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Exxon Valdez Oil Spill Continued Effects On The Alaskan Economy

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Introduction

The Exxon Valdez oil spill of 1989 was one of the worst environmental disasters in history and it is still harming the Alaskan economy today (Ott, 2009). While a small number of Alaskan industries have managed to recover, the economic activity in the damaged fisheries, tourism, and recreation industries, as well as the countless nonmarketable goods and services the coastal ecosystem provides, are still suffering from the aftermath of the spill (Cleveland, 2008; Ott, 2009; "Recreation and Tourism"). As Alaskans struggle to recover from the enduring ecological and economic damage from the oil spill, one big question remains: Has Exxon fully compensated the Alaskans for the damage caused by the oil spill?

Exxon's Oil Spill Relevant to Current BP Oil Spill

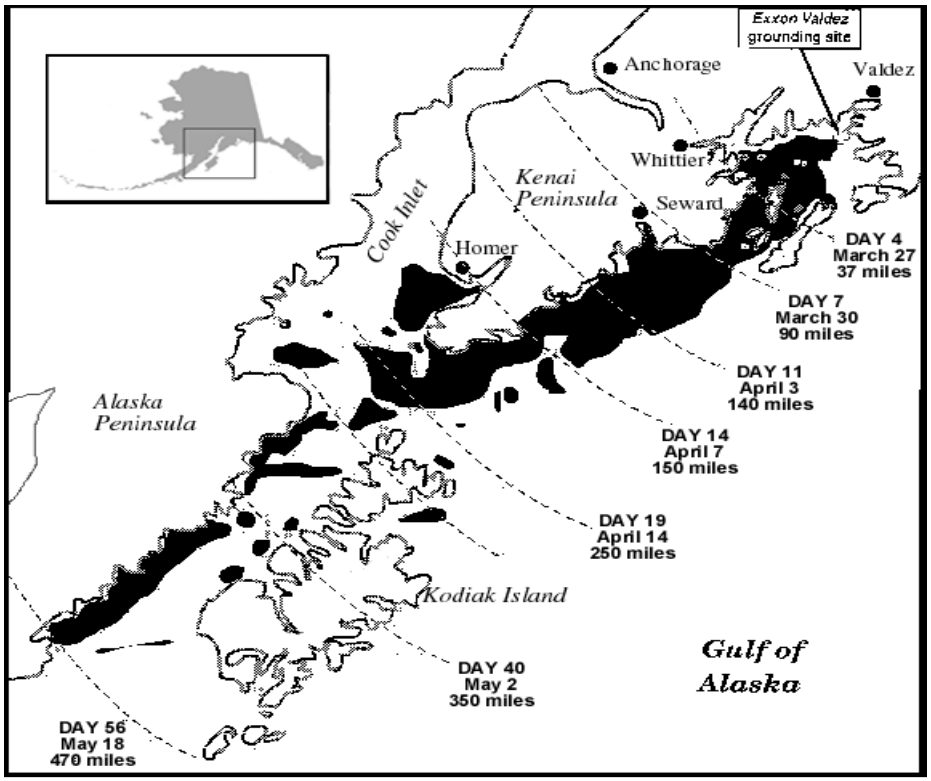
It is very important to study and analyze the effects of the Exxon Valdez oil spill, so current and future oil spills can be better handled in relation to the ecological and economic effects, especially the current BP (British Petroleum) oil spill in the Gulf of Mexico. The BP oil spill began April 20th 2010, and by May 29th 2010, the spill had already eclipsed the amount of oil released in the Exxon Valdez oil spill (Nuckols and Bluestein, 2010). BP finally capped the leaking well on July 15th 2010; almost three months after the spill began (Cleveland, 2010). The exact flow rate of the oil coming from the deep underwater pipe during the spill is uncertain. However, the current total of oil spilled is estimated to be 4.9 million barrels, which is 205.8 million gallons (Cleveland, 2010). On the other hand, 800,000 barrels, or 33.6 million gallons, were successfully captured in cleanup efforts. This leaves a remaining 4.1 million barrels (172.2 million gallons) in the Gulf of Mexico to be evaporated, broken down, washed up on shore, etc. The Exxon Valdez oil spill's short and long term effects can be used to estimate the short and long term effects from the BP oil spill both environmentally and economically. Despite differences between these oil spills, such as the amount of oil, and types of ecosystems at risk, the research done concerning the effects of Exxon's oil spill can greatly assist the Gulf States and BP manage the long road of negative oil spill effects, currently and in the future.

