EVALUATING THE JOURNALISTIC NORMS OF MASS MEDIA COVERAGE INVOLVING ENVIRONMENTAL ISSUES WITH POLICY PROCESSES

by

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(Under the Direction of Rebecca Moore)

ABSTRACT

The primary purpose of this research is to evaluate the journalistic norms found in mass media coverage involving environmental issues with policy processes. This information will give a better understanding of how the quality and quantity of environmental coverage affects the public's awareness and perception concerning these issues. Specifically this research employs a content analysis model to analyze magazine articles involving acid rain and CFCs from the years 1980-1989 to assess the journalistic trends of this decade and apply these findings to current environmental coverage. The qualitative findings of the study indicate that mass media present information in a framed manner leaving audiences with values of how to view respective environmental issues.

INDEX WORDS: Mass media, Environmental journalism, Content analysis, Acid rain, Chlorofluorocarbons, Ozone depletion

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B.S.E.S., The University of Georgia, 2008

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE

ATHENS, GEORGIA

2011

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May 2011

DEDICATION

For my family, who have provided me with opportunity and unwavering support.

ACKNOWLEDGEMENTS

My sincerest thanks to Dr. Rebecca Moore for providing me with the opportunity and the guidance to conduct this research. I would like to thank my committee members, Dr. Daniel Markewitz and Dr. Rhett Jackson, for their contributions and support. Additionally I would like to thank the many librarians at The University of Georgia, especially Diana Hartle, for their assistance in locating the data for this project.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

While many historians of the environmental movement cite the first Earth Day of 1970 as the turning point in Americans' consciousness involving environmental issues, others suggest that the passage of the Clean Air Act of 1970 was equally significant (Rogers, 1990). Beginning in the late 1970s, environmental issues found a prominent position in the mass media, accessing and adapting Americans' perceptions about the environment, while also affecting the U.S. legislative process. The environment has remained a staple in the news media, as the diversity of topics and environmental awareness in the United States have continuously increased. News accounts are an immediate first draft of history, and are therefore rich in description about the present while reflecting and influencing public opinion and policy formation (Howland, Becker, & Prelli, 2006). The mass media is credited with the ability to provide the public with information to identify, perceive, and act involving environmental concerns that intersect with public policy and scientific research. Mass media coverage of environmental issues creates the social relationships between scientists, policy makers and the public, which are mediated by news providers (Boykoff & Boykoff, 2007). It is vital to understand the means in which messages involving social and environmental sciences are conveyed to the public; by studying the qualitative and quantitative behaviors of media tendencies, we can better understand the media's role in shaping social attitudes.

The news media, policy-makers, and scientists all intersect to form and influence how the public perceives and makes decisions involving environmental issues. Business managers, government environmental regulators, and members of environmental protection groups have historically been involved in disputes involving the environment and public policies; conflicts often arise due to the perceived and real differences in power and legitimacy of these stakeholder groups (Cordano, Irene Hanson, & Ellis, 2004). These disputes are played out in the news media as opposing viewpoints arise dependent on the journalists and news sources. As the public gathers and interprets environmental information from the media, public attitudes and decisions develop. Economists, social scientists, and policy makers are concerned with environmental attitudes of society; attitudes play a fundamental role in motivating the behaviors of individuals with established stakeholder affiliations (Cordano, et al., 2004). Studying the messages the media conveys will provide essential information on the relationships between the stakeholders of environmental issues. The media shapes public attitudes and directs governmental action towards policy concerns; currently there is a lack of research studying the relationships and patterns of the media's influence upon society involving environmental issues. Research is needed to analyze and illustrate the connection between the news media, the public's attitude toward environmental issues, and policy formation; this research attempts to bridge the existing gap by creating a categorically designed system employing content analysis to describe trends found in the news media involving environmental issues. By critically reviewing magazine articles found in mass media, I draw conclusions on the journalistic norms by reviewing the quality and quantity of

environmental media coverage involving past environmental and policy issues in the United States.

