

The *Queen Anne's Revenge* shipwreck site: a case study for evaluating and managing historic shipwrecks

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Abstract

While discovery and exploration of internationally recognized maritime heritage sites naturally attracts attention, management of these quasi-public, multi-cultural resources is seldom easy. Using economic models developed for public resources as an analytical tool, North Carolina shipwreck 31CR314, believed to be *Queen Anne's Revenge*, will be examined and discussed. This heritage site associated with the internationally recognized historic figure, Edward Teach, aka "Blackbeard", is an important, highly visible, state-held resource, which holds implications for many people. The site has been a challenge for managers charged with allocating its use. The central objective of this paper is to identify key interest groups and the way they value the *Queen Anne's Revenge* shipwreck site. Three basic management options for this public resource will be examined through cost-benefit analysis and the affects each have on the various interest groups. In this manner, state archaeologists have begun to develop a means to measure and optimize the allocation of one of North Carolina's most important cultural resources.

Keywords: underwater resource management, non-market valuation.

1 Introduction

The 1996 discovery of shipwreck 31CR314 in Beaufort Inlet has provided North Carolina one of the most important management challenges in the past forty years. Discovered by the commercial firm Intersal, Inc., state underwater archaeologists agreed that the site was quite possibly the remains of the internationally recognized pirate Blackbeard's flagship, which was known to



have been lost at that location in 1718, fig. 1. After agreements were signed with the discoverers, state managers from the NC Underwater Archaeology Branch, began an extensive assessment at the wreck site of the alleged *Queen Anne's Revenge (QAR)*. During initial field investigations between 1997 and 1999, exposed remains were mapped, remote-sensing surveys conducted and test excavations employed, in order to thoroughly examine the nature and extent of buried remains.

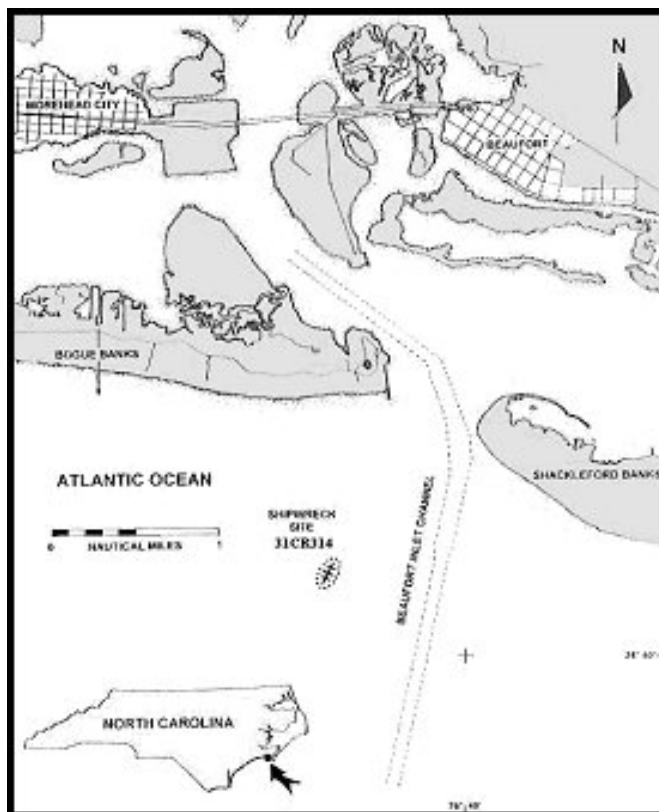


Figure 1: *Queen Anne's Revenge* site location map.

In response to a series of storms, particularly Hurricane Floyd in 1999, archaeologists conducted additional recovery bringing the total excavated area to 150 square feet. Items brought to the surface include 6 cannons, 14 major components of the ship's hull, miscellaneous objects, and 1,500 concretions, which once cleaned have produced more than 15,000 individual artifacts. The vast majority are repetitious items, primarily lead shot and ballast stones. In this collection are also a modest number of remarkable and personal items, such as a variety of brass scientific instruments, bottles and dishes, tobacco pipes, a firearm, and a medical syringe. Artifacts from *QAR* have attracted over a million

visitors to the permanent exhibit in Beaufort, N.C., and its traveling counterpart, which has been as far away as the Maritime Museum in Paris, France. Media coverage of the project exceeds 1,000 articles, including the *New York Times* and *Smithsonian* magazine, a BBC/*Discovery* documentary that has aired many times throughout the world, and the project website [7] which averages 8,000 hits monthly, all of which pique public curiosity.

