# This Lake Alive!

## An Interdisciplinary Handbook for Teaching and Learning about the Lake Champlain Basin

Written and Edited by Amy B. Demarest

With illustrations by Bonnie Acker and Holly Brough
Photographs by Lou Borie

Published by Shelburne Farms, Shelburne, Vermont

Printed with funding from the U.S. Environmental Protection Agency
through the Lake Champlain Basin Program (grant #001840-01-0).

Work for this book was supported in part by a grant from the Christa McAuliffe Foundation.

*The Stewardship Institute of*
**SHELBURNE FARMS**
*Shelburne, Vermont 05482*
*Phone:* 802-985-8686 *Fax:* 802-985-8123



*Author and Editor:* Amy Demarest, *Illustrators:* Bonnie Acker, Holly Brough, *Book Designer:* Elizabeth Nelson,
*Editorial and Production Staff:* Judy Elson, Holly Brough, *Copy Editors:* Suzi Wizowaty, Jennifer Ingersall

*Editorial Board:* Jeanne Brink, Colleen Carter, Mary Dupont, Judy Elson, Elise Guyette, Sue Hardin, Carol Livingston, Karen Murdock, Tim Titus, Jill Vickers

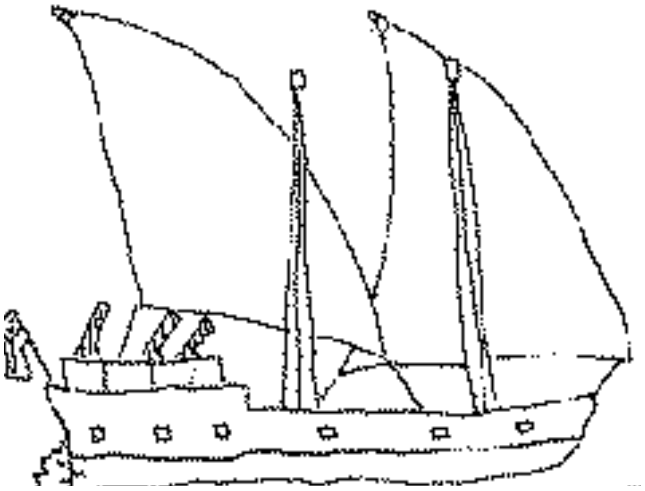
Printed in Burlington, Vermont in the United States of America by Queen City Printers, Inc.
*Printed on recycled paper.*

*Bonnie Acker's cover illustration is a cut-paper collage created from both Japanese paper hand-dyed with watercolors, and handmade paper from Langdell Paperworks in Topsham, Vermont. The inside illustrations were cut from black paper originally used to protect new offset printing plates enroute to printing houses.*

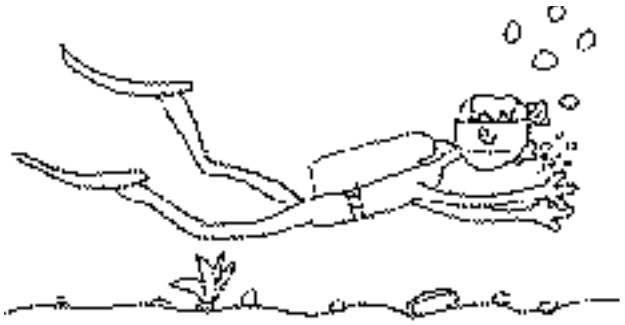
# Nautical Archeology in the Lake Champlain Basin

# What is Nautical Archeology?

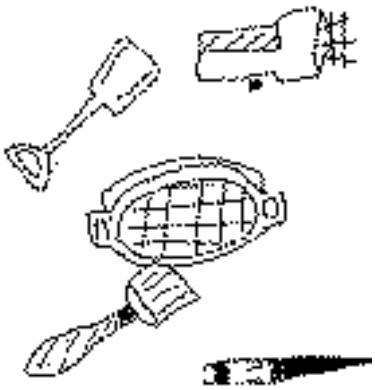
*Text by Sarah Hamilton. Artwork by Kyle Green*
*Grade 5, School Street School, Milton, Vermont*



Nautical archeology means underwater archeology, or the study of things that have happened in the past that are left underwater. Just like archeology you look for artifacts that will help you find out about our history. In this case, underwater history.



Most nautical archeology artifacts are found by scuba divers.



There are many different tools that you can use when studying nautical archeology.

Scuba divers use a vacuum-like tool to help them suck up the dirt and other small artifacts. Then they use a smurf pool to search through what they had sucked up.


When you have found an artifact you have to tell the state or you will be breaking the law. You also have to handle the artifacts carefully.

# Introduction

This essay was written by Art Cohn, whose vision and leadership has prompted much of the activity described in the chapter. I edited it and made changes to fit the language and intent of THIS LAKE ALIVE!

Ten years ago, few people knew that there were boats beneath the waters of Lake Champlain. Indeed, there are hundreds of them and they are probably one of the most significant collections in the world.

This essay outlines the importance of this collection and current efforts to preserve the underwater treasures. It is a timely piece of writing and both the threat of zebra mussels and the possibility of many more finds may change the tale told here.

Most importantly, the story of these ships provides tangible relics to help students unravel the past. Any teacher who has taken her students to the Lake Champlain Maritime Museum or had a diver visit the class can attest to the incredible interest and excitement that these boats create. Because of the work done by the outstanding staff at the museum, students can sit on board the life-size replica of the *Philadelphia II* and shout the commands of a captain in the American Revolution, simulate a dive on an underwater wreck (no talking), and see an incredible amount of boats and related nautical artifacts, photos and artwork that tell the tale of days gone by.

Dale Henry, one of the more well-known staff persons at the museum, is featured here in "Champ's Chat." I interviewed him on board the *Philadelphia II*.

***Philadelphia II*** *docked at the Lake Champlain Maritime Museum*

# Nautical Archeology in the Lake Champlain Basin

People love shipwrecks. Maybe it's because we have heard so many stories about underwater treasures that the idea of shipwrecks stirs our imagination. Lake Champlain has an extraordinary collection of underwater wrecks, perhaps the largest in North America. But the treasure on these vessels is not gold or diamonds. The treasure is the clues and links to the past that these vessels provide.

Like many things, our sense of historical appreciation runs in cycles. In the 1960s and 1970s, people weren't thinking or talking much about Lake Champlain. Waterfronts were less active, ferry service was reduced and the lake's last steamboat was retired and moved to the Shelburne Museum. Most likely, there weren't many students who learned about the lake in school. A fourth grader from the town of Addison, Vermont, would have known that Arnold's Bay was a place with good fishing, not a place where an important naval battle was fought during the American Revolution.

In the 1980s and 1990s, many things happened to bring the lake into the public eye. You are living at a time when there is an incredible amount of discussion on all fronts about what should be done to save this precious resource. Scientists, geologists, historians, farmers, anglers, city planners and lots of ordinary citizens are involved in this dialogue.

One of the sparks that triggered this new awareness was the discovery of a vast collection of shipwrecks and other historic sites beneath the waters of the lake.

If you know your country's history, you know that many important chapters were written right here on Lake Champlain. This history can be studied by looking at the different kind of boats that were used throughout history.

The first boats that traveled for centuries on Lake Champlain were dugout and bark canoes. In recent history, there has been an incredible variety of ships. In the 1700s, people used bateaux, flat-bottomed vessels, primarily for transporting military supplies and soldiers. When the French, British and Americans staged war on the lake, they used naval vessels: sloops, gunboats,

row gallies, radeaux, gondolas and other ships of war.

*The radeau was a flat-bottomed, barge-like boat with sails. It could carry heavy cannon.*

These military vessels were displaced by early ferries, log rafts, lake sloops and schooners. Steamboats were a main mode of travel during the nineteenth century. Commercial watercraft gradually gave way to recreational interests and now people use sailboats, windsurfers and motorboats to travel on the lake.

Signs of the past are all around us. Tourists who visit Lake Champlain are able to visit a multitude of historical sites on land that are linked to the lake's past. School children like yourselves are part of a new generation of citizens studying the lake.

*Imagine the task of throwing away a giant steamship. What people did was remove anything of value, take the ship out in the harbor and let it sink.*

But many of our cultural resources are not on land, but underwater. The submerged vessels are on the lake's bottom for a variety of reasons. Some were abandoned after their useful life was over, some sank in battle and others sank from storms or accidents.

