

The Economic and Biological Impacts of The BP Oil Spill

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Abstract

The BP oil spill that occurred in April of 2010 is the largest human caused environmental disaster to date. Spurring from this disaster there will inevitably be impacts on the local economies, which could potentially extend out to a national level and even an international level. In addition spilling millions of barrels of oil into a delicate ecosystem will pose a significant amount of negative effects on a biological level. This paper will address both the economic and biological effects of the oil spill in the surrounding area. From both of these aspects we will explore both positive and negative aspects of the oil spill. To address these problems we will observe:

Economic Effects:

- Positive economic effects?
- The oil spills effect of fisheries?
- The oil spills effect of tourism?
- The oil spill's effect on the rental and housing markets?
- The oil spills effect on gasoline scarcity?
- The oil spills effect on the gulf shipping industry?

Biological Effects:

- Dispersants, chemistry and their effects
- Tarballs
- The biochemistry and physics of an oil spill
- Damages

By addressing these topics we will be able to provide a good analysis of the economic and biological impacts of the BP oil spill.

Economic Effects of The BP Oil Spill

The BP oil spill will go down in history as one of the greatest human caused disasters of our time. This oil spill has interrupted a very delicate ecosystem that many industries in our country depend on to operate their businesses and hindering these could lead to an economic ripple effect throughout the country. Some of these industries in the Gulf of Mexico include, fisheries, resorts, shipping and many others that branch off of those main three sectors. When the oil spill occurred it caused a number of these Gulf industries to be temporarily shut down or lose a lot of business, which could have potentially lead to a small but temporary economic down turn throughout the country. There is also a chance that because we are unable to keep the fisheries operating or unable to get people to go on vacation there, people may decide to buy seafood and vacation elsewhere, which would lead to negative economic effects in the gulf area. Though many of these instances may seem like a bad thing there are also a number of places in the gulf and outside the gulf that will thrive because of the money given to them in order to clean up the oil spill and also business that are sending supplies down in order to assist the clean up. Some of these could mean buying the dispersants from chemical companies that are used to break up the surface oil, using people that had originally worked around the gulf to help clean up the oil that made it to the shoreline and flying animal specialist in to help capture and help revive the animals to their original state. These

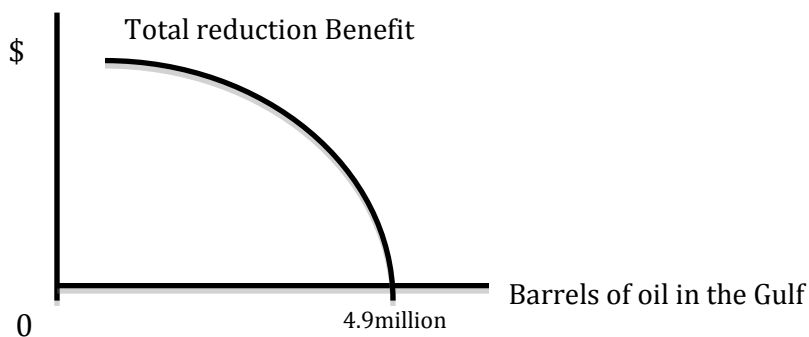
instances will all have negative and positive effects on the United States economy and could have positive effects on foreign economies as well.

Some of these positive effects come from the increased use in certain services that are necessary for the clean up and also the restoration on wild life. Though some of the people that have participated in the clean up efforts are suffering from health issues due to breathing the toxic petroleum fumes there was a large amount of money distributed to these men and women that may not have otherwise been circulating. A large amount of this money that is being put into cleanup efforts could potentially help to cover the money lost in the fishing industries, tourism and also in the real estate markets. There was also a large payout from different government agencies like the Department of Environmental Protection who paid out 29 million to different cleanup crews and industries like Ashbritt Inc. and Calvin, Giordano & Associates, the tourism industry and many other smaller state or county organizations. All of the departments combined that provided funding to the clean ups and other restoration processes the total money ended up being over 58 million not including any money from BP. A major portion of the restoration process has to do with bringing back the wild life to the way it originally was. When it came to the Exxon Valdez spill this part ended up being extremely expensive to bring back. In Valdez the wild life was very expensive, mostly for capturing the animals. These expense ran Exxon around \$50,000 to capture sea Otters, in addition to this the Otters would need to be relocated because their original home is now contaminated and the cost of relocating fifty Otters would cost between \$75,000 and \$110,000. Many animals cost a similar amount to these Otters like the Eagles, which cost

