

Oil Spill Impacts

Georgia Standards of Excellence:

- **MGSE5.G.2** Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.
- **S7L4.** Obtain, evaluate, and communicate information to examine the interdependence of organisms with one another and their environments.
 - **c.** Analyze and interpret data to provide evidence for how resource availability, disease, climate, and human activity affect individual organisms, populations, communities, and ecosystems.

Next Generation Science Standards:

- **MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Learning Objective:

- Students will analyze the effects of human impact UMEs on the cetacean population in the Gulf of Mexico.
- Students will identify what a UME is and its lasting significance on the environment.

Essential Question:

- How can humans utilize renewable energy sources to reduce potential environmental impacts?

Key Vocabulary:

- UME (Unusual Mortality Event)
- Deepwater Horizon
- Oil Spill
- Renewable Energy
- Cetacean

Materials:

- Oil Spill Coverage Map
- Stranded Cetaceans Data Sheet
- Stranded Cetaceans Graphing Worksheet
- Colored writing utensils (blue, red, green, and orange)

Oil Spill Impacts

Background Information:

- **What is a UME?** An UME is an Unusual Mortality Event that has a large amount of animal strandings and death that is far above the normal average. It demands immediate action. Dolphins, sea lions, and manatees are the most commonly affected species by UMEs. Biotoxins, human involvement, or climate change are the most common causes of UMEs. There are seven criteria points that classify a die-off event to be a UME.
 - Most recently, the California Sea Lion UME that started in 2013 (and still remains active) has affected Georgia Aquarium. We built our Pier 225 gallery and took in several rescues while also sending our staff to facilities in California to help research the event and rehabilitate the animals affected.
- **What is a cetacean stranding?** “Whales, dolphins, and porpoises (cetaceans) are considered stranded when they are found dead, either on the beach or floating in the water, or alive on the beach and unable to return to the water.” (NOAA)
- **The Deepwater Horizon Spill** On April 20, 2010, the Deepwater Horizon drilling unit exploded and the fail-safes, set in place to prevent a spill, failed resulting in a massive oil spill. 134 million gallons of oil were spilled into the Gulf of Mexico and spread over 43,300 square miles which is about the size of Virginia.





Oil Spill Impacts

Background Information:

- **The subsequent UME and other UMEs for prenatal animals** The Deepwater Horizon Natural Damage Resource Assessment was assembled in the wake of the incident and ruled with the UME investigation that the oil spill was the cause of the many cetacean deaths in the Gulf of Mexico between 2010 and 2014, though effects can still be seen today.
 - “A December 2013 study of living dolphins in Barataria Bay, Louisiana, found that roughly half were extremely sick; many suffered from lung and adrenal disorders known to be linked to oil exposure. Some 1,400 whales and dolphins had been found stranded by the end of 2015, a figure representing only a tiny percentage of the animals affected.” (Encyclopedia Britannica)
 - Many of these cetaceans were found with lung disease and adrenal gland insufficiency which helps with your bodies hormone regulation. The amount of successful cetacean pregnancies and births also declined rapidly and still shows signs of lingering issues today.
- **Clean-up efforts** People immediately started cleaning up the spill. Oil was pulled up by boats that collected the surface spill and airplanes dropped chemicals in the water that solidified the spill to make the oil blocks sink to the bottom of the ocean. Groups also formed to rescue animals to clean them up, rehabilitate them, or house them if they are non-releasable.





Oil Spill Impacts

Activity Instructions:

- **Oil Spill and UME Data**
- Review the background information with the students:
 - What is a UME is and how the aquarium was affected by one? (sea lions)
 - The basics of what happened in the Deepwater Horizon spill:
 - Watch the following short videos of the oil spilling during the event:
 - <https://www.youtube.com/watch?v=IPpKZx854VQ>
 - <https://www.youtube.com/watch?v=hd7-hPnDJX0&feature=youtu.be>
 - The basics of the 2010-2014 Cetacean UME
 - What is an animal stranding?
- Look at the Oil Spill Coverage Map.
- Present the students with the Stranded Cetaceans Data Sheet and the Graphing Worksheet
 - Students will need to complete the graph by plotting the years 2010-2013 in the proper color (the average and 2014 have already been graphed).
 - Average = Brown
 - 2014 = Purple
 - 2010 = Blue
 - 2011 = Red
 - 2012 = Green
 - 2013 = Orange
- Observe the effect of the oil spill on cetaceans over time from the graphing results.
 - Have students add up the number of strandings each year on a calculator (write the answer underneath each year on the graph) and determine which year has the most strandings.
- *For Teachers: There is a Key to the graph and data addition included below the worksheets*

Oil Spill Impacts

Evaluate:

- Answer the summary questions regarding the background information and the graph results.
 - What does UME stand for? (*Unusual Mortality Event*)
 - When was the Deepwater Horizon incident? (*April 20, 2010*)
 - What marine family of animals was affected in this UME? (*Cetaceans*)
 - Which year had the most amount of marine mammal strandings? (*2011*) Why? (*Effects of the oil spill are not instantaneous if they cause an animal to become sick. 2011 is close enough to the initial incident and enough time for sickness to take hold*)
- (Teacher's Choice) Finish with a discussion about renewable sources of energy compared to non-renewable sources of energy and how this could lessen the probability of an event like Deepwater Horizon in the future.

Extension:

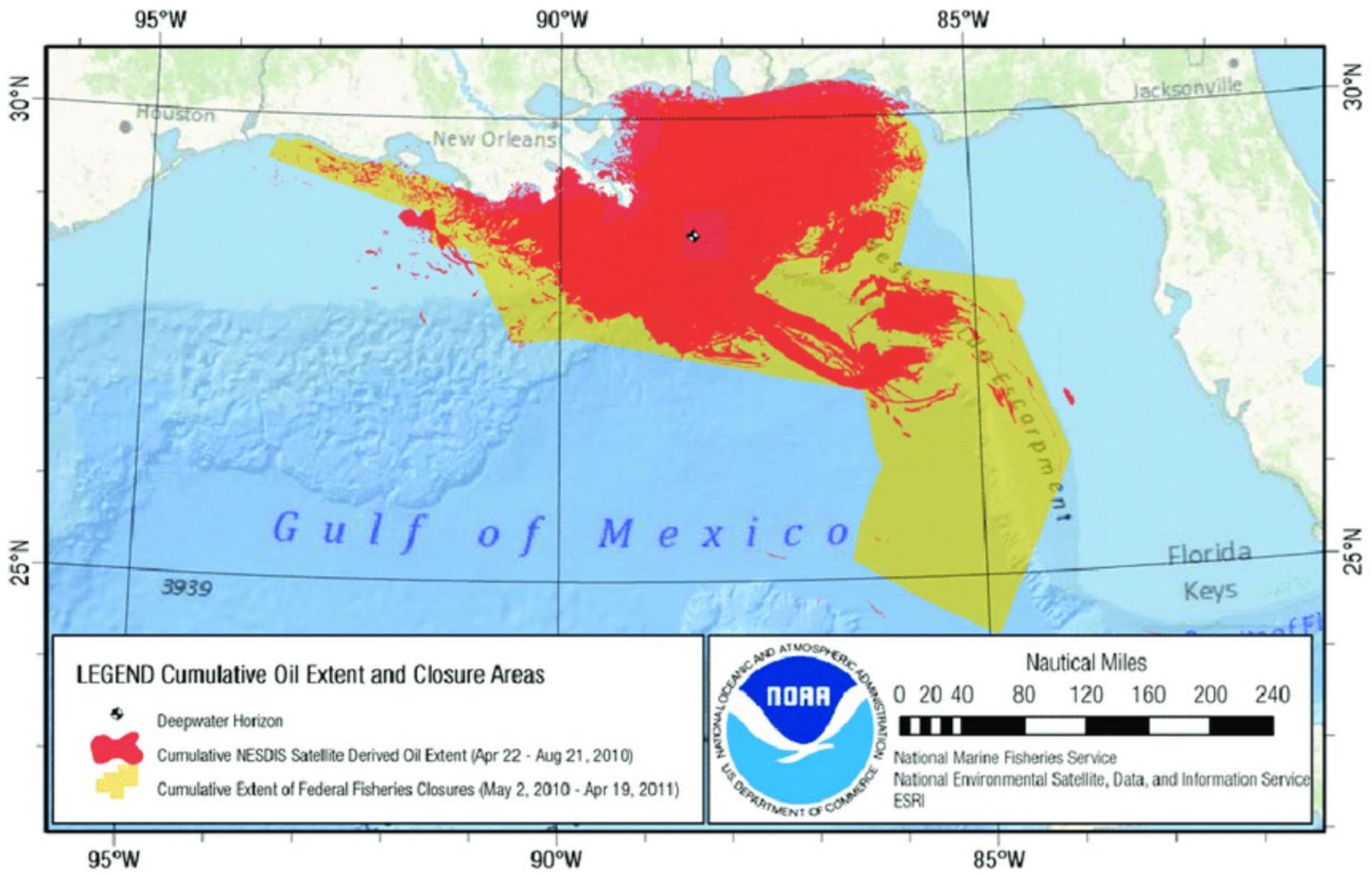
- Follow this link: <https://www.georgiaaquarium.org/at-home-learning-with-georgia-aquarium/> to Georgia Aquarium's web page for 'at home learning' and scroll down to 'Deep Sea Learning'.
- Select 'Episode 8: Oil Spills'
 - There is an educational video accompanied with a study guide/activity for students to do!

Oil Spill Impacts

References:

- Fisheries, NOAA. "Marine Mammal Unusual Mortality Events." NOAA. Accessed August 12, 2020. <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-unusual-mortality-events>.
- "Active and Closed Unusual Mortality Events." NOAA, June 4, 2020. <https://www.fisheries.noaa.gov/national/marine-life-distress/active-and-closed-unusual-mortality-events>.
- "Understanding Marine Mammal Unusual Mortality Events." NOAA. Accessed August 12, 2020. <https://www.fisheries.noaa.gov/insight/understanding-marine-mammal-unusual-mortality-events>.
- "2010-2014 Cetacean Unusual Mortality Event in Northern Gulf of Mexico (Closed)." NOAA, September 12, 2019. <https://www.fisheries.noaa.gov/national/marine-life-distress/2010-2014-cetacean-unusual-mortality-event-northern-gulf-mexico>.
- "The Deepwater Horizon BP Oil Spill: Impact on Ocean Life." Ian Somerhalder Foundation. Accessed August 12, 2020. <https://www.isfoundation.com/infographic/deepwater-horizon-bp-oil-spill-impact-ocean-life>.
- Pallardy, Richard. "Deepwater Horizon Oil Spill." Encyclopædia Britannica. Encyclopædia Britannica, inc., April 13, 2020. <https://www.britannica.com/event/Deepwater-Horizon-oil-spill>.
- "The Environment." Ducksters Educational Site. Accessed August 12, 2020. https://www.ducksters.com/science/environment/renewable_energy.php.
- Fisheries, NOAA. "Understanding Marine Wildlife Stranding and Response." NOAA. Accessed August 12, 2020. <https://www.fisheries.noaa.gov/insight/understanding-marine-wildlife-stranding-and-response>.
- NOAA. *Deep Water Horizon Final Damage Assessment and Restoration Plan*. NOAA Gulf Spill Restoration. Accessed 2019. https://www.gulfspillrestoration.noaa.gov/sites/default/files/wp-content/uploads/Chapter-2_Incident-Overview_508.pdf.

