



NOAA's Remediation of Underwater Legacy Environmental Threats (RULET) Database & Wreck Oil Removal Program (WORP)

Brief for CRRT II

**NOAA Office of National Marine Sanctuaries
Lisa C. Symons**

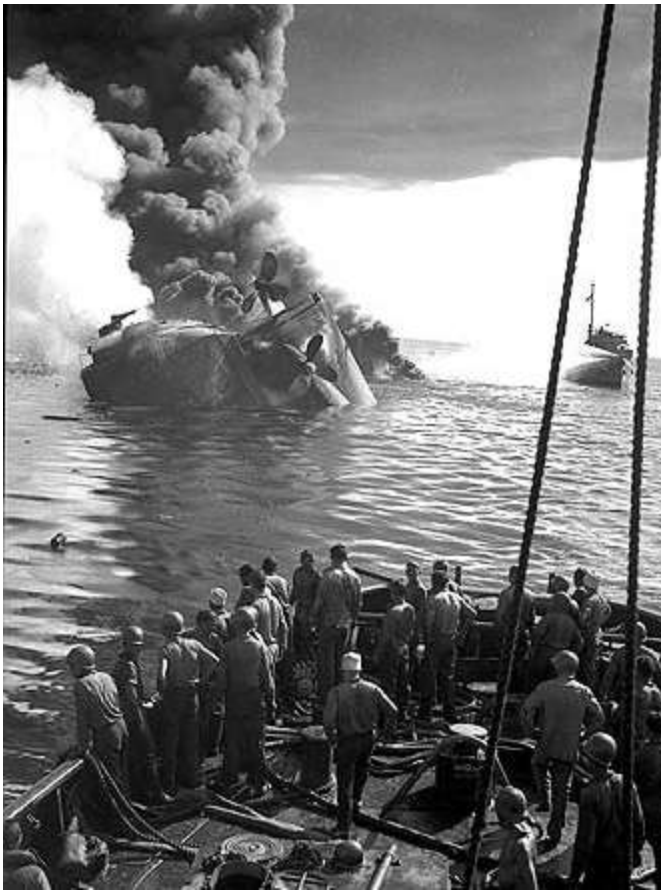


ENVIRONMENTAL
RESEARCH
CONSULTING



S.S. Jacob Luckenbach

Sank on July 14, 1953 off San Francisco. Oil removed in 2003



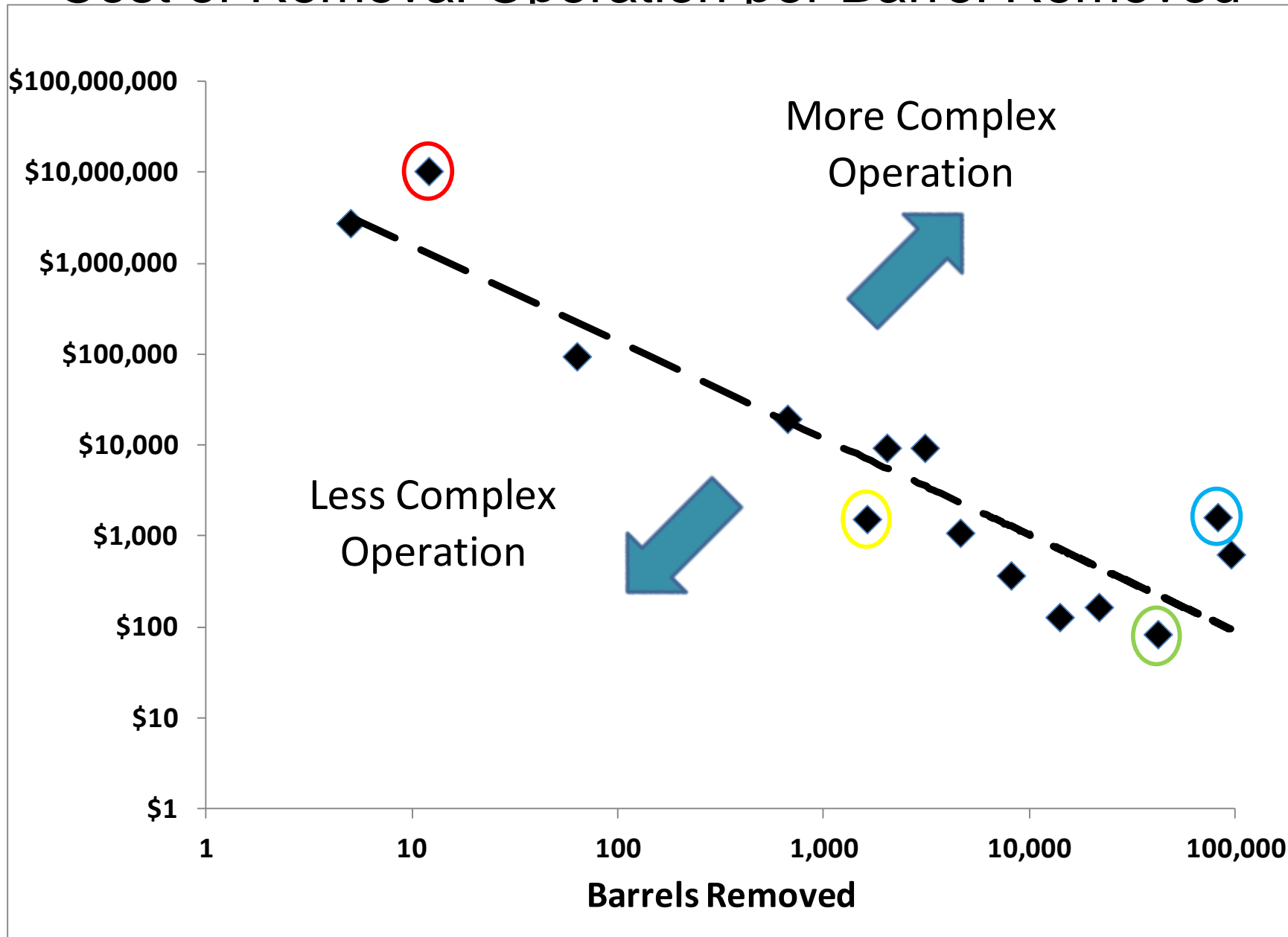
USS Mississinewa,

November, 1944. Sunken in Ulithi Atoll in Federated States of Micronesia.
Oil removed in 2003

Resources and Undersea Threats (RUST) Database



Cost of Removal Operation per Barrel Removed



Vessel	Year	Location	Bbl Oil Removed	Total Cost	Per Bbl Cost
<i>Davy Crockett</i>	2011	Washington	900	\$15.5M	\$17,222
<i>Ex-USS Chehalis</i>	2010	Amer. Samoa	1,620	\$2.5M	\$1,543
<i>Princess Kathleen</i>	2010	Alaska	2,095	\$14.0M	\$6,683
<i>Don Pedro</i>	2008	Spain	1,400	\$3.0M	\$2,143
<i>Solar I</i>	2006	Philippines	63	\$12.0M	\$857
<i>Palo Alto</i>	2005	USA	12	\$125.0M	\$10.42M
<i>Mwaalil Saat</i>	2005	Mariana Islands	5	\$13.9M	\$2.78M
<i>Prestige</i>	2004	Spain	91,000	\$132.6M	\$1,617
<i>Ex-USS Mississinewa</i>	2003	Micronesia	42,000	\$3.5M	\$83
<i>Jacob Luckenbach</i>	2002	California	2,450	\$19.2M	\$7,836
<i>Ehime Maru</i>	2001	Hawaii	0	\$13.0M	\$90,225
<i>Osung No. 3/Yuil No. 1</i>	2001	1998	4,600	\$13.0M	\$2,826
<i>Irving Whale</i>	1996	Canada	21,700	\$29.0M	\$1,366
<i>T/B Cleveco</i>	1995	Lake Erie	8,120	\$3.6M	\$443
<i>KMS Blücher</i>	1994	Norway	7,000	\$7.1M	\$1,014
<i>Betelgeuse</i>	1979	Ireland	280,000	\$120.0M	\$430

RUST → Remediation of **Underwater** Legacy Environmental **Threats (RULET)**

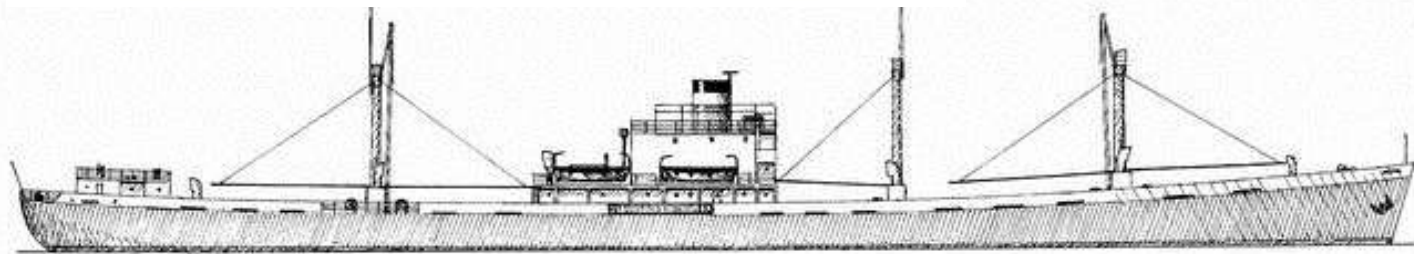
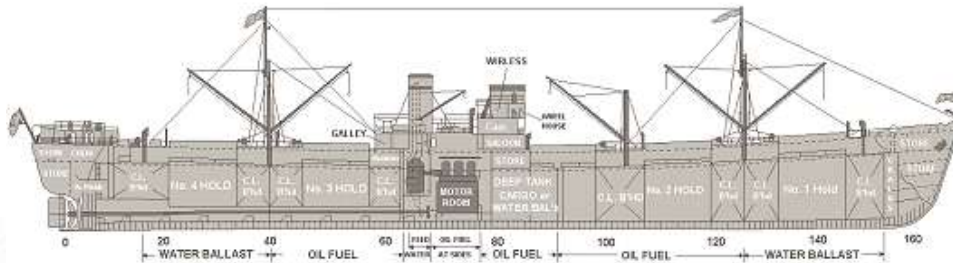
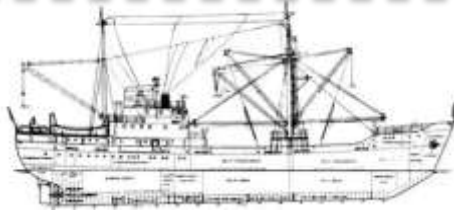
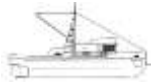
Initial Narrowing Criteria: 30,000 to 573

- ~~Post 1910~~ ~~Post 1902~~ Post 1891 (UK uses 1873)
- Steel Hull (as well as iron or concrete)
- Tanker/Tank Barge
- >200' or 1000GT

RULET: ~~233~~ ~~228~~ ~~162~~ ~~115~~ 107

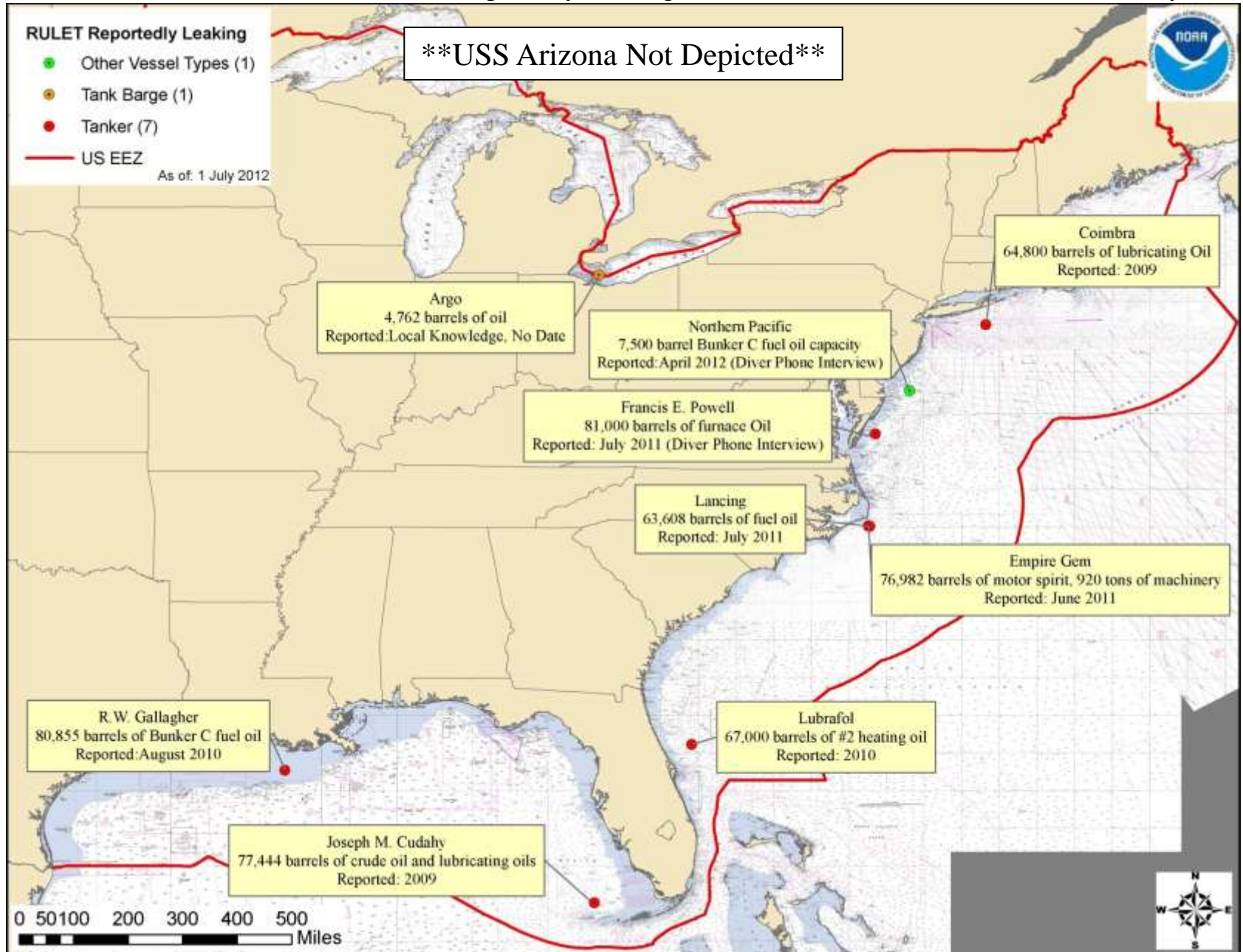
High Priority: ~~58~~ ~~28~~ 23

Reported to be leaking: 10



Size or Tonnage

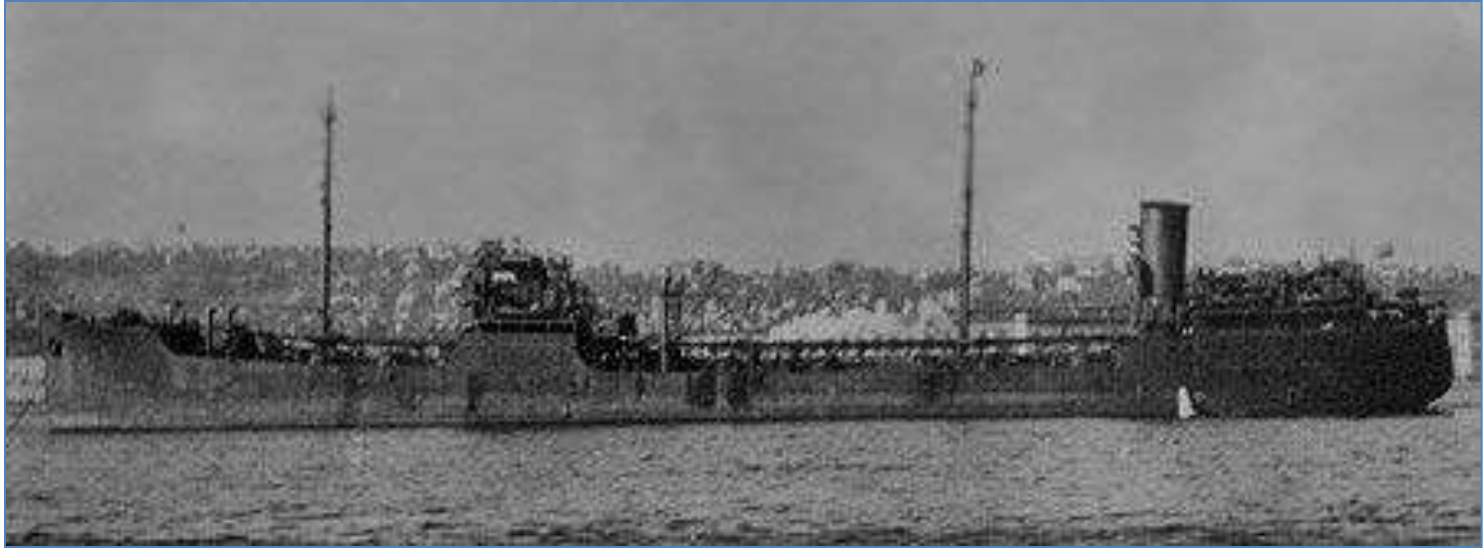
Vessels over 1000 gross tons or 200 feet





Leaking Liberty Ship off Sabine Pass, TX

Vessel believed to be the SS William Beaumont, sunk 1971.
Oil removed 2009.



Leaking Tanker off Southern Long Island, NY.

Believed to be the *Coimbra* , sunk by U-123 on January 15, 1942 while en route from New York to England with a full cargo of lube oil. Investigation is on-going

Prioritizing wrecks

Resources and Undersea Threats Database



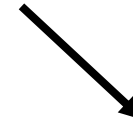
**Summary Report
and follow-up
recommendations**



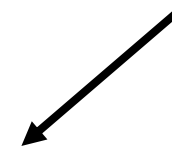
**Modeling
trajectory and fate
and consequences**



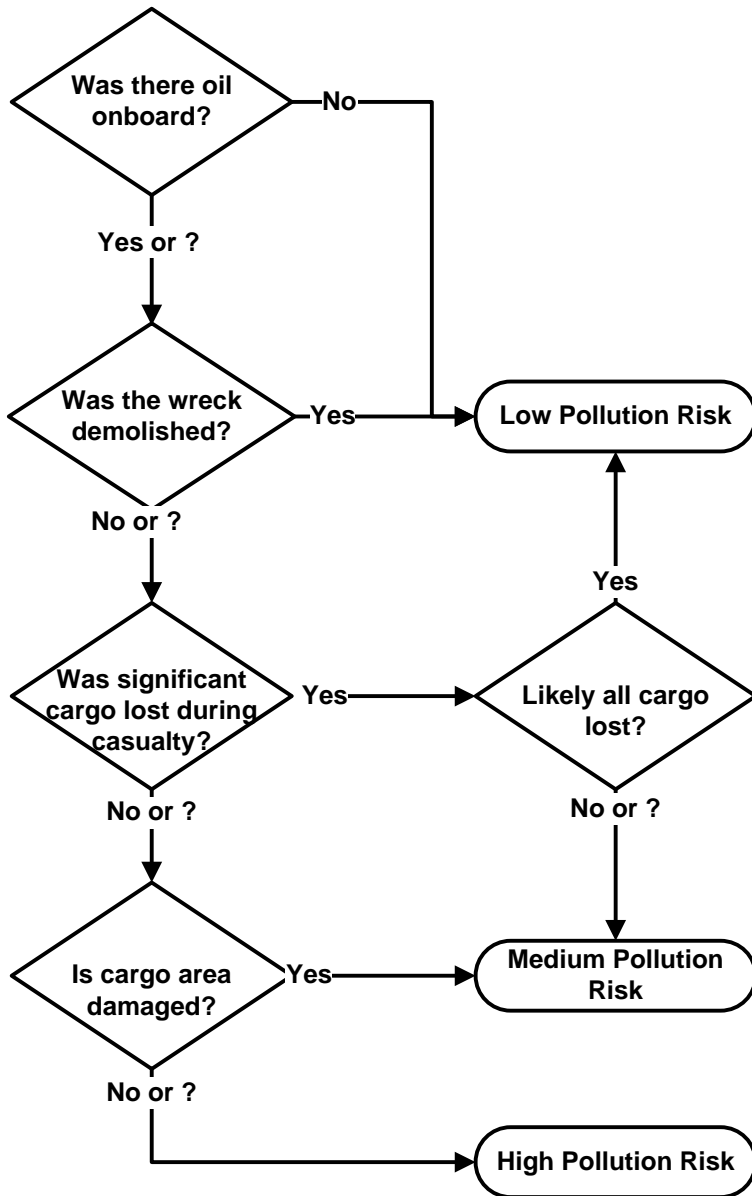
**Secondary screening based on historical
information on vessel, engineering analysis
and archaeological site formation**



**Initial
Screening
based on age,
size, hull
material, type
and location**



Pollution Potential Tree (USCG SERT)



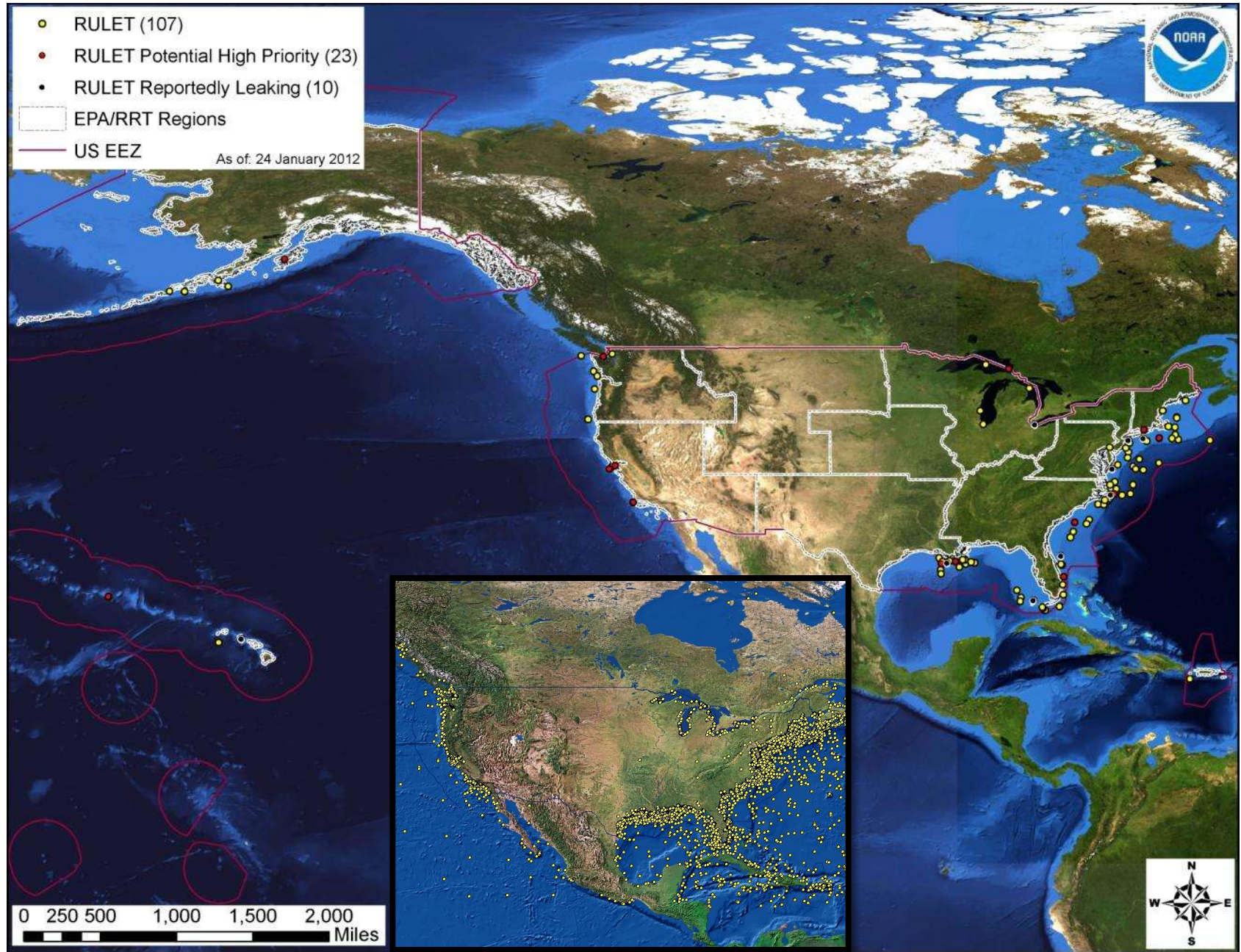
(As of 4/9/12) 15 vessels

(As of 4/9/12) 80 vessels

(As of 4/27/12) 15 vessels

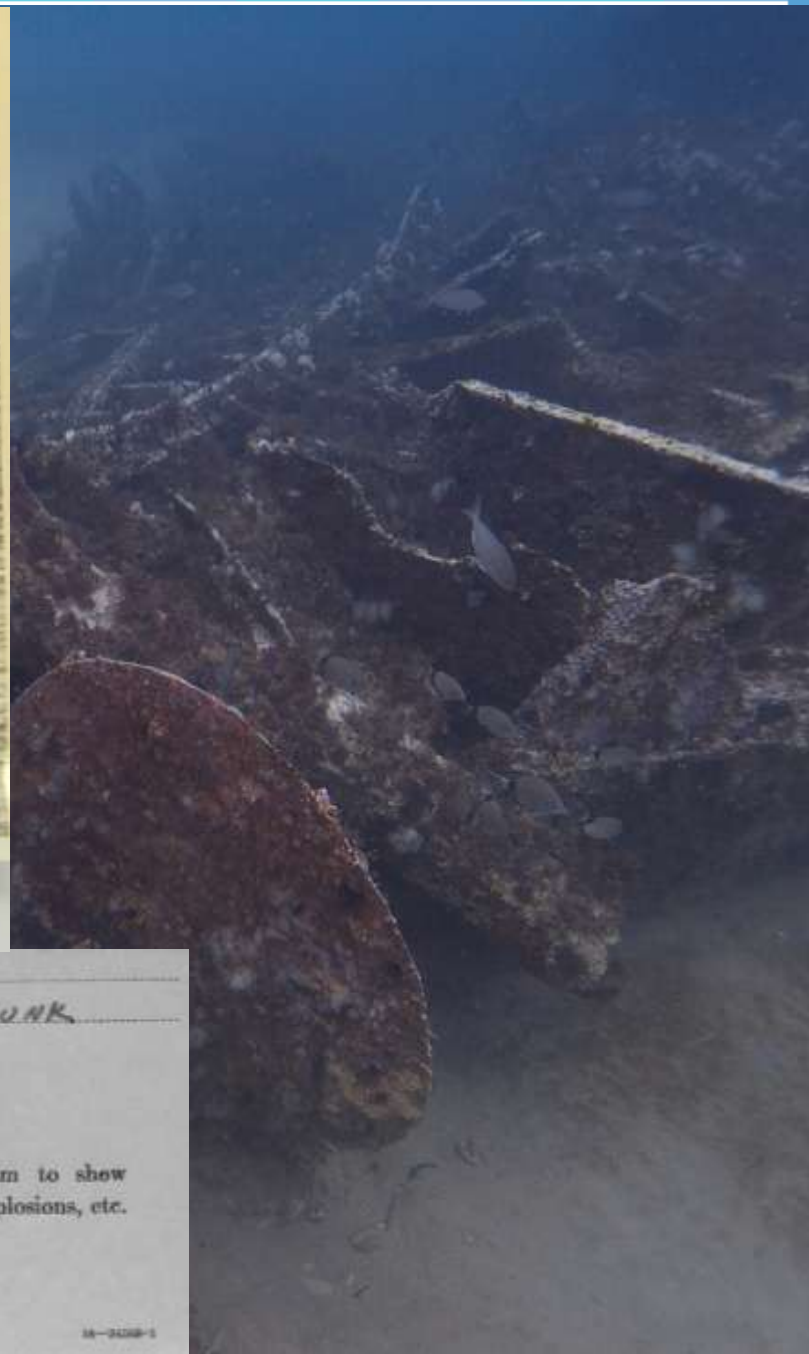
Where does this information come from?

- **Lloyd's Register of British and Foreign Shipping**
- **Annual List of Merchant Vessels of the United States**
- **National Archives and Records Administration**
 - **Records of the U.S. Maritime Commission, 1917-1950**
 - **Records of the U.S. Shipping Board, 1914 – ca. 1939**
 - **Records of the Bureau of Marine Inspection and Navigation**
 - **Records of the Office of the Chief of Naval Operations, 1875-2006**
 - **Records of the U.S. Coast Guard, 1785-2005**
- **Historic Newspapers**
- **United States Coast Guard Incident Investigations**
- **Many other secondary sources (books, internet, databases)**

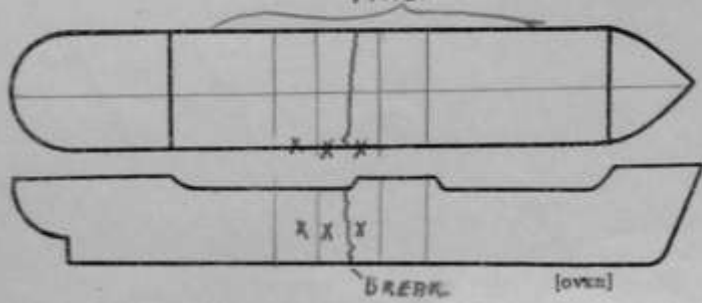




DECLASSIFIED
 Authority: NND 73853
 Disposal: NAKA Date 6/15/11

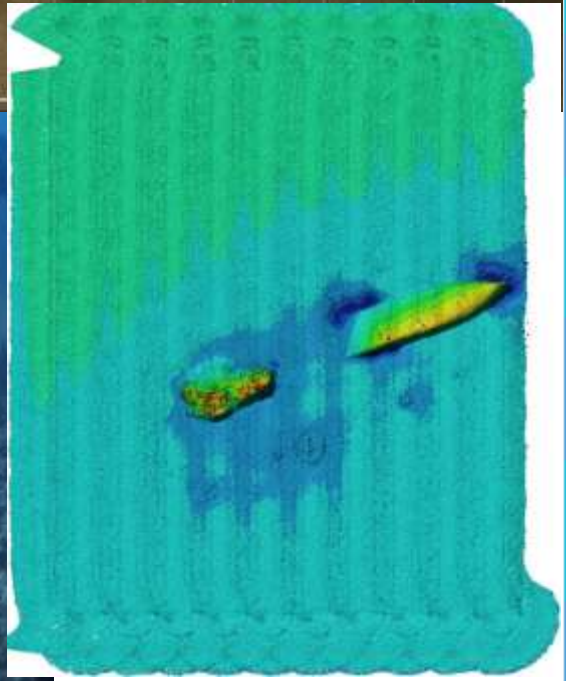
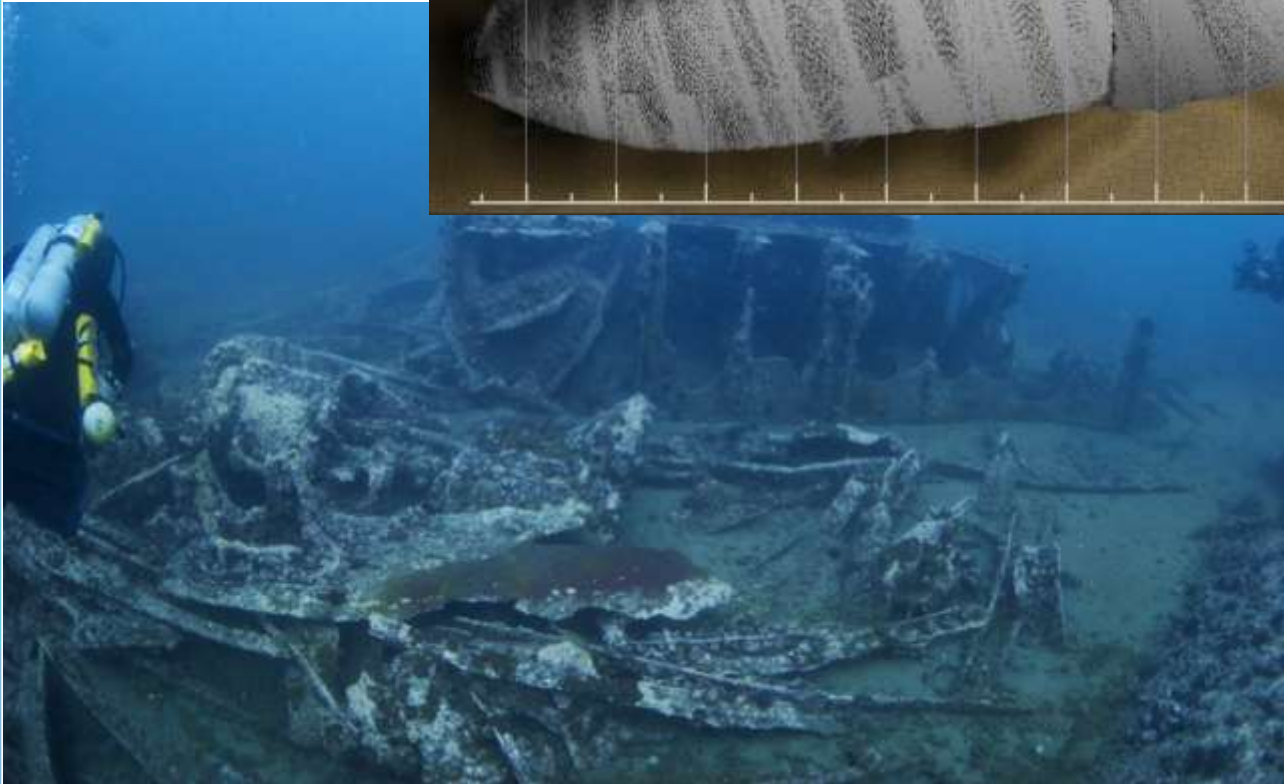
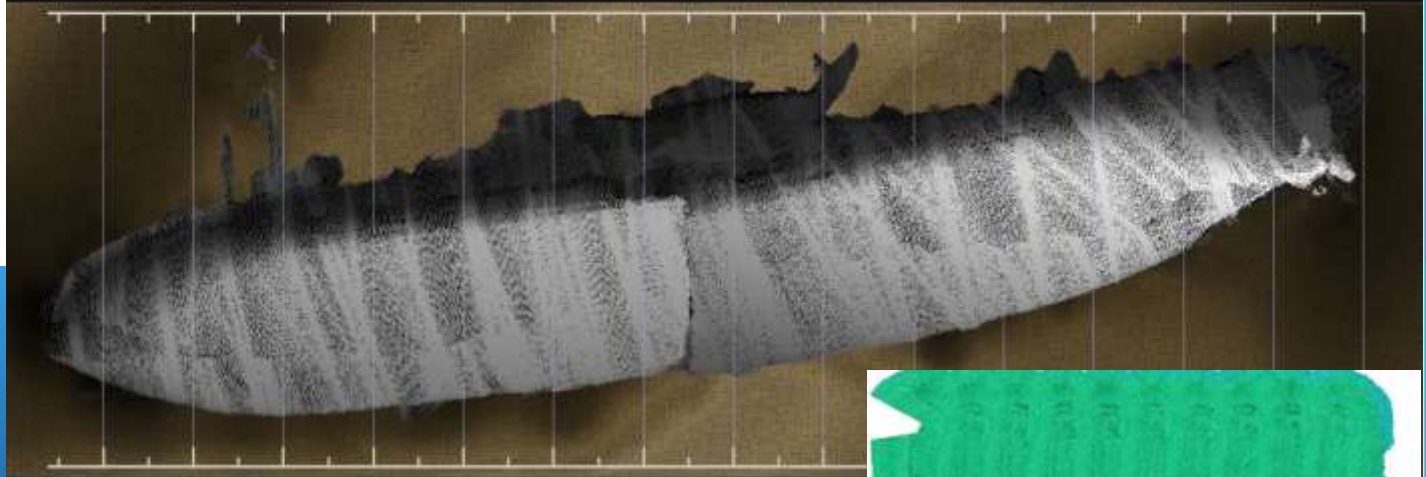


32 Was ship reboarded _____ By whom NO When _____
 33 Was ship brought in _____ How FIRE. Approximate damage SUNK

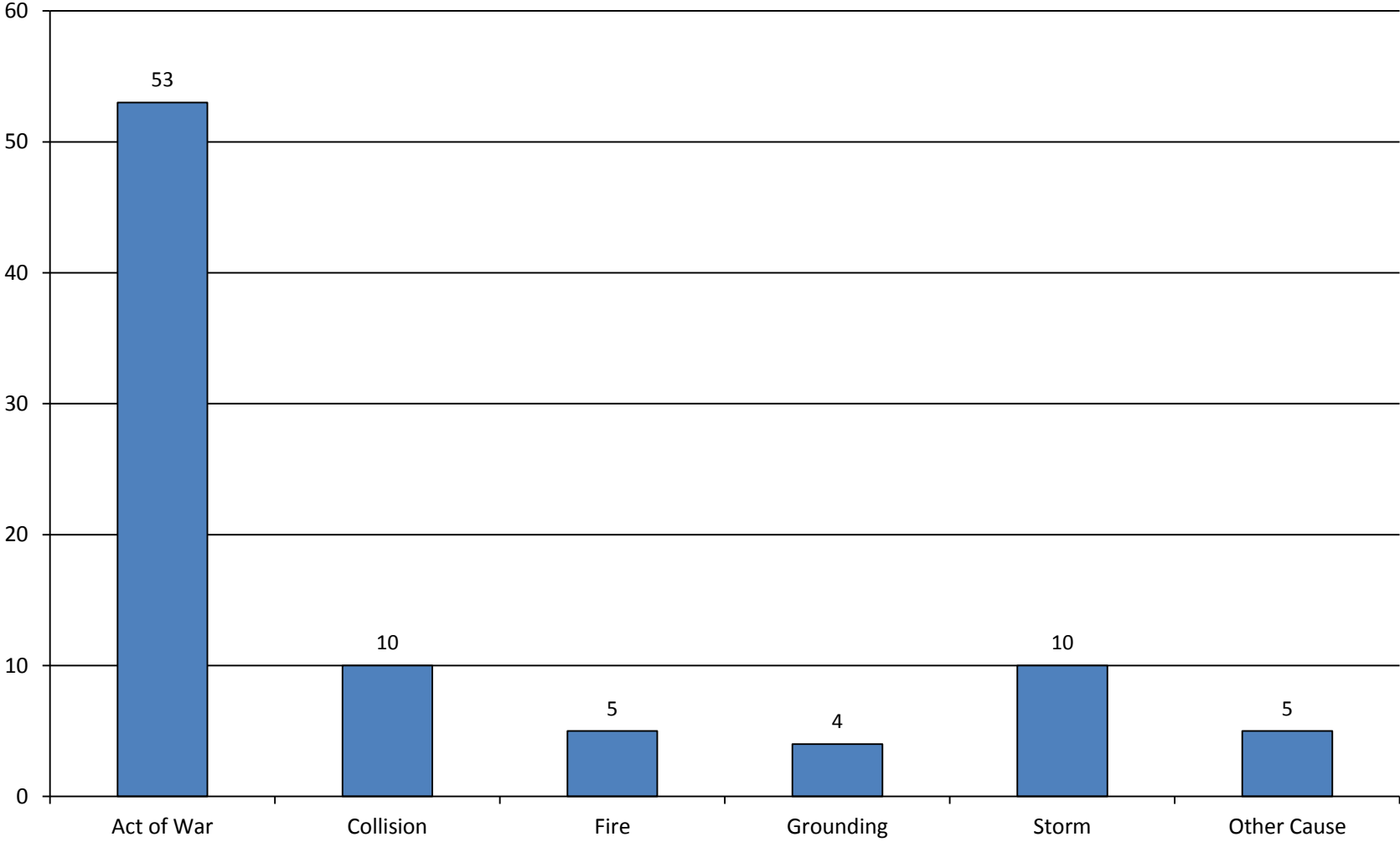


Fill in this diagram to show attack hits, fires, explosions, etc.

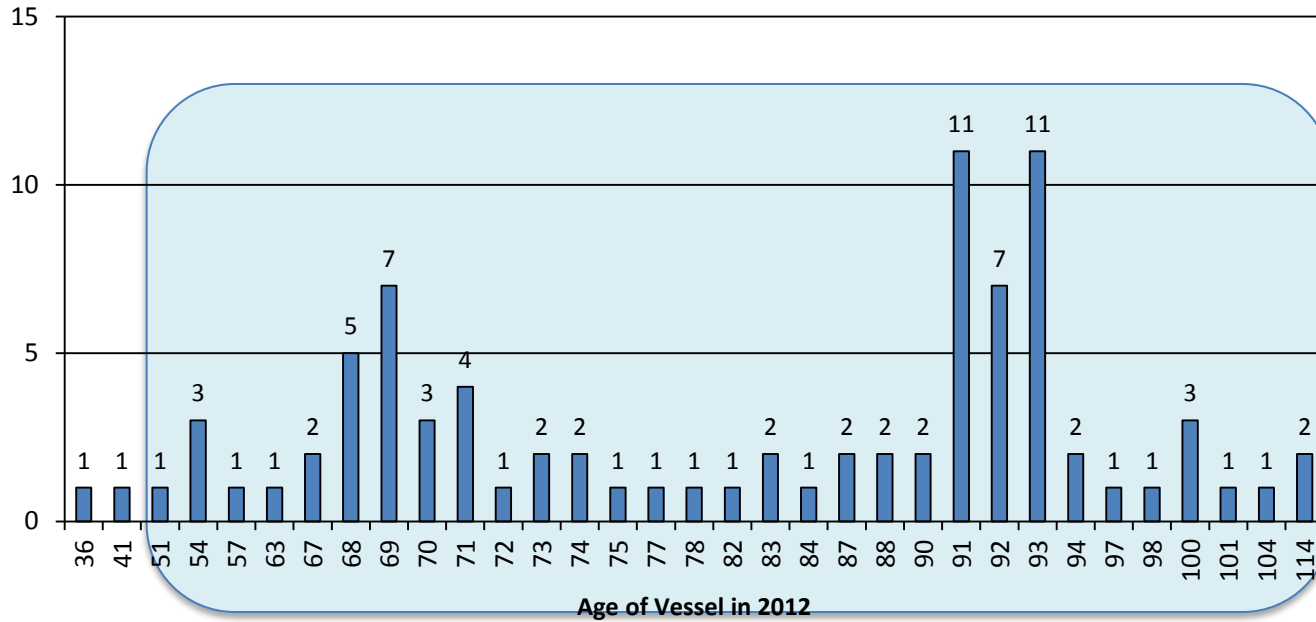
ADUS Ltd. high-resolution multibeam survey of *Lancing*.
NOAA/UT AUV survey of the *Empire Gem*,
British Splendour
(Images courtesy of NOAA)



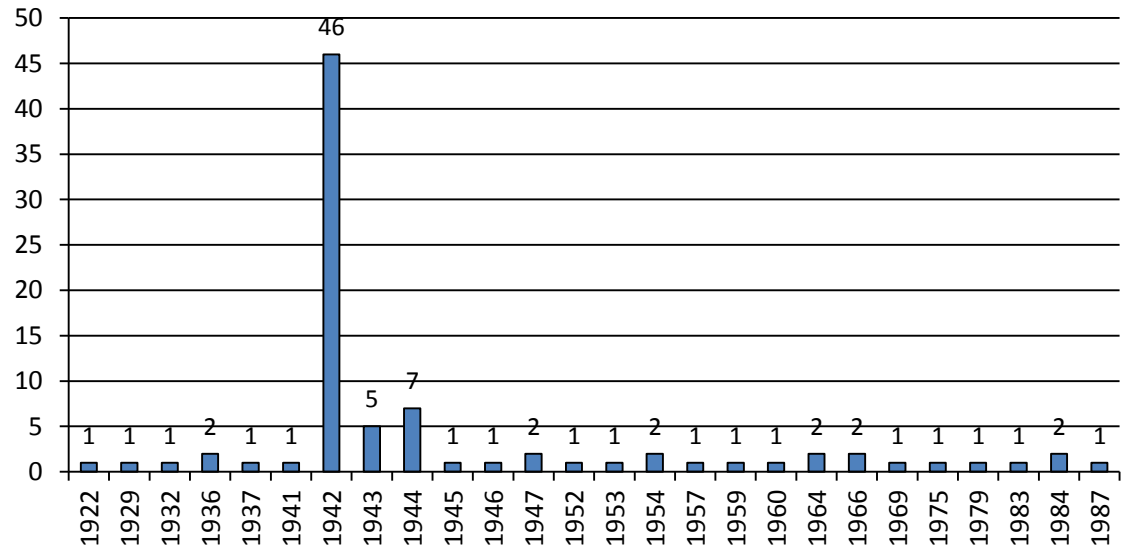
Number of Vessels Lost by Cause



Current Age (yrs) of Shipwrecks

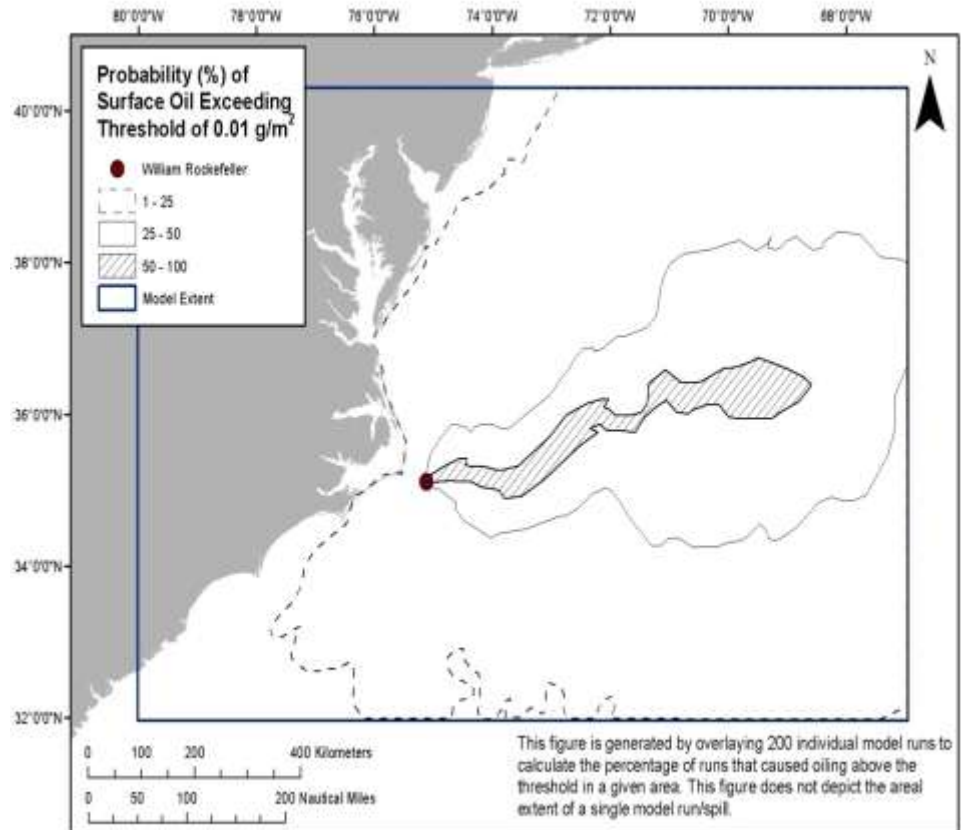


Number of Vessels Lost by Year

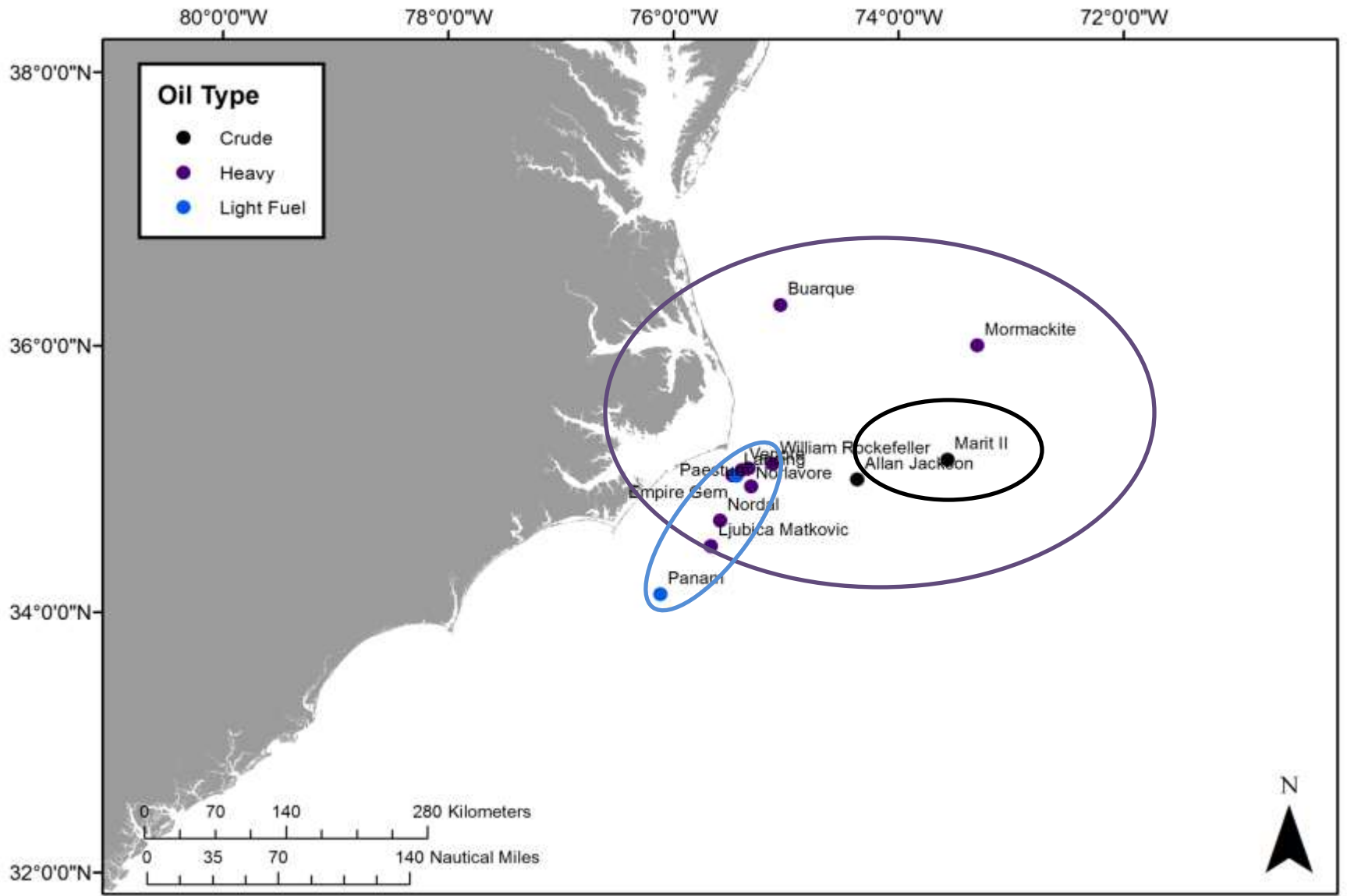


Release Scenarios

- Release duration of 12 hours
- Model simulations run for a 30 days. 200 runs/site, 4 different spill volumes
- Releases assumed to be from a depth between 2 and 3 meters above the sea floor.
- Simplified oil types: e.g., South Louisiana light crude (representing crude) and Medium aromatic Fuel Oil No. 2 (representing light fuels).

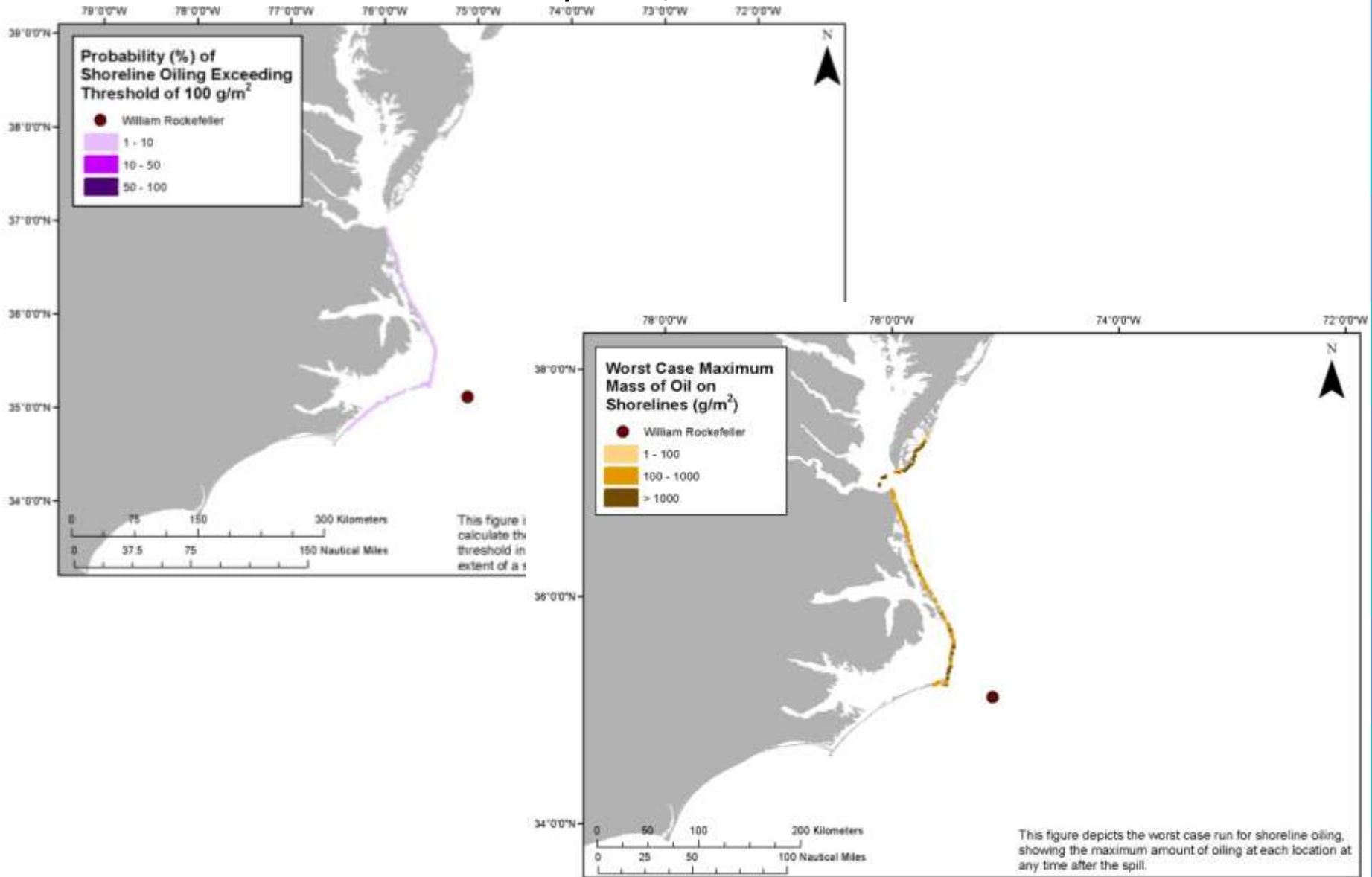


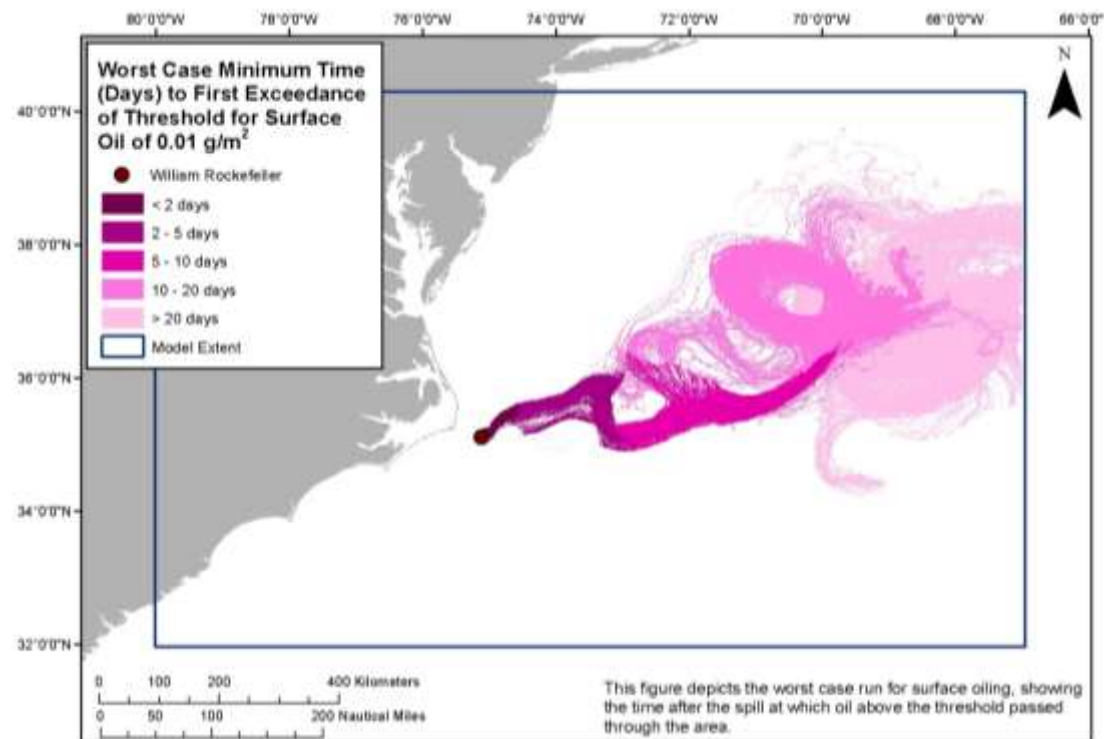
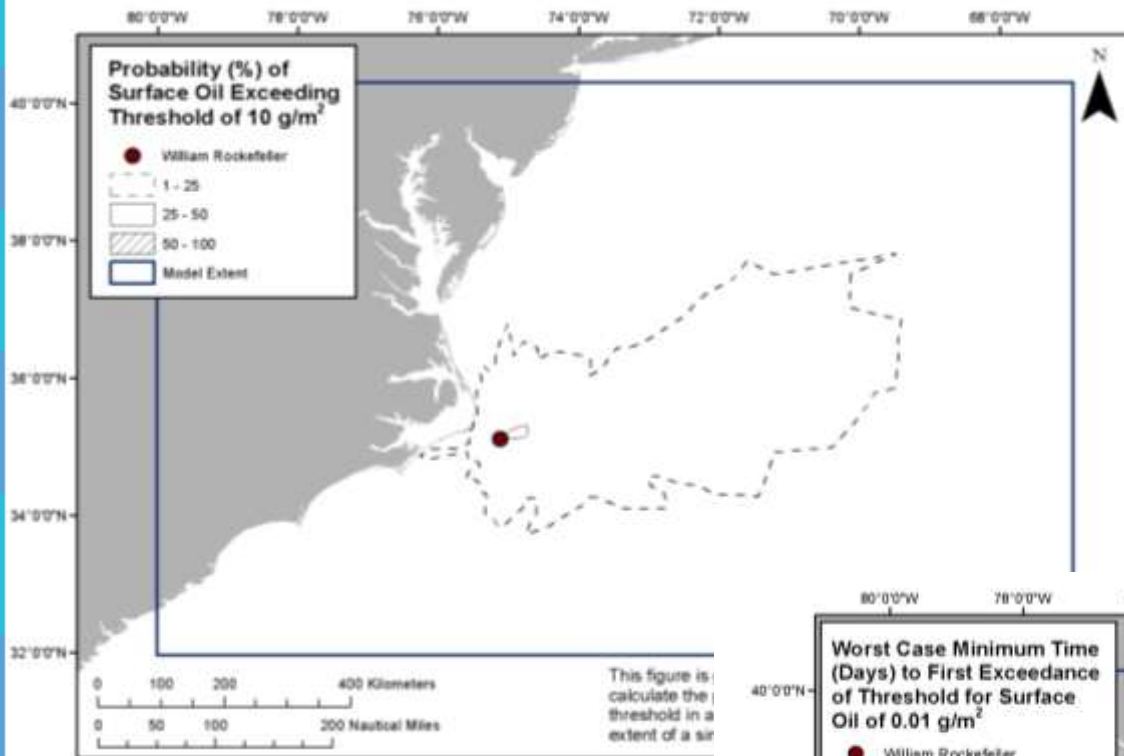
Consequence	Impact Measure	Impact Threshold
Impact to ecological resources - water surface	Water surface area exposed to floating oil	10 g/m²
Impact to ecological resources - shoreline	Shore length exposed	100 g/m²
Impact to socioeconomic resources – water surface	Water surface area exposed to floating oil	0.01 g/m²
Impact to socioeconomic resources - shoreline	Shore length exposed	Sheen (1 g/m²)
Water column impact	Water volume exposed to dissolved aromatic concentrations	1 ppb

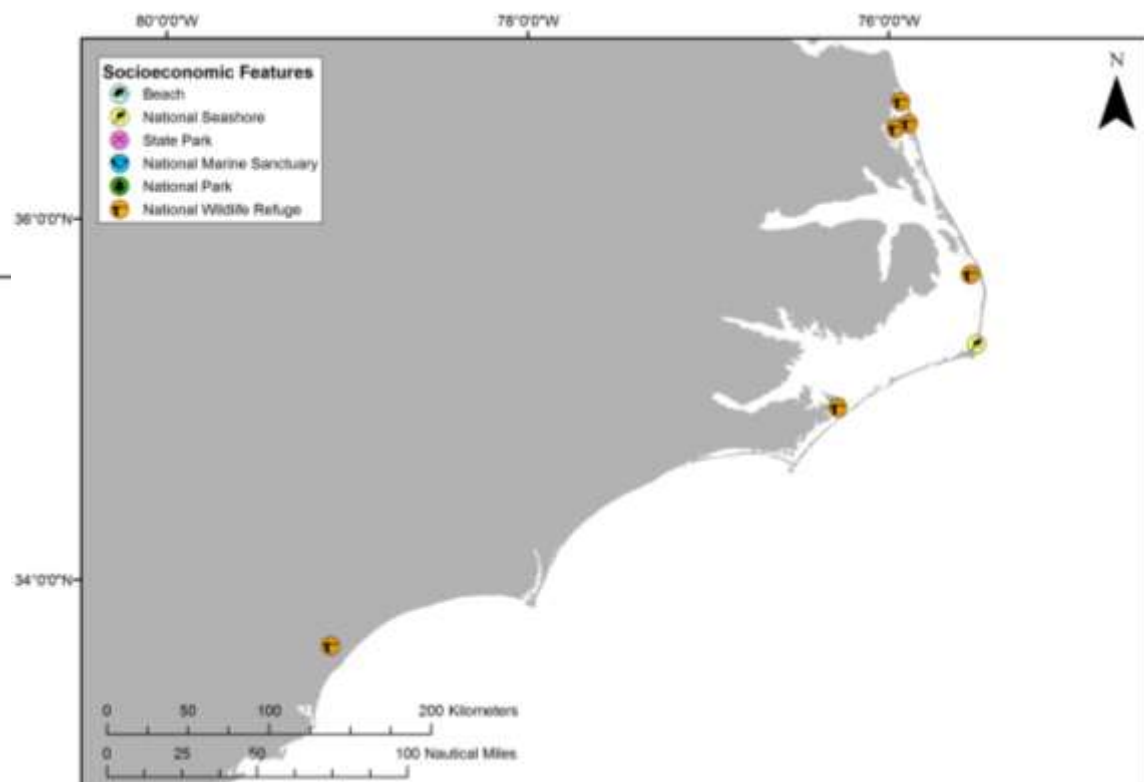
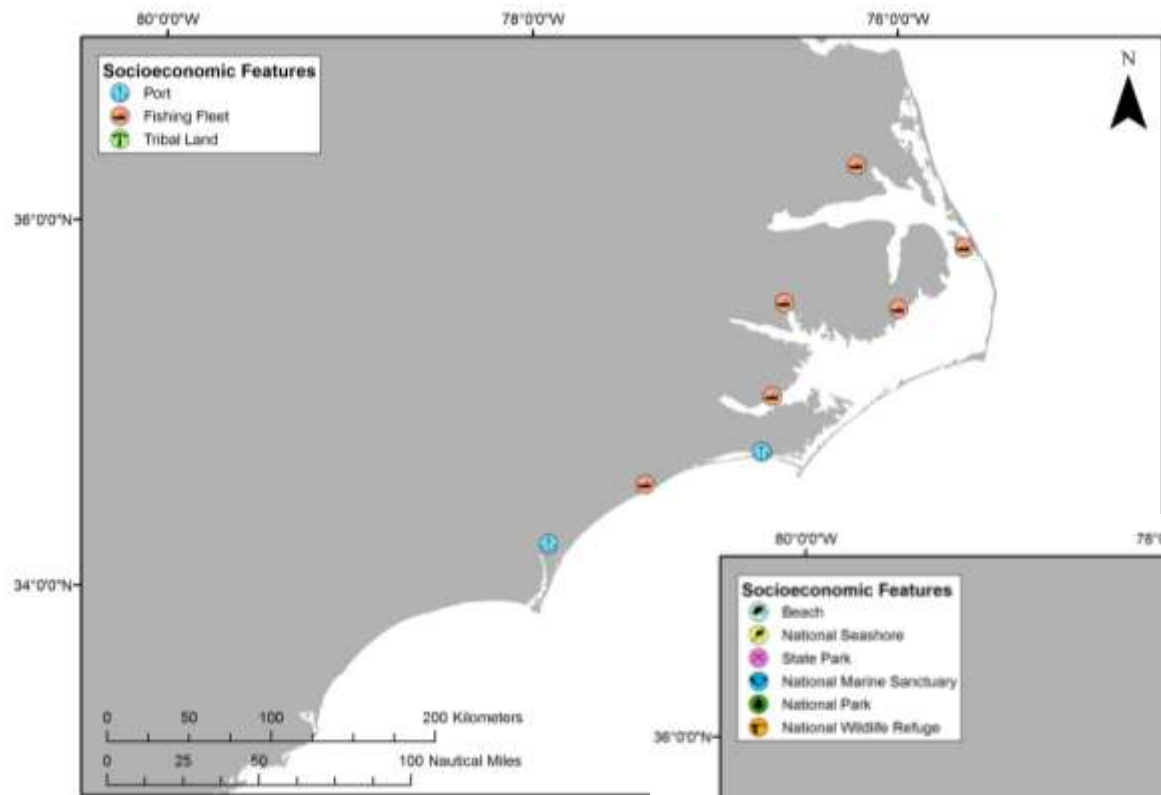


William Rockefeller: 14,054 gross tons

Pollution Potential: in theory 150,000 barrels of Bunker C







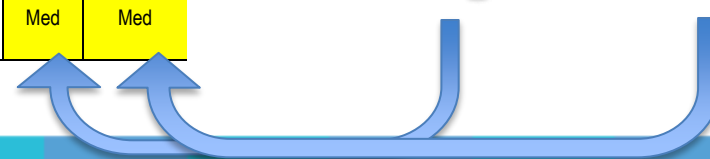
Vessel Risk Factors		Data Quality Score	Comments	Risk Score	
Pollution Potential Factors	A1: Oil Volume (total bbl)	High	93,000 barrels, leaking reported in 2011	Med	Med
	A2: Oil Type	Low	The exact type of oil remaining is unknown		
	B: Wreck Clearance	High	Appears to have been partially cleared		
	C1: Burning of the Ship	High	Burned prior to sinking		
	C2: Oil on Water	Med	No oil reported on the water		
	D1: Nature of Casualty	High	One torpedo		
	D2: Structural Breakup	High	In two sections, stern yet to be located		
Archaeological Assessment	Archaeological Assessment	High	Detailed sinking records of this ship exist, assessment is believed to be very accurate	Not Ranked	Not Ranked
Operational Factors	Wreck Orientation	High	Bow inverted, amidships broken up.	Not Ranked	Not Ranked
	Depth	High	95 feet		
	Visual or Remote Sensing Confirmation of Site Condition	High	Two sections are well-known recreational dive sites.		
	Other Hazardous Materials Onboard	High	No		
	Munitions Onboard	High	No		
	Gravesite (Civilian/Military)	High	Yes		
	Historical Protection Eligibility (NHPA/SMCA)	High	NHPA and possibly SMCA		
				WCD	Most Probable
Ecological Risks	3A: Water Column Resources	High	Large spills of a light fuel oil can have significant impacts to water column resources; smaller spills are less persistent in open water	High	Med
	3B: Water Surface Resources	High	Large area potentially affected, very high use by marine birds	High	Med
	3C: Shore Resources	High	Light fuel oiling on sand beaches, not persistent, though seasonally important shorebird habitat	Med	Low
Socio-Economic Resources	4A: Water Column Resources	High	A significant area of water column would be impacted in important fishing grounds	High	Med
	4B: Water Surface Resources	High	Large offshore water surface area would be impacted in areas with shipping lanes	High	High
	4C: Shore Resources	High	Moderate length of shoreline with high-value sensitive resources would be impacted	Med	Med

Vessel Specific Scoring

Each risk assessment has scored and unscored components.

The scores are compiled to generate a Worst Case Discharge and a Most Probable Discharge (10%) score for each vessel.

WCD High **MP Med**



Category Rank	Range of Scores	No. Wrecks for Worst Case Discharge	No. of Wrecks for Most Probable Discharge
High Priority	15-21	36	6
Medium Priority	12-14	40	36
Low Priority	7-11	11	45

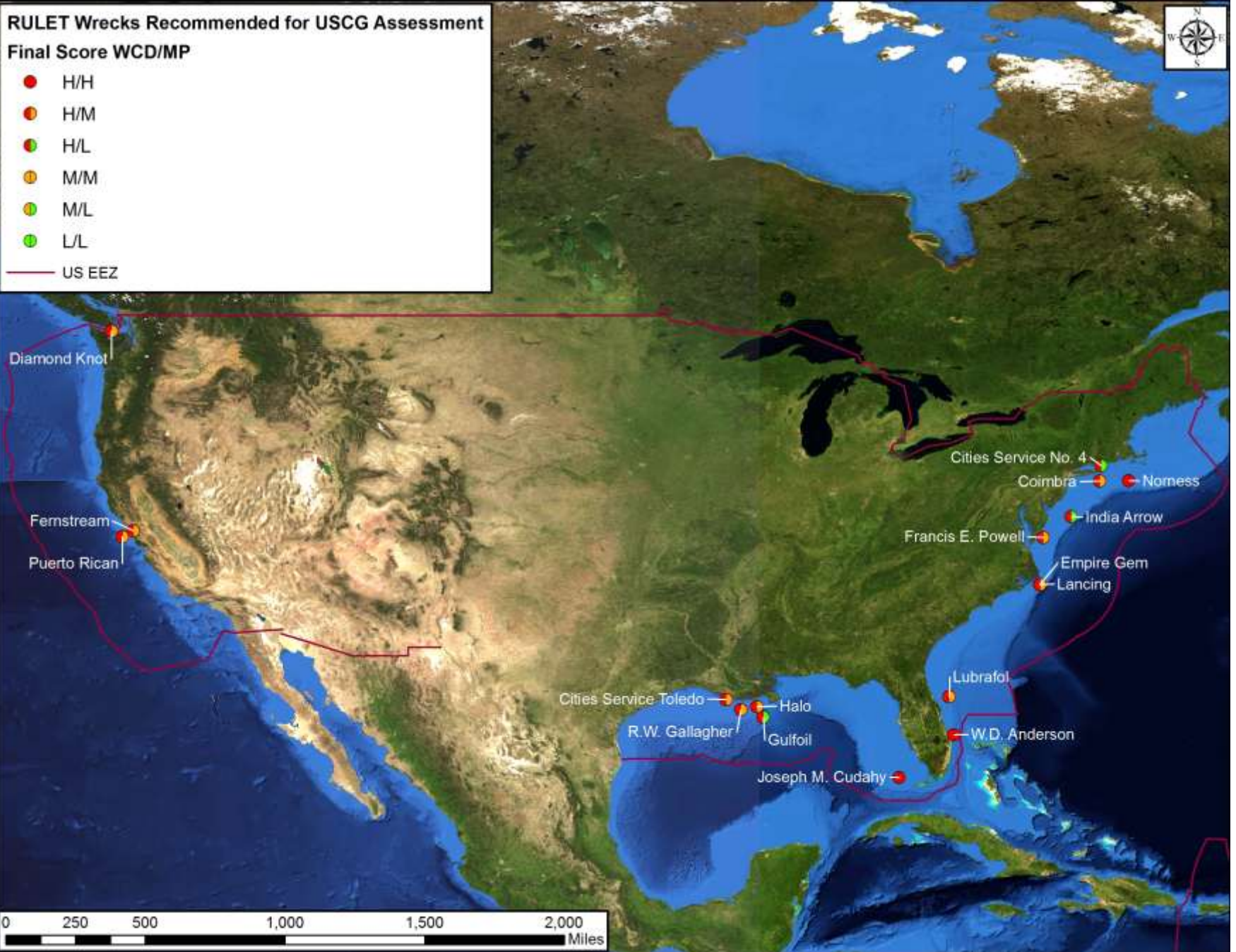
Vessel Scores	Possible NOAA Recommendations	Number of Vessels Receiving Recommendation
High (+1 Med)	Wreck should be considered for further assessment to determine the vessel condition, amount of oil onboard, and feasibility of oil removal action	17
High & Med. (Unk Loc.)	Use surveys of opportunity to attempt to locate this vessel and gather information on the vessel condition	46
High & Med.	Conduct active monitoring to look for releases or changes in rates of releases	22
All	Be noted in the Area Contingency Plans	87
All	Conduct outreach efforts to regional users.	87

RULET Wrecks Recommended for USCG Assessment

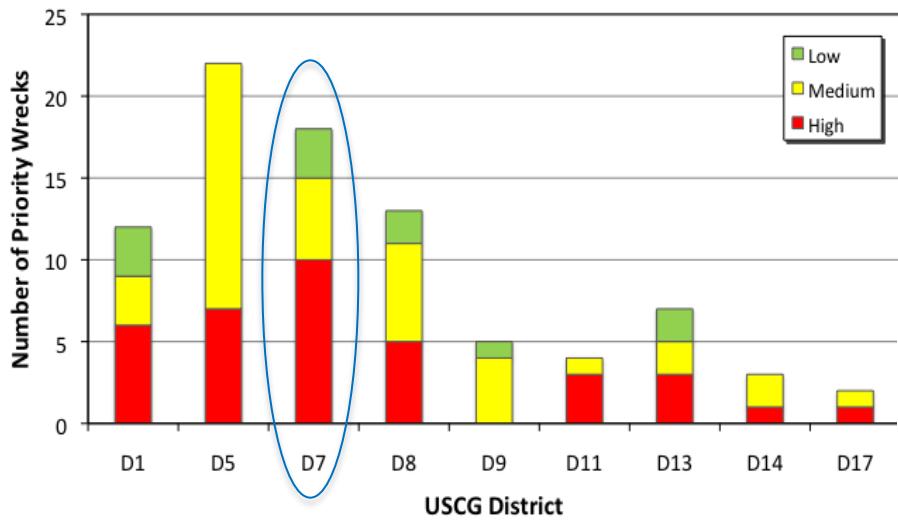
Final Score WCD/MP

- H/H
- H/M
- H/L
- M/M
- M/L
- L/L

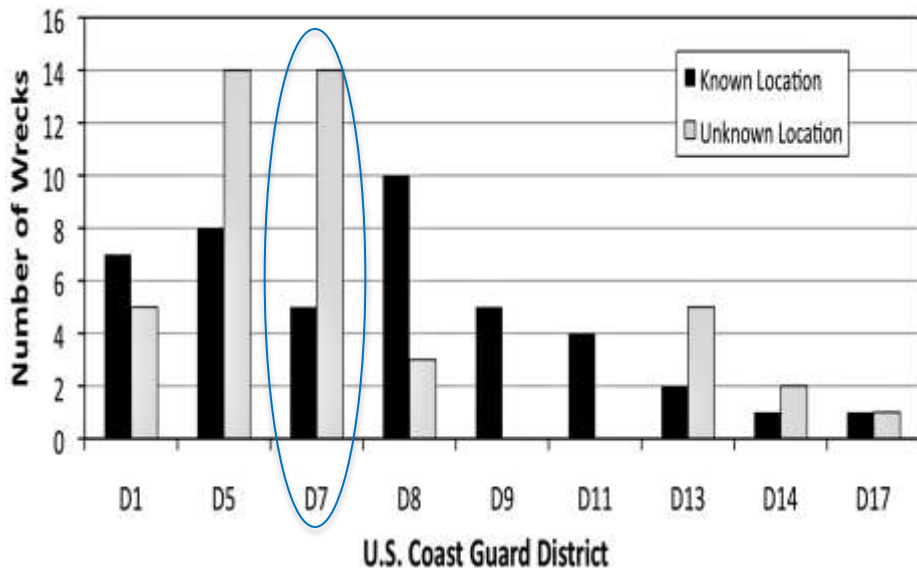
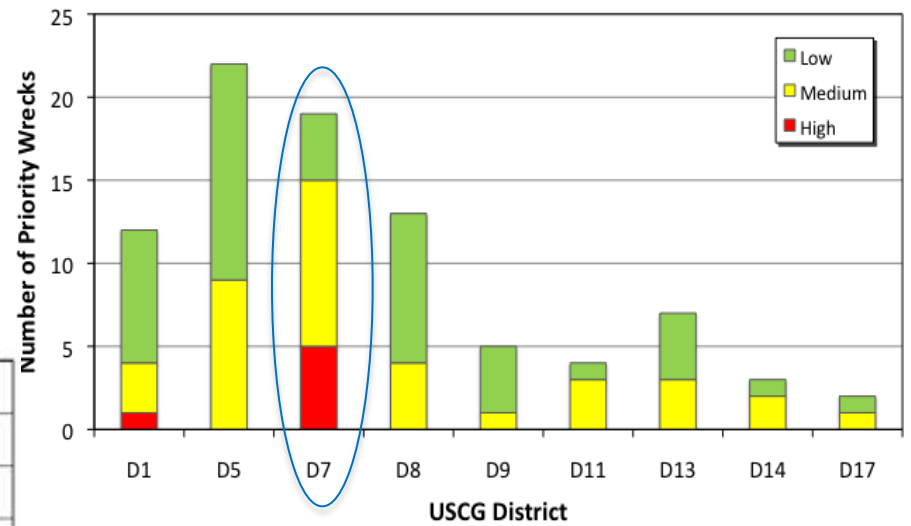
— US EEZ

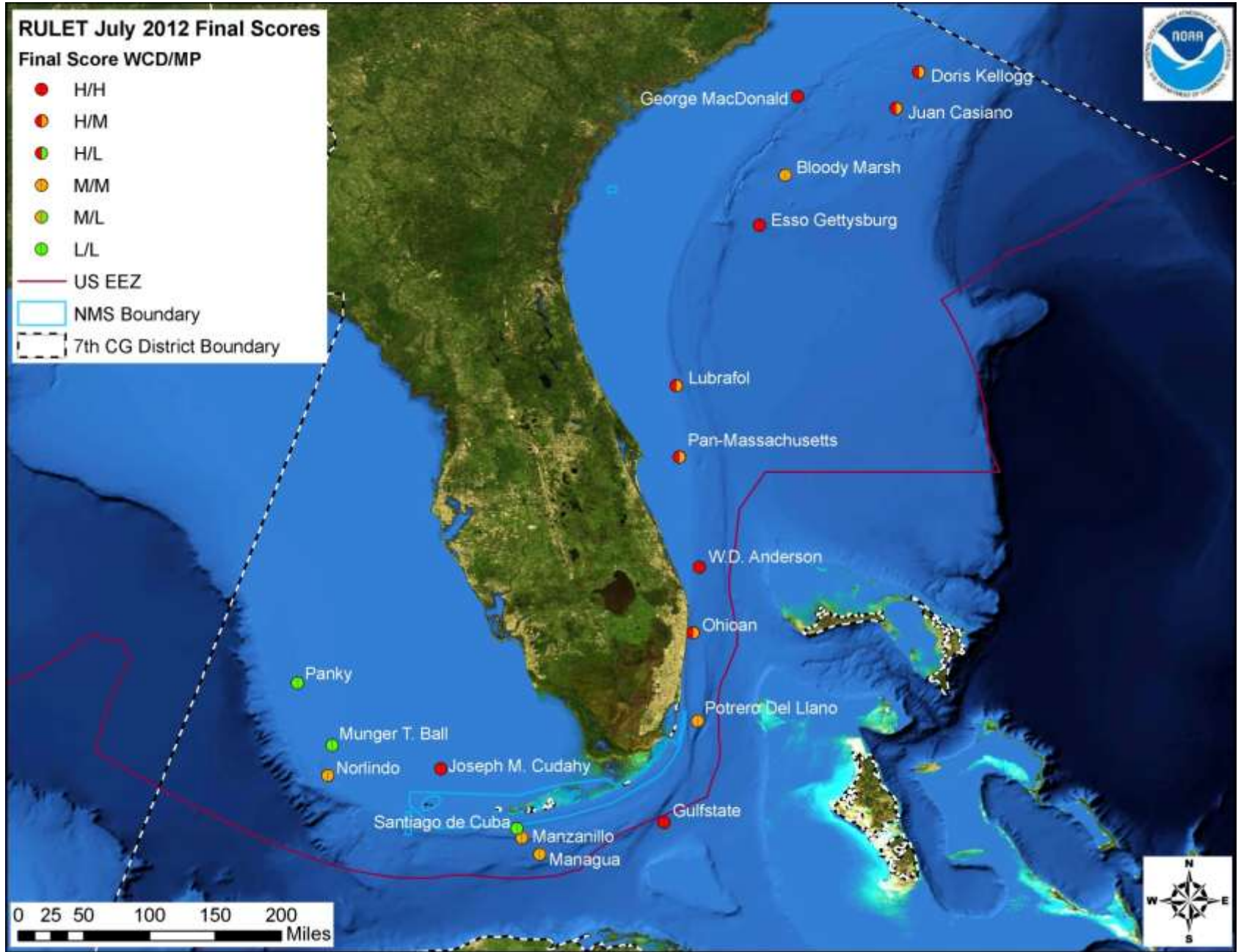


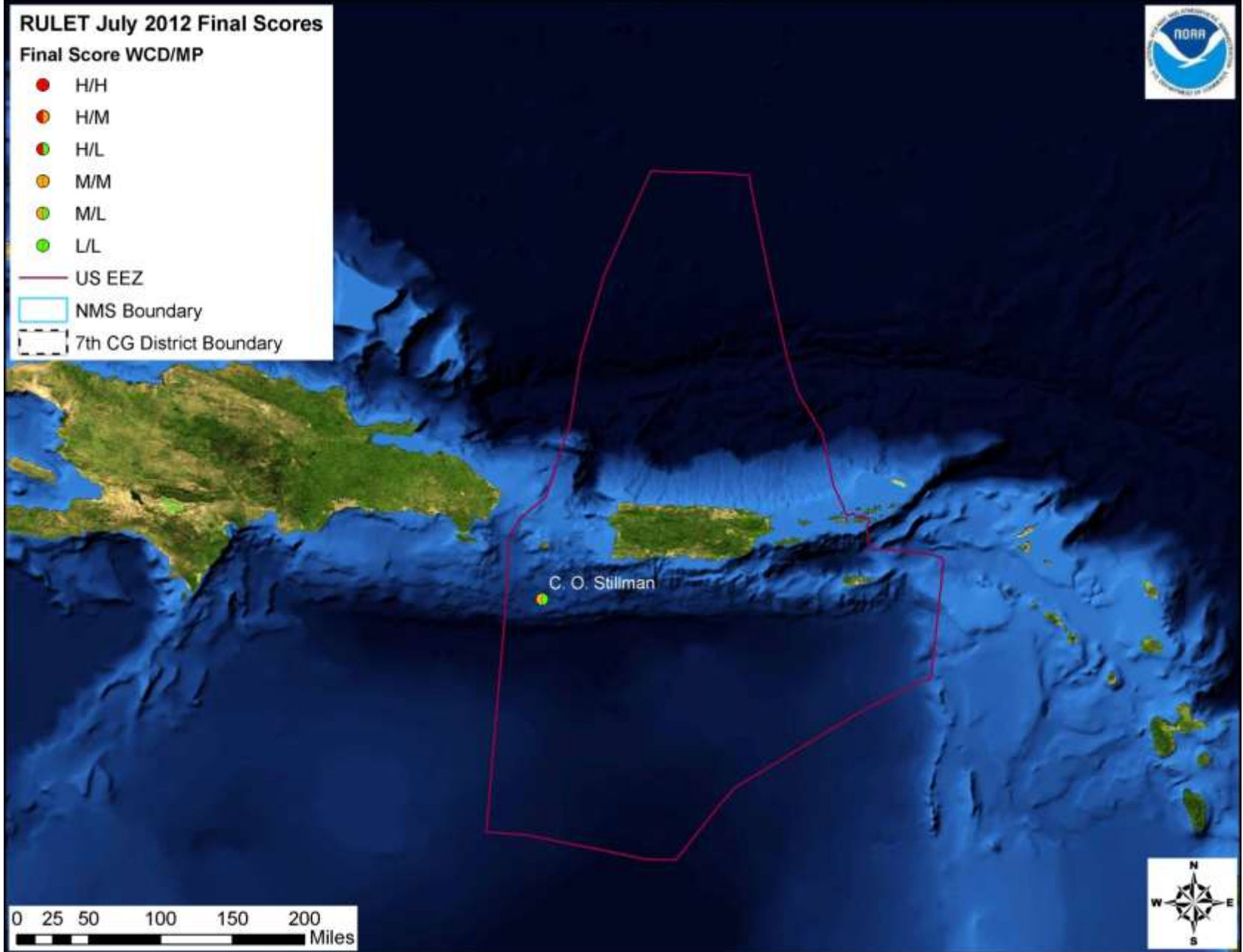
Worst Case Discharge



Most Probable Discharge







Name	WCD Final Score	MP Final Score	USCG District
Gulfstate	20	17	7
Esso Gettysburg	18	16	7
Lubrafol	18	12	7
W.D. Anderson	17	15	7
Pan-Massachusetts	17	12	7
George MacDonald	16	15	7
Joseph M. Cudahy	16	15	7
Doris Kellogg	16	13	7
Juan Casiano	15	12	7
Ohioan	15	12	7
Bloody Marsh	14	14	7
Potrero Del Llano	14	12	7
Managua	13	12	7
Manzanillo	13	12	7
Norlindo	13	12	7
Munger T. Ball	11	10	7
Santiago de Cuba	11	9	7
Panky	10	9	7
C. O. Stillman	14	8	7

Blue denotes WWII casualties. Brown denotes known location. Gray unconfirmed location.

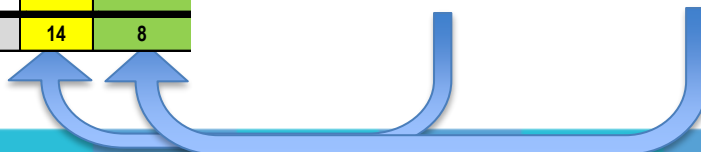
Vessel Risk Factors		Data Quality Score	Comments	Risk Score	
Pollution Potential Factors	A1: Oil Volume (total bbl)	Medium	Maximum of 144,000 bbl, not reported to be leaking	Med	
	A2: Oil Type	Low	Cargo is thought to be light fuel oil, a Group II oil type		
	B: Wreck Clearance	High	Vessel not reported as cleared		
	C1: Burning of the Ship	High	A severe fire was reported		
	C2: Oil on Water	High	Oil was reported on the water; amount is not known		
	D1: Nature of Casualty	High	Two torpedo detonations		
	D2: Structural Breakup	Low	Unknown structural breakup		
Archaeological Assessment	Archaeological Assessment	Low	Limited sinking records of this ship were located and no site reports exist, assessment is believed to have limited accuracy	Not Ranked	
Operational Factors	Wreck Orientation	Low	Unknown, potential to be upright	Not Ranked	
	Depth	Low	>12,000 ft		
	Visual or Remote Sensing Confirmation of Site Condition	Low	Location unknown		
	Other Hazardous Materials Onboard	High	No		
	Munitions Onboard	High	Munitions for onboard weapons		
	Gravesite (Civilian/Military)	High	Yes		
	Historical Protection Eligibility (NHPA/SMCA)	High	NHPA and possibly SMCA		
				WCD	Most Probable
Ecological Resources	3A: Water Column Resources	High	Area of highest exposure occurs in offshore waters without any known concentrations of sensitive resources;	Med	Low
	3B: Water Surface Resources	High	Seasonally very high concentrations of marine birds, mammals, and sea turtles in coastal and offshore waters but light sheens pose lesser risks	Med	Low
	3C: Shore Resources	High	Mostly sand beaches at risk, where a light fuel oil is not likely to persist	Med	Low
Socio-Economic Resources	4A: Water Column Resources	High	A relatively small fishing industry in the area that would be affected	Med	Low
	4B: Water Surface Resources	High	A relatively small fishing industry in the area and little port traffic in area that could be affected	Med	Low
	4C: Shore Resources	High	Mostly sand beaches at risk, where a light fuel oil is not likely to persist	Med	Low
Summary Risk Scores				14	8

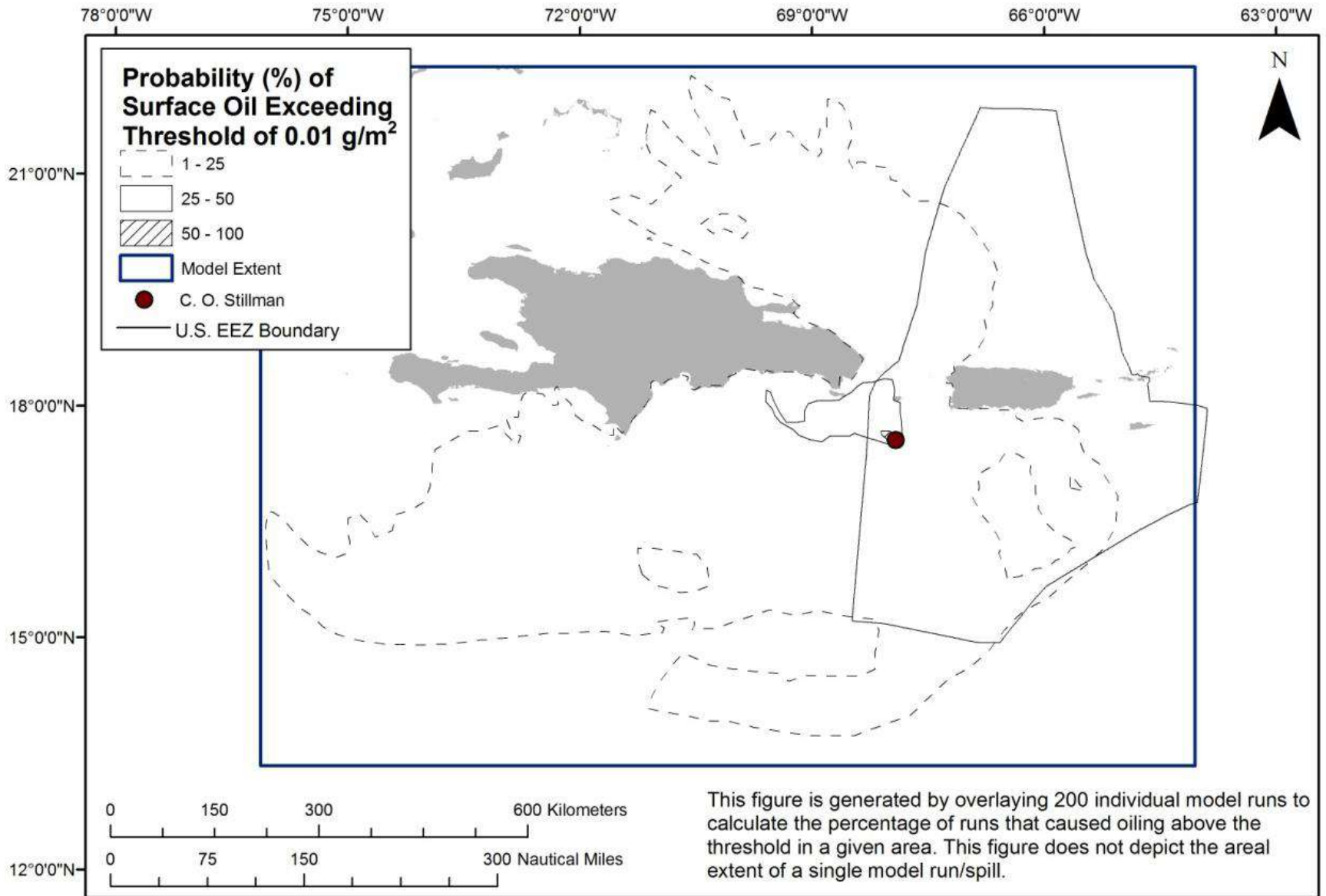
C.O.Stillman Specific Scoring

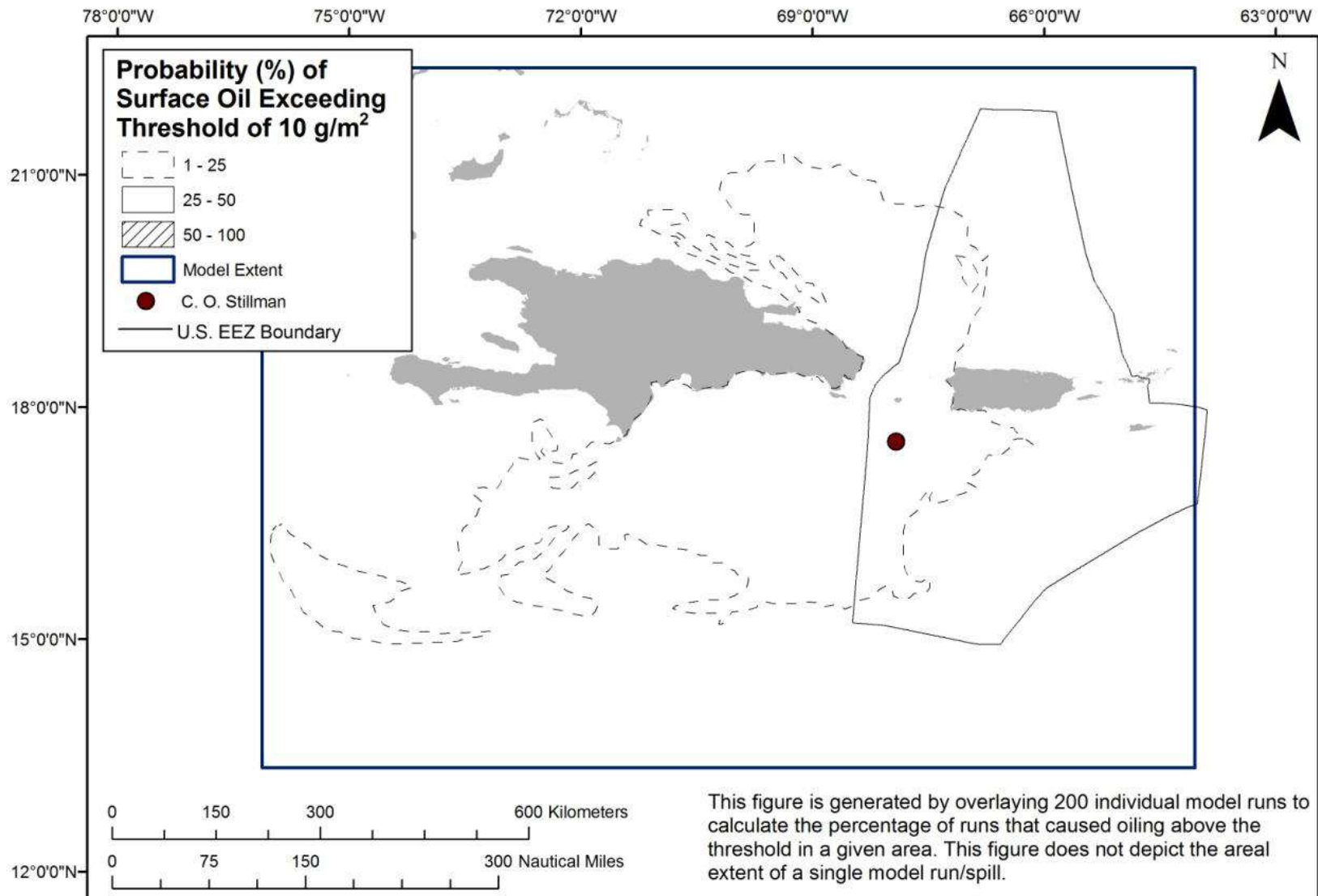
Each risk assessment has scored and unscored components.

The scores are compiled to generate a Worst Case Discharge and a Most Probable Discharge (10%) score for each vessel.

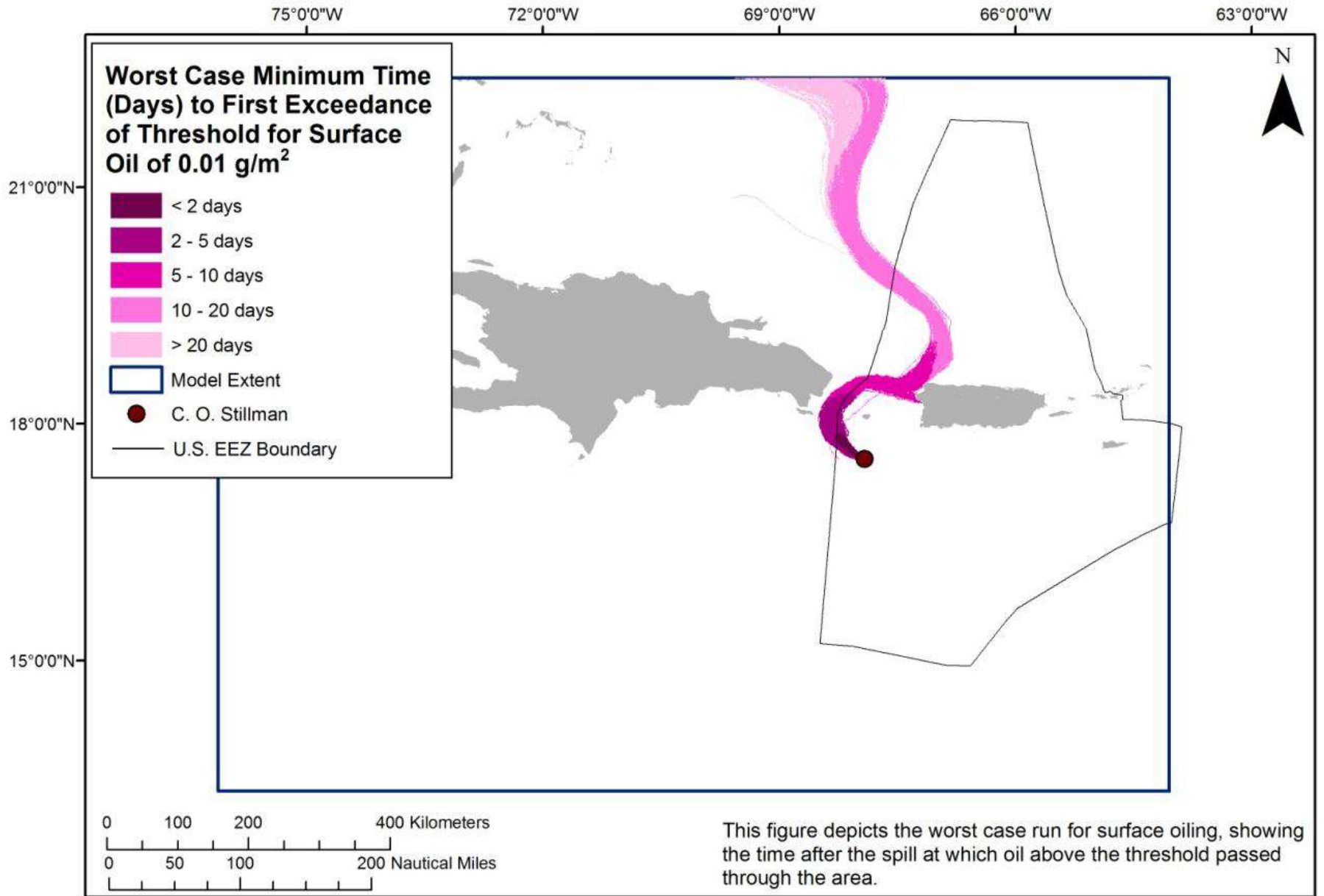
WCD **Med** MP **Low**

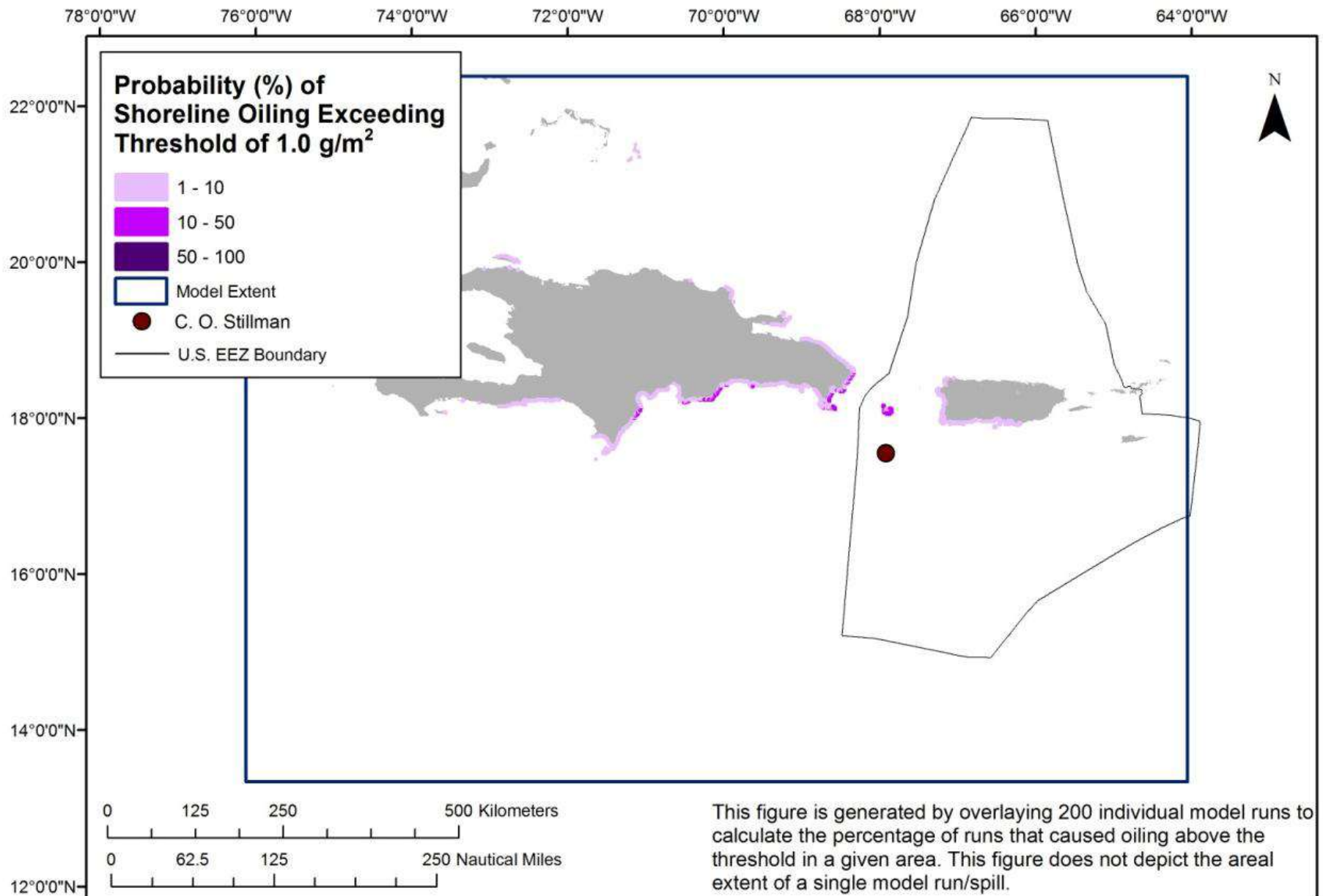


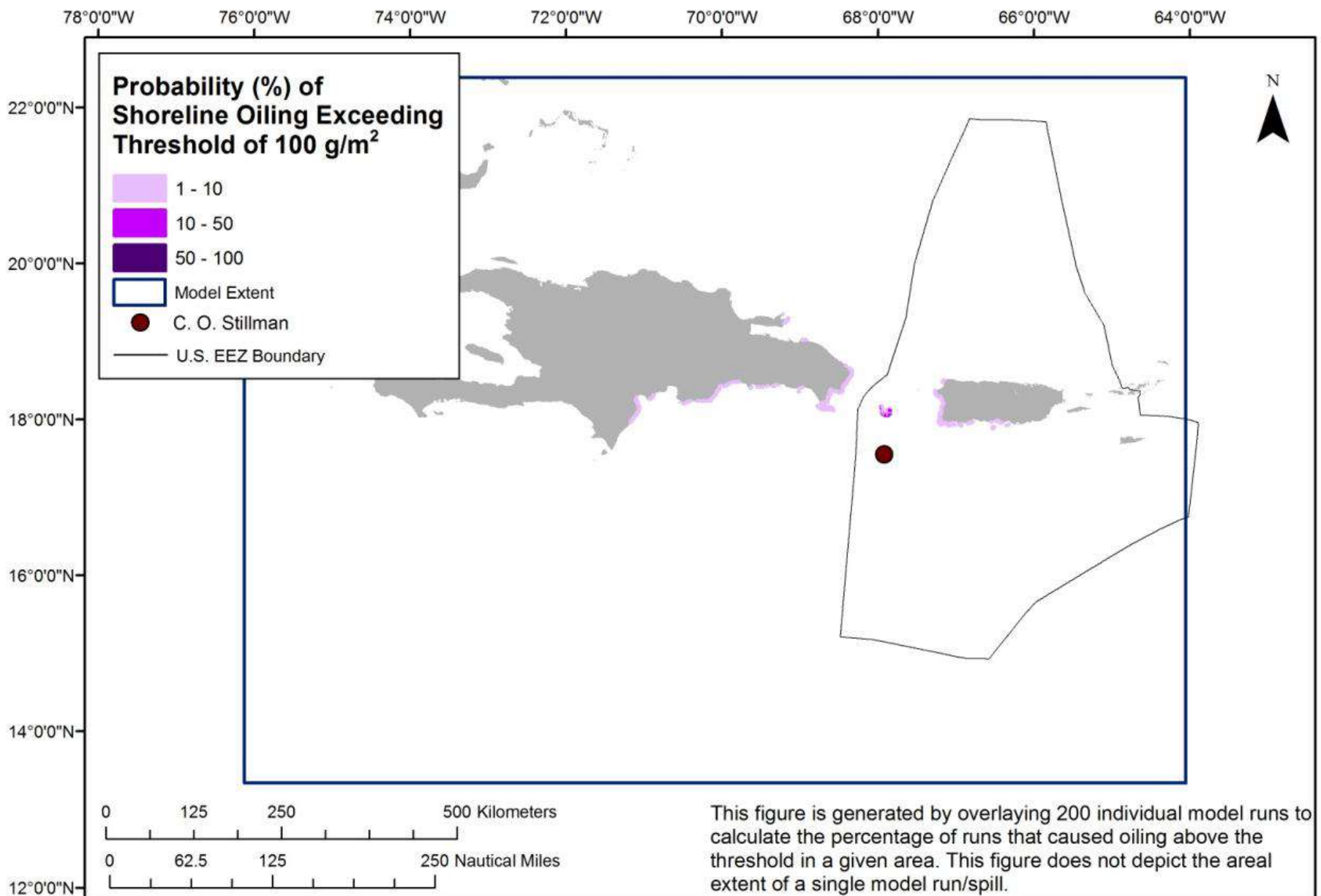




Probability of the **Most Probable** spill of 14,400 bbl of light fuel oil from the *C.O. Stillman* at the threshold for **ecological resources at risk**.







This figure is generated by overlaying 200 individual model runs to calculate the percentage of runs that caused oiling above the threshold in a given area. This figure does not depict the areal extent of a single model run/spill.



Images courtesy of the National Archives



Questions?

<http://sanctuaries.noaa.gov/protect/ppw/>

Lisa Symons 301-713-7275

Lisa.Symons@noaa.gov



ENVIRONMENTAL
RESEARCH
CONSULTING