around 15,000 to rise from eggs and then to bring them back into a new environment. These costs, regardless of the negative environmental affects, will have a positive affect on the economy because they are stimulating many markets that may not receive very much money all that often. These payments may not be enough to cover the amount of money a lot of these areas have lost though. The fishing industries and tourism in the gulf areas is a major portion of the local economies in the Gulf States. Many people come for summer vacations and also during the winter to escape the cold weather of the north. In addition to the government agency money being fed into the local economies there was a large amount of money that was fed into different clean up and restoration efforts by BP. They fed in over 83 million dollars in grants to the state of Florida alone. There could be a potential loss or negative affect on the local economy or even the whole United States economy but it would be nearly impossible to determine if there is actually a loss so early after the spill. We would need to be able to look back on it like we can with Exxon Valdez in order to determine this for sure. Once we are able to view long run data we will be able look at it to determine if there is a long run cumulative loss in vacationing, fishing or in general from the local economies having to spend more money to clean up their areas.

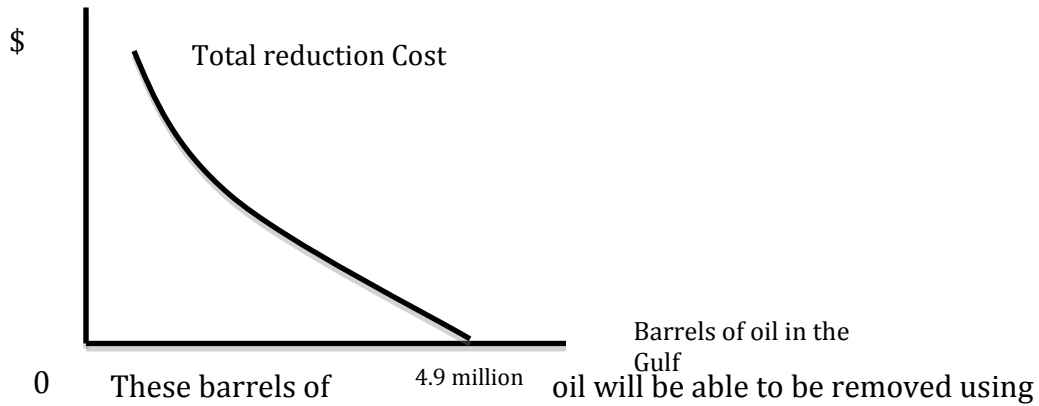
It is a great aspiration to restore habitats affected in environmental disasters back to their original state. This goal is very admirable but never practical. The public would love to have the Gulf area totally restored to the way it was pre-spill and BP would more than likely prefer just to dump their dispersants on the surface oil and let nature do its thing. There is a happy medium, which is the level of clean

up that would provide the maximum amount of satisfaction to both parties. Suppose BP had to clean up every last particle of oil from the Gulf area, this clean up effort would be insanely expensive and insanely impractical. If we imagine the spill being cleaned up the way that BP would prefer to do it the clean up practice would be relatively inexpensive but there would be a lot of people who love those waters and would prefer to see a lot more done. If we look at the graph below we can see there is a level of clean up that would allow the maximum amount of benefit to each party.

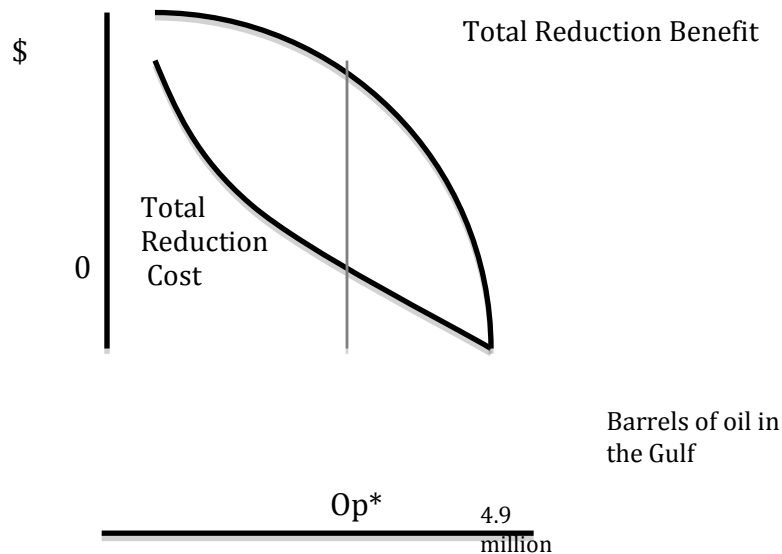


Looking at this graph we can see that somewhere in the middle of the total reduction benefits curve would be the optimal place to meet, where it wouldn't be outrageously expensive but also provide a great deal of benefit to both groups of people and remove the oil that is easy to recover.

