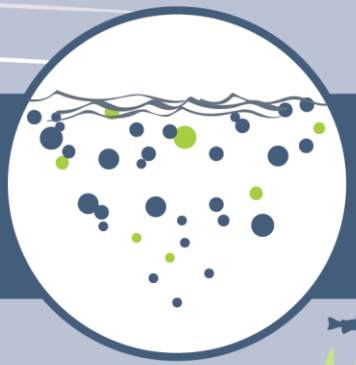
The Role of Dispersants in Oil Spill Response

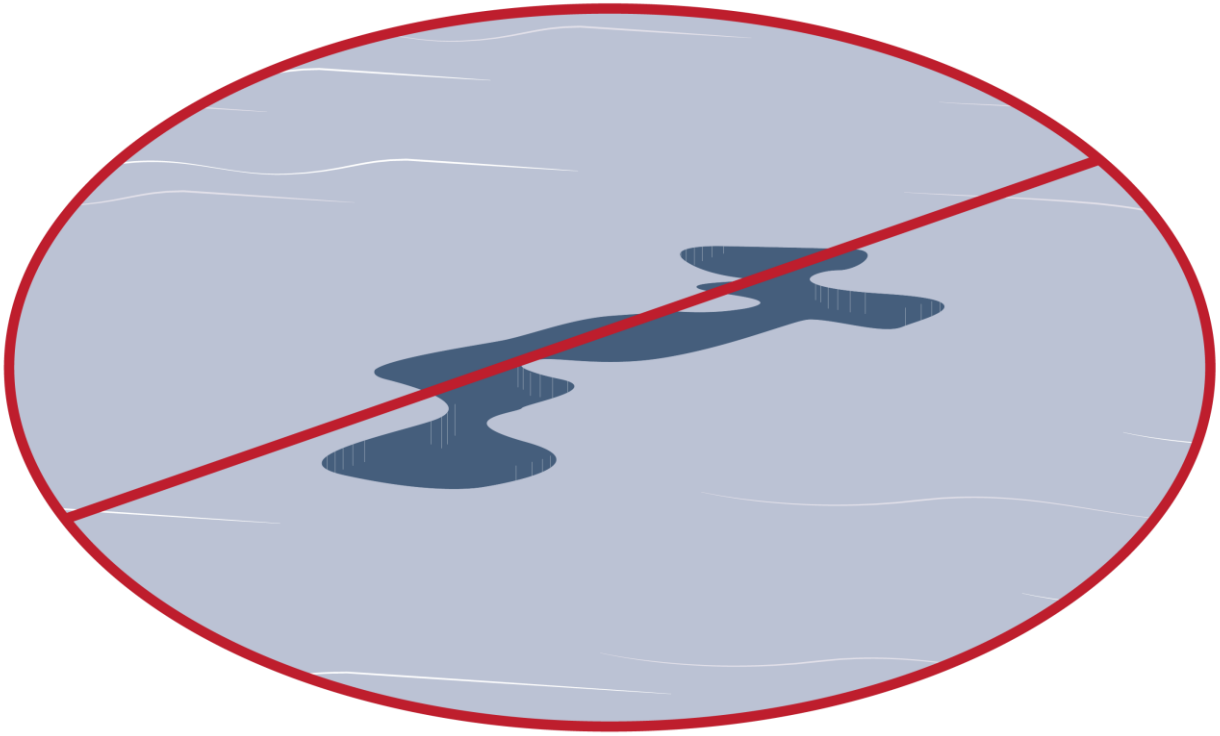


Objectives

- We will illustrate the facts about dispersants and why they are an important oil spill response option.
- We want to work effectively with regulators and communities to minimize impact to people and the environment through the appropriate use of response options.
- We ask that regulators continue to develop new policies and support existing policies and plans that enable speedy response, critical resource sharing, and alignment on dispersant use.

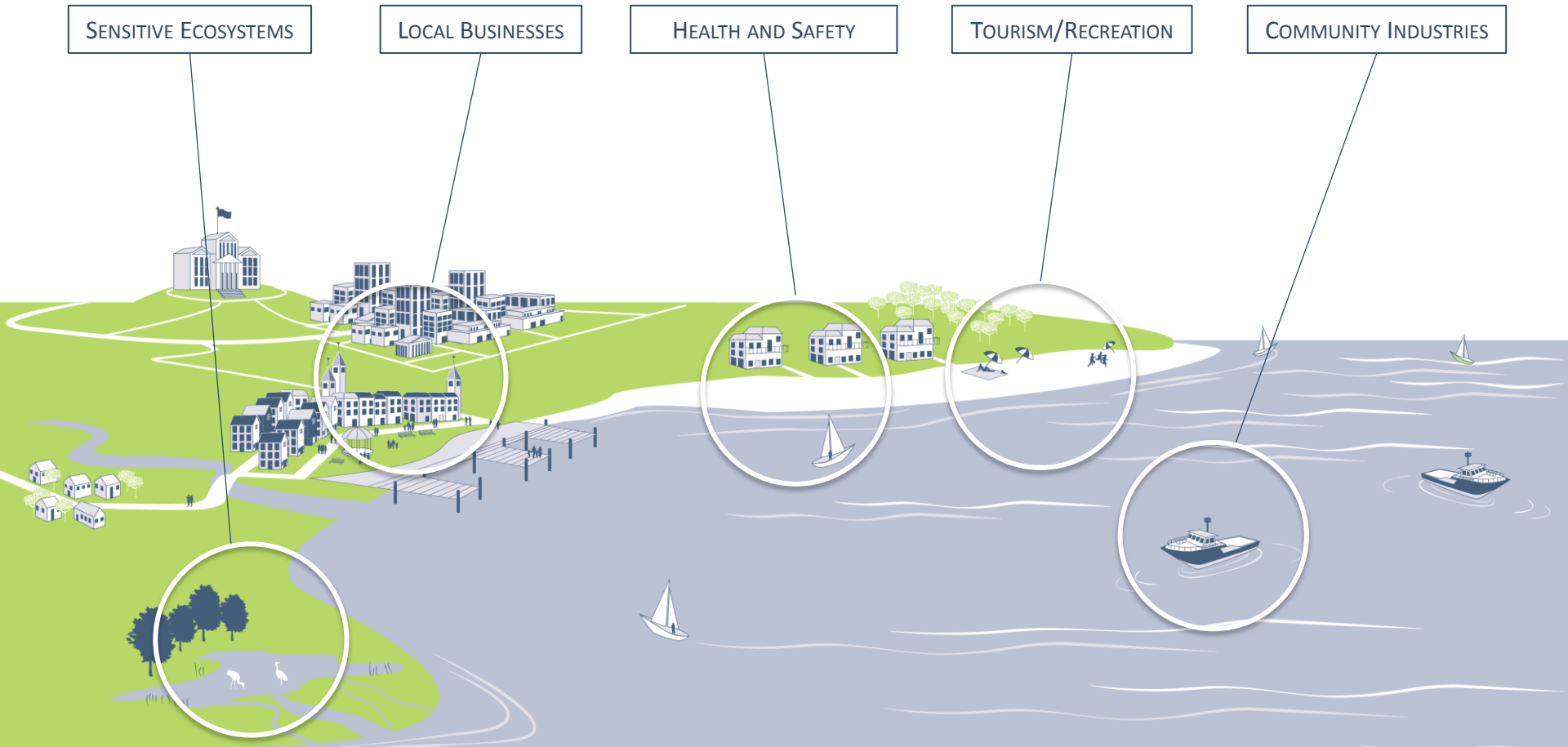
Preventing Oil Spills

Our goal is to never have an oil spill, and the industry takes extensive precautions to prevent spills from occurring.