Oil Spill Coverage Map



Stranded Cetaceans Data



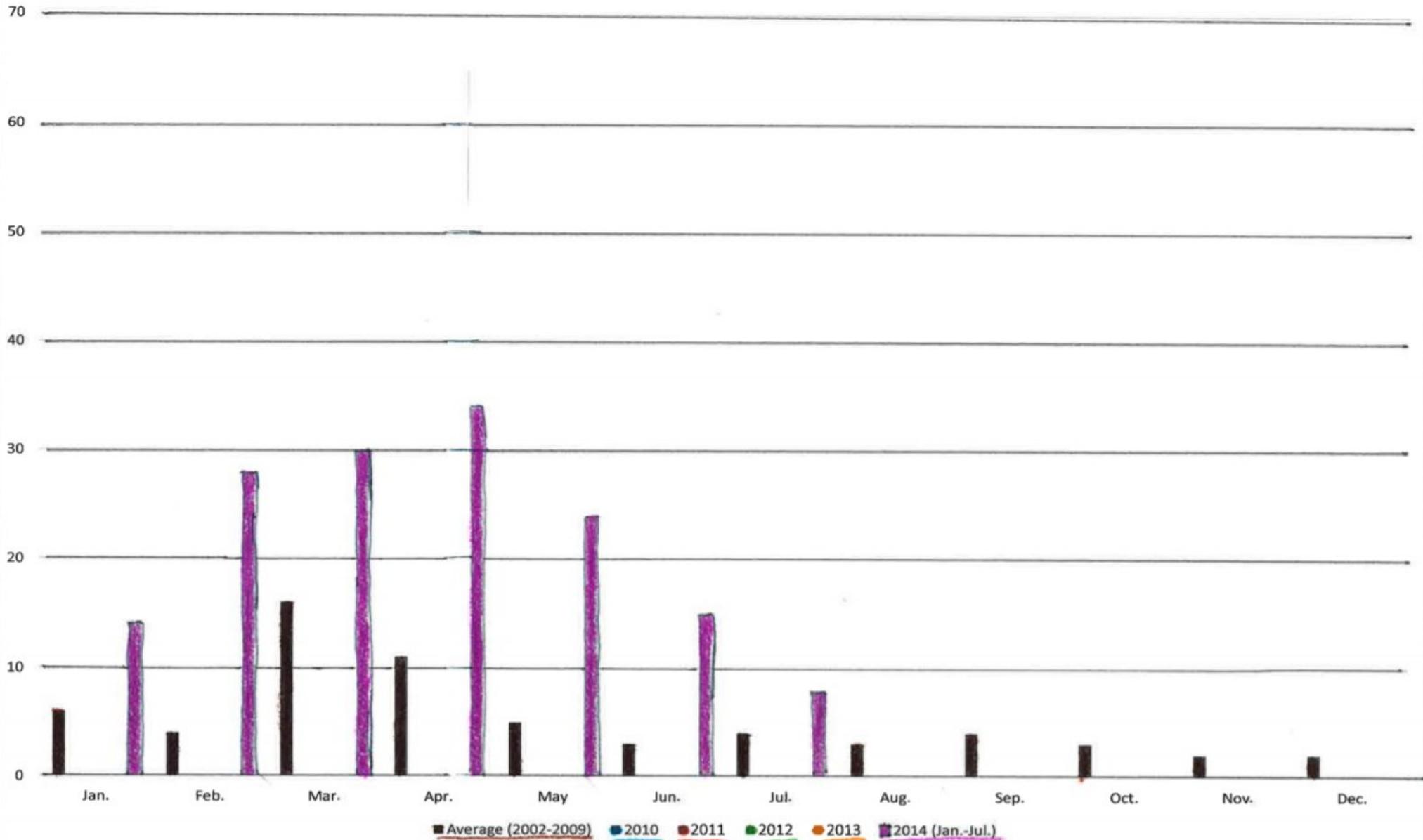
All Stranded Cetaceans in the Gulf of Mexico 2010-2014 (Data Sheet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average (2002-2009)	5.5	3.6	16.3	11.1	4.8	3	3.9	3.3	4.1	3.3	2.4	2
2010 Total			53	36	39	30	11	18	15	6	11	12
2011 Total	20	62	64	35	20	22	16	30	15	26	17	15
2012 Total	21	21	43	17	11	6	7	5	10	13	16	13
2013 Total	22	24	45	65	29	12	3	7	4	8	4	9
2014 Total (Jan-Jul)	14	28	30	34	24	15	8					

Stranded Cetaceans Graph



All Stranded Cetaceans in the Gulf of Mexico 2010-2014



Stranded Cetaceans Data **KEY**



All Stranded Cetaceans in the Gulf of Mexico 2010-2014 (Data Sheet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Average (2002-2009)	5.5	3.6	16.3	11.1	4.8	3	3.9	3.3	4.1	3.3	2.4	2	63.3
2010 Total			53	36	39	30	11	18	15	6	11	12	231
2011 Total	20	62	64	35	20	22	16	30	15	26	17	15	342
2012 Total	21	21	43	17	11	6	7	5	10	13	16	13	183
2013 Total	22	24	45	65	29	12	3	7	4	8	4	9	232
2014 Total (Jan-Jul)	14	28	30	34	24	15	8						153

2011 has the highest number of strandings because it was closest to the initial event (April 20th, 2010) while also granting the oil time to affect the cetacean's health and environment.

Stranded Cetaceans Graph KEY



All Stranded Cetaceans in the Gulf of Mexico 2010-2014