With interest running high and pressure to commence recovery at an accelerated pace, state managers have stayed the course in order to complete the necessary conservation, analysis and reporting of work conducted during the assessment and emergency recovery. Completion of these phases is scheduled for early 2005 and managers are now considering how best to proceed.

2 Management options for *QAR*

Association with the notorious historical figure, Edward Teach, alias the pirate Blackbeard, makes *QAR* a highly visible and consequently significant public resource. With an estimated 95% of the shipwreck remaining on the seabed, the site continues to need a proper strategy to determine how best to allocate its use for the betterment of all citizens. An economic valuation model proposed by Kaoru and Hoagland has been adopted for *QAR*.

“Cultural resource managers need a different kind of value classification – one that allows both measurement and comparisons of economic benefits across different management alternatives. Managers need to be able to measure and compare, for example, the aesthetic and recreation benefits from the creation of a marine park around a shipwreck, the benefits of *in-situ* for historical or archaeological reasons, and the monetary benefits from salvaging and auctioning shipwreck artifacts.” [3]

2.1 Interest groups

Figure 2, a chart modified from Kaoru and Hoagland [3], shows the values and interest groups related to *QAR*.

2.1.1 Private interests

After discovery, Intersal Inc. relinquished its claim to *QAR* in return for exclusive rights to market commercial documentaries and replica artifacts [6]. While the sale of artifacts is not at stake, Intersal and its non-profit entity, are interested in the rapid and wholesale recovery of the shipwreck remains. They believe this would provide the level of public excitement and pace of recovery to attract viable contracts from documentary companies, and provide artifacts for replication and use on public tour. Public interest, they argue, would generate the funding to properly care for all artifacts recovered in perpetuity.

2.1.2 Academic interests

Dozens of scientists from 21 universities and research institutions have participated in field and conservation activities. This multi-disciplinary group includes underwater and terrestrial archaeologists, coastal geologists, marine



biologists, maritime historians, water quality technicians, forensic specialists, and others. Corresponding graduate research is a key component of this user group, which advocates the study and protection of the site for its intrinsic research value. Scientific research can be consumptive by transferring data from the seabed to the laboratory and ultimately into curatorial facilities and reports. Research aimed at passively monitoring the *QAR* site and its artifacts is a non-consumptive activity of this group.

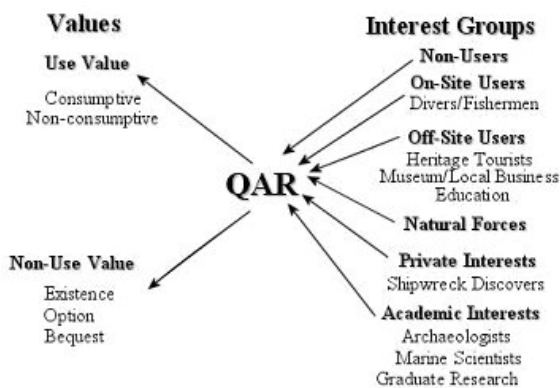


Figure 2: Valuation of a quasi-public resource, *Queen Anne's Revenge Project*.

2.1.3 On-site user interests

Recreational uses at *QAR* involve fishing and diving. While boats can enter the restricted area around the site, anchoring is not allowed. This curtails bottom fishing and recreational diving. The exposed artifacts at the site consist of anchors, cannon, and ballast stones to create a small, near-shore reef with a modest biological community. It's loss as a resource to fishermen is minimal in terms of overall catch opportunities given the extensive number of unrestricted historic shipwrecks and artificial reefs. This would be true for divers, as well as, if it were not for the association with Blackbeard and piracy, which dramatically increases the value this user group places on *QAR*. Diver activity will not be a consumptive use since the controlled nature of the public access should deter indiscriminant disturbance and willful looting of artifacts.