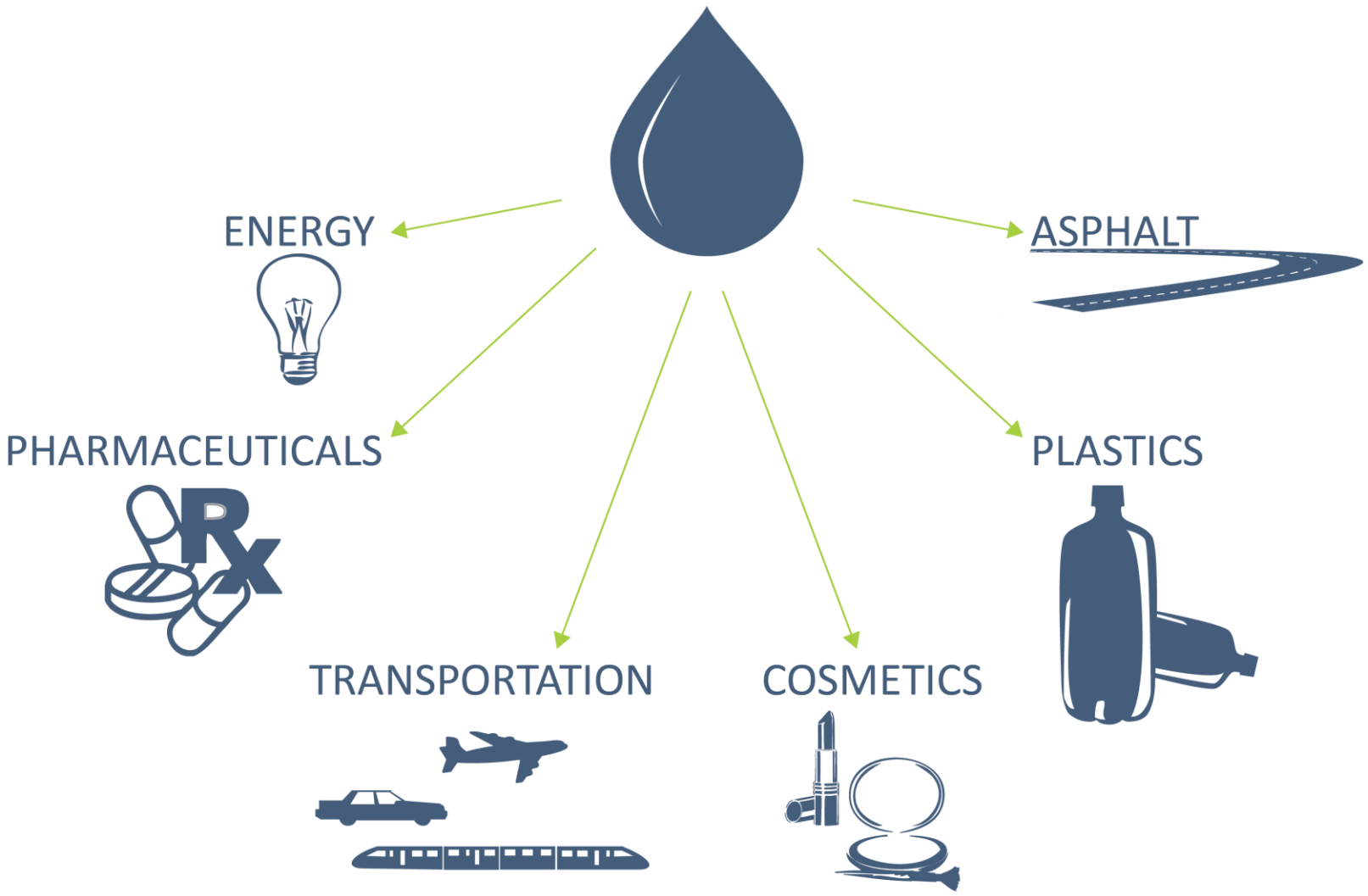


Protecting Our Shared Values

We follow a set of guiding principles that allows the response community to protect our shared values.

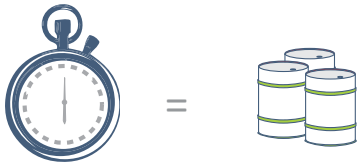


Oil is a Crucial Resource



It will continue to be an important resource for decades to come.

