Environmental Economics Essay, Research Paper

Environmental Economic Impact of Pollution in the Chesapeake Bay

The Chesapeake Bay is the nation?s largest estuary with six major tributaries, the James, the Potomac, the Susquehanna, the Patuxent, the York, and the Rappahannock Rivers, feeding into the bay from various locations in Maryland, Virginia, Pennsylvania, and the District of Columbia (Chemical Contaminants in the Chesapeake Bay ? Workshop Discussion 1). These areas depend on the Bay as both an environmental and an economic resource. Throughout the last 15 years the Chesapeake Bay has suffered from elevated levels of pollution. Nitrogen and phosphorous from wastewater treatment plants, farmland, air pollution, and development all lead to reduced water clarity and lowered oxygen levels, which harm fish, crabs, oysters and underwater grasses (Key Commission Issues 1). There are other types of pollution in the bay such as toxic chemicals, but because nutrient pollution is the most significant and most widespread in the Bay its effects are the most harmful to fisheries. Nitrogen and phosphorous fuel algal blooms which cloud the water and block sunlight from reaching underwater grass beds that provide food and habitat for waterfowl, juvenile fish, blue crabs, and other species (Blankenship 11-12). Algae plays a vital role in the food chain by providing food for small fish and oysters. However, when there is an overabundance of algae it dies, sinks to the bottom of the Bay, and decomposes in such a manner that depletes the oxygen levels of the Bay (11). The reduced oxygen levels in the Bay reduce the carrying capacity of the environment and these ?dead areas? sometimes kill off species that can not migrate to other areas of the Bay, such as oysters (11). Increased abundance of algal blooms also led to the overabundance of harmful and toxic algae species and microbes such as the microbe Pfiesteria, which was responsible in 1997 for eating fish alive and making dozens of people sick (12). The heightened awareness of diseases that can be contracted through consumption of contaminated fish also has an economic impact. Therefore, the excess levels of nitrogen and phosphorous have fueled an overabundance of algal blooms, which has reduced water clarity and lowered oxygen levels, affecting many species within the bay and ultimately the industries that rely on these species.

The signing of the 1987 Chesapeake Bay Agreement marked the first joint venture between Virginia, Maryland, Pennsylvania, the District of Columbia, the Environmental Protection Agency, and the Chesapeake Bay Commission to improve water quality by reducing point and non-point source pollution (The Chesapeake Bay Watershed 1). The goal of this program was to reduce the level of nitrogen and phosphorous flowing to the Bay by 40% by the year 2000, from their 1985 levels (Blankenship 2). The first step in this program was to reduce the amount of nutrient pollution from point sources (end-of-the-pipe) such as wastewater treatment facilities that feed into the many tributaries of the Chesapeake Bay (The Chesapeake Bay Watershed 1). However, the results of these cleanup efforts were not enough to reach the goal of the program. Therefore, the areas involved now had to target the non-point sources of nitrogen and phosphorous. The non-point sources are storm water run off from agricultural and developed sites, air pollution, and the development of sensitive forests that act as buffers for tributaries and the Bay (1). The Chesapeake Bay Preservation Act of 1989 took aim at these sources in Tidewater Virginia by requiring resource management practices in the use and development of environmentally sensitive land (1). The Chesapeake Bay Preservation Area Ordinance of 1991 also took aim at these non-point sources by designating environmentally sensitive areas in Virginia Beach as Resource Protection Areas and Resource Management Areas which are intended to protect the integrity of the lands that effect the Chesapeake Bay (2). The States involved also enforced tougher car emissions policies so that the air pollution contribution would be reduced (2). These ordinances were aimed at reducing the pollution of the Chesapeake Bay by reducing high levels of phosphorous and nitrogen. The government?s policies effect the economy in the Chesapeake Bay by changing the ways in which industries distribute their waste.

The pollution and over-harvesting of the Chesapeake Bay have greatly effected the economy of the area. The net economic condition of the region is caused by the downward swing of fishery output and sales due to the pollution in the Bay as well as the businesses that are effected by the government mandates. There has been a significant downturn in the net profit of the fisheries due to sewage runoff and development around the Bay. The government has recognized the pollution as a problem for economics and bio-diversity. Stated governments, mainly Maryland, have made attempts to reduce pollution by making command and control policies that further hurt the inland economy in an attempt to alleviate Bay damage. The solutions to the pollution problems in the Bay are not easily defined because the government must weigh the rights of the polluters to those being hurt by the pollution and try to come up with ways to get closer to the optimal points for both inland and off-land firms at least cost to both parties.