This study focuses on news media involving the acid rain debate and the role of chlorofluorocarbons (CFCs) in ozone debate during the 1980's and early 1990's. A study by McGeachy (1989) highlighted the importance of expanding mass media studies involving environmental issues in the 1980's to include specifically acid rain and ozone depletion to better understand the most significant environmental issues of the time period. These two environmental issues were chosen based upon the initiative and action undertaken by the Environmental Protection Agency to amend the Clean Air Act in 1990, as well as the bans placed on the use of CFCs in the 1980's by the Montreal Protocol, as a means to reduce the pollution caused by these contaminants. The prominence of these two issues in the media also serves as a basis to study the means in which information was conveyed to the public through popular press. Many parallels exist in the manner in which information was conveyed to the public through the news media involving the acid rain debate and CFCs' role in the depletion of the zone layer. Similarities can also be identified in the means in which policy was addressed to manage pollution through the 1990 amendments to the Clean Air Act involving both acid rain and CFCs. These similarities are identified and analyzed in this study to further understand the media's role in human perception and public policy. This study is unique in that few studies, if any, have linked media content, public perceptions, and public policy framework through journal articles found in magazines. A content analysis model was created based upon the combination of elements from other studies (Boykoff & Boykoff, 2007; Howland, et al., 2006; McGeachy, 1989).

1.2 OBJECTIVES

The primary purpose of this research is to evaluate the journalistic norms found in mass media coverage involving environmental issues with policy processes. This information will give a better understanding of how the quality and quantity of environmental coverage affects the public's awareness and perception concerning these issues. Specifically this research will use a content analysis model to analyze magazine articles involving acid rain and CFCs from the years 1980-1989 to assess the journalistic trends of this decade and apply these findings to current environmental coverage. The content analysis model was driven by the following research questions that outline the specific goals of the study:

1. What can we learn about the qualitative means in which information is conveyed to the public through media coverage? Assuming magazines tailor information to its readers, does this contribute to divisiveness within the public involving environmental issues? This objective investigates the journalistic norms of magazine genres based upon information given by the content analysis model. The following factors will further outline how we will specifically answer this question:

    1.1: Are journalists more likely to frame information with an environmental or industrial tone based upon magazine genre? I hypothesize that journalists will frame information with an environmental or industrial tone based upon magazine genre.

    1.2 Do journalists phrase environmental issues in a more persuasive and subjective manner, or is their diction more objective? I hypothesize that the diction used by journalists will not depend on magazine genre.

1.3 ORGANIZATION OF THE STUDY

This thesis is composed of six chapters. Chapter Two contains a review of relevant literature explaining the media's role involving environmental coverage and public perception, as well as including previous studies that have employed content analysis models to study environmental media coverage. In Chapter Three, an overview of the issues evaluated in this study, acid rain and CFCs, is given to provide a historical, scientific, and political background. Chapter Four details the methodology used to construct and implement the content analysis model. Chapter Five presents the results of the research. Chapter Six concludes the study with a discussion of the findings.

CHAPTER 2

REVIEW OF LITERATURE

2.1 NEWS MEDIA AND THE ENVIRONMENT

While there is no established definition of environmental journalism, environmental journalism can be defined by the gathering, writing, editing, and distribution of information about the interaction of people and the natural world, as well as issues related to that interaction (Neuzil, 2008). Environmental coverage became a part of journalism in the 1960s and early 1970s due to increased environmental interests coalesced around literature such as Rachel Carson's *Silent Spring*, events such as the first Earth Day in 1970, dramatic images of the famous *Apollo 11* photograph of the Earth taken in 1969, and the creation of the EPA in 1970. Increased media attention directed to conservation issues around this time were also attributable to events such as the 1967 break-up of a super-tanker in England off the coast of Cornwall and the 1969 Santa Barbara Channel Union Oil leak in the United States; these events stimulated sustained debate among interested stakeholders such as government agencies, industry spokespeople, scientists, citizen action groups, consumer organizations, and the academic community (Allan, Adam, & Carter, 2000).