2.2 Off-site user interests

This user group consists of people seeking to experience the era of American colonial expansion and piracy by viewing *QAR* artifacts and information displayed at museums and visiting the area where the shipwreck occurred. Heritage tourists, often travel long distances in pursuit of cultural experiences and contribute to the economic and social interests of the area. Students and teachers value the opportunity to learn about *QAR* by visiting the area or obtaining information at a distance through print and electronic outreach. The

additional attention given to the area and influx of travelers affects local communities and thrusts them into this user group, often with a diverse range of opinion. Generally speaking, off-site users value and benefit from scientific recovery and study that leads to enhanced artifact displays.

2.2.1 Non-user interests

Some people value the preservation of a shipwreck, just as others seek to preserve a pristine forest or protect the habitat of an endangered species. Even though they have no intention of visiting the shipwreck, viewing exhibits or reading an article about explorations at *QAR*, they support its long-term protection. In expressing a willingness-to-pay this interest group is essentially deferring use until later (option) or gaining satisfaction from the knowledge that the site exists (existence) and is preserved for future generations (bequest).

2.2.2 Nature's interest

The natural loss of the shipwreck's archaeological integrity through storm damage does nothing to benefit mankind's use of this cultural resource; these impacts are real and many feel imminent. At the *QAR* site, marine geologists have determined that while ocean currents continue to affect the remains lying on the seabed they are generally stable [5, 9]. Wells [10] determined that due to the relatively shallow burial of artifacts, however hurricanes, such as was experienced with Floyd and Isabel, will alter the site and a catastrophic event would cause extensive damage. Should this happen the only benefit is the opportunity to study site deterioration

2.3 Management options

While there are many options and variations concerning the allocation of *QAR*, three basic options have been proposed for initial study: 1). Treat the site as a passive scientific preserve with no public access or active scientific investigation; 2). Make it a public park with limited diver access; 3). Complete full-scale recovery, in which all artifacts and archeological information are removed from the seabed, studied, conserved and placed in a museum.

2.3.1 Preserve option

Currently, *QAR* is designated as a protected area of primary scientific, archaeological, and historical value. If only passive scientific research is allowed and public access is restricted, only non-use benefits are derived. Costs related to the preserve option, however, may come from storms and site loss. A few might argue that scientific monitoring of the continued deterioration of *QAR* holds value in providing a better understanding of the physical processes that affect shipwrecks. This knowledge could be transferred to other shipwreck sites to enhance archaeological understanding and provide resource managers better predictive tools. The public, however, would be much better served by directing such studies toward shipwreck sites that hold less overall historic value.

Whitehead and Finney [11] provide a glimpse of the historical, non-market value relating to non-use held by residents of eastern North Carolina for



shipwrecks and *QAR*. During the summer of 2001, 884 households were contacted by phone to solicit their willingness to pay for a historic shipwreck state park with its primary intent to protect sites from treasure hunters in North Carolina. Sixty-eight percent of those surveyed supported creation of an historic shipwreck state park and a willingness-to-pay of \$38 per household. Aggregating the commitment of the area's 650,000 households would provide a one-time amount of \$22.33 million.

Implications for non-use value of North Carolina shipwrecks, in which *QAR* is an important component, are significant and should be a management consideration. This popular support may explain the current state funding of a six-member staff dedicated to the management of shipwrecks. Two of these positions deal primarily with *QAR*. Costs to maintain the preserve option, which include site surveillance and monitoring, are currently being met within the state budget. With this option the non-user realizes site value, while user groups generally lose out.

