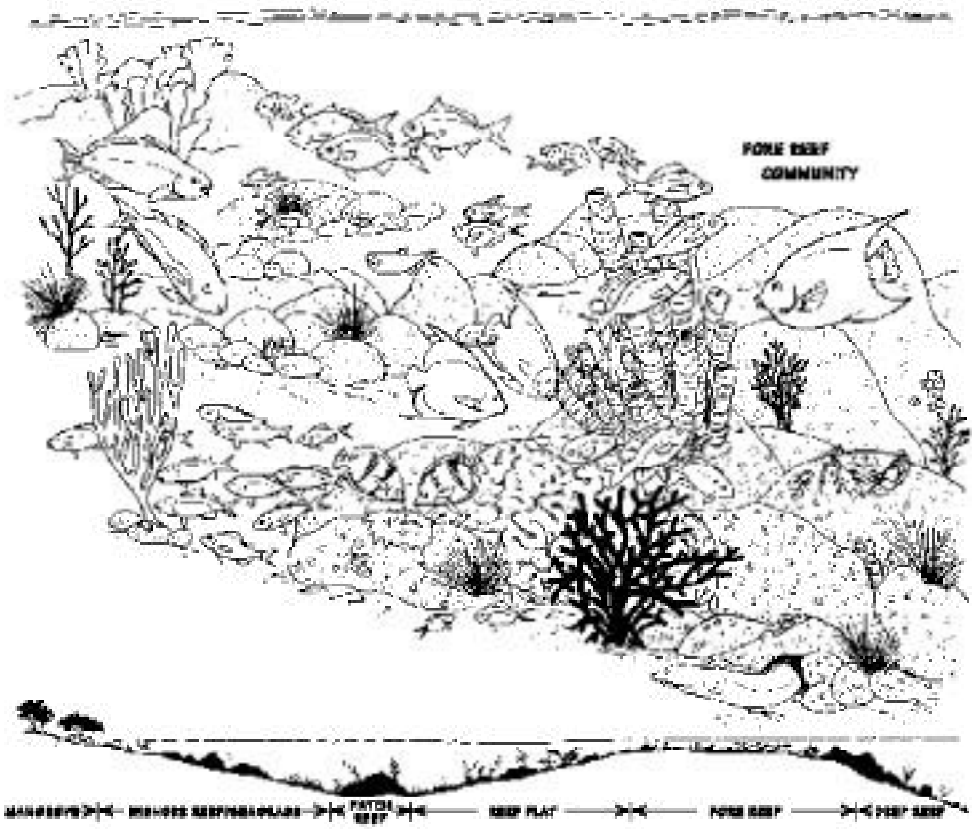
FORE REEF
COMMUNITY

Coral Reefs

Description

- Coral reefs are structures created and maintained by the establishment and growth of populations of stony coral and coralline algae.
- Coral reefs are mostly subtidal in nature, although the most shallow portions of some reefs can be exposed during very low tides.
- Broad, pavement-like platforms formed by reefs when they reach sea level are a special concern.
- Many coral species spawn simultaneously over a very short time period (days), a behavior that makes the entire recruitment class very vulnerable.

Predicted Oil Behavior

- Coral reefs vary widely in sensitivity to spilled oil, depending on the water depth, oil type, and duration of exposure.
- There are three primary exposure pathways: direct contact with floating oil; exposure to dissolved and dispersed oil in the water column; and contamination of the substrate by oil deposited on the seafloor.
- Reef-associated community of fish, crustaceans, sea urchins, etc. can experience significant mortality.

Response Considerations

- Caution is needed when deploying and anchoring booms near reefs to prevent physical damage to the reef.
- Foot and vehicular traffic should not be allowed across a reef flat; access must be from the seaward side via boats.
- The use of dispersants directly over shallow reefs is likely to have significant impacts to the reef community. Their use in offshore areas can reduce impacts to highly sensitive intertidal environments.
- In situ burning outside of the immediate vicinity of reefs can protect sensitive intertidal environments. Burn residues can sink; the potential effects of these residues will depend on the composition and amount of oil.

SUBTIDAL

Oil Category Descriptions

I – Gasoline products
II – Diesel-like products and light crudes
III – Medium grade crudes and intermediate products
IV – Heavy crudes and residual products
V – Non-floating oil products

The following categories are used to compare the relative environmental impact of each response method in the specific environment and habitat for each oil type. The codes in each table mean:

A = The least adverse habitat impact.
B = Some adverse habitat impact.
C = Significant adverse habitat impact.
D = The most adverse habitat impact.
I = Insufficient information - impact or effectiveness of the method could not be evaluated.
— = Not applicable.

