

Historic Shipwrecks of the Gulf of Mexico A Teacher's Resource

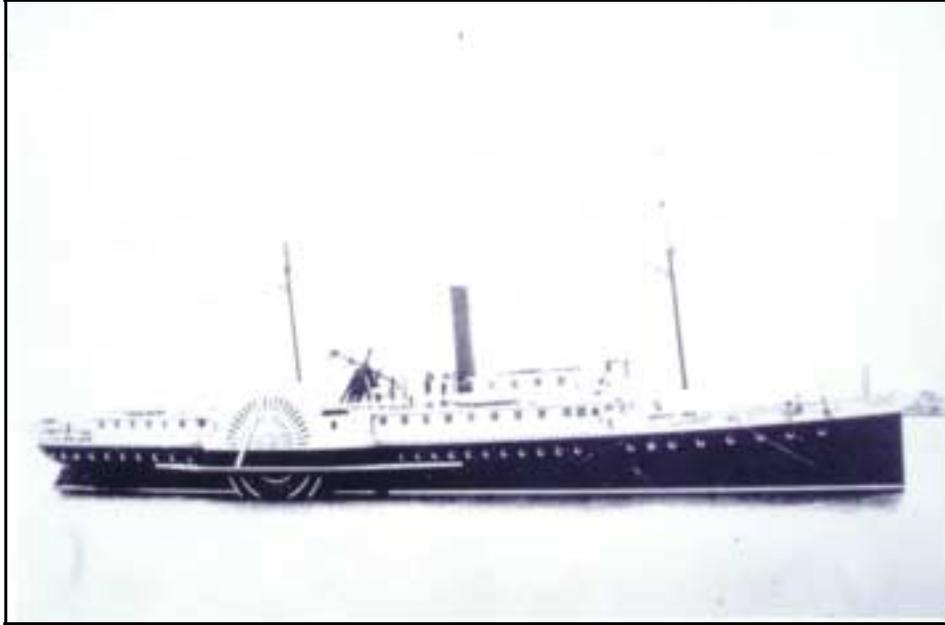


MMS

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region



Instructional Resources for the Sidewheel Steamship *Josephine*



The sidewheel steamship *Josephine* (Photo courtesy of the Mariner's Museum, Newport News, VA).

“A Steamer from Havana Goes to Pieces near the Mississippi Coast – No Lives Lost!”

This was the headline from a New Orleans newspaper on the morning of February 9, 1881. The steamer was the sidewheel merchant ship *Josephine*. She was enroute from Havana, Cuba, to New Orleans, Louisiana, when she foundered during a severe winter storm. Though all of her 65 passengers and crew survived, the shipwreck may still hold clues to the lives of people who endured this perilous journey.

In 1997 the shipwreck was identified off the coast of Biloxi, Mississippi, by marine archaeologists with the Department of the Interior's Minerals Management Service (MMS). Research conducted on this important shipwreck has also identified clues about the merchant shipping industry, and the development of iron-hulled steamship technology of the 19th century.

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About This Lesson

This lesson is based on the National Register of Historic Places registration file “*Josephine*” and other sources on sidewheel steamships of the 19th century. It was written by Dave Ball, marine archaeologist with the U.S. Department of the Interior’s Minerals Management Service, Gulf of Mexico Region, New Orleans, Louisiana. The material presented follows the National Register’s Teaching with Historic Places (TwHP) guidelines. You can also access this Teacher’s Resource online at <http://www.gomr.mms.gov/homepg/lagniapp/shipwreck/>.

Where it fits into the curriculum

Topics: This lesson could be used in units on commerce, maritime transportation, or technology. It can be used to help students learn about the maritime industry along the Gulf Coast of the United States in the 19th century, or to understand the importance of merchant steamships in the settlement of the Texas Gulf Coast.

Time period: Mid-19th century

Standards: This lesson complies with standards set forth by the National Council for the Social Studies. In particular, it falls within the following themes:

- II. Time, Continuity, and Change;
- III. People, Places, and Environment;
- VII. Production, Distribution, and Consumption;
- VIII. Science, Technology, and Society.

Objectives for students

- 1) To understand the importance that maritime transportation had on the settlement and development of the Gulf Coast.
- 2) To examine the significance of historic shipwrecks in understanding the past.
- 3) To learn how historical documents and photos can assist researchers in learning more about historic events.
- 4) To gain skills in drawing conclusions on the basis of map analysis, readings, and visual exercises.

Materials for students

The materials listed below either can be used directly on the computer or can be printed out, photocopied, and distributed to students. The maps and images appear twice: in a low-resolution version with associated questions and alone in a larger, high-resolution version.

- 1) One map of steamship routes along the Gulf Coast, and the current location of the vessel.
- 2) Three readings on the importance of steamship commerce along the Gulf of Mexico in the mid 19th century, the foundering of the vessel, and Charles Morgan, the owner of the *Josephine*.
- 3) One sidescan-sonar image and one site map of the shipwreck for comparison.
- 4) Three photos and a sketch of the *Josephine*.
- 5) One list of vocabulary terms.
- 6) One list of supplemental resources.

Visiting the site

Because of the nature of this particular site, it is rather difficult to visit. However, it is not impossible. The remains of the vessel lie in about 35 feet of water, approximately 6 miles south of Ship Island and Horn Island. Visitors must be certified SCUBA divers, and would need to have access to a boat to take them to the site.

Setting the Stage

Explain to students that the *Josephine* played a critical role in the development of merchant shipping along the Gulf Coast. Before the advent of cars, airplanes, and gas-powered engines, steamships were one of the most dependable and commonly used methods of transporting passengers and cargo over long distances. With the development of iron-hull steamships in the mid 19th century, the merchant shipping industry grew and regular routes were established to areas that had previously been difficult to reach. Situated near the mouth of the Mississippi River, the city of New Orleans held a unique position that allowed it to become the largest port city in the southern United States. Goods from the interior U.S. were brought downriver and loaded onto ocean-going vessels for transport to markets elsewhere along the U.S. coast, or to foreign markets such as those in Europe. Likewise, foreign merchandise was transferred from ocean-going ships at New Orleans to riverboats, then carried upstream to reach towns in the interior.

One of the most influential men involved in the Gulf Coast steamboat industry was Charles Morgan, who developed interests in merchant shipping in the 1830s. During his career, Morgan established the first regular steamship route between New York and Charleston, South Carolina. He started the first steamship business in Texas, which brought the first steamship to the Gulf of Mexico. He had ties to the Pacific merchant steamship trade, and also had interests in merchant shipping in Central America and Mexico. Morgan's influence can still be seen in the southern U.S. today. For example, Brashear City, Louisiana, was renamed Morgan City after he established a regular steamship route between this city and Galveston, Texas. The Morgan steamship *Josephine* was the first vessel to operate along that route.

By conducting historical research, as well as recording and analyzing the current remains of the *Josephine*, we can learn more about this vessel and the impact it had on the merchant steamship trade along the U.S. Gulf Coast in the mid 19th century.

Locating the Site

Map 1: Steamship routes along the United States Gulf Coast.

During the middle of the 19th century, the major transportation routes along the southern states were often over water. The map below shows the major water routes discussed in the following pages; shown also are the approximate locations of the shipwrecks *Mary*, *New York* and *Josephine*.



Exercises for Map 1:

1. Trace the major steamship routes along the Gulf Coast of the United States.
2. Review the locations of each of the cities on the map.
3. Locate the two major routes of the steamship *Josephine*: Morgan City to Galveston; New Orleans to Havana.
4. Review the locations of the three shipwrecks on the map.
5. Why do you think New Orleans developed into one of the major port cities of the United States?

Determining the Facts

Reading 1: The History of the Steamship *Josephine*

In 1867 New York businessman Charles Morgan contracted the Harlan and Hollingsworth Company to construct the iron-hull sidewheel steamer *Josephine*. Completed in early 1868, the vessel first arrived at New Orleans, Louisiana, on February 29, 1868, having departed from Wilmington, Delaware, on February 6. The *Josephine* made stops in Havana, Cuba, and Key West, Florida, along the way.

The *Josephine* was designed for use along the U.S. Gulf Coast, and incorporated design features similar to most of the sidewheel steamers that were constructed along the Atlantic Coast during the middle 1800s. The ship had a round stern, two cabins, two decks, two masts, and could transport up to 250 passengers. While no plans have been identified for this vessel, she was registered at 1,282.53 tons, 235 feet long, 34 feet wide, with an 18.5' depth of hold. Though she operated primarily between New Orleans, Louisiana, and Galveston, Texas, the *Josephine* foundered in a storm in 1881 while enroute to New Orleans from Havana, Cuba.

Among the passengers on her maiden voyage were the vessel's owner, Charles Morgan, and several members of his family. A newspaper report from that time described the vessel as "...the most beautiful and elegant of any that have entered the port of Havana" (*Daily Picayune* 1868). The *Josephine's* arrival in the Crescent City (New Orleans) coincided with the implementation of a regular route between Brashear City (later renamed Morgan City in honor of Charles Morgan), Louisiana, and Galveston, Texas. During her service, from 1868 to 1881, the *Josephine* made two to three trips per week between these ports. Additional vessels also serviced this route. As with many of the regularly established routes, the U.S. Mail became a standard cargo on these vessels, allowing for regular communication between the New Orleans and Galveston areas.

The *Josephine* played a critical role in the development of merchant shipping along the Gulf Coast. As regular routes were established, harbor improvements were made, which contributed to the growth of these areas. As a result, people and businesses began to settle near these locations in order to take advantage of the newly established transportation.

Not long after the *Josephine* began regular service she was almost lost when she ran aground off the Texas coast. After about two weeks the steamer was refloated, taken back to New Orleans and placed in dry dock at the Vallette Dry Dock facility in Algiers where she was inspected for leaks. Inspection was unable to identify any major damage, and the vessel was soon returned to service.

For the most part, the *Josephine's* service along the Gulf Coast was uneventful. In March 1875, however, the *Josephine* played a role in Texas history by serving as a refuge for the citizens of Corpus Christi when Mexican bandits attacked the town. When it was learned that an assault was imminent, residents boarded the *Josephine* and waited it out safely offshore.

Early in 1881 the *Josephine* was transferred to the New Orleans, Louisiana, to Havana, Cuba, route, replacing the steamer *Morgan*, another vessel built by the Harlan and Hollingsworth Company and operated by Charles Morgan. This was to be the *Josephine's* last voyage.

On January 27, the *Josephine* left New Orleans, and arrived in Havana a few days later. On February 2 she departed Havana with several passengers and a cargo of tobacco and cigars. Among the passengers was a family of musicians led by Professor Herman Franko. According to Professor Franko's account of the foundering, the steamer began her return trip to New Orleans at 5 pm on February 2. She arrived in Key West the following afternoon and departed for Cedar Key that evening, arriving on the morning of Friday the fourth. At Cedar Key the *Josephine* picked up several more passengers. Included among the new passengers were 14 members of an Italian crew that had recently survived the sinking of their lumber ship, originally bound for London from Pensacola.

The *Josephine* left Cedar Key around 4 pm Friday enroute to New Orleans, and sailed without incident until sometime Sunday, when one of the crewmembers noticed that the vessel was leaking. Passengers and crew worked frantically to bail water, but could not control the leak, so arrangements were made to abandon the ship. Prior to the Captain giving the order, however, the leak began to subside. Yet not long after, the seas picked up and the *Josephine* began to take on water once more. On Monday evening the Captain again had the crew prepare to abandon ship. By 3 am Tuesday morning all had escaped, and the vessel began to heel to one side. Though all of the approximately 65 passengers and crew escaped the sinking, the captain's dog was not so lucky.

A second account, from an unidentified passenger, said the *Josephine* ran into a hurricane sometime Saturday afternoon, which did not let up until Monday. "On Sunday morning it was discovered that the pressure of the water against the side of the ship opened the seams and the water was pouring in at a fearful rate." This incident was reported as the first serious accident to a Morgan Line vessel in eleven years. The loss of the *Josephine* was valued at \$75,000.

Though it was described as a hurricane by one of the survivors, the time of the foundering was in early February, well after hurricane season ends on the Gulf Coast. Nevertheless, it must have been a very severe winter storm, for several accounts of storm damage were detailed in the February 10, 1881, edition of the New Orleans *Daily Picayune*. Included in the reports was an account that most of the buildings at Pass Manchac were destroyed. Damage was also incurred at least as far east as Pensacola, Florida.

Discovery of the *Josephine*

Today the shipwreck lies in about 38 feet of water between Horn Island and Ship Island, two of the barrier islands in the Chandeleur chain off Mississippi. Divers from the Department of the Interior's Minerals Management Service carried out investigations on this wreck during the summers of 1997 and 1999. These investigations were limited to just a few days, with the primary purpose of photo-documenting the site. The investigations also aimed to collect as much information as possible to confirm the identification of the vessel using non-invasive techniques.

At present, much of the iron hull of the wreck is buried, but appears to be mostly intact from the keel to the waterline. The upper hull above the waterline is gone. The bow of the ship is completely buried, but the line of the hull may be followed with only short interruptions to the vessel's rudder.

One of the most dramatic features of the wreck is the walking beam engine, the diamond-shaped feature that connected the engine piston to the eccentric of the paddlewheels, and which lies collapsed against the starboard side of the ship. The walking beam engine was built by the Morgan Iron Works Company of New York City. This company was also owned by Charles Morgan.

Questions for Reading 1

1. During what years did the *Josephine* operate between Brashear City and Galveston?
2. What was one of the regular cargoes carried on the *Josephine*?
3. How many trips did the *Josephine* make to Havana, Cuba?
4. Approximately how many days did it take to travel from New Orleans to Havana?
5. What caused the vessel to sink?

Determining the Facts

Reading 2: Who was Charles Morgan?

One of the foremost figures in the development of the steamship trade along the Gulf Coast of the United States was not a Southerner at all, but a New York businessman named Charles Morgan. Morgan was born in Killingsworth, Connecticut, on April 21, 1795. At the tender age of 14, young Charles traveled to New York City to take a position as a grocery clerk. Opportunities abounded for ambitious young men in the bustling port of New York and by age 20 Morgan was proprietor of a *ship chandlery* and soon thereafter began importing goods from the southern United States and the West Indies.

Charles Morgan developed interests in merchant shipping in the 1830s and achieved success numerous times. As part owner of the New York and Charleston Steam Packet Company, he established the first regular steamship route between these two cities in 1834. Shortly thereafter, he bought out the other partners and established the Southern Steam Packet Company. This company prospered under his direction and acquired government contracts to transport U.S. troops and supplies to Florida during the Florida Indian Wars. The company also secured a contract to transport the U.S. Mail between New York and Charleston.

In 1837 Charles Morgan expanded his interests to the Gulf Coast. Though he lost about ten ships in the process, he established the first regular steamship service in Texas in the late 1830s. Around this time Morgan also had ties to the Pacific merchant steamship trade and merchant shipping in Central America and Mexico.

As with all of Morgan's steamship companies, one of the regular cargoes shipped on the Gulf Coast line was the U.S. mail. By 1855 Morgan's Southern Steamship Company established routes between New Orleans, Galveston, and Port Lavaca, and by 1860 Morgan was operating six regular routes in the Gulf.

In addition to his vast steamship interests, Morgan also developed a lucrative ironworks company. The Morgan Iron Works company, located in New York City, became one of the leading producers of marine steam engines in the United States in the mid-19th century. The company provided steam engines for many of the Atlantic coastal steamers. It also equipped most of the ships employed by Morgan, as well as many of the American-owned steamships operating in China. At its peak, the company employed over 1,000 men.

During the Civil War, the Morgan Iron Works supplied machinery for several Union naval vessels and also constructed the Union Monitor-class ironclad *Onondaga*. After most of his Gulf Coast ships were commandeered by the Confederate Navy, the Southern Steamship Company ceased operations in 1863. A few of his remaining Gulf Coast steamers, however, operated as *blockade runners* during the war. Always one to profit from opportunity, Morgan arranged for the construction of five new vessels at the Harlan and Hollingsworth ship building facilities in Wilmington, Delaware, between 1862 and 1864. These ships operated as Federal charter vessels. After the Civil War, Morgan's interests returned to the Gulf of Mexico and within four years had surpassed his pre-war holdings.

Morgan's greatest goal after the Civil War was to develop a unified system of steamship and rail lines that would connect the Gulf southwest with the Mississippi Valley, northern Latin America, and the Atlantic and Pacific coasts. Between 1877 and 1885, Morgan realized much of his dream. The initial step was taken by the newly elected Democratic legislature of 1877, which chartered Morgan's Louisiana and Texas Railroad and Steamship Company (M.L. & T.R. & S.), giving him the widest possible latitude to extend rail lines throughout Louisiana and Texas, to connect to existing lines, and to own and operate his ships.

Charles Morgan died at the age of 83 in 1878, at the zenith of his company's power and influence. The M.L. & T.R. & S. lived on briefly in the capable hands of Morgan's son-in-law and

heir, Charles Whitney, until his death in 1882. Between the death of Charles Whitney and the railroad consolidation movement of the 1880s, the Morgan Line ceased to exist as a family enterprise by 1885. The mark that it left on the economic history of the Gulf South and on the United States was indelible. During the span of Morgan's lifetime, the public had come to take the existence of regular, long-distance transportation for granted, and national and state governments undertook projects that had been left to private initiative. In other words, the modern mixed economy evolved as a result of achievements of men such as Charles Morgan.

Remains of an Empire

Of the 117 steamships owned by Charles Morgan or his corporate enterprises between 1833 and 1885, the wrecks of three have been discovered in the Gulf of Mexico or contiguous waters. One of these, the *Mary*, was recorded by archaeologists off Aransas Pass, Texas, in 1995. The U.S. Department of the Interior's Minerals Management Service (MMS) has documented two others, the *New York* and the *Josephine*. Taken together, these vessels represent the span of steamships employed by the Morgan Line and document the changing technology of steam navigation in the United States.

Questions for Reading 2

1. When did Charles Morgan begin operating merchant steamships?
2. Between what two cities did his first steamships operate?
3. What was one of the primary cargoes transported on all of Morgan's steamships?
4. Did Charles Morgan work with the Union, the Confederacy, or both sides during the Civil War?
5. How many of his ships have been found by archaeologists? What are their names?

Determining the Facts

Reading 3: Paddlewheel Steamboats

By the beginning of the 19th century, several cities located along the coast and at the mouths of major waterways in the United States had already been established as centers for maritime trade and commerce. Cities like New York, Boston, and New Orleans served as hubs to move products and people from the interior to places elsewhere. Regular maritime shipping routes had also been established between coastal communities of the U.S. as well as with major markets overseas (primarily in Europe). People from the interior used the major river systems to transport their goods to these coastal port cities where they could be loaded on large oceangoing vessels for further transport to other markets. In return, the large oceangoing vessels brought goods from other markets to the coastal ports, where they were off loaded and then shipped upriver to the smaller communities of the interior.

Though the routes these sailing vessels traveled had long been established, their reliability to arrive on a particular day was extremely variable. While riverboats could rely on both wind and current to carry them downstream, the oceangoing vessels were dependent primarily on sail power. If there was no wind to carry a vessel, it could cause serious delays, sometimes up to several weeks.

In the early 1800s, steamboat technology began to take off in the United States. The idea of harnessing the energy produced from steam was not new, but steamboat technology was not readily accepted until Robert Fulton successfully completed construction of the *Clermont*, the first steamboat built in the United States. After its trial run from New York to Albany in 1807, a regular route was established and the *Clermont* became the first steam-powered packet-boat. The reason the *Clermont* was so successful was because she was able to reliably make the round trip voyage from New York to Albany to New York, a distance of approximately 250 miles, in about 62 hours. Though this seems rather long by today's standards (for instance, a car on the highway can travel this distance in about 4 hours), sailboats could take several days to complete a journey of this distance.

In December 1811 the first steamboat began its way down the Ohio and Mississippi rivers, from Pittsburgh, Pennsylvania, to New Orleans, Louisiana. This was the sternwheel steamer *New Orleans*, owned by Nicholas J. Roosevelt. It arrived at the city of New Orleans on January 12, 1812, taking fourteen days to complete this voyage. Once it was shown that steamboats could reliably travel great distances on the navigable waterways of the United States, they became the preferred method of transporting passengers and cargo. Major waterways of the United States, such as the Missouri, the Ohio, and the Mississippi, as well as the Great Lakes, and the coastlines of the Atlantic, Pacific, and Gulf of Mexico became the primary transportation routes of the 19th century.

Steamboats had many advantages over sailboats. Since steamboats were not dependent upon the wind to move them, they could travel non-stop as long as the engine was operational. With the ability to operate regularly and faster than sailboats, steamboat owners could schedule frequent and dependable arrival and departure times, which, in turn, encouraged the development of such things as tourism, transshipment of fresh produce, and the expansion of settlement into frontier areas. Further, since all of the early steamboats were propelled by large paddlewheels, they could maneuver in much shallower water.

As more steamboats were constructed, and more routes established, maritime commerce increased. As new routes were developed, steamboat owners would often work closely with local businesses to develop facilities to improve maritime trade. Improvements were often made to facilities such as harbors and wharves, and once the area began to grow, more warehouses were built to handle the rise of import and export commerce.

Another key component of regular steamboat routes was the transport of the U.S. mail. Since the inland and coastal waterways were the most efficient means of travel, many steamboats were contracted to carry the mail between port cities. The reliability of regular mail service and supplies, as well as improvements to infrastructure, made these port cities more desirable to people, and resulted in population increases in these cities as well.

The heyday of the paddlewheelers came after the end of the American Civil War. During the 1870s and 1880s, people came to rely on steamboats to take them between cities and to transport freight. However, by the early 20th century, steamboats were phased out as new ship technology was developed. Today, paddlewheel steamboats are used primarily for tourism, as a way to allow people to experience what 19th-century river life was like.

Questions for Reading 3

1. What was the name of the first steamboat built in the United States? When was it built?
2. Who was responsible for bringing the first steamboat down the Mississippi River to the city of New Orleans?
3. What was the name of the first steamboat to cruise down the Mississippi River, and from where did it start?
4. Describe some of the reasons why steamboats were more efficient than sailboats.
5. Describe how steamboats influenced development of port cities.

Visual Evidence

Exercise 1: Mapping the shipwreck *Josephine*.

The sketch map below (Figure A) was made from information gathered by scientific divers working for the Minerals Management Service in 1999. Additional information was obtained by analyzing data obtained through a sidescan-sonar survey of the shipwreck (Figure B). A sidescan-sonar operates by sending out an acoustic signal from a sensor (towfish) that is towed by a survey boat. The signal is sent from both sides of the sensor to the seafloor, then the signal returns to the sensor, giving a visual image of the bottom surface.

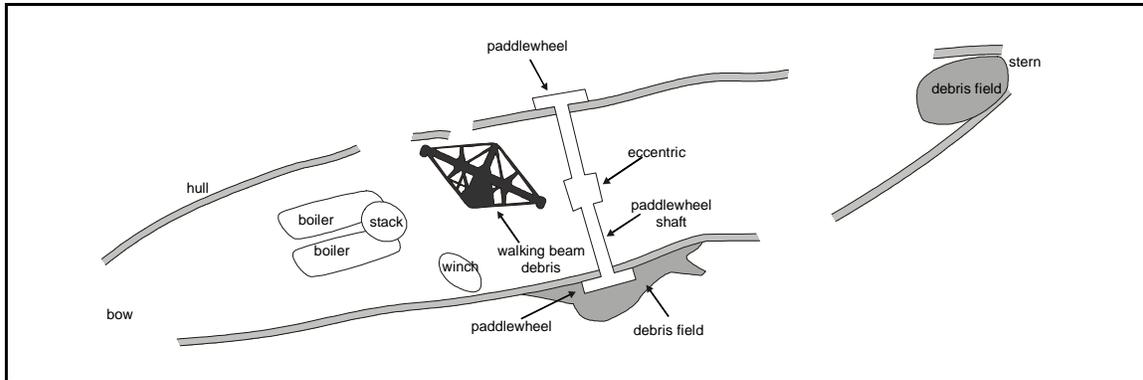


Figure A. Sketch map of the sidewheel steamship *Josephine* (site number 22HR843).

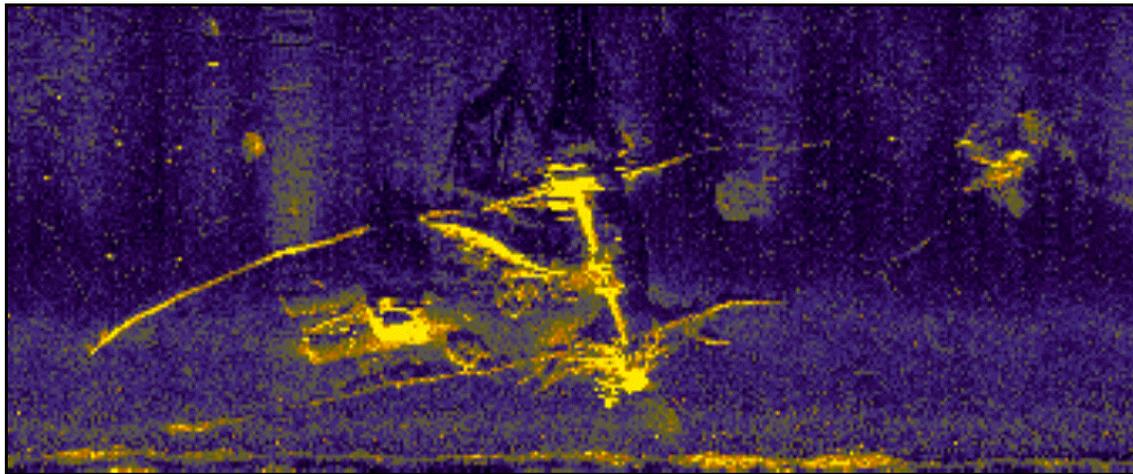


Figure B. Sidescan-sonar image of the *Josephine*.

Questions for Figures A and B:

1. Compare the two figures and locate the outline of the hull in Figure B.
2. How can you tell the image in Figure B is a shipwreck?
3. What features can you identify in Figure B?
4. Why do you think the hull line in the two figures is not continuous?

Visual Evidence

Exercise 2: The Walking Beam Engine

The two figures below depict part of the walking beam engine that was used on the *Josephine* and many other steamships. The walking beam was a specific type of steam engine developed for steamboats in the United States around 1830. As Figure A shows, the diamond-shaped beam sits atop an A-frame structure and is connected to rods at either end. One of these rods causes the crankshaft to move, which in turn causes the paddlewheel to rotate, propelling the ship through the water.

This type of engine was used primarily for river steamboats, but was also found occasionally on oceangoing vessels. The drawing (Figure A) comes from an historical sketch of the walking beam engine that was used to power Charles Morgan's steamship *Arizona*, which was built in 1858. The photo (Figure B) was taken by scientific divers from the Minerals Management Service during their investigation of the shipwreck in 1999. Note the similarity of the diamond-shaped beam at the top of Figure A to the feature in Figure B.

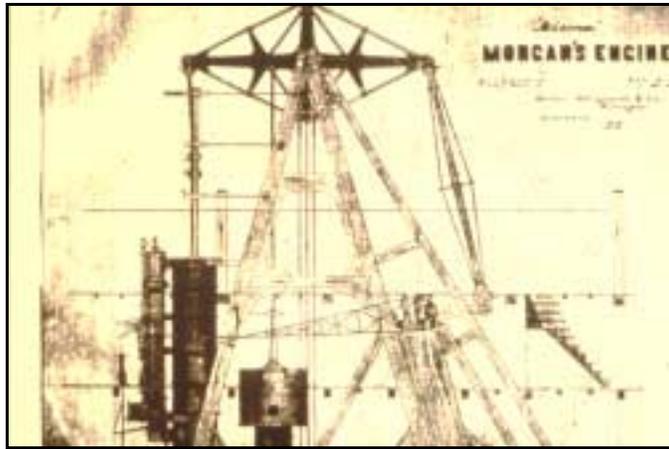


Figure A. Historical sketch of walking beam (courtesy of the Mariner's Museum, Newport News, VA).



Figure B. Photo of divers mapping walking beam of *Josephine*.

Questions for Figures A and B:

- 1) Locate the diamond-shaped walking beam and the A-frame structure in Figure A.
- 2) Which of the following (the mast, the paddlewheels, or the bow) would you expect to find near the walking beam engine?
- 3) How do you think the top figure (Figure A) can help archaeologists document features like the walking beam engine (Figure B)?

Visual Evidence

Exercise 3: Photo Documentation

Below are two historical photos of the steamship *Josephine*. The first picture (Figure A) shows the vessel in operation, perhaps near New Orleans. The second photo (Figure B) shows the ship in dry dock, possibly after it ran aground off the coast of Texas (see Reading 1).



Figure A. Historical photo of *Josephine*, note walking beam (photo courtesy of the Mariner's Museum, Newport News, VA).



Figure B. Historical photo of *Josephine* in dry dock (photo courtesy of the Mariner's Museum, Newport News, VA).

Questions for Figures A and B:

- 1) Locate the walking beam engine in the photos above.
- 2) How do you think photos like these can help archaeologists document the current condition of the shipwreck?
- 3) What information can you infer about the construction of the ship on the basis of these photos (that is, how many decks, how many masts, how many paddlewheels? etc.).

Putting It All Together

Activity 1: Create a paddlewheel.

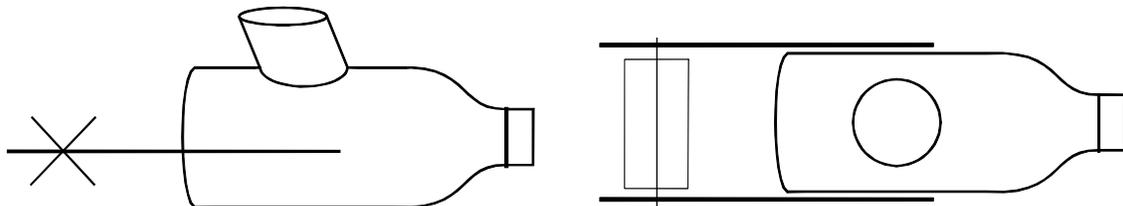
This activity is designed to give students a basic understanding of how a paddlewheel works. Students will construct a paddlewheel from the material listed below. After the activity is completed, explain to the students that the paddlewheel operates by using potential energy to create kinetic energy. When the rubber band is wound it stores energy (potential energy) until the paddlewheel is released. As it unwinds, it causes the paddlewheel to turn, pushing water away from the bottle (kinetic energy), and forcing the bottle forward. This exercise was adapted from the book *“Water, Paddles, and Boats”* by Pam Robson (Aladdin Books, 1992).

Materials:

1. A small plastic bottle with a top.
2. A rubber band.
3. Two sticks (or pencils), approximately 6 inches long.
4. One small cardboard juice or milk carton.
5. Tape and scissors.
6. An empty cardboard papertowel roll.
7. A sink or tub filled with water.

Assembly:

1. With the bottle on its side, tape the two sticks to either side of the bottle so that at least two inches of the stick lengths extend past the bottom of the bottle.
2. Cut two rectangular pieces from the cardboard carton, making sure the pieces are smaller than the base of the plastic bottle.
3. Cut a slit halfway down the middle of each rectangular piece, lengthwise. Slide these two pieces together to make the paddlewheel.
4. Place the paddlewheel between the two sticks at the base of the bottle and loop the rubber band around each stick. Be sure the paddlewheel does not touch the bottle or the sticks.
5. Fill the bottle with enough water so that the paddlewheel will be partially submersed.
6. Cut a one- to two-inch piece from the papertowel roll and tape this to the top of the bottle as shown in the figures below.
7. Now wind the rubber band, place the boat in water and let it go.
8. Have the students conduct different experiments with the paddlewheel. Does the boat travel farther if the rubber band is wound tighter? What happens if you wind the rubber band the opposite way? What happens if you use rubber bands of different sizes? Does the amount of water in the bottle affect the movement of the boat?



Putting It All Together

Activity 2: Local Shipwrecks

This activity is designed to give students a sense of the importance of underwater archaeology in their community. Over the past ten years, historic shipwrecks have been discovered in most of the major waterways of the United States. Have the students conduct an Internet search, or conduct research in their local library for underwater archaeological sites in their area (there are a few Internet sites listed in the “Supplementary Resources” section). See if the students can identify any shipwrecks that may have been associated with transporting people or merchandise to their area. Ask them to describe what impact this shipwreck had on their community. See if the students can determine how archaeologists are able to learn more about the history of their community by studying the remains of ships that wrecked more than fifty years ago.

Vocabulary

A-FRAME: A support structure that consists of two legs that come together at the top, resembling the letter A.

BOW: The front end of a boat or ship.

COASTAL STEAMER: A steamship that was built to operate in the open-water areas along the coast.

FOUNDER: The sinking of a ship at sea, usually caused by flooding of some sort.

IRON-HULL: This term refers to the material used to construct the hull of a vessel. The use of iron for hull construction did not begin until the middle of the 19th century, with the advent of the industrial revolution.

KEEL: Often referred to as the backbone of the ship. This is the principal timber that runs the length of the vessel, and is often the first timber placed in construction.

PACKET (PACKET-BOAT): A vessel that operated on a regular route carrying mail, passengers, and other cargo.

PADDLEWHEEL: A wheel that is fitted with a series of paddles, blades, or floats used to propel a vessel through the water. Paddlewheel propulsion is found on steamships and can be in the form of either a sternwheeler (where the paddlewheel is mounted on the back of the vessel), a centerwheeler (where the paddlewheel is mounted across the center of the vessel), or a sidewheeler (where the vessel is propelled by two paddlewheels, located near the center on either side of the vessel). Typically, paddlewheel ships can navigate in shallower waters than vessels propelled by other means.

SIDESCAN-SONAR: A remote-sensing device that operates with an acoustic sensor. This instrument consists of three components: a processor (computer), a sensor (towfish), and a cable. An acoustic signal is sent down and away from the sensor toward the seafloor. When the signal bounces off the seafloor and returns to the sensor, the signal is then processed by the computer to give a visual image of the bottom.

STARBOARD: The right side of a vessel. The word developed from an old English term "steer-board." This referred to the use of a board or rudder ("steor") that was used on the back right side of boats for steering.

STEAMBOAT (STEAMSHIP): A vessel that uses steam for power.

WALKING BEAM: A type of steam engine developed for steamboats in the United States around 1830. It was used primarily for river steamboats, but occasionally found on oceangoing vessels. As Exercise 2, Figure A shows, the diamond-shaped beam sits atop an A-frame structure and is connected to rods at either end. One of these rods causes the crankshaft to move, which in turn causes the paddlewheel to rotate, propelling the ship through the water.

WATERLINE: The line on a ship where the surface of the water is located. A ship's waterline can change according to whether the vessel is loaded or empty.

Supplementary Resources

Steamboat resources on the Internet:

Newton's Apple: Riverboats (show #1403), How does steam power big machinery?

This site was created to complement one of the shows from the PBS series "Newton's Apple." It contains lesson plans related to riverboats and steam engines, as well as a list of vocabulary words.

<http://www.eecs.umich.edu/~coalitn/sciedoutreach/funexperiments/agesubject/lessons/newton/riverboats03.html>

Project Steamboat

This site consists of a lesson plan to create your own steam-powered boat model. Information is presented on the results from two groups that built these boats.

<http://www.milwaukee.k12.wi.us/stuart/steamboat.html>

The History Channel Classroom Study Guides

The Mississippi: Steamboat's a Comin'. This is a companion website for a History Channel series on the Mississippi River. It includes vocabulary, discussion questions, and activities.

<http://www.historytv.com/classroom/guides/missstem.html>

Shipwreck resources on the Internet:

Take Only Photos and Leave Only Bubbles: Learn About American History from a Sunken Spanish Galleon.

This site focuses on studying a sunken Spanish galleon, and contains several links to additional underwater archaeology sites.

<http://score.rims.k12.ca.us/activity/bubbles/>

Blackbeard's Queen Anne's Revenge:

Learn about the famous pirate Blackbeard and his ship, the *Queen Anne's Revenge*. This site focuses on recent findings by marine archaeologists working for the North Carolina Department of Cultural Resources. The site is split into three learning levels: elementary, middle school, and high school.

<http://blackbeard.eastnet.ecu.edu/main.html>

Exploration, Colonization, and Immigration:

This site was developed by the University of West Florida and focuses on early explorers in Florida. It consists of a four-week unit that integrates different subject areas to teach students about early exploration. Included is a lesson on mapping skills.

<http://scholar.coe.uwf.edu/delunaexpedition/challenge.htm>

NOVA Online Teacher's Guide:

This site contains a list of numerous lesson plans that correspond to the PBS program "Nova." Lessons are listed alphabetically and by subject material, and contain several that are relevant to underwater archaeology and the study of shipwrecks. These include the La Salle shipwreck project, a history of Vikings, and a lesson on navigation.

<http://www.pbs.org/wgbh/nova/teachers/teachersguide.html>

National Maritime Museum:

The National Maritime Museum of the UK has put together an informative site that covers a wide range of seafaring topics from the British Empire. The site includes excellent classroom resources.

<http://www.nmm.ac.uk/education/index.html>

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