In the 1800s, historic vessels had to be seen from the surface at low water to be found. When they were, they were often raised. For the past 40 years, divers have explored what they could find in the lake in water up to 100 feet deep. They often searched vessels for artifacts and sometimes took wooden timbers from the boats. You may know someone who has a cane, gavel, lamp or table made from wood from one of these historic vessels. Now this kind of "treasure hunting" is against the law.

Prior to the 1970s, over a dozen historic vessels were raised from the lake. Time has taught us that this can be disastrous for submerged wooden ships because most of them cannot survive the destabilizing transition from water to air without large doses of conservation. Some vessels literally fall apart when they are exposed to the air.

***Duke of Cumberland**, raised in 1909*

Nautical archeology is the archeological study of wrecks and vessels underwater. It is a relatively new science and it includes a complex process of planning, research, surveying, recovery, analysis and conservation.

We have learned that the best way to preserve a wreck is to leave it where it is. The cold, fresh water of Lake Champlain keeps the vessel from decaying. How well a wreck survives underwater depends on a number of things: salinity of the water, depth, light, temperature, and the amount of oxygen in the sediment on which the wreck sits. Much of this lake's underwater environment is clear, cold water, which is perfect for preserving ships.

Over the past 15 years, researchers have had the privilege of being able to locate and study *in situ*, or right where they are, a variety of underwater sites. Lake Champlain has vessels that represent just about all historic times: Native American dugout canoes; French and British colonial naval craft; American and British Revolutionary era ships as well as remnants from the submerged "Great Bridge;" American and British War of 1812 ships; commercial vessels of all kinds, including the *Phoenix*, the oldest surviving steamboat hull in the world, and the Burlington Bay Horse Ferry, the only known survivor of its class. As exceptional as these discoveries are, it is important to realize that as of this writing we are only beginning to scratch the surface of the size and diversity of this collection. There are more boats to be discovered!

*The use of side-scan sonar in 1988 revealed the wreck **Sarah Ellen**, a lake schooner built in 1849, which sits intact in over 300 feet of water. The state of preservation of this boat is so good that you can still read its name in white paint on the transom.*

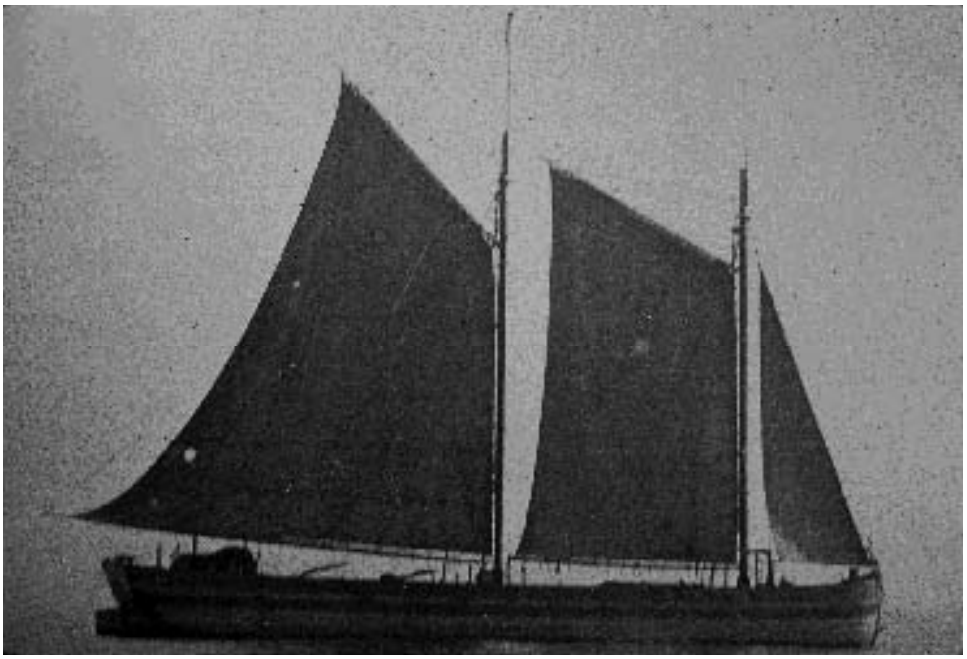
*The "Great Bridge" was constructed during the American Revolution. It spanned the lake between Fort Ticonderoga and Mount Independence.*

Recently, we have seen a technological leap in the way underwater sites are located and studied. New advances in electronic remote sensing equipment have radically changed our ability to locate submerged properties. New advances in electronic technology have the potential to reveal all the lake's previously hidden secrets.

In the spring of 1994, Art Cohn directed a sonar survey with a team of historians and identified a vessel they hadn't known about. That fall the team, with archeologist Kevin Crisman, returned to the site with an ROV (Remote Operated Vehicle). They relocated the vessel and sent the remote camera down to study and record the site on videotape. After reviewing the tape, the team concluded that they had found the *L.A. Hall*, a canal boat loaded with pig iron from Port Henry. The boat had sunk in 1878.

*For the first time, the team used a "differential GPS," a global positioning system that employs a satellite-generated navigational mechanism. This marks another huge leap in technological advances of underwater archeology.*

Sometimes diving is a lot like solving a mystery. For example, until divers discovered the *General Butler* in 1981, historians didn't refer to sailing canal boats. It was commonly believed that canal boats were towed. But when divers surveyed the *General Butler*, they found mast supports and a centerboard. They thought that the vessel must have been rigged for sail. They continued research in the library and found that the boat was registered as a "schooner rigged Lake and Canal Boat." Further research determined that sailing canal boats were used on Lake Champlain.



*a sailing canal schooner similar to the* ***General Butler***

*stern of the **General Butler**; diver is Pat Beck*

Due to new technology, wrecks can be studied *in situ*. Divers use new electronic survey equipment to study the wreck without having to raise it to the surface.

On behalf of the citizenry, the States of Vermont and New York own the underwater heritage of Lake Champlain and no one may disturb artifacts, shipwrecks or significant sites without permission. Once a vessel is found, a team of historians, archeologists, photographers, artists and artifact handlers is assembled and a permit is issued by the Division for Historic Preservation.

***Identifying and documenting a wreck is a long process. Giovanna Peebles, head of the Vermont Division for Historic Preservation, outlines the four stages of nautical archeology:***

*• Library research to get background information on time, place, events, technology and social and economic patterns.*

*• Survey to document precise location of vessel. (Sometimes wrecks are found by accident, like the discovery of the **Phoenix**. But sometimes a group of divers does a survey of a specific area, such as the survey done of the "Ft. Ti/ Mt. I" area in 1983. A survey might be done by a group of divers or by side scan sonar.)*

*• Evaluation of wreck to determine if survey information matches what is already known and if identity of ship can be determined. Evaluation involves a precise and thorough description of the property as it presently exists, including a record of its dimensions, all fittings, equipment, cargo, ballast, artifacts and other materials observed in it or nearby, and its present condition. The team produces scale drawings, photographs, video footage and historical reports.*

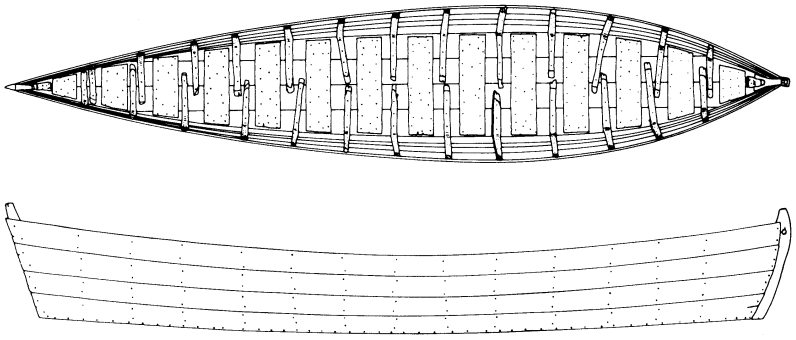
*• Data recovery, the last stage of this process. It involves physical disturbance of some or all of the artifacts. It is an incredibly time-consuming and arduous process. Even the smallest item may have significance and everything that is removed is recorded and cataloged.*

*"If by documentation we know enough about these boats to create construction plans and scale models, why can't we build a full-sized, working reproduction?"*

*Art Cohn*

The Lake Champlain Maritime Museum has recently experimented with a new interpretive process made possible by this improved archeological documentation of underwater sites. The museum began a program of building full-sized working replicas of historic vessels.