Response Method	Oil Category I	II	III	IV	V
Natural Recovery	A	A	A	A	B
Booming	–	B	B	B	–
Skimming	–	B	B	B	–
Physical Herding	–	–	–	–	–
Manual Oil Removal/Cleaning	–	–	B	B	B
Mechanical Oil Removal	–	–	–	D	D
Sorbents	–	A	A	A	B
Vacuum	–	–	B	B	B
Debris Removal	–	–	–	–	–
Vegetation Cutting/Removal	–	–	–	–	–
Low-pressure, Ambient Water	B	B	B	C	C
Dispersants	–	C	C	C	–
In-situ Burning	–	B	B	B	–

Consult the *Environmental Considerations for Marine Oil Spill Response* document referenced on page 5 before using this table.

SUBTIDAL

Description

- Seagrasses are highly productive habitats that occur on intertidal flats and in shallow coastal waters worldwide from arctic to tropical climates.
- Water temperature, light penetration, sediment type, salinity, and wave or current energy control seagrass distribution.
- Seagrasses provide a food source for green turtles, manatees, and waterfowl, who graze on seagrasses.
- Seagrasses are used by fish and shellfish as nursery areas.

Predicted Oil Behavior

- Oil will usually pass over subtidal seagrass beds, with no direct contamination.
- Oil that is heavier than seawater can become trapped in the beds, coating the leaves and sediments.
- Oil readily adheres to the vegetation, and the oiled blades are quickly defoliated when intertidal beds are oiled.
- Floating oil stranded on adjacent beaches can pick up sediment and then get eroded and deposited in adjacent beds.

Response Considerations

- Be careful when deploying and anchoring booms to prevent physical damage to seagrass beds.
- Be careful to prevent sediment suspension and mixing with the oil, and disturbance of roots and vegetation by foot traffic and boat activity.
- Do not cut seagrass unless species like sea turtles, manatees, or waterfowl are at significant risk of contacting or ingesting oil.
- Dispersant use directly over subtidal seagrass beds may impact the highly sensitive communities. However, use in offshore areas can reduce impacts to highly sensitive intertidal environments.
- In situ burning can be considered outside the immediate vicinity of seagrass beds to protect sensitive intertidal environments. Burn residues can sink; the potential effects of residues will depend on the composition and amount of the oil to be burned.

Seagrasses

Oil Category Descriptions

I – Gasoline products
II – Diesel-like products and light crudes
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Response Method	Oil Category I	II	III	IV	V
Natural Recovery	A	A	A	B	B
Booming	B	B	B	B	–
Skimming	–	B	B	B	–
Physical Herding	–	B	B	B	–
Manual Oil Removal/Cleaning	–	–	B	B	B
Mechanical Oil Removal	–	–	D	D	D
Sorbents	–	A	A	A	B
Vacuum	–	–	B	B	B
Debris Removal	–	–	B	B	B
Vegetation Cutting/Removal	–	–	C	C	C
Low-pressure, Ambient Water Flushing	–	–	–	–	–
Dispersants	–	C	C	C	–
In-situ Burning	–	B	B	B	–

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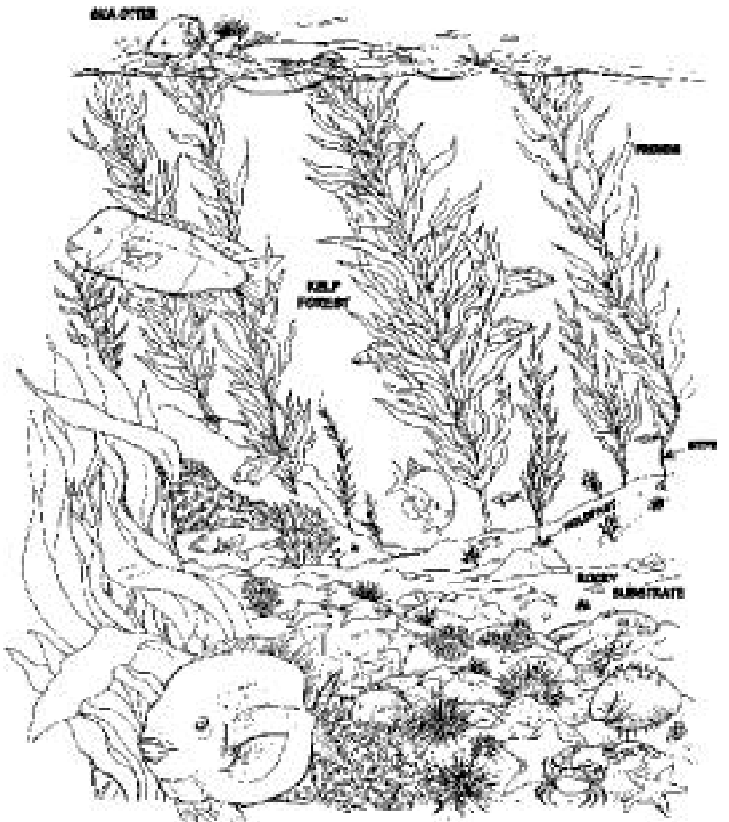
Kelp



Description

- Kelps are very large brown algae that grow on hard subtidal substrates in cold temperate regions.
- Kelps have a holdfast that attaches to the substrate, a stem-like or trunk-like stipe, and large, flattened, leaf-like blades called fronds.
- Because kelps require constant water motion to provide nutrients, they are located in relatively high-energy settings.
- Kelp forests support a diverse animal community of fish, invertebrates, and marine mammals as well as important algal communities.

Predicted Oil Behavior

- Kelp has a mucous coating that prevents oil from adhering directly to the vegetation on the water surface.
- Oil can be trapped in the dense surface canopy, increasing the persistence of oil within the kelp environment.
- Oil persistence in kelp increases the risks of exposure to organisms concentrated in kelp forest habitats.

Response Considerations

- Cleanup efforts are often hampered by the difficulty of recovering oil from the dense canopy.
- Heavy oils could accumulate in sheltered pockets on the bottom, refloat during storms and re-expose resources to the oil.
- Use caution when anchoring vessels and boom to minimize mechanical damage to the kelp.
- Cutting kelp abruptly changes the light regime to the seafloor below.
- Cutting can be more appropriate for some kelp (*Macrocystis* and *Cystoseria*) than for others (*Nereocystis*).
- The impact of dispersed oil is likely to be greater on the community of organisms associated with the kelp habitat than on the kelp itself.
- In situ burning would be conditional on the absence or removal of mammals and birds in the immediate area. The kelp canopy might act as a natural boom against and within which oil can concentrate to burnable thicknesses.

SUBTIDAL

Kelp

Oil Category Descriptions

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	Oil Category				
Response Method	**I**	**II**	**III**	**IV**	**V**
Natural Recovery	A	A	A	B	B
Booming	–	B	B	B	–
Skimming	–	B	B	B	–
Physical Herding	–	B	B	B	–
Manual Oil Removal/Cleaning	–	–	–	–	–
Mechanical Oil Removal	–	–	–	–	–
Sorbents	–	A	A	A	–
Vacuum	–	–	–	–	–
Debris Removal	–	–	–	–	–
Vegetation Cutting/Removal	–	–	B	B	–
Low-pressure, Ambient Water Flushing	–	–	–	–	–
Dispersants	–	C	C	C	–
In-situ Burning	–	B	B	B	–

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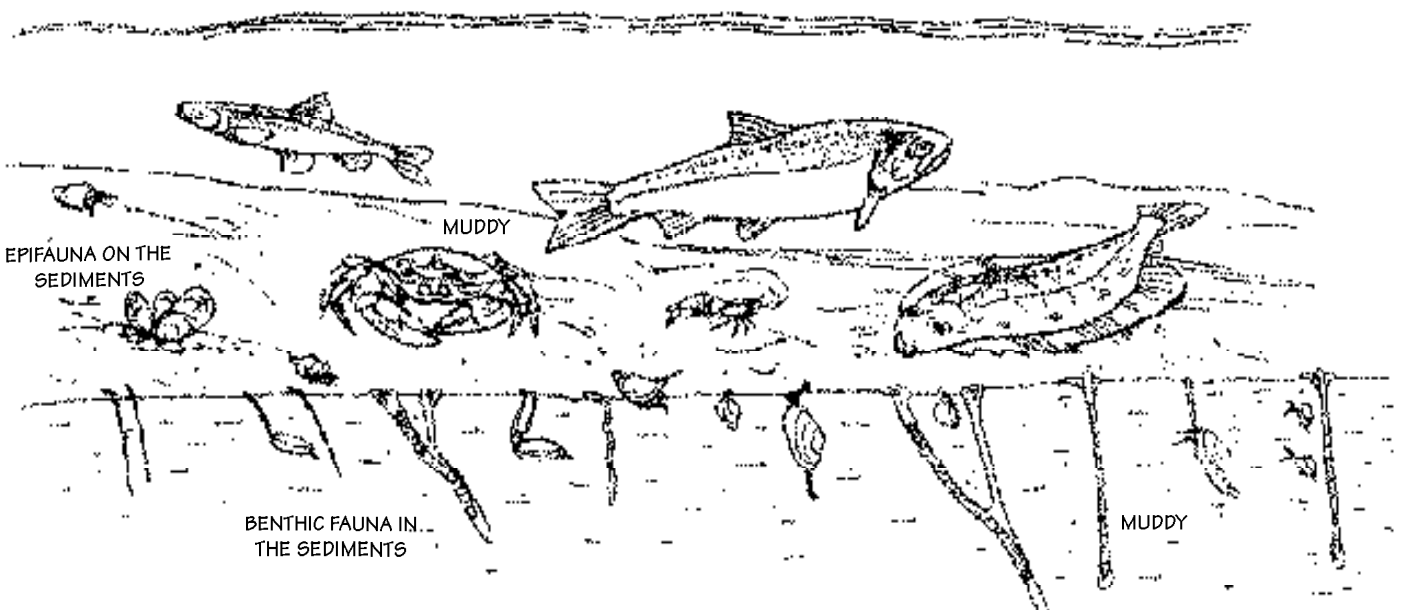
MUDDY
EPIFAUNA ON THE SEDIMENTS
BENTHIC FAUNA IN THE SEDIMENTS
MUDDY

SUBTIDAL

Soft Bottom

Description

- Soft-bottom, subtidal habitats consist of various percentages of sand, silt, and clay, occurring in sheltered bays and estuaries, and deeper offshore areas.
- The presence of fine-grained sediments indicates that the substrate is not exposed to significant wave or tidal energy.
- Biological resources associated with this habitat include shrimp, crabs, clams, fish, and the pelagic and benthic communities that support them (e.g., plankton, worms, amphipods, isopods).

Predicted Oil Behavior

- This habitat is not often exposed to spilled oil. The greatest risk of exposure is from the sinking oil or the sorption of dispersed oil onto suspended sediments that are then deposited on the bottom.
- Significant natural dispersion of oil and sediments into the water column occurs only during large storms and nearshore oil spills.
- Shoreline cleanup can suspend oil and fine-grained sediments, causing deposition of oily sediments in nearshore habitats.
- Concerns about seafood contamination from dispersed oil or oiled sediments can become a significant issue. Real, potential, or fear of contamination can close seafood harvesting activities.

Response Considerations

- Removal might be needed where significant amounts of oil have sunk and formed mats or concentrations of tarballs on the sediment surface.
- Special efforts will be needed to control suspended sediments and resuspended oil during recovery operations.
- Dispersants can be used over soft subtidal habitats in order to protect more sensitive intertidal environments. Effects on biota are less for applications in deep water or high dilution rates.
- In situ burning can be used to protect sensitive intertidal environments. When burned, some oils can produce a sinkable residue; the potential effects of these residues will depend on the composition and amount of oil to be burned.

Soft Bottom

SUBTIDAL

Oil Category Descriptions

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Response Method	Oil Category I	II	III	IV	V
Natural Recovery	A	A	A	B	B
Booming	A	A	A	A	–
Skimming	–	A	A	A	–
Physical Herding	–	B	B	B	–
Manual Oil Removal/Cleaning	–	–	B	B	B
Mechanical Oil Removal	–	–	–	C	C
Sorbents	–	A	A	A	B
Vacuum	–	–	B	B	B
Debris Removal	–	–	–	–	–
Vegetation Cutting/Removal	–	–	–	–	–
Low-pressure, Ambient Water Flushing	–	–	–	–	–
Dispersants	–	C	C	C	–
In-situ Burning	–	B	B	B	–

