



Introduction

The Dugout Canoe Project began as an experiment to use traditional Native American technologies. Archaeologists are reliant on just a few ethnohistoric sources that mention how Native Americans made dugout canoes using stone tools and fire. Numerous contemporary examples of dugouts exist, particularly Plymouth Plantation's Wampanoag Indian Program, made by burning and scraping out logs. However, to the best of our knowledge, no one has attempted to fell a live tree using only stone tools and fire. We wanted to see if we could cut down a live tree using these technologies, something that may not have been done in this area for several hundred years.

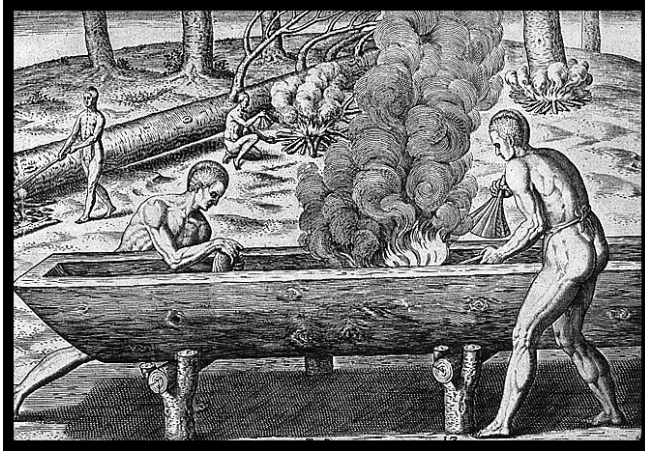
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by Mike Volmar

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Documentary Evidence

Dugout canoes are probably the first type of boat ever made. People from all over the world made dugouts. They were widely used in North America before the arrival of Europeans. Dugout canoes were made by Native Americans across North and South America for transportation and to hunt fish with a spear, bow and arrows, or with hooks



Woodcut by De Bry

made from antler or bones. In Eastern North America, dugout canoes were typically made from a single log of chestnut or pine. Carefully controlled fires were used to hollow out these logs. The fires were extinguished at intervals to scrape out the burned wood with a wood, shell or stone tools, giving the canoes a flat bottom with straight sides. Canoes were then propelled by either paddling or polling, depending on the nature of the water.

Much of what we know about Native American dugout canoes is based on a few ethnohistoric sources. The first, published in the late 1500s are a series of woodcuts by Theodor De Bry. De Bry was a publisher of the works of Hans Staden and others. Staden had been shipwrecked during a voyage to Brazil. De Bry's illustrations of Staden's story and of the New World, had enormous commercial appeal. They remain some of the most important early images of Native Americans. One of the most important aspects of De Bry's work for our purposes shows how Natives used fire to burn trees down.

In 1585 John White, an artist and cartographer, accompanied Sir Walter Raleigh on a voyage to North America (Feest 1978). White was at Roanoke for about thirteen months before he returned to England. During this period he made a series of watercolors of indigenous people, plants, and animals to provide Europeans with an accurate idea of the inhabitants and environment in the New World. Despite their extraordinary significance,



Watercolor by White

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the watercolors were not published until the twentieth century (Hulton and Quinn 1964). In 1590, De Bry made engravings based on White's drawings to illustrate an account of the same journey written by Hariot (Hariot 1590).

Samuel de Champlain (1613) observed Natives along the Massachusetts coast making dugouts.

Those who inhabit it have canoes all made in one piece, very easy to upset... **After having taken much trouble and spent a long time in felling the largest and tallest tree that they can find with stone hatchets** [my emphasis], they take off the bark and round it all but one side, where they set fires every little way all along the log.

Sometimes they take red-hot pebbles, which they also put on it, and when the fire is too fierce they extinguish it with a little water, not entirely, but only enough to prevent the edge of the canoe from being burned. When it is as much hollowed out as they wish, they scrape it all over with stones. The pebbles with which they do the cutting are like our musket flints (Champlain 1613 in Fowler 1975).

Dutch cartographer Johannes Blaeu (c.1599-1673), an investor in the Dutch colonies in North America, published a series of important images related to New England. Blaeu's family ran the largest printing press in Europe in the seventeenth century. After 1638 he became the chief cartographer to the Dutch East India Company. In 1629 his company

began work on the first world atlas, publishing 3000 pages in 12 volumes by the 1660s, the most expensive book in the world at the time. His 1635 illustration in *Nova Belgica et Anglia Nova* showing the southern New England coast depicts both birch bark and dugout canoes. This illustration was copied repeatedly by later illustrators (Salwen 1978).

It is interesting to note that the illustrations by De Bry and White of dugout canoes show a different bow and stern design than the illustrations by Johannes Blaeu. This may indicate that there were regional or group differences in dugout canoe styles (see Sturtevant 1981).