The press was an integral variable in advancing the environmental agenda during the early 1970s; the extensive and prominent press coverage helped educate the public and heighten public awareness of environmental issues, which allowed the press to help build and sustain congressional support involving the Clean Air Act (Neuzil, 2008). However,

during the mid-1970s, political attention shifted from environmental issues to the energy crisis, and press coverage simultaneously decreased. Environmental awareness and concern both influence and are influenced by the amount of news coverage on a given topic (Allan, et al., 2000; Parlour & Schatzows, 1978). Allan et al. (2000) attribute the decline in the level of public interest in environmental issues to the lack of coverage during the time.

Americans' concerns involving environmental issues experienced a sharp increase again in 1986, as reported by opinion polls and participation in voluntary organizations, alongside with increasing environmental media coverage (Dunlap, 1991; Dunlap & Scarce, 1991; Mazur, 2006). From 1987-1991, the prominence of the environment as a United States policy issue in news media was paralleled by a shift from problems that are primarily local or regional in extent (e.g. acid rain, smog, waste disposal) to those with worldwide dimension (depletion of the earth's ozone layer, global warming, destruction of rainforests, mass extinction of species) (Kowalok, 1993; Mazur, 2006). From 1992 to 2000, environmental coverage began to decline, and in some places began to shift from pro-environmental to pro-business. In 2001, coverage picked up again before declining following the events of September 11, 2001. The popularity of Al Gore's documentary on climate change, *An Inconvenient Truth*, as well as additional attention from his Nobel Peace Prize seemed to stimulate coverage once again from 2006-2007 (Neuzil, 2008). However, a decline in environmental coverage in print sources occurred once more with the U.S. economic recession that began in December 2007(Kahn, 2010).

2.2 THE NEWS MEDIA, PUBLIC OPINION, AND POLICY SCIENCE

It is universally accepted that the media has a powerful influence in society, as it conveys information to the public and highlight certain news items while ignoring others, setting the agenda of public life and creating consensus or disagreement on certain issues (Andina-Dîaz, 2007). The news media also deciphers the means in which scientific language is translated into terminology that is recognizable and understandable to the general population; Boykoff & Boykoff (2007) state:

> Scientific findings constitute a specialized mode of knowledge that is almost always packaged in professional language. Scientists generally employ a lexicon of caution and speak in a language of probability, which usually does not translate smoothly into the crisp, unequivocal commentary that is valued in the press…Therefore, scientific findings usually require translation into more colloquial terms in order for it to be comprehensible.

A study by Mazur (2006) found that individuals perceive environmental hazards as increasingly dangerous if national media coverage of the environment increases. Risk controversies as represented by the news media are understood to have a major structuring impact upon public opinion, especially involving environmental issues (Wilkinson, 1999). For the most part, members of the public do not have direct experience of environmental risks aside from the ways in which they are represented in the news; accordingly, when it comes to determining what the public believes about different types of risk, most experts in the field of risk communication concentrate their analysis upon the content of news media.

In addition to conveying risk, the news media are the key source of information for society and, as such, are critical for a well-functioning democracy (Yi & Sarvary, 2007). Mazur (2006) states that public concern and government action rise and fall with the quantity and prominence of news coverage involving hazards and risks. The mass media has the ability to direct public attention and governmental action toward specific policy

concerns, including publicized instances of risks to the environment (Mazur, 2006). The accessibility of information to the public by the media has profoundly changed political behavior and the nature of political negotiation; the media provide the public with the frames with which to assimilate and structure information about a wide range of social problems and issues, which keep the political system deeply bound to the media through a complex web of influences (Anderson, 1997). Beginning in the late 1960s and 1970s, the onset of warnings by the scientific community prompted the development of political dimension to environmental issues. An example of the news media playing an integral role as a successful contributing factor to policy change is the media's role in the 1978 CFC aerosol propellant ban in the United States; Cook & Forte (1996) note:

> Media coverage helped trigger a sequence of events that made it easier for both aerosol manufacturers and policy-makers to envision—and economically justify—a rapid shift away from CFC propellants. Media attention helped squeeze the aerosol industry by fostering both consumer demand for "ozone-friendly" products and public pressure for a government ban on CFC aerosols. In response to these market forces, industry stepped up efforts—already under way for economic reasons—to improve less-expensive products, such as pumps, and to reformulate aerosols. Media attention also prompted and assured coverage of S.C. Johnson's 1975 decision to immediately drop CFC propellants-the pivotal falling domino.

This early example of media driven policy change initiated a shift to "green consumerism", which remains evident in economic demand today.

2.3 CONTENT ANALYSIS

In order to study journalistic norms found in print sources, content analysis is a widely recognized method used to aid researchers in identifying and enabling trends in social and decision processes found in the media. Harold Lasswell is widely acknowledged for his pioneering work involving communication theory, quantitative content analysis

methodology, and political sciences spanning multiple social sciences disciplines (Howland, et al., 2006; Lasswell, 1972; Neuendorf, 2002). In 1952, Lasswell, along with his fellow researchers, prompted the first comprehensive and integrated content analysis study involving mass communication in which they established scientific standards for assessing applications of content analytic methodology (Danielson, 1997; Howland, et al., 2006). Lasswell established a new methodology that transformed the means in which social sciences studies are carried out. Lasswell and his team sampled text over time, created a form of reliability and validity of their coding models, counted the occurrence of key components in the press and political documents, and tallied what they called themes.

> Lasswell and his colleagues saw human beings as living mainly in a symbolic environment. Our physical environment as humans is basic, of course, but the environment that counts the most to us is the environment of words and images, the environment of meanings that surround us from our earliest moments of existence. Lasswell and his associates believed that these symbols, although they can be frozen and studied in the short term, are most meaningful if studied over long time periods so that trends or changes can be observed (Danielson, 1997).

Content analysis systems can be briefly defined as the "systematic, objective, quantitative analysis of message characteristics"; its usefulness as a quantitative analysis tool reaches many areas of study, including communication, journalism, sociology, psychology and business (Neuendorf, 2002). Content analysis can be employed to examine human communication through the media along with policy sciences. According to Howland et al. (2006):

> Content analysis cannot substitute for other methods, such as polls, surveys, and interviews used to understand communication. But in combination with one or more of these other methods, content analysis methodology can help researchers study relationships between messages, senders, and receivers.

By concentrating on the content of news media discourse on risks and hazards, researchers can provide insights to the ideological components of social problems as represented by

the public arena (Wilkinson, 1999). The following section contains examinations of previous studies in which content analysis was used to analyze environmental issues found in the mass media. These studies are meant to provide a summary of the research methods available in this area of study.

2.4 EXAMINATIONS OF PREVIOUS CONTENT ANALYSIS MODELS

A study by Howland et al. (2006) employs a human coding system to describe and map trends in the social process involving the national news media surrounding the development of the Montreal Protocol ozone treaty. This research designed a content analysis categorical system to merge a policy sciences framework with descriptive trends found in national news media involving social and decision processes. Specifically, the purpose of the study was to allow human coders to: 1) identify arguments in news articles bearing upon a specific policy problem and solutions to solve it; 2) assess the direction of the arguments relative to a specific set of policy goals and principles; 3) categorize the content of the arguments; 4) note the stakeholders linked to the argument; and sort the arguments by relevance of the policymaking process. Importantly, the judgment of human coders was used rather than computer programs to identify and code phrases based on research of argumentation and persuasion from scholarly research, which contends that important elements of arguments are often implied rather than explicit in statements made within a text (Bitzer, 1959; Woodward & Denton, 2000). Howland et al. (2006) present a content analysis of 90 news articles involving the stratospheric ozone hole to assess the arguments relative to the goals and principles of the Montreal Protocol. The study uses a content analysis system applied to the articles to answer the following four research

question enabled by coding categories: (1) Are the arguments supportive or opposed to the goals and/or principles of the policy at hand, the Montreal Protocol; (2) In what proportion are the arguments international or domestic, and economic, political, social or environmental in nature? (3) What stakeholder groups are the main sources/subjects of the arguments? (4) What are the arguments' relevance to the policy process? The answers to these research questions provide information that enables the researchers to analyze the rhetorical structure and tenor of news reporting relative to the Montreal Protocol.

Howland's study provides the guidelines in which this research's categorical design and content analysis is structured. From this study, we draw upon the framework established to: set guidelines to select and narrow media sources and articles, identify key elements in articles to establish a categorically designed model, and employ content analysis to analyze and understand trends found from our individual content analysis.

An earlier study by McGeachy (1989) measures trends in magazine coverage of environmental issues from 1961-1989. A content analysis system was used to code magazine issues as a means to monitor environmental reporting. The following information was coded for each magazine issue in the study: the number of environmental articles, the total number of pages in the issue, the specific subject classification of each environmental article, whether there was an environmental section in the magazine, and whether the cover mentioned an environmental article. From the subject category, articles were analyzed that were considered "environmental" based upon specific definitions designated in the research. Once an article was categorized as "environmental", it was then analyzed for the following information: title of article, author, location in the issue, length of article, subject, and sources. Additionally, a more subjective classification was given to the articles

classified as “environmental” based on apparent bias and emphasis on risk. From these classifications, McGeachy evaluated trends based on the coverage of environmental issues from a 25-year period to measure (1) data on the amount of environmental coverage for the magazines analyzed, and (2) evaluate trends involving the types of articles and magazines that would mention and emphasize environmental risks. From this study, our research draws upon the idea of classifying an article as “environmental” dependent on specific elements, however our analysis extends this classification to include more detailed analyses, discussed in the methodology chapter.

A study by Boykoff and Boykoff (2007) employs a content analysis system to study how journalistic activities have shaped interactions involving climate change, policy and the public. The study examines the quantity and quality of anthropogenic climate change coverage in the US mass media from news articles and television coverage from the years 1988 to 2004. Analysis began in 1988 due to specific events that year, which sensitized US policy makers and the public to the issue of global warming. The newspapers included in the study were selected based on the highest reported circulation numbers, while television news coverage were selected based on programs with the highest number of viewers. To examine how journalistic norms shape mass media coverage of anthropogenic climate change, news stories were coded according to whether the exhibited evidence of five journalistic norms under consideration, each defined by the study (personalization, dramatization, novelty, authority-order bias, and balance). The study totals the population of newspaper articles and television news segments with a central focus on climate change to indicate the rises and declines in amount of coverage. The results indicate that five time spans received the most coverage: 1990, 1992, 1997, 2001-2002, and 2004. The study

further elaborates the specific environmental, political, and social events which could have contributed to the time spans with the increase in coverage. The study concludes that over time, the US news media has evolved into a powerful player in the production, exchange, and dissemination of ideas between the scientific, political and social arena. From this study, our research draws upon the framework in which articles were chosen based upon significant environmental events, as well as using a content analysis system to analyze the quantity and quality of articles.

While previous research involving content analysis for environmental media coverage is limited, these studies provide a summary of the research available. It is important to note that the studies by Howland et. al (2006) and Boykoff & Boykoff (2007) analyze newspaper articles, while the study by McGeachy (1989) analyzes magazine issues; our research is unique in that it analyzes magazine articles independently as well as magazines as categorized by genres.