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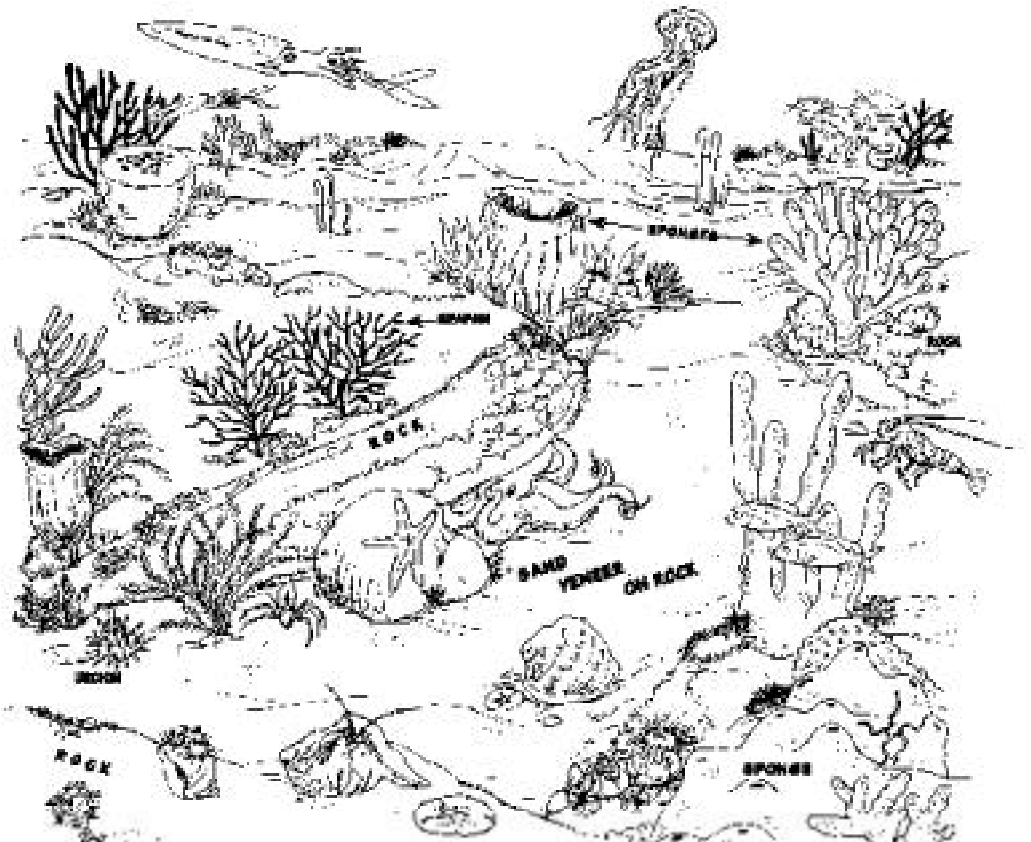
Mixed and Hard Bottom



Mixed and Hard Bottom

Description

- This habitat consists of subtidal substrates composed of rock, boulders, or cobbles, though there can be patches of sand veneer covering a hard bottom.
- There may be rich, diverse communities of attached and associated algae and animals; often there is little open space.
- Some of these habitats form a relief (reef or bank) several meters high that attracts a diversity of fish.

Predicted Oil Behavior

- Mixed and hard-bottom habitats are usually considered to have low sensitivity to oil spills.
- Oil in the water column seldom reaches toxic levels and benthic organisms have little exposure.
- There is little risk of deposition of oil or oiled sediments in these habitats.
- There could be a short-term exposure as oiled sediments are transported through the habitat into deeper areas.
- Concerns about seafood contamination from dispersed oil or oiled sediments can become a significant issue. Real, potential, or fear of contamination can close seafood harvesting activities.

Response Considerations

- Natural cleansing is expected to occur quickly, especially in the higher-energy environments.
- Avoid anchoring booms in known sensitive areas, such as unique live-bottom areas.
- Dispersants can be used directly over these habitats to protect sensitive intertidal areas. The deeper the water, the greater the dilution, and hence the lesser effect it will have on the mixed and hard-bottom habitats.
- In situ burning can be used directly over these habitats to protect sensitive intertidal environments. When burned, some oils can produce a sinkable residue; the potential effects of these residues will depend on the composition and amount of oil to be burned.

Mixed and Hard Bottom

Oil Category Descriptions

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Natural Recovery	A	A	A	B	B
Booming	–	B	B	B	–
Skimming	–	A	A	A	–
Physical Herding	–	A	A	A	–
Manual Oil Removal/Cleaning	–	–	B	B	B
Mechanical Oil Removal	–	–	–	–	–
Sorbents	–	A	A	A	B
Vacuum	–	–	B	B	B
Debris Removal	–	–	–	B	B
Vegetation Cutting/Removal	–	–	–	–	–
Low-pressure, Ambient Water Flushing	–	–	–	–	–
Dispersants	–	B	B	B	–
In-situ Burning	–	B	B	B	–

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