Illustration by Blaeu

An influential written account from Rhode Island provides us with information on Native techniques for making dugout canoes and the time involved. In 1643 Roger Williams reported seeing a Native man *goe into the woods with his hatchet, carrying onely a Basket of Corne with him, & stones to strike a fire when he had feld his tree (being a chestnut) he made him a little house or shed of bark of it, he puts fire and follows the burning of it with fire, in the midst in many places: his corne he boyles and hath the Brook by him, and sometimes angles for a fish; but so hee continues burning and hewing until he hath within ten or twelve days (lying there at his worke alone) finished, and*

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(getting hands) launched his boate; with which afterward hee ventures out to fish in the Ocean (Williams 1643:106-107).

Williams describes *mishoons* or dugout canoes as made of “pine, oak or chestnut”. He reports seeing various sizes of canoes, some built to carry just a few people as well as larger crafts that could fit thirty to forty individuals. He suggests that besides their use for transportation, Native people used canoes with basic sails set on small poles, in naval battles between large groups of warriors in opposing canoe fleets, and for fishing using harpoons and nets (Williams 1643; see also Wood 1897[1634]).



Courtesy of Plimouth Plantation

Narragansett Words for canoes (Williams 1643)

Mishittouwand – a great canoe

Peewasu – a small canoe

Paugautemissaund – an oak canoe

Kowawwaund – a pine canoe

Chemosh-chemeck – paddle or row

Around the same time, William Wood made these observations of Native dugout canoes.

Their Cannows be made either of Pine trees, which before they were acquainted with English tooles, they burned hollow, scraping them smooth with Clam-shells and Oyster-shells, cutting their outsides with stone-hatchets: These Boates be not above a foot and a halfe, or two feete wide, and twenty foote long. Their other Cannows be made of thinne Birch-rines, close ribbed on the inside with broad thinne hoopes, like the hoopes of a tub (Wood 1897[1634]:96).

In 1658 the colony of Massachusetts banned the use of canoes as ferries (Colonial Laws of Massachusetts). On Nantucket there is a tradition concerning a group of young English settlers and an Indian capsizing on their way back to Nantucket from Martha's

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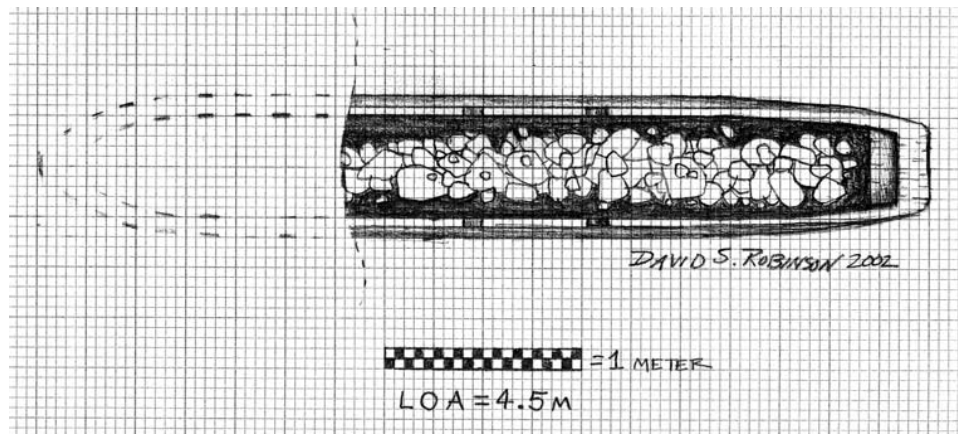
Vineyard. Everyone drowned except one Eleazer Folger (uncle to Ben Franklin) who was able to climb back in and bail the canoe out and eventually drifted all the way to Chatham, where he was rescued by a couple of Indians (Philbrick 2004). Canoes appear to have persisted in Native communities into the 19th century in southern New England.

Canoes preserved in the archaeological record are relatively uncommon. Most of the examples found have been discovered in river or lake bottoms. In 2000 Archeologists discovered dozens of prehistoric canoes in Newnan's Lake near Gainesville, Florida. The canoes range from 500 to 5,000 years old, with most built between 3,000 and 5,000 years ago. The wooden canoes had remained hidden and preserved at the bottom of the lake for centuries until water levels dropped during a dry spell. The canoes, likely used as fishing boats, were up to 22 feet long. Many had rounded sterns and bows. Tests on six canoes showed they were made of pine (<http://www.nationaltrust.org/primer/list.asp?i=22>).

During the 1960s, on Martin's Pond in North Reading, Massachusetts near the Skug River, extensive charcoal deposits were discovered alongside diagnostic artifacts, small stemmed and eared points and a grooved axe (Petzold 1961). The Late Archaic site has been interpreted as the result of dugout canoe manufacture (Fowler 1975).