Getting Oil Around the World

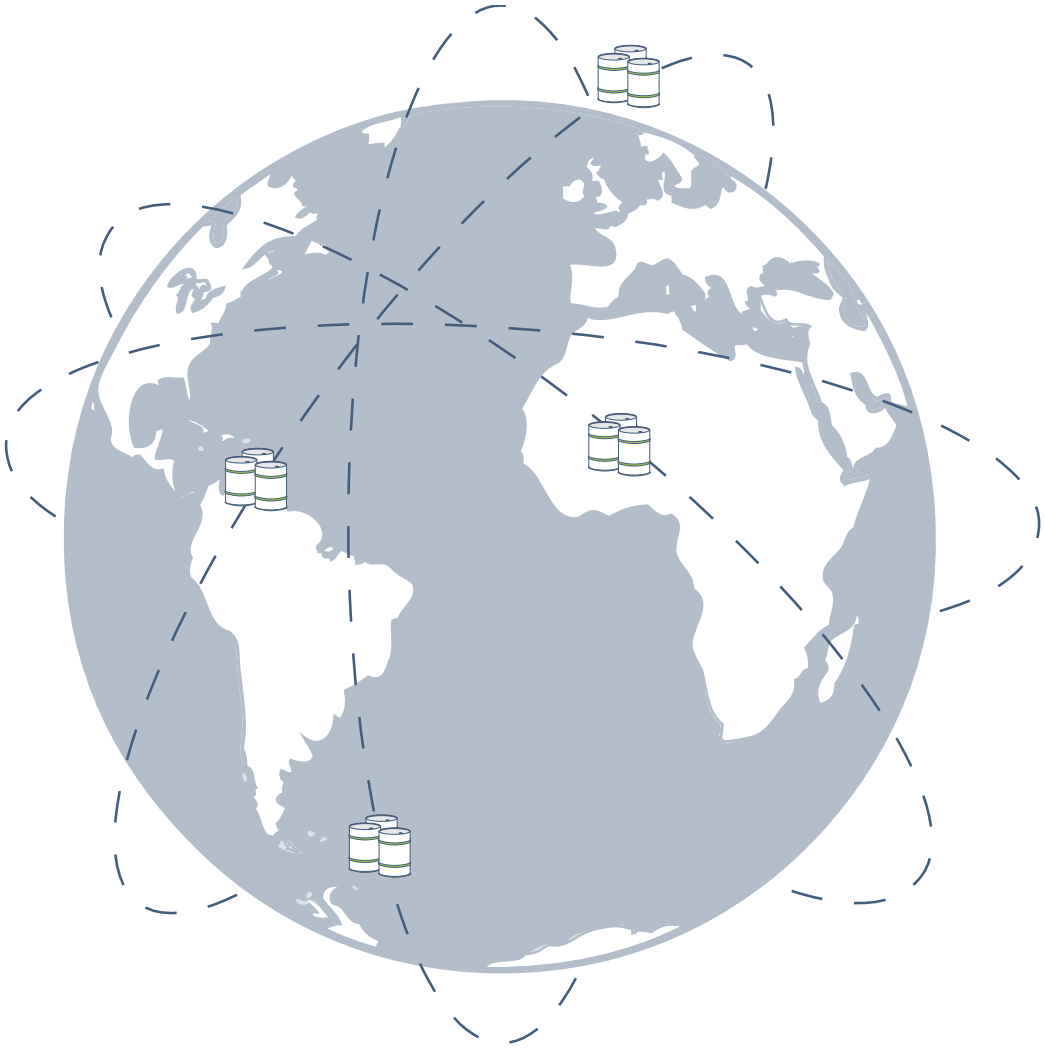


1 sec = 18.85 tonnes

Every second, approximately 18.85 tonnes of oil are being moved across the globe to power the world.

That's over 1,625,000 tonnes every day.

More than 99.9999% of oil shipped via tanker arrives safely at its destination.



SOURCE: INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION 2012

Combating the Spread of Spilled Oil

Our common enemy is the spread of spilled oil and its impact on our shared values – protecting them is a race against time.

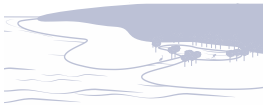
The efficacy and speed of response are accelerated by:

- Sharing of objective information
- Pre-approving response tools
- Rapid, nonpartisan decision-making
- Mobilizing response capabilities

Factors Considered in Oil Spill Response

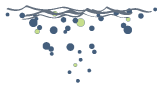
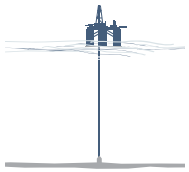
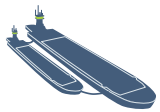
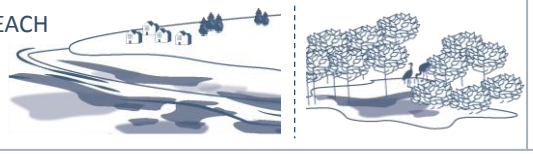
Response teams consider a variety of factors in making decisions prior to and during an oil spill.

Environmental and Social Factors

- Local Populations 
- Cultural and Historical Considerations 
- Sensitive Species 
- Recreational Activities 
- Ecologically Sensitive Areas 
- Critical Infrastructure 
- Local and Community Industries 
- Seasonal Variables 

Our Response Toolbox

We are prepared to respond to potential spill scenarios.

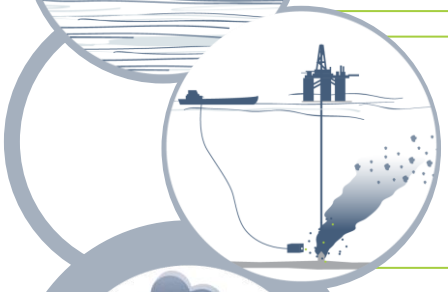
Example Scenarios	Possible Response Tools					
	Source Control	Dispersants	Mechanical Recovery	In-Situ Burning	Shoreline Clean Up	Natural Processes
Offshore Release Tanker Spill 						
Offshore Release Subsea Spill 						
Offshore Release Spill flowing towards populated area 						
Near Shore Release Spawning Season 						
Onshore or Near Shore Release Near Marsh or Sand Beach 						

Why Dispersants?

Dispersants are used when environmental and spill factors limit the efficacy of other response options.

For offshore spills, dispersants can be transported and applied by airplane, and are therefore able to reach spills located further offshore faster.

Aerial application allows dispersants to reach a greater spill surface area than mechanical recovery, which can only be achieved by boat.