The Oyster fisheries that depend on the Chesapeake Bay are also suffering greatly due to pollution and over-harvesting. The added nutrients, mainly Nitrogen and Phosphorous, are lowering the oyster population and causing fisheries to harvest a significantly lower number of bushels each day. ?The Oysters importance as a prized food, a vital industry, and an organism that filters pollution is universally recognized? (Meyer 1991, 26). The Supply of oysters has decreased greatly causing the price to rise. Restaurant owners in the Bay area say that the price of oysters and crabs has risen so greatly that they can no longer make a profit off of the victuals (Lipske). The hazard of serving oysters has increased because they are usually served raw and pollution related diseases that the oysters carry could harm humans. The fisherman themselves have decreased their profit due to a disease that is wiping out a great deal of the oyster population in the Chesapeake Bay. The parasite is called Multinucleated Sphere X (MSX), it may be caused by the fact that oysters feed by filtering particles suspended in water which helps to clear pollution. These particles, due to the excessive amount of pollution have weakened their immune system, making them more susceptible to disease (Impacts of Disease and Disease Resistant Oysters). To counteract the downturn in oyster harvesting the government, economists, as well as environmental theorists have offered a number of plausible solutions.

Due to the disease, harvest output has decreased causing some to contend that the easiest way to fix the problem is to increase the population artificially. A Japanese Oyster species could be introduced to the Bay area, the oyster is resistant to the MSX parasite. The benefit to the oyster fisheries would be great because these oysters are more desirable on the market due to their size and they would multiply quickly. The major risk of this project is that if the oyster does not act precisely like the native oyster the costs to the habitat would be great. Introducing a non-native organism into a habitat has great costs if it overtakes the environment, which happens often when no native predators exist to keep the population under control. If the new oyster species over populated the bay the costs to the other industries that depend on the bio-diversity of the Bay would be greater than its benefits to the oyster industry.

Another solution offered to help the Bay is mandates on development in certain zones surrounding the Bay. Although the decrease in sediment runoff into the Bay from construction and development helps the oyster and marine life population, the costs to agriculture and industry have an impact on the net economy. In 1986 Maryland enacted the Chesapeake Bay Critical Area Protection Program, which gave the government the right to regulate the land usage in the critical areas of pollution surrounding the Bay. Beaton and Pollock did an in depth survey using the Critical Valuation Method and Hedonistic pricing in order to define how this mandated change would affect the land value of the areas selected, affecting agriculture, industry and residential housing. The project is difficult because it is hard to compare different land values because of the many variables that effect land prices. They were able to include a variable comparison ratio in order to limit their price result to the one variable they were interested in, which was the CAPP act. They found that the value of residential property in the selected areas went up by almost 100%, while the value of the agricultural and industrial land went down greatly. The pecuniary externality of this method upon the industry and agricultural land proves that large businesses are not readily willing to decrease their waste without government mandates. Therefore the government has to control part of the Bay pollution through command and control, permits and subsidies. Command and control, combined with other solutions, such as privatization, could help to significantly reduce pollution in the long run. The shared costs and benefits of these two methods would have the least cost to both parties because they could share the costs, even though the fisheries reap most of the benefits.

Privatization of the oyster industry is a feasible solution to the pollution problem in the Chesapeake Bay. Since oysters tend to be rather stagnant, a harvester could buy a spot of the Bay to dredge. The government would have to find a way to enforce this method through fines or coast guards; the cost of enforcement would probably be fairly low as compared to the benefits for fisheries. This would be a radical change in the industry because fisheries are considered a near perfect example of a common property resource. Through this method over-harvesting would be diminished as well as pollution greatly lessened. The problem with this method is the polluters would cause a technical externality upon the oyster bed owners. Their pollution would directly effect the economic value of the bed. Hence the government would have to mandate waste controls for on-land industry to protect the fisheries. The owners, through bed pricing and innovative pollution technology control in the water, would deal with the pollution that is still left over. Capital, in this instance, would be substituted for labor; so many sea-men would lose their jobs, but most are losing their opportunity cost through fishery labor anyway. So the loss of their preferred job is offset by their ability to make better wages elsewhere (Santopietro and Shabman, 413). The Privatization of Oyster fisheries seems to be the least cost solution to the government in attempting to find the optimal satisfaction between land industry and Bay fisheries.

Privatization does not work for all Bay industry. Fisheries that specialize in fish and crabs cannot be privatized because of the migration of their products. The fishing industry in the Chesapeake Bay has declined in sales by and average of 10% during 1996 and 1997 (University System of Maryland). The loss in seafood sales is due to a fish disease called Pfiesteria. The Pfiesteria problem became very publicized in 1997. People in the Bay area became aware of the dangers of eating infected seafood and began buying less fish. Lipton did a major survey of 360 seafood businesses to find out how the disease was effecting the local economies of the Chesapeake Bay areas in Maryland. He found the industry suffered a 43 million-dollar loss in 1997 due to the disease awareness among consumers. The hardest hit by the decline in sales were grocery stores and local restaurants. The actual fisheries were able to sell their extra fish in other markets where Pfiesteria awareness was low, so they did not suffer as badly as others did. Grocery stores sold almost 13% less Chesapeake Bay seafood then the year before. Restaurants were also unable to sell the local seafood so they had to import more expensive seafood. These results do not show the entire economic effect because people substituted meats for fish. The grocery stores and restaurant sold more of their other products that helped to counter balance the decrease in seafood sales. The true economic losers in the situation were the stores and restaurants that specialized solely in seafood (Lipton).