Another aspect to take into consideration is the cost curve of reducing the amount of oil that is present in the Gulf. This cost of a clean up is the opposite of the benefit curve and moves in an increasing rate, which illustrates the first barrels of oil being relatively inexpensive but once you begin to increase the amount being recovered it becomes more and more expensive. This graph will help to illustrate:



dispersants and through mechanical recovery with boats or using certain methods on beaches. The reason the curve shows last barrels being so expensive is because this is where we do not have machinery or the correct chemicals to remove it. This oil is located on the ocean floor and in marshes and estuaries where it is difficult to get to and everything we have to clean it with is useless. In order to determine the optimum clean up level we end up combining these two graphs to make something that looks like this:



The Op* represents the optimum clean up level. This is where the benefits curve and cost curve are equal to one another thus producing the cost and the correct amount of clean up that should be done. By doing this BP and the states wouldn't exceed the amount that provides the most benefit to the people, BP and the wildlife it would be able to make everyone happy at once. By cleaning to this level it also reduces a large amount of unnecessary expenses that wouldn't provide all that much benefit to everyone.

The fisheries in the Gulf of Mexico supply around 40% of the Unites States

***Most Productive Fishing Ports
by Value***

Rank	Port	Millions of Dollars
1	Empire-Venice, LA	46.9
2	Brownsville-Port Isabel, TX	45.8
3	Dulac-Chauvin, LA	44.4
4	Key West, FL	44.2
5	Port Arthur, TX	39.3
6	Galveston, TX	34.8
7	Bayou La Batre, AL	32.6
8	Intracoastal City, LA	32.2
9	Palacios, TX	29.8
10	Golden Meadow-Leeville, LA	28.1

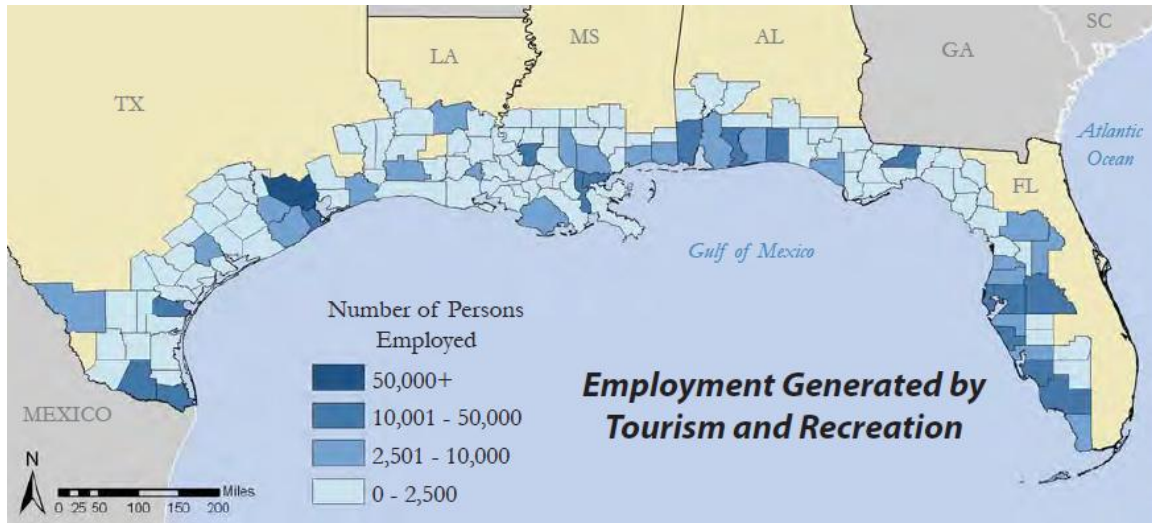
seafood is supplied to us by fisheries in the gulf. This is the second highest supplier of seafood to the U.S. under Alaska, which supplies almost 50%. The oil spill has caused the fishing industry in Louisiana to lose 77% of their production and this could become

higher in later years because the clams, oysters and other shell fish that aren't able to move will be more susceptible to becoming contaminated with the oil and oil dispersants. As we can see in the chart above Louisiana earns a combined 151.6 million dollars in their fisheries, If they lose 77% of their production this would bring them down to a little over 35 million in production, which would be detrimental to the states economy. This would also be extremely bad because as we

