POLLUTION PROBLEMS

There are many forms of pollution to be considered:

Plastic
PCBs
Micro beads
Heavy metals
Radiation
Oil

These are just some.

Things "break down" or "degrade" as a result of many things. Biodegradable means that living organisms like bacteria. Some things are photodegradable – break down by light. In all cases though, the degrading progress requires the degrading force be there. For example in some areas where biodegradable materials have been placed, the bacteria are not present and so things like lettuce leafs which should break down rapidly do not.

Oil which can be broken down by some bacteria last because the bacteria exist in sufficiently small quantities that they cannot possible consume all the oil

One has to remember that the "degradability" of anything is contingent on the appearance in sufficient quantities to degrade it. (see the pamphlet on the "notes" page or go directly to

http://userhome.brooklyn.cuny.edu/anthro/jbeatty/CORESEA/images/trash.pdf

Much of the material moved into the ocean by people or natural forces, winds up in the gyres in the middle of the oceans. It has been thought that it will take decades to clean it, and it will have an astronomical cost. However a young man in Europe has come up with a possible solution.

https://www.youtube.com/watch?v=8K5isWrsDjY

Plastic

Plastic presents problems in terms of degradation, which doesn't happen, since although it is a biological product it has been so altered that it no longer breaks down like that. Whereas oil is even biodegradable thanks to some bacteria, plastic is not. It leads to concerns since plastic bags and can containers are trapping animals and are sometimes eaten by them which they mistake for food, Seat turtles are fond of jellyfish which the plastic bags often resemble. The plastic may be eaten and cause blockages in the digestive tract and cause the animal to die. Plastic is common place and bags, plastic plates, utensils and such often find their way onto the beach where people picnic. This also happens with bottles, both plastic and glass.

Microbeads

Microbeads are solid bits of plastic less than I millimeter in size (0.0393701 of an inch) The occur in personal exfoliating cleaning products such as shampoo, toothpaste and the like.

The Microbead-Free Waters Act of 2015 phased out microbeads in rinse off cosmetics as of July 2017. Because of the small size they can pass through sewerage treatment plants and move on into various bodies of water.

Their impact is largely on fish that develop behavioral problems like the inability to smell predators (or perhaps ignoring the smell of predators)

Birds have been known to eat them and this produces problems for them and other animals up the food chain that eat them.

PCBs (Polychlorinated Biphenyls)

These are chemicals made by humans and do not occur naturally. For 50 years (1929 - 1979) they were made in the US, then their production was outlawed. Because they exhibit non-flammability, chemical stability, high boiling point and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including Electrical, heat transfer and hydraulic equipment, plasticizers in paints, plastics and rubber products, pigments, dyes and carbonless copy paper and other industrial applications. They can accumulate in different organisms some of which are used for food by people, hence bio-magnification is a possibility. They may be cancer producing. There is evidence to suggest they impact the immune system as well as the reproductive systems among other things.

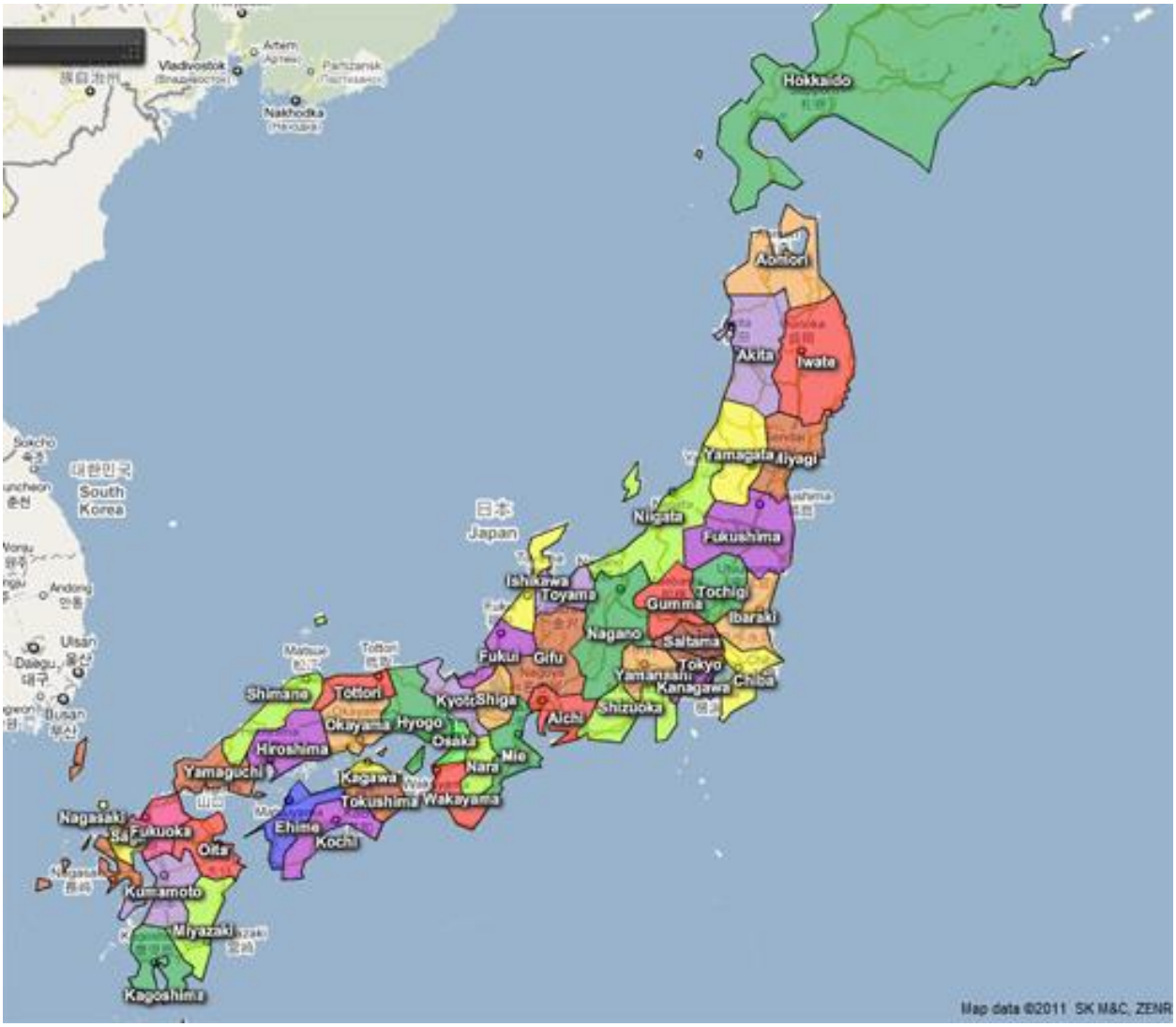
Heavy Metals (Not the music groups)