In 1987, a bateau was constructed. The bateau was a large rowboat used in the 1700s to transport troops and supplies. The crew at the Maritime Museum had to document the boat's construction, make actual builder's drawings and then plan the construction of the boat. The bateau was launched in 1987 and is now at the Maritime Museum.



Building a replica has many advantages. People of all ages enjoy watching a boat being built. Historical information can be preserved to help people understand the story of the vessel. Launching the boat is a very exciting and festive occasion. Once launched, the completed vessel can be technically evaluated. This adds to our knowledge of watercraft. The completed vessel lets us "see history" without harming the original.

The Maritime Museum began construction of its second replica, the *Philadelphia II*, in 1989. It was launched in the summer of 1991.

# The Story of Philadelphia I & II

## Philadelphia I

The original *Philadelphia*, an American gunboat under the command of Benedict Arnold, was sunk at the Battle of Valcour Island on October 11, 1776. The gunboat remained underwater until 1935, when Colonel Lorenzo Hagglund raised it to the surface. There was no scuba equipment at the time. Hagglund and his crew took special care to make an inventory of the ship's location and document each artifact and part of the boat as they raised it. They also dried it out slowly, which minimized the damage of the air to the old wood.

Hagglund took the boat on a barge and toured the Hudson River and Lake Champlain for the next 25 years. In his will, Hagglund left the boat to the Smithsonian Institution in Washington, D.C. Since 1961, the *Philadelphia* has become a central exhibit at the National Museum of American History.

## Philadelphia II

In 1989, the Lake Champlain Maritime Museum began construction of a replica of the gunboat *Philadelphia*. Created from plans and blueprints provided by the Smithsonian, the replica duplicates exactly the details and features of the 54-foot, 29-ton original. The crew at the museum worked for three years on the construction of the replica. Many classes and visitors saw and took part in the construction of the boat.

There were many problems that the boat builders had to solve in their efforts to build a vessel that was historically accurate. They tried as much as possible to use the tools and materials that were used to build the first *Philadelphia*, but they also made some decisions based on twentieth-century conditions.

The boat is now permanently docked at the museum and thousands of visitors board it each year and imagine what it might have been like to live, work and fight on it in 1776.

# Champ's Chat with Dale Henry

**Champ:** Would you describe your job at the Maritime Museum?
**Dale:** I am a boat builder and a blacksmith. I also am an interpreter, which means I work on the site and explain the exhibits to our guests.

**Champ:** What was your part in the building on the *Philadelphia II*?
**Dale:** My official title was "boat builder's assistant." I was in charge of all the metal on board, anything that was iron, copper or lead. I also was in charge of authenticity, that's trying to make everything the way it was in 1776.

**Champ:** Is everything on the *Philadelphia II* exactly like the original?
**Dale:** No, but it's pretty close. We had to make some choices and we had a twentieth-century deadline. But there are some things that you can't do by machine. For example, the stem that holds all the planking at the bow, basically holding the front end of the boat together, has to fit exactly. It's a curved groove which can't be made by machine. So we made that and a lot of other things by hand, just for the experience of doing things like they were done then.

**Champ:** Why did the museum decide to build a replica?
**Dale:** Well, everyone can't go diving and most of the good wrecks are under the lake. Seeing a replica is a perfect way for people to get the feel of an historical boat.

**Champ:** What kind of decisions did you have to make when you started?
**Dale:** Well, we had to ask ourselves the question: Did we want to give people rides or build an exact replica? If we were going to give people rides, the Coast Guard would put so many restrictions on us there wasn't any way the boat could be authentic. So we decided to build an exact replica and the boat stays docked most of the time. If we do take it out on a sail, we have a crew of volunteers who choose to be on the boat and we don't have the same restrictions. I think we made the right choice.

**Champ:** How did you know where to start?
**Dale:** You know the original *Philadelphia* is in Washington, D.C., right?

**Champ:** Of course, I saw it sink during the Battle of Valcour Island and I was the only one who knew where it was until Hagglund discovered it.
**Dale:** Sorry, I forgot. Well, soon after the boat was brought to Washington, a man who worked there did detailed drawings of the boat. These detailed plans were like architectural drawings and they were our best resource.

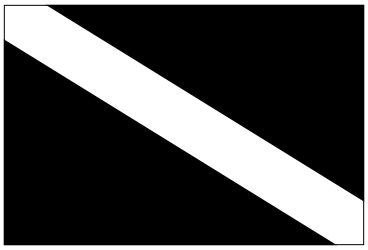
**Champ:** What were some of the things you had to figure out?
**Dale:** I had to figure out how many nails were on the original *Philadelphia*. I figured that there were 250 nails on one plank. Then I counted the planks and figured out that there were about 9,000 nails on the original boat.

**Champ:** Did you make all those nails?
**Dale:** No, this was a time when we had to make some choices. The nails on the original boat were wrought iron, which is very hard to come by. It's around, but it's not made anymore, so you'd have to find things made of wrought iron and reform them into nails. That seemed like a huge task. So we bought square-cut nails. But modern nails have rounded heads and the handmade nails they used in 1776 had flat heads. So we had a blacksmith heat up the nails and flatten the heads. We only did this on the 5,000 nails that were visible. The other ones we left with the round heads.

**Champ:** I won't tell anyone, I promise. What were some other materials you used and why?
**Dale:** Well, we chose oak to build the boat. Oak was the standard wood everyone used back then because it was strong and durable. And oak was available nearby. We got our planks from a local sawmill. The mast, made of white pine, was from Bethel, Vermont, and the man that we got it from cut it down with an ax and had his team of horses carry it out of the woods, just like in the old days. He would have liked to have hewn the whole thing by hand, but again we had to finish the boat on schedule, so we did some of the hewing by machine.

**Champ:** Aren't there some crooked pieces of wood holding the boat together?
**Dale:** Yes, there are. They are called ribs because they hold the boat together just like your ribs hold you together. One of my jobs was to find trees of a special shape, with a natural crook in them, that would serve as the ribs of the boat. It was great fun, walking around the woods, looking at trees. The boat has 104 of these natural crooks and I found most of them. It used to be called compass wood.

**Champ:** Thanks so much for talking to me, Dale. One last question! What's the best thing about your work?
**Dale:** The best thing is the satisfaction I feel because I'm preserving these time-honored traditions in a modern, high-tech world!

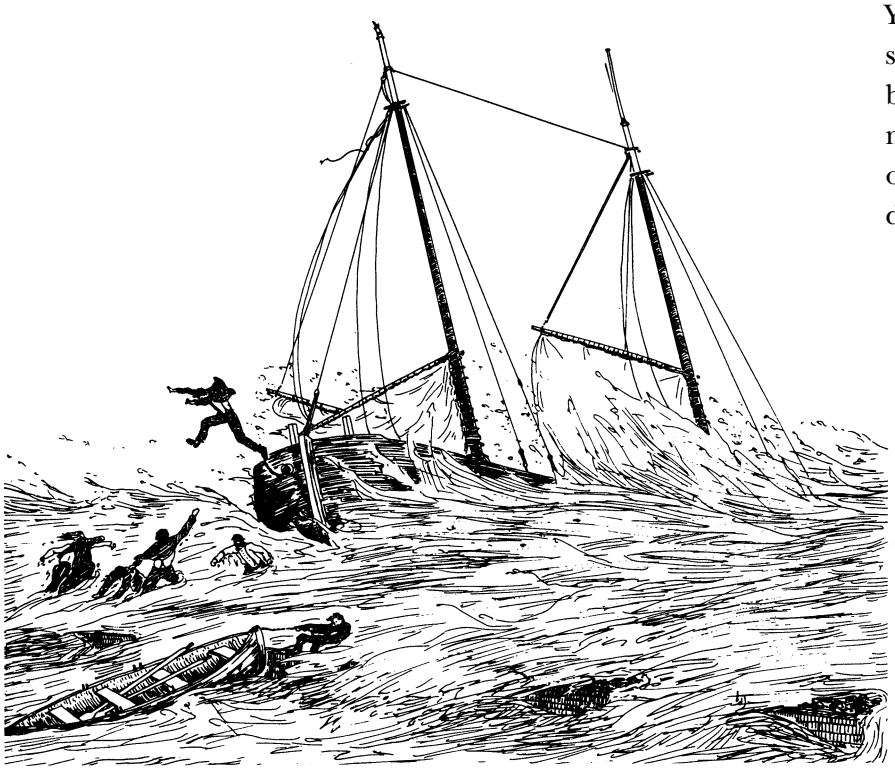


*This symbol (red and white) is used by divers in the United States to alert water traffic to diving activity.*

