

MAPPING CUMULATIVE THREATS IN ENDANGERED COOK INLET BELUGA WHALE HABITAT

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THE CONCERN & GOAL



The beluga whale population in Cook Inlet, Alaska is on a path towards extinction within our lifetime as fewer than 280 whales remain in what was, until a few decades ago, considered a healthy population numbering over 1000. In 2008, the Cook Inlet beluga whale (CIBW) distinct population segment was listed as endangered under the Endangered Species Act; however, based on the most recent abundance estimate from 2018, the population has declined at a rate of 2.3% annually during that 10-year period. If the current rate of decline continues, there could be less than 200 Cook Inlet belugas by 2033; a population abundance level that NOAA's National Marine Fisheries Service (NOAA Fisheries) has suggested is the point where small population dynamics, such as inbreeding depression or loss of genetic diversity, pose a significant risk to the CIBW population's recovery. NOAA Fisheries identified cumulative effects of multiple stressors as a threat of high concern to beluga recovery. Yet, both federal and state agencies continue to authorize the legal harassment of CIBWs and/or degradation of their habitat, without comprehensively understanding the extent of various threats these highly mobile whales are already encountering throughout Cook Inlet. Complicating matters are the varying regulatory definitions of cumulative effects/impacts/risk, most of which do not align with scientific or colloquial interpretations. Given the urgency for curbing the population decline, our goal for this project was to develop a visualization of the areas within Cook Inlet where belugas were exposed to threats.

CIBW LOCATIONS

Location data from CIBWs tagged with satellite transmitters 1999-2002



DATA SOURCE: Provided by NOAA Fisheries based on "Shelden et al. 2018. Beluga whale, *Delphinapterus leucas*, satellite-tagging and health assessments in Cook Inlet, Alaska, 1999 to 2002. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-369, 227 p."

CRITICAL HABITAT

NOAA Fisheries designated critical habitat for CIBWs in 2011



DATA SOURCE: CIBW critical habitat data from <https://www.fisheries.noaa.gov/resource/map/beluga-whale-cook-inlet-dps-critical-habitat-map-and-gis-data>

THE METHODS

We started by identifying a small number of threats with datasets that were easily mappable: shipping patterns using AIS data; NOAA Fisheries permitted level B harassment zones for projects authorized to incidentally take Cook Inlet belugas; mixing zones where pollution was allowed to exceed water quality standards, permitted by Alaska Department of Environmental Conservation and the Environmental Protection Agency; and physical infrastructure associated with oil and gas extraction. We overlaid these data with CIBW locations and critical habitat boundaries to visualize the cumulative, geographic extent of these few threats to the endangered beluga whales in Cook Inlet.

VESSEL TRAFFIC

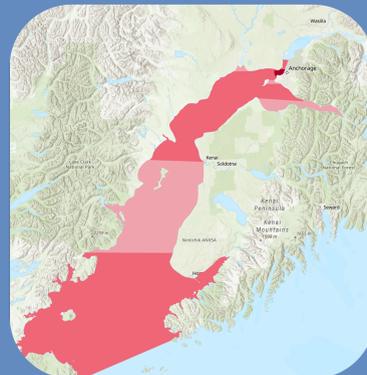
We mapped the paths of vessels with AIS transponders transiting Cook Inlet in 2019 (2021 data wouldn't download, and 2020 deemed atypical due to covid).



DATA SOURCE: AIS data were downloaded from <https://marinecadastre.gov/ais/>

INCIDENTAL HARASSMENT

We mapped the geographic extent of all non-CIBW research projects which were authorized by NOAA Fisheries to legally, incidentally harass CIBWs in 2021. The darker the shading, the more projects authorized in that geographic area (ranging from 1 to 3). The area in darkest red near Anchorage had the most projects (n=3) authorized to harass CIBWs.



DATA SOURCE: Level B harassment zones were obtained from Incidental Take Statements (<https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act>) and Biological Opinions (<https://www.fisheries.noaa.gov/alaska/consultations/section-7-biological-opinions-issued-alaska-region>) issued by NOAA Fisheries



OIL & GAS INFRASTRUCTURE

We mapped the 2021 existing infrastructure for oil and gas extraction in and along Cook Inlet.



DATA SOURCE: A full list of sources we explored can be found at <https://www.one-tab.com/page/wgH8SE2kTReNydXv3j40jw>

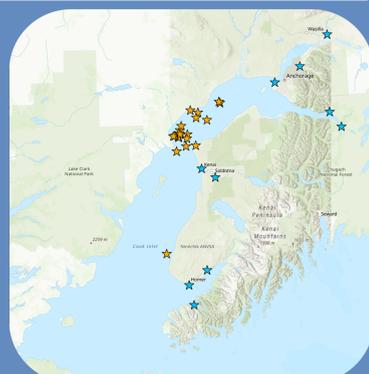
THE RESULTS & NEXT STEPS

Mapping data from even these limited sources shows just how few areas within their federally-designated critical habitat that CIBWs have where they are not exposed to at least one anthropogenic threat, be it noise, habitat loss or degradation, pollution, or the potential for physical injury due to vessel strike. In several habitat areas, they are exposed to multiple threats. It is important to note that our depiction of cumulative threats is incomplete; not all sources within a threat category are mapped (e.g., not every vessel is required to have AIS tracking; not all mixing zones for all activities are included), nor are all possible threats included in this initial mapping exercise (e.g., threats not included are legal harassment from CIBW research activities; unauthorized harassments; catastrophic events; strandings; etc.). Regardless of these limitations, mapping these few sources is a powerful tool in helping to visualize and explain the extent of cumulative threats to CIBWs. Furthermore, this project highlights the need for regulators to meaningfully consider the multitude of existing stressors this declining population is already enduring throughout their range prior to permitting more activities that harass CIBWs or affect their habitat. Unfortunately, the current status quo harassment permitting process is not designed to allow for a range-wide assessment of cumulative threats to CIBWs.

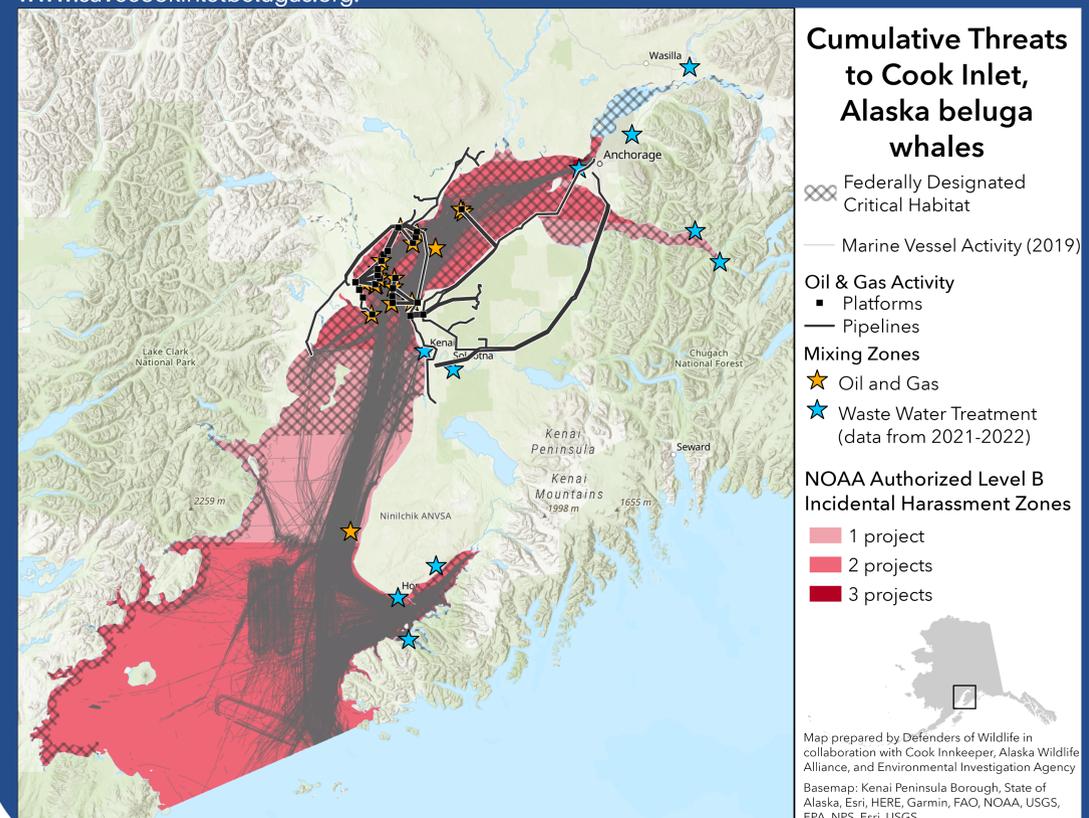
Our next steps include updating the existing data layers with complete data for 2021 (i.e., replacing 2019 vessel traffic patterns with 2021 AIS data when available; including mixing zones from all projects with permitted mixing zones). Once those layers are updated, we will look into adding more data layers for more threats and years. Updated maps will be accessible online at www.savecookinletbelugas.org.

POLLUTION MIXING ZONES

We mapped the approximate location, but not size, of activities in 2021 with mixing zones (areas where pollution levels are allowed to exceed water quality standards) in the Cook Inlet watershed. The orange stars represent mixing zones from oil and gas activities; the blue stars represent wastewater treatment facilities. This is not a comprehensive list of all mixing zones in 2021.



DATA SOURCE: Mixing zone permits identified from Alaska's Environmental Data Management System (dec.alaska.gov/applications/water/edms/hcore/external/home)



Cumulative Threats to Cook Inlet, Alaska beluga whales

— Federally Designated Critical Habitat

— Marine Vessel Activity (2019)

Oil & Gas Activity

■ Platforms

— Pipelines

Mixing Zones

★ Oil and Gas

★ Wastewater Treatment (data from 2021-2022)

NOAA Authorized Level B Incidental Harassment Zones

■ 1 project

■ 2 projects

■ 3 projects



Map prepared by Defenders of Wildlife in collaboration with Cook Inletkeeper, Alaska Wildlife Alliance, and Environmental Investigation Agency
Basemap: Kenai Peninsula Borough, State of Alaska, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS, Esri, USGS