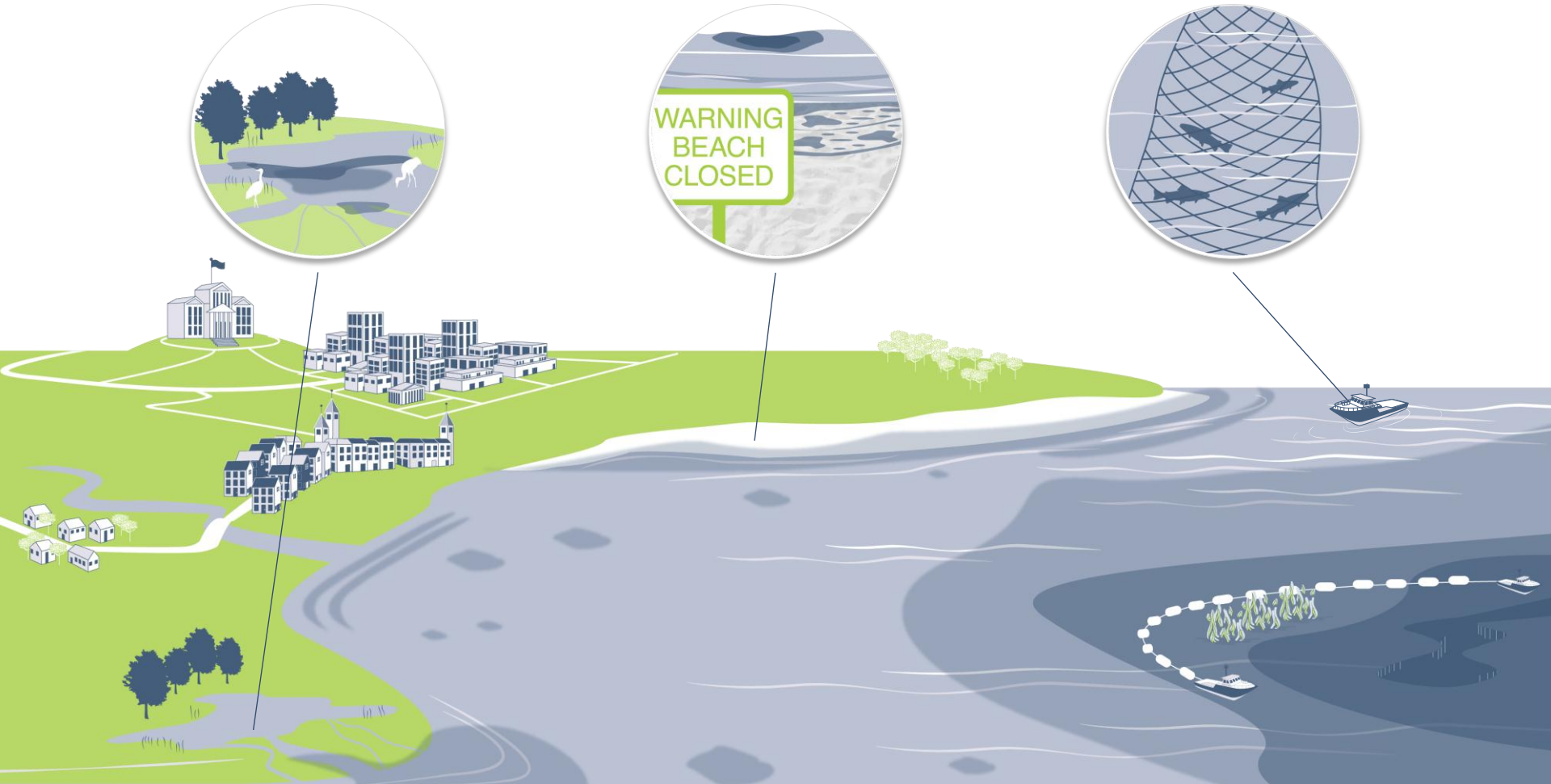


In the event of a subsea spill, dispersants can be applied proportionately and with minimal disruption, and can prevent most oil from reaching the surface.

Unlike mechanical recovery and in-situ burning, dispersants can be applied under a broader range of weather conditions, including high winds and rough seas.

What Happens When Dispersants Are Not Used?

In larger, offshore oil spills, mechanical recovery and in-situ burning can only prevent a small percentage of the oil from impacting our shared values. Without the use of dispersants, oil often spreads to the shore, affecting people, the environment, and community assets.



Realities of Dispersants

Dispersants break down oil in the environment and accelerate natural biodegradation processes.

DISPERSANTS DO…

BREAK DOWN OIL SLICKS INTO TINY DROPLETS SO THAT THEY CAN MORE EASILY BE BIODEGRADED

DISPERSANTS DO NOT…

DRIVE OIL TO THE SEA FLOOR

DISPERSANTS DO NOT…

HIDE THE PROBLEM INSTEAD OF SOLVING IT

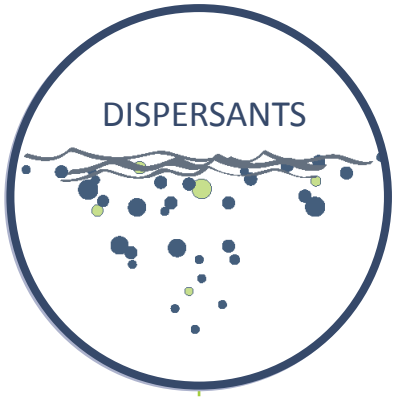
DISPERSANTS DO NOT…

INCREASE THE TOXICITY OF OIL

DISPERSANTS DO…

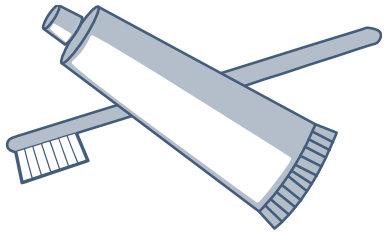
MINIMIZE ENVIRONMENTAL AND ECONOMIC DAMAGE TO PEOPLE, HABITATS, AND NATURAL RESOURCES NEAR AND ON THE SHORELINE

Understanding the Composition of Dispersants



Dispersants work just like soaps and shampoos. They clean up spills by breaking oil slicks into tiny droplets – smaller than the diameter of a human hair. Dispersants are designed to work in the marine environment and prevent oil from re-coalescing.

The same ingredients in dispersants are also found in:



Toothpaste

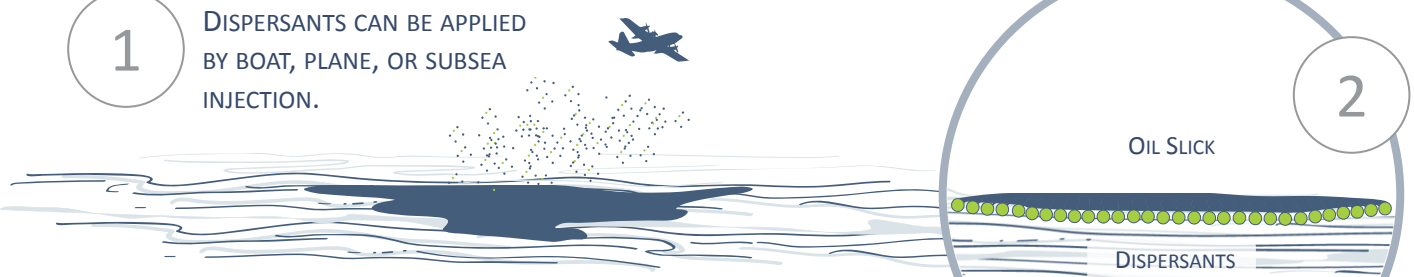
Sunscreen

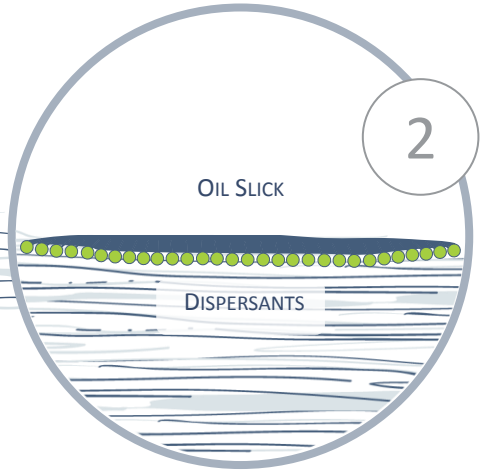
Juice

How Do Dispersants Affect Oil?