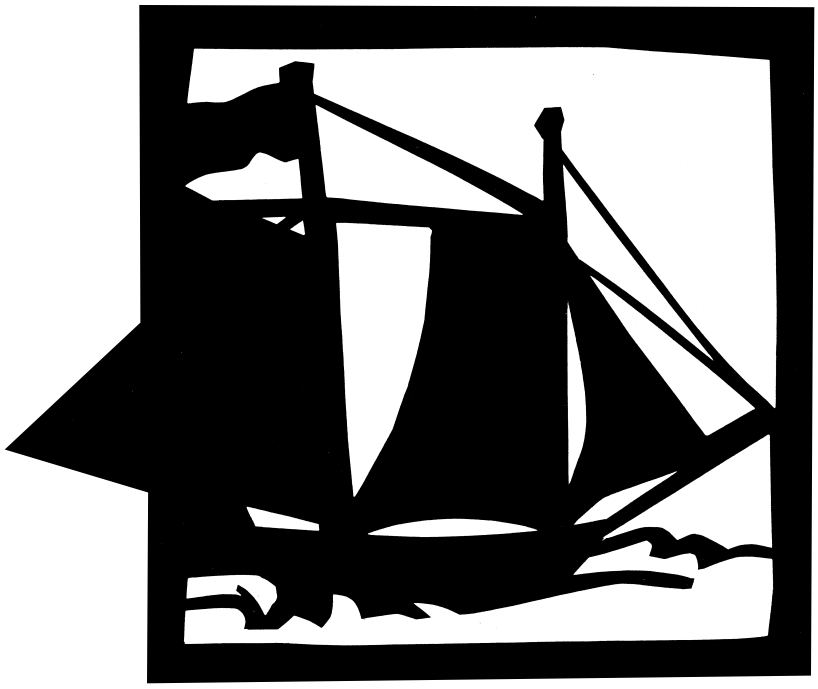
Building replicas is one exciting way that you can learn the nautical history of Lake Champlain. But if you are a bit more adventurous and become a certified diver, there is another way you can see the boats that once traveled on Lake Champlain. In 1985, the Vermont Division for Historic Preservation created the first of five historic shipwreck sites as "Underwater Historic Preserves." This allows divers to safely locate and dive on historic wrecks.

One of the preserves is the wreck of the *General Butler*, which sank in a storm off Burlington harbor. It was manned by Captain William Montgomery, who with his teenage daughter and the crew escaped to safety. The *General Butler* is often visited by divers who can still see its remarkably intact hull and marble cargo. Bright yellow mooring buoys placed at its bow and stern make the *Butler* easy to find. Divers can follow a chain to the bottom, which connects to a yellow travel line that guides them along the lake bottom to the vessel. On the deck are the *Butler*'s anchor windlass, mast tabernacles, hatches, and dead-eyes. At the stern, divers can peer into the rear cabin where meals were served and bunks provided a moment's rest. The woodstove is still there, although it toppled on its side from the impact of the wreck. Fish congregate in schools on the stern deck and around the tiller bar that Captain Montgomery quickly lashed with a chain in his futile attempt to save his ship.

*Zebra mussels, which currently pose a threat to underwater wrecks in Lake Champlain, were first found on the* ***General Butler*** *in the fall of 1994.*



Your generation is the caretaker of this special collection of shipwrecks on the bottom of the lake. Are we to raise them, mine them, study them, recreate on them, or leave them alone? These are important decisions that you can be a part of.



# Nautical Archeology in the Lake Champlain Basin

## Activities

The activities in this section represent a sampling of the many exciting and worthwhile things you can do when studying nautical archeology with your students. Although nautical archeology and historic preservation are not subjects taught in our schools, you'll soon find out that they are incredible magnets for whatever else you are learning. The study of boats—how they were built, how and why they sunk, where they are and how they should be cared for—will add an exciting dimension to your lake study and present your students with important questions relating to the development of one's historical perspective and stewardship that they should consider.

## QUESTIONS

- What is nautical archeology?
- What things are on the bottom of Lake Champlain?
- How did they get there?
- What technology is involved to survey and document them?

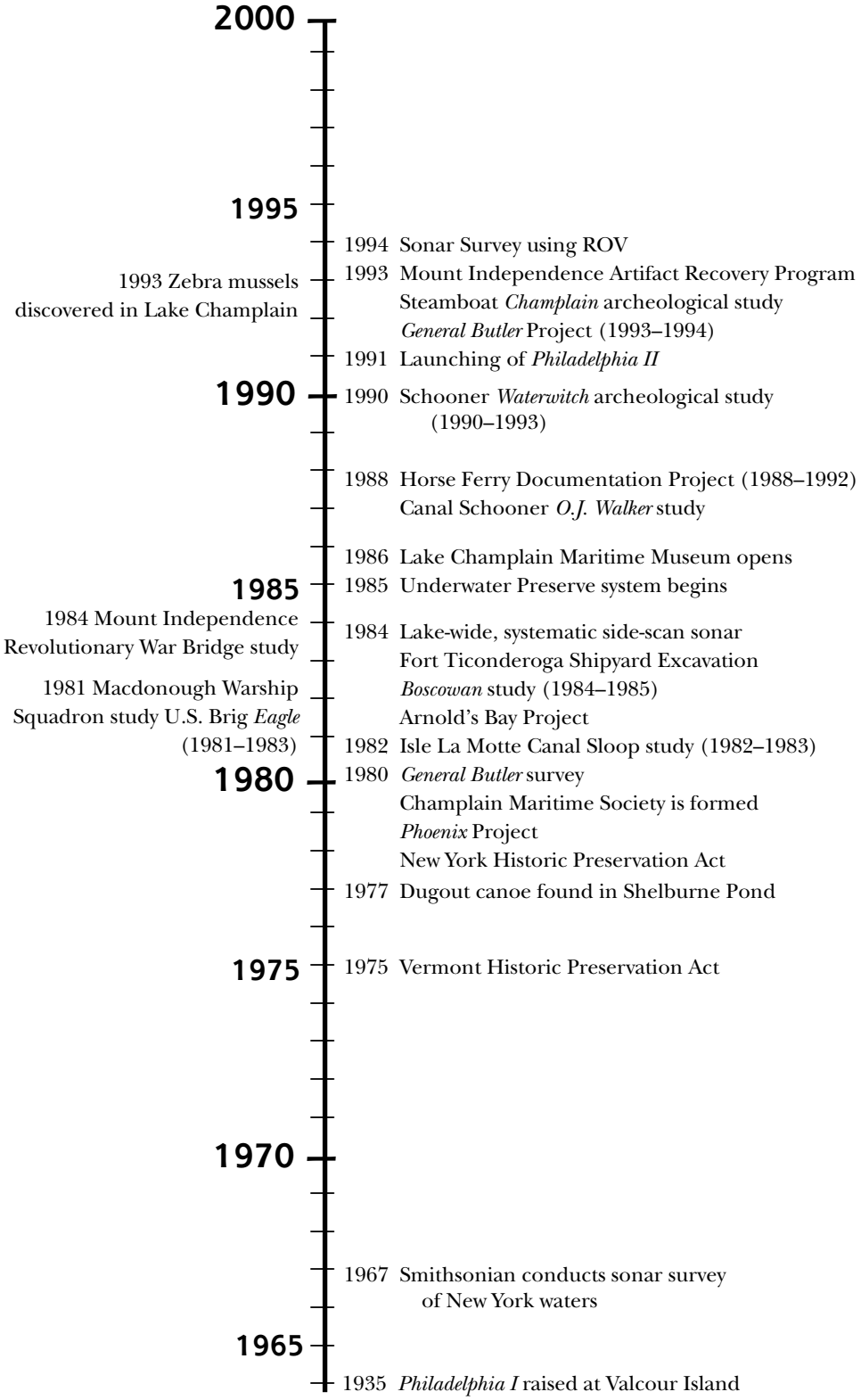
## KEY RESOURCES

- From Sailing Ships and Sidewheelers *by Kevin Crisman (out of print)*
- Sails and Steam in the Mountains: A Maritime and Military History of Lake George and Lake Champlain *by Russell Bellico*
- Lake Champlain Maritime Museum—*field trip and educational resources*
- "Dive Historic Lake Champlain: Vermont's Underwater Historic Preserve System"—*Vermont Division for Historic Preservation*
- "Lake Champlain Dive and Historic Sites"—*Dive Research and Associates*

# Word Bank

aft
amidship
archeology
artifact
ballast
barge
bateau
bow
brig
canal boat
capstan
centerboard
deadeye
draft
dugout canoe
frame
frigate
galley
gondola
gunboat
hull
keel
nautical
port
preservation
radeau
replica
rib
row galley
rudderpost
schooner
scow
ship
shipwright
side-wheeler
sloop
starboard
stern
tabernacle
tiller

## *Significant Archeological Events in the Lake Champlain Basin*



# *Activity:* Float a Boat

**TEACHER NOTES *and* INFO**

Boats float because their weight is less than that of an equal volume of water. While boats may be made of materials that themselves will not float, such as steel or concrete, the weight of the boat hull, including its construction materials and contents (even air!), must be less than an equal volume of water—or the boat will sink.