can see from the chart Louisiana has the most productive fisheries in the gulf. If these receive this much damage from the oil it would dramatically raise the prices of seafood throughout the United States. In addition a lot of the buyers of the seafood have decided not to buy their seafood for their restaurants or stores from the gulf just because they believe that it will make their customers sick or their customers do not find it desirable to eat fish from the gulf, even if it wasn't from a contaminated area. This shows that the majority of the problem is perceptual. The seafood that is being served comes from areas that are totally safe but it is the Gulf's reputation that has been tarnished by the incident. Now that this primary producer of seafood is working at a very slow rate now it will cause the supply of seafood to become scarcer which will inevitably raise the price of it. In addition to the commercial fisheries the gulf has a large number of fishing skiffs that sport fisherman will rent for the day in order to go catch some large fish offshore. Many of these businesses, which are usually operating with packed schedules, are now unable to keep their doors open because business has gone down so much. As soon as the oil spill occurred business had dropped over twenty percent for these businesses but as time has progressed business has gone down even more because all the people believe that a large number of the fish population has died off from the oil pollution. In addition to the Gulf being harmed there could be even long-term issues caused in other fisheries up and down the east coast. If the polluted water from the oil and dispersants is able to make it into the Gulf Stream it could affect all of those waters. Many of those fisheries rely on the Gulf Stream to actually get their larger deep-sea fish. If these waters become contaminated and move up the east

coast it could temporarily wipe out those states fishing industries as well. Many of these people that are affected in the gulf or up and down the east coast would not be able to get other jobs or receive compensation from BP for the amount of money they are losing. These particular instances will have a negative impact on the economy due to many people losing their jobs or them being laid off because the demand for their services is no longer needed until the waters are restored to their natural way and also people will want to go back down there for sport fishing. In past oil spills like Exxon Valdez, which happened in 1989, they are still suffering long-term problems. Many tourists still refuse to visit there because they believe that the landscapes are still scared by the remains of oil on the shorelines and a lot of people still refuse to eat the fish that comes out of the water there. This includes many of the native tribes that inhabit the area who are actually importing fish from elsewhere now.

The Gulf of Mexico is high traffic vacation spot for travelers. The vacationers could be going to beaches in Florida, Texas or Louisiana but primarily Florida. When the spill occurred the oil was very far away from Florida for the duration of the summer. The problem is people don't have to see it. There is a psychological factor that can turn people off to going and visiting an area. They can know the oil isn't there but that won't stop them from not wanting to go and visit a place. In this case a lot of the vacation spots in the gulf have been significantly affected by this spill and have suffered from this. People do not want their families exposed to things that could potentially make their families sick so when they are planning their vacations that would cause Florida



<http://www.eoearth.org/article/Gulf_of_Mexico?topic=49460>

and the other states in the gulf to be go under the radar and not be chosen for their family

vacation. These proved to be true because within the first few weeks there were a large number of hotel and home rental cancelations. These effects will certainly hit the local economies hard because a lot of these areas rely on the summer vacation season to keep their heads above the water but if the vacationers decide to go somewhere else then that could put them all out of business in those areas. A lot of these people were also already in a bad state because the recession has already had a significant impact on the amount of vacationers that can actually afford to bring their families somewhere. The rental businesses were all starting to see their books start to fill until the oil spill happened and just as fast as the rentals were being booked they started getting canceled, stated by a Louisiana rental agent to Daily Finance. In addition another issue that people have been pushed away by is the seafood industry. Many people love going on their beach vacations because there are restaurants that serve extremely fresh seafood. This has caused many people do

be deterred from visiting the Gulf on their vacation because the food could be potentially tainted by the oil spill. The idea of going on a vacation and getting some seafood and a person's whole family getting sick from it would certainly cause people to pick a different destination for their summer vacation.

The decline in vacationers will have a pretty large impact on the local economies of the Gulf. If they lose a significant amount of their summer vacationers a lot of the businesses will not be able to survive. There is also the issue of how long will these effects last? If we compare this to the Exxon Valdez spill, the effects it has had on the tourists there has lasted over twenty years. If the Gulf spill is able to last that long then a lot of the west coast of Florida may be a thing of the past for a vacation destination. The effects of the oil spill are still being reported around the coastal areas with dead animals washing up on the shore, the breeze coming off the water having the distinct scent of petroleum also there are still tar balls washing up on shore. These complaints will deter many tourists from visiting these areas along with some natives of the states making the trip to visit the ocean.