Background of Exxon Oil Spill

The Exxon Valdez oil spill occurred at midnight on March 24th, 1989 when the tanker ran aground on the Bligh Reef in the Prince William Sound of Alaska (Guterman and Pasotti, 2009). The tanker, which filled up in Valdez, Alaska, was headed to Los Angeles, California (Cleveland, 2008). Several factors are said to have contributed to the grounding. First, the tanker was traveling outside of the shipping lanes, in an effort to avoid ice. Then due to fatigue, the third mate failed to maneuver the ship properly, while the ship captain provided poor navigation, because he was intoxicated (Cleveland, 2008). The tanker spilled approximately 11 million gallons of crude oil (Tietenberg and Lewis, 34), or in metric terms about 40 million liters of crude oil (Guterman and Pasotti, 2009).

After the spill, most of the oil washed toward the southwest, starting from Prince William Sound, Alaska (Cleveland, 2008) (See the following maps). The oil had many reactions after being spilled; some evaporated, some dissolved, some dispersed, some sank, some was broken down by bacteria and digested by sea life, and some washed up on the beaches of the Alaskan shore (O'harra, 1999).

Two days after the spill, a powerful storm with winds over 70 mph hit the Alaskan coast, which transformed the oil into mousse and tar balls (Cleveland, 2008). The mousse consisted of 67% water and 33% oil, and had a volume that was three times larger than the pure oil spilled. This spill has caused countless economic and ecological problems that the Alaskans had to deal with in the short run and are still dealing with in the long run.



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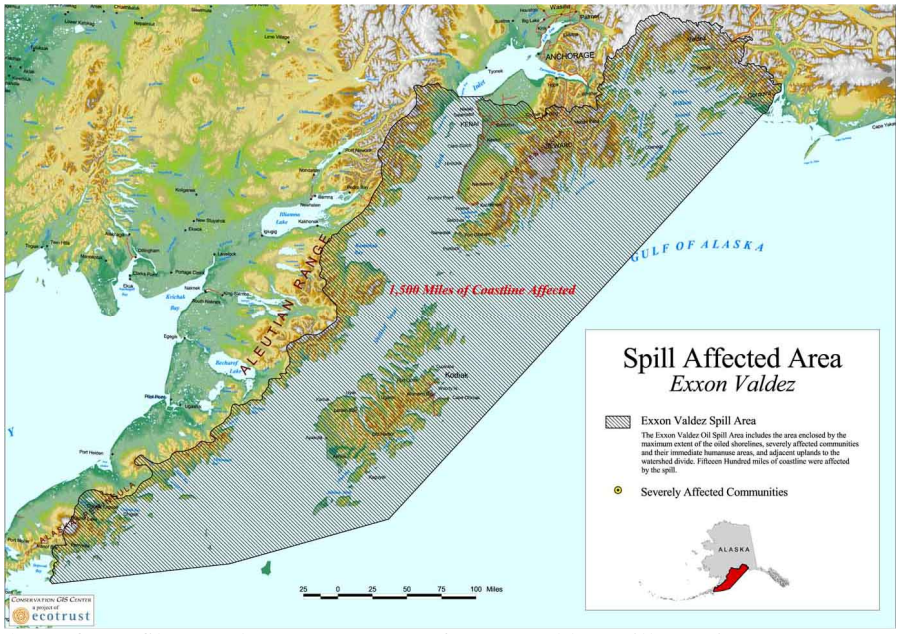

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Loss Estimates for the Short Term Ecological Effects