Heavy metals include cadmium, mercury, lead and arsenic, all of which appear in the World Health Organization's list of 10 chemicals of major public concern. Other examples include manganese, chromium, cobalt, nickel, copper, zinc, selenium, silver, antimony and thallium
Thallium had been claimed a “Wonder Drug” for pregnant women who were suffering from insomnia and morning sickness. However a large number of children (over 10,000) whose mothers had used the drug were born with birth defects which included being born with shortened arms and/or legs, or no arms or legs at all. Many died young and only fewer than 3,000 were still alive in 2011.

Minamata

The other major event had to do with mercury poisoning (methylmercury) in Minamata in Kumamoto Prefecture, Japan.
(SEE Prefecture map of Japan below)


Hokkaido
Aomori
Akita
Iwate
Yamagata
Miyagi
Fukushima
Niigata
Tochigi
Gunma
Ibaraki
Toyama
Ishikawa
Nagano
Saitama
Fuku
Gifu
Yamanashi
Chiba
Aichi
Shizuoka
Tokyo
Kanagawa
Kyoto
Shiga
Hyogo
Tottori
Shimane
Okayama
Hiroshima
Mie
Nara
Osaka
Wakayama
Yamaguchi
Kagawa
Tokushima
Ehime
Kochi
Fukuoka
Saga
Oita
Nagasaki
Kumamoto
Miyazaki
Kagoshima
Okinawa



There the Chisso had been releasing this chemical into the water from 1932 to 1968. It took several years to identify the cause of the illness and many more get legal compensation for the damage. The symptoms of the illness include ataxia, numbness in the hands and feet, general muscle weakness, loss of peripheral vision, and damage to hearing and speech. In extreme cases, insanity, paralysis, coma, and death follow within weeks of the onset of symptoms. A congenital form of the disease can also affect fetuses in the womb.

MINAMATO VIDEO

Kumamoto is the light purple on the island furthest south. Niigata is on the west coast of Japan, on the main island (Honshu) and is marked light green – the fourth prefecture down from the top of the main island. The single green island on the top is Hokkaido. Toyama prefecture (see below) is just below Niigata and is shown in purple on the map Mie Prefecture (see below) is located on the main island on the large peninsula next to the island of Shikoku which lies just south of the main island and east of Kyushu (the island on which Kumamoto is found). Mie is indicated by a green color.

Toyama prefecture (see below) is just below Niigata and is shown in purple on the map

Mie Prefecture (see below) is located on the main island on the large peninsula next to the island of Shikoku which lies just south of the main island and east of Kyushu (the island on which Kumamoto is found). Mie is indicated by a green color.

Of the 2265 people affected by the disease, 1784 have died. In 1965 a second outbreak occurred in Niigata prefecture Of the four major pollution disasters (all caused by improper handling of industrial waste), three involved water. Itai -

Itai (“itai” is Japanese for “it hurts”) disease was caused by cadmium poisoning in rivers, the Minamata and Niigata Minamata disease were involved with the sea. Only the Yookaichi Asthma disease in Mie Prefecture was air pollution

Name of disease	Japanese prefecture affected	Cause	Source	Year
Itai-itai disease	Toyama Prefecture	Cadmium poisoning	Mitsui Mining & Smelting Company	1912
Minamata disease	Kumamoto Prefecture	Methylmercury	Chisso Corporation	1956
Niigata Minamata Disease	Niigata Prefecture	Methylmercury	Showa Denko	1965
Yokkaichi Asthma	Mie Prefecture	Sulfur dioxide	Air pollution within Yokkaichi	1961

Problems of Minamata disease and relation to A-bombs and ETA. People from these pariah groups have problems in marrying because of fear of genetic mutations.

Radiation

There are questions about the impact of radiation on life in the ocean. From the A-bomb tests on Bimini through the