In addition to the decline in the amount of rentals being utilized by vacationers, there has also been a decline in the amount of houses being bought in the Gulf. Many of these markets were beginning to recover from the recession, as we can see in graph as the lines for each location are moving gradually upward but once the oil spill was announced there is an abrupt downward trend. These homes not being sold have a serious impact on the Gulf economy. Many could have been utilized, as secondary vacation houses like in Florida, which seems to be, affected the least but in Louisiana, Texas and Alabama. The houses in these areas would

mostly be used as a primary house. It is too early to tell how this will affect the United States economy as a whole. Many of these people that might have been thinking of buying a house in these areas might have gone somewhere else to purchase a house that has the same settings and characteristics that they were looking for. If they did decide to do this it would affect the nations economy in a positive manor. If these people decided to settle down and wait to purchase a new house then there would be a massive decline in the housing market because places like Texas alone experienced massive drops in home sales of around 25%. The graph shows there is proof that there is a drop in the amount of houses being sold but it is still too early to tell if this was an affect from the oil spill or if it was a continuing issue from the recession.



<<http://www.worldpropertychannel.com/us-markets/residential-real-estate-1/>

In addition to the decline in housing sales there has been a significant drop in the actual property values of the homes that are located around the Gulf. Some of these decreased around 5-15%. If these people were considering moving they may decided not to anymore because they would be taking a large financial hit on their

initial investment for the house. This may also be a primary reason for people to avoid buying a house in these areas, they may be speculating to see if the house prices go down even farther so they can get the best deal possible on an ocean front house. If this is the way people decide to buy a house it will have a negative impact on the whole United States housing market because there people will not be buying houses, they will just be waiting. This waiting will lead to uncertainty for when the prices will be at their lowest point so the buyers resisting on buying a house may go on a lot longer than it actually should.

Another aspect that must be taken into consideration is not that all of this oil that is now unusable, will it affect gas prices around the United States? The answer is yes, but it may not be a very significant amount. Once the well could be plugged there had been around 4.9 million barrels of oil pumped into the Gulf. Each of these barrels once they are put through thermal cracking produces 19.5 gallons of gasoline. This is equal to 9.6 million gallons of gasoline that are now unusable by consumers or producers of other goods. This seems to be a pretty significant amount but in the United States we use roughly 375 million gallons of gasoline per day. The amount spilled into the gulf is equivalent to 25.5% of what the United States consumes in a single day. This is a very large amount of crude oil to be considered useless. We may not see a direct affect on gas prices from this incident but there is potential we will see it in the long-run. The reason for this is now we will be moving farther away from oil exploration in the United States and concentrating more on getting our oil from other countries. For instance, we are trying to avoid further oil exploration off of our coasts but we are going to other

countries like South America and asking them to start drilling offshore. As we progressively move farther from producing our own oil due to the negative environmental affects we are going to see the prices gradually go up, especially as the easy to access wells begin to dry up and the hard to reach wells are the ones we have to figure out safe cost effective ways of accessing them. As we see these affects we will see it not only affect the Gulf, this will have a massive impact on the whole United States and also other countries because a significant amount of our oil we produce is exported. Also having higher fuel costs raises the price of product production and shipping costs, which will lead to difficulty keeping small businesses operating because of higher costs. This issue has the ability to positively affect other countries though because the United States oil demands are increases and the less we supply means the more we need to import. For instance, after the oil spill the government put a temporary ban on offshore drilling and pumping. This temporary ban was released but the country looks down upon exploration of offshore oil fields now so we have decided to look elsewhere in order to increase our imports of oil. One other country we have gone to is South America to encourage them to start drilling offshore.

Top Ten Ports in the United States Ranked by Tonnage in 2006006

Rank	Port	Millions of Short Tons*
1	South Louisiana, LA	225.5
2	Houston, TX	221.1
3	New York, NY and NJ	157.6
4	Long Beach, CA	84.4
5	Beaumont, TX	79.5
6	Corpus Christi, T	77.6
7	Huntington – Tristate, WV-OH-PA	77.2
8	New Orleans, LA	76.9
9	Los Angeles, CA	66.0
10	Mobile, AL	59.8