To help reduce the outbreaks of Pfiesteria, Maryland has enacted a Water Quality Improvement Act. The WQIQ is meant to lessen the nutrients in the Bay spurring growth of its inhabitants. The government is currently willing to spend a great deal of money to clean up the Bay, they spent over 80 million dollars in making sewage treatment plants more efficient, proving the economic benefits of fisheries are worth protecting. The act encourages subsidies to agriculturists, which will cost the government greatly. The urban impacts of the WQIQ are minimal; parks, state owned lands, golf courses and large landscapers must test and record the nutrient balances in the soil; proper management will ensure the simplicity of this law (Parker 1). The WQIA costs the agricultural farmers the most. Fertilizer runoff creates a great amount of pollution for the Chesapeake Bay. The act mandates that poultry litter, which is rich in Phosphorous, will be rationed as fertilizer. The farmers must buy special chicken food that will reduce phosphorous output and they will have to supplement phosphorous free fertilizer for the low cost poultry litter they usually use. Maryland is making the change less costly to the farmers through subsidies. The state government is making fertilizer 50% tax free, paying $3 an acre for fertilizer and assisting the farmers in finding buyers further inland for their poultry litter. The government is even paying farmers who switch from poultry litter to approved fertilizers 4,500 dollars per year for up to three years (Parker 5). The government has not found the optimal solution in reducing Pfiesteria in the Bay because the cost of the WQIA are very high to the government and the benefits to the Bay are smaller then the costs. Since Pfiesteria has only infested small parts of the Bay, and Phosphorous is not the only agent causing the problem, it seems that the government has not found equilibrium between costs and benefits through the WQIA. Reducing Phosphorus is important, but the subsidy money could be put to better uses. For example, there are plants that use phosphorus and reduce the amount in the soil. Supplying an abundance of these plants to farmers in the critical zones around the Bay area would be a low cost alternative to subsidizing farmers. Also enforcing the poultry litter mandate would be fairly difficult and expensive. There are better solutions for the amount of money the government is spending to reduce phosphorous levels.

The importance of the fishery industry in the Chesapeake Bay is obvious because the government is willing to spend huge amounts of money in order to clean it up. The most plausible solution to the problem is a sharing of cost between inland and water dependent firms. The costs to inland industry and agriculture are minimized by the government?s willingness to subsidize. The benefits to the Chesapeake Bay economy are larger then the government costs, if they choose the best options, because it is the nations largest estuary. The solutions are not easily attainable, but through costs and benefits of pollution control it is possible to find feasible solutions that help to minimize the problems that the Bay faces in the long run.

Beaton,W. Patrick, and Marcus Pollock. ?Economic Impact of Growth Management

Policies Surrounding the Chesapeake Bay.? Land Economics, v68,n4 (August

1991): 308-316.

Blankenship, Karl. ?The Chesapeake: A Bay Legacy? American Forests, v104, n3

(August 1998): 11-15.

?Chemical Contaminants in the Chesapeake Bay ? Workshop Discussion?.

Available: http://www.mdsg.umd.edu/CBEEC/toxicsrpt/workshop.html. (4 Nov. 1999).

?The Chesapeake Bay Watershed.? Available:

http://www.virginia-beach.va.us/cityhall/planning/cbay.html (4 Nov. 1999)

?Fish Health in the Chesapeake Bay: ?Estimate of Seafood History Losses.? Available:

http://www.mdsg.umd.edu/fish-health/pfiesteria/pfeconomics/sld005.html. (22 Nov. 1999).

Glibert, Patricia M. and Daniel E. Terlizzi. ?Nutrients, Phytoplankton, and Pfiesteria In

the Chesapeake Bay.? Available: http://www.arec.umd.edu/policy/Pfiesteria/terlizzi/terlizzi.htm (22 Nov. 1999).

?Impacts of Diseases and ?ase Resistant Oysters? Available:

http://biology.uroregon.edu/classes/bi130/webprojects/15/oyster.html (22 Nov. 1999).

?Key Commission Issues? Available: http://www2.ari.net/cbc/old/cbc\_issu.htm

(4 Nov. 1999).

Lipske, Michael. ?Getting to Know You? National Wildlife, v33. (1995): 24-29.

Parker, Doug. ?The Economic Costs of Implementing the Maryland Water Quality

Improvement Act of 1998.? Available:

http://www.arec.umd.edu/policy/Pfiesteria/parker/parkertext.html (22 Nov. 1999).

Santopierro, George D., and Leonard Shabman. ?Can Privatization Be Inefficient?: The

Case of the Chesapeake Bay Oyster Fishery.? Journal of Economic Issues, v26

n2 (June 1992): 407-415.