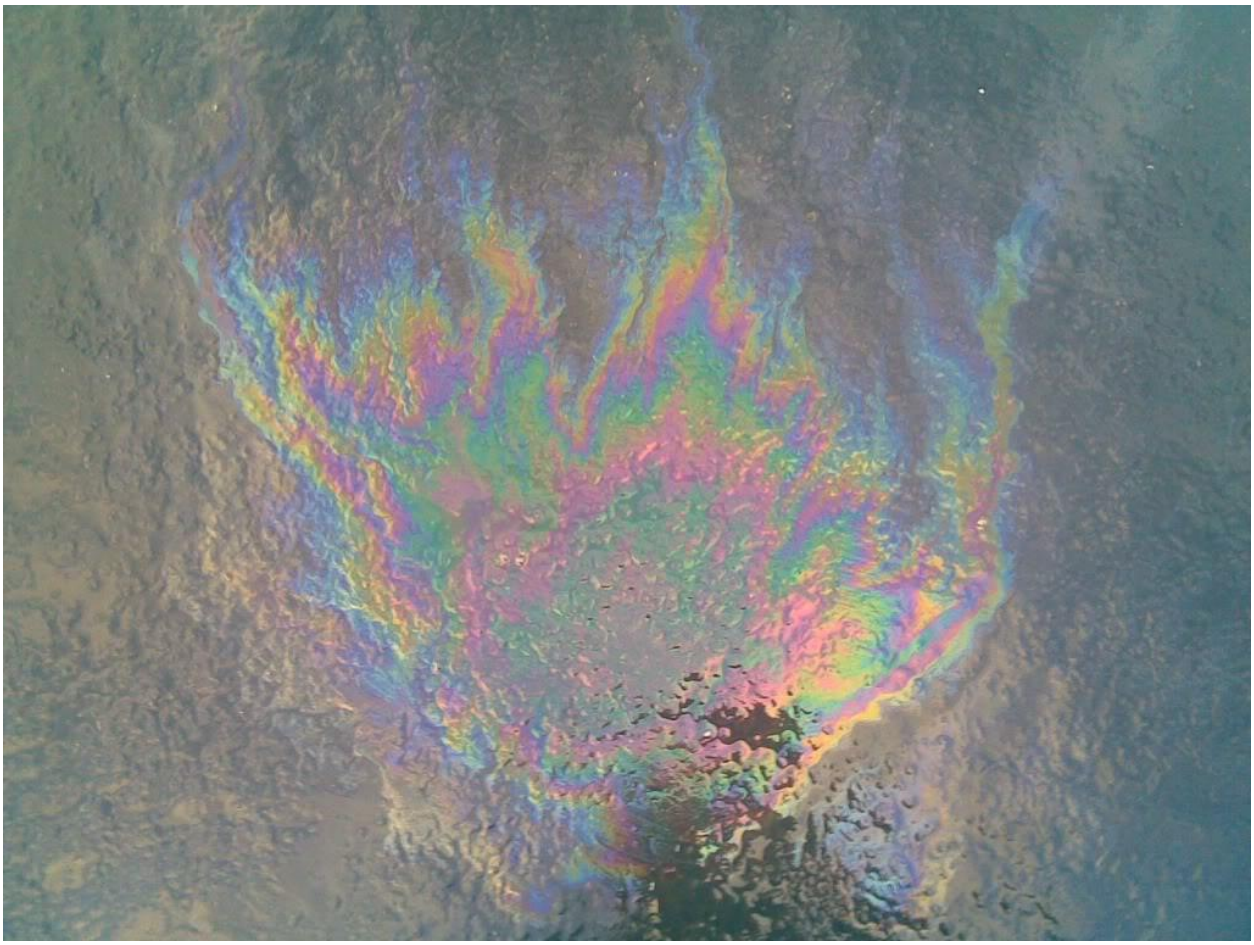
problem of radiation from the Dai ichi Nuclear plant in Fukushima that was heavy damaged by the recent tsunami there have been questions about how much radiation has occurred and what impact it has had on life in the ocean.

The idea of radiation impacting life in the ocean has been common in popular culture in post WWII films. Godzilla is a prime example. The original Japanese film (not the altered American version with Raymond Burr) raises questions about the social responsibility of scientists (dutifully removed from the American release)

Radiation is not only possible from nuclear plants, but also from atomic powered vessels like atomic powered submarines. One Russian submarine had gotten into trouble and there was some question as to whether there would be a nuclear melt down in the ocean.

OIL

Oil on the water can be recognized by “sheen”



HOW DOES THE OIL GET INTO AND OUT OF THE WATER?

While most people think of the major oil spills like the Exxon Valdez or the BP Deep Water Horizon as the major polluters, oil, often in larger quantities enters the ocean in many ways.

There are actually oil seeps in the ocean where oil pours out through underwater vents with no help at all from people.

There is always some concern about ships rupturing and spilling oil, or oilrigs breaking down and pouring huge amount of oil into the sea. Not all ships that run aground

spill oil. Oil can come from tankers transporting it or from the fuel used to power any ship with a motor. This is true for example of large cruise ships and was a major worry with the Costa Concordia

Costa Concordia

This huge cruise ship ran aground with the death of about 32 people. Given the number of people on board this was almost miraculous. The ship nearly sank because of the captain's improper behavior. As a result he was charged and convicted of 32 counts of manslaughter. He is serving 16 years in prison.

There was great deal of concern about the rupturing of the fuel tanks in an effort to remove it. All went fine relative to a major ecological disaster with spilled oil and there was no oil released into the water.

This oil in the photos of sheen on water in the street comes from leaks in automobiles and other mechanical devises using oil. Sometimes it just “leaks” out or sometimes it is dumped by people changing the oil in their cars.

Most pollution including oil comes from the land from run offs. Some people estimate that there is 4 times as much oil entering the ocean every year as a result of the oil dripping or leaking out of cars and washing into the ocean as was spilled in the EXXON VALDEZ spill in Alaska. There is much work that needs to be done in determining just how much oil enters the water from these sources. The figures are often controversial and misleading. Some figures give the amounts of oil spilled from the amount carried in the ship that leaked minus the amount left on board. Others claim the amount spilled is the amount left on the ship + the amount or oil recovered. This can be as much as 15% less, since the amount recovered is not considered to have been spilled. Oil spills cause a great deal of damage to the life in the ocean and this is the major concern since it impacts many things – especially food supplies.

The recent oil spill from Con Ed was one of 37,000 gallons of "dielectric fluid," or transformer oil, which may contain PCBs. This is transformer oil which is used for insulation and is mineral oil based. When I examined the spill on Wed. most of the oil appeared gone. There was some sheen near the shore, which is probably oil that adhered to plants and rocks and is being slowly washed away with each tide.