In general, the lighter the vessel, the higher it will float in the water. For example, if you are sitting in a rowboat next to an identical empty rowboat, more of the empty boat's topsides will be visible above the water than those of your boat. The force that holds up the boat is called buoyancy. Buoyant force can be understood by imagining the part of the boat hull that's below water as a "hole" in the water that the water constantly tries to fill in. Water pushes the hull upward until the boat's weight equals the weight of the water that would fill the hole.

Most students do not expect that they can make boats from materials that do not float. The concept of buoyancy is a dynamic starting point to alter their perception of what appears to be a discrepancy in logic.

**STUDENT ACTIVITY**

Before beginning this activity, discuss these questions with your students:

- Why do you think boats float? Why do you think supertankers or large sailing ships float?
- What type of boat do you think was first on Lake Champlain?
- What materials can be used to construct a boat or a ship?
- Why do you think the American fleet that was on Lake Champlain during the Revolutionary War was built of oak? How do you think they came up with the designs they did for the fleet?

**You will need**

for each pair of students:

- a small pail with several inches of water
- oil-based modeling clay
- paper clips and other small objects that will sink

Students will arrange themselves in pairs with the necessary equipment. Instruct each pair to do the following:

1. Fashion a canoe/bateau hull from one of their balls of clay, leaving the other in a ball form.
2. Place each piece of clay, the ball and the boat, gently into the water.
3. Observe the result. Note that the boats will float. Some boats may need reshaping (higher topsides will provide a deeper "pocket").
4. Measure the load capacity of the vessels by using uniform objects as cargo. Use small paper clips or other similar sinkable objects.

This entire activity can be extended into a boat-design contest with prizes given to the designer who produces the hull with the greatest cargo capacity.

## FOLLOW-UP QUESTIONS *to* Float a Boat

1. What helped your boat float?
2. What do you think is important about the design of a boat?
3. What helps a steel ship float? a wooden ship?
4. Compare data from the different hulls to initiate a discussion about buoyancy, volume and stability.

**Credit:** *Activity from Lake Champlain Maritime Museum. Used with permission.*

# *Activity:* As Time Floats By

*Artwork by Kyle Green, Grade 5, School Street School, Milton, Vermont*

**TEACHER NOTES *and* INFO**

Carol Livingston has developed a nautical timeline activity that is a valuable way for students to comprehend the changes in nautical technology. The drawings for this activity come from a book published by the Division for Historic Preservation called FROM SAILING SHIPS TO SIDEWHEELERS by Kevin Crisman. The book, unfortunately, is out of print. We have designed this activity to be done without it, but get a copy if you can, as it contains 5valuable information about the boats and their history. The boat drawings by Kevin Crisman are included in this activity. The kinds of boats used on Lake Champlain are similar to those used other places, so you can use a general resource, such as a book on sailing ships.

Decide before you begin how big a timeline students are going to make and prepare copies of boat drawings as needed.

**Examples:**

• Reduce boat drawings (p. 220-221) and have each student make a $8\frac{1}{2}$" x 11" timeline. Use blank timeline on p. 195.
• Reduce drawings and have pairs of students make a timeline on two sheets of legal paper, taped together.
• Make one large timeline on the wall and have groups of students research a particular boat, design a way to share that information in written form and mount the drawing and the information on the large class timeline.
• Using any size timeline, have students make their own drawings using Crisman's drawings as a reference and place their own artwork on the timeline.

**STUDENT ACTIVITY**

Share with students basic information about the different kinds of boats on Lake Champlain. Discuss with students the changes in technology, demands of commerce and the human needs that drove this technology.

Have students make a nautical timeline.

# *Activity:*
# Lake Champlain Boat Model

*One year we decided to put only one requirement on the students' boats: that they float. I expressed my hope that students would use the boats to process the historical information we had learned. They decided to organize the projects to cover the span of history, as well as the present and future. They wrote stories about what happened when their boats traveled the lake, then read the stories aloud while presenting their models. Their projects became a talking nautical timeline!*

**Credit:** *Activity and handout from Carol Livingston. Used with permission.*

**TEACHER NOTES *and* INFO**

This boat model activity can be done as a culminating activity for "As Time Floats By" or by itself. Both activities are great to do after you have been to the Lake Champlain Maritime Museum.

**STUDENT ACTIVITY**

Invite students to make a model of any kind of boat. Carol Livingston has students make their boats at home, on their own time, using any materials that they choose.

Students working in the same time period can draw a mural background with historically accurate information. Boat models and murals can be a large three-dimensional display. Students might be able to design a mechanism for the boats to "glide by" with the mural they create!

**STUDENT HANDOUT** - "Lake Champlain Boat Model"

**Name:** _____

# Lake Champlain Boat Model

**You need to choose one type of boat that was used on Lake Champlain—between 5,000 B.C. and the present—and make a simple model of it. It may be constructed of cardboard, wood, toothpicks or other materials you have studied.**

**The model is due _____, and you must complete the information below for your boat. Please learn about your boat and have fun constructing a BASIC model. Try to be accurate with your details but don't get overly concerned with how perfect a structure it is!**

Name of your boat: _____

Type of boat: _____

Time period it was used on Lake Champlain: _____

What was happening on the lake during this time period? _____

_____

_____

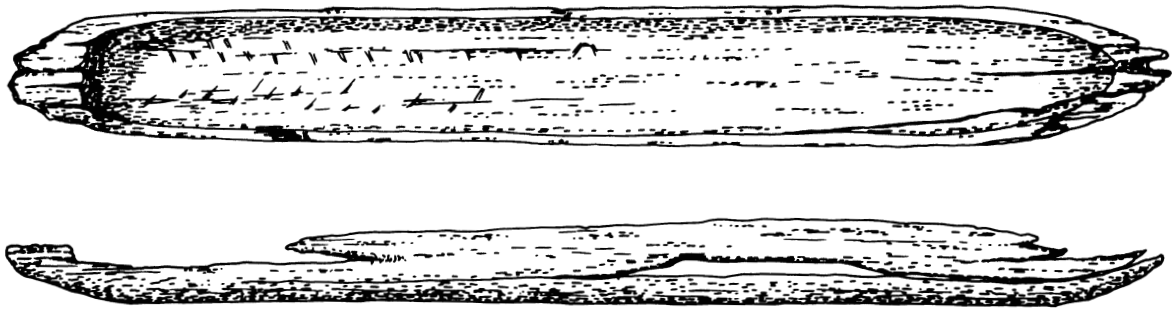
Who used your boat? For what? _____

What was the real boat constructed of? _____

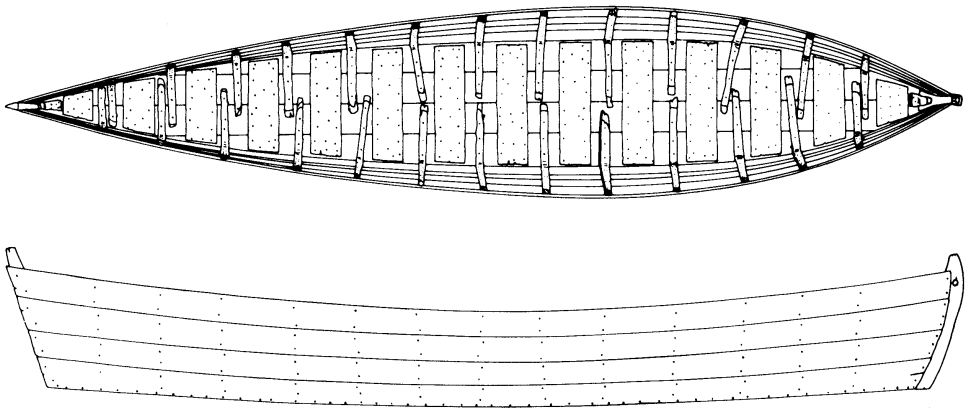
How was the boat powered? _____

Why did you choose this boat? _____

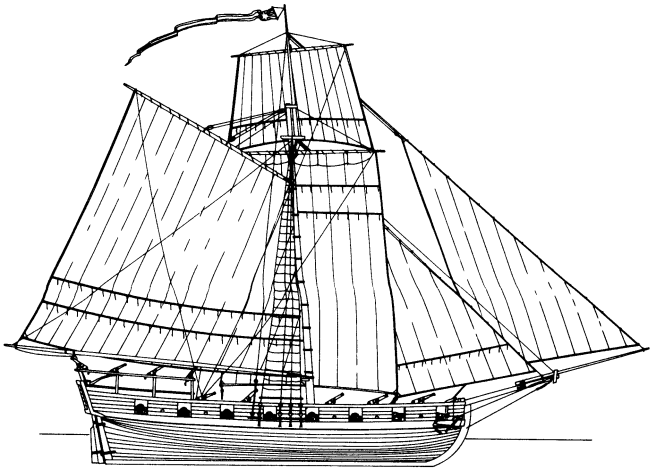
_____



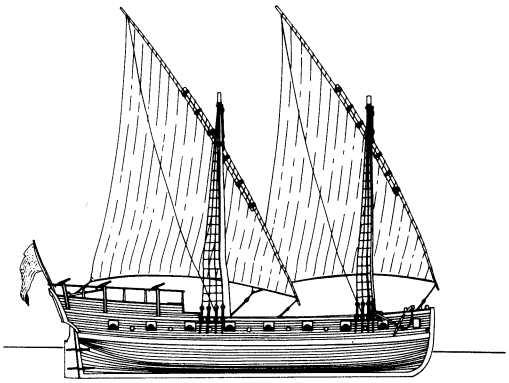
**Type of boat:** dugout canoe
**Historical Period:** Native American



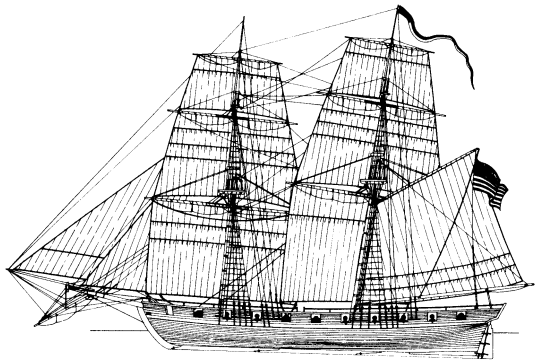
**Type of boat:** bateau
**Historical Period:** Colonial



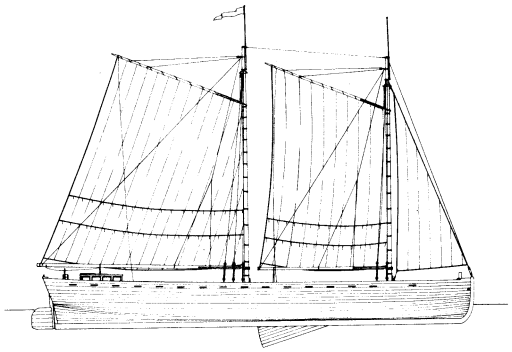
**Type of boat:** sloop (British 16-gun sloop: *Boscawen*)
**Historical Period:** European Settlement



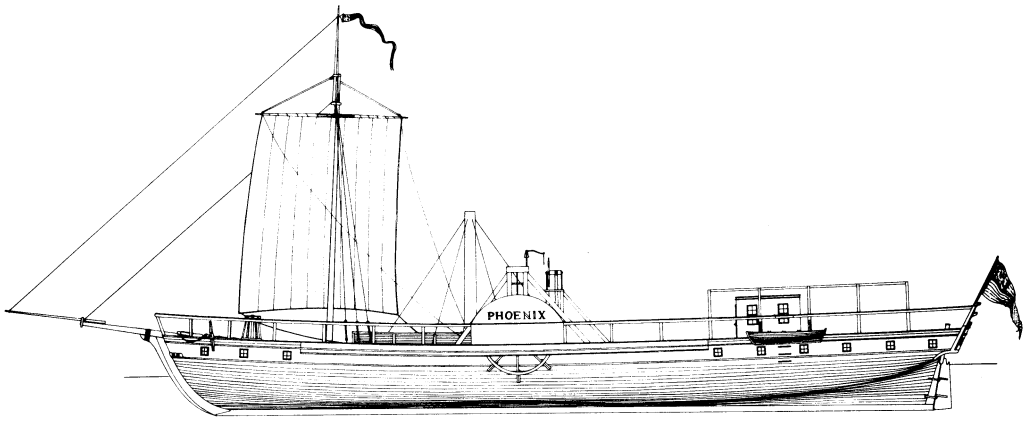
**Type of boat:** galley (Benedict Arnold's flagship: *Congress*)
**Historical Period:** American Revolution



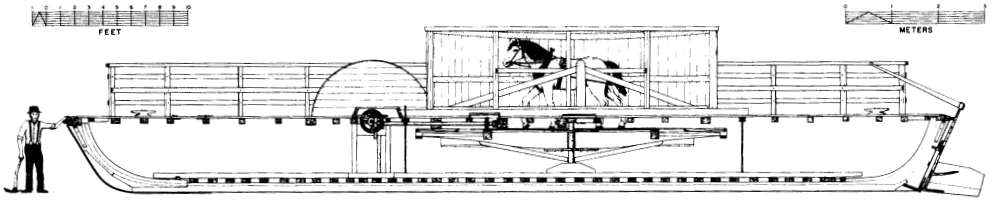
**Type of boat:** brig (U.S. Navy's *Eagle*)
**Historical Period:** War of 1812



**Type of boat:** canal schooner (*General Butler*)
**Historical Period:** Commercial




**Type of boat:** steamer (Lake Champlain Transportation Company's *Phoenix)*
**Historical Period:** Commercial




**Type of boat:** horse ferry; **Historical Period:** Commercial

**Type of boat:** commercial ferry (Lake Champlain Transportation Company's *Plattsburgh)*
**Historical Period:** Modern Times

# *Activity:* Phoenix III: Reading Interpretation

**TEACHER NOTES *and* INFO**

Although the story of the *Phoenix* has been edited from the original article that appeared in the "Phoenix Project," the procedure of underwater archeology may still be hard for your students to understand. There are a variety of ways to help them. Here are a few suggestions:

**STUDENT ACTIVITY**

• Choose 20 nautical words from the article that you think students will need help understanding. Reference materials, including glossaries, are available from the Vermont Division for Historic Preservation or the Lake Champlain Maritime Museum. General information in the library will also help. Assign teams of students to design glossary definitions within the context of the story. Make a class "nautical dictionary" or an illustrated glossary of these terms.

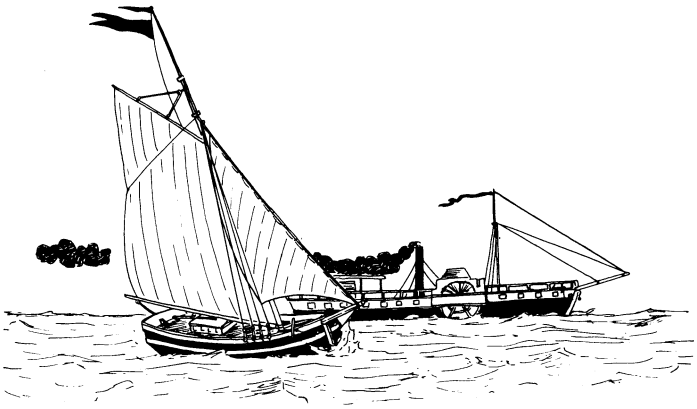
• Assign your students the task of writing a manual for new divers who are participating in an underwater inventory. The manual could include diagrams, "five important things to know," a step-by-step process or safety tips.

• Assign your students a creative writing piece that tells the story of the archeological survey from the viewpoint of the *Phoenix*. Ask the students to write what the boat would be able to observe that the divers are doing.

• Paraphrase the story into one page and design a worksheet with missing information. (See "Facts About the Ticonderoga," p. 161.)

# Phoenix III

For at least one hundred and twenty years, shipwrecks have been pulled out of Lake Champlain. But very few of the early salvagers showed much interest in the historical preservation of their finds. For the most part, the wrecks were brought up for their value as lumber, scrap iron or souvenirs.



The *Phoenix* Project was one of the first attempts to recover information from a sunken vessel in some kind of scientific way. This time, there was never any attempt to raise the boat.

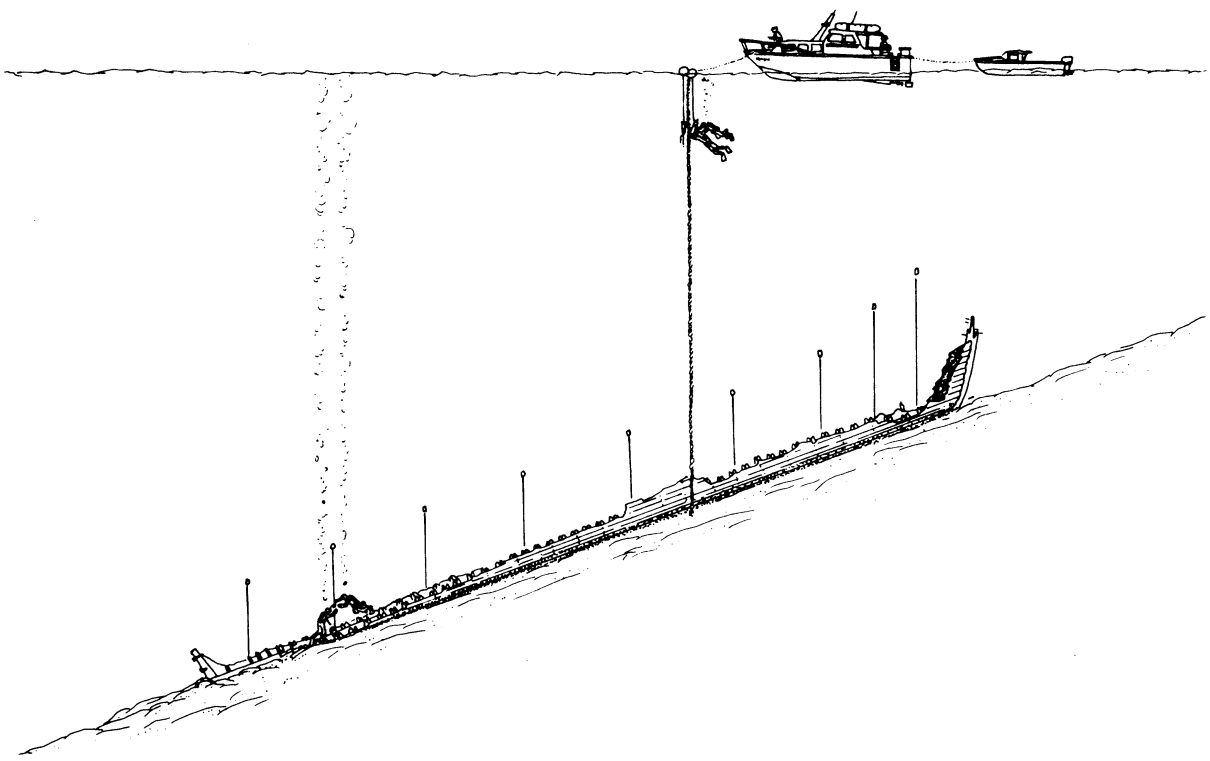
Except for the depth, the *Phoenix* was in an excellent position for underwater exploration and study. The dark, cold water had been a perfect preservative. There were no rotten timbers or planking on the boat, and she was clean of any marine growth.

The goal of the underwater archaeological expedition was to gather enough information to be able to reconstruct the *Phoenix* on paper. This was important because there are no existing plans for the boat. Shipwrights during this period usually built boats by sight and made adjustments during construction. Historians wanted a scale drawing of the *Phoenix* so they could learn more about early steamboats. To get such a drawing, however, it was necessary to label and measure the entire wreck. This was no easy task and required some special skills. How would you have done it?

The *Phoenix* team was fortunate to have a man named Jack Chase. He began working on a technical plan to make these measurements underwater. Chase developed specific methods for taking each of the required measurements. His methods then were turned into diving tasks.

Divers had to determine, down to the last detail, exactly what was needed to complete these tasks. This demanded extreme attention to detail and a lot of ingenuity. Tools and other equipment were kept as simple as possible and all calculations were done on the surface to save time below.

How to take the vertical measurement was one of the problems the divers faced. In order for the draftsman to draw the height of the boat, he had to measure from the keelson to the ribs. The *Phoenix* team devised a way to do this. They created a series of lines by marking a plumbline at one-foot intervals (a plumbline is a line with a weight at one end). To keep the lines from entangling the divers, they tied plastic milk jugs to the lines and attached weights on the other ends. These lines were then dropped over the boat from the surface.



For five days the *Phoenix* team dove on the wreck with clipboards and measuring tapes. When the divers surfaced they reported their measurements to Kevin Crisman, the draftsman for the project, and he translated the mass of figures into a scale drawing. Slowly a picture of the *Phoenix* began to emerge.

Early in the diving work on the boat, the divers noticed the steamer's round bottom. This bottom, which flared up and out much like the shape of a whaleboat, differed markedly from the more traditional hull designed by Robert Fulton. After some research, the team decided that the round bottom was designed to make the boat easier to sail because it could turn easier than a flat-bottomed boat.

Although it is still open to question, the team thinks that the *Phoenix* was steered by a wheel rather than a tiller. Some clues about the wheel can be found in an account of the fire on the *Phoenix*:

> *"…the flames burst through the decks, and shrouded the pilot, the mast, and the chimney in a column of flames. The helmsman, however, held to the wheel, until his limbs were scorched and his clothes half consumed upon his back. The unusual heat around the boilers gave a double impetus to the engine. The vessel dashed madly through the waters, until she was within a few rods of land."*

From this description the team thought that the ropes leading from the wheel to the rudder were burned through, making the boat lose its steering. If the boat had been steered by a tiller, and if the accounts of the boat losing its steering are true, then when the divers studied the wreck, they would have found

a burned sternpost. But, in fact, the divers found the sternpost still intact and the gudgeons still firmly attached to it.

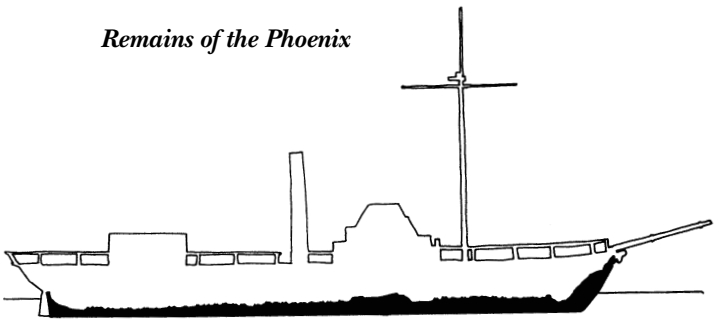
The *Phoenix* team was able to determine the location of the engine, which was removed while the boat sat on Colchester reef before it sank. A particular problem that builders of early steamboats faced was how to make the hull strong enough to prevent sagging from the weight of the engine. The team discovered that the builder of the *Phoenix* solved this problem in two ways. First, the breadth of the boat was increased. While most steamboats of this period were eighteen feet across at their widest point, the *Phoenix* measured 27 feet. Second, the divers found a series of heavy, ten-inch-square, longitudinal timbers where the engine would have been.

With the engine located, it was a simple matter to find where the paddlewheels had been placed. Since the *Phoenix* was powered by a crosshead or steeple engine, the paddlewheels had to be in line with it.

Locating the position of the boiler was not so easy. The *Phoenix* team found two brick areas on the hull of the boat. One area was forward of the engine and one was just aft of it. Although there was some evidence that the boiler had been located forward of the engine, it was more likely that it had been located aft. The *Phoenix* team surmised that the bricks in this area were probably part of the fire box on which the boiler would have been mounted. The other brick pile was near the crew's cabin and may have been part of the cooking stove.