CHAPTER 3

BACKGROUND

News accounts about humans and their interaction with the environment are incomplete without a historical context—scientists research one particular problem for years, pollution accumulates over time, and man alters the natural environment on a daily basis (Neuzil, 2008). Over the course of the decade of articles analyzed by this project, scientific research developed, policies were introduced, and awareness involving the issue increased. To fully understand the role of acid rain and CFCs in the policy debates found in the news media, as well as formulating research questions for the study, it was necessary to first independently describe the historical, scientific, and political background; the following section provides a brief background of both acid rain and CFCs.

3.1 ACID RAIN

The problem of acid deposition was first acknowledged in the 1950s when increased acidification of freshwater lakes and streams resulted in the deaths of freshwater fish in Scandinavia; it was subsequently identified affecting regions in Eastern North America and Europe. Acid rain, scientifically referred to as "acid deposition" and "acid precipitation," occurs when precursors, predominately sulfur oxides (SO_2) and nitrogen oxides (NO_x), chemically interact with water vapor and oxidants in the atmosphere and return back to the earth in dry or wet form. Dry deposition occurs in the form of dry particulates or gases while wet deposition occurs in the form of dew, fog, snow and rain. Automobiles and other

means of transportation are the main sources of NO_x emissions while fossil-fuel power plants, refineries, and paper and pulp mills are responsible for SO_2 emissions. These pollutants can be transported up to 600 miles, with the patterns of deposition dependent upon the location of the sources and prevailing weather patterns; large-scale emitters can have significant effects outside of the polluting region (Grafton, 2004). While some evidence shows that nitrogen deposition from acid rain can result in positive effects for forests, research also indicates that acid rain adversely affects freshwater lakes and streams, coastal habitats, agricultural production, forests, soils, plant health, human health and the erosion of building structures (Visgilio, 2007).

Acid rain is an international issue because the precursors, SO_2 and NO_x, are transported over national boundaries by natural processes. Because meteorological patterns predominately cause depositions to occur in one direction, acid rain is considered a reciprocal externality or unidirectional spillover problem (Perman, 2003). Acid rain is closely linked to energy policy due to its transboundary implications, and also because the precursors originate as emissions from fossil-fuel plants. In the 1970's and 1980's, the United States struggled to address inequities and externalities resulting from the flow of emissions into Canada.

In 1970, the United States launched the first substantial control program to address acid rain by passing the Clean Air Act. A system of local ambient air quality standards was established along with conferring powers to states to enforce emission quantity regulations. The program was widely considered a disappointment; the legislation led to taller emission stacks, which achieved local ambient standards, but resulted in additional transboundary implications (Perman, 2003). However, through the program Congress

adopted new approaches to regulation such as national air quality standards and statutory deadlines for compliance that are commonplace today, and represented a significant turning point in addressing environmental issues through legislative action in 1970 (Rogers, 1990).

In 1990, the Clean Air Act was amended in which significant revisions and additions were included to more affectively address abatement measures to control the precursors of acid rain. These amendments provided the United States with the legislation needed to address acid rain problems at a national level while also providing the foundation for the international agreement Canada had long sought. The amendments required NO_x emissions to be reduced by 2.5 million tons and SO_2 to be reduced by over 50% to 10 million tons, relative to 1980 levels. Attainment of the regulations was set through a cap-and-trade system of marketable permits in emissions in the precursors of acid rain. In the first stage in 1995, permits were issued for 110 large coal-burning utilities, followed by permit issued for 2400 smaller generators. Permits issued at no cost to generators allowed emissions between 30 and 50 percent of 1985 pollution levels.

The success in the reduction of acid rain by the 1990 Clean Air Act amendments was accomplished through the achievement of multiple goals; in recent decades acid deposition in the U.S. has significantly declined due to reductions in emissions by electric companies, industrial boilers and power plants. Figure 3.1 illustrates the significant decline in acid deposition in the United States; wet sulfate deposition decreased by over 30% in the Northeast and Midwest, wet nitrate deposition decreased by approximated 30% in the Mid-Atlantic and Northeast, and 20% in the Midwest ("Our Nation's Air: Status and Trends Through 2008," 2010).

