Whale They Survive?

A Habitat Assessment of the Southern Resident Killer Whale in the Puget Sound

INTRODUCTION

Southern Resident killer whales (*Orcinus orca)* are among the most endangered marine mammals in the world. As of 2018, their population totals only 76 whales, the lowest it has been in 30 years. As top predators in their marine environment, they play a critical role in ecosystem dynamics. Their extinction could be catastrophic to the waters they inhabit.

The primary threats impacting Southern Resident killer whales have been identified as chemical pollutants, vessel traffic and noise, and prey availability. A comprehensive recovery plan was proposed in 2018 to save this culturally and ecologically important species.

The purpose of this analysis is to assess the impacts of several threats and conservation efforts to determine the killer whales' overall habitat quality in the Puget Sound.

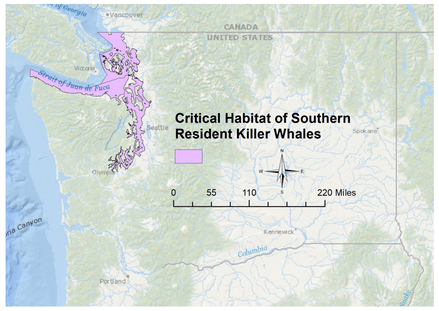
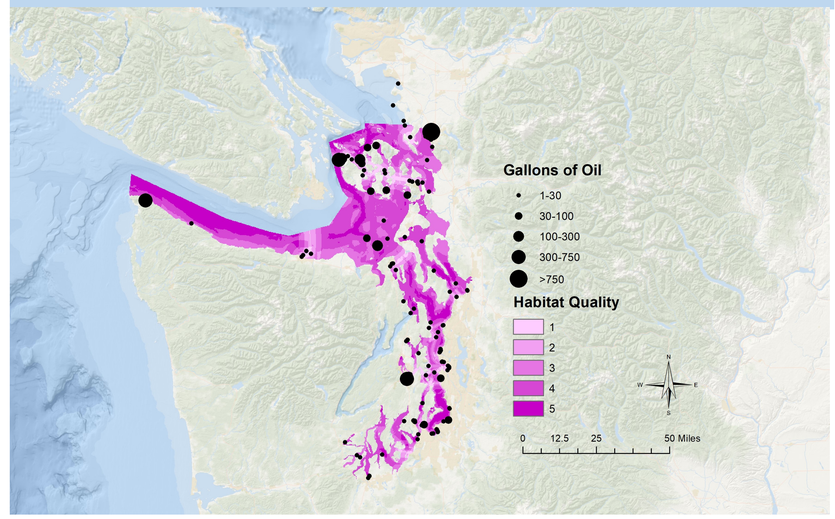


Figure 1. Map of Washington State. Critical habitat of the whale population as identified by NOAA.

Factor	Weight	1 = Bad Condition	2	3	4	5 = Good Condition
Depth (m)	30%	0-50	50-100	100-150	150-200	>200
Distance from Ferry Routes (m)	45%	0-100	100-3,000	3,000-10,000	10,000-20,000	>20,000
Distance from Boat Pump Out Stations (m)	25%	>30,000	10,000-30,000	3,000-10,000	1,000-3,000	0-1,000

Table 1. The factors and their respective weights used to assess the habitat quality.

FINAL HABITAT QUALITY ASSESSMENT



METHODS

In order to assess the habitat quality, 4 factors were identified and analyzed: ferry routes, bathymetry, boat pump out stations, and locations of oil spills from 2015 to 2018. Ferry routes, bathymetry, and boat pump out stations were converted to raster files and reclassified on a scale from 1 to 5 (Table 1). Oil spills weren't included in the raster analysis because they are temporary factors. The oil spills were symbolized based on the amount of oil released per spill.

RESULTS & DISCUSSION

This analysis highlights the areas of most concern for the killer whales. Only 36% of the study area is rated less than 3, which suggests that the factors weighted in this study aren't their primary threats.

The bathymetry analysis highlights the surprising depth of the Puget Sound. Since the whales are able to maneuver in the narrow southern channels of the waters, it's critical to protect these areas from pollution. The analysis shows that those channels contain a relatively high concentration of boat pump out stations which help mitigate water contaminants. In 2017, Washington State reported that the pump out stations helped prevent 10,641,431 gallons of sewage from entering the ocean.

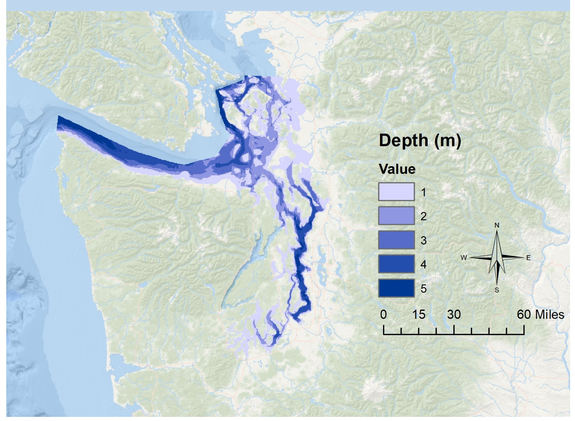
The ferry lines also run directly through these southern channels. Since the channels are so narrow, the whales are most likely severely impacted by the noise and possible incidences of collisions. Rerouting the ferry lines or running trips less frequently is recommended for the whales' survival.

The location of the oil spills is primarily along the ferry routes and shorelines. Oil exposure can cause external damage to the whales and is believed to cause population-level impacts when ingested. Between 2015 and 2018, there have been a total of 596 spills, 8.6% of which have contained over 30 gallons. There has been a high abundance of spills in the southern channels, further reinforcing this area as one of primary concern for the whale population.

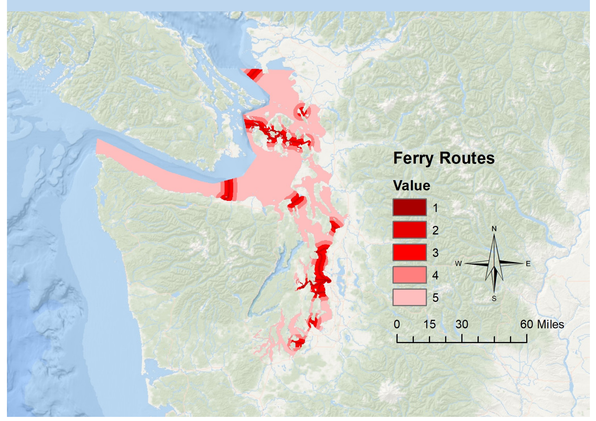
Cartographer: Kat Grellman, Introduction to GIS 101, Fall 2018
Sources: NOAA, Washington State Department of Transportation, Washington Geospatial Open Data, State of Washington Department of Ecology, Clippervacations.com
Projection: NAD_1983_HARN_StatePlane_Washington_South_FIPS_4602_Feet

Tufts

BATHYMETRY



DISTANCE FROM FERRY ROUTES



DISTANCE FROM PUMP STATIONS