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This leads to another potential issue and this is how will the oil spill

affect the shipping industry in Louisiana, Texas and Alabama. As we can see Louisiana is responsible for the most imports out of any state in the United States, thus making this a potentially large issue if they were to shut the ports down temporarily. They could have shut these ports down while the oil was still spreading because these massive cargo ships have to collect ballast water in order to keep the ship balanced with a load on it. This could raise an issue because when they collect the water they would be picking it up and bringing contaminated water to a different location, making the spill much harder to clean up. A significant amount of the shipments in these areas are for oil and grain. If these areas were disrupted it would slow the processing of the crude for the refineries and create an oil shortage that would cause the prices of gasoline to shoot up dramatically in just a matter of hours. The reason for this is because the Gulf LOOP as they call it, typically imports 15% of the United States daily oil supply. The good thing is that most shipping was not disrupted in the Gulf from the oil spill. Many people were worried it would be because the coast guard would not want any of the outgoing or incoming ships to be fouled because of the high concentrations of oil in the water. There was also talk of any boat that makes it through the oil will have to be stopped and cleaned before it is allowed to continue on, which could slow the shipping process and lead to a back up or slow then down. There would have been a major problem if the oil spill was

pushed closer inland toward Louisiana or Alabama because the coast guard was only allowing the ships to continue their usual routes because the actual spill was so far away from shore. If this had actually happened we would be feeling the effects through higher gas prices and also higher prices on certain food due to the loss of grain imports.

There are many issues that can spur economically from this oil spill but a lot of it is still too early to determine if all of the effects will be negative or positive to our economy or the world. Some of the mentioned problems may not even be viewed as something that was caused by the oil spill; it could just be something that was caused due to a second turning of the recession, like the housing markets. There are also many potential problems that we may not be able to see yet because of a ripple effect that will lead to more and more issues over time. There are also certain natural disasters that could cause this to become even more expensive. For instance, if a hurricane made it into the gulf it would pull all of the oil from the bottom and push it up on shore. This could make the clean up far more expensive. There are many things that we can look at now and say they were caused all because of the oil spill but the current economic situation of the United States can lead to all of these negative factors being falsifiable. The positive factors are the only ones we are able to say for sure that they had a positive impact on individuals and could potentially help to stimulate the economy. It was obvious that a lot of smaller companies were able to make fortunes off of the clean up, lawyer's fees and other services. There are still a lot of things that could spur from this oil spill but in order to see these changes we will have to wait for time to tell.

Biological Effects of the BP Oil Spill

Dispersants, Chemistry and Effects:

There are arguments that the crude oil spill is not the worst thing to happen to the Gulf of Mexico. There are many opinions that say that the oil spill is being exacerbated by the addition of crude oil dispersants such as Corexit, but contrasting those opinions there are arguments that suggest that the use of dispersants helps the recovery of the Gulf of Mexico.

The arguments that support the use of crude oil dispersants such as Corexit claim that the dispersed oil is quickly digested by naturally occurring bacteria in the water. This oil that is dispersed is actually turned more dense than the surrounding water, and is allowed to sink lower in the water column. The physics of how this descent may help the dissolution of the crude oil is a topic of surface area. Oil floating on the surface of the water only has a maximum of 50% total immersion in the solvent; as the oil sinks it then has a chance to have a more than 50% covering of solvent. This covering percentage is respectful to the size of the globule that was separated from the floating oil (the larger the oil globule the lower the percentage that the molecules on the inside of the globule will be affected by the solvent which contains the oil digesting bacteria).

The contrasting argument does not disagree with the dispersants ability to cause oil to become more dense than the surrounding water and increase the surface area; what the argument suggests is that the dispersant used on the oil does not increase the rate of dissolution but instead causes the oil to enter into an “out of sight, out of mind” status. The argument proposes that once the oil is considered “gone” it will be moved out of the spotlight of news media, tourists, and political officials. This takes pressure away from cleanup efforts and allows the oil to fester at the bottom of the Gulf of Mexico.

The way Corexit, and other dispersants like it, work is by breaking the crude oil down on a molecular level. This process works mainly in two ways: The first acts almost like industrial strength dish soap by essentially making the oil less viscous. The second is by using its polarity, when a dispersant such as Corexit (which was the main dispersant used by British Petroleum in cleanup efforts in the Gulf of Mexico) is applied to an area the polarity of the dispersant moves the oil out of the applied area. Due to the properties of Corexit, there are arguments that the dispersant used in the Gulf of Mexico just creates an “out of sight out of mind” mentality. The reason being that when the dispersant is applied to the oil it has a change in density and sinks towards the bottom. As the oil droplets sink they are affecting many of the gulf’s inhabitants. These can range from littoral species that are in tidal regions, pelagic creatures that live in the water column, and most

affected of all are the benthic organisms. Benthic means bottom dwelling, and the properties of Corexit force the oil towards the bottom where these organisms live.

What is an oil spill and why does it matter?

On April 20th 2010 an explosion aboard British petroleum owned well platform named the Deepwater Horizon crippled the piping leading at least a mile to the ocean floor in the area known as the Macondo Prospect. This blowout caused nearly 4.9 million barrels (which can be rounded to 208.5 million gallons of oil) to leak into the Gulf of Mexico. This appropriately named “disaster” has and will continue to have negative effects on the Gulf of Mexico and its marine inhabitants.

The Deepwater Horizon experienced a blowout of extremely flammable methane gas in the late afternoon early night of April 20th 2010. This methane was discharged from an exploratory well in the Macondo prospect in the Mississippi Canyon area of the Gulf of Mexico. This explosion killed 11 men and wounded 17 others; after burning for 36 hours the rig finally sank into the gulf.

Tarballs:

The ill effects that soon followed were seen almost immediately. There were reports of “oil sightings” of tarballs that were washing ashore. These tarballs would, soon after the spill, have a detrimental effect on the tourism industry of the Gulf States. These tarballs have a limited environmental effect due to their concentrated

nature. The tarball have a low surface area to volume ratio compared to floating oil and are not exposed to water. There are pros and cons for the environment in respect to tarballs. The pros are that the oil is not in contact with the water and has a lower rate of toxin release. This is due to the fact that there is no water to hold oil digesting bacteria to dissolve the toxins into water. The cons of tarballs are more extensive than the pros due to the same dissolving argument. The oil takes much longer to degrade. The oil when not in contact with water can only photo-degrade (degradation from light and ultraviolet rays), and be reduced by micro invertebrates, larger organisms such as birds, and macro invertebrates such as crabs. The most powerful con of the tarballs however is the effect they have on human decision making processes. If we as humans see or hear of tarballs washing ashore in our favorite vacation spots we will most likely change plans to visit a different beach or estuary. The main problem with tarballs is that they are a trigger word for sub-par vacation areas and are an eyesore which can influence human decisions on where to spend their money.

The biochemistry and physics of an oil spill:

Crude oil is an organic compound that is comprised of many various hydrocarbons and other certain nitrogen heterocyclic compounds. These compounds such as pyridine, picoline, quinolone, and benzene in some cases have been reported as contaminants and carcinogens. These compounds tend to have a highly volatile nature and are soluble in water. These properties allow them to move

and dissolve into water due to physical force, such as wave action or current pull.

There are also naturally occurring bacteria such as *Micrococcus*, *Arthrobacter*, and *Rhodococcus*, that have been proven to slowly degrade these compounds.

An oil spill is a release of either crude or refined oil onto the terrestrial environment or into an aquatic ecosystem. Whether the spill comes from an oil tanker, blown out well, or from a neighbor who accidentally kicked his or her oil pan whilst changing the oil in their car; the damage is the same. The difference however is the location and intensity of the spill. An oil spill in an aquatic environment, however equally negative, is much worse in respect to containment and ability to clean. Oil spills at sea are generally much more damaging than those on land, since they can spread for hundreds of nautical miles in a thin oil slick which can cover beaches with a thin coating of oil. This can kill sea birds, mammals, shellfish and other organisms it coats. Usually oil spills on land are more readily containable if a makeshift earth dam can be rapidly bulldozed around the spill site before most of the oil escapes, and land animals can avoid the oil more easily.

The Macondo oil spill, for example, is infamous for single handedly polluting a massive ecosystem and breeding ground for fish and seafood prospects. However oil continuously leaks from the gulf even without human interaction due to natural seepage from cracks in the ocean floor over these massive repositories of crude oil. This natural seepage is a chronic exposure of oil to the environment and can be balanced out by the natural processes of the Gulf of Mexico. The Macondo spill

cannot be compared to this natural phenomenon due to the sheer magnitude and difference in amount released in respect to time. The Macondo spill was an acute release of oil and released more crude oil into the environment than the natural processes of the Gulf of Mexico could eliminate from the environment.

Damages:

Oil spills in the past have damaged natural ecosystems on the coasts and in the waters of many countries. These coastlines can be covered in rock encampments, sandy beaches, or in the case of the Macondo oil spill: the beaches may be covered in estuary type marshland. This type of marshland is the most susceptible of the other coastline habitats to the ill-fated effects from oil spills.

Marshland estuary habitats, in the marine science, are considered the nurseries of the oceanic world. These habitats harbor the spawn and fry of the tidal to oceanic realm. The structure of an estuary consists of a benthic bottom, a mid-tidal area where fry and spawn are suspended as planktonic organisms, and a surface area where more pelagic organisms move in. The coastline of the Gulf of Mexico in respect to areas such as Louisiana have two main levels in which the organisms can live are in the sub tidal eelgrass mudflat and the intertidal mangrove estuaries.

Eelgrass mudflats have a muddy nearly anoxic benthic layer better known as Detritus. Detritus defined scientifically is the remains of dead organisms and fecal matter from living organisms. In this detritus macro invertebrates (such as crabs,

bivalves, and benthic sea cucumbers), and micro invertebrates (such as nematodes, amphipods, isopods) exist and thrive. These sea grass mud flats are seemingly open and are dangerous for weaning organisms so these organisms that need to use sexual reproduction in order to procreate migrate to the more sheltered mangrove estuaries. In these habitats the organisms are more sheltered and provide a higher chance of their offspring surviving the gauntlet of early life in the ocean.

Mangrove ecosystems are a thick intermeshed collection of mangrove roots and sea grasses. This barrier from the sub tidal areas creates a perfect arena for the production of younger organisms. However this intermeshing of roots and plant matter is excellent at collecting oil as well as viable nutrients. The reason why estuarine systems are so susceptible to the ill effects of oil is due to the physics of the water dynamics entering these areas. The areas around Louisiana are considered a highly stratified estuary system. The water comes into the mangrove beaches at a force stronger than at other beachheads. Due to this, the oil has the ability to be forced into the mangroves and then not released because of the intermeshed structure of the mangroves.

Once oil is in the environment all of the organisms in said environment will be affected. These organisms could choke out, if respiration cannot be accomplished due to blockages of oil in their gills or throats. They could be poisoned due to ingesting toxic hydrocarbons, or they could lose the ability to move about their environments and not be able to feed. These effects are of an acute fashion and only

last a short while of time but are extremely fatal. More chronic effects of oil exposure can be evidenced in food chain interactions where bio accumulation occurs.

Bioaccumulation:

Bioaccumulation occurs when an organism absorbs a toxic substance at a rate greater than that at which the substance is lost, thus, the longer the biological half-life of the substance the greater the risk of chronic poisoning. In food web interactions there is a 10% rule which states that only 10% of the energy gained by the organisms consumed can be used by the consumer. Toxins however do not follow this rule. Once a consumer ingests the previous organism 10% of the energy from the organism is absorbed, but 100% of the toxin the previous organism absorbed is transferred to the consumer. For example we can take a lesson from bioaccumulation; plankton are the organisms that will take in the majority of the oil and hydrocarbon toxins without harm. As organisms higher on the food chains consume the plankton, those consumers will receive a dose that is concentrated more in their bodies due to the sheer numbers of organisms that need to be eaten in order for them to break even on their energy deficit. However consuming these large amounts of organisms increases the concentration of toxins in their bodies. Though these effects may not be manifested in the fish that eat the plankton and other lower trophic organisms, it can be seen in higher trophic organisms such as humans.

Conclusion:

On March 20th 2010 an oil spill in the Macondo Prospect of the Mississippi Canyon region of the Gulf of Mexico caused nearly 4.9 million barrels (which can be rounded to 208.5 million gallons of oil) to leak into the Gulf of Mexico. The oil spill had many negative effects on the local environment and economy of the areas surrounding the spill and the world. These economic effects were evidenced by drops in the tourism industries near the regions affected by the spill and also in the increase in price of gasoline locally and worldly.

The biological effects evidenced after the spill were all detrimental to the environment and the organisms which lived in those ecosystems. Many of the trends seen in the economy can be stemmed from the ill-fated effects of the environment. The drop in tourism can be attributed to the introduction of tarballs and oil slicks on the beaches. The increase in price for seafood can also be seen to be caused by the fish and shellfish population drops and also the fear held by humans of ingesting oil particles in their food.

The oil spill cleanup effort can help the environment reach a stable condition, but the dream of returning the Gulf of Mexico to its former state is virtually impossible. The manpower, time, and capital that need to be invested in order to remove every molecule of oil in the Gulf of Mexico is astronomical and impractical. Returning the Gulf to its former glory is not an option, but restoring the Gulf to a stable environment is possible given enough time.

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