The Coast Guard requires that all oil spills be reported. Failure to report can result in serious fines depending on the

size of the spill it can be up to $45,000 a day or three times the cost of the clean-up.

DAMAGE is to plant and animal life in the water. Oil gives birds problems in they can lose their ability to fly, ability to stay warm; gets into gills of fish so they can't get O2 Gets into shellfish

What follows is from the web page by Michelle Rivera at

https://animals.mom.me/effects-exxon-valdez-oil-spill-alaskan-wildlife-5478.html

The Exxon-Valdez oil spill of March 24, 1989, had long-lasting effects on Alaska's environment, animals and way of life. At the time of the spill, hundreds of volunteers stepped forward to clean up seabirds and other animals drenched in oil. Their work helped a modest number of animals, but many still died, and recovery efforts for a number of species continue after 24 years.

Sad Statistics
According to the National Wildlife Federation, the death toll of individual species of native Alaskan wildlife is still being tallied as of 2013. In the days immediately following the spill -- which, at the time was the worst in U.S. history -- many animals died including upwards of 100,000 and possibly as many as 250,000 seabirds. More than 2,800 sea otters and 12 river otters immediately expired . At least 300 harbor seals and almost 250 bald eagles were also instantly destroyed. Orcas living in the area at the time, 22 in number, were killed, as were countless fish. Small

organisms were killed by the trillions, leaving those animals who prey on them with nothing to eat, causing even more deaths. In the following days and weeks, these numbers climbed much higher.

How They Died

Aside from the reef fish and other animals nearby when the Exxon Valdez ran aground, millions of animals died as a direct or proximate cause of the spill. Animals covered in oil tried vainly to clean their bodies by licking themselves, only to be poisoned by the toxins in the oil. Birds weighted down by the heavy oil were unable to fly. Otters depend upon the unique design of their fur to help them tolerate extreme cold climates. When covered in oil, their fur is unable to act as a protective covering, so otters die of hypothermia. Whales are killed when they eat fish covered in oil or when their blowholes are plugged with oil, making it impossible for them to breathe.

Ten Years After

Ten years after the Exxon Valdez oil spill, scientists from the University of North Carolina at Chapel Hill reported in the journal "Science" that many animal species were still recovering and the damage to their habitats had not significantly decreased. It was once thought that the number of animals killed acutely -- that is, immediately following the spill -- would be much higher than any subsequent numbers. But Chapel Hill's researchers reported in 2009 that Alaska's coastal ecosystem continues to show toxins that affect wildlife.

Twenty Years After

In 2007 -- two decades after the oil spill -- the National Oceanic and Atmospheric Administration reported that 21,000 gallons of crude oil still pollutes the ecosystem within a 450-mile radius -- and the oil continues to kill animals within its sphere. The problem persists because the spill is contained within the Prince William Sound, so it doesn't biodegrade as it would in the open ocean. The orca pod affected by the spill never recovered. Sea otters and ducks, who forage for food in the beaches, need only scratch the surface to find layers of oil soaked into the sand. The oil remains toxic to these animals. Oceana, a conservation organization, reports that some species of loons, salmon, seals, ducks, herrings, pigeons, mussel and clam populations have never fully recovered. Commercial fishing, a $286 million industry, has not completely resumed in the area.

The slick stretched from Bligh Reef to the village of Chignik on the Alaskan Peninsula. 250,000 seabirds, 2,800 sea otters, 300 harbor seals, 250 bald eagles, 22 killer whales, and billions of salmon and herring eggs……the 'best' estimate of how many animals died outright from the spill. Mar 24, 1989

The Deep Water Horizon Disaster was even greater. Here is a web site from the Center for Biological Diversity Report in April of 2011.

https://www.biologicaldiversity.org/programs/public_lands/energy/dirty_energy_development/oil_and_gas/gulf_oil_spill/a_deadly_toll.html

A DEADLY TOLL: THE GULF OIL SPILL AND THE UNFOLDING WILDLIFE DISASTER

A Center for Biological Diversity Report — April 2011

The BP Deepwater Horizon catastrophe in 2010 spilled 205.8 million gallons of oil and 225,000 tons of methane into the Gulf of Mexico. Approximately 25 percent of the oil was recovered, leaving more than 154 million gallons of oil at sea. In addition to the oil, nearly 2 million gallons of toxic dispersants were sprayed into the Gulf's waters. This did not actually reduce the amount of oil left in the ocean, but merely broke it into smaller particles, which may actually make the oil more toxic for some ocean life and ease its entry into the food chain. A year after the April 20, 2010, explosion that caused the well to leak oil for months, the ultimate toll on people and wildlife is still not fully understood. But one thing is clear: The number of birds, sea turtles, dolphins and other animals sickened or killed and tallied as part of the government's official count represents a small fraction of the total animals harmed by this disastrous spill. The toll on wildlife continues to mount. Dead turtles, marine mammals, birds and fish are still washing up on beaches. Dolphins are miscarrying, and pelicans are attempting to nest on beaches polluted with tar balls and subsurface oil. The impacts of previous oil disasters show that wildlife in the Gulf will continue to be affected by this spill for decades. Lingering pollution from a 1969 spill in Massachusetts, for example, is still affecting fiddler crabs. Likewise, oysters and mangroves in Mexico are still affected by pollution from the 1979 Ixtoc spill in the Gulf, and oil remains on Alaskan beaches from the 1989 Exxon Valdez spill with continuing impacts on birds and fish. In order to comprehensively assess the likely impacts of the

Gulf oil spill to date, the Center for Biological Diversity has combed government figures, news reports and scientific articles. To provide a more accurate estimate of the death toll, we used multiplication factors identified by leading scientists that estimate how many more animals are killed than are actually observed or collected. In total, we found that the oil spill has likely harmed or killed approximately 82,000 birds of 102 species, approximately 6,165 sea turtles, and up to 25,900 marine mammals, including bottlenose dolphins, spinner dolphins, melon-headed whales and sperm whales. The spill also harmed an unknown number of fish — including bluefin tuna and substantial habitat for our nation's smallest seahorse — and an unknown but likely catastrophic number of crabs, oysters, corals and other sea life. The spill also oiled more than a thousand miles of shoreline, including beaches and marshes, which took a substantial toll on the animals and plants found at the shoreline, including seagrass, beach mice, shorebirds and others.