During a drought in 1911, workers who were pumping water from Mountain Pond in Bethel, CT discovered a Native American canoe. The vessel, which measures slightly more than 14 feet, was carved from a solid piece of American chestnut. (<http://www.mnh.uconn.edu/underwater/Dugout.html>)

Kevitt (1968) reports a dugout canoe discovered in Great Pond in Weymouth, Massachusetts. The dugout canoe was made of eastern White Pine and C-14 dated to 445 B.P +/- 100 (Geochron-GX0541). This particular example shows evidence of contact period alterations including metal nails.



Dugout #2, Overall Length 4.5 meters, Illustration by Dave Robinson for Project Mishoon

In 2001, three dugout canoes were located by recreational divers in a pond in central Massachusetts. A series of underwater dives has taken place to examine the canoes involving collaboration between Native people, state officials, professional divers and underwater archeologists. All the canoes seem fairly well preserved and are reminders of

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Massachusetts rich Indian heritage (<http://projectmishoon.homestead.com/>). The dugouts are in good condition; however the bows are buried in lake sediment. In all three cases the Project Mishoon dugouts have square sterns. A C-14 date of dugout #2 has yielded a date of 220 +/- 40 ybp (Beta 162754). This information suggests that dugout design changed during historic times toward a more European boat design.

Based on a systematic survey of surviving dugouts in the Northeast, Plane (1991) divides logboats into two loosely defined types: coastal/river boats and lake boats. Plane argues that “while logboats had a source in Native American culture, they were also integrated into Euro-American culture...[that] persisted beyond the initial point of contact into the twentieth century (Plane 1991:15). She argues that most surviving “logboats” like the aforementioned examples probably all date to the contact or historic period and may or may not be directly associated with Native Americans.

Methods

At the beginning of the project, conventional wisdom suggested that in precontact times Native people would burn and chop trees down. Our project began in the late Fall of 2000. We tried to cut and burn a white pine tree (*Pinus strobus*) down for about 6 hours and discovered a few facts. First, it was difficult at best to burn the tree and chop at the



same time. The fire was too hot. Second, even after 6 hours very little of the tree trunk burned due to the high amount of moisture in the green wood.

The moisture content in green wood varies over the course of the year (growing vs. dormant season and spring vs. fall) and according to species. There may be a season when cutting and burning a tree down might be more successful. Similarly, some tree species might be drier at specific points in the year. Girdling a tree during or before the growing season would encourage it to dry out and might significantly reduce the energy required to burn it down later in the year. However, this may also ignite a tree when attempting to fell it using fire. There are as yet undocumented reports of precontact Native people packing clay around the base of the tree and some distance up the trunk to prevent this from happening (Coombs 2002).

Since we were working with a living tree with a high moisture content, we decided to switch to chopping exclusively to fell the tree. It took us 30 hours to chop the 36” diameter white pine tree down using only stone axes. Once the tree was down we used fire, wood scrapers and some modern tools, including a chain saw and steel adzes, to speed up the canoe production process and decrease expenses. Traditionally, stone adzes

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and fire would have been used. It took us about 10 days to transform the tree trunk into a canoe using modern tools and fire.

Conclusion

The ethnohistoric literature suggests variability in the methods of dugout manufacture and ultimately the resulting design. Our experiment suggests that Champlain's account of trees felled using only stone axes is most accurate. Burning and chopping down a live tree seems improbable at best. All accounts consistently describe the use of fire and scraping tools to shape the dugout once it is on the ground. The popularity of the De Bry illustrations may have overly influenced our understanding of dugout manufacturing process.

Evidence of canoe manufacturing has been identified in the archaeological record in Massachusetts (Petzold 1961). The dugout canoe manufacturing site at Fruitlands, and perhaps also at Plimouth Plantation, may be good locations to excavate as a comparative example for archaeological deposits to see the result of the dugout manufacturing process.



Jeff Kalin working on the Fruitlands canoe

Based on this experiment we conclude that the information provided by many ethnohistoric sources written accounts and illustrations is misleading or incomplete at best. Accurate information on how or how long it may have taken Native people to make a canoe using stone tools and fire probably varied by time period, location, the intended use (lake vs. ocean travel), wood type, and condition. It is probable that the introduction of metal tools significantly changed the time it took to make a dugout, possibly making it less of a communal activity. Also, it is unclear if green or seasoned trees are used to make dugouts in the 17th century. It is quite possible that both were used in different times and locations, with resulting differences in the manufacturing process.

It is quite probable that Native craftsmen were more knowledgeable about and adept at canoe construction than us. The ethnohistoric literature provides us with only an entry point for understanding Native lifeways. We can augment these sources by conducting experiments using stone tools, fire and other technologies employed by past Native American people. In so doing, we enhance our understanding of the past and our appreciation for traditional Native craftsmanship.

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