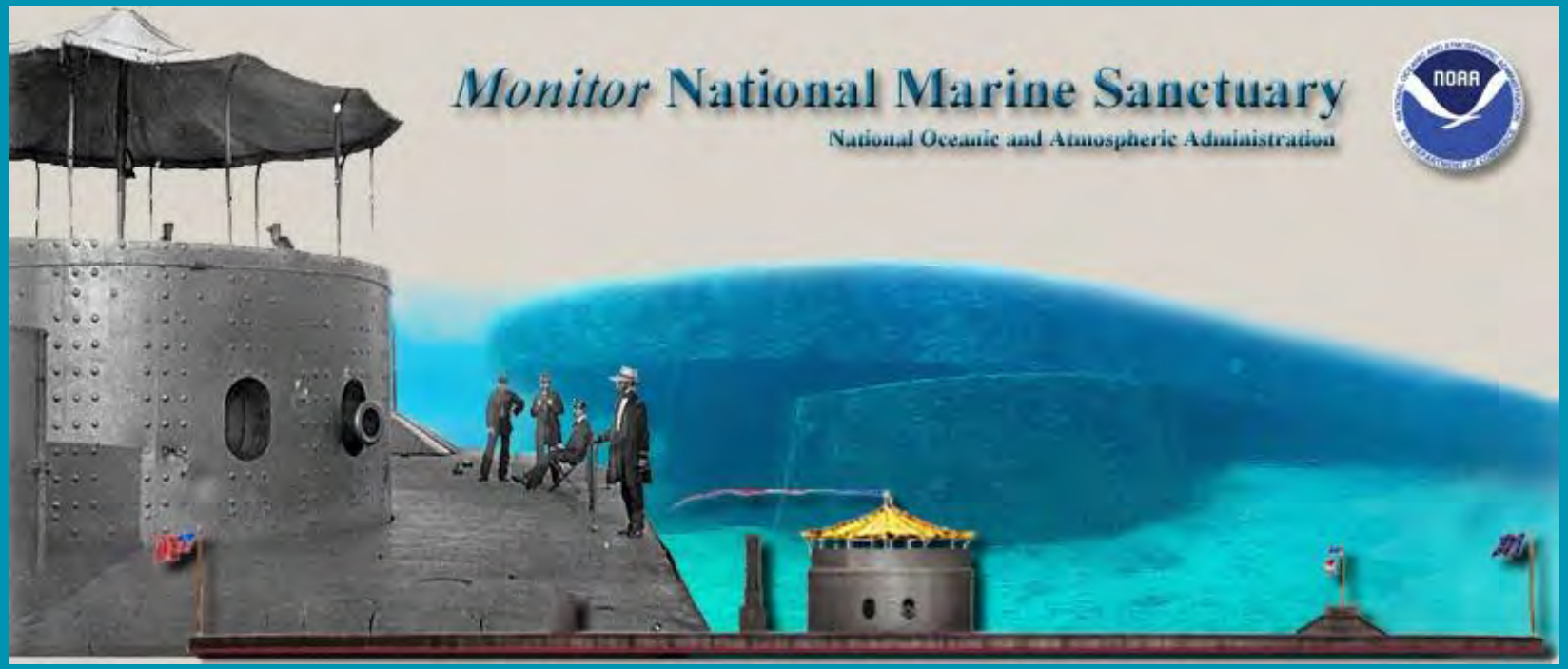
National Marine Sanctuaries
National Oceanic and Atmospheric Administration

NATIONAL MARINE
SANCTUARIES

Monitor National Marine Sanctuary



Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

National Marine Sanctuary System

Olympic Coast
Greater Farallones
Cordell Bank
Papahānaumokuākea
Hawaiian Islands Humpback Whale
Monterey Bay
Channel Islands
American Samoa (U.S.)
(Including Rose Atoll)

Wisconsin - Lake Michigan
Thunder Bay
Stellwagen Bank
Mallows Bay - Potomac River
Monitor
Gray's Reef
Florida Keys
Flower Garden Banks

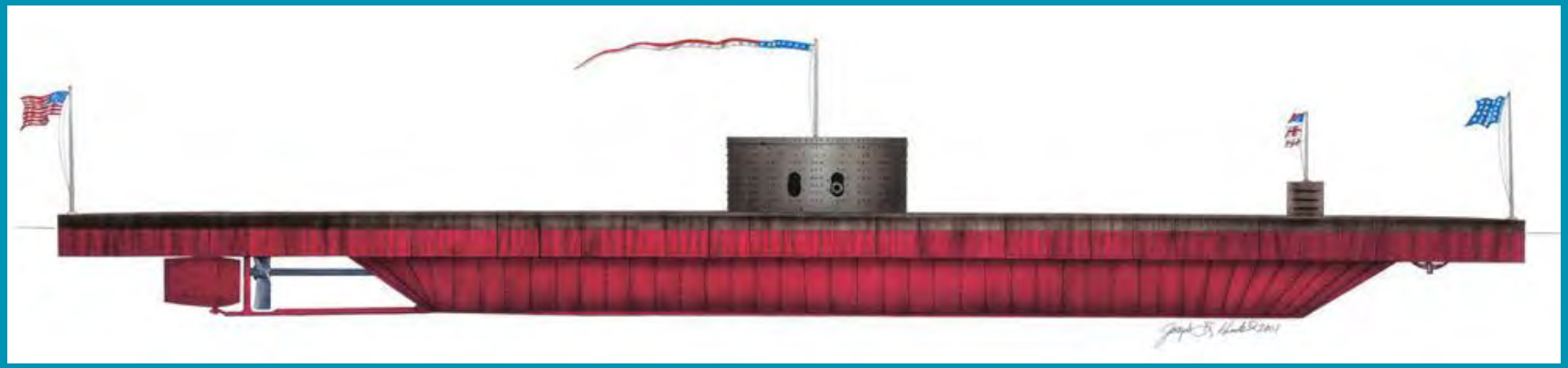
National Marine Sanctuary
Marine National Monument
Proposed National Marine Sanctuary

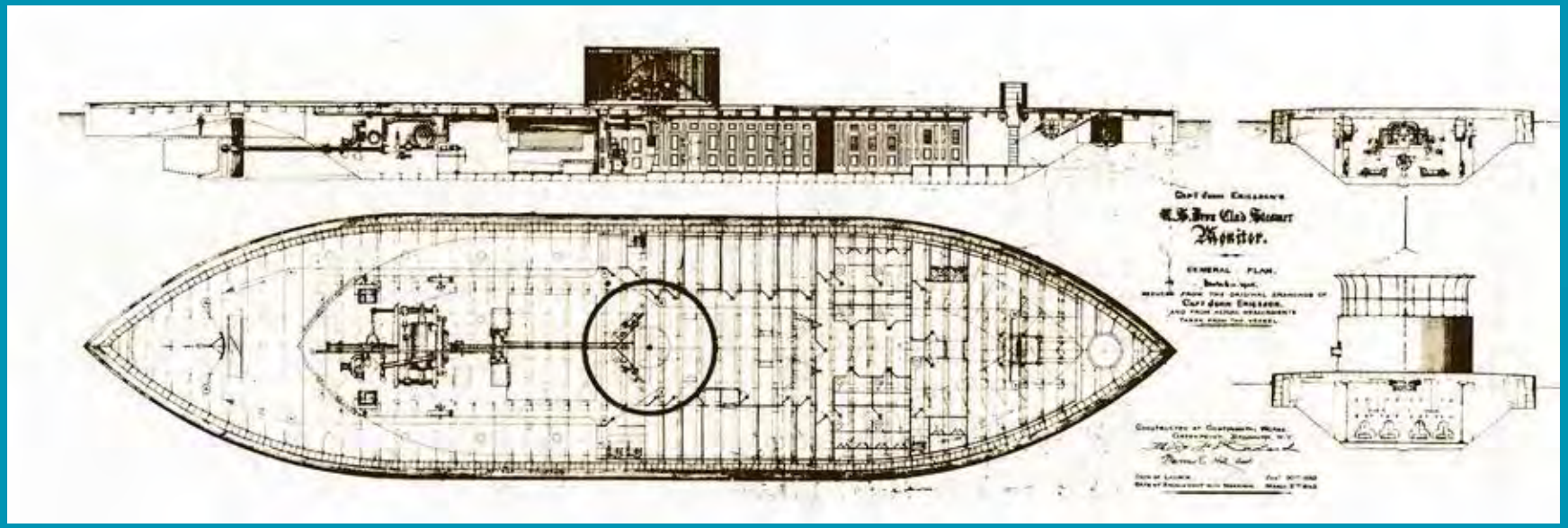
Scale varies in this perspective. Adapted from National Geographic Maps.

Curriculum and More

- Overview of the Monitor NMS and Maritime Heritage Program
- *Shipwreck of the Deep*—Integrated curriculum developed in partnership with Newport News Public Schools
- *Maritime Archaeology: Discovering and Exploring Shipwrecks*—A guide integrated with social studies and STEM
- Other Educational Offerings—A variety of standalone activities and learning modules from Civil War to WWI

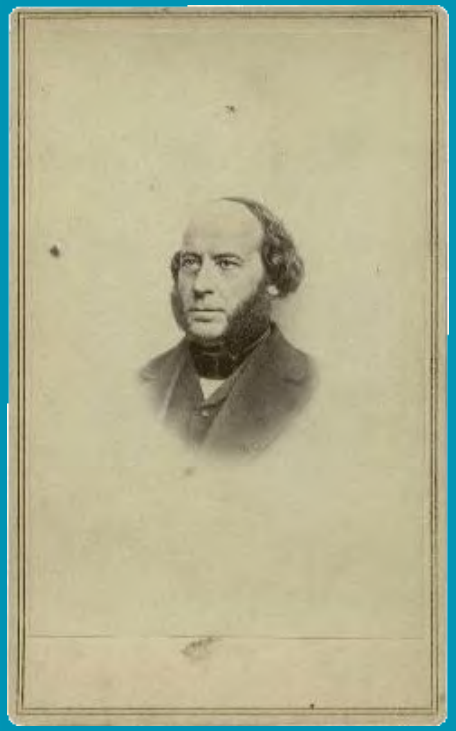
What was the USS *Monitor*?



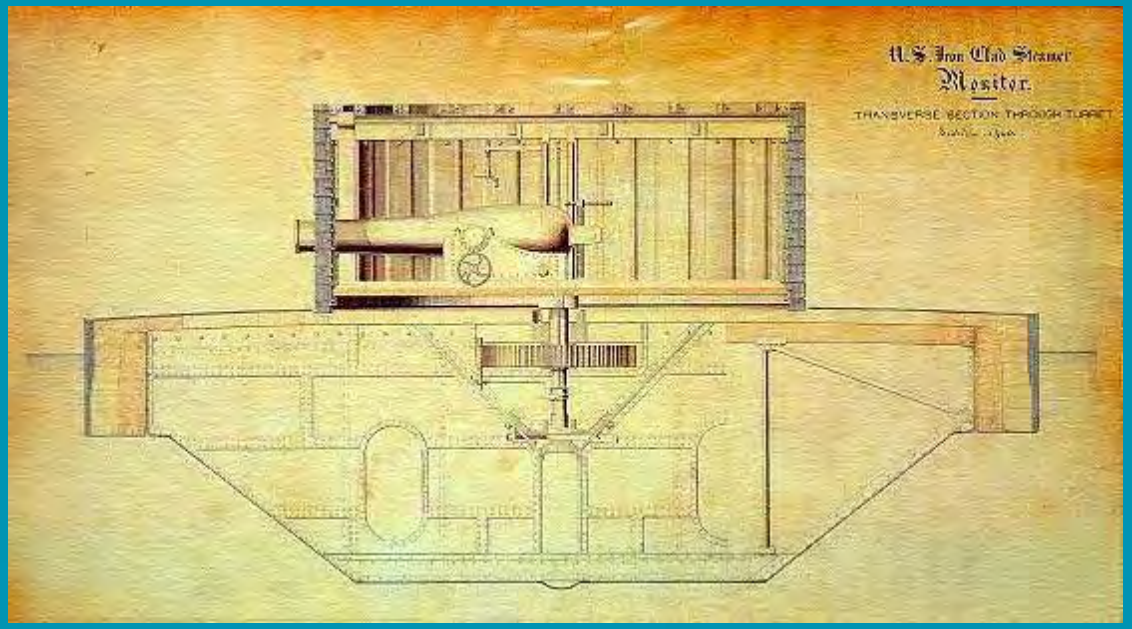


An Innovative Warship Built in less than 100 Days

Inventor and Innovator



- John Ericsson
- Innovative Technology
- Major Impact on Maritime and Military History

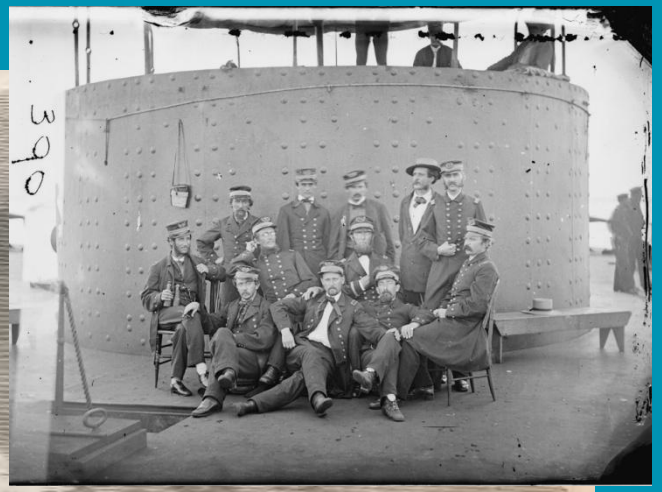


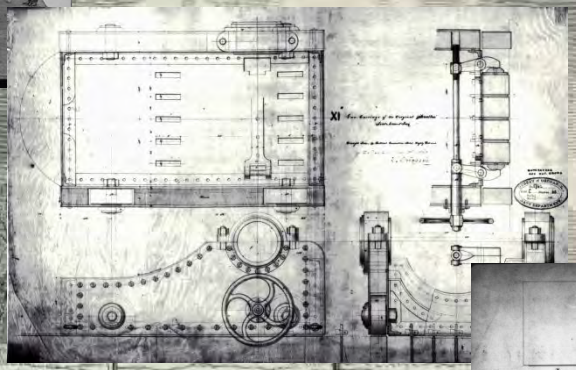
USS *Monitor* and the CSS *Virginia* engage in the first battle of steam powered ironclads. The battle ushers in a new era of naval technologies and naval warfare.

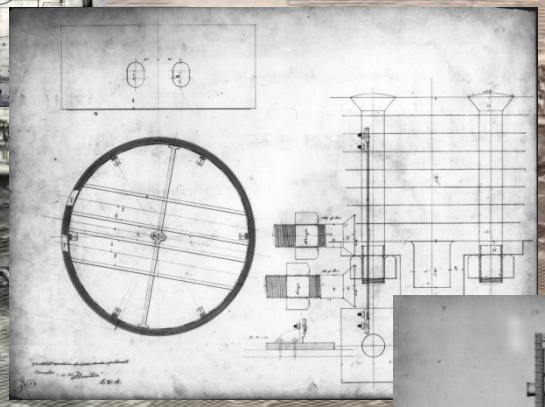
Discovery - 1973

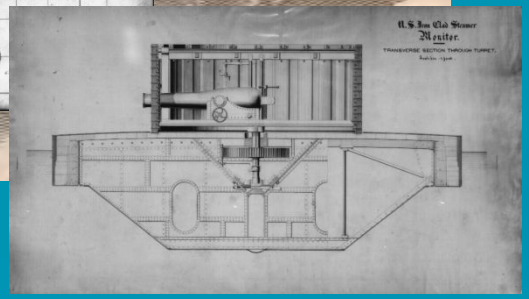
John G. Newton of the Duke University Marine Laboratory proposed testing the application of geological survey equipment for underwater archaeological survey and assessment.

History and Technologies Worth Preserving

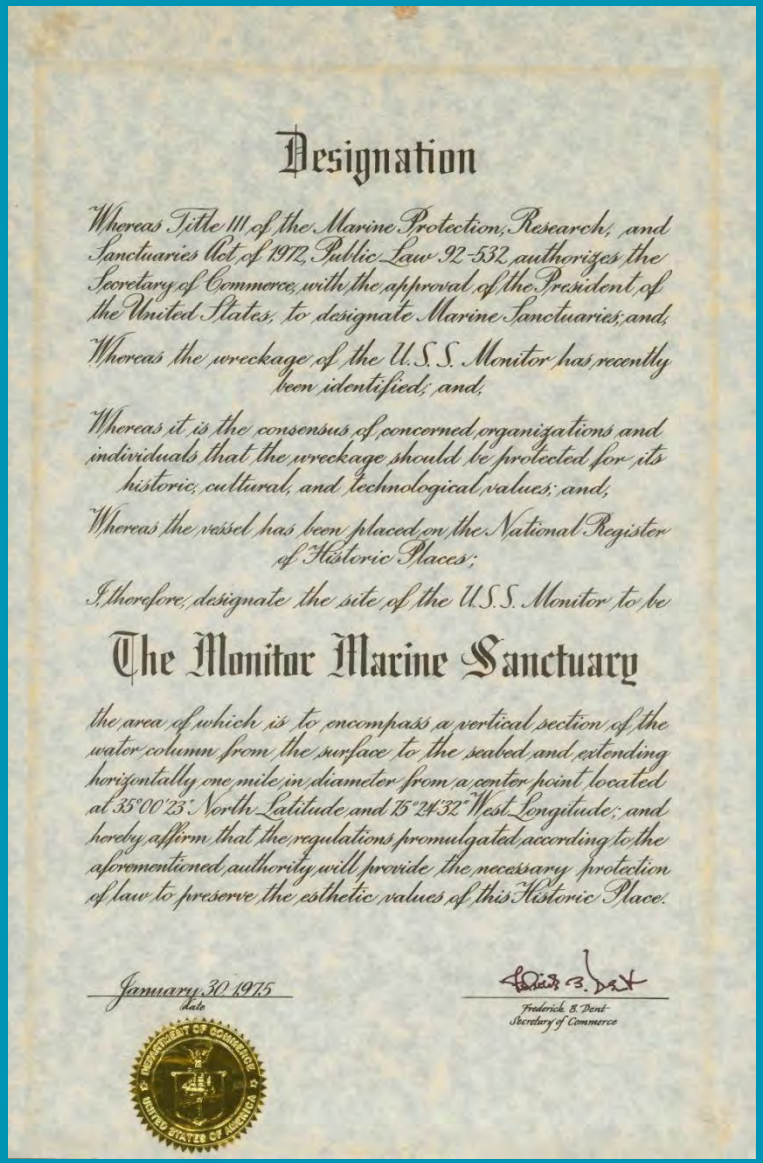








National Oceanic and Atmospheric Administration



Designation

Whereas Title III of the Marine Protection, Research, and Sanctuaries Act of 1972, Public Law 92-532, authorizes the Secretary of Commerce, with the approval of the President of the United States, to designate Marine Sanctuaries; and,

Whereas the wreckage of the U.S.S. Monitor has recently been identified; and,

Whereas it is the consensus of concerned organizations and individuals that the wreckage should be protected for its historic, cultural, and technological values; and,

Whereas the vessel has been placed on the National Register of Historic Places;

I, therefore, designate the site of the U.S.S. Monitor to be

The Monitor Marine Sanctuary

the area of which is to encompass a vertical section of the water column from the surface to the seabed and extending horizontally one mile in diameter from a center point located at 35°00'23" North Latitude and 75°24'32" West Longitude; and hereby affirm that the regulations promulgated according to the aforementioned authority will provide the necessary protection of law to preserve the esthetic values of this Historic Place.

January 30 1975
Date

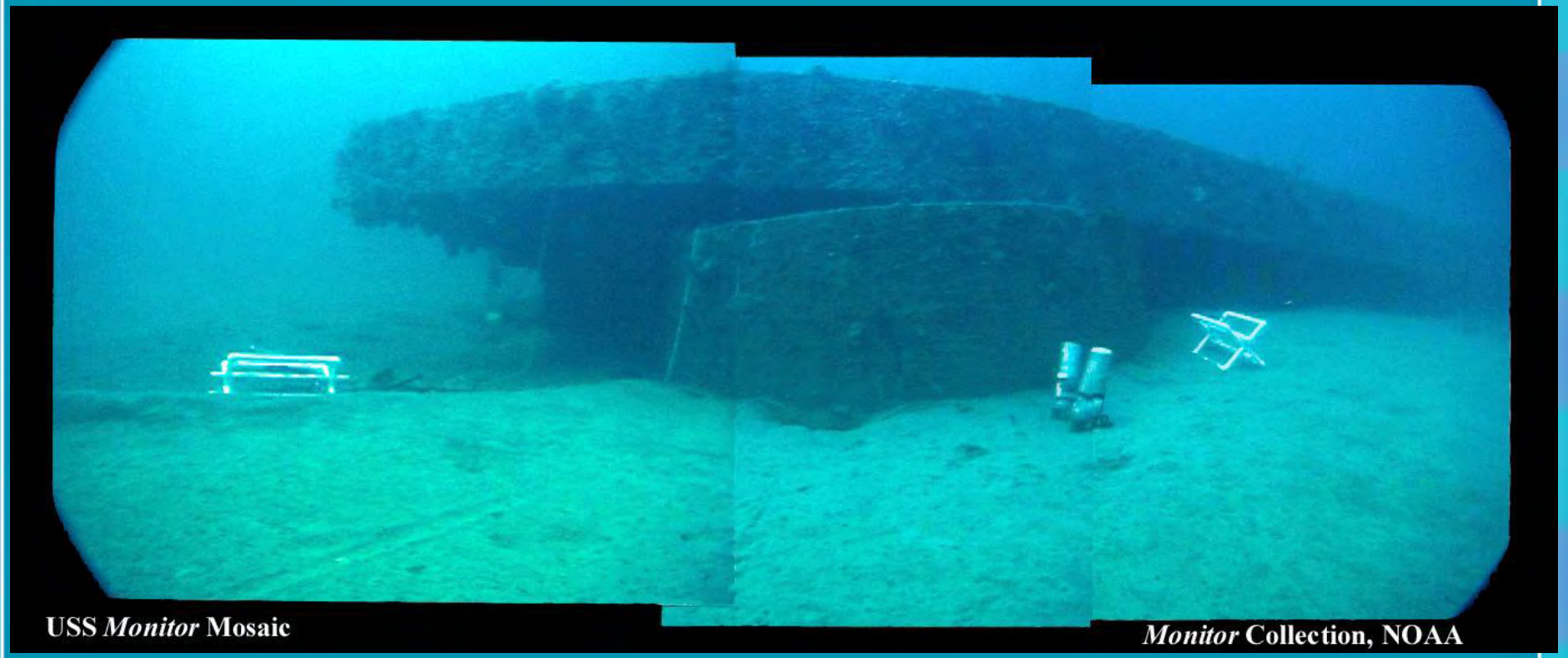
Frederick B. Dent
Secretary of Commerce

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

The *Monitor* National Marine Sanctuary was established by Congress on January 30, 1975, the 113th Anniversary of the *Monitor's* launching at Greenpoint, NY.

A column of water one mile in diameter from the surface of the sea to the seafloor

Recovery and Archaeology



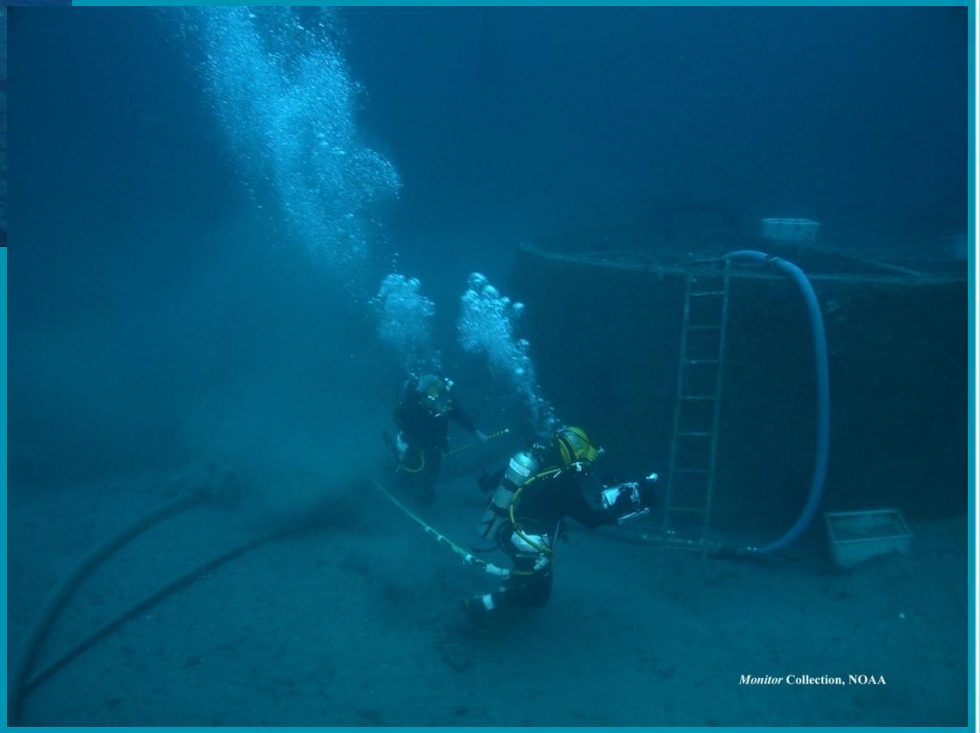
USS *Monitor* Mosaic

Monitor Collection, NOAA

Recovery and Archaeology

Once the sections of deck and armor belt were removed….

….the turret was partially excavated to reduce the lift weights.



Human Remains

Monitor Expedition 2002 – Turret Recovery

August 5, 2002 5:47 PM

Joint POW/MIA Accounting Command (JPAC)

(Central Identification Laboratory)

Hawaii

LSU FACES Lab

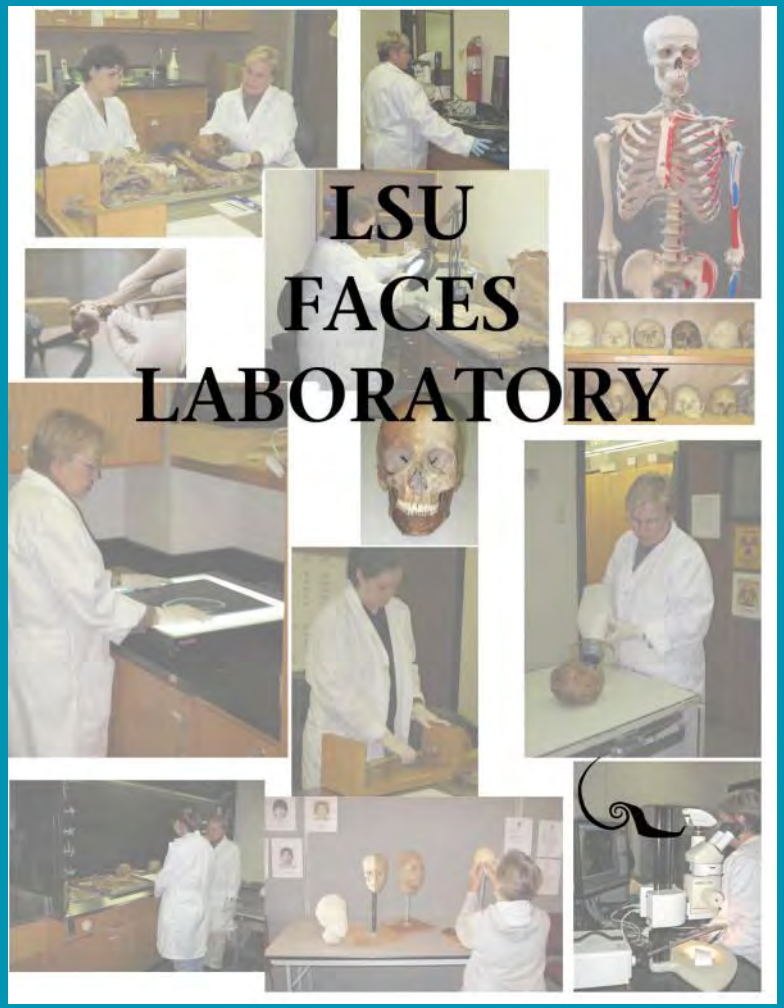
(Forensic Anthropology and Computer Enhancement Services)

LSU FACES LABORATORY

FORENSIC ANTHROPOLOGY AND COMPUTER ENHANCEMENT SERVICES

Mary Manhein
Director

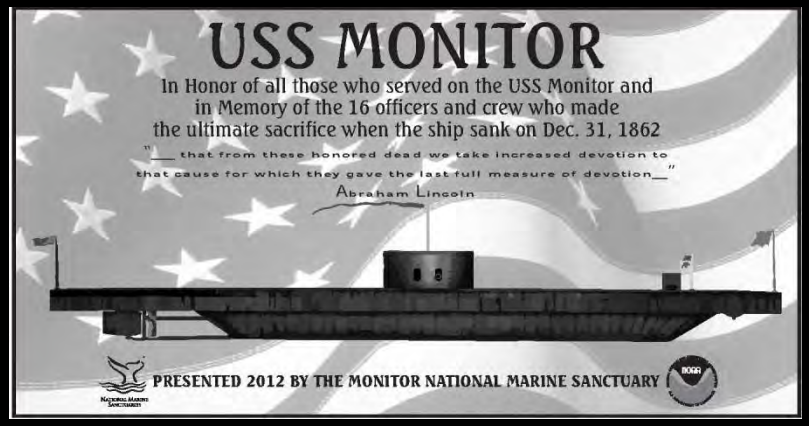
Nicole Del Harris
Forensic
Anthropologist




LSU

https://www.youtube.com/watch?v=-jFt4k35DIQ

US Navy Memorial Museum
Washington, DC



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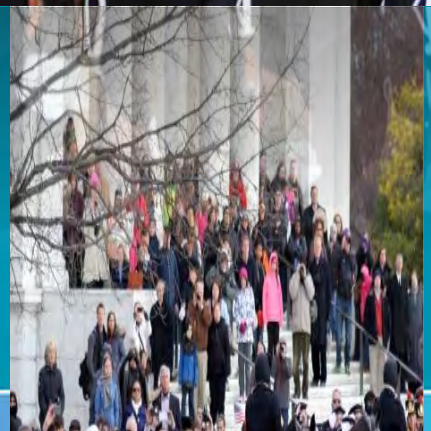
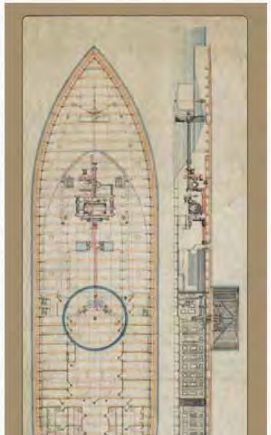


USS *Monitor:* Preserving a Legacy



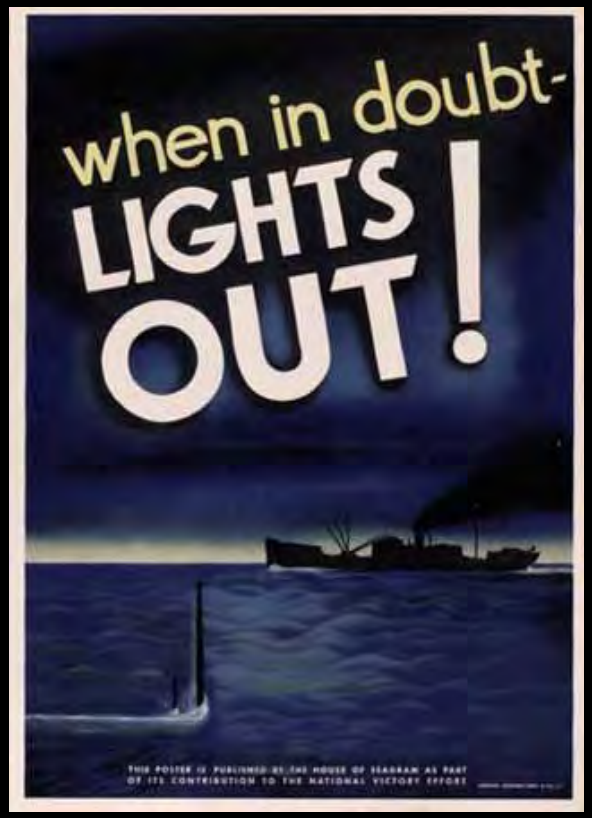
NOAA's Maritime Heritage Program

Battle of the Atlantic

WWII off the Coast of North Carolina

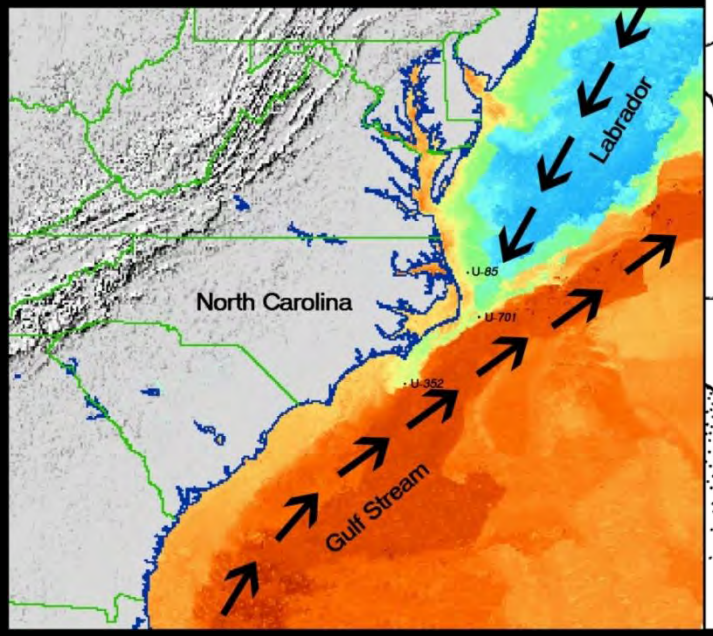
Battle of the Atlantic (1939-1945)

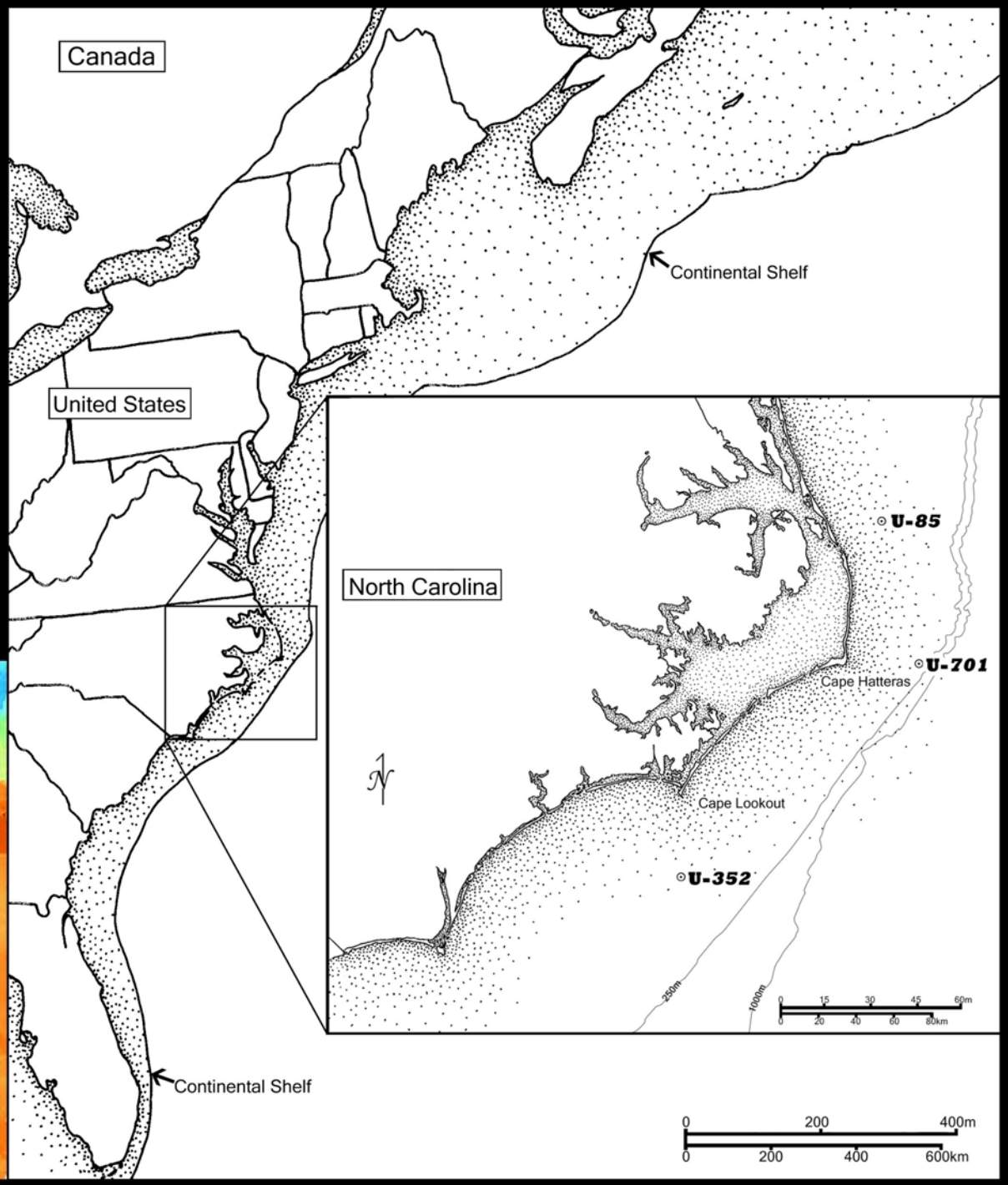
- Little known, but significant part of our national story
- U-Boats operated all along the Atlantic coast including the Chesapeake Bay
- North Carolina - Where the war came home



Significance of North Carolina

- Shipping Lanes
- Oceanic Currents
- Continental Shelf
- Water Depth
- Water Temperatures





Documenting and Surveying


BARE


U-701


U-85

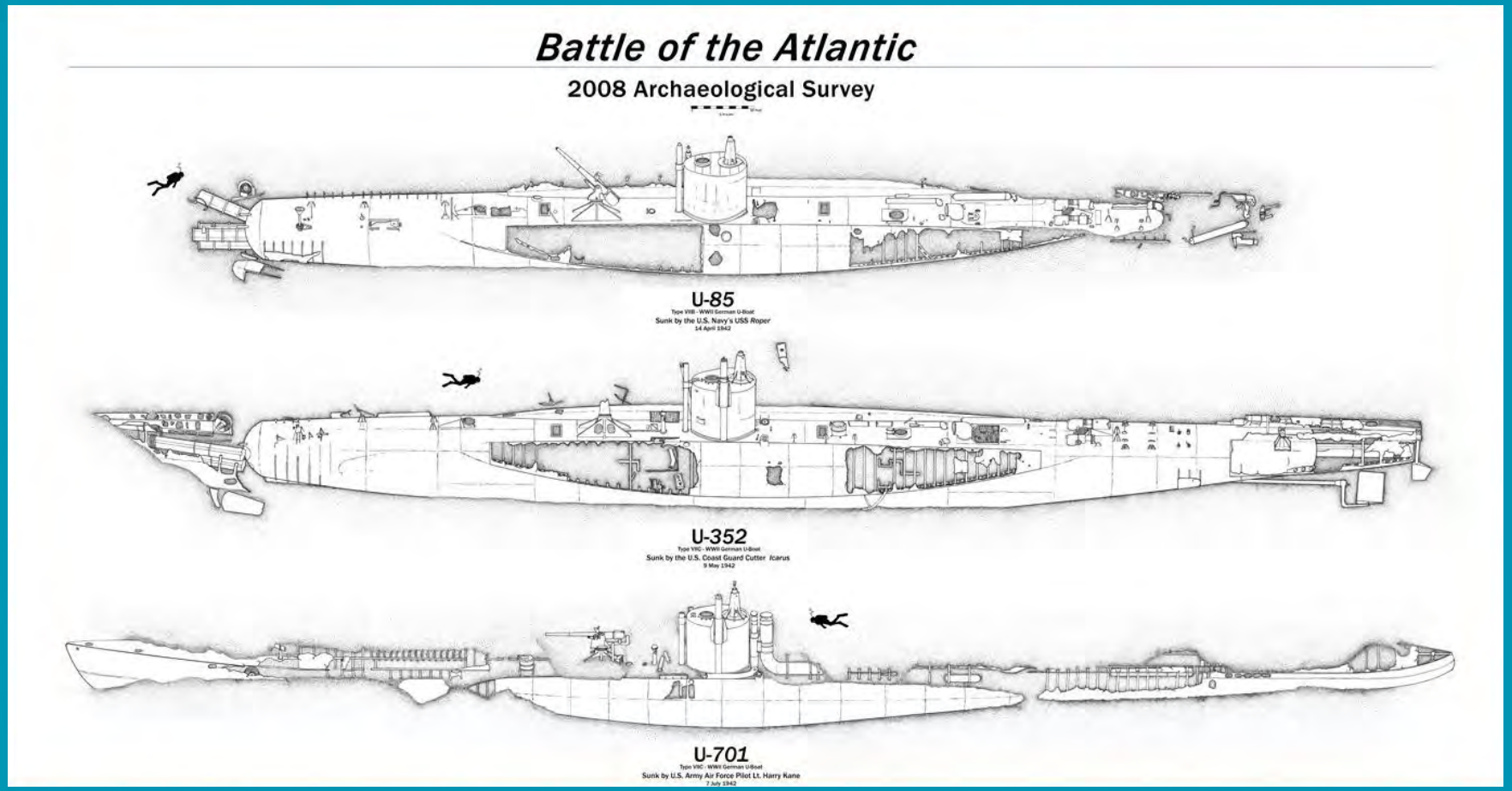

U-352

Photomosaics

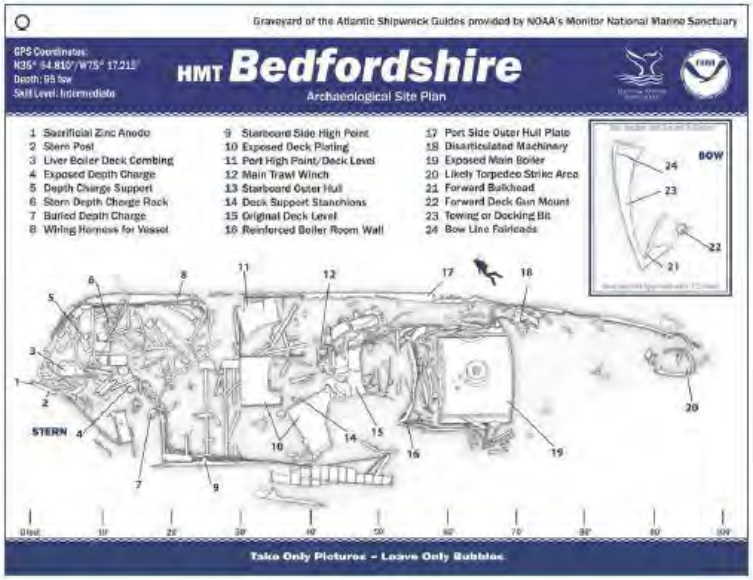
U-85

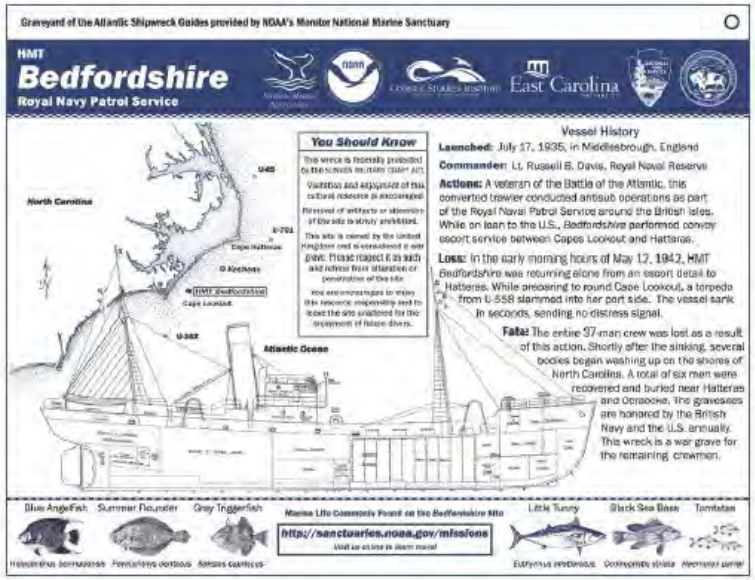
U-352

Site Plans



Drawn to Scale

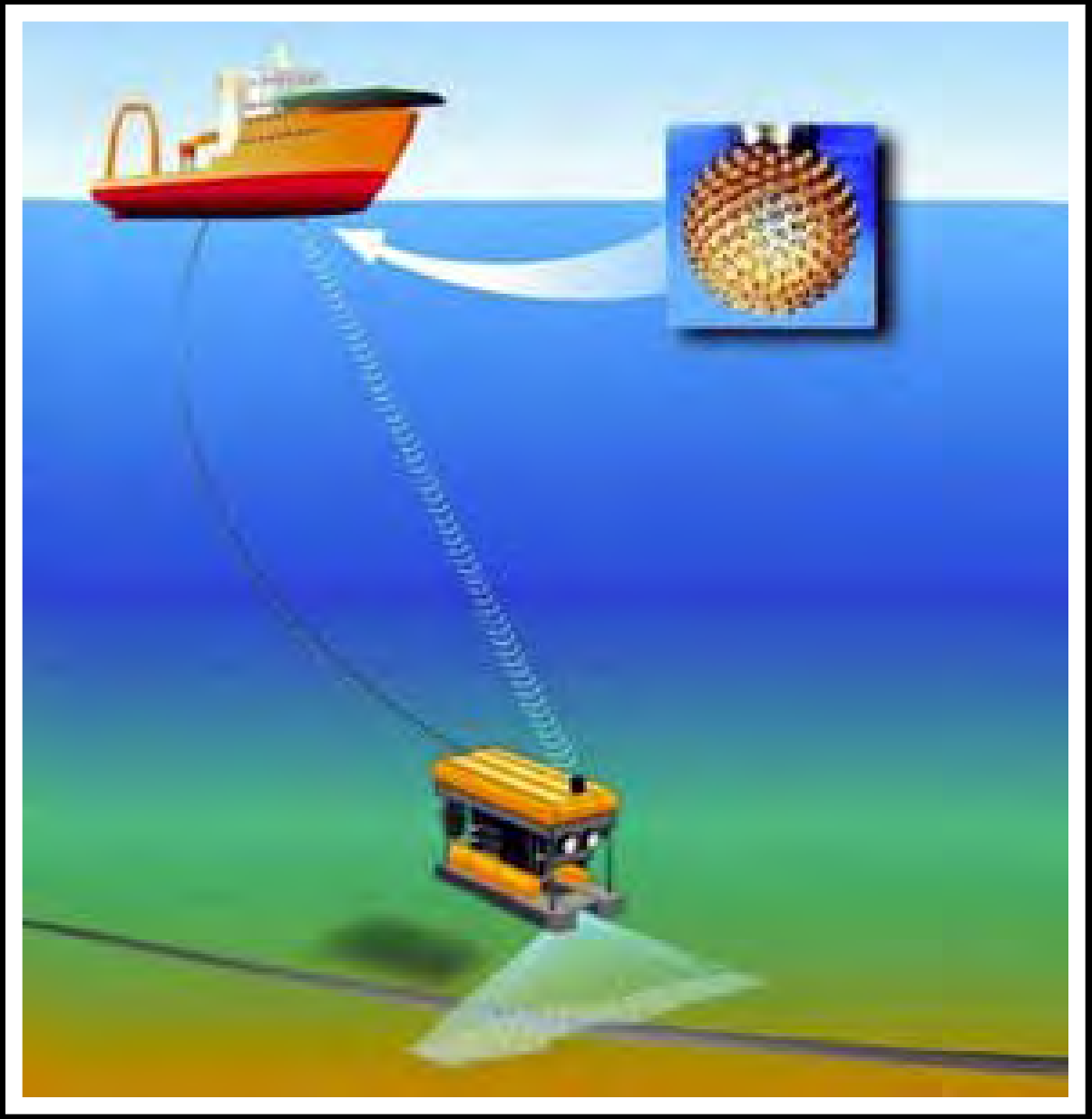




Front and back of dive slate for British ship, HMT *Bedfordshire* that sank off the North Carolina coast in 1942. Image: NOAA

To request a hard copy of the dive slate or slates for *U-85*, *U-352*, *U-701*, or *Keshena*, email monitor@noaa.gov

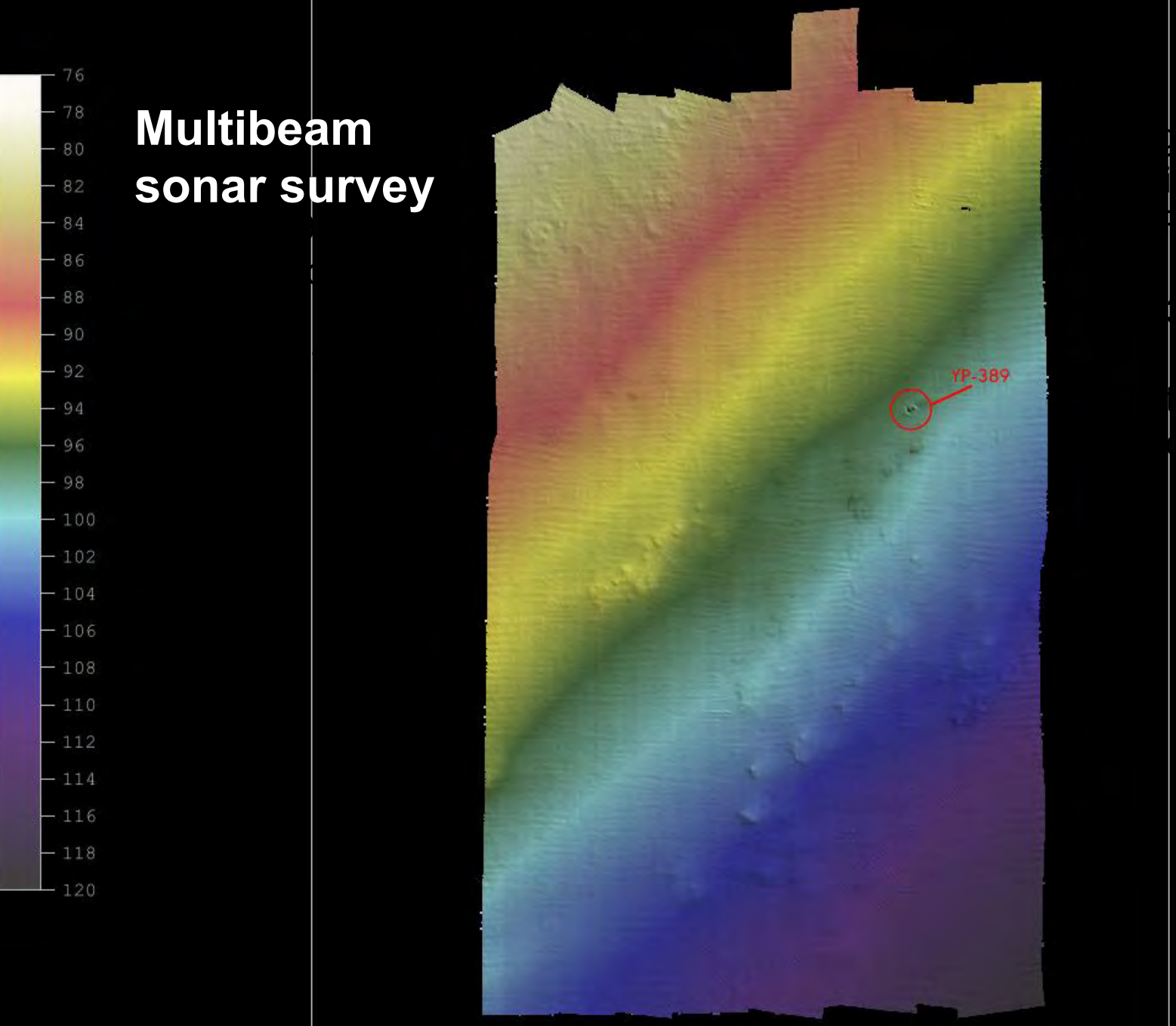
Dive Slates



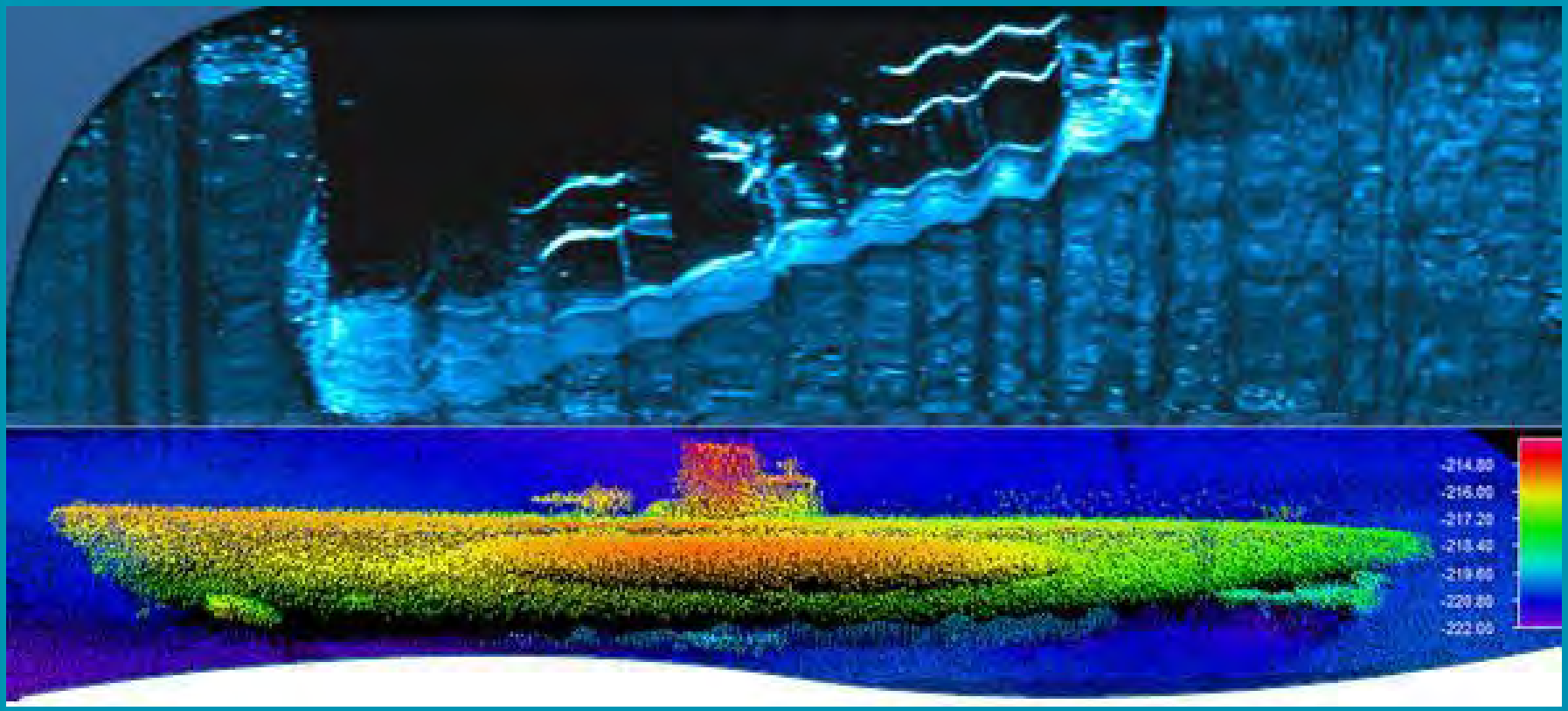
Technology

Multi Beam Sonar on an ROV

Multibeam sonar survey



Discovery of U-*576* and *Bluefields*



Maritime Heritage:

Shipwrecks of the Deep

Project Based Learning

Crittenden Middle School

75% Black
17% White
6% Hispanic
2% Asian
1% Two or more races

68% Free or Reduced Lunch

Course Outline Development

Two Teachers

Semester Course

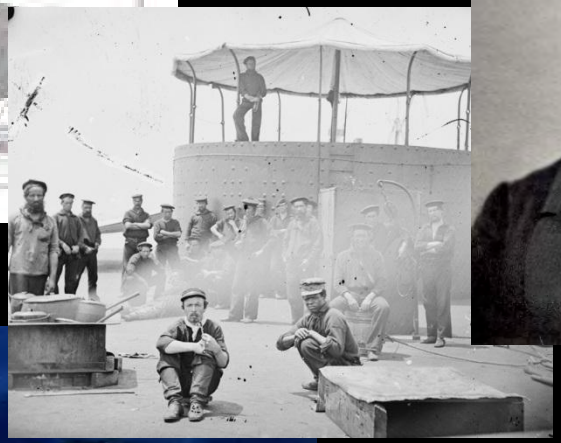
Maritime Heritage

Ecology / MWEE

Crittenden Goals

Semester-length, Motivating STEM Curriculum with Ecology Service Project

Our Goals



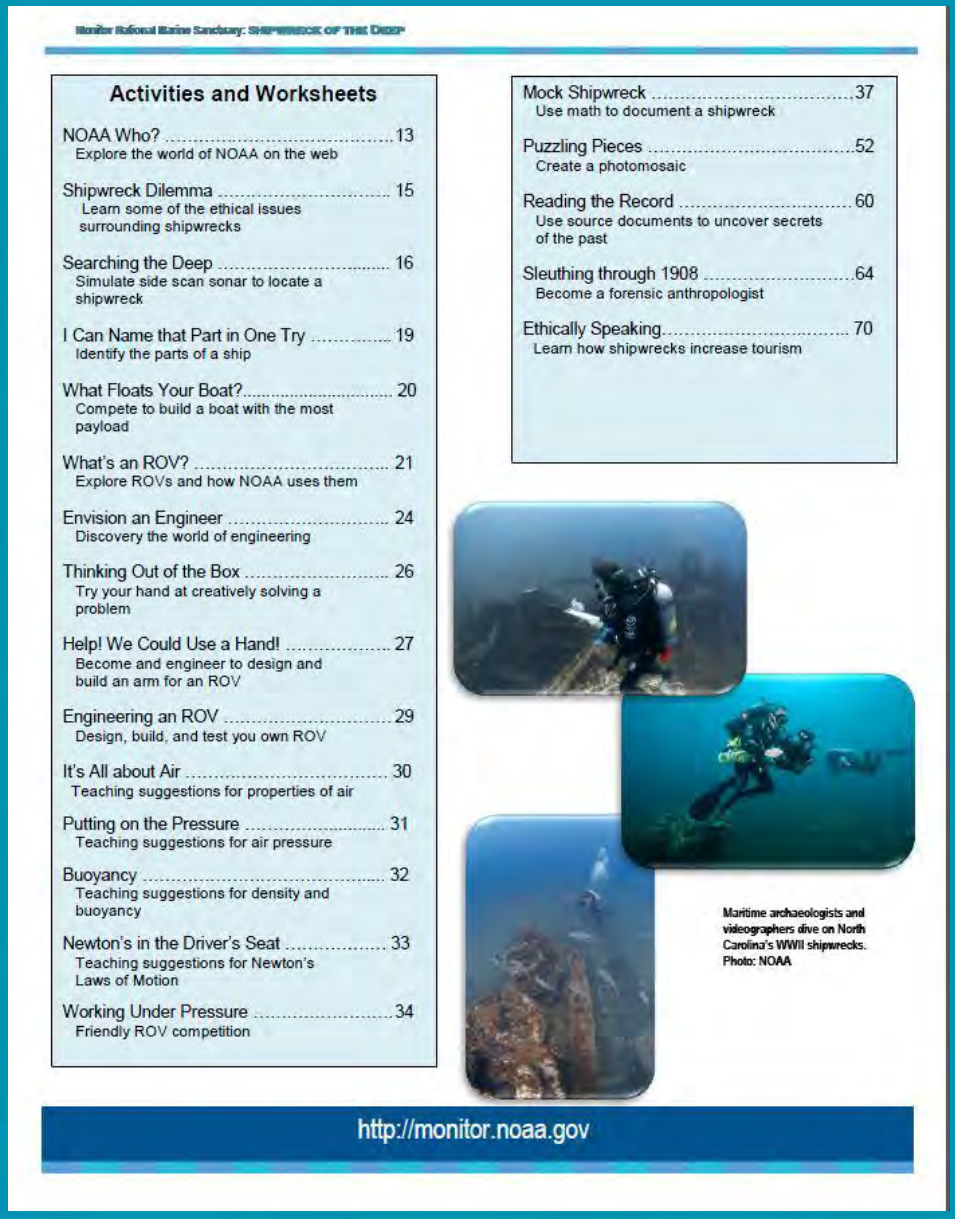
NOAA's Maritime Heritage Program

Integrated Curriculum

Three Sections:

- Maritime Heritage and Archaeology
- Life Science
- Chemistry of Conservation

Part I—Maritime Heritage



Monitor National Marine Sanctuary: SHIPWRECK OF THE DEEP

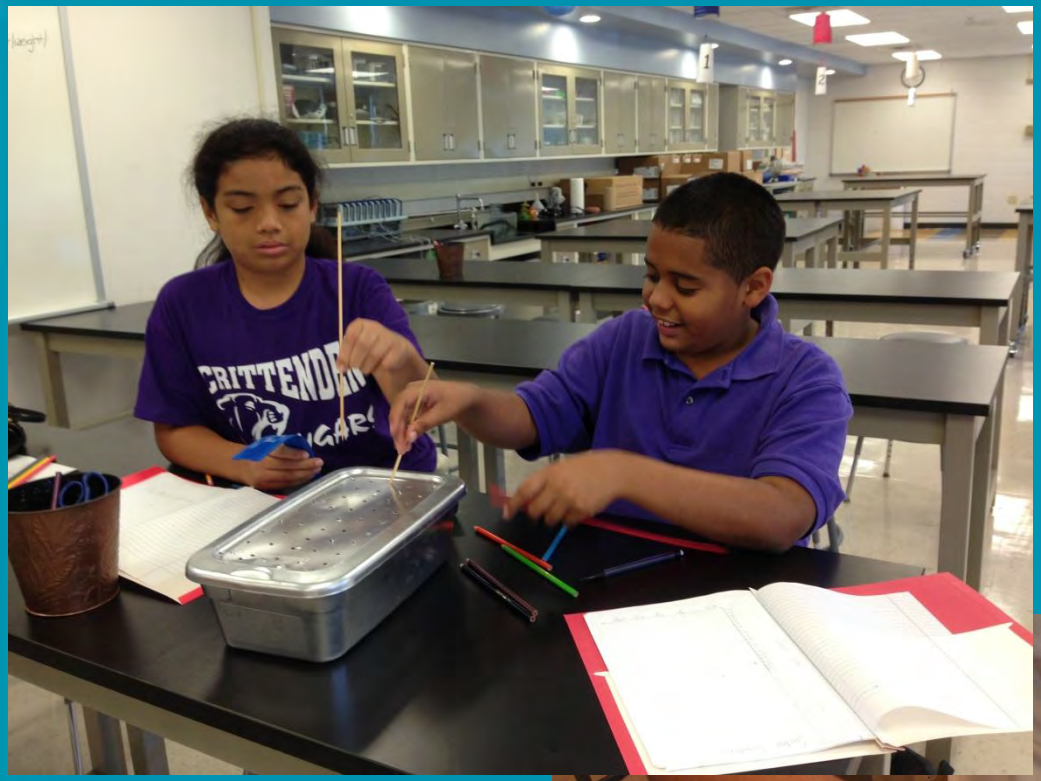
Activities and Worksheets

Maritime archaeologists and videographers dive on North Carolina's WWII shipwrecks. Photo: NOAA

http://monitor.noaa.gov

Project-Based

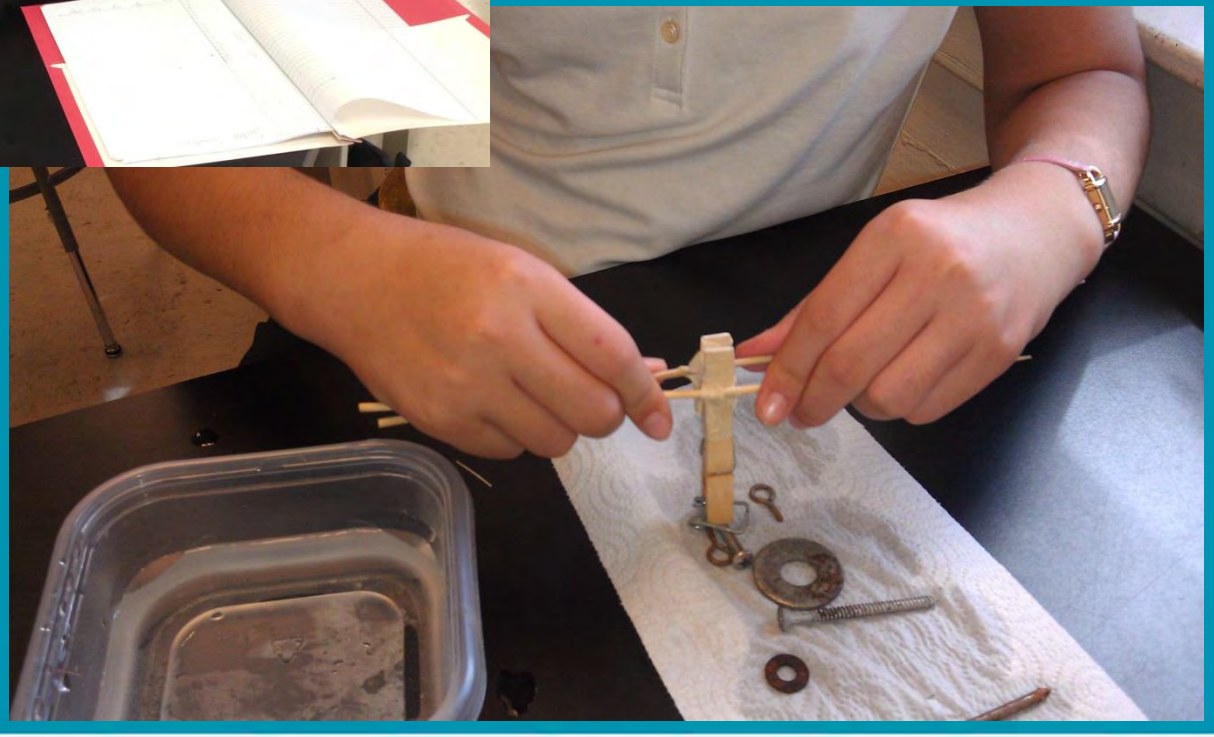
Students simulate searching for a shipwreck while learning about maritime heritage and archaeology. They use primary source documents and images to identify the shipwreck.



Students Simulating Searching for Shipwrecks

and

Engage in Engineering



Incorporating STEM into the Classroom

- Engineering Design
- Newton's Laws of Motion
- Buoyancy—Archimedes
- Principle

Mock Shipwreck Mapping Activity

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

Education

Mock Shipwreck: Mapping the Past

Grade Level

- Grades 9 – 12

Timeframe

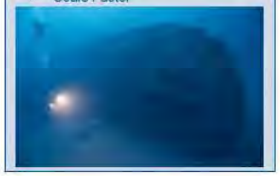
- 45 – 90 minutes

Materials

- Mock shipwreck tarp/outline
- Tape (scotch/duct)
- 30ft measuring tape
- Shorter measuring tape (enough for each pair/group of students)
- Clipboards (enough for each pair/group of students)
- Log Sheets (provided)
- Dive Slate (provided)

Key Words

- Maritime Archaeology
- Site Plan
- Baseline
- Scale Factor



Activity Summary

Maritime archaeology is a field of study that provides many career opportunities based in science, technology, engineering, and mathematics (STEM). The focus of this lesson is the creation of a shipwreck site plan. The students engage in teamwork as "divers" to create sectioned, scaled drawings of a mock shipwreck. The students make connections to maritime history, mathematics, and technology.

NOTE: Extension activities incorporate English language and social studies.

Learning Objectives

Students will be able to:

- Define maritime archaeology and describe its importance to our national maritime heritage.
- Employ measuring and scaling techniques to sketch drawings of a mock shipwreck to better understand how divers document an actual shipwreck.
- Determine the scale factor of their drawing in relation to the mock shipwreck.
- Make inferences about the mock shipwreck based on observations.

Background Information

During World War II, many battles were fought on foreign shores. However, few people know about those fought closer to home. The Battle of the Atlantic consisted of several skirmishes and decisive maneuvers between German U-boats and Allied and merchant ships all along the coasts of Europe and the United States.

The German U-boats were under orders to prevent merchant vessels from getting supplies to Allied nations. The United States deployed their own ships to act as defensive escorts armed with anti-submarine artillery. Many German and Allied and merchant ships fought and sank off the North Carolina and Virginia coasts.

The wrecks of these sunken ships still lie at the bottom of the ocean. It is the job of maritime archaeologists to find and study these links to our past in order to understand our history, conserve our heritage, and honor the memory of those who died defending our nation's future.

http://sanctuaries.noaa.gov/education

Pool Time

Puzzling Pieces

Materials:

Per Pair:
- Bag 1 of puzzle pieces
- Bag 2 of puzzle pieces
- cardstock
- *Parts of a Ship*
- *Dream Gazette*

Teacher Prep:

For each team, copy activity pp. 52-53.

For each team, copy diagrams on pp. 54-56. Cut along the dotted lines into small square pieces. Keep the pieces for each page together and place them in a zip lock bag. You will have four bags. Label bags accordingly: *Ship 1-A* (bow); *Ship 1-B* (stern); *Ship 2-A* (bow); and *Ship 2-B* (stern)

Copy *Parts of a Ship*, p. 57 and *Dream Gazette*, p. 58-59 for each team.

Extension:
Give students the ship pages and have them cut into their own unique puzzle pieces and exchange puzzles with another group.

Have students draw their own shipwrecks and create puzzles.

Reading the Records

Materials:

Per Pair:
- nautical chart
- ships' logs (4)
- colored pencils

Teacher Prep:

Make copies of the ships' logs and nautical chart for each student.

Old Weather Project
Under the leadership of the University of Oxford's Zooniverse Programme, the U.S. National Oceanic and Atmospheric Administration (NOAA), U.S. National Archives, UK Meteorological Office and Naval-History.Net are working with large numbers of online volunteers to transcribe historical weather data and naval events from the logbooks of United States ships in the 19th and 20th centuries. This includes ships of the United States Navy, U.S. Revenue Cutter Service, later the U.S. Coast Guard, and the U.S. Coast and Geodetic Survey. These transcriptions will contribute to climate model projections and will improve our knowledge of past environmental conditions.

http://www.oldweather.org/

Purpose: To ex
tracing ships' mo
ship's log from a

Background
Ships' logs have
record book of a
the calculation o
certain amount o
record the speed

Today, the ship'
or written. It is a
conditions, times
crewmembers, n
sometimes even
fail. It is also an
the same way as
cases involving

Ships' logs also
They might also
record of valuabl
used to infer clin

In this activity, y
longitude coordi
and use informa
and site plan, to

Activity
1. Use a c
2. Connect
3. Repeat
4. Read th
clues to
5. The ship
6. Write a
crew, fo

Log of Coast
Geodetic Sur
Steamer Patt
from 1914. Ph
NOAA

http:/

Sleuthing Through 1908

Materials:
Per Group:
- 12 bags with artifacts and letters
- list of missing people

Per Class:
- tub or small swimming poos filled with sand

Sailors of the USS *Monitor*
When the turret of the Civil War ironclad, USS *Monitor*, was recovered in 2002, two sets of human remains were discovered inside. In anticipation of human remains being found and due to the fact that the *Monitor* was a U.S. Navy vessel, the Joint POW/MIA Accounting Command (JPAC) was onboard.

With the help of Navy divers, maritime archaeologists, and JPAC, the remains of the two sailors were recovered and sent to JPAC for investigation. Personal artifacts recovered with the remains were sent to The Mariners' Museum for conservation.

On March 8, 2013, the sailors were laid to rest at Arlington National Cemetery with full military honors.

To learn more about the sailors, JPAC, the forensics, the recreation of their faces, and the burial, visit http://monitor.noaa.gov/150th

Casts of the USS *Monitor* sailors' skulls Photo: Monitor Collection, NOAA

Cornelia B. Windiate. Photo: NOAA

Purpose: To collect clues, analyze and compare them and use source documents to draw conclusions

Background

In this activity, students read a story of a fictional ship, the *Betsy*, which sank in September 1908. In the story, 12 people perished with the ship, including the Captain's wife and son. Then the story jumps to 2013, when the shipwreck was found, along with human remains. Because the remains were not military, they were left *in situ*, but extensive documentation was done. A report was made to the company that had the legal rights to the ship, and later the next year, the company raised parts of the ship that included the remains. Forensic anthropologists conducted an investigation on the remains and attempted to identify them against records and DNA samples. Artifacts recovered also helped to identify the unknown.

Teacher Prep

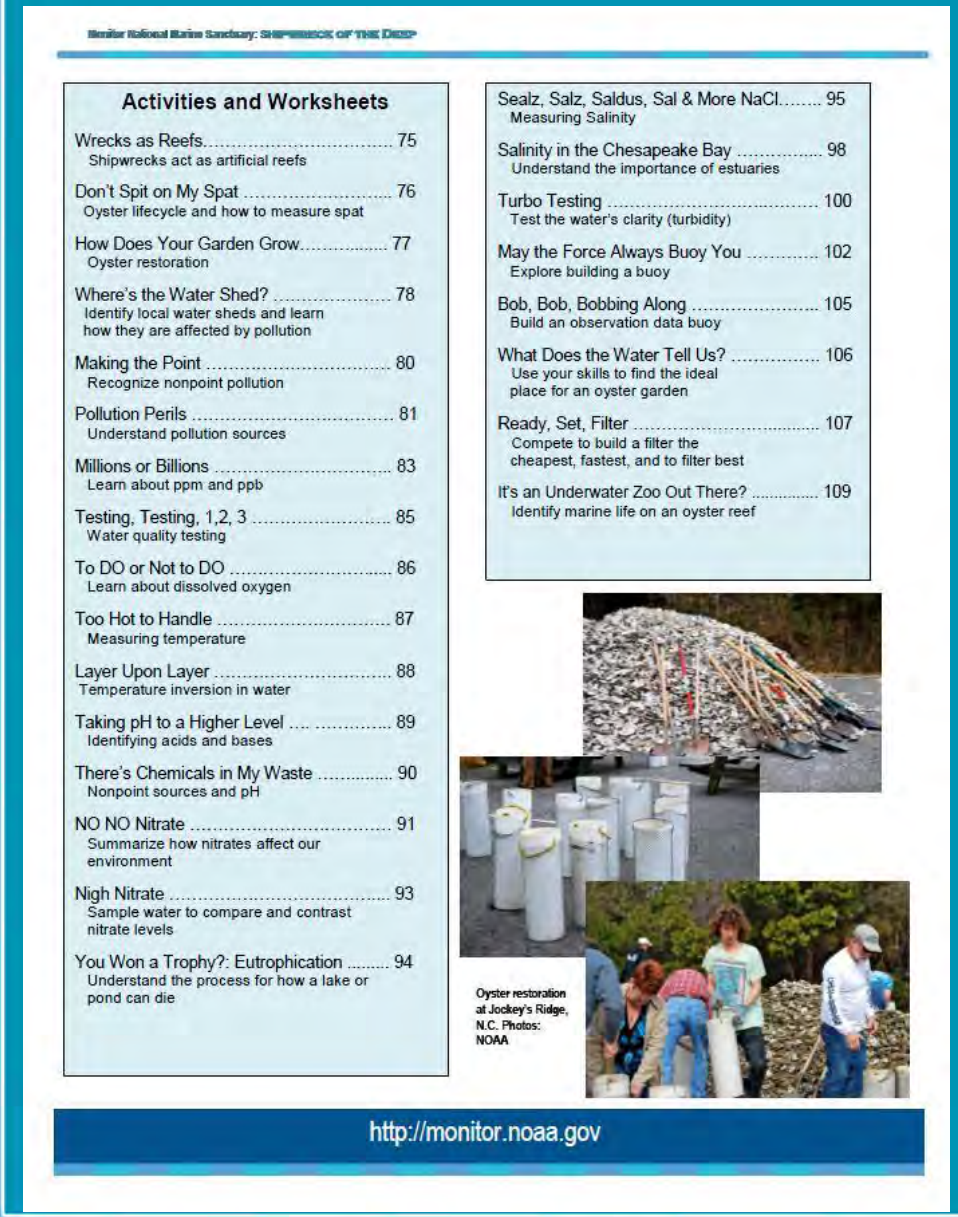
The teacher will create 12 bags (one will be used with the tub of sand). Inside each small bag, place "artifacts" that help to identify the owners of each bag. Suggested "artifacts" are listed on the *Artifact Sheet* (p. 65), but you may substitute other items that might be more readily available. Just be sure to have the stories of each person match the items you place in the bag (e.g.—if the story says that a sailor had a wife and two children, then the photograph should be of a woman and two children). Search the Internet for images that match information. Write letters from sweethearts. (See *Sample Letters* p. 66.)

To model how to use artifacts to help identify unknowns, fill a large tub or small swimming pool about halfway with sand. Make sure sand is dry and not damp. In the sand, hide the suggested "artifacts" for, William Stuarts, whose remains have been discovered. Also in the sand, conceal some seashells and other ocean related items you might have on hand. To spark a conversation on marine debris, you may also want to put some marine debris, such as a soda can, into the sand. Ask the students if they had soda cans in 1908, and if not, then how did the can get there?

For each group of students, print story sheet, *The Demise of Betsy: A Fictional Story* (p. 69) and the activity sheet with the *List of Crew and Passengers* (p. 67). Go through the artifacts in the tub one-by-one, and have students review the story and the list of those onboard. Come to a consensus with the group as to the identity of the remains. Have students continue working independently with their group going through the artifacts in their bag to determine who once owned the bag.

***NOTE: For realism, wear gloves as you handle the "artifacts."**

Part II—Life Science



Monitor National Marine Sanctuary: SHIPWRECK OF THE DEEP

Activities and Worksheets

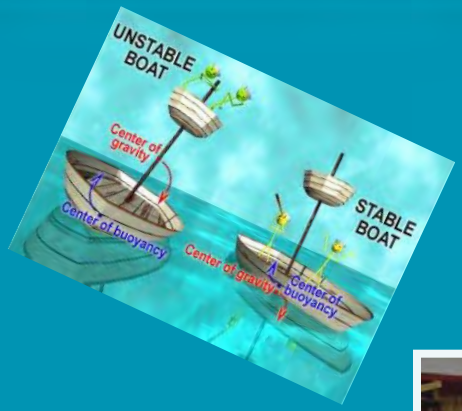
Oyster restoration at Jockey's Ridge, N.C. Photos: NOAA

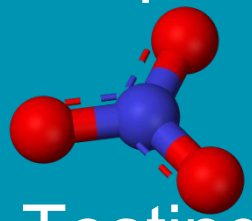
http://monitor.noaa.gov

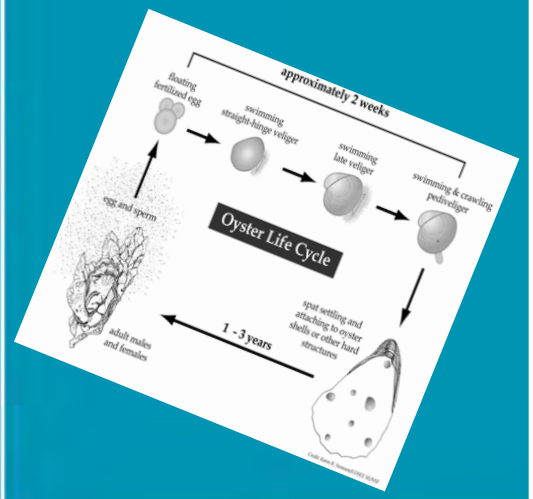
Students build an observation buoy and learn about water quality in order to determine if the shipwreck site is a healthy artificial reef.

Then they explore oyster gardening, grow spat, and do an oyster restoration project.

Wrecks as Reefs
Growing Oyster Spat
Water Shed
Pollution
Water Quality Testing
Basic Observation Buoy (BOB)
Oysters as Filters
Plankton Tow—Identifying Plankton

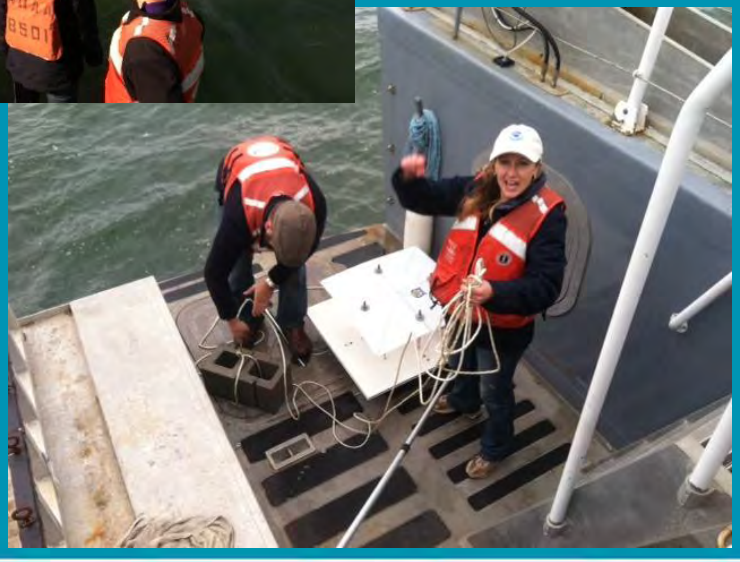






Built BOB

Deploying and Recovering Buoy from the SRVx *Sand Tiger*



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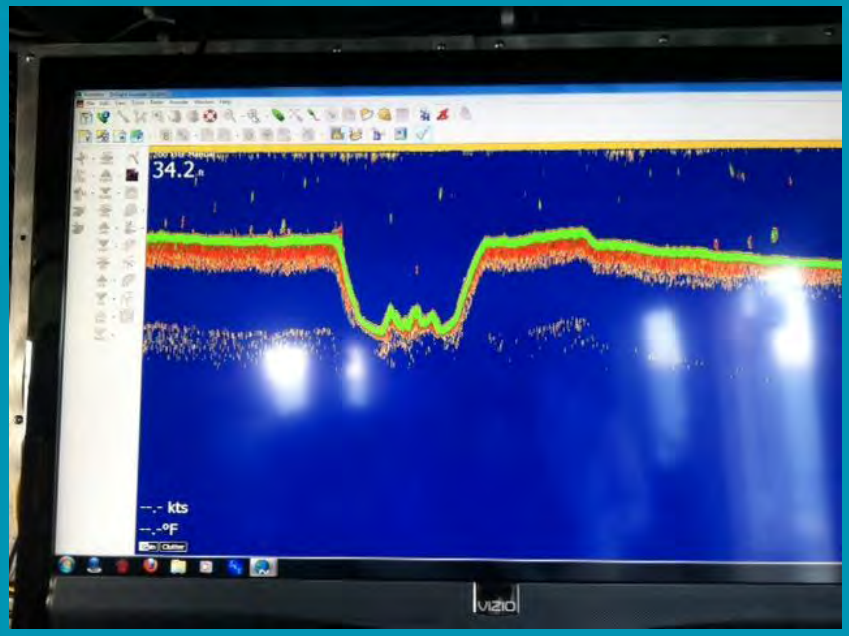
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EMERGENCY EXIT

Part III—Chemistry of Conservation

Cole, Joanna: *Magic School Bus Shows and Tells: A Book about Archaeology.* Scholastic, 1996, ISBN: 0590922424.

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Mebane, Robert C. and Thomas Rybolt: *Metals (Everyday Material Science Experiments).* 21st Century, 1997, ISBN: 0805028420.

Oxlade, Chris: *How We Use Metal.* Raintree, 2004, ISBN: 1410908933.

Panchyk, Richard: *Archaeology for Kids: Uncovering the Mysteries of Our Past.* Chicago Review Press, 2001, ISBN: 1556523955.

Sanford, Patricia: *Archaeology for Young Explorers: Uncovering History at Colonial Williamsburg.* Colonial Williamsburg Foundation, 1995, ISBN: 087935089X.

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Dive slates with site drawings Photo: NOAA

Volunteer diver helps NOAA to survey and document the Caribsea. Photo: NOAA

Activities and Worksheets

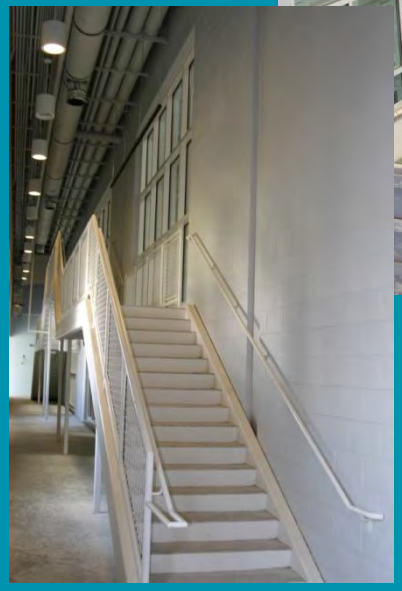
In the last section, students learn about conservation of artifacts and ethical practices.

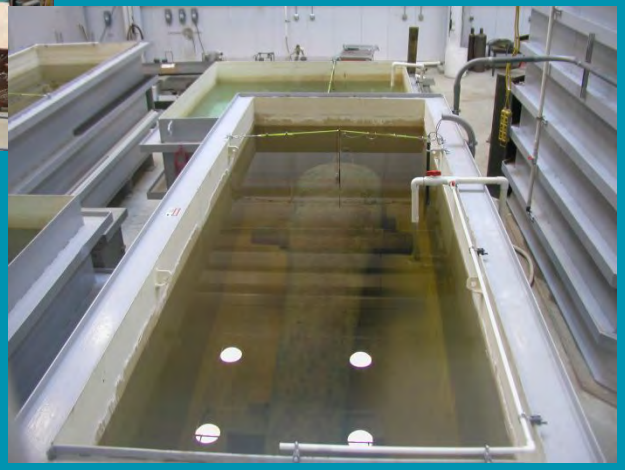
As a culmination of the project, students hold a Socratic seminar and give their final decision to NOAA on what to do with the shipwreck.

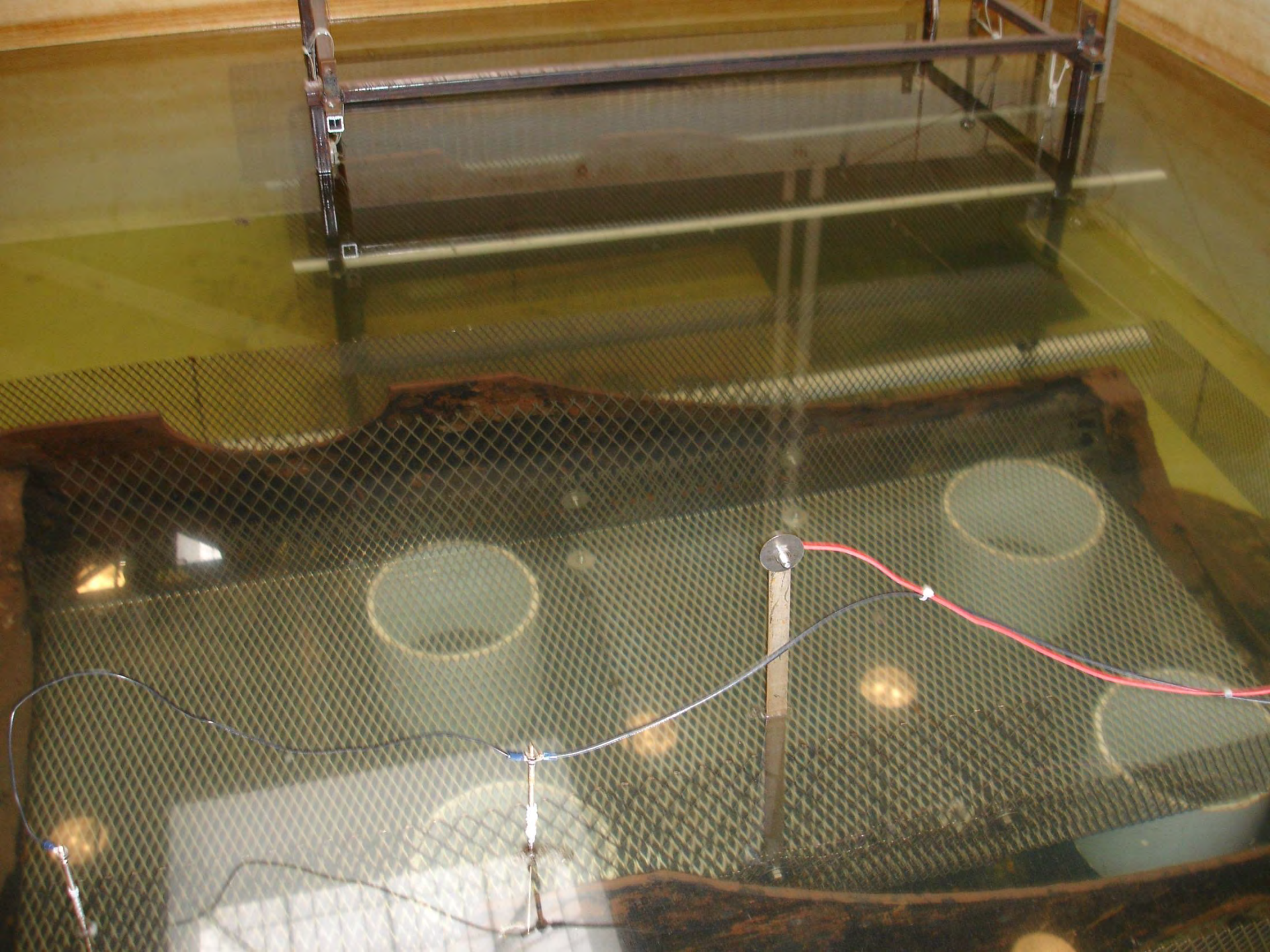
Artifact Recovery

August – December 2002

USS *Monitor* Center
Batten Conservation Laboratory Complex

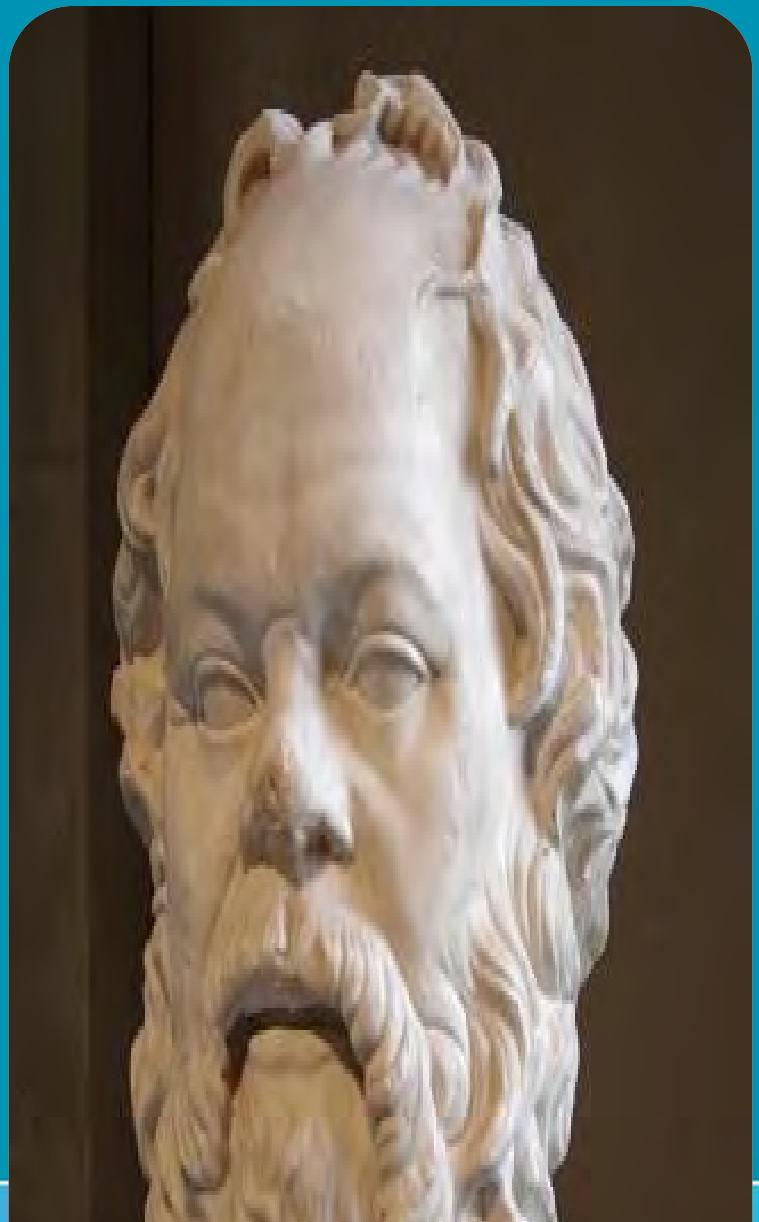







U.S.N.


IFRAO 10 cm



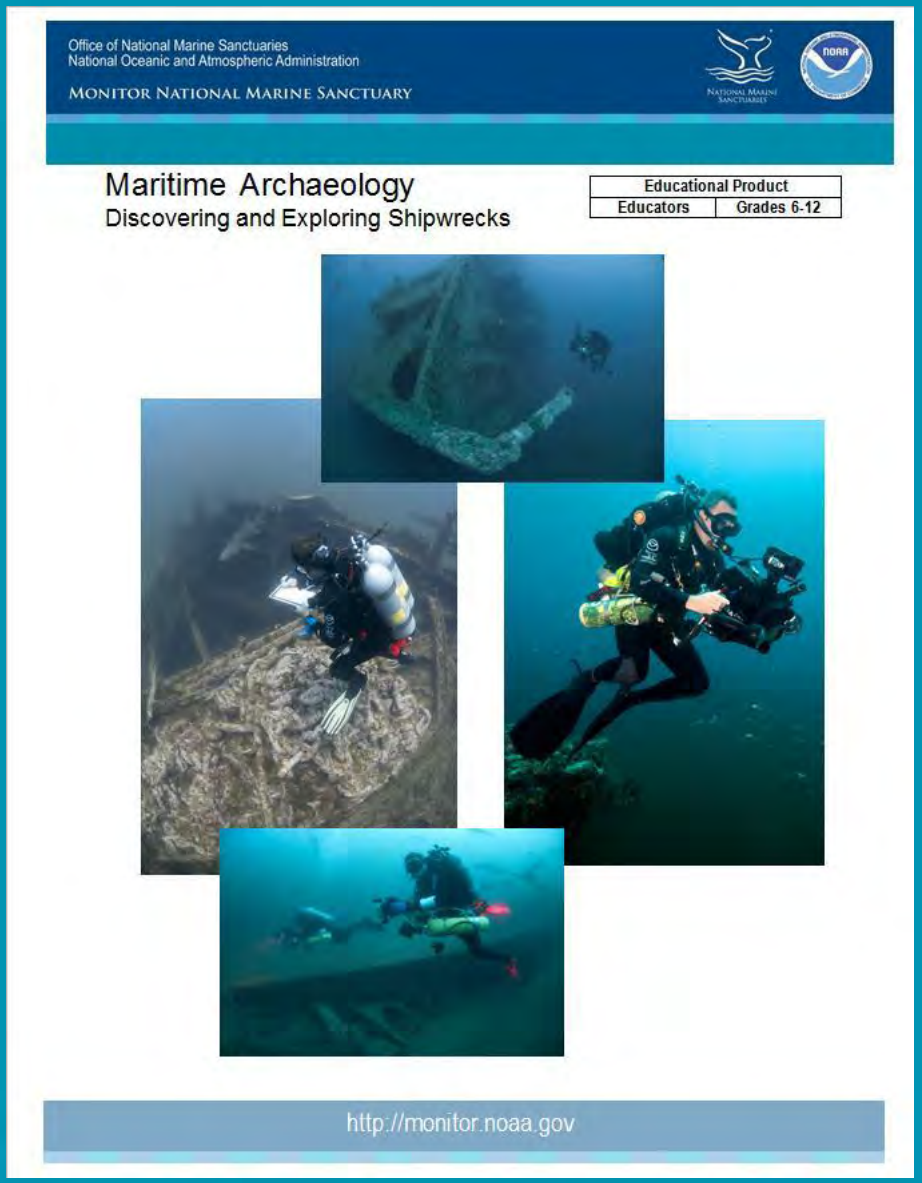
Socratic Seminar

Final Presentation

Maritime Archaeology:

Discovering and Exploring Shipwrecks

Integrated Curriculum



- NOAA and MHP
- Ships through Time
- Maritime Archaeology
- Tools of Shipwreck Discovery
- Documenting Shipwrecks
- What's Next?

PROGRAM

This curriculum introdu
curriculum flows seque
archaeologists, to unde
completing the curricul
in preserving our natio

Although, this curriculu
Each lesson can be us
create a tailored plan ju

We hope that you find
heritage. Through a va
math, and social studie
welcome your feedbac

CURRICULUM OU

A. Course Introdu
   1) Introductio
      Atmospher
      Office of N
      (ONMS), M
      (MHP) and
      Sanctuary
B. Historical Signi
   1) Students le
      time
   2) Understanc
   3) Appreciate
      our past
C. Maritime Archa
   1) History of
   2) Who's wh

OBJECTIVES

Students will:

- Learn about NO
- Understand the
  to our past
- Understand the
- Identify key peo
- Dramatize and e
  shipwrecks
- Recognize the i
  documents) play
- Learn how side
  shipwrecks
- Interpret how RO
  underwater arch
- Learn the histor
  development of
- Discovers how
- Learn about NO
- Identify and diffe
- Model how mari
- Construct a pho
- Analyze policy p
  divers and shipw
- Appreciate the i
- Evaluate the val

SUGGESTED IMPLI

1. Review
2. Review
   determi
3. Review
   supplen
4. Once re
   and intr
   Marine
   Nationa
5. Have st

Vocabulary—Gen
Vocabulary)

archaeology—the study
through the excavation
and other physical rema

artifact—any object ma
cultural or historical inter

AUV—Autonomous Und

base line—a line servin
calculation or location; a
area from which triangul

bio-historical poem—a t
line format and focuses
identities, such as exper

bow—forward part of th
is most forward when th

buoyancy—the upward
keeps things afloat

conservation—preserva
deterioration of archaeol
and artifacts

conservator—a person
preservation of works of
cultural or environmenta

coordinate—a group of
position of a point, line,

in situ—to leave in its o

grid—a network of squa
excavation and recordin

magnetometer—an inst
magnetic forces; an inst
magnetic materials by th
field

maritime archaeology—
specifically studies huma
and rivers through the st

multibeam sonar—emi
producing a swath of so
survey area

RESOURCES

Web Resources:

NOAA's Office of Nation
Discover the marine life a
make up your nation's ma
the continuing efforts to c
treasures.
http://sanctuaries.noaa.gc

Monitor National Marine
Visit this site to learn mor
check out the teacher sec
lesson plans.
http://monitor.noaa.gov

NOAA National Ocean S
Learn about side scan so
map the ocean floor.
http://oceanservice.noaa.g
mapping/how_sidescansc

NOAA Ocean Explorer
Discover how NOAA uses
various NOAA ROVs cum
Hercules was built just for
travel to depths of 4,000 r
http://oceanexplorer.noaa

Exploring WWII: Battle
For six years, maritime ar
other partners have docu
shipwrecks off the North
WWII's Battle of the Atlan
remains of German U-boa
and the ships they sank. E
treasures firsthand throug
images.
http://sanctuaries.noaa.gc
hives.html

Thunder Bay National M
With over 200 shipwrecks
maritime archaeologists a
sites for future study. Visi
download photomosaic im
to delve deeper into the u
Lesson Plan:
http://thunderbay.noaa.go

Book Resources

Adams, Simon: *Titanic (DK Eyewitness Books)*. DK Children, 2009, ISBN-13: 978-0756650360.

Armstrong, Jennifer. *Shipwreck at the Bottom of the World: The Extraordinary True Story of Shackleton and the Endurance*. Crown Books for Young Readers, September12, 2000. ISBN-10: 0375810498.

Baker, Beth. *Sylvia Earl (Just the Facts Biographies)*. Lerner Publications, January 15, 2006. ISBN-10: 0822534223.

Ballard, Robert D. *Finding the Titanic Level 4*. Cartwheel, November1, 1993. ISBN-10: 0590472305.

Ballard, Robert D., Rick Archbold, and Ken Marschall. *Ghost Liners: Exploring the World's Greatest Lost Ships*. Little, Brown Young Readers, September 1, 1998. ISBN 10: 0316080209.

Broadwater, John D. *USS Monitor: A Historic Ship Completes Its Final Voyage*. Texas A&M University Press, February 14, 2012. ISBN10: 1603444734.

Cerullo, Mary M.: *Shipwrecks: Exploring Sunken Cities Beneath the Sea*. Dutton Juvenile, 2009, ISBN-13: 978-0525479680.

Gibbons, Gail. *Exploring the Deep, Dark Sea*. Little, Brown Young Readers, April 1, 2002. ISBN 10: 0316755494.

Jefferis, David. *Super Subs: Exploring the Deep Seat (Megatech)*. Crabtree Publishing Company, September1997. ISBN-10: 0778700631.

Platt, Richard. *Eyewitness: Shipwrecks*. DK Children, June 1, 2000. ISBN 10: 0789458845.

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Smith, K.C.: *Exploring for Shipwrecks (Watts Library)*. Franklin Watts, 2000, ISBN-13: 978-0531164716.

Walker, Sally M. *Shipwreck Search: Discovery of the H. L. Hunley (On my Own Science)*. First Avenue Editions, November 30, 2006. ISBN 10: 0822564491.

Wall, Julia: *Mapping Shipwrecks with Coordinate Planes (Real World Math: Level 5)*. Capston Press, 2011, ISBN-13 978-1429666176.

SEE INDIVIDUAL ACTIVITIES FOR ADDITIONAL BOOK RESOURCES

EDUCATION STANDARDS

The following pages list an overview of educational standards for

- National Council for Social Studies (NCSS)
- Common Core (CC)
- National Geography Standards (NGS)
- National Council of Teachers of English (NCTE)
- National Science Standards (Archived Standards from NSTA)
- Next Generation Science Standards (NGSS)
- Ocean Literacy Principles (OLP)
- National Mathematics Standards (NCTM)

This is not a comprehensive list, but indicates the standards that are the most prominent within the curriculum guide. The standards for each activity are listed on the first page of the activity in the blue box on the left at the bottom. See each standard for key to citing format in the activities (e.g. NCSS: US.ERA.9 FOR National Council of Social Studies, U.S. History, Era 9).

Education Standards Continu

National Geography Standard

Error! Hyperlink reference not va

National Council of Teachers of English

http://www.ncte.org/

National Science Standards

Archived PDF:

http://www.nap.edu/openbook.php?isbn=0309053269

Next Generation Science Standards

http://ngss.nsta.org/

Ocean Literacy Principles

http://oceanliteracy.wp2.coexploration.or

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

National Council for Social Studies http://www.socialstudies.org	**NCSS STANDARDS:** • Standard I—Cultur • Standard II—Time, • Standard III—Peop • Standard IV—Indivi • Standard VIII—Scie • Standard IX—Globa **NCSS HISTORY THINK** • Standard 1—Chron • Standard 2—Histor • Standard 3—Histor • Standard 4—Histor • Standard 5—Histor **UNITED STATES HIST** • Era 6—The Develo • Era 7—The Emerg • Era 9—Postwar U.S • Era 10—Contempo **WORLD HISTORY CON** • Era 3—Classical Tr **(NCSS:WH.ERA.3)** • Era 6—The Emerge • Era 8—A Half-Cent
Common Core http://www.corestandards.org/	**READING INFORMATI** • Key Ideas and Deta • Craft and Structure • Integration of Know **WRITING GRADES 6-1** • Write narratives… (• Research to Build a **HISTORY/SOCIAL STU** • Key Ideas and Deta • Craft and Structure • Integration of Know **SCIENCE & TECHNICA** • Key Ideas and Deta • Craft and Structure • Integration of Know

http:

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

Education Standards Continued

National Mathematics Standards

http://www.nctm.org/

- **NCTM 6-8 Numbers and Operations** — Understand numbers, ways of representing numbers, relationships among numbers, and number systems (Computation, D)
- **NCTM 6-8 Numbers and Operations** — Understand numbers, ways of representing numbers, relationships among numbers, and number systems (Computation, A and B)
- **NCTM 6-8 Geometry** — Specify locations and describe spatial relationships using coordinate geometry and other representational systems
- **NCTM 6-8 Measurement Standard** — Understand measurable attributes of objects and the units, systems, and process of measurement (A, B, and C)
- **NCTM 9-12 Geometry** — Specify locations and describe spatial relationships using coordinate geometry and other representational systems (A and B)
- **NCTM 9-12 Geometry** — Use visualization, spatial reasoning, and geometric modeling to solve problems (A, B and D)
- **NCTM 9-12 Measurement Standard** — Understand measurable attributes of objects and the units, systems, and process of measurement (A)
- **NCTM 9-12 Process Standards** — Problem solving; Connections; Representation

Monitor National Marine Sanctuary: Maritime Archaeology—Discovering and Exploring Shipwrecks

Activities and Worksheets

Activities and Worksheets Continued

http://monitor.noaa.gov

Six Sections

A: NOAA and Maritime Heritage

B: Ships Through the Ages

C: Maritime Archaeology

D: Tools of Shipwreck Discovery

E: Documenting Shipwrecks

F: What's Next?

Section A

Exploring NOAA

Grade Level
- 6-12

Timeframe
- 1-2 hours

Materials
- Computer with Internet access or
- Printed resources

Activity Summary

This activity explores the many missions of NOAA, ONMS, Monitor NMS and NOAA's Maritime Heritage Program.

Learning Objectives
- To understand the important work that NOAA does to provide valuable information to those who need it.
- To learn about our nation's first national marine sanctuary
- To understand the importance of our nation's maritime heritage

Key Words

NOAA, ONMS, USS *Monitor*, national marine sanctuary, line office, maritime heritage

National Standards:

NCSS:1.a; NS.5-8.F; NS.6-12.F; CCSS.ELA.LIT.RI6-8.1, 11-12.1; NCTE:1

Background

Residing under the Department of Commerce, the National Oceanic and

Monitor to the Rescue

As our nation's first national marine sanctuary, Monitor National Marin (MNMS) was established to preserve and protect our nation's first Civi ironclad, USS *Monitor*. The *Monitor* and her brave crew helped to turn Civil War and forever changed naval warfare when it fought the Confe ironclad, CSS *Virginia*, also known as the *Merrimack*.

As the two ships fought in the Battle of Hamptons Roads on March 9, battle also marked the first time that iron met iron and the age of the w came to an end. Another unique new invention that the *Monitor* ushere rotating gun turret. The clever design gave warships more maneuvera battle and became a standard on all future ships.

The *Monitor* did not see much action after the Battle of Hampton Roac was sent to support a small skirmish off Sewel's Point and it also parti Battle at Drewry's Bluff near Richmond. The crew, affectionately know *Monitor* Boys, spent most of their time in Hampton Roads waiting for a once again battle the CSS *Virginia*.

On December 31, 1862, just 11 months after it launched from Greenpo N.Y., the *Monitor* encountered a storm off Cape Hatteras, N.C., and sa night, sixteen brave men made the ultimate sacrifice. The *Monitor*'s ex remained unknown until 1973, when John G. Newton and his team fro University Marine Lab, using side scan sonar, identified an unknown s they thought was the *Monitor*. They confirmed its identity in 1974. Nort petitioned Congress to protect this national treasure and on January 3 *Monitor* became our nation's first national marine sanctuary.

In 2002, NOAA, in collaboration with the US Navy, raised the iconic gu Navy divers were excavating the turret, they found the remains of a M Once the turret was on the barge's deck, a second set of remains was the 150th anniversary of the USS *Monitor*, the Secretary of the Navy a interment at Arlington National Cemetery on March 8, 2013. Today the pieces of the USS *Monitor* are conserved at The Mariners' Museum in News, Va.

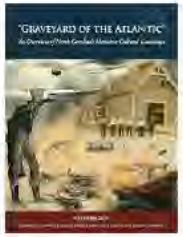
Photos Clockwise: John Ericsson; Battle of Hampton Roads; Monitor crew on deck; Monitor sinking; Turret being raised on August 5, 2002; Burial at Arlington National Cemetery of two Monitor sailors. Photos: NOAA's Monitor Collection

NOAA's Maritime Heritage Program

Museums of the Deep
Class Activity

Background

America's greatest museum of our past as a seafaring nation lies on the bottom of our nation's ocean, seas, lakes and rivers. They are places to explore, discover and appreciate our country's maritime cultural heritage. That heritage is a legacy of thousands of years of settlement, exploration, immigration, harvesting the bounty of the sea, and creating coastal communities and maritime traditions. Overall, it is an important link to our past and how we developed as a nation. Through NOAA's dynamic education and outreach programs, exhibits, visitors' centers and media, the importance of our unique heritage provide people with the knowledge they need to promote the preservation of these nonrenewable cultural resources.



In June 2000, the president recognized the need to increase ocean exploration and thus, he established the Office of Ocean Exploration and Research (OER). The office was created to coordinate the agency's exploration and research expeditions with the mission to enhance research, policy and management decisions, to develop new lines of scientific inquiry and to advise NOAA and the nation on critical issues. OER works with archaeologists, scientists, and oceanographers to explore the vast mysteries of our country's waterways.

Created in 2002, NOAA's Maritime Heritage Program is an initiative of the **Office of National Marine Sanctuaries** (ONMS). Each of our thirteen national marine sanctuaries and two marine national monuments, regardless of regulation and designation purposes, contain cultural resources. However, two sanctuaries, Monitor NMS and Thunder Bay NMS, were specifically designated to protect shipwrecks. Today through partnerships with the Office of Ocean Exploration and Research, other state and federal agencies and academia, the program continues to focus on maritime heritage resources within the National Marine Sanctuary System and promotes maritime heritage appreciation throughout our entire nation.

Visit the web site,
http://sanctuaries.noaa.gov/mariti

Section B

Sailing Through the Ages

Artistic rendering of a Viking ship. Courtesy Gbloquendox00black

Grade Level

- 6-12

Timeframe

- 2-4 hours

Materials

- Computer with Internet access
- Journal
- Rubric

Activity Summary

This lesson highlights the similarities and differences between ships through the ages.

Learning Objective

To develop a timeline of the construction of sailing ships

Key Words

See Vocabulary Box

National Standards:

NCSS:HT:1, 4, and 5; NCSS:I and II CCSS.ELA.LIT.RI.1; CSS.ELA.LIT.W.2, 4; NCTE:1, 7, and 8

Abandon Ship!

German U-boat, U-701, is located off the North Carolina coast. Photo: NOAA's Monitor NMS

Grade Level

- 6-12

Timeframe

- 2-4 hours

Materials

- Computer with Internet access or
- Printed resources for students to use to prepare their media report

Activity Summary

This lesson explains the various reasons why ships sink. Using primary, secondary and tertiary sources, students will create posts, tweets, videos, or other news media to describe a shipwreck in history.

Learning Objectives

- To understand how and why ships wreck.
- To learn about some of the most famous shipwrecks
- To interpret the facts of a shipwreck and to disseminate the information to the public

Vocabulary

See Vocabulary Box

National Standards:

NCSS:HT:1, 2, and 4; CCSS.ELA.LIT.6-8.1, 2, and 3; CCSS.ELA.LIT.9-12.1 and 3; CSS.ELA.LIT.RH.1, 2 and 3; CCSS.ELA.LIT.W.2 and 4; NCSS:I and II; NCTE:1, 4, 5, 7, and 8

Background

Why do ships wreck? The shipwrecks, because many shipwrecks are even intent are often a common reaso anchorage and into danger break apart or to take on w off course causing them to

Other factors that make sh piracy, mutiny, sabotage, f a shipwreck can be a haza unknown and does not app might not know his ship's l However today, technology technology is dependent u have power to work. And e charts onboard, charts can unusable.

Another factor that caused Many ships were sunk fror torpedoes, or by numerous 1500 merchant ships were II especially played a role i coast.

The answer as to why ship has a unique story to tell. *Titanic* and some never ma story may seem to be, eac on the ship or who had lov gravesites for those who w relative perished at sea, th you learn about shipwreck wrecks look for each ship's associated with it.

Activity Overview

In this activity students will research selected or assig answer key questions and article, newscast video seg

Past Connections

Two-masted schooner, Defiance, Thunder Bay National Marine Sanctuary. Photo: NOAA

Grade Level

6-12

Timeframe

2-4 hours

Materials

- Computer with Internet access*
- Plastic tubs with sand and water
- Toothpicks and string
- Modeling clay and graph paper
- Various objects for artifacts

*Optional — Print web pages if no Internet or use other resources

Activity Summary

This lesson illustrates how artifacts offer historical information of the past.

Learning Objectives

- To describe types of artifacts found on ancient shipwrecks.
- To understand the valuable historical information artifacts offer
- To interpret the historical significance of artifacts and the importance of professional maritime archaeologists in their interpretation.

Key Words

See Vocabulary Box

National Standards:

NCSS:HT:1 and 4, NCSS:I, II and III; NCSS:WH:Era1:1a and 1.b; NCTE: 1, 7 and 8;

Background

Humans, ships and the ocean have long been intricately bound together. Even in ancient times, ships provided the fastest and most economical method to move goods, people, and ideas from one place to another. However, the ocean can be an unforgiving place and some ships will inevitably wreck.

Shipwrecks offer an exciting window into the study and preservation of our past. They are a random sampling of voyages, a record of past trade and communication. It is almost as if they are frozen in time.

These submerged cultural resources give us a fresh perspective on history and are valuable classrooms offering a vast array of knowledge, beauty and heritage. The story of each shipwreck is woven into the intricate tapestry of its regional history. The preservation and research of sunken vessels provide a variety of information, such as the history of shipbuilding, a better sense of the physical development of the area, an understanding of innovations of the day, a look at the culture of the people on the ship, the identification of products that were coming into and through a region, the social structure in ship construction, and so much more.

Much of what we know about a region comes from historic documents, such as journals, newspapers, and first hand-accounts written in letters by those who lived during the time. However, shipwrecks contain a wealth of information that is not found in the documentary record. They help tell us what people did at a very specific moment in time. If a ship sank in 1200 BCE, everything onboard at the time of the sinking came from 1200 BCE or earlier. Clothing, tools, navigational instruments, cargo, personal items, and even the ship itself, tell us the story of how people lived and worked at that specific time in the past. If later items are found on a shipwreck, then they too tell another story. They offer clues as to what has happened to the ship since it sank.

Shipwreck exploration is a wonderful adventure, and underwater archaeologists are committed to studying the history on the ocean floor as well as preserving it for future divers. Protecting these resources allows for the continued interpretation and understanding of the lives of mariners and the struggles and successes they encountered.

Section C

Maritime Archaeology

Maritime archaeologist documents HMT Bedfordshire's boiler. Photo: Tane Casserley, NOAA

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials

- Internet (printed resources if Internet is not available
- Worksheet pages

Activity Summary

This lesson highlights the development of maritime archaeology as a disciplined study

Learning Objectives

- To compare and contrast terrestrial and maritime archaeology.
- To create a timeline of the major events in maritime archaeology.
- To summarize and write succinctly.

Vocabulary

See Vocabulary Box

National Standards:

NCSS:HT.1 and 4; NCSS:II, VIII; NCTE:1, 7 and 8; CCSS.ELA.LIT.RI.1 NS.5-8.F

Background

Archaeology is the study of the ancient and recent past through material a subfield of anthropology, the study of all human culture, archaeology of perspectives on human history and culture. Furthermore, archaeology he understand when and where people lived, as well as why and how they li much of history relies on written records and documents to interpret the p archaeology allows us to go back in time even before written language. T analysis of objects left behind, we are able to glimpse at what everyday li have been like in the past.

Underwater, maritime or nautical archaeology are terms to describe archa conducted under water. Although each discipline is slightly different from they all basically study human interaction with the sea, lakes, and rivers t study of physical remains. Whether on land or in the water, the tools, tech products for each location are essentially the same—although, different environments may require different tools, such as SCUBA gear. Nonethe goal to understand the past is always the same—to connect to real peopl everyday life including evidence of both the mundane and the extraordina

Although most people think of shipwrecks when they think of maritime ar is so much more. Today, maritime archaeologists study complete system the natural environment, referred to as the "'maritime cultural landscape" Specifically, this consists of a combination of archaeological resources re maritime activity, whether they are on land or in the water. Looking at the landscapes can encompass shipwrecks and associated sites on shore, s docks and wharves, harbor and fishing structures, warehouses and shipy lighthouses, military forts, sites of religious significance and more. It also natural geography of an area taking into account the coasts, routes, road and even the direction of prevailing currents and winds. Incorporating all a place provides a perfect framework to assess the varied and extensive structures, sites, and material culture of a project area. Collectively, they complete story.

Maritime archaeology is important because shipwrecks offer a rare glimp past, and contain information about the people and life onboard the ship. are non-renewable resources, and once destroyed or disturbed, they are forever. Many factors can cause the disturbance or destruction of a shipu as storms, dredging, war, divers and more. Even an archaeologist recove from a site using careful scientific methods of archaeology, is causing a c destruction. However, it is important to study these microcosms of history understand our past cultures. The information obtained from a site may o cost of minimal disturbance. Moreover a deeper understanding of a cultu us learn more than we can from written history alone.

Who's Who in Maritime Archaeology

Captain Barbara "Bobbie" Scholley, U.S. Navy (Ret.), during the expedition to recover the USS Monitor's gun turret. Photo: NOAA, Monitor Collection

Grade Level

6-12

Timeframe

4-8 hours

Materials

- Internet (printed resources if Internet is not available
- Digital story software, PowerPoint, or other
- Worksheet pages

Activity Summary

Students conduct research to produce a digital story or multimedia presentation highlighting the people of maritime archaeology and shipwreck exploration.

Learning Objectives

- To research people who are significant in maritime archaeology and shipwreck exploration.

Vocabulary

See Vocabulary Box

National Standards:

NCSS:HT.1 and 4; NCSS:I, II, IV and VIII; NCTE:1, 7 and 8; CCSS.ELA.LIT.RI.1, CSS.ELA.LIT.W.2, 3, 4, 6, 8 and 9; NS:F

Background

With over three million shipwrecks resting on the world's seabed, much of human history lies hidden beneath the water. Until the 1960s, most shipwrecks were inaccessible to archaeologists. SCUBA diving was new and used only for commercial or recreational activities. Archaeologists had to depend on professional divers for information about a shipwreck. Furthermore, because professional divers were not trained in archaeology that information could never be counted as totally reliable. Then along came George F. Bass.

Bass started out as an English major at John Hopkins University, but while spending his sophomore year in England at the University of Exeter, he was suspended for pulling a prank. With nowhere to go, he went to Sicily with some friends for spring break, and there among the Roman theater with Mount Etna in the background, he thought about how great it would be to earn a living as a terrestrial archaeologist studying ancient cultures.

Bass soon began to realize that much could be learned from the many shipwrecks laying on the sea floor; and shipwrecks had advantages over terrestrial sites—they were not easily accessed by humans. In the 1960s, Bass began to apply rigorous excavation techniques to underwater wrecks. Along the way, he transformed underwater archaeology from an amateur's pastime to a modern scientific discipline.

Other early pioneers, such as Peter Throckmorton, who is often described as the "Father of Underwater Archaeology," helped to develop maritime archaeology into the discipline it is today. These early leaders led the way for the many secrets held beneath the waves to finally be revealed offering valuable insight into past cultures.

Activity Overview

In this activity, students will explore some of the great maritime archaeologists and shipwreck explorers of the 20th and 21st centuries. Using their research, students will create a bio-historical and acrostic poem and generate a storyboard. From their storyboard, students will create, produce, publish and present the biographical information they have learned using digital stories, PowerPoint, or other software.

Section D

Searching the Deep

Divers survey a shipwreck. Photo: NOAA

Grade Level

- 6-12

Timeframe

- ~1 hour per activity

Materials

- See each activity for a list of materials

Unit Summary

This unit is divided into six individual activities that introduce students to the basic process of searching for a lost shipwreck and the tools used. Students learn about research, side scan sonar, ROVs, towfish, AUVs, magnetometers, science of SCUBA, and NOAA's ships and submersibles.

Learning Objectives

See unit overview for a list of objectives.

Key Words

See vocabulary for each unit section.

National Standards:

See individual activities for specific standards

Searching the Deep — Plotting the Course

U-576 Captain Hans-Dieter Heinicke (left). Photo: Ed Gatan

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials per Group

- Activity Sheet: Plotting the Course
- Colored pencils
- Copy of *Convoy KS-576*
- Two copies of map

Activity Summary

This activity simulates the first stage of searching for a lost shipwreck—research. Students conduct research to narrow the search area of an underwater battlefield.

Learning Objectives

Discover how maritime archaeologists conduct research when searching for a shipwreck in order to narrow the search area.

Key Words

See Vocabulary Box

National Standards:

NG:1, 13 and 17; NCSS:I, II; NCSS:HT.2, 3 and 4; NCSS:WH.ERA8.2B and 4B; NCTE:1, 3, 7 and 8; CCSS:ELA:LIT.RI.8.1; NCTM:6-8:G; NGTM:9-12:G.A, B; OL:6 and 7

Activity A

Battle of the Atlantic

Although World War II's Battle
it has been extensively studie
Germany surrendered in 1945
in winning the war.

Once the U.S. entered WWII i
In 1942, their presence was ir
off Cape Hatteras, N.C., in ar
casualties in Torpedo Alley in
roughly 50 merchant ships. F
between Convoy KS-*520* and
archaeologists searched for th
information will be obtained gi
happened that day in July 194

Since 2008, the Monitor Natio
biological, and historical surve
Carolina coast associated with
researchers attempted to loca
the same day. During this mul
federal and state agencies, ur
After years of research and m
located in the summer of 201

When searching for lost shipw
secondary and tertiary source
identified, NOAA maritime arc
search for the shipwreck, such
remotely operated vehicles (R
towfish, magnetometers, and
edge tools and the abundant
helped to lead the way to prot

Activity Overview

In this activity students learn t
of shipwrecks. They look at pr
understand the importance of
research on U-boat activity in
sunken U-boats off the East C
520 as they begin to simulate

http://monitor.noa

Searching the Deep — Sonar Imaging

SIDE SCAN SONAR

Grade Level

- 6-12

Timeframe

- 2-4 hours

Materials per Group

- Prepared box—See Teacher Prep Section
- Masking tape
- Different colored pencils
- Graph paper (or use provided)
- Wooden skewer (~ 30 cm)

Activity Summary

Students will simulate how side scan sonar works.

Learning Objectives

- Use a coordinate grid system to map a simulated ocean floor
- To have an understanding of how side scan sonar works
- To learn how side scan sonar is used to locate shipwrecks
- To make inferences about the topography of an unknown and invisible landscape

Key Words

Echo; side scan sonar; topography

National Standards:

NG:1 and 3; NGSS:III and VIII; NCTE:1; CSS.ELA:LIT.RST.7; NCTM:6-8:NO.D; NCTM:6-8:MS.A; NCTM:9-12:G.A and B; NGSS:HS-ETS1.B; OL:6 and 7

Activity B

Side Scan Sonar

Side scan sonar is a specialized system to detect objects on the seafloor. Sonar is short for "sound navigation and ranging." Thus, sonar uses sound waves to locate underwater objects by measuring the time it takes for a transmitted sound wave to be reflected back to its source. The sound wave is transmitted through a transducer, which is comparable to a speaker in a radio. Side-scans use a transducer housed in a hollow container called a towfish that is towed through the water 10 to 20 feet above the bottom. The transducer emits sound waves to either side of the towfish and measures the time it takes for the waves to be reflected back to the towfish.

These sound waves are processed into an image that resembles an aerial photograph and can be viewed in real-time on a computer monitor aboard the towing vessel. A global positioning system (GPS) is used to guide the towing vessel along predetermined search paths, as well as to identify points of interest on the side scan image. This allows scientists to return to any point on the image for further investigation.

In a side scan, the transmitted energy is formed into the shape of a fan that sweeps the seafloor from directly under the towfish to either side. Typically, this distance is about 100 meters (~330 feet), but actual distance is based on frequency. The strength of the return echo is continuously recorded, creating a picture of the ocean bottom. Side scan sonar does not depend upon light and can be used under conditions that would make searching by divers dangerous or impossible. Because it covers a swath of up to 183 meters (600 feet) or more at about 2-4 miles per hour, it is a very efficient way to search large areas.

Experimental side scan sonar systems began during the 1950s by both the military and commercial industry. Dr. Harold Edgerton was a professor of electrical engineering at the Massachusetts Institute of Technology. He was intrigued with the unique challenges of underwater research and worked to design and develop many tools used in underwater exploration including side scan sonar. In 1973, he and John G. Newton from Duke University teamed together to see if side scan sonar imaging could be used to locate shipwrecks. Working off the North Carolina coast, the one ship that had a unique distinct "signature" was the USS *Monitor*. In August 1973, the team began to map the ocean floor in an area where they thought the *Monitor* might lay. On August 27, the side scan sonar recorded a "long amorphous" echo, and in April 1974, the location of the *Monitor* was verified for the first time in 112 years!

Left: Diagram illustrating survey techniques Photo: NOAA

Right: First side scan sonar image of the USS *Monitor*, August 27, 1973. Photo: NOAA, *Monitor* Collection

http://monitor.noaa.gov

Section D Continued

Searching the Deep — Roving Along

Researchers look on as the ROV sends image from the ocean floor. Photo: NOAA

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials per Group

Activity 1
- Internet

Activity 2
- 2-liter bottle
- Nail
- Duct tape
- Water

Activity 3
- 2-liter bottle
- Eyedropper
- Water

Activity Summary

To learn how ROVs, AUVs and towfi are used in maritime archaeology; a how increasing pressure at increase depths affect divers.

Learning Objectives

To describe how and why ROVs, AU and towfish are used in maritime archaeology.

Key Words

See Vocabulary Box

National Standards:

NS.1 and 12; NCSS:III and VIII; NCSS:HT CCSS.ELA.LIT.RH.7, NS.5-8.A, E and F; NS.9-12.B, E and F; NGSS:MS-PS4.A an NGSS:HS-PS4.A and C; NGSS:HS-ETS1 OL.6 and 7

Searching the Deep—Magnetometers

Crew prepares to deploy a magnetometer. Photo: NOAA

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials per Group

Activity 1
- Small bar magnet
- Clear plastic box (petri dish works well)
- Iron filings

Activity 2
- 10-cm piece of plastic straw
- 2 straight pins
- Masking tape
- 30-cm of sewing thread
- Bar magnet with poles marked

Activity Summary

Students will observe a magnetic field and make a simple magnetometer.

Learning Objectives

To understand how a magnetomete is used to search for shipwrecks.

Key Words

magnetometer

National Standards:

CCSS.ELA.LIT.RST.4 and 7; NS.5-8.F NS.9-12.B, E and G; NGSS:HS:PS4.B, C; OL.6 and 7

SCUBA, SCUBA, SCUBA — DO!

Divers wait to dive on a shipwreck. Photo: NOAA

Grade Level

- 6-12

Timeframe

- 1- 2 hours

Materials

- Computer with Internet access
- Or printed resources for students to use to prepare their media reports

Activity Summary

This activity challenges students to use the format of modern social media technology to create a complete history of an import figure in SCUBA diving, while learning about the development of modern day SCUBA diving.

Learning Objectives

- To understand the development of SCUBA.
- To summarize the lives of famous divers using modern social media technology.

Key Words

See Vocabulary Box

National Standards:

NCSS:III and VIII; NCSS:HT.1, 2 and 4; NCTE:1,3, 4, 5, 6, 7 and 8; NS:5-8.E, F and G; NS.9-12.E, G; CCSS.ELA.LIT.W.4, OL.6 and 7

Searching the Deep — NOAA Vessels

SRVx Sand Tiger hosting an open house to showcase underwater archaeological research conducted off North Carolina's coast.

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials per Group

- Internet
- If internet is not available, print copies of information needed to complete the activities

Activity Summary

Students will explore NOAA's fleet and small boat program.

Learning Objectives

To understand the types of NOAA vessels used in scientific research and to learn how small boats are used throughout U.S. waters to conduct research projects that protect our natural and cultural resources.

Key Words

Activity E

NOAA Vessels

NOAA ships and aircraft play a critical role in the collection of oceanographic, atmospheric, hydrographic, and fisheries data. The NOAA fleet is managed and operated by the Office of Marine and Aviation Operations (OMAO), an office composed of civilians and officers of the NOAA Commissioned Corps. OMAO also manages the NOAA Diving Program and the NOAA Small Boat Program.

OMAO's research and survey ships compose the largest fleet of federal research ships in the nation. The fleet ranges from large oceanographic research vessels capable of exploring the world's deepest ocean, to smaller ships responsible for charting the shallow bays and inlets of the United States. The fleet supports a wide range of marine activities including fisheries research, nautical charting, and ocean and climate studies.

OMAO's aircraft operate throughout the world to perform a wide range of services including hurricane reconnaissance and research, marine mammal and fisheries assessment, and coastal mapping. NOAA aircraft carry scientists and specialized instrument packages to conduct research for NOAA's missions.

In addition to research and monitoring activities critical to NOAA's mission, OMAO ships and aircraft provide immediate response assistance for unpredictable events. Following Hurricanes Katrina and Rita, NOAA ships conducted emergency surveys for navigation hazards that helped Gulf ports reopen quickly. Aerial images of disaster-torn areas—taken by NOAA aircraft—enabled residents and emergency workers to verify the condition of houses, bridges and roads.

NOAA's fleet is divided into three regions: 1) Atlantic; 2) Pacific; and 3) Pacific Islands. The Atlantic Fleet has nine vessels: *Ronald H. Brown, Henry B. Bigelow, Ferdinand Hassler, Nancy Foster, Gordon Gunter, Okeanos Explorer, Thomas Jefferson, Oregon II*, and *Pisces*. The Pacific Fleet has five vessels: *Oscar Dyson, Bell M. Shimada, Rainer, Fairweather*, and *Reuben Lasker*

Section E

I Can Name that Part

USS Constitution Photo: U.S. Navy

Grade Level

- 6-12

Timeframe

- 1-2 hours

Materials

- Internet (optional)
- Books, articles and other resources for nautical terms

Activity Summary

This lesson helps students to learn the terminology associated with ships and to identify a ship's parts.

Learning Objectives

Students will learn the names of various parts of a ship; become familiar with nautical terms and their etymology; and learn the origin of phrases used today.

Key Words

amidships	keel
anchor	line
bow	mast
deck	port
fore and aft	starboard
hull	stern

National Standards:

NCTE:1 and 9; CCSS:ELA.LIT.RL.4; CCSS:ELA.LIT.W.3; CCSS:ELA.LIT.RH.4; OL.6 and 7

Background

Every profession has its own terminology and jargon, and sailing is no exception.

Putting the Pieces Together—Photomosaics

Photomosaic of the Monitor's turret. Photo: NOAA's Monitor Collection

Grade Level

- 6-12

Timeframe

- 1 hour or less

Materials per Group

Activity A

- Photomosaic image
- Scissors
- Tape

Activity B

- Digital camera
- Ability to print
- Scissors
- Tape
- Internet (optional)

Activity Summary

Students simulate how archaeologists document and survey a shipwreck.

Learning Objectives

To recognize the importance of archaeology in documenting shipwrecks and to simulate creating a photomosaic.

Key Words

See Vocabulary Box

National Standards:

NCSS:VIII; CCSS.ELA.LIT.RST.3; OL.6 and 7

Background Information

How do maritime archaeologists study
dive down to a wreck to observe and r
site, they carefully document the shipw
measurements, make drawings, and ta

When archaeologists make a carefully
site plan. If archaeologists piece togeth
they create a photomosaic. Photomos
taken in sequence and then put togeth
picture. Photomosaics are very useful
archaeologists can see exactly what th
lake.

Sometimes when a shipwreck site, suc
archaeologists cannot spend a long tin
operated vehicles (ROVs) to take pictu
document a shipwreck site because th
can stay on the bottom for a very long

In 1974, National Geographic and *Mon*
complete photomosaic of the wreck of
the sunken ironclad were joined togeth
site. The task of fitting all the images t
the product provided invaluable inform
site.

From the early 1990s to 2002, archaeo
Monitor, including the steam engine, p
turret. With all the changes to the site,
be created to document the changes a
2006, MNMS worked with the Universi
Exploration to create a new partial pho
continued to document and survey the
will be created.

Photomosaics are like snapshots in tin
archaeologists in studying the site, the
capture details that are often unseen o

Activity Overview

Students will simulate creating a photo
Monitor and cutting it into pieces and t
students will also research and discuss
important to document a shipwreck wit

http://monitor.noaa.

Mock Shipwreck: Mapping the Past

Students map a mock shipwreck. Photo: NOAA

Grade Level

- 6-12

Timeframe

- 45-90 minutes

Materials

- Mock shipwreck tarp/outline
- Tape (Scotch/duct)
- 30 ft. of measuring tape
- Shorter measuring tape (one for each group)
- *Log Sheets* (provided)

Activity Summary

This lesson engages students to map a mock shipwreck to create a site plan using scale drawings.

Learning Objective

To understand maritime archaeology and describe its importance in preserving our maritime heritage. To measure and draw to scale. To make inferences based on observations.

Key Words

See Vocabulary Box

National Standards:

NCTM:8-12:G, M; NCTE:4 and 5; NS.5-8.E, F and G; NS.9-12.E and G;

Background

During World War II, many battles were fought on foreign shores. However, few people know about those fought closer to home. The Battle of the Atlantic consisted of several skirmishes and decisive maneuvers between German U-boats and Allied and merchant ships all along the shorelines of the Atlantic Ocean including the United States.

The German U-boats were under orders to prevent merchant vessels from getting supplies to Allied nations. The United States deployed their own ships to act as defensive escorts armed with anti-submarine weapons. Many German and Allied and merchant ships fought and sank off the North Carolina and Virginia coasts.

The wrecks of these sunken ships still lie at the bottom of the ocean. It is the job of maritime archaeologists to find and study these links to our past in order to better understand our history, conserve our heritage, and honor the memory of those who died defending our nation's future.

To better understand these cultural resources, maritime archaeologists document them by physically mapping the shipwrecks. Once the shipwreck is mapped, a site plan is created. During the dives, numerous images are taken to enhance the detail of the site plan and to provide a complete photo documentation of the resource. This thorough documentation gives researchers a complete snapshot of the shipwreck at that moment in time, thus allowing them to study the site, learn about its history and even gather information on how shipwrecks deteriorate over time.

Activity Summary

Maritime archaeology is a field of study that provides many career opportunities based in science, technology, engineering, and mathematics (STEM). The focus of this lesson is the creation of a shipwreck site plan. The students engage in teamwork as "divers" to create sectioned, scaled drawings of a mock shipwreck. The students make connections to maritime history, mathematics, and technology.

NOTE: Extension activities incorporate English language and social studies.

Section F

Historically Significant

Section of the armor belt, USS Monitor
Photo: NOAA, Monitor Collection

Grade Level

6-12

Timeframe

1-2 hours

Materials

- Computer with Internet access or
- Printed resources for students to use in researching the National Register

Activity Summary

In this lesson, students will explore the National Register of Historic Places focusing on the nomination process of vessels. Students learn the complex process of determining if a vessel is historically significant.

Learning Objectives

- To identify various criteria required for a vessel to be classified as historically significant
- To use knowledge learned and construct a fictitious nomination for the National Register.
- To analyze nominations based on criteria learned.

Vocabulary

See Vocabulary Box

National Standards:

NCSS:II; NCSS.HT.1 and 3; CCS.ELA.LIT.RI.4; NCTE:1, 5, 7 and 8; OL6,7

Ethically Speaking

Military craft, such as the U-352 off Beaufort, N.C., are protected by the Sunken Military Craft Act.
Photo: NOAA, Monitor NMS

Grade Level

6-12

Timeframe

1-2 hours

Materials

Computer with Internet access or printed resources

Activity Summary

Students answer an overarching question: Do divers have the right to take artifacts from shipwrecks? They will explore how and why military craft are protected and engage in a Socratic Seminar.

Learning Objectives

- To understand that shipwrecks offer a window into the past and should not be disturbed.
- To learn about the Sunken Military Craft Act and other protections for cultural resources.
- To debate using a Socratic Seminar.

Vocabulary

See Vocabulary Box

National Standards:

NCSS:II, III, V, VI and IX; CCSS:ELS.LIT.RI.4; CCSS:ELS.LIT.SL.1-5; NCTE:1, 3, 7 and 8;OL.6 and 7

The Art of Artifacts

Government issued pocket comb found in the USS Monitor's turret. Photo: NOAA, Monitor Collection

Grade Level

6-12

Timeframe

2-4 hours

Materials

- Variety of objects to represent artifacts (see *Teacher Preparation and Implementation*)
- Variety of broken objects and a basket for each group (see *Teacher Preparation and Implementation* for Activity C)

Activity Summary

This lesson engages students to explore the recovery of artifacts and recognize the importance of skilled archaeologists in any recovery efforts.

Learning Objectives

- To understand that artifacts should only be removed by trained archaeologists
- To experience the difficulty in identifying unfamiliar artifacts and to make inferences.
- To discover the difficulty in piecing together artifacts

Vocabulary

See Vocabulary Box

National Standards:

NCTE:1; NCSS:HT.1, 2, 3, 4 and 5; CCSS:ELA.LIT.RH.7, OL.6 and 7

Conservation and Conservators

USS Monitor's turret shortly after recovery. Photo: NOAA, Monitor Collection

Grade Level

6-8; easily adapted for 9-12

Timeframe

1-2 hours

Materials

See *Teacher Preparation and Implementation* for each activity's materials

Activity Summary

This lesson engages students to explore the conservation of artifacts through online learning and experiments.

Learning Objectives

- To understand that artifact conservation is complex and can take years to complete
- To observe the destructive properties of rust
- To discover that modern metals differ from historic metals

Vocabulary

Background

When planning to recover artifacts from a marine archaeological site, two of the most important items to consider are: 1) how to preserve the artifact and 2) how much it will cost (and who is funding it). Without conservation, most artifacts would perish and all historical information would be lost. Conservation may seem like a straightforward and simple process, but it is very complicated. Conservation is also time consuming and expensive, often costing more than the original recovery of an artifact.

Conservation does not simply involve a single set of procedures; therefore, only highly trained professional conservators should work to conserve artifacts. Moreover, professional conservators are often the first person to see an actual artifact, and for that reason, they are deeply concerned with the integrity of the artifact and the history it represents.

Conservators take on the same responsibilities as an archaeologist, and they also fill the roles of a mender, caretaker and recorder of the artifacts they conserve. They take great care to handle the artifact with respect and ensure that the artifact is conserved correctly. Additionally, conservators are guided by a set of ethical guidelines adopted by the International Institute for Conservation.

When artifacts are recovered from a salt water environment, they must not be allowed to dry. Artifacts absorb salt from the water and over time, these salts become embedded in an artifact, especially in iron objects. The presence of salt can be fatal for an artifact, because as the artifact dries, salt comes out of solution and crystalizes. Salt crystals act as tiny wedges breaking apart an artifact. Therefore, before an artifact can dry, the salt must be removed. The salt removal process varies in length. Many other factors can also affect the length of time it takes to conserve an artifact, such as its size and source material.

Removing salt from objects can take years or even decades, like with the USS *Monitor*'s turret. The process requires that skilled, professional conservators and other support staff are hired. A facility must be acquired and then, there are numerous other costs, such as utilities, supplies, chemicals and more. Therefore, funding is a key component in recovering artifacts from a shipwreck

SCUBA, SCUBA, SCUBA—DO!

Activity D

Activity Overview

Students learn the history of scuba diving, through important inventors and divers. After choosing a historical figure in

Vocabulary

scientific diving – diving performed as a necessary part

Name: _____ Date: _____

The People of SCUBA
Class Activity

Historical Inventors and Divers

Pioneers of Diving

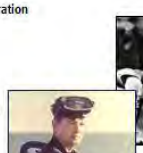
- John Smeaton (1724-1792): air pump
- Sieur Freminent (1700s): recycled air
- William James (1800s): iron belt
- Benoît Rouquayrol (1826-1875): and Auguste Denayrouze (1837-1883): rgid diving suit
- Henry Fleuss (1851-1932): closed circuit breather
- Victor Berge (1891–1974): helmet diving
- Émile Gagnan (1900–1979): inventor of demand regulator
- Philippe Tailliez (1905–2002): skin & scuba diving
- Philippe Diole (1908–1977): undersea exploration
- Teseo Tesei (1909–1941): inventor of human torpedo
- Jacques-Yves Cousteau (1910–1997): co-inventor AquaLung
- Frédéric Dumas (1913–1991): spearfishing, wreck diving
- Arne Zetterström (1917–1945): mixed gas diving
- Hans Hass (1919-2013): underwater photography
- Eduard Admetlla i Lázaro (1924–): inventor of scuba diving device & deep diving[clarification needed]
- James F. Cahill (1926–2008): scuba diving
- Nick Icorn (1929-2013): scuba & rebreathers
- Robert Sténuit (1933-): first Aquanaut
- Gary Gentile (1946-): wreck diving
- E. Lee Spence (1947-): underwater archaeology
- Sheck Exley (1949–1994): cave diving
- Bret Gilliam (1951-): technical diving
- Bill Nagle (1952–1993): wreck diving
- Wesley C. Skiles (1958–2010): cave diving
- Jarrod Jablonski (1969-): technical diving
- Dick Rutkowski: diving medicine, diver training
- Tom Mount: technical diving

Notable for Other Reasons

- Craig B. Cooper (born 1949?): Aquanaut
- George F. Bass (1932): Early underwater archaeologist
- James Talacek: Aquanaut
- Nate Bender: Aquanaut
- Berry L. Cannon (1935–1969): Aquanaut
- Dominic Landucci: Aquanaut
- Dewey Smith (1972–2009): Aquanaut
- Karen Kohanowich: Aquanaut
- Lionel Crabb
- Carl Brashear (1931-2006): First African American US Navy Diver
- Michael C. Barnette
- Willard Franklyn Searle (1924–2009)
- Agnes Milowka (1981–2011)
- Bob Halstead (born 1944)
- David Shaw (1954–2005)
- Deon Dreyer (1974–1994)
- Joachim Wendler (died 1975)
- Keith Jessop (1933–2010)
- Leigh Bishop (born 1968)
- Stephanie Schwabe (born 1957)
- Steve Lewis (diver)
- Ted Eldred (1920–2005)
- Trevor Jackson (diver) (born 1965)
- Billy Deans (diver)
- Fabien Cousteau (born 1967)
- Graham Jessop (born 1957)
- John Chatterton (born 1951)
- Jean-Michel Cousteau (born 1938)
- Richie Kohler
- Oscar Gugen (born 1910)
- Philippe Cousteau (1940–1979)
- Mark Hulsbeck (born 1956): Aquanaut

Record Holders for Depth or Cave Penetration
(Scuba and surface supplied)

- Simon Mitchell
- Claudia Serpieri
- Jim Bowden (diver)
- John Bennett (diver) (1959–2004)
- Mark Ellyatt
- Nuno Gomes (diver) (1951-)
- Pascal Bernabé



L-R: Nick Icorn, Henry Fleuss , and Jacques Cousteau

Facebook—Sample Template

Social Media Profile

Date of Birth:

twitter

Tane
@NOAADiver

What's happening?

Sample Fact Sheet

George F. Bass—Scuba Diver and Founder of Marine Archaeology

Images of George F. Bass

Lesson Plans, Activities and More!

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

Education

When Johnny Comes Marching Home

Grade Level
- 4-8

Timeframe
- 1-2 hours

Materials

Computer with Internet access, paper, pencils

Key Words

Shanty, Sea Shanty

Activity Summary

This lesson focuses on the songs of the Civil War and what role music played

Learning Objectives

To learn the role that music played during the Civil War

National Standards:

Background Information

Music could be heard throughout the Civil War amongst soldiers, sailors, slaves, women, men, and children. Many of the songs were taken from print, memory, or passed down orally and were sung because they were familiar songs that brought comfort or inspiration. New lyrics were often created to embellish traditional songs and the words were pertinent to circumstance or motivation.

Some songs originated as African-American spiritual songs. Slaves and workers in the fields often sang spiritual songs to bring courage, strength, and unity to the unkind conditions in which they lived and worked. Spiritual songs were usually composed in the moment, reflecting suffering or understanding.

Shanties were work songs set to a tempo that synchronized to repetitive tasks. Sea shanties, such as *Blow the Man Down*, also brought men together who worked on the ships at sea. The songs had a purpose and the lyrics harmonized with the sailors' labors. There were also patriotic battle songs that inspired and united the troops. Sailors and soldiers had songs about the flag and love of country, their sweethearts, religion, and even drinking songs. Music offered a time for the soldier and sailor to relax and reflect.

Women, children and the men who did not go to war, also sang songs that revealed their suffering and hope for an end to the war. Civil War songs span from spiritual and protest to historical, shanty, and traditional. Action songs roused people to raise their voices. Traditional songs and ballads spoke of heritage and remembrance.

Today, songs usually are sung for entertainment. However, some still serve the purpose to pass down oral traditions, show love of country, pay tribute to the struggles of ancestors, or to protest in order to rally people to action.

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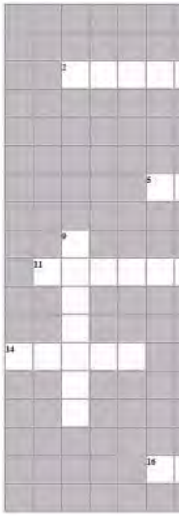
MONITOR NATIONAL MARINE SANCTUARY

The Civil War in Review

Across

4. First state to secede from the Union
6. A woman who led many slaves to freedom
8. The _____ Railroad helped slaves escape to
10. First Confederate ironclad
12. The withdrawal of a state from the Union
13. A proclamation giving freedom to Southern sla
14. Battle between USS *Monitor* and CSS *Virginia*

Test Your USS *Monitor* Knowledge



Down

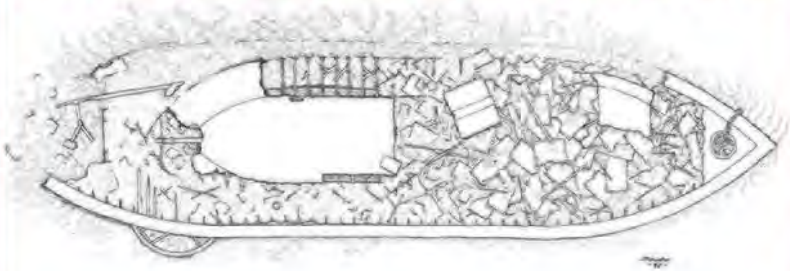
1. A kitchen artifact from the USS
3. Name of the CSS *Virginia* befo Confederates captured her
6. Large government organization protects the USS *Monitor*
7. The study of history using the t people leave behind
8. The huge mechanical claw that the turret
9. Union President during the Civi
12. How many cannons did the U have?
15. One way to record a shipwrec Kodak could help with this)

Name a state that borders Virginia to the west	Name one of t Union ships th participated in t Battle of Hampt Roads other than *Monitor*
Name one partner from a *Monitor* expedition	Name of the oc where the *Moni* sank
Name of the US President during the Battle of Hampton Roads	Why did the *Merrimack* sin
Name one member of the *Monitor* crew	What is an ironc vessel?
Name one of the ocean currents located near the shipwreck site of the *Monitor*	Where did the *Monitor* sink?

Tour the Wreck of the USS *Monitor*

Monitor National Marine Sanctuary

Move mouse cursor slowly around plan view for details and images.



Back to the *Monitor* National Marine Sanctuary Home Page

Learning Modules

Mock Shipwreck Activity

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

Education

Mock Shipwreck: Mapping the Past

Grade Level

- Grades 9 – 12

Timeframe

- 45 – 90 minutes

Materials

- Mock shipwreck tarp/outline
- Tape (scotch/duct)
- 30ft measuring tape
- Shorter measuring tape (enough for each pair/group of students)
- Clipboards (enough for each pair/group of students)
- Log Sheets (provided)
- Dive Slate (provided)

Key Words

- Maritime Archaeology
- Site Plan
- Baseline
- Scale Factor

Activity Summary

Maritime archaeology is a field of study that provides many career opportunities based in science, technology, engineering, and mathematics (STEM). The focus of this lesson is the creation of a shipwreck site plan. The students engage in teamwork as "divers" to create sectioned, scaled drawings of a mock shipwreck. The students make connections to maritime history, mathematics, and technology.

NOTE: Extension activities incorporate English language and social studies.

Learning Objectives

Students will be able to:

- Define maritime archaeology and describe its importance to our national maritime heritage.
- Employ measuring and scaling techniques to sketch drawings of a mock shipwreck to better understand how divers document an actual shipwreck.
- Determine the scale factor of their drawings in relation to the mock shipwreck.
- Make inferences about the mock shi

Background Information

During World War II, many battles were
few people know about those fought clo
consisted of several skirmishes and dec
boats and Allied and merchant ships all
United States.

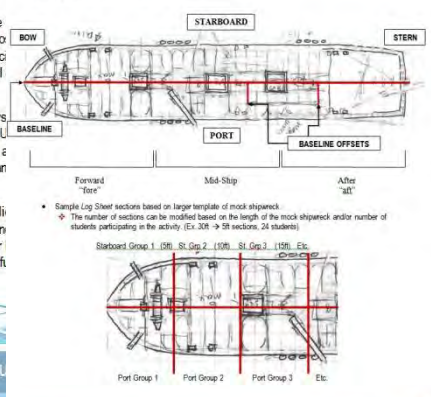
The German U-boats were under orders
getting supplies to Allied nations. The U
to act as defensive escorts armed with a
and Allied and merchant ships fought ar
Virginia coasts.

The wrecks of these sunken ships still li
job of maritime archaeologists to find an
to understand our history, conserve our
those who died defending our nation's fr

http://sanctuaries.noaa.gov/edu

Teacher Page

Outline of a Shipwreck with Vocabulary Words



- Sample *Log Sheet* sections based on larger template of mock shipwreck
  - The number of sections can be modified based on the length of the mock shipwreck and/or number of students participating in the activity. (Ex. 30ft → 5ft sections, 24 students)

http://sanctuaries.noaa.gov/education

Shipwrecks as Reefs

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

Education

Shipwrecks as Reefs: Biological Surveys

Grade Level
- Grade 6 – 8

Timeframe
- 45 – 90 minutes

Materials
- 20ft Measured rope or measuring tape (x2)
- Cut-outs of fish species and benthic species
- 2ft x 2ft square frames (e.g. rulers taped together)
- Clipboards
- Student sheets

Key Words
- Artificial Reef
- Biological Survey
- Transect Line
- Quadrat
- Biodiversity

Activity Summary

The focus of this lesso
Students will conduct a
practiced methods of v
will apply and practice
Students will make obs
and then make informe

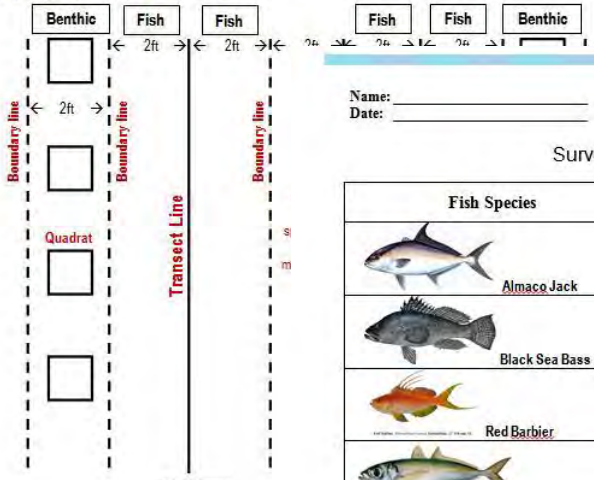
Learning Objective

Students will be able to
- Define artificial ree
- Demonstrate data
- Illustrate graphical
- Compare surveys b
effects of the facto

http://sanctuaries.no

Teacher Page

Sample Layout of Transect Lines and Quadrats:



Distribution

Wreck	Almaco Jack	Black Sea Bass	Red Barbier	Sand
EM Clark	4	0	35	
Dixie Arrow	0	4	0	

Wreck	Algae	Cnidaria	Chordata
EM Clark	10	7	0
Dixie Arrow	40	5	10

http://sanctuarie

Name: _____
Date: _____

Shipwreck: _____

Survey Log – Transect Line

Fish Species	
Almaco Jack	
Black Sea Bass	
Red Barbier	
Scad	
 Sheepshead Porgy	
 Tomtate	
 Vermilion Snapper	
 Sand Tiger Shark	
Total Number of Fish	

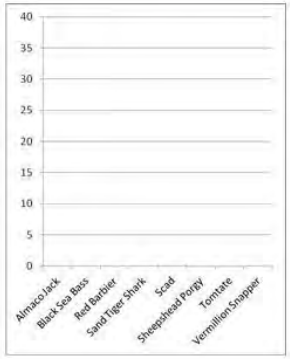
http://sanctuaries.n

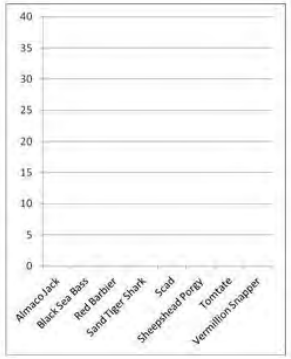
Analyzing Your Data

Part 1

Now that you made observations and collected data, what do you do? In order to draw conclusions or make inferences about the environment, scientists must be able to analyze data they have collected. Follow the steps below using the species count data you have collected.

1. Create bar graphs for the Transect Line – Fish Counts
   a. Title each according to the shipwreck surveyed
   b. Label the x-axis and the y-axis
   c. Draw bars based on your fish counts





2. Compare the shipwrecks:

Shipwreck	Total Number of Fish	Total Number of Species	Most Common Species	Least Common Species	Species present at both wrecks
EM Clark					
Dixie Arrow					

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World War I

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

Education

In or Out? Debating Entrance into the Great War

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

Education

The Mystery of the *Mirlo*: Interpreting Primary Sources

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

Education

Propaganda: Posters with a Purpose

Photo: Library of Congress

Photo: The Royal Naval Division

Grade Level

6-12

Timeframe

90 Minutes

Materials

- Colored pencils, markers and poster board.
- Large print outs or an A/V projector to display posters for entire class to view and analyze.
- A computer or a computer lab is necessary to access images and resources online.
- Poster-making materials may

Activity Summary

This lesson will require students to examine and evaluate propaganda posters used during World War I. At the conclusion of the activity, students will create their own poster which will require the students to demonstrate an understanding of the reasons the United States entered the war.

Learning Objectives

Students will be able to:

- Analyze propaganda posters for bias and symbolism.
- Explain and illustrate the reasons for the United States joining the Allied Powers in the First World War.
- Create an original propaganda poster.
- Evaluate other students' posters and explain which posters are the most persuasive.

Left: Liberty Bond poster Photo: Walter H. Everett/The Sackett & Wilhelms Corporation, N.Y. Right: Urging women to knit socks for soldiers. Photo: American National Red Cross

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

Education

Life during the War: My Scrapbook

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

Education

WWI Profiles: Historical Voices in Modern Technology

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

Education

Zimmerman Telegram: The Last Straw

Grade Level

- 7-12

Timeframe

- 90 Minutes

Materials

- Handout modeling code breaking (provided)
- Handout with code to break (provided)
- plain paper for students to make their own code,
- access to Internet to use Cryptokids website to make their own code (http://www.nsa.gov/kids/home.shtml) or Wordles to make a cryptogram at (http://www.wordles.com/getmycrypto.aspx)

Key Words

Photo: Berkeley Northside Research Group

Activity Summary

This lesson focuses on the importance of the Zimmerman Telegram and other causes of World War I. Students are given a portion of the Zimmerman Telegram and must break the code and analyze the message. They are asked to think critically to determine how Americans and key decision makers, who wanted to be neutral in the European war, would feel about the telegram. Finally, they will make their own short code on how to avoid another world war.

Learning Objectives

Students will be able to:

- Examine the causes of U.S. involvement in World War I
- Demonstrate the value in military intelligence practices, such as code breaking

Background Information

The assassination of Archduke Franz Ferdinand in Austria-Hungary set off a chain reaction of defense alliances that in 1914 led Europe into war. Austria-

OBX Maritime Heritage Trail

OUTER BANKS MARITIME HERITAGE TRAIL

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Images | Videos | Oral Histories

Welcome to the Outer Banks Maritime Heritage Trail. Click the arrow buttons on the map to play the videos and click [+] below for descriptions of each video.

Coastal North Carolina is an extraordinary place with strong ties to the marine environment. Surrounded by water, the Outer Banks of North Carolina are a chain of narrow barrier islands separating the Currituck, Albemarle, and Pamlico Sounds from the Atlantic Ocean. This dynamic environment has shaped the islands and its people for centuries.

Along Highway 12 are a series of iconic places and features that make the Outer Banks unique. From the lighthouses to the wildlife to the shipwrecks offshore, the Outer Banks culture reflects the surrounding marine environment. We invite you to take a trip down this stretch of road and experience the maritime heritage of the Outer Banks of North Carolina through videos, pictures, and stories.

Videos

1 Video: "Introduction"
Start at Whalebone Junction

[+] **2 Video:** "The Story of the U-85"

[+] **3 Video:** "The Ecology of the Outer Banks"

[+] **4 Video:** "WWI and WWII off the Coast of North Carolina"

[+] **5 Video:** "The Chicamacomico Life Saving Station"

[+] **6 Video:** "The Cape Hatteras Lighthouse"

[+] **7 Video:** "The Story of the U-701 and the YP-389"

Click here for more information about the Outer Banks.

Images

Sand tiger sharks and schools of fish are just a few of the marine organisms that can be found living on and around the shipwrecks off the coast of North Carolina. (Credit: NOAA)

Oral Histories

The residents of the Outer Banks have amazing stories to tell. Their lives are constantly influenced by the marine environment in which they live and their stories are as unique and dynamic as their surroundings. During WWII, many residents were witness to the Battle of the Atlantic which occurred along the East Coast of the United States. Listen to their stories as they recall their experiences with the war that was being fought right off of their shores.

- Carol Dillon
- Carol Dillon (2)
- Gibb Gray
- Anne Henry
- Anne Henry (2)
- Lorraine Hinnant
- John Watkins

Educational Activities

Students experience the unique maritime culture of the Outer Banks, N.C., when they watch one, or all ten, video clips and listen to the oral histories of those who experienced WWII on the shores of the Outer Banks. Each video is accompanied by supporting activities and a set of focus questions, to be answered while the students view the video.

Click here to download the educational activity packet.

Office of National Marine Sanctuaries
National Oceanic and Atmospheric Administration

Education

Outer Banks Maritime Heritage Trail

USS *Monitor* (2011) is located 16 miles South-South East of Cape Hatteras, N.C. Photo: NOAA

Grade Level

- Grade 4-12

Timeframe

- Each video is approximately 3-5 minutes. They can be viewed as a class or students can view them independently.

Materials

- Internet/Computer
- Worksheet

Key Words

- Cape Hatteras
- Diversity
- Ecosystem
- Gulf Stream
- Ironclad
- Outer Banks
- Sanctuary
- Sonar
- U-boat

Background Information

Coastal North Carolina is an extraordinary place with strong ties to the marine environment. Surrounded by water, the Outer Banks of North Carolina are a chain of narrow barrier islands separating the Currituck, Albemarle, and Pamlico Sounds from the Atlantic Ocean. This dynamic environment has shaped the islands and its people for centuries.

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Learning Objectives

Students will be able to:

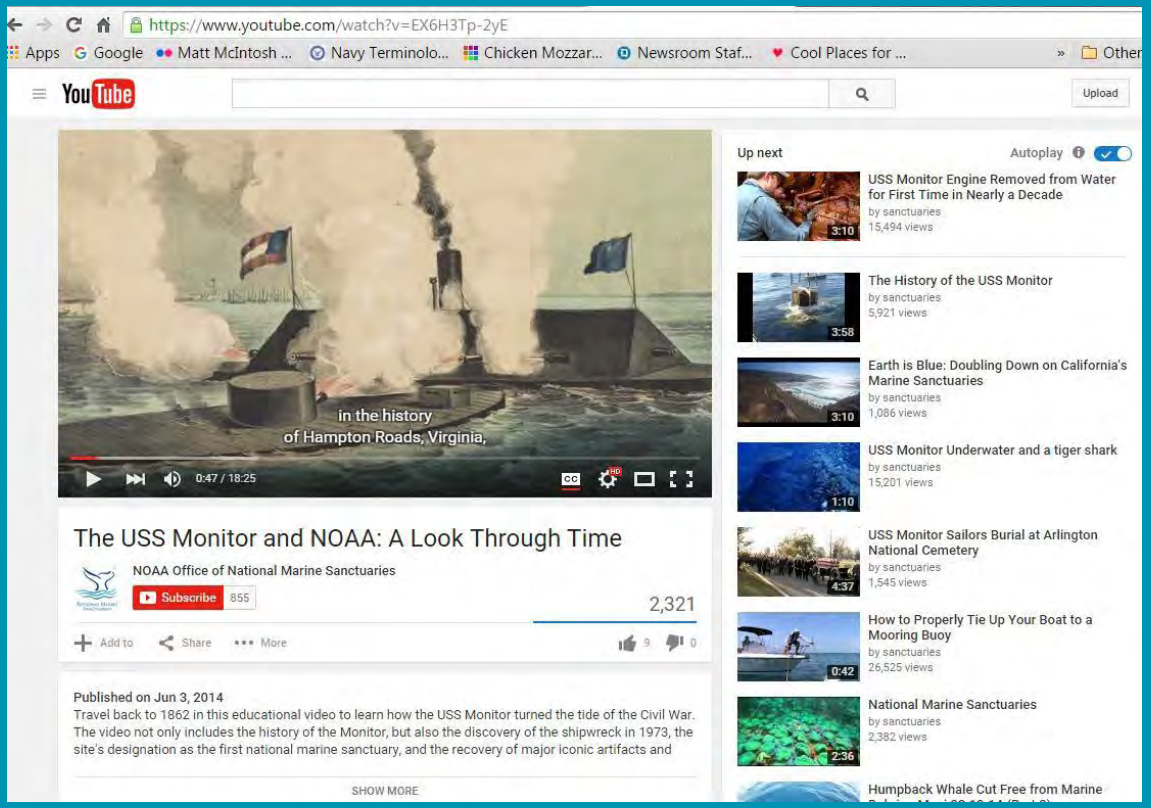
- Recognize unique features of the Outer Banks, N.C.
- Understand the area's significance during World War II
- Discover the final resting place of the USS *Monitor*
- Appreciate the importance of lighthouses along the coast
- Explain why this area is called *The Graveyard of the Atlantic*
- Learn about the rich ecology of the Outer Banks

Teacher Prep

Download videos and/or oral histories, or bookmark website http://monitor.noaa.gov/obxtrail/ for students.

http://sanctuaries.noaa.gov/education

Video: *The USS* Monitor *and NOAA: A Look Through Time*



https://www.youtube.com/watch?v=EX6H3Tp-2yE

Or visit the “Teacher” Section at http://monitor.noaa.gov

To download copies of modules and activities visit:

http://monitor.noaa.gov

“Education” Tab

Monitor NMS Education Websites

http://monitor.noaa.gov/education/teachers.html

MONITOR NATIONAL MARINE SANCTUARY

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EDUCATION

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Teachers

The Monitor National Marine Sanctuary offers a variety of free resources for educators. Resources include social studies activities, as well as science, technology, engineering, art, and math (STEAM) activities, lesson plans, and guides. Upon request, the sanctuary staff offers free in-school programs on a variety of topics for the K-12 audience. Free educator workshops for school staff can also be scheduled year round.

Teachers building an ROV during a teacher workshop. (Photo: Monitor Collection)

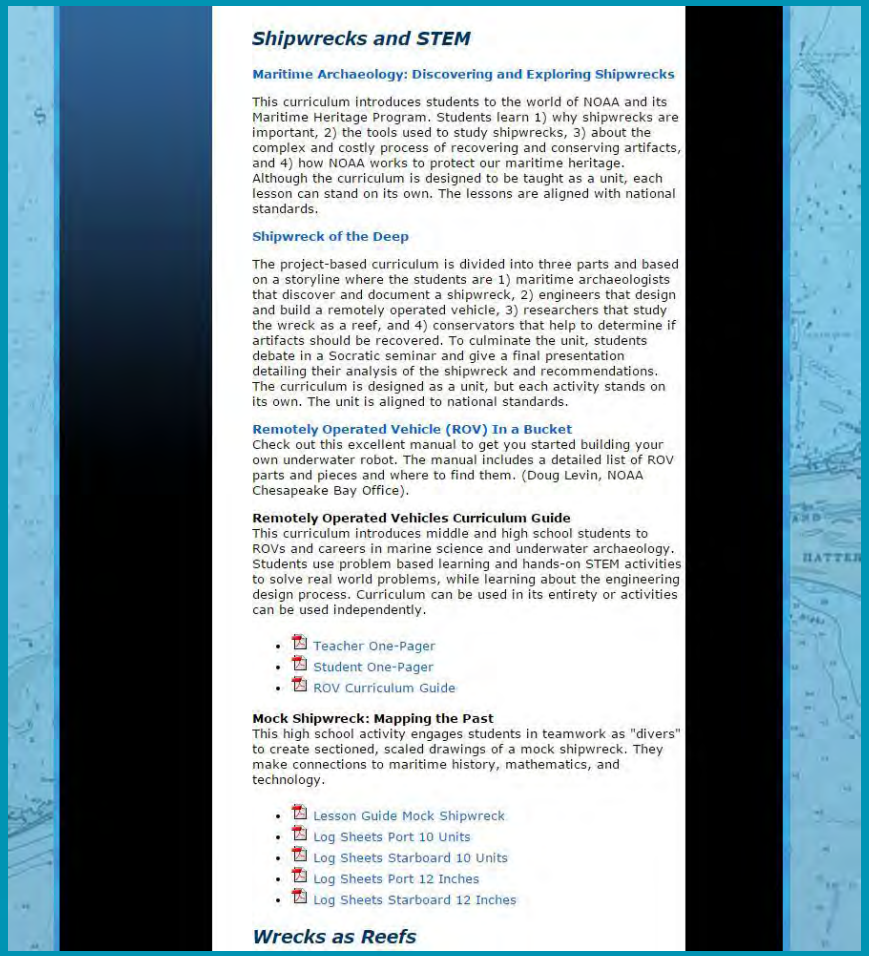
Below are three sections: Civil War and USS *Monitor*; Shipwrecks; and Wrecks as Reefs. Each section is filled with STEM activities and lesson plans.

For additional information about specific products and programs, or to request hard copies of products, please contact monitor@noaa.gov. When requesting hard copies of items, please remember to include your physical mailing address.

Civil War and USS Monitor

New Video for Ages 9 (Grade 4) to Adult

The USS *Monitor* and NOAA: A Look Through Time Video
Travel back to 1862 in this educational video to learn how the USS *Monitor* turned the tide of the Civil War. Learn about the discovery of the shipwreck in 1973, the site's designation as the first national marine sanctuary, and the recovery of major iconic artifacts and how they are being conserved today. Included are the recent events to identify two *Monitor* sailors' remains and their burial at Arlington National Cemetery. Funding for this video was provided in part by NOAA & The Preserve America Initiative.
Click here to view the *Monitor* video on YouTube



Shipwrecks and STEM

Maritime Archaeology: Discovering and Exploring Shipwrecks

This curriculum introduces students to the world of NOAA and its Maritime Heritage Program. Students learn 1) why shipwrecks are important, 2) the tools used to study shipwrecks, 3) about the complex and costly process of recovering and conserving artifacts, and 4) how NOAA works to protect our maritime heritage. Although the curriculum is designed to be taught as a unit, each lesson can stand on its own. The lessons are aligned with national standards.

Shipwreck of the Deep

The project-based curriculum is divided into three parts and based on a storyline where the students are 1) maritime archaeologists that discover and document a shipwreck, 2) engineers that design and build a remotely operated vehicle, 3) researchers that study the wreck as a reef, and 4) conservators that help to determine if artifacts should be recovered. To culminate the unit, students debate in a Socratic seminar and give a final presentation detailing their analysis of the shipwreck and recommendations. The curriculum is designed as a unit, but each activity stands on its own. The unit is aligned to national standards.

Remotely Operated Vehicle (ROV) In a Bucket
Check out this excellent manual to get you started building your own underwater robot. The manual includes a detailed list of ROV parts and pieces and where to find them. (Doug Levin, NOAA Chesapeake Bay Office).

Remotely Operated Vehicles Curriculum Guide
This curriculum introduces middle and high school students to ROVs and careers in marine science and underwater archaeology. Students use problem based learning and hands-on STEM activities to solve real world problems, while learning about the engineering design process. Curriculum can be used in its entirety or activities can be used independently.

- Teacher One-Pager
- Student One-Pager
- ROV Curriculum Guide

Mock Shipwreck: Mapping the Past
This high school activity engages students in teamwork as "divers" to create sectioned, scaled drawings of a mock shipwreck. They make connections to maritime history, mathematics, and technology.

- Lesson Guide Mock Shipwreck
- Log Sheets Port 10 Units
- Log Sheets Starboard 10 Units
- Log Sheets Port 12 Inches
- Log Sheets Starboard 12 Inches

Wrecks as Reefs

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https://www.facebook.com/pages/Monitor-National-Marine-Sanctuary/751015779 27

- #MonitorMondays
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- *Monitor* Trivia
- This Day in History
- Current Expeditions
- And More!

Thank You!

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757-591-7328