1

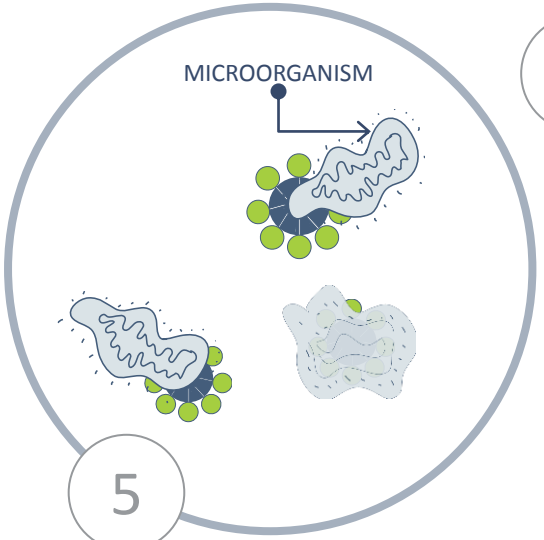
Dispersants can be applied by boat, plane, or subsea injection.





2

Dispersants reduce surface tension between oil and water so that oil slicks can break apart.



5

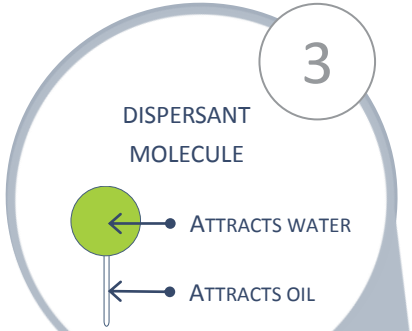
Microorganisms convert ingested oil into mostly carbon dioxide (CO_2) and water (H_2O).

4

Wave motion naturally breaks up oil. Dispersants enhance the separation process.

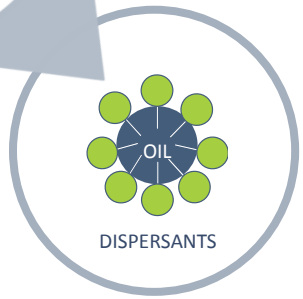
Tiny droplets remain neutrally suspended in the water column and are more readily available for biodegradation by microorganisms.

3



Dispersants are comprised of two parts.

Dispersant molecules attract water on one end, and oil on the other.



SOURCE: National Academies Press, Understanding Oil Spill Dispersants: Efficacy and Effects

Dispersants Break Down Oil in the Environment

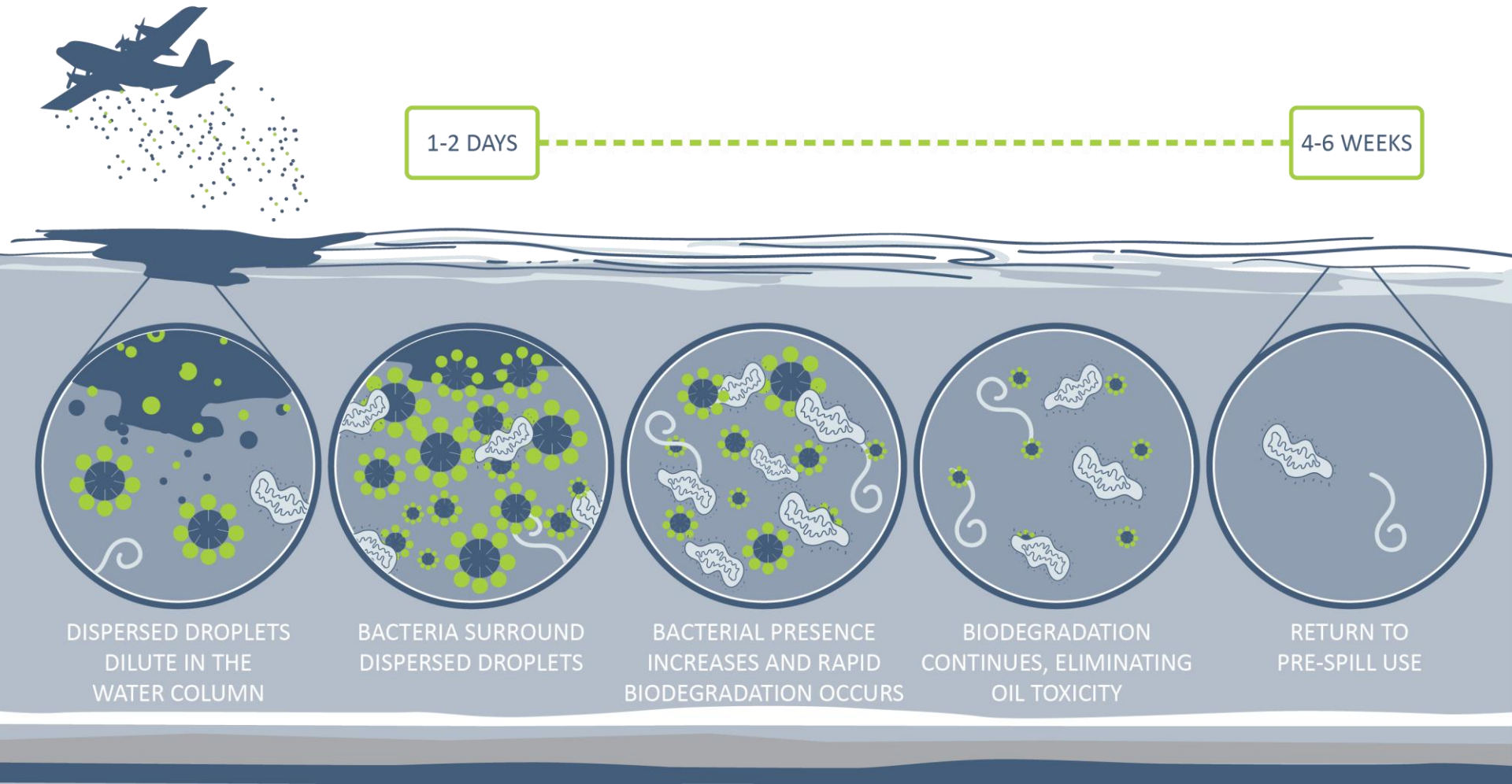
"Dispersants don't remove oil from the sea, but they are designed to help nature do so...Imagine a cake the size of a house, and a hundred thousand people trying to wolf it down at once; then imagine that cake cut into slices and passed around to the same crowd."
-The New Yorker, March 2011

VERSUS

Dispersants work in a similar fashion to the cake analogy above: oil is broken into tiny droplets that are more easily consumed by microorganisms.

How Do Dispersants Affect Oil Toxicity?

Dispersants help to break apart the oil slick into tiny droplets that then biodegrade in the water column. This reduces the effects of oil toxicity to the marine environment.



How Do We Measure Toxicity?

Experts perform laboratory tests to determine the effect of dispersants to oil toxicity levels.

Additionally, studies conducted by the US Food and Drug Administration (FDA) and the National Oceanic and Atmospheric Administration (NOAA) have shown that, unlike mercury, ingestion of dispersed oil by marine organisms does not impact the food chain.

Sources: Environmental Protection Agency 2010

How Do We Compare Toxicity?

Members of government, industry, and academia test toxicity levels in dispersants before they are approved for use.

An Environment Canada study found dishwasher detergent to be 25-27 times more toxic than COREXIT 9500.

Evaluating Our Response

A Net Environmental Benefit Analysis (NEBA) is conducted for spill response situations to minimize the impacts on people and the environment.

Response Decision: Dispersant Use

Benefits

- Reaches and treats significantly more oil than other response options
- Can be applied over a broader range of weather conditions
- Speeds up oil removal from the water column by enhancing natural biodegradation
- Prevents oil in a subsea spill from surfacing, mitigating harm to sea birds, mammals, and other wildlife
- Prevents oil from spreading to shoreline, reducing risk for sensitive shoreline vegetation and wildlife
- Reduces impact on community assets and local industries

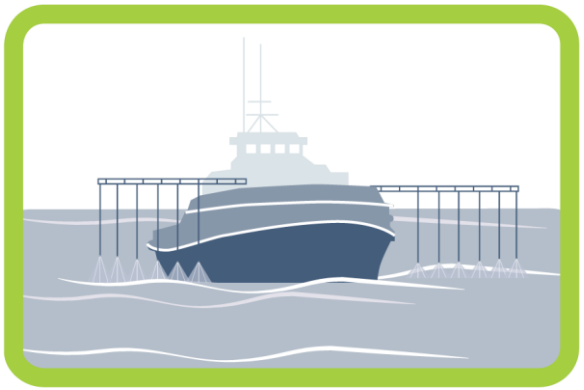
Drawbacks

- Does not directly collect the oil from the environment, but rather transfers it from the surface to the water column where it can be biodegraded
- Potential effects of dispersed oil on water column-dwelling wildlife and vegetation (anticipate short-lived and localized exposures)
- Will not work on high viscosity fuel oils in calm, cold seas
- Has a limited "window of opportunity" for use
- Potential impact to fishing industries due to public misunderstanding of dispersants' effects on seafood

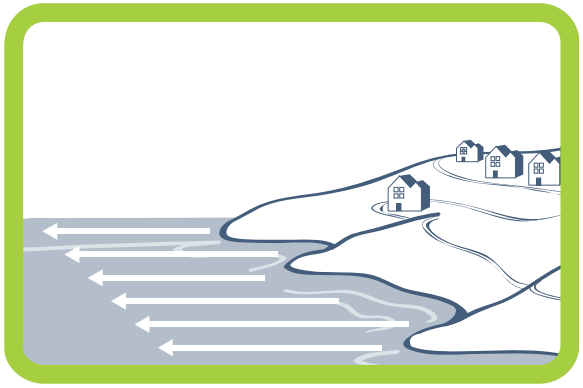
Protecting Human Health and Safety

Precautionary measures around dispersant application are taken to minimize possible human exposure.

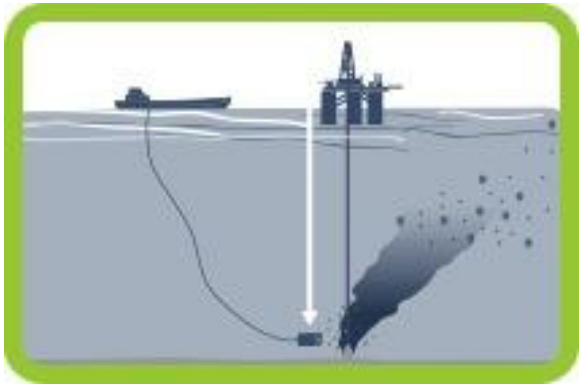
Low flying planes target specific locations for precise application



Dispersants are applied in a controlled and contained manner



Dispersant application occurs far from the shoreline at a sufficient depth



Subsea dispersant application minimizes direct human contact with dispersants, oil, and volatile fumes

Innovating for the Future

Industry scientists have conducted decades of research and are actively engaged in dispersant innovation:

Research

Industry and government organizations are currently sponsoring projects to study further the fate and effects of oil in subsea and arctic environments.

Decision-Making Processes

To support the dispersant pre-approval and response decision-making processes, regulators have developed guidance for dispersant selection and post-spill monitoring.

Monitoring Methods

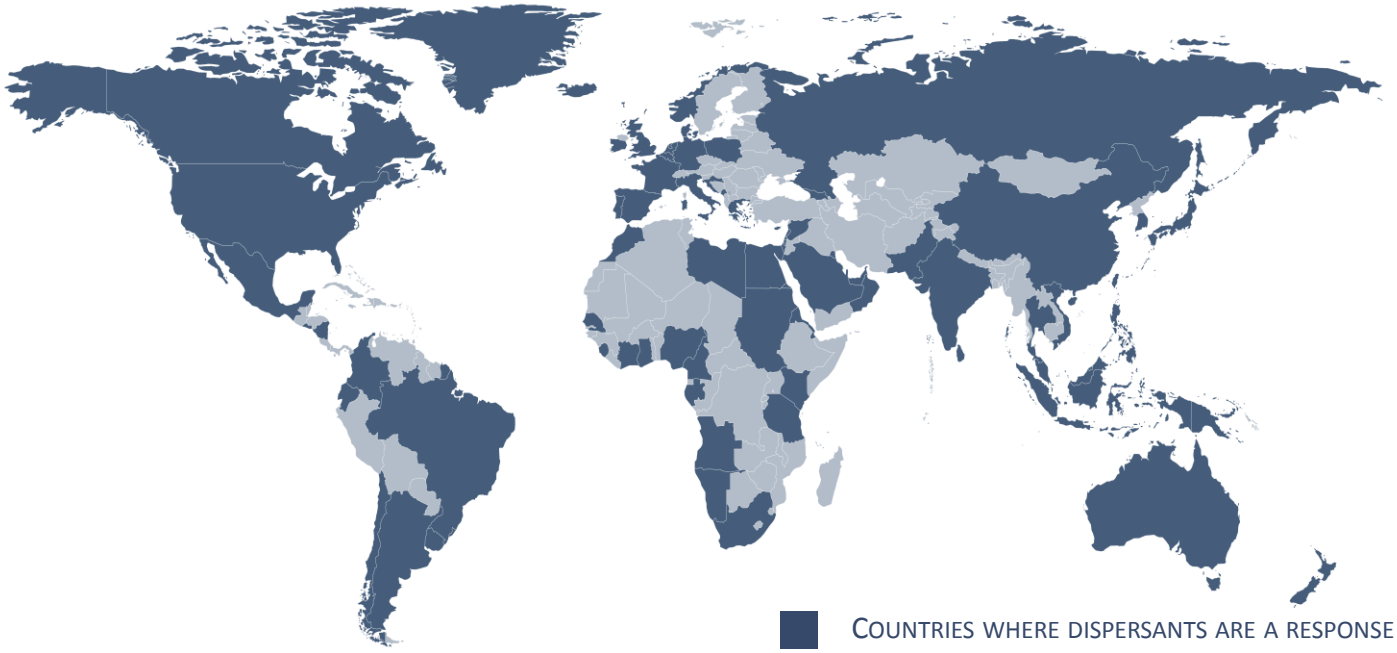
Industry is evaluating new tools to monitor and detect oil, including tools that detect oil at night and in the deep sea. This will support better, more informed response decision-making.

Product Development

Scientists are working to develop dispersants that are even more environmentally friendly and efficient.

Dispersant Use Across the Globe

Many countries consider dispersants an important tool in oil spill response. However, there are global differences in the types of approved dispersants and how and when to use them.



Countries where dispersants are a response option

- Angola
- Argentina
- Australia
- Belgium
- Brazil
- Brunei
- Cameroon
- Canada
- Chile
- China
- Columbia
- Côte d'Ivoire
- Croatia
- Cyprus
- Denmark
- Djibouti
- Ecuador
- Egypt
- El Salvador
- Eritrea
- France
- French Guiana
- Gabon
- Georgia
- Germany
- Ghana
- Greece
- Greenland
- Iceland
- India
- Indonesia
- Ireland
- Israel
- Italy
- Japan
- Kenya
- Kuwait
- Lebanon
- Libya
- Malaysia
- Malta
- Mexico
- Montenegro
- Morocco
- Namibia
- Nicaragua
- Netherlands
- New Zealand
- Nigeria
- Norway
- Oman
- Pakistan
- Papua New Guinea
- Philippines
- Poland
- Portugal
- Qatar
- Russia
- Saudi Arabia
- Senegal
- Sierra Leone
- Singapore
- South Africa
- South Korea
- Spain
- Sri Lanka
- Sudan
- Syria
- Tanzania
- Thailand
- UAE
- UK
- Uruguay
- US
- Vietnam

SOURCE: INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION

Working with Government

Industry has developed plans in support of government policies to guide dispersant use during oil spill response.

Speed is critical in oil spill response, and pre-approvals in government policies greatly aid in this.

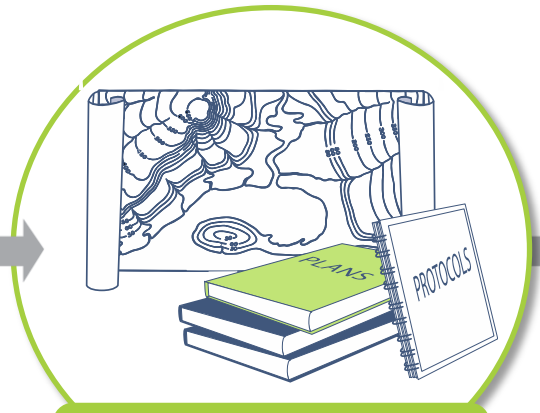
In areas where pre-approvals do not exist, efficient and rapid decision-making is especially important.

OUR SHARED GOAL IS TO PRESERVE HUMAN LIFE, THE ENVIRONMENT, AND COMMUNITY WELL-BEING DURING OIL SPILL RESPONSE.

HOW CAN YOU BE A PART OF THIS GOAL?

LEARN

THE FACTS ABOUT OIL SPILL RESPONSE AND EVALUATE THE ROLE OF DISPERSANTS.



UNDERSTAND

THE VALUE OF DISPERSANTS AND WHEN AND WHERE THEY SHOULD BE APPLIED.

SUPPORT

POLICIES AND PLANS THAT PROMOTE RAPID AND EFFECTIVE DECISION-MAKING IN OIL SPILL RESPONSE.

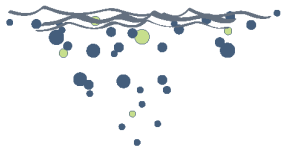
Summary

- The goal of oil spill response is to minimize impact to people, environments, and the community and enable the most rapid recovery.
- The decision to use dispersants is a choice made after careful evaluation of the factors, with a clear understanding of the possible trade-offs.
- Dispersants are used in specific spill scenarios where they are the most effective tool, such as larger, offshore spills.
- Dispersants break down oil in the environment by creating smaller droplets of oil that dilute in the water column, which are then biodegraded.
- The application of dispersants does not increase the toxicity of oil; components of dispersants are found in common household products.
- Dispersants are applied far from people, with human health and safety as the first priority.
- Governments and industry must plan ahead in order to act with speed and alignment and to make dispersant-use decisions during spill events.

Appendix

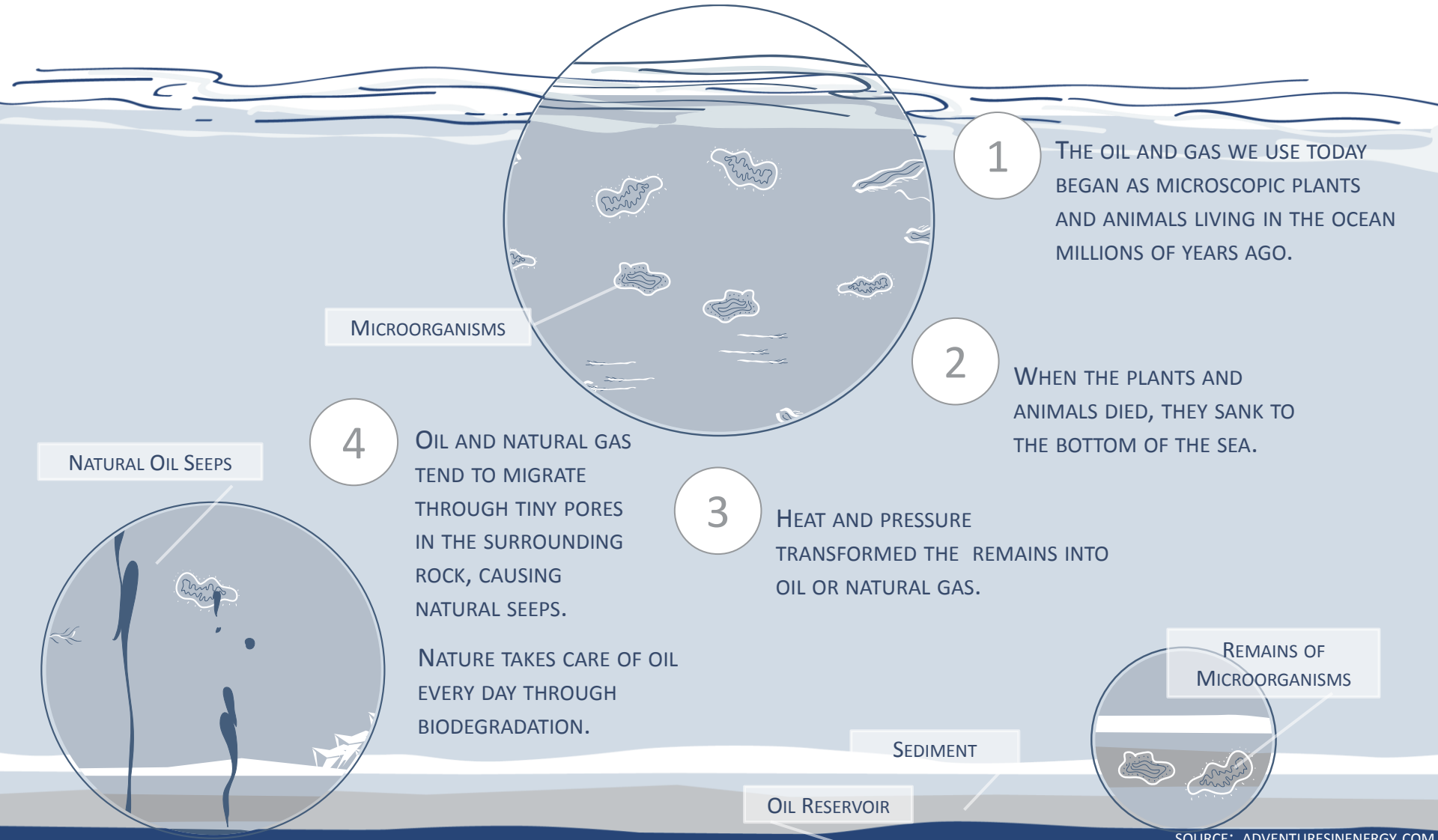
Our Response Toolbox

When a spill occurs, source control is immediately applied – after which, response tools are implemented.

Response Toolbox	Benefits	Drawbacks
Dispersants  Dispersants allow small oil droplets to form which speed up natural breakdown in the water column.	• High aerial coverage rate possible at the water surface • High treatment efficiency possible subsea • Large volumes of oil can be treated • Potentially high oil elimination rate • Reduced vapors at the water surface; improves safety • No recovered oil storage requirements • Lower manpower requirements • Potentially the quickest response option • Prevents oil from spreading to shoreline • Useful in higher wind and sea conditions • Effective over wide range of oil types and conditions	• Special approvals required • Less known about long term effects of subsea use • Perceived to be unsuitable for calm seas • Short-term, localized reduction in water quality • Potential impact on water column ecology • Specialized equipment and expertise required • Usage near shore in shallow water could result in greater water column impacts • Will not work on high viscosity fuel oils in calm, cold seas • Has a limited "window of opportunity" for use
Mechanical Recovery  Mechanical recovery uses booms and skimmers to contain and remove oil from the water surface.	• Well-accepted, no special approvals needed • Effective for recovery over wide range of spilled products • Large "window of opportunity" • Minimal side effects • Greatest availability of equipment and expertise • Recovered product may be reprocessed	• Inefficient and impractical on thin slicks • Ineffective in inclement weather or high seas • Requires storage capability • Typically recovers no more than 10-20 percent of the oil spilled • Labor- and equipment-intensive
In-Situ Burning  In-situ burning involves igniting contained oil slicks.	• High oil elimination rate possible • No recovered oil storage requirements (except possibly for burn residue) • Effective over wide range of oil types and conditions • Specialized equipment (boom) is air transportable • Minimal environmental impact	• Special approvals required • Ineffective in inclement weather or high seas • Black smoke perceived as significant impact on people and the atmosphere • Localized reduction of air quality • Specialized equipment and expertise required • Potential for secondary fires during inland use • Burn residue can be difficult to recover
Physical Removal  Physical removal consists of the physical removal of surface oil by crews with tools and machinery.	• Non-aggressive methods can have minimal impact on shore structure and shore organisms • Useful for detailed cleaning of near shore environment in specific or sensitive areas	• Aggressive removal methods may impact shoreline and shore organisms (e.g., sand removal and cleaning) • Potential for heavy equipment and high foot traffic (trampling) can cause additional environmental damage • Removal occurs after oil has already impacted shore • Labor-intensive
Natural Processes  Natural removal allows for more effective recovery in environments where intervention would be detrimental.	• No intrusive removal or cleanup techniques that further damage the environment • Complements other response techniques • May be best option if there is little to no threat to human or environmental well-being • When selected for certain areas and conditions, the environment can recover from the spill more effectively than it might when using other response tools	• Winds and currents can change, sending the oil spill toward sensitive areas • Residual oil can impact shoreline ecology, wildlife, and economically relevant resources • Public perception that responders are doing nothing

Where Does Oil Come From?

Crude oil is a naturally occurring substance that is found in many places, including below the ocean floor.

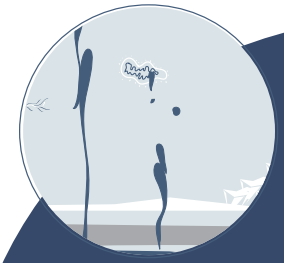


1. The oil and gas we use today began as microscopic plants and animals living in the ocean millions of years ago.
2. When the plants and animals died, they sank to the bottom of the sea.
3. Heat and pressure transformed the remains into oil or natural gas.
4. Oil and natural gas tend to migrate through tiny pores in the surrounding rock, causing natural seeps.

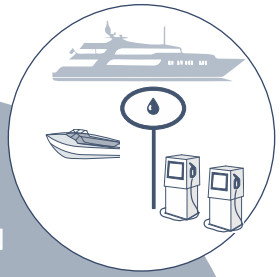
Nature takes care of oil every day through biodegradation.

SOURCE: ADVENTURESINENERGY.COM

How Oil Gets into the Environment



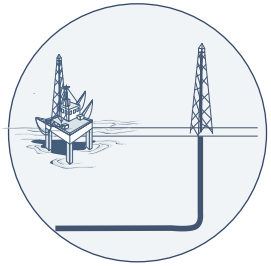
46%
Natural Seeps



37%
Consumption

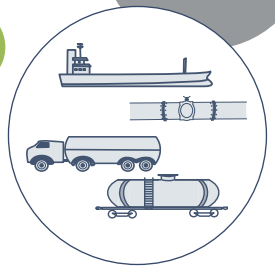
- Land-based runoff
- Recreational marine vessels
- Spills (non-tanker)
- Atmospheric deposition

Much of the oil released into the marine environment comes from natural seeps and consumption.



Extraction of Petroleum 3%

- Platforms
- Produced water
- Atmospheric deposition



12%
Transportation of Petroleum

- Pipeline leaks
- Tanker spills
- Facility leaks
- Atmospheric deposition

About 15% of oil released into the environment comes from the oil industry, and it is working every day to reduce spill risk and develop innovative response solutions.

Source: The National Academies Press, Oil in the Sea III: Inputs, Fates, and Effects (2003), worldwide best estimates

Additional information on dispersants and other tools in the oil spill response toolbox is available at:

www.oilspillprevention.org

or

http://oilspillresponseproject.org

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