BIRDS

More than 82,000 birds may have been harmed by the spill. At least 102 species of birds are known to have been harmed by the BP oil spill, including black skimmers, brown pelicans, clapper rails, common loons, laughing gulls, northern gannets and several species of terns. Oiled birds have been collected from west of Galveston, Texas, to south of Fort Myers, Fla. The number of birds reported by the government as being injured by the spill represents only a portion of the total affected. The official number represents only the number of birds collected by wildlife officials, and does not include oiled birds that were seen but not collected

or birds that vanished undetected. Biologists on the scene say that the official count greatly underestimates the number of birds actually harmed. Scientific research indicates that mortality can be assumed to be four to 11 times higher than the number of birds retrieved, and that a common "rule of thumb" estimate is that the actual mortality was likely 10 times higher. To date more than 8,200 birds have been collected, indicating that more than 82,000 may have been harmed by the spill. Of particular concern are brown pelicans and federally threatened piping plovers. Brown pelicans were removed from the endangered species list just five months before the Gulf disaster. Since the spill, 932 brown pelicans have been collected, so it can be assumed that more than 9,300 have likely been harmed. Scientists are reporting that oiled pelicans are still being found a year later. Despite good intentions, cleaning oiled pelicans doesn't necessarily save their lives, and cleaned pelicans that do survive may never be able to reproduce. Only one dead piping plover has been collected, but oil pollution has soiled the bird's critical habitat on the Chandeleur Islands.

SEA TURTLES

Approximately 6,000 sea turtles have likely been harmed by the spill. The five sea turtles species found in the Gulf (green, Kemp's ridley, hawksbill, leatherback and loggerhead) are all federally listed as endangered or threatened, and all have been harmed by the spill. Oiled turtles have been collected from Port Arthur, Texas, to Apalachicola Bay, Fla., and seaside residents are reporting that dead turtles continue to wash up on a daily basis. The official tally of collected turtles underestimates total mortality because it does not include turtles that perished undetected,

and includes only turtles collected last winter. The official number of turtles collected and attributed to the spill is 1,146. The government is not adding turtles that are washing ashore this spring to the total due to an ongoing federal criminal investigation of the spill's effects. The media has reported that at least 87 dead turtles have washed onto beaches this spring, though some of these deaths may be attributable to drowning in shrimp trawls. Scientists estimate that at least five times as many turtles die as wash up on shore, indicating that between 5,730
and 6,165 sea turtles have likely been harmed by the oil spill to date.

MARINE MAMMALS

As many as 25,900 marine mammals may have been harmed by the oil spill to date. At least four species of marine mammals have been killed by the oil spill, including bottlenose dolphins, spinner dolphins, melon-headed whales and sperm whales. Oiled marine mammals have been collected from west of Cameron, Texas, to Port St. Joe, Fla. Researchers are reporting that carcasses are washing up daily, and that half of the dead animals are stillborn or dead infant dolphins. The oil spill could impair marine mammal reproduction in the Gulf for decades, as some orca whales that were exposed to the Exxon Valdez oil spill have not been able to reproduce since that spill in 1989. As with birds and sea turtles, the number of marine mammals reported as harmed by the spill grossly underestimates the true number affected. Scientists estimate that the number of marine mammals harmed may be up to 50 times higher than the number that have been

collected. The government has collected 128 dead or affected dolphins and whales whose harm was attributed to the BP spill, indicating that at least 6,400 marine mammals may have actually been harmed. Though oil on some of the dolphins that have washed ashore this spring has been traced to the BP disaster, the government is not adding those dolphins to the official tally because of the ongoing criminal investigation. The media has reported 390 strandings this spring. If these animals are included in the tally, then it can be estimated that up to 25,900 marine mammals may have been harmed by the oil spill to date.

FISH

It is difficult to conceive of how many fish have been killed by the Gulf disaster. The widespread pollution from the BP oil spill caused fishing closures across 88,500 square miles. The Gulf of Mexico is home to more than 500 fish species, with new species continuing to be discovered. Oil and dispersed oil are toxic to all life stages of fish, and oil spills affect fish reproduction for at least decades. The BP disaster particularly threatens species that are already at risk of extinction such as Atlantic bluefin tuna, Gulf sturgeon, smalltooth sawfish and the dwarf seahorse. The oil spill occurred during the peak spawning months for the bluefin tuna, pushing this severely overfished species closer to the brink of extinction. The spill could extirpate our nation's smallest seahorse, the one-inch long dwarf seahorse, from much of its range, as both oil and dispersants are toxic to seahorses and the seagrass they need to survive.

INVERTEBRATES

Oil and dispersed oil are toxic to marine invertebrates such as corals, lobsters, crabs, oysters, clams, zooplankton, starfish and sand-dwelling organisms. It is impossible to tally how many invertebrates have been harmed by the BP oil spill. The government has stated that resources that invertebrates rely on have been injured, ecological services have been disrupted, and that the potential for invertebrate recovery is limited. Researchers have observed dead and dying corals in deep waters southwest of the BP well, reporting that the corals have been covered with a brown substance. Fishermen have reported vanishing oysters, and oiled crabs are being found on beaches. In November, fishermen reported pulling up tar balls in their shrimp nets, and the closure on royal red shrimp fishing lasted until February. Oil pollution will persist for decades or longer in the Gulf, resulting in continued disruption to invertebrate life. Scientists tracing the fate of the dispersed oil in the water column have found that oil particles are being transferred within the food web, which poses ongoing risks to all marine life in the Gulf. Forty years after an oil spill off the coast of Massachusetts, fiddler crabs are still being harmed by persistent pollution.

PLANTS

Oil, dispersed oil and dispersants are all toxic to marine and onshore plants such as seagrasses, mangroves and wetland vegetation, which provide habitat and food for many species. Oil pollution can have long-term negative effects on plants, and oil trapped in plant roots can become re-suspended in the water column during storms. Pollution from the BP spill oiled more than 1,000 linear miles of shoreline and contaminated marshes and mangrove

habitats that support nesting birds. Seagrass beds that support sea turtles and seahorses were also harmed by the spill.

TERRESTRIAL MAMMALS
Tarballs and subsurface oil on beaches threaten terrestrial mammals such as federally protected beach mice, including the Alabama, Choctawhatchee, St. Andrews and Perdido Key beach mice. Mice can ingest tar balls and subsurface oil when constructing burrows, putting them at risk of tumors and lowered immune response.
CONCLUSION The price paid by wildlife in the Gulf for the BP oil spill will continue to rise. Although it is the largest to date, the Gulf oil spill was simply the latest in a string of ongoing and inevitable spills produced in the Gulf. More than 320 known spills involving offshore drilling have occurred there since 1964. Spills massively degrade ecosystems and all of the wildlife dependent on those ecosystems in the Gulf. Clean-up efforts only remove a fraction of the persistent oil and gas spilled. The remainder of the oil, including millions of gallons remaining in the Gulf, will continue to poison wildlife for generations. Besides the direct harm to wildlife, the spill impoverishes the people of the Gulf and the nation, who depend on this rich body of water for food, culture, environmental enrichment and recreation.

Generally the oil is blocked from spreading by the use of “boomers”. They don’t always in rough seas since the oil on the surface of the water can wash over the boomers and escape into the water from which it is being blocked. It is picked up by skimmers or vacuums.

SOME TERMS

Absorbtion: something is taken into some material

Adsorbtion: something attaches to the outside of some material

SOME THINGS USED IN OIL SPILLS

Booms: There are different kinds, but the main point is that they are used to contain and absorb some of the material

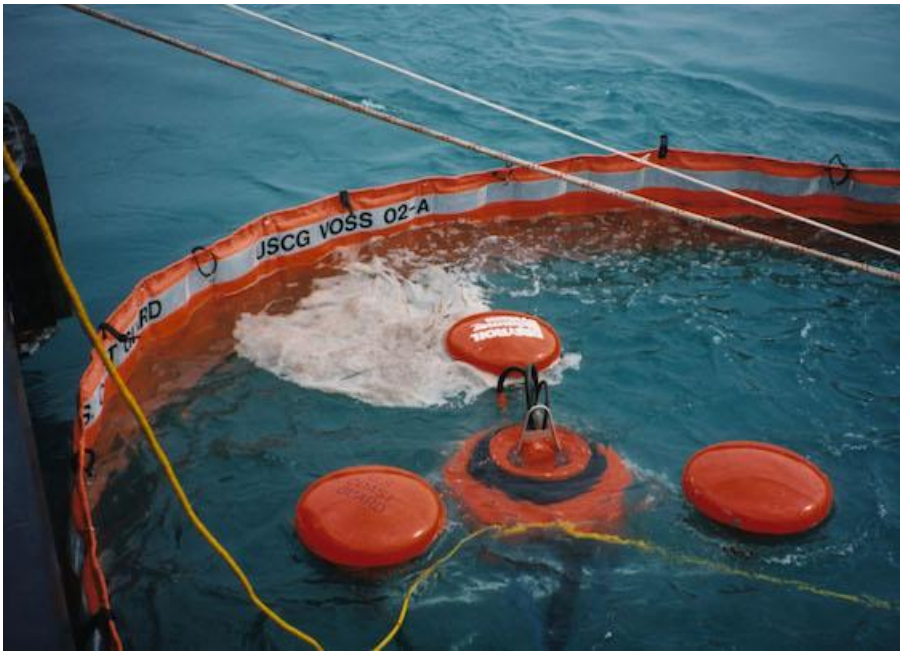
Booms are floating, physical barriers to oil, made of plastic, metal, or other materials, which slow the spread of oil and keep it contained. Skilled teams deploy booms using mooring systems, such as anchors and land lines. They commonly place boom:

- Across a narrow entrance to the ocean, such as a stream outlet or small inlet, to close off that entrance so that oil can't pass through into marshland or other sensitive habitat.
- In places where the boom can deflect oil away from sensitive locations, such as shellfish beds or beaches used by piping plovers as nesting habitat.
- Around a sensitive site, to prevent oil from reaching it.

There are three main types of boom. **Hard boom** is like a floating piece of plastic that has a cylindrical float at the top and is weighted at the bottom so that it has a "skirt" under the water. If the currents or winds are not too strong, booms can also be used to make the oil go in a different direction (this is called "deflection booming"). **Sorbent boom** looks like a long sausage made out of a material that absorbs oil. If you were to take the inside of a disposable diaper out and roll it into strips, it would act much like a sorbent boom. Sorbent booms don't have the "skirt" that hard booms have, so they can't contain oil for very long. **Fire boom** is not used very much. It looks like metal plates with a floating metal cylinder at the top and thin metal plates that make the "skirt" in the water. This type of boom is made to contain oil long enough that it can be lit on fire and burned up.

Pompoms: They look like the pompoms used by cheer leaders. The streamers are plastic strips like old audio cassettes. Oil is ADSORBED by these.

Pom poms on the beach



Skimmers are boats and other devices that can remove oil from the sea surface before it reaches sensitive areas along a coastline. In the photo below, oil is being skimmed from the sea surface by a "vessel of opportunity." Sometimes, two boats will tow a collection boom, allowing oil to concentrate within the boom, where it is then picked up by a skimmer.

Machines that move around in an oil spill and the oil on the surface spills over the edge of the skimmer and into it.

Vacuums: pretty much like the machine at home. This lifts oil off of the water, with some water comping up as well.

Vacuuming

Vacuums: pretty much like the machine at home. This lifts oil off of the water, with some water comping up as well.

IN SITU BURNING

In Situ burning of oil

More recently, a technique has been developed by which magnetite (a naturally occurring mineral) can be put onto the oil and magnets can be used to attract it. The magnetite drags the oil with it and it can be lifted out of the water, and then separate it with magnets. This leave the water clean of oil and the oil clean enough of water to processes it in a refinery.

https://www.youtube.com/watch?v=ZaP7XOjsCHQ

There follows a list of the more important laws concerning the environment. Following the list is information on aquatic nuisance species and invasive species and steps to be take to protect against them

MARPOL In 1973, the International Convention for the Prevention of Pollution from Ships at Sea (MARINE POLLUTION) was drafted and signed by a number of seafaring nations. In 1978, it was updated to include five annexes on ocean dumping. In 1997, an annex on air pollution by ships was added. The annexes cover the following:
Annex I Oil
Annex II Hazardous liquid carried in bulk
Annex III Hazardous substances carried in packaged form
Annex IV Sewage
Annex V Garbage
Annex VI Air Pollution

By ratifying MARPOL 73/78, a country automatically adopts annexes I and II; the remaining annexes are optional. The United States has ratified optional annexes III and V. For a summary of MARPOL, see

http://www.epa.gov/OWOW/OCPD/marpol.html

MPPRCA
Marine Plastic Pollution Research and Control Act (1987) – MPPRCA implements the International Convention for the Prevention of Pollution from Ships, Annex V

(MARPOL 73/78) and restricts the overboard discharge of plastic and other garbage. For a summary, see

http://www.cmcocean.org/mdio/marpol.php3

CWA
Clean Water Act (1972) – focuses on the use, discharge, and disposal of sewage, oil, and hazardous substances including dispersants. For a summary of the CWA and a link to the full text of the Act, go to

http://www.epa.gov/region5/defs/html/cwa.htm

OPA
Oil Pollution Act (1990) – requires reporting and cleanup of all oil and hazardous substance spills. For a summary of the OPA and a link to the full text of the Act, see http://www.epa.gov/region5/defs/html/opa.htm

OAPCA
Organotin Antifouling Paint Control Act (1988) – regulates the use and application of antifouling paints for some marine vessels. For the full text of the Act, see

http://www4.law.cornell.edu/uscode/unframed/33/2404.html

CVA
Clean Vessel Act (1992) – designed for the construction of pumpout facilities through financial incentives to local marinas.
For a summary of the CVA, see

http://fa.r9.fws.gov/cva/cva_info.html#CVA .

For the details of the Act, see

http://www.fws.gov/laws/digest/reslaws/clenves.html

FWPCA
Federal Water Pollution Prevention and Control Act (1997) – establishes goals and policies for the restoration and maintenance of the chemical, physical, and biological integrity of our nation's waters. A summary of the FWPCA can be viewed at:

http://www4.law.cornell.edu/uscode/33/ch26.html .

For FWPCA (section 1322) information on the use of marine sanitation devices:

http://www.uscg.mil/hq/gm/mse/regs/FWCPA.html

ESA
Endangered Species Act (1973) –provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. For a summary of the ESA and a link to the full text of the Act, see

http://www.epa.gov/region5/defs/html/esa.htm

MMPA
Marine Mammal Protection Act – establishes a moratorium on taking and importing marine mammals, their parts, and products. The Act provides protection for polar bears, sea

otters, walruses, dugongs, manatees, whales, porpoises, seals, and sea lions. For a summary of the MMPA, see

http://www.lab.fws.gov/lab/cargo/mmp.htm

CZMA

Coastal Zone Management Act – encourages states to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. For a summary of the CZMA, see

http://tis-nt.eh.doe.gov/oepa/law_sum/CZMA.HTM

CAA

Clean Air Act – regulates air emissions from area, stationary, and mobile sources. This law authorizes the U.S. Environmental Protection Agency to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment.
For a summary of the CAA, see

http://www.epa.gov/region5/defs/html/caa.htm

RCRA

Resources Conservation and Recovery Act – addresses the issue of how to safely manage and dispose of the huge volumes of municipal and industrial waste generated nationwide. For more information on the RCRA, see

http://www.epa.goepaoswer/hotline/rcra.htm

PWSA

Port and Waterways Safety Act – states that navigation and vessel safety and protection of the marine environment are matters of major national importance. It Insures that the handling of dangerous articles and substances on the structures in, on, or immediately adjacent to the navigable waters of the United States is conducted in accordance with established standards and requirements. For details, see

http://www4.law.cornell.edu/uscode/33/1221.html

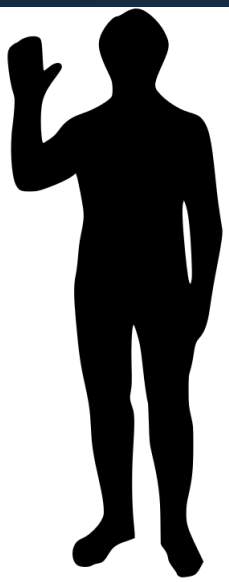
NMSA
National Marine Sanctuaries Act – protects special marine resources, such as coral reefs, sunken historical vessels or unique habitats, while facilitating all "compatible" public and private uses of those resources. For a summary of the NMSA, see

http://www.sanctuaries.nos.noaa.gov/natprogram/nplegislation/nplegislation.html

In addition to dealing with oil spills and other pollutants in the water, the USCG deals with the taking of fish and violations of laws which deal with over fishing and by-catches as well as the dangers of the transportation of Aquatic Nuisance Species into American Waters. These are life forms that arrive in bilge water and also just attached to the bottom of a vessel which become transplanted into areas where they may have no natural predators and may drive native species out of existence. extinction. The spill could extirpate our nation's smallest seahorse, the one

inch long dwarf seahorse, from much of its range, as both oil and dispersants are toxic to seahorses and the seagrass they need to survive.

ANS – Aquatic Nuisance Species



ANS are nonindigenous aquatic species that pose significant ecological and economic threats to aquatic ecosystems. This can include fish, aquatic plants, algae, invertebrates, mussels, viruses, and other aquatic pathogens.

AQUATIC NUISANCE SPECIES AND INVASIVE SPECIES

DEPARTMENT OF ENVIRONMENTAL CONSERVATION NYS

1. An Aquatic nuisance species is any species found in the water which becomes an annoyance to people. As defined by

As per **Executive Order 13112** an "invasive species" is defined as a species that is:

1) non-native (or alien) to the ecosystem under consideration and

2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

2. **Definition of Aquatic Nuisance Species**
3. ANS are nonindigenous aquatic species that pose significant ecological and economic threats to aquatic ecosystems. This can include fish, aquatic plants, algae, invertebrates, mussels, viruses, and other aquatic pathogens.

Aquatic Nuisance Species (ANS) are non indigenous species that threaten the diversity or abundance of native species, the ecological stability of infested waters, or any commercial, agricultural, aquacultural or recreational activities dependent on such waters.

Invasive species come into the environment in different ways. Some, like those hitching a ride on different kind of vessels

- Ballast water operations
- Biofouling of ship hulls
- Transported on watercraft, fishing gear, and other recreational equipment/li>
- Escape from aquaculture facilities
- Escape from nurseries and water gardens
- Intentionally stocked as food or recreational sources
- Released as biological control of existing an existing invader
- Intentional release of unwanted pets

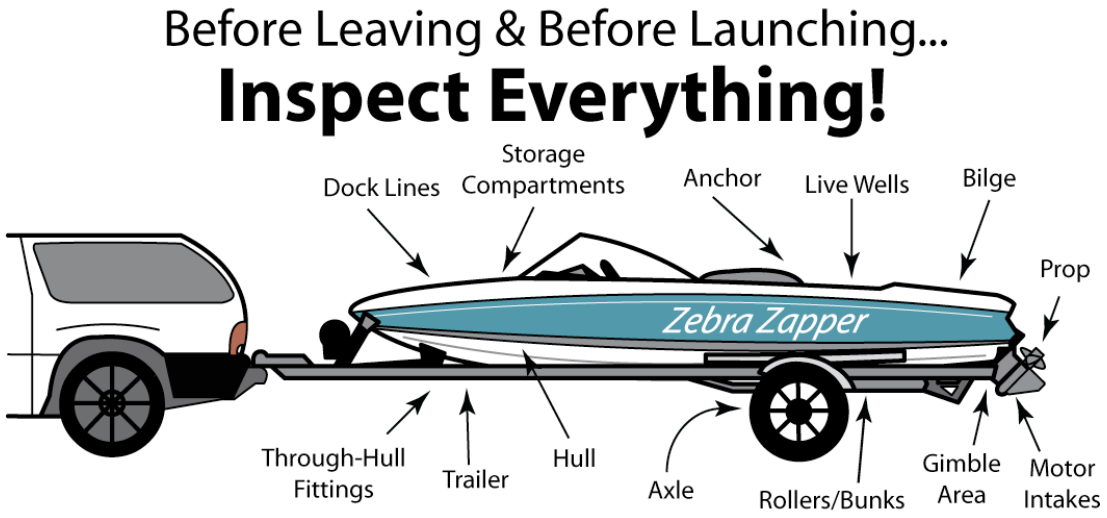
- Utilized for habitat restoration or erosion control efforts
- Accidental or intentional release of classroom and laboratory animals
- Fishing bait release
- Accidentally released with other species in the plant and animal trade

Prevention

• Don’t release exotic pets or plants into the environment.
• Buy and plant only native trees and plants.
• Learn to identify invasive species in your area and report sightings to the proper authorities.
• Prevent and help clean up pollution on land and in the water.
• Obey all related laws and educate others about the negative impacts of invasive species.

• Spray your boat and trailer with high-pressure water and then rinse with hot water after each use. DO NOT use salt and/or chlorine water mixtures as the runoff can pollute the waterway and the mixtures can damage boat equipment.
• Drain and flush the motor, live well, bilge and transom wells with hot water.
• Remove all visible vegetation from your boat, propeller, anchor, trailer and any other equipment or objects that were in the water.
• Dry your boat and equipment for at least five days before entering another body of water.

Some ANS, like Zebra and Quagga mussels, can live for days or even weeks out of water
depending on the relative humidity and time of year.
• DO NOT dump unused bait or its packing material into the water. While bait may be bought locally, it is often shipped from farther away.



In addition to the instructions above, people who use personal watercraft with jet-drive systems
(such as Jet Skis) should also:
• Avoid running your engine through aquatic plants when on the water.
• Push or winch the watercraft onto the trailer when leaving the water
• Once on the trailer, run the engine for five to ten seconds to blow out excess water that
may contain ANS.
• Carefully inspect the engine and steering nozzle for fragments of aquatic plants or other

ANS. Be sure the motor is turned off first!

UNITED STATES COAST GUARD RECOMMENDATIONS

a. the boat be left out of the water for a few days
b. Remove all visible vegetation from your boat, propeller, anchor, trailer and any other equipment or objects that were in the water
c. Drain and flush the motor, live well, bilge and transom wells with hot water.

Here are some examples of what can grow on the vessel: