Pu and 241Am. The dose from 137Cs and 90Sr are of no consequence being 5 or more orders of magnitude less than plutonium and americium via inhalation (1).

The estimated effective committed dose equivalent for 239+240Pu and 241Am at Bikini Atoll is based on resuspension studies conducted at Bikini Atoll (12). The estimate is based on a scenario of 9 hours on the island in a resting state in which 4.8 m³ of air are breathed, 5 hours active time in which 6.0 m³ of air are breathed, and 10 hours on or near the lagoon and beaches, which are not relevant to inhalation of resuspended Pu or Am.

The calculated committed effective dose equivalent for a two-week stay on Bikini Island is 0.02 mrem for 239+240Pu. The contribution from 241Am would be about 70% of the plutonium dose, or about 0.014 mrem. The total effective committed dose equivalent is, therefore, 0.036 mrem. For perspective, the annual committed dose equivalent in the United States is 300 mrem/year. For additional perspective, the increased dose equivalent received flying at altitude in a jet aircraft for about 8000 miles is 4 mrem (9).

External Gamma Dose

The external gamma dose equivalent rate from 137Cs on Bikini Island is estimated to be about 11.8 mrem/year. This estimate is based on a scenario of 12 hours every day inside the schoolhouse (bunk and mess hall building), 4 hours/day around the schoolhouse, 1 hour/day in the interior of the island, and 7 hours/day in or on the lagoon. Consequently, for a person visiting for only two weeks, the dose equivalent would be about 0.45 mrem. For perspective, this can be compared to the U.S. background committed dose equivalent rate of 300 mrem/year or about 12 mrem/2 weeks.

Summary of the Total on Island Radiological Dose

The estimated effective committed dose equivalent for two weeks residence on Bikini Island, for the scenario outlined above including natural background, is about 0.03 mrem. The net result is that the estimated dose for Bikini Island, for the scenario outlined above including natural background, is about 1/10 that for a similar period of residence in the United States.

<table>
<thead>
<tr>
<th>Source</th>
<th>Marshall Islands</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Background</td>
<td>0.45</td>
<td>12</td>
</tr>
<tr>
<td>137Cs External</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>239+240Pu + 241Am Inhalation</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>-1.3</td>
<td>12</td>
</tr>
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</table>

Table 3. The estimated dose equivalent for two weeks at Bikini Island and the average United States.
REFERENCES


APPENDIX IV: Archeological Site Record Forms for the Documented Shipwrecks

<table>
<thead>
<tr>
<th>National Maritime Initiative Shipwreck/Hulk Database</th>
<th>INIT #10596</th>
</tr>
</thead>
<tbody>
<tr>
<td>Popular Name: APOGON</td>
<td></td>
</tr>
<tr>
<td>Location: BIKINI ATOLL LAGOON</td>
<td></td>
</tr>
<tr>
<td>Nearest City: BIKINI ISLAND</td>
<td></td>
</tr>
<tr>
<td>Owner/Manager: REPUBLIC OF THE MARSHALL ISLANDS</td>
<td></td>
</tr>
<tr>
<td>Address: C/O HISTORIC PRESERVATION OFFICE</td>
<td></td>
</tr>
<tr>
<td>MAJURO, MI 96960 Phone: 3264</td>
<td></td>
</tr>
<tr>
<td>Is Site on the Shoreline? NO; Underwater? YES; Depth: 180</td>
<td></td>
</tr>
<tr>
<td>Percent Present: 76-100%</td>
<td></td>
</tr>
<tr>
<td>Present Remains are intact? YES; Scattered? NO; Buried? NO; Excavated? NO</td>
<td></td>
</tr>
<tr>
<td>Present Remains consist of:</td>
<td></td>
</tr>
<tr>
<td>Hull? YES; Decks? YES; Superstructure? YES; Masts? NO; Rigging? NO; Engines/Boilers? YES; Auxiliary Machinery? YES; Ballast? NO; Armament? YES; Anchors? UNKNOWN; Cargo? NO; Associated Material? YES</td>
<td></td>
</tr>
<tr>
<td>Wreck Date: 20TH CENTURY</td>
<td></td>
</tr>
<tr>
<td>Archeological survey? YES; Date: 1990</td>
<td></td>
</tr>
<tr>
<td>Surveyor: DANIEL J. LENIHAN, NPS</td>
<td></td>
</tr>
<tr>
<td>Publication Resulting? YES</td>
<td></td>
</tr>
<tr>
<td>Publication Name: NPS CULTURAL RESOURCES ASSESSMENT NO. 37</td>
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<tr>
<td>Vessel Identity Firmly Established? YES</td>
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</tr>
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<td></td>
</tr>
<tr>
<td>Vessel Name: USS APOGON (SS-308)</td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td># of Masts: 0; Rigging: UNRIGGED</td>
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</tr>
<tr>
<td>Length: 311.90; Beam: 27.30; Draft: 15.30</td>
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<tr>
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<td>Engine: DIESEL</td>
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<tr>
<td>Propulsion: SCREW</td>
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<tr>
<td>Armament: 10X21-INCH TT; 2X40MM</td>
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<tr>
<td>Year Built: 1943; Place of Construction: PORTSMOUTH, NEW HAMPSHIRE</td>
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<tr>
<td>Wreck Year: 1946</td>
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<tr>
<td>Use at Loss: TARGET SIPHON, OPERATION CROSSROADS</td>
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<td>Cargo at Loss: TEST EQUIPMENT</td>
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<tr>
<td>Contact: DANIEL LENIHAN/SUBMERGED CULTURAL RESOURCES UNIT</td>
<td></td>
</tr>
<tr>
<td>Phone: 505-988-0750 or FTS-476-1750</td>
<td></td>
</tr>
</tbody>
</table>
National Maritime Initiative Shipwreck/Hulk Database

Popular Name: ARKANSAS
Location: Bikini Atoll Lagoon
Nearest City: Bikini Island

Owner/Manager: Republic of the Marshall Islands
Address: C/O Historic Preservation Office
Alele Museum/Box #629
Majuro, MH 96960
Phone: 3264

Is Site on the Shoreline? NO; Underwater? YES; Depth: 180
Percent Present: 76-100%

Present Remains are Intact? YES; Scattered? NO; Buried? NO; Excavated? NO

Percent Remains consist of:
- Hull? YES
- Masts? YES
- Auxiliary Machinery? YES
- Anchors? YES
- Decks? YES
- Rigging? YES
- Ballast? NO
- Engines/Boilers? YES
- Armament? YES
- Cargo? NO
- Associated Material? YES

Wreck Date: 20TH CENTURY

Archaeological Survey? YES; Date: 1990
Surveyor: Daniel J. Lenihan
Publication Resulting? YES
Publication Name: NPS Cultural Resources Assessment No. 37

Vessel Identity Finally Established? YES
Source: Archaeological? YES; Oral History/Tradition? NO; Archival? YES

Vessel Name: USS ARKANSAS (BB-33)
Vessel Type: Battleship; Arkansas Class
# of Masts: 2; Rigging: Unrigged
Length: 562.00; Beam: 106.00; Draft: 32.00
Displacement: 31,900.00

Hull Materials: Steel
Engine: Steam Turbines
Propulsion: Screw
Armament: 12X12", 6X5", 10X3", 9X40MM Quads, 36X20MM
Year Built: 1912; Place of Construction: Camden, New Jersey
Builder: New York Shipbuilding Co.

Wreck Year: 1946
Use at Loss: Target Ship, Operation Crossroads
Cargo at Loss: Test Equipment

Contact: Daniel Lenihan/Submerged Cultural Resources Unit
Phone: 505-988-6750 or FTS-476-1750
**National Maritime Initiative Shipwreck/Hulk Database**

**Init #10595**

**Popular Name:** CARLISLE  
**Location:** BIKINI ATOLL LAGOON  
**Nearest City:** BIKINI ISLAND  
**Owner/Manager:** REPUBLIC OF THE MARSHALL ISLANDS  
**Address:** C/O HISTORIC PRESERVATION OFFICE  
**AILELE MUSEUM/BOX #629**  
**MAJURO, MH 96960**  
**Phone:** 3264

**Is Site on the Shoreline? NO; Underwater? YES; Depth: 180**  
**Percent Present: 76-100%**

**Present Remains are Intact? YES; Scattered? YES; Buried? NO; Excavated? NO**

**Present Remains consist of:**  
- Hull? YES  
- Decks? YES  
- Superstructure? YES  
- Masts? YES  
- Rigging? YES  
- Engines/Boilers? YES  
- Auxiliary Machinery? YES  
- Ballast? NO  
- Armament? YES  
- Anchors? YES  
- Cargo? YES  
- Associated Material? YES

**Wreck Date: 20TH CENTURY**

**Archaeological Survey? YES; Date: 1990**  
**Surveyor:** DANIEL J. LENIHAN, NPS

**Publication Resulting? YES**  
**Publication Name:** NPS CULTURAL RESOURCES ASSESSMENT NO. 37

**Vessel Identity Firmly Established? YES**

**Source:** Archeological? YES; Oral History/Tradition? NO; Archival? YES

**Vessel Name:** USS CARLISLE (APA-69)  
**Vessel Type:** ATTACK TRANSPORT/GILLIAM CLASS

**# of Masts:** 3  
**Rigging:** UNRIGGED

**Length:** 426.00; **Beam:** 58.00; **Depth:** 37.00; **Draft:** 15.60  
**Displacement:** 6800.00

**Hull Materials:** STEEL  
**Engine:** STEAM TURBINES  
**Propulsion:** SCREWS

**Armament:** 1X5-INCH/38; 4X40MM; 10X20MM

**Year Built:** 1944; **Place of Construction:** WILMINGTON, CALIFORNIA  
**Builder:** CONSOLIDATED STEEL CORPORATION  
**Wreck Year:** 1946  
**Use at Loss:** TARGET VESSEL/OPERATION CROSSROADS  
**Cargo at Loss:** TEST EQUIPMENT

**Contact:** DANIEL LENIHAN/SUBMERGED CULTURAL RESOURCES UNIT  
**Phone:** 505-988-6750 or FT3-479-1750

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<table>
<thead>
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<th>Hull</th>
<th>Decks</th>
<th>Superstructure</th>
<th>Masts</th>
<th>Rigging</th>
<th>Engines/Boilers</th>
<th>Auxiliary Machinery</th>
<th>Ballast</th>
<th>Armament</th>
<th>Anchors</th>
<th>Cargo</th>
<th>Associated Material</th>
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**191**
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<tr>
<th>Popular Name: GILLIAM</th>
<th>Location: BIKINI ATOLL LAGOON</th>
<th>Nearest City: BIKINI ISLAND</th>
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<tbody>
<tr>
<td>Owner/Manager: REPUBLIC OF THE MARSHALL ISLANDS</td>
<td>Address: CIO HISTORIC PRESERVATION OFFICE</td>
<td>MAJURO, MH 96960 Phone: 3264</td>
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<th>Is Site on the Shoreline? NO</th>
<th>Underwater? YES</th>
<th>Depth: 180</th>
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<th>Present Remains are Intact? YES</th>
<th>Scattered? YES</th>
<th>Buried? NO</th>
<th>Excavated? NO</th>
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<tbody>
<tr>
<td>Auxiliary Machinery? YES</td>
<td>Engines/Boilers? YES</td>
<td>Armament? UNKNOWN</td>
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<tr>
<td>Anchors? UNKNOWN</td>
<td>Cargo? YES</td>
<td>Associated Material? YES</td>
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<th>Wreck Date: 20TH CENTURY</th>
<th>Archeological Survey? YES</th>
<th>Date: 1989</th>
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<tr>
<th>Vessel Identity Firmly Established? YES</th>
<th>Vessel Name: USS GILLIAM (APA-57)</th>
<th>Vessel Type: ATTACK TRANSPORT/GILLIAM CLASS</th>
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<tr>
<td># of Masts: 0</td>
<td>Rigging: UNRIGGED</td>
<td>Length: 426.00</td>
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<tr>
<td>Displacement: 6800.00</td>
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<th>Hull Materials: STEEL</th>
<th>Engine: STEAM TURBINE</th>
<th>Propulsion: SCREW</th>
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<td>Year Built: 1946</td>
<td>Place of Construction: WILMINGTON, CALIFORNIA</td>
<td>Builder: CONSOLIDATED STEEL CORPORATION</td>
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<th>Wreck Year: 1946</th>
<th>Use at Loss: TARGET SHIP/OPTION CROSSROADS</th>
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<tbody>
<tr>
<td>Cargo at Loss: TEST EQUIPMENT</td>
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</table>

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<thead>
<tr>
<th>Contact: DANIEL LENIHAN/SUBMERGED CULTURAL RESOURCES UNIT</th>
<th>Phone: 505-865-3728 or FTS-476-1728</th>
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</table>
**Popular Name:** NAGATO

**Location:** BIKINI ATOLL LAGOON

**Nearest City:** BIKINI ISLAND

**Owner/Manager:** REPUBLIC OF THE MARSHALL ISLANDS

**Address:** C/O HISTORIC PRESERVATION OFFICE

ALELE MUSEUM/BOX #629
MAJURO, MH 96960
Phone: 324

**Is Site on the Shoreline?** NO; **Underwater?** YES; **Depth:** 180 feet

**Percent Present:** 76-100%

**Present Remains are:** Intact? YES; Scattered? NO; Buried? NO; Excavated? NO

**Present Remains consist of:**

- Hull? YES
- Decks? YES
- Superstructure? YES
- Auxiliary Machinery? YES
- Ballast? NO
- Armament? YES
- Anchors? YES
- Cargo? NO
- Associated Material? YES

**Wreck Date:** 20TH CENTURY

**Archaeological Survey?** YES; **Date:** 1990

**Surveyor:** DANIEL J. LENIHAN, NPS

**Publication Resulting?** YES

**Publication Name:** NPS CULTURAL RESOURCES ASSESSMENT NO. 37

**Vessel Identity Firmly Established?** YES

**Source:** Archaeological? YES; Oral History/Tradition? NO; Archival? YES

**Vessel Name:** HIJMS NAGATO (BB-9)

**Vessel Type:** BATTLESHIP/NAGATO CLASS

- # of Masts: 2
- Rigging: UNRIGGED
- Length: 708.00; Beam: 95.00; Draft: 30.00
- Displacement: 38500.00
- Hull Materials: STEEL
- Engine: STEAM TURBINE
- Propulsion: SCREW
- Armament: 8X16", 20X5.5", 4X3.1''AA, 3MGS, 8X21''TT(4 AW/4 VW)
- Year Built: 1912; Place of Construction: KURE, JAPAN
- Builder: KURE DY

**Wreck Year:** 1946

**Use at Loss:** TARGET SHIP, OPERATION CROSSROADS

**Cargo at Loss:** TEST EQUIPMENT

**Contact:** DANIEL LENIHAN/SUBMERGED CULTURAL RESOURCES UNIT
Phone: 505-988-6750 or FTS-476-1750
### Popular Name: PILOTISH
### Location: BIKINI ATOLL LAGOON
### Nearest City: BIKINI ISLAND

#### Owner/Manager: REPUBLIC OF THE MARSHALL ISLANDS
#### Address: C/O HISTORIC PRESERVATION OFFICE
#### MAJURO, MH 96960
#### Phone: 3264

- **Is Site on the Shoreline?** NO
- **Depth:** 170 feet
- **Percent Present:** 76-100%
- **Present Remains are Intact?** YES
- **Scattered?** NO
- **Buried?** NO
- **Excavated?** NO

#### Present Remains consist of:
- **Hull?** YES
- **Decks?** YES
- **Superstructure?** YES
- **Auxiliary Machinery?** YES
- **Ballast?** NO
- **Cargo?** NO
- **Armament?** YES
- **Associated Material?** YES

**Wreck Date:** 20TH CENTURY

**Archeological Survey?** YES; **Date:** 1989
**Surveyor:** DANIEL J. LENIHAN, NPS
**Publication Resulting?** YES
**Publication Name:** NPS CULTURAL RESOURCES ASSESSMENT NO. 37

#### Vessel Identity Firmly Established?** YES
### Source:
- **Archeological?** YES
- **Oral History/Tradition?** NO
- **Archival?** YES

#### Vessel Name: USS PILOTISH (SS-386)
#### Vessel Type: SUBMARINE, BALAO CLASS
#### # of Masts: 0
#### Rigging: UNRIGGED
#### Length: 311.80
#### Breadth: 27.30
#### Draft: 15.30
#### Displacement: 1525.00

#### Hull Materials: STEEL
#### Engine: GE/GM DIESEL-ELECTRIC
#### Propulsion: SCREW
#### Armament:
- 10X 21-INCH TT
- 1X 20MM
- 1X 40MM

#### Year Built: 1943
#### Place of Construction: PORTSMOUTH, NEW HAMPSHIRE
#### Builder: PORTSMOUTH NAVY YARD

#### Wreck Year: 1946
#### Use at Loss: TARGET VESSEL/OPERATION CROSSROADS
#### Cargo at Loss: TEST EQUIPMENT

#### Contact: DANIEL LENIHAN/SUBMERGED CULTURAL RESOURCES UNIT
#### Phone: 505-988-6750 or FTS-476-1750
National Maritime Initiative Shipwreck/Hulk Database

Shipwreck Name: PRINZ EUGEN
Location: KWAJALEIN ATOLL LAGOON
Nearest City: CARLSON ISLAND

Owner/Manager: U.S. NAVY
Address: C/O NAVAL HISTORICAL CENTER
WASHINGTON NAVY YARD
WASHINGTON, DC 20374
Phone: 202-433-6437

Is Site on the Shoreline? YES; Underwater? YES; Depth: 120
Percent Present: 76-100%

Present Remains are intact? YES; Scattered? NO; Buried? NO; Excavated? NO

Present Remains consist of:
- Hull? YES
- Decks? YES
- Superstructure? YES
- Auxiliary Machinery? YES
- Ballast? NO
- Armament? YES
- Anchors? YES
- Rigging? YES
- Engines/Boilers? YES
- Cargo? NO
- Associated Material? YES

Wreck Date: 20TH CENTURY

Archaeological Survey? YES; Date: 1989
Surveys: DANIEL J. LENIHAN
Publication Resulting? YES
Publication Name: NPS CULTURAL RESOURCES ASSESSMENT NO. 37

Vessel Identity Firmly Established? YES

Source: Archeological? YES; Oral History/Tradition? YES; Archival? YES

Vessel Name: USS PRINZ EUGEN (IX-300)
Vessel Type: CRUISER, HIPPER CLASS
# of Masts: 2; Rigging: UNRIGGED
Length: 654.50; Beam: 71.00; Draft: 15.00
Displacement: 10000.00

Hull Material: STEEL
Engine: GEARED TURBINES
Propulsion: SCREW
Armament: 8X8", 12X4.1", AA, 12X37MM AA, 12X21''TT, 4AC/6X8° SUNK

Year Built: 1936; Place of Construction: KIEL, GERMANY
Builder: KRUPP AT GERMANIA WERFT SHIPYARD
Wreck Date: 1946
Use at Loss: LAID UP AFTER OPERATION CROSSROADS
Cargo at Loss: TEST EQUIPMENT

Contact: DANIEL LENIHAN/SUBMERGED CULTURAL RESOURCES UNIT
Phone: 505-988-6750 or FTS-476-1750

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National Maritime Initiative Shipwreck/Hulk Database

Popular Name: SARATOGA
Location: BIKINI ATOLL LAGOON
Nearest City: BIKINI ISLAND

Owner/Manager: REPUBLIC OF THE MARSHALL ISLANDS
Address: C/O HISTORIC PRESERVATION OFFICE
ALELE MUSEUM BOX #629
MAJURO, MH 96960 Phone: 3264

Is Site on the Shoreline? NO; Underwater? YES; Depth: 180

Percent Present: 76-100%

Present Remains are Intact? YES; Scattered? NO; Buried? NO; Excavated? NO

Present Remains consist of:
- Hull? YES
- Deck? YES
- Superstructure? YES
- Masts? YES
- Rigging? YES
- Engines/Boilers? YES
- Auxiliary Machinery? YES
- Anchors? YES
- Cargo? YES
- Armament? YES
- Associated Material? YES

Wreck Date: 20TH CENTURY

Archaeological Survey? YES; Date: 1990
Surveyor: DANIEL J. LENIHAN, NPS
Publication Resulting? YES
Publication Name: NPS CULTURAL RESOURCES ASSESSMENT NO. 37

Vessel Identity Firmly Established? YES
Source: Archeological? YES; Oral History/Tradition? NO; Archival? YES

Vessel Name: USS SARATOGA (CV-3)
Vessel Type: AIRCRAFT CARRIER/LEXINGTON CLASS

- # of Masts: 1
- Rigging: UNRIGGED
- Length: 880.00; Beam: 106.00; Draft: 24.10
- Displacement: 33000.00

- Hull Materials: STEEL
- Engine: STEAM TURBINES
- Propulsion: SCREW
- Armament: 8X8", 12X5", 4-6 PDRS. 81 AC

- Year Built: 1922; Place of Construction: CAMDEN, NEW JERSEY
- Builder: NEW YORK SHIPBUILDING CO.

- Wreck Year: 1946
- Use at Loss: TARGET SHIP, OPERATIONS CROSSROADS
- Cargo at Loss: TEST EQUIPMENT

Contact: DANIEL LENIHAN/SUBMERGED CULTURAL RESOURCES UNIT
Phone: 808-988-0020 or FTS-476-1720
BIBLIOGRAPHY

BOOKS


--------------


ARTICLES


MANUSCRIPTS


Log Book, USS Lamson, entries for May 30, June 30, and July 1, 1946, National Archives Record Group 24, National Archives, Washington, D.C.


Memorandum, CNO to CINCPAC, "Removal of Equipment and Supplies from Contaminated CROSSROADS Target Ships," February 18, 1947, Serial 034P36, Operational Archives, Naval Historical Center, Washington, D.C.


Memorandum, Joint Task Force One, Records of the Defense Atomic Support Agency, National Archives Record Group 374, National Archives, Washington, D.C.

Records of the Manhattan Engineer District, National Archives Record Group 377, National Archives, Washington, D.C.


Saratoga Report, serial 007 of 21 February 1945, Box 616, World War II Action Reports, Operational Archives, Naval Historical Center, Washington, D.C.


Ships Section, Office of Public Information, Navy Department, "History of the USS Saratoga (CV-3)," August 29, 1946, copy on file with the Ships History Branch, Naval Historical Center, Washington, D.C.

"A Short Historical Sketch of the 'Prinz Eugen' IX-300, also General Statements Involving the Ship's Characteristics," Serial 00-00C, Operational Archives, Naval Historical Center, Washington, D.C.

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INTERVIEWS


The Submerged Cultural Resources Unit was established in 1980 to conduct research on submerged cultural resources throughout the National Park System with an emphasis on historic shipwrecks. One of the unit's primary responsibilities is to disseminate the results of research to National Park Service managers, as well as the professional community, in a form that meets resource management needs and adds to our understanding of the resource base. A report series has been initiated in order to fulfill this responsibility. The following are the categories of reports that comprise this series.

Submerged Cultural Resources Assessment
First line document that consists of a brief literature search, an overview of the maritime history and the known or potential underwater sites in a park, and preliminary recommendations for long-term management. It is designed to have application to GMP/DCPs and to become a source document for a park's Submerged Cultural Resources Management Plan.

Submerged Cultural Resources Survey
Comprehensive examination of blocks of park land for the purpose of locating and identifying as much of the submerged cultural resources base as possible. A comprehensive literature search would most likely be a part of the Phase I report but, in some cases, may be postponed until Phase II.

Phase I - Reconnaissance of target areas with remote sensing and visual survey techniques to establish location of any archaeological sites or anomalous features that may suggest the presence of archaeological sites.

Phase II - Evaluation of archaeological sites or anomalous features derived from remote sensing instruments to confirm their nature and, if possible, their significance. This may involve exploratory removal of overburden.

Submerged Cultural Resources Study
A document that discusses, in detail, all known underwater archaeological sites in a given park. The intended audience is managerial and professional, not the general public.

Submerged Cultural Resources Site Report
Exhaustive documentation of one archaeological site which may involve a partial or complete site excavation. The intended audience is primarily professional and incidentally managerial. Although the document may be useful to a park's interpretive specialists because of its information content, it would probably not be suitable for general distribution to park visitors.

Submerged Cultural Resources Special Report Series
These may be in published or photocopy format. Included are special commentaries, papers on methodological or technical issues pertinent to underwater archaeology, or any miscellaneous report that does not appropriately fit into one of the other categories.

Published Reports of the Southwest Cultural Resources Center
1. Larry E. Murphy, editor, Submerged Cultural Resources Survey: Portions of Point Reyes National Seashore and Point Reyes-Farallon Islands National Marine Sanctuary, Submerged Cultural Resources Unit, 1984.
2. Toni Carroll, Submerged Cultural Resources Inventory: Portions of Point Reyes National Seashore and Point Reyes-Farallon Islands National Marine Sanctuary, Submerged Cultural Resources Unit, 1984.


10. John S. Speaker, Joanna Choe, Carol Poynter, Herschel Franks, and R. Christopher Goodwin, Archeological Assessment Barataria Unit, Jean Lafitte National Historical Park, Division of Anthropology, 1986.


of Land Adjacent to Bayou des Familles:
Barataria Unit, Jean Lafitte National
Historical Park and Preserve, Division of
Anthropology, 1989.

28. Walter K. Wait and Peter J. McKenna,
Quarai Parking Lot Rehabilitation:
Archaeological Testing Program,

29. Diane Taylor, Lyulirl Hultbl, Nancy Wood,
and Barbara Feldhe, The 1977 La Mesa
Fire Study: An Investigation of Fire and
Fire Suppression Impact on Cultural
Resources in Bandelier National Monument,
Division of Anthropology, 1990.

30. Wesley R. Hunt, The 1939-1940
Excavation
Project at Quarai Pueblo and Mission
Buildings, Salinas Pueblo Missions
National Monument, Division of
Anthropology, 1990.

31. Roger E. Coleman, Archeological
Investigation for Construction of a
Pedestrian Trail and Identification of
Laundress Row, Division of Anthropology,
1990.

32. James E. Day, President of the Big Bend
Area, Bilingual publication, English and
Spanish, Division of History, 1990.

33. Neil C. Magness, In the Land of Frozen
Fire: A History of Occupation of El
Malpais County, Division of History, 1990.

34. Jack R. Bertram, Archeological
Investigations Along the Proposed Alibates
Tour Road Improvement Construction
Route, Alibates Flint Quarries National
Monument, Potter County, Texas,
Division of Anthropology, 1990.

35. Robert Wosnitz, Ph.D., History of Fort
Davis, Texas, Division of History, 1990.

36. Bruce A. Anderson, The Wupatki
Archeological Inventory Survey Project:
Final Report, Division of Anthropology,
1990.

37. James P. Delgado, Daniel J. Lechman, and
Larry Margolis, The Archeology of the
Atomic Bombs: A Submerged Cultural
Resources Assessment of the Southern Fleet
of Operation Crossroads at Bikini and
Eniwetok Atolls Lagoons, Republic of the
Marshall Islands, Submerged Cultural
Resources Unit, 1991.

38. George Sabo III, Randall L. Gundling,
W. Fredrick Limp, Margaret J. Guciuna,
Susan L. Scott, Gayle J. Politz, and Pamela
A. Smith, Archeological Investigations at
WRP0-Area D in the Basin Development
Area, Buffalo National River, Arkansas,
Division of Anthropology, 1990.

39. Larry E. Murphy, ASLIP Natural
Site-Formation Processes of a
Multiple-Component Subaqueous Site in
Florida, Submerged Cultural Resources
Unit, 1990.

A Note About the National Maritime Initiative
Production of this document was coordinated
by the National Maritime Initiative. The
Initiative was created under a 1984
Congressional request to the National Park
Service, asking it to "conduct a survey of
historic maritime resources, recommend
standards and priorities for the preservation of
these resources, and recommend appropriate
Federal and private sector roles in addressing
these priorities." In 1987, a special office
within the History Division in Washington,
D.C., was created to conduct activities
associated with the initiative. The initiative is
a cooperative effort involving the Service’s
numerous cultural resource programs, other
Federal Agencies dealing with cultural
resources, State Historic Preservation Offices,
the National Trust for Historic Preservation,
and the maritime community at large. For
more information, contact National Maritime
Initiative, History Division (418), National Park
Service, P.O. Box 37127, Washington, DC
20013-7127.
Mission. As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally-owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration.