

# NAVAL HISTORY STEM-H LESSON PLAN

**LESSON PLAN:** How Does Sonar Work? Mapping the Ocean Floor

**DEVELOPED BY:** Kenneth A. Nagel, Apex High School, Academy of Information Technology, Apex NC, 2011 Naval Historical Foundation Teacher Fellowship

**ACTIVITY NAME:** Ocean Floor Mapping Worksheet

**OBJECTIVE:** Provide students a basic understanding of how sonar (SOund NAvigation and Ranging) is used to map the ocean floor. Students use a simple calculation to determine the depth of the ocean floor at 15 points from Miami Beach eastward to the wreck of the SS Sapona in the Bahama Islands. This is a total distance of 53 miles.

**MATERIALS:**

Data Map with sonar duration times listed (last page)

Graph Paper (following page).

**INSTRUCTIONS: Ocean Floor Mapping Worksheet**

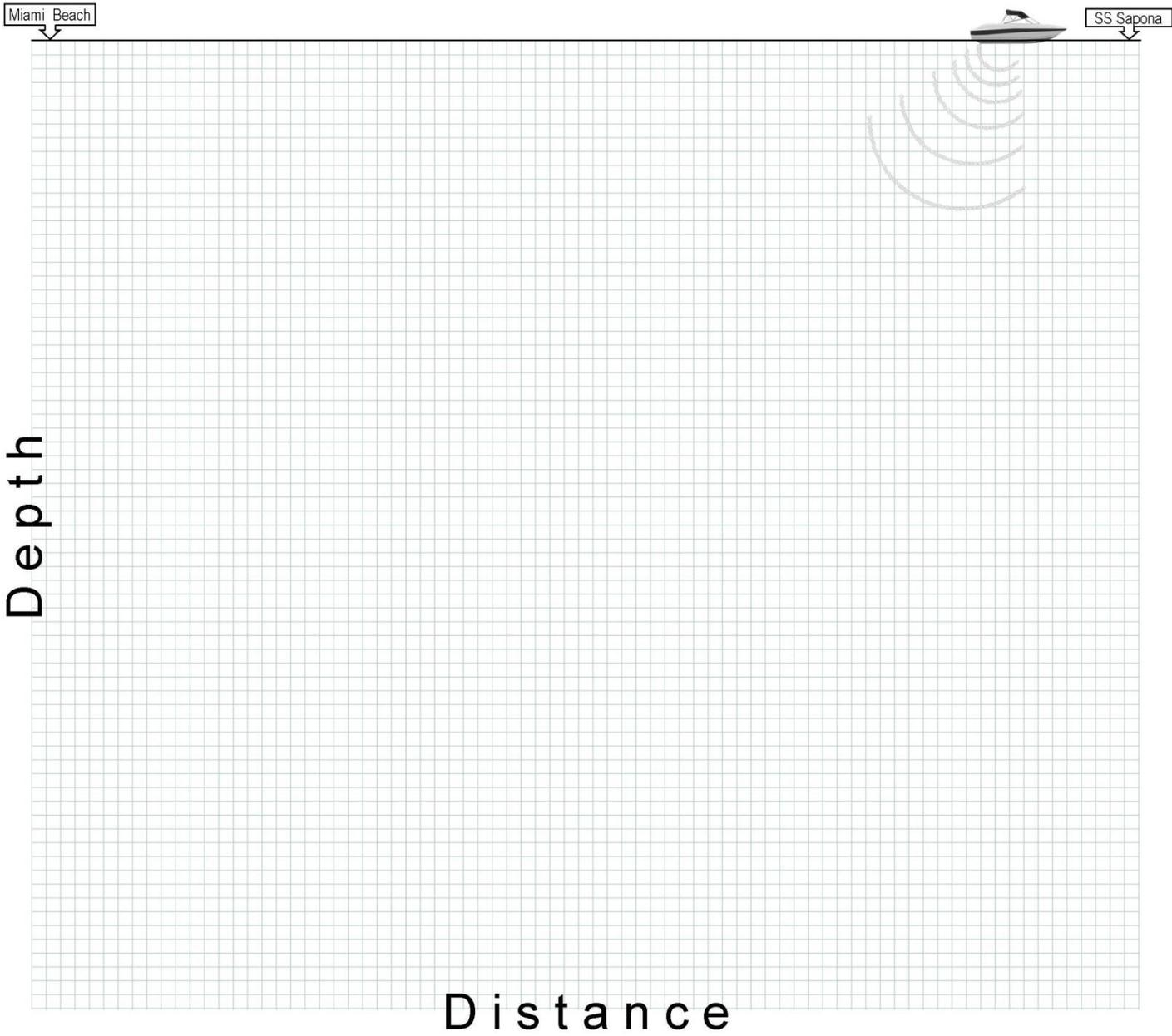
In 1926, the SS Sapona, a ship used to transport alcohol during prohibition, ran aground during a hurricane. Today the ship sits almost 54 miles from the beaches of Miami, yet even at this distance the water is so shallow that much of Sapona's remains are well above the surface. You can actually see the remains of the ship on Google Earth at these latitude and longitude coordinates: 25°39'2.22"N 79°17'36.17"W.



How is it that fifty-four miles out from the beach this ship is sitting in such shallow water? How deep is the water where the ship lies if it can still be seen above the waves? Does the water stay shallow all the way from Miami Beach to the wreck? With sonar sounding data it's possible for us to sketch a profile of what the ocean floor looks like between Key Biscayne Beach and the wreck of the Sapona.

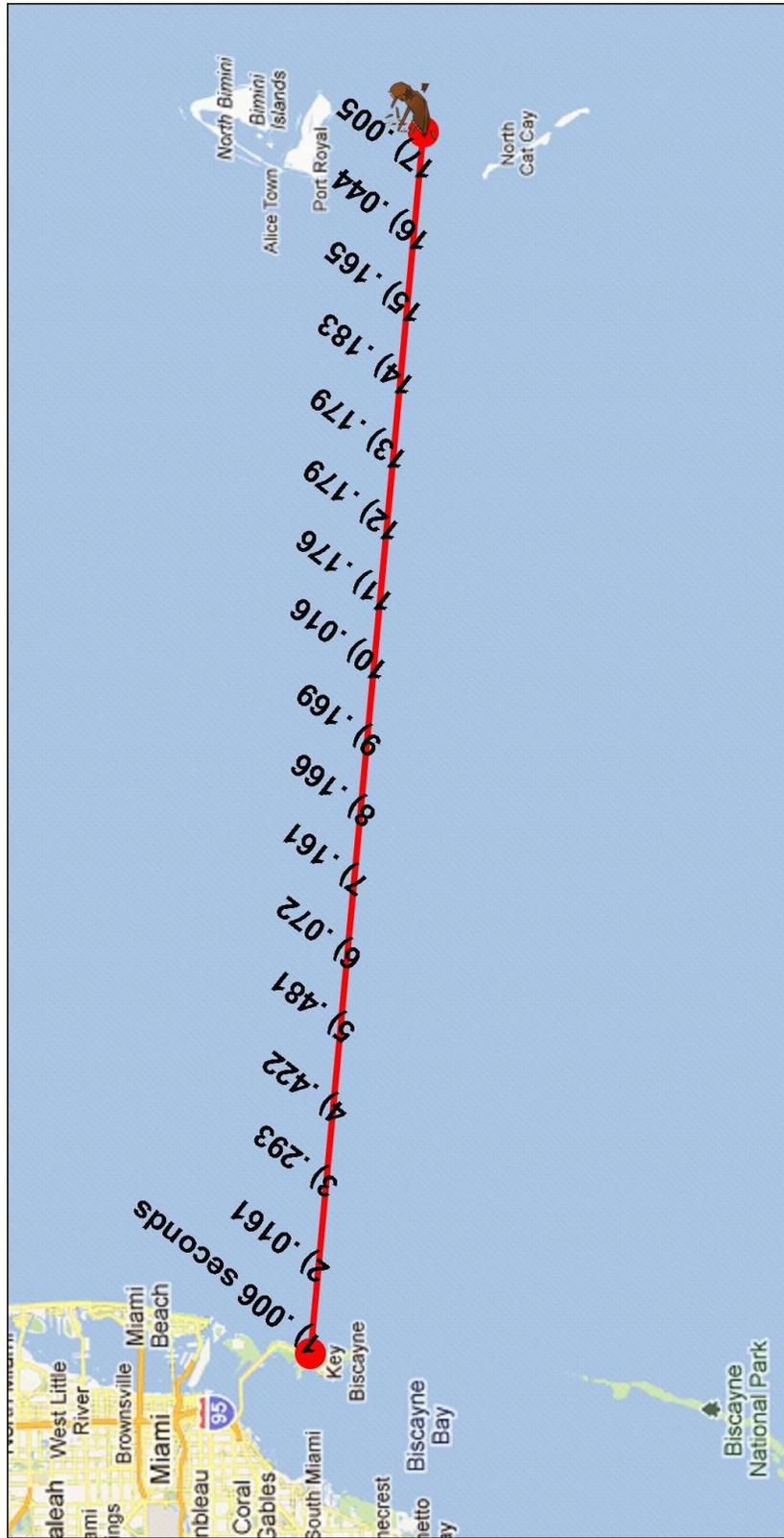
The map on the following page shows the Atlantic Ocean from Miami Beach eastward to the Bahamas. Imagine, you are on a boat traveling out to scuba dive the wreck of the Sapona. Along the way the boat you are traveling on is collecting sonar data. The sonar is emitting a soundwave and tells you **how long it took the sound to travel to the bottom and bounce back**. Using the times listed on the map, construct a cross-section showing the slope of the ocean. Remember, in saltwater sound travels at 5000 ft/sec.

# NAVAL HISTORY STEM-H LESSON PLAN



# NAVAL HISTORY STEM-H LESSON PLAN

## Data Map:



The 17 positions on the map shown here give the length of time that a sonar pulse took to travel to the ocean floor and back to the sonar array onboard your boat. Use the formula discussed in the article to determine the depth at each location. Transfer the data to the Ocean floor worksheet to create an ocean floor profile.