Divers were also able to figure out where the mast had been. They found a large square hole in the keelson twenty five feet from the bow. On one dive during the expedition, they found strips of a whitish grey substance near the engine area. They found out that it was lead. This told the researchers that the *Phoenix*, like other early steamers had trouble with a leaking engine; hot lead was used to seal engine leaks.

***Remains of the Phoenix***



Very few artifacts were found on the *Phoenix*. No pieces of hardware, such as an anchor or chain were found. Most of these things were probably salvaged when the boat lay on the Colchester reef the winter after it burned, or maybe were removed by other divers.

No artifact symbolizes a vessel more than its bell. The bell of the *Phoenix*, according to one historian, hangs in a bell tower in a Presbyterian Church in Danville, Illinois. How the bell traveled to the Midwest is a mystery!

All in all, it seems all right that some mysteries remain unsolved. Think of all the answers that were uncovered since the short time ago when no one even knew where the *Phoenix* was!

**Credit:** *Adapted with permission from the "Phoenix Project," a publication of the Champlain Maritime Society and the Vermont Division for Historic Preservation.*

# *Activity:*
# Zebra Mussels Be Gone!

**TEACHER NOTES *and* INFO**

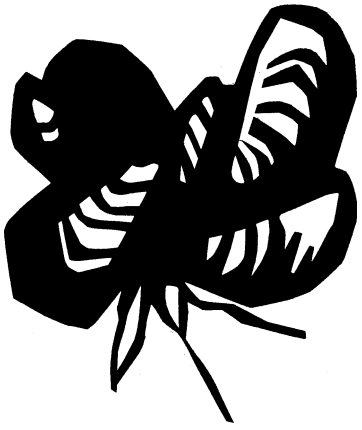
This activity asks students to design a plan to keep zebra mussels off of shipwrecks in Lake Champlain. It calls for students to write a detailed proposal, with drawings, action steps and costs. This activity came about while I was working on a grant related to the publication of THIS LAKE ALIVE! The process of setting out one's goals and objectives in a structured format clarifies one's thinking and brightens one's purpose. The task of outlining a project down to the last dime clarifies one's priorities. This is one of the few activities in this book that I have not done with students. I have outlined one method; it seems it could be amended a number of different ways.

**STUDENT ACTIVITY**

Share with your students information about zebra mussels (see "The Latest Exotic: Zebra Mussels" and "Zebra Mussels Worksheet" in *Living Treasures*, p. 387-390 & 404), and the following article from the Lake Champlain Maritime Museum newsletter, Spring/Summer 1995, "The Race is On!"

After you have read the article together and feel that students have enough information about the damage zebra mussels can do to shipwrecks, discuss different methods that might prevent the zebra mussels from reaching the shipwrecks.

Each group must make a proposal that includes the following:
1. A written description of their project. (Limit: one page.)
2. A diagram of the project (on one plain white paper).
3. An action plan that includes a timeline of action steps. (Limit: one page.)
4. A budget of labor and expenses.



These steps are an abridged version of a standard grant and you can get much more detailed in your requirements. It is probably a good idea to show them an actual grant proposal or invite in a person who is involved in writing grants. Be sure to have your guest write one for you to fund your Lake Champlain studies!

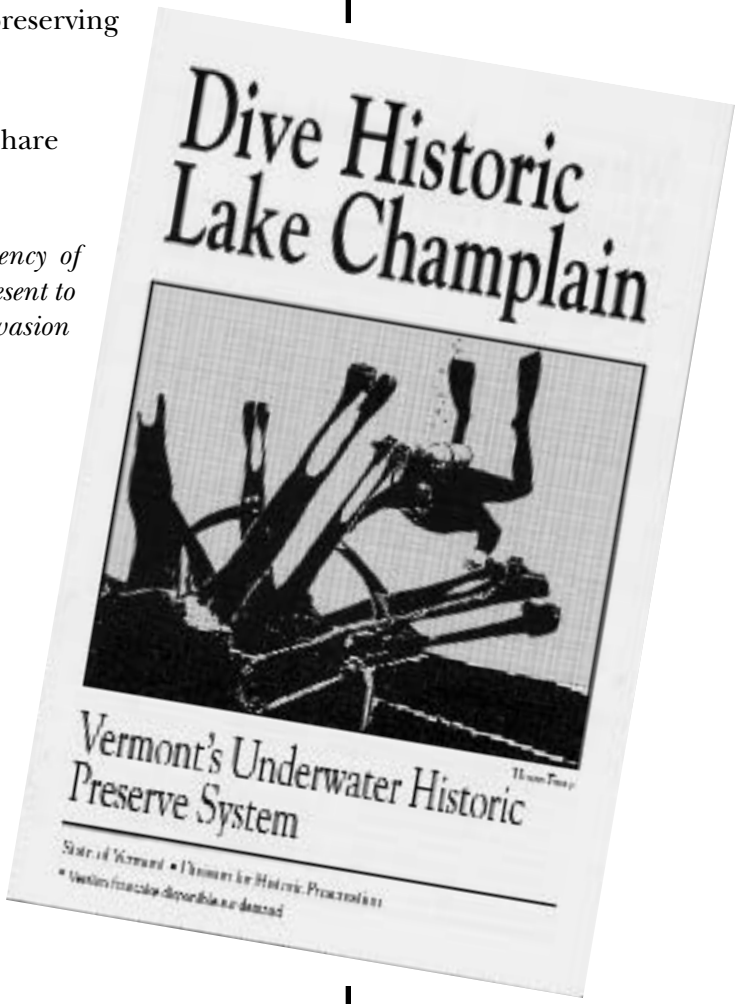
***Note:*** *The Vermont Division for Historic Preservation has just published a brochure titled "Dive Historic Lake Champlain: Vermont's Underwater Historic Preservation System." It describes the location of specific underwater wrecks. If you wish, you can obtain this and have each team design a protection plan for one of the wrecks. This provides more of a challenge, since the brochure gives specific dimensions of a wreck as well as its specific location, including depth and water conditions.*

The goal of the project is for students to design a way to prevent the zebra mussels from reaching the shipwrecks. Divide the class into problem-solving teams. Have them decide on the location and dimensions of the ship, unless everyone is going to be working on preserving the same ship.

It is also a good idea to invite in a guest speaker to share information about zebra mussels.

***Note:*** *Michael Hauser, who works for the Vermont Agency of Natural Resources, is available throughout the basin to present to school groups about the current situation regarding the invasion of the zebra mussel.*

**STUDENT HANDOUT** - "The Race is On!"



# The Race is On!

A new and profound phenomenon has occurred in Lake Champlain: the arrival of a small mollusk known as the zebra mussel. This extraordinary invasion adds new urgency to our ongoing program to locate, inventory and document the cultural resource collection sitting on the lake bottom. We are now in a race to do this before shipwrecks are coated with zebra mussels.

We are not pausing to wring our hands or wonder why. Instead the Lake Champlain Maritime Museum is proposing what we believe is the only logical course of action: get out in front of the spreading invasion and locate and document shipwrecks before they are coated! We have the advantage of being able to learn from the Great Lakes experience and react during what we predict will be a brief window of opportunity.

A systematic approach to survey the entire lake bottom within the next five years has the potential to save a priceless body of information....We believe there are dozens—perhaps hundreds—of unlocated shipwreck sites scattered throughout the lake. If the Great Lakes experience is a guide, we predict the zebra mussels will begin by impacting shallow water sites, then migrate to sites in deeper water. Once they colonize a shipwreck they will provide an effective barrier to extracting information from the site.

We agree on the following points:
• It is a waste of time to worry about whether zebra mussels will coat shipwrecks; they almost certainly will.
• Water depth probably will not protect wrecks. In the Great Lakes, quagga mussels, which are closely related to zebra mussels, have been found coating boats in depths exceeding 200 feet.
• Nobody in the United States or Canada is looking specifically at the impact of the mussels on historic shipwrecks.
• Currently there are no practical controls available to prevent mussels from attaching to shipwrecks, and removal once they are attached will cause more damage than leaving them in place.
• We can expect a geometric increase in the numbers of zebra mussels in Lake Champlain over the next five years.

**Credit:** *Adapted with permission from Lake Champlain Maritime Museum newsletter, Spring/Summer 1995.*