2.3.2 Park option

The park option for *QAR* is currently being considered [2]. This management option retains protection of the site's scientific and non-use value identified in the preserve option; catastrophic storm damage would continue to be a potential cost. The primary difference is permitting public dive access. While free access is a park option, as it is on other shipwrecks such as the USS *Huron* [4], only controlled and limited diver access is considered at *QAR* due to its historical significance. Divers will be required to participate in a state sanctioned, two-day educational course prior to taking a chaperoned group dive. This will protect the site while using its appeal to enhance submerged resource preservation ethics in the diving community. Willingness-to-pay for a *QAR* dive experience derives from informal surveys conducted by the Carteret County dive industry [8]. The Cape Lookout area is a common dive destination due to its closeness to the Gulf Stream and number of shipwrecks, mostly World War II losses from German torpedoes. In an average year, weather conditions permit dive companies to take divers out 17 weeks. At this rate, a proposed *QAR* program in which 40 divers participate weekly would involve a maximum number of 680 dives. The near-shore location and closeness to the effluent of Beaufort Inlet of *QAR*, however, further diminishes optimum conditions, which are known to be generally better in the fall and winter months and on either side of high tide. Physical considerations and time constraints at the site are real and restrictive to the proposed park program. To provide a range, cost-benefit analysis is provided for a annual program for a single diver and then one, two, and three eight-week sessions that would permit 320, 640 or 960 divers, as shown in table 2.

Due to its historical significance and limited access, Purifoy [8] estimates that divers will pay up to \$500 for the experience to dive *QAR*. Since project costs for the educational program are \$270 per diver, which is required for site visitation, willingness to pay for the dive itself is \$230. There will be diminishing demand based on diver visitation as the chances for a positive experience and public demand decrease. If 960 divers are allowed to visit the site (24 weeks of



visitation), their willingness-to-pay will be reduced to the basic cost of the providing the educational program (\$270) plus a half-day dive trip (\$55) for a total of \$325. Considering startup costs a cost-benefit analysis found the maximum net benefit for the park option is 640 divers annually and that 320 divers is the most economically effective.

Project No.	Benefits	Costs	Net Benefit	Ben/Cost Ratio
1 diver	\$305	\$12,000	-\$11,695	.025
320 divers	\$73,600 (WTP \$230)	\$20,000	\$53,600	3.68
640 divers	\$99,200 (WTP \$155)	\$30,000	\$69,200	3.31
960 divers	\$78,800 (WTP \$80)	\$43,000	\$33,800	1.79

Figure 3: Cost-benefit analysis of the park option with dive costs deducted.

Travel expenditures by public divers visiting the site will add to the economic benefits gained through the park option. According to Purifoy [8], divers come from inland areas of North Carolina or beyond and for the most part spend two nights. Studies conducted by the Carteret County Economic Development Council project that visitors to the area spend \$130 a day [2]. It is easy to demonstrate the value of the park option when considering tourism dollars – 320 divers would introduce an estimated \$125,000 in travel spending into the local economy annually to the benefit of that segment of non-users.

2.3.3 Recovery option

The third option is total recovery of *QAR*. This is a consumptive use that transfers site value from the seabed to research facilities and ultimately, to museum exhibit and long-term storage. The beneficiaries would be multi-fold: archaeologists and historians would have access to the scientific information derived from the site but would lose long-range study opportunities and off-site users would benefit from exhibits and public interpretation and increased heritage tourism. On-site use groups would lose the recreational opportunity, but natural forces would not be allowed to disturb or destroy the site. There are, however, substantial and immediate economic costs related to the recovery option, especially when considering the long-term costs of artifact conservation and storage.

Costs of full-scale recovery (2003\$) are estimated from past *QAR* project expenditures and based on the need for five-year recovery program (\$530,000 annual expenditures) and an additional five years of conservation (\$150,000). In the sixth year, a capital improvement of 5 million dollars is required to construct a *QAR* exhibit and curation facility to handle the estimated million individual artifacts. Beginning in the tenth year, with the completion of the exhibit hall, costs are estimated at \$100,000 to maintain exhibits and collections.