Some of the short term ecological effects occurred right away, while others were delayed a few years before setting in. One of the immediate negative impacts was death to a great deal of marine wildlife. "About 250,000 sea birds died, along with 22 killer whales, 2800 sea otters, 300 harbor seals, and untold numbers of fish eggs" (Guterman and Pasotti, 2009). Consequently, for the two pods of whales living along the southwest Alaskan coast each pod lost about 40% of their members directly following the spill. Three years later, the death toll estimates for sea birds increased from 250,000 to approximately 435,000 (National Park Conservation Association, pg.13). Many other species death tolls also increased significantly within the first few years. Due to the fact that the spill contaminated more than 1,200 miles of Alaska's shoreline, it is hard to quantify all of the ecological damage (Ott, 2009). According to Douglas Wolfe, head of the Bioeffects Assessment Branch of the National Oceanic and Atmospheric Administration's National Ocean Service, by May 1st, 1989, 20% of the toxic compounds in the oil had evaporated into the atmosphere, and 20- 25% of the oil had dispersed into the ocean and was rapidly degraded through natural processes, (O'harra, 1999). The rapid break down of the oil did not last long, within a few years the oil began to degrade at a much slower rate (Short et al, 2004). Therefore, experts have determined that the oil has been having negative effects on the marine ecology and economy since the night of the oil spill.

Short-Term and Long-Term Effects to the Alaskan Economic Activities

Commercial Fishing

The Alaskan economy suffered severely after the spill, especially since most Alaskans rely heavily on fishing as their main economic activity. The two kinds of fish that they were most dependent upon prior to the spill were salmon and herring. Right after the spill, though, the salmon population decreased significantly closing many salmon fisheries (Ott, 2009). Yet, the worst year was not the year directly after the spill, but 1993. The reason was that billions of salmon eggs never hatched following the spill, so there was a lack of mature fish.

Now, 21 years later, the Alaskan salmon have recovered (Ott, 2009). The Alaskan herring fishery suffered even more than the salmon fishery. Before the spill in the late 1980's, the herring fishery was at an all time high, even in 1990 the population was still high, at 120,000 tons (Guterman and Pasotti, 2009). Then, in 1993, the herring population severely crashed and has not been able to rebound enough to support a fishery, or the top predators that ate them on a regular basis (Guterman and Pasotti, 2009; "Pacific Herring"). Even twenty years later, the population of herring was only 15% of what it was prior to the spill. One factor strongly limiting their recovery is disease from hunger due to the poor blooms of plankton (Guterman and Pasotti, 2009; "Pacific Herring"). The sudden change in the way that the herring laid their eggs directly following the spill served as an early indicator that the population would downturn. They had always laid them in flat sheets, but after the spill they started laying them in towers (Bernton, 2009). Today, even twenty one years later, the herring fishermen have completely lost their livelihood since the herring fishery remains closed. The herring's lack of recovery is not only bad for the Alaskan economy, but for the ecology of the Sound. The herring were an important source of protein for the marine mammals, birds, and other fish (Bernton, 2009). Assigning value to environment is a difficult task because there are many environmental services to consider. For example, the herring were not only used in a fishery, but a crucial role in a food web. One method of calculating the extent of the environmental degradation is through market productivity valuation. This is done by calculating the change in productivity due to damage of the environment (King and Mazzotta). Using market productivity, the value of the damage done to the Sound can begin to be quantified at a loss of 120,000 tons of herring for every year the fishery remains closed. This method has the advantage of being straightforward, but as you can see, it leads to an understatement of environmental value (King and Mazzotta). It does this by not taking into account all of the services the herring provide ecologically, such as being a main source of protein for a range of marine animals.

Recreation and Tourism

Another Alaskan economic activity that has suffered since the spill is recreational sport fishing. It has impacted anglers from all over, by limiting "the number of sport fishing trips, the areas fished, the species fished for, and the length of these trips" (Cleveland, 2008). In 1989, the loss to recreational fishing was estimated to be up to $580 million dollars and in 1990 the range of loss was anywhere from

$3.6 million to $50.5 million (Cleveland, 2008). Similarly, the Alaskan tourism industry has suffered a dramatic drop since the spill. It saw "decreased resident and non-resident vacation/pleasure visitor traffic" (Cleveland, 2008), and there was a labor shortage in visitor services as a result of the attraction to high paying cleanup jobs. Another reason for a decrease in tourism and recreation was the limited access to beaches and other oiled coastlines ("Recreation and Tourism"). This introduces an additional method of estimating the economic value for an ecological site, the travel costs method. It uses how much people pay in travel expenses to get to the given site as a means to assign a dollar value to that site, in this case the Prince William Sound. Travel costs include: gas mileage multiplied by distance travelled, number of trips, camping/lodging fees, etc. The oil for the first few years prevented near and far travelers from enjoying the Alaskan beaches. The loss experienced is a way to assign a numerical value to the environmental degradation of the Prince William Sound. An advantage of this method is it incorporates a wide array of costs. On the other hand, this method is very time consuming and expensive. Nevertheless, recreation is currently rebounding, since most of the oil is no longer visible on the surface. Beaches have reopened and visitor services are rising. In 2003, recreation and tourism accounted for 26,000 jobs, which generated $2.4 billion dollars and contributed $1.5 billion to Alaska's economy ("Recreation and Tourism"). Alaskan tourism and recreation is on the rise again and is expected to grow approximately 28% per year, through 2020.

Cleanup Jobs

Although Alaskan tourism suffered from the oil spill, the cleanup jobs brought in a lot of revenue for the Alaskan economy. Some Alaskan fishermen made fortunes by leasing their boats for the cleanup effort, while their neighbors could not get similar contracts or refused them on principle. People from all over the country flocked to the area to help clean the coastline at a hefty wage of $16.69/hour (Mauer, 1999). More than 11,000 workers came to Valdez in order to clean up the oil making about $1,750 per week (Phillips, 1999).

Net Effects of Spill on the Alaskan Economy

Even though cleanup jobs brought a lot of business to Alaska in the short run, the long term net outcome was a loss for Alaskan economy. The visitor spending reduction alone resulted in a loss of $19 million ("An Assessment of the Impact of the Exxon Valdez Oil Spill on the Alaskan Tourism Industry", pg. 5). The revenue lost from the Alaskan tourism by itself was much less than the revenue paid to all of the cleanup workers. Based on the figures presented, the 11,000 workers when multiplied by the estimated $1,750 earned per week per person, produces a product of over $19 million for just one week of work. Though some of the cleanup workers were local, many of the out of town helpers used the spill cleanup work as a fast cash summer job. However, including the loss in fisheries and non-market value, the spill's long term net effect is a loss to the Alaskan economy because the long term loss outweighs the revenue gained from cleaning up the oil.

Nonmarket Value Cost Estimates

Contingent valuation methods were used to estimate the value of loss to the nonmarket environmental goods, like the existence and replacement value of the birds and mammals lost because of the spill, in addition the amount of aggregate ecological loss was estimated. The contingent valuation method directly asks individuals to state their willingness to pay (WTP) to prevent damage or willingness to accept (WTA) compensation if the environment is degraded through oral or written surveys (Tietenberg and Lewis, 39). The results for the Prince William Sound were then compiled. The replacement value of birds and mammals was calculated to: "$20,000 to $300,000 per marine mammal (sea otters, whales, sea lions and seals), $125 to $500 per terrestrial animal (bears, river otters, mink, and deer), and $170 to $6,000 for seabirds and eagles" (Cleveland, 2008). The amount of aggregate loss due to the spill was $4.9 to $7.2 billion. These amounts reflect the public's willingness to pay to prevent another *Exxon Valdez* type oil spill (Cleveland, 2008). Therefore, additional willingness to pay surveys does not appear to be necessary because the estimates are directed toward future prevention. However, if willingness to accept surveys were the chosen method, then additional surveys would be necessary. The Alaskans have experienced twenty one years of damaged economic activity, so they would express that additional compensation is needed. Willingness to pay surveys are

the preferred survey type because willingness to accept surveys tend to have higher values due to the fact people assign higher value to something that they already have and are losing. On the other hand, contingent valuation has many advantages, such as: flexibility, understandability, reliability and validity. It is the most widely accepted method for estimating the environment's economic value ("Contingent Valuation Method"). Although, it does have its problems, like misunderstandings in the questions, lack of education among those surveyed, and it can have issues with bias.

Exxon's Contingent Valuation Process

The National Oceanic and Atmospheric Administration (NOAA) gave many recommendations to insure that the results of the contingent valuation methods be reliable and have minimal confusions, or bias. The design and development period of the contingent valuation survey took over 18 months, from July 1989 to January 1991 (Carson et al). The goal was to develop a valid survey to measure lost passive use (existence or nonuse value) due to the oil spill. Several objectives were taken into consideration while formulating the final survey interview questions. Some of these objectives are: "Respondents from all education levels and varied life experiences should be able to comprehend the language, concepts, and questions used in the survey so that they could make an informed decision" (Carson et al). Followed by plausibility, meaning the scenarios and payment vehicles are believable. In addition, neutrality was important, so no interests of a particular party were favored.

The final survey incorporated many strategies to obtain maximum reliability. During the face to face interview surveys, many forms of visual aids were used to help with comprehension of the questions asked. The randomly selected participants voted yes or no about presented programs for a one-time tax to go into a Prince William Sound protection fund. Then the valuation function was constructed from the willingness to pay responses. The total lost passive use, or lost existence value was calculated to be 4.87 billion dollars (Carson et al). This estimate is only a fraction of the value lost in the spill because this survey focused on existence value alone. It did not calculate the value lost to actively use the Sound or the value lost to have the option to use the Sound in the future. However, the contingent valuation survey used did a thorough job of minimizing possible survey errors, meaning this survey was a reliable valuation method.

Exxon's Contribution to Cleanup and Restoration

Exxon Mobil spent $2.1 billion in cleanup efforts (Tietenberg and Lewis, pg. 34). They spent $303 million to compensate fishermen. In 1991, Exxon agreed to pay $900 million in a civil settlement with the U.S. and Alaskan governments, in order to restore the Prince William Sound. Of the money spent on cleanup efforts, the Trustee Council dedicated $180 million of the cleanup money to research, which will continue indefinitely thanks to an endowment fund of about $100 million (Guterman and Pasotti, 2009). Exxon has done a decent job of paying for the short term costs of the oil spill, but the long term effects have been denied by them to have any relationship with the accident. More scientific tests are being done to prove that there is a relationship between the oil spill and the low herring population.

Amount of Oil Present Twenty Years Later

Oil has persisted along Alaska's coast for the past 20 years. Twelve years after the spill, Jeffrey Short, a chemist with the U.S. National Oceanic and Atmospheric Administration, randomly sampled 91 beaches in the oiled parts of the sound. Short estimated that 55,000 liters of oil remained (or roughly 15,000 gallons), spread across and underneath 11 hectares of beaches (Guterman and Pasotti, 2009). The majority of the oil was below the rocky surface of the beaches. The volume of oil decreased at a rapid rate the first 3.5 years, but the rate of decrease has slowed a great deal since then (Short et al, 2004). Twenty years later, the estimate of remaining oil was 16,000 gallons in a small portion of the Alaskan intertidal zone (Bernton, 2009). In other words, over an eight year time span the amount of oil that remains has relatively remained constant due to a very slow decay rate.

Total Economic Cost/Debt of Fishermen- Twenty Years Later

The fisheries have suffered a large amount of loss since the oil spill. Due to closings and restrictions on all the commercial fisheries immediately following the spill, the commercial fishermen lost $136.5 million in 1989 ("Exxon Valdez

TED Case Study"). Given that the reputation of Alaskan salmon has been ruined, the fishermen have since lost a total of $580.4 million. Initially following the spill, the fishermen had three years of booming herring harvests that totaled more than $20 million, but this is still significantly low for what herring harvests were before the spill (Bernton, 2009). However, in 1993 the herring population nose-dived (Bernton, 2009). The salmon fishery had a record year the year before the spill. The value of the commercial salmon harvest in Prince William Sound was nearly $70 million in 1988 and in 1993 the value of the harvest was approximately $24.7 million ("Exxon Valdez TED Case Study"). Therefore, the salmon fisheries lost $45.3 million in 1993 alone.

The previous mentioned reduction in the market price of the salmon is an effective method to value the environmental degradation from the oil spill. It has many advantages including easily accessible data on price, quantity and costs, since the fisheries have a well established market (King and Mazzotta). However, if the market is flawed then the price will not be an accurate indicator of value.

Ten years later, "the combined harvest value from salmon, herring, crab, and shrimp fisheries was less than half what it was in the years leading up to the spill" (Knickerbocker, pg. 12). In addition, the value of fishing equipment and commercial fishing permits plummeted post spill. The fishery that has suffered the most has been the herring fishery. They have lost about $12 million a year because of the loss of the herring fishery, so 20 years times 12 million is a total of $240 million (Guterman and Pasotti, 2009). The fishery crash is a major concern because fishermen take out loans to buy fishing permits and they have not had enough of a yearly income for the past 20 years to pay the loans off (Ott, 2009). Those fishermen that did try to get out of the business by selling their permits lost $23.3 million in this attempt ("Exxon Valdez TED Case Study"). Some of the fishermen received checks of several hundred thousand dollars to help pay down debt after the spill (Bernton, 2009). Yet, this barely breaks most Alaskan fishermen even, because of all the debt they accrued with the interest on their loans.

Long Term Ecological Effects

Some of the species living along Alaska's southern coast have recovered, but there are still subtle amounts of oil inflicting damage to the wildlife (Guterman and Pasotti, 2009). First, several species have recovered in the Prince William Sound over the past 20 years. These species include: bald eagles, loons, cormorants, salmon, sea birds, seals, and river otters (Guterman and Pasotti, 2009; Bernton, 2009; Hopkins, 2009). Next, species that are still "recovering" are sea

otters, killer whales, and clams (Bernton, 2009). Although, some believe that the killer whales will not be able to recover (Hopkins, 2009). Finally, herring are considered as "not recovering", since they have failed to rebound. The herring were a cornerstone species of the Prince William Sound's ecosystem (Bernton, 2009). Many have given up hope that the herring will naturally recover and have proposed building a hatchery that could bring the possibility for more disease to the herring population. One federal scientist who has spent the past 20 years studying the spill's impact states they are not going to consider Prince William Sound recovered until the herring recover (Bernton, 2009).

Predictions for the Future

A number of people who have studied the Exxon Valdez oil spill have made predictions for the future of the Sound. Some biologists believe there will be a gradual extinction of the killer whale pods over the next 25 years (Guterman and Pasotti, 2009; Hopkins, 2009). Some scientists believe the oil will take decades, or even centuries to disappear entirely (Ott, 2009). The most important thing that will help the Sound recover, still, is for people to be patient with the coastal environment (Guterman and Pasotti, 2009).

The oil spill has severely hurt food chains in the Sound. The top predators, such as killer whales, are especially sensitive to deterioration of these food chains. The whales can no longer eat herring for their major source of protein because there are not enough herring to be used as a dietary staple. Oil persistence studies along the southwest Alaskan coast have proven that the oil decayed rapidly at first, but currently is decaying very slowly. This means the oil will likely remain in the coastlines for a very long time. The presence of the oil will continue to harm intertidal organisms and the animals that consume them. Humans are especially at risk, since we are one of the top predators in the food web of the Alaskan marine ecosystem.

Should Exxon Compensate Alaskans More?

Many estimates of loss and gain have been mentioned and to sum them all up, the net aggregate result of the ecological and economic effects from the spill is negative. The gains from the cleanup jobs and the compensation by Exxon total to roughly about $2.4 billion. The losses to the Alaskan economy and ecology, excluding health costs, are about $5 billion. However, when willingness to pay

(WTP) and willingness to accept compensation surveys were totaled the value of the losses were $7.2 billion. As previously stated, the contingent valuation method is the best method to assign value to nonmarket environmental goods or services. The net aggregate loss totals are between $2.6 billion to $4.8[1] billion, meaning Exxon should not be finished compensating Alaskans for their losses.

Countless amounts of oil cleanup workers have developed cancers due to their exposure to the toxic oil (Phillips, 1999). For example, volunteers have gotten lung cancer, brain tumors, and other malignant cancers from exposure to the oil in 1989. In addition to cancers, Alaskans have suffered from an increased amount of mental illnesses, violence, and respiratory illnesses due to the stress of debt, unemployment, and exposure to the harmful oil (Phillips, 1999; Ott, 2009). More supporting evidence that the oil made people develop health problems can be found in the large number of visits made by the cleanup workers to health clinics for upper respiratory illnesses during the summer of 1989 (Phillips, 1999). It is estimated that an undeterminable number of the 11,000 workers made a total of 5,600 visits to health clinics that summer. The source of the illness was never identified. However, it is hard to deny the oil as the cause, since a vast number of chemical exposure related health problems have developed among the cleanup workers over the past twenty years (Phillips, 1999).

Another reason some believe Exxon owes Alaskans more money is that the herring fishery still cannot be reopened even though twenty one years have passed (Bernton, 2009). The inability of the herring fishery to reopen is one of the causes of the excessive amount of debt in the Alaskan economy (Ott, 2009; "Exxon Valdez TED Case Study"). Likewise, wildlife observing tourists, especially whale watchers, have been disappointed with the number of whales and other wildlife currently available to be observed ("Recreation and Tourism"). If whales become extinct, then the whale watching tourism of Alaska will never recover.

These reasons warrant that Exxon owes the Alaskans, who were affected by the oil spill, additional compensation. If Exxon had not spilled the oil, then the Alaskan herring fishery would still be open and thriving. The same can be said for the Alaskan tourism industry. If the oil had not killed off such a large number of the wildlife, there would be more tourists exploring Alaska. Similarly, since herring fishermen cannot fish, they have been unable to pay off their loans, which have caused an increased amount of debt for these fishermen (Ott, 2009; "Exxon Valdez TED Case Study"). The surrounding towns have suffered a great deal too, since tourism for sport fishing, commercial fishing, and other economic or recreational activities have declined (Cleveland, 2008). The spill has reduced the

[1] Keep in mind that these estimates do not include every aspect of loss or gain, but just give a rough aggregation from the numerical losses and gains mentioned in this work.

overall amount of people traveling in southwest Alaska, and has reduced local spending because of economic hardships.

Although Exxon has taken responsibility for the oil spill, they have yet to admit that these negative long term effects are related to the oil spill. They paid fishermen for short term negative effects, but have not compensated them for any long term financial hardships that the oil spill has caused them (Guterman and Pasotti, 2009). Exxon should be forced to pay for more research to identify the long term effects they are responsible for as a company, because of the continued presence of the oil spilled in 1989. As more research is conducted, the relationship between the oil and its long term effects will become more obvious and less easy for Exxon to dismiss as not their responsibility. Once more scientific evidence is established for these relationships, Exxon will have a much stronger incentive to finish paying off their debt to the Alaskans.

Exxon's Research Able to Assist BP's Cleanup Efforts

BP can benefit a lot from studying the short and long term effects of the 1989 Exxon Valdez oil spill. The Gulf of Mexico, where the BP oil spill is located, is a leader in multiple fishing industries, so a timely response to the oil spill is very important in determining the extent of the oil spill related damages economically and environmentally. "The Gulf supplied one-eighth of all fish and shellfish caught in the United States in 2008, and Louisiana is the nation's leading supplier of domestic shellfish" (Wheeler, 2010). In other words, there is a massive fishing industry on the line, so BP must continue their cleanup efforts. Several ecological effects BP should be aware of thanks to the Exxon Valdez oil spill are: first, cleanup attempts can be more damaging than the oil itself (Cleveland, 2008). Secondly, the full extent of the damages to the ecosystem from the oil spilled will not be known until several years after the fact. This is a result of delayed impacts, such as all of the fish eggs that did not hatch and therefore are not available to support the Gulf coast's commercial fishing industry. Thirdly, oil penetrates deep into beaches were it can remain fresh for years, then later resurface, which will prolong harmful effects, especially in sea birds and mammals since they are harmed by continuously ingesting contaminated prey. Finally, the oil spilled will decay at varying rates, but will generally follow the pattern of faster decay at first, then slower decay over time (Cleveland, 2008). BP is predicted to have similar economic and ecological damages as Exxon, such as losses in commercial fishing, tourism, recreation, marine life death tolls, etc., but the magnitude will of course be different since BP had a much larger spill in comparison with Exxon (Cleveland, 2010). Exxon and BP both helped the local economies in the midst of

their oil spill crisis by using local fisherman as part of their oil cleanup crew (Wheeler, 2010). They both also helped the local economies by paying compensation to those directly affected by their spills. "On June 16, 2010, BP agreed to create an independent $20 billion fund to pay claims arising from the oil spill" (Cleveland, 2010). In addition, BP announced September 7th, 2010 it will provide $10 million to the National Institute of Health under the Gulf of Mexico Research Initiative (GRI) to support a study of potential public health issues from the Gulf spill. "GRI is a 10-year, $500 million independent research program established by BP to better understand and mitigate the environmental and potential health effects of the Gulf spill" ("BP Provides $10 Million To Support Study of Health Issues Relating To Gulf Oil Spill, 2010). Hopefully, these funds will allow BP to do a more thorough job of compensating those affected by the oil spill in the long run. However, we will not know until many years have passed.

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