

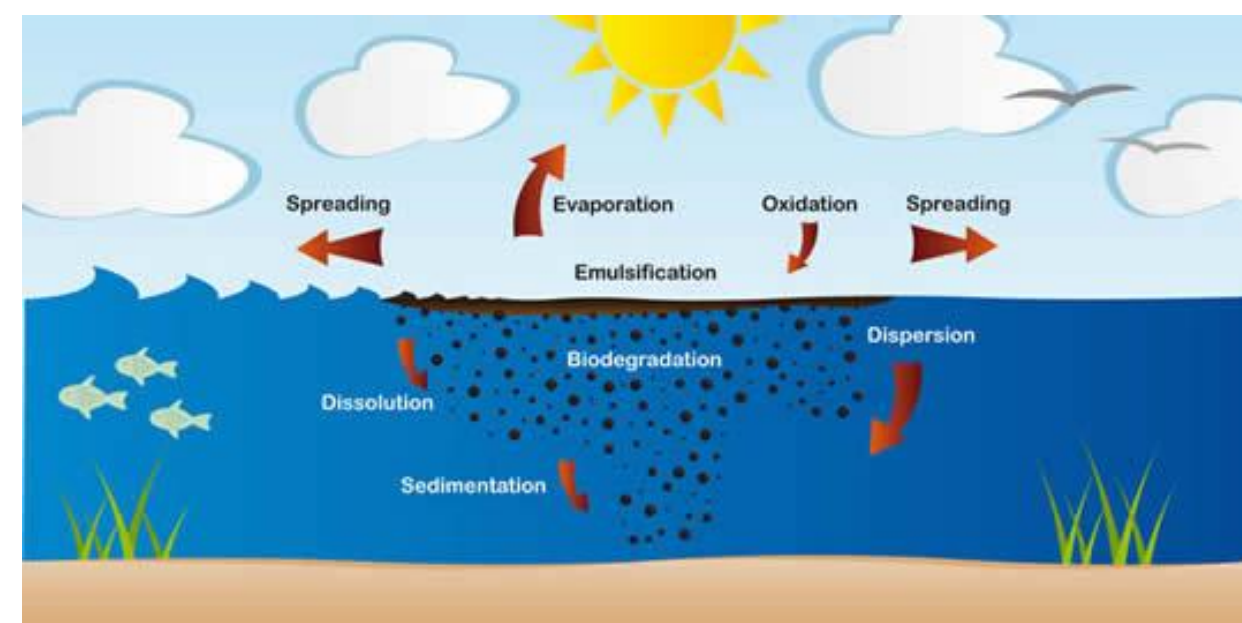
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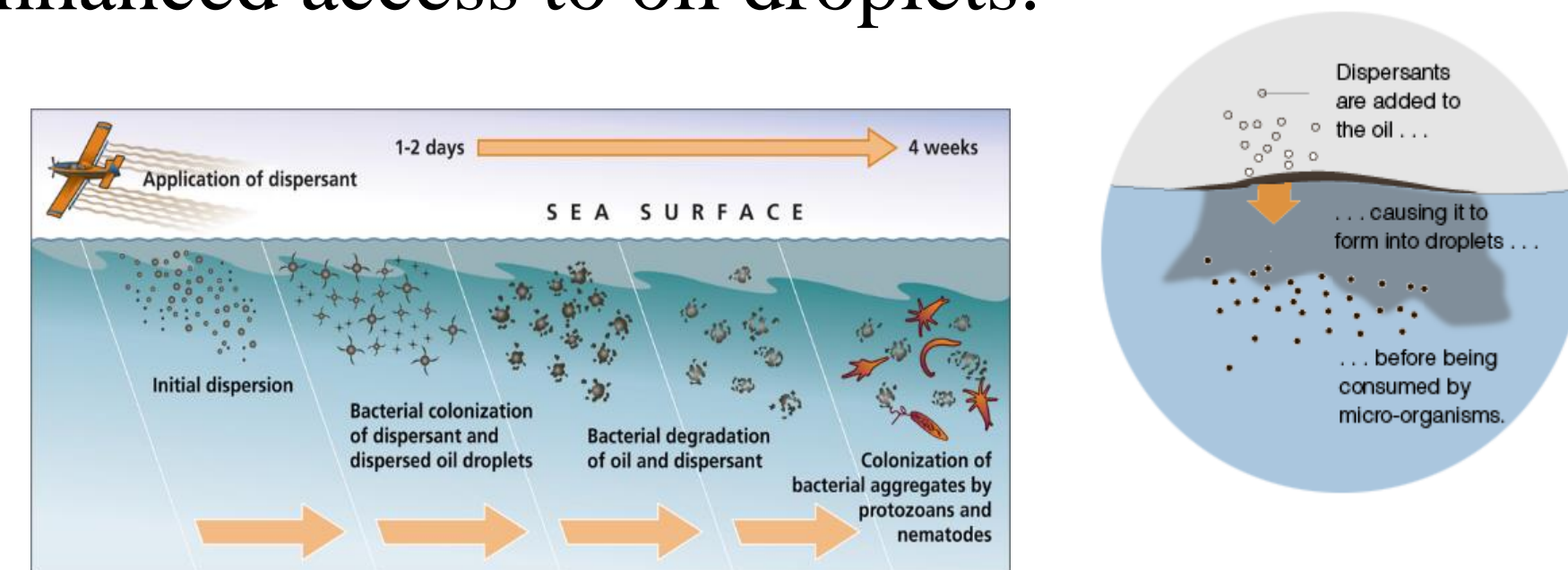
Robyn Conmy, National Risk Management Research Laboratory

Purpose/Utility of Research

The fate of crude oil spilled in water is dependent upon complex interrelated physico-chemical and biological weathering.



Microbial organisms biodegrade oil and dispersants. Addition of dispersants forms smaller oil droplets that allows microbes enhanced access to oil droplets.



Needed is a comprehensive understanding of biodegradation rates over a wide range of dispersed oil types, under a variety of environmental conditions. This allows for improved predictions of the ultimate fate and transport of oil in the environment.

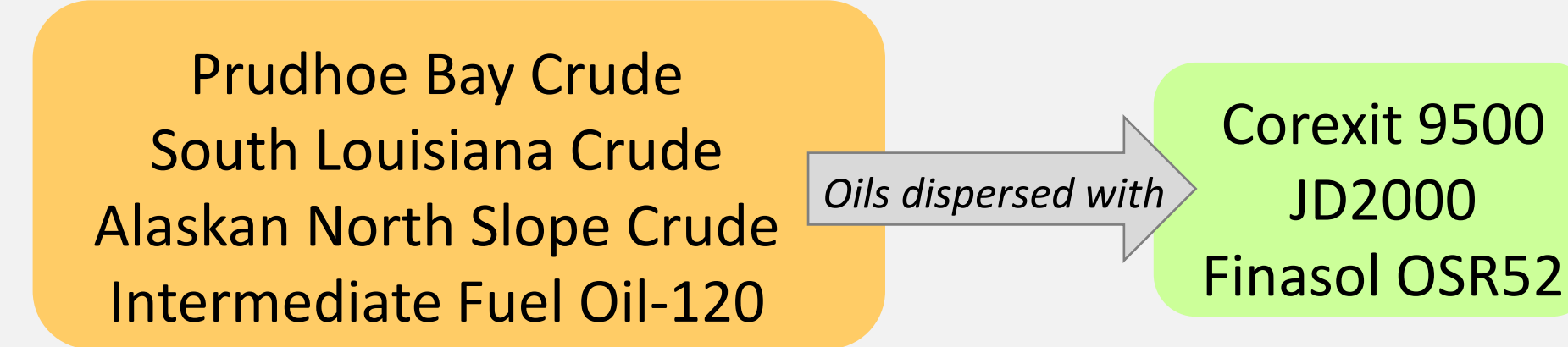
Connection to SHC Portfolio

Supports SHC program in protecting communities. Characterizing biodegradation rates allows for predicting oil concentrations and potential exposure to humans and ecosystems.

SHC 3.62 Environmental Releases of Oils and Fuels
Task 2. Behavior, Fate & Effects of Oil and Spill Agents

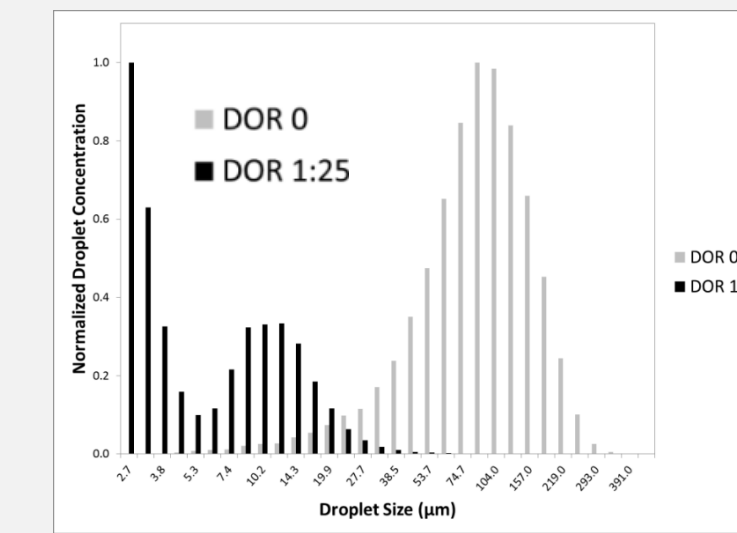
Highlights

- SHC 3.62 conducts research on biodegradation rates of crude oils and dispersants under warm and cold temperatures. Published articles are resources during ocean spills to predict longevity of spilled oil components.



- Biodegradation rates of Diluted Bitumen is not well characterized. A parametric study of Access Western and Cold Lake Blends is underway. Metagenomic sequencing (DNA and 16S rRNA) used to determine microbes best suited to degrade this heavier oil.

- Oil biodegradation is dependent upon oil droplet size. Better predicting Droplet Size Distribution (DSD) improves prediction of biodegradation.



Application & Translation

Biodegradation of oil components is key to determining the fate and transport of spilled oil. This is essential for informing emergency responders, FOSCs, OSWER OEM, Regional Partners and community stakeholders on the potential outcomes of spills. This has implications for the agency's efforts in RESTORE and damage assessment.

Biodegradation rates of dispersed oils are used by NOAA's ADIOS and GNOME weathering and transport models.

ORD dispersion and degradation rates are used as inputs to the VDROD model and for decision making on dispersant application for subsea oil blowouts.

Characterizing rates of Diluted Bitumen biodegradation using Kalamazoo River cultures in support of Region 5.



Intended End users

- Federal: EPA OSWER OEM, EPA Office of Water, ERT – Emergency Response Teams, NRT – National Response Team, ICCOPR – Interagency Coordinating Committee on Oil Pollution Research, FOSC – Federal On Scene Coordinators, Regions
- States
- International: Fisheries and Oceans Canada
- NGO: GoMRI, National Academies of Science, Industry Partners

Lessons Learned

Research in Charter 3.62 provides scientific building blocks to address knowledge gaps identified by the scientific community and emergency responders, including:

- Effects of Oil Mineral Fines on the biodegradation of oil.
- Fate of diluted bitumen in fresh and salt water.
- Dispersant Efficiency and biodegradation in Arctic brine waters.



For more information on this project within SHC Charter 3.62, please contact Robyn Conmy conmy.robyn@epa.gov