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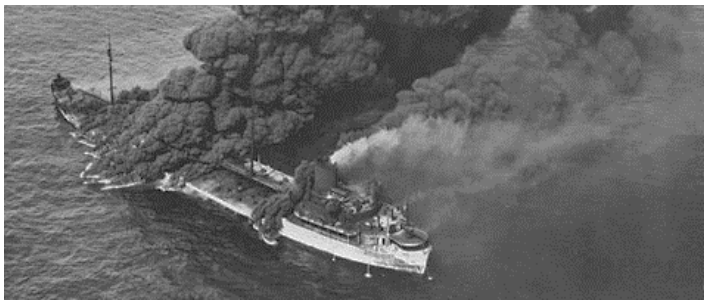


Figure 1. SS *Pennsylvania Sun* torpedoed by the German submarine U-571 in July 1942 (US Navy).

Willing to Attend Workshop?
Yes

Target Name/Area of Interest
Potentially Polluting Shipwrecks (PPW)

Geographic Area of Interest
Southwest, Northwest

Relevant Subject Areas
Marine Archaeology
Chemistry
Biology

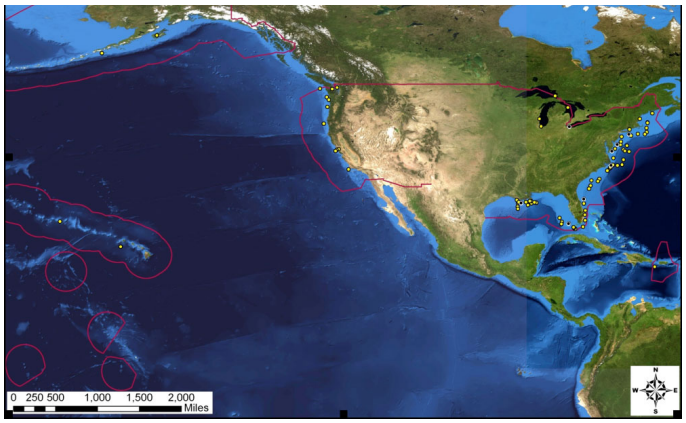


Figure 2. Location of 87 priority shipwrecks identified in NOAA's 2012 Potentially Polluting Wreck (PPW) study (NOAA).

Description of Topic Recommended for Exploration

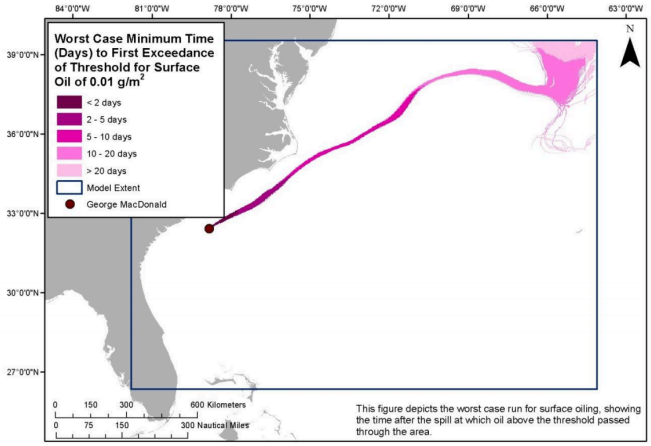
America's entrance into World War II awakened its industrial power as it sought to supply allies and its own fleets and armies in two oceans. Oil tankers and freighters transporting these supplies for the war effort became the targets of German and Japanese submarines seeking to interrupt the flow to the two fronts. Today, these sites represent a national maritime cultural landscape reflecting wartime maritime commerce. However, many of these wrecks still contain cargo and fuel and represent pollution hazards as corrosion in the marine environment weakens the hulls. Many of these shipwreck sites remain unlocated or undocumented yet are important historical sites as well as potential environmental hazards. Efforts to locate and characterize these World War II shipwrecks will assist with the determining their historical integrity and environmental condition.

The identification of 87 priority shipwrecks that pose a threat of oil or chemical spills in NOAA's 2012 Potentially Polluting Wreck (PPW) study was an essential first step at mitigating possible pollution events. However, five years after the study, only a minority of these wrecks have been investigated, while less than half of them have been located. A handful of shipwrecks have leaked oil, and the response has been to conduct large-scale remediation to remove fluids from the hulls and mitigate catastrophic leaks; however, the cost is too great, ranging from $25 million for the wreck of *Jacob Luckenbach* off San Francisco to more than $70 million for the wreck of USAT *Brigadier General M. G. Zalinski* in Canadian waters. In each of these instances, it was determined

that the oil leaking out was due to shifting currents moving oil out of small overhead spaces in the shipwreck, and there was little to no oil remaining in the hulls.

In 2016, archaeologists from NOAA and SEARCH took advantage of a cruise of opportunity with E/V *Nautilus* to lead a dive remotely through telepresence from the Inner Space Center at the University of Rhode Island on the wreck of SS *Coast Trader* off Victoria, British Columbia. Through this one dive, it was able to be determined which bunker tanks survived the torpedo impact and that there was little corrosion present, effectively lowering this wreck's pollution risk factor. Such comprehensive assessments are able to characterize the wrecks' potential environmental impacts, hull or tank condition, and determine the overall site stability without the large cost of reactionary remediation.

During World War II, dozens of merchant tankers and freighters were sunk by German U-boats off the US east coast and in the Gulf of Mexico during the Battle of the Atlantic. A number of tankers and freighters on the PPW list have never been found or identified. Many PPW are potentially eligible for listing on the National Register and their identification will provide a greater understanding of the war's undersea maritime cultural landscape. U-boat activities during Operation Drumbeat in 1942 spanned the entire eastern seaboard of the United States resulting in merchant ship casualties from the Gulf of Maine to the Florida Keys and into the Gulf of Mexico. The potential impact of pollutant spills from these wrecks, however, is not limited to the western Atlantic. Modelling of oil movement from these wreck sites in the PPW study show much of the oil moving eastward throughout the Atlantic due to the influence of the Gulf Stream.



Water surface oiling from the most probable spill of 11,500 bbl of heavy fuel oil from *George MacDonald* shown as the area over which the oil spreads at different time intervals (NOAA 2012)

Support from the ASPIRE campaign can assist with mapping efforts to locate and characterize PPWs allowing scientists to determine level of risk to local communities, the environment, and sensitive marine resources resulting from a release event. The increased knowledge about PPWs will help better inform response managers to prioritize what sites are a hazard and warrant detailed assessments. Next steps could include an archaeological, biological, and hydrocarbon assessment, analysis of the hull stability and thickness, and oil type, quantity, and location. This information will ultimately result in recommendations for removal of polluting substances or stabilization.

Relevant Partnerships

National Oceanic and Atmospheric Administration (ONMS, OER, OR&R)
Bureau of Ocean Energy Management
Coast Guard