A cost-benefit analysis of the recovery option shows that in the 20th year financial benefits will surpass money spent for excavation, conservation, long-term maintenance, and museum capital improvements, fig. 4. Costs are weighed



against benefits derived solely from gate receipts at \$5.00 per person beginning in the eleventh year and calculated on visitation of 200,000. These estimates are based on the fact the NC Maritime Museum currently draws 200,000 to the area, which should double with a state-of-the-art exhibit hall dedicated to *QAR* and piracy. The museum's standard admission fee has been \$5 to view artifacts from the historic shipwreck. Both the costs and benefits have been discounted and demonstrate that in times of low economic growth investment in the recovery option provides greatest benefit. Related travel spending has not been figured in, but would be substantial and primarily benefit private and off-site interests.

Year	Cost PV	Cost 1%	Cost 2%	Cost 5%
1	620,000			
2	520,000	514,851	509,804	495,238
3	520,000	509,754	499,808	471,655
4	520,000	504,707	490,008	449,196
5	520,000	499,710	480,400	427,805
6	5,150,000	4,900,048	4,664,514	4,035,160
7	150,000	141,307	133,196	111,932
8	150,000	139,908	130,584	106,602
9	150,000	138,522	128,024	101,526
10	150,000	137,151	125,513	96,691
11	100,000	90,529	82,035	61,391
12	100,000	89,632	80,426	58,468
13	100,000	88,745	78,849	55,684
14	100,000	87,866	77,303	53,032
15	100,000	86,996	75,788	50,507
16	100,000	86,135	74,301	48,102
17	100,000	85,282	72,845	45,811
18	100,000	84,438	71,416	43,630
19	100,000	83,602	70,016	41,552
20	100,000	82,774	68,643	39,573
Total:	9,450,000	8,351,957	7,913,472	6,793,556

YEAR	Benefit PV	Benefit(1%D)	Benefit (2% D)	Benefit(5%D)
1-10	0	0	0	0
11	1,000,000	905,287	820,348	613,913
12	1,000,000	896,324	804,263	584,679
13	1,000,000	887,449	788,493	556,837
14	1,000,000	878,663	773,033	530,321
15	1,000,000	869,963	757,875	505,068
16	1,000,000	861,349	743,015	481,017
17	1,000,000	852,821	728,446	458,112
18	1,000,000	844,377	714,163	436,297
19	1,000,000	836,017	700,159	415,521
20	1,000,000	827,740	686,431	395,734
Total	10,000,000	8,659,991	7,516,225	4,977,499
Long Term Benefit		100,000,000	50,000,000	20,000,000

Figure 4: Benefit/cost analysis of park dive program and dive costs deducted.



3 Summary and conclusions

There are a variety of other uses and variations in allocating *QAR* and more economic analysis is needed. This preliminary assessment of three basic options, however, provides a starting point from which to examine potential values and interest groups surrounding *QAR* and maritime heritage sites in general. For each of these options, benefits outweigh costs, while the various interest groups stand to lose or gain. Since the *QAR* site has been extensively studied, reported and exhibited, management decisions may not be as controversial as at the time of discovery. The preserve option, for instance, would hold the shipwreck in trust as an *in-situ* public repository, in which everyone could enjoy its non-use value. Support from non-users appears to be significant and has the potential to counter those user interests focused only on artifact recovery. The fact that a catastrophic storm may significantly alter or destroy the site poses a consumptive “natural” user that could quickly diminish the public’s held value. The park option is closely related to the preserve option, however, allows enhanced benefits through visitation by a select public group. As a group, recreational diver willingness-to-pay makes the park option economically feasible even when restricted to a small number of visitors. The recovery option essentially transfers non-use value to the museum exhibit hall and storage facility where archaeological records and artifacts can be enjoyed by the public and held in perpetuity. The high up-front cost of recovery often depends on long-term financing tied to future museum displays and public interest in them. Travel dollars generated through heightened public interest may go a long way by indirectly helping to pay these costs.

The shipwreck site believed to be *Queen Anne’s Revenge* represents an important quasi-public resource, which holds implications for many people. Using the economic valuation begun in this paper, the next step requires managers to delve into deeper detail concerning the various ways to allocate the benefits, absorb the costs and demonstrate what the real gains and losses are for all interest groups regarding this significant public resource. With a sound basis, shipwreck resource managers can convince fellow North Carolinians and their elected officials of the viability and importance of protecting and developing the state’s rich collection of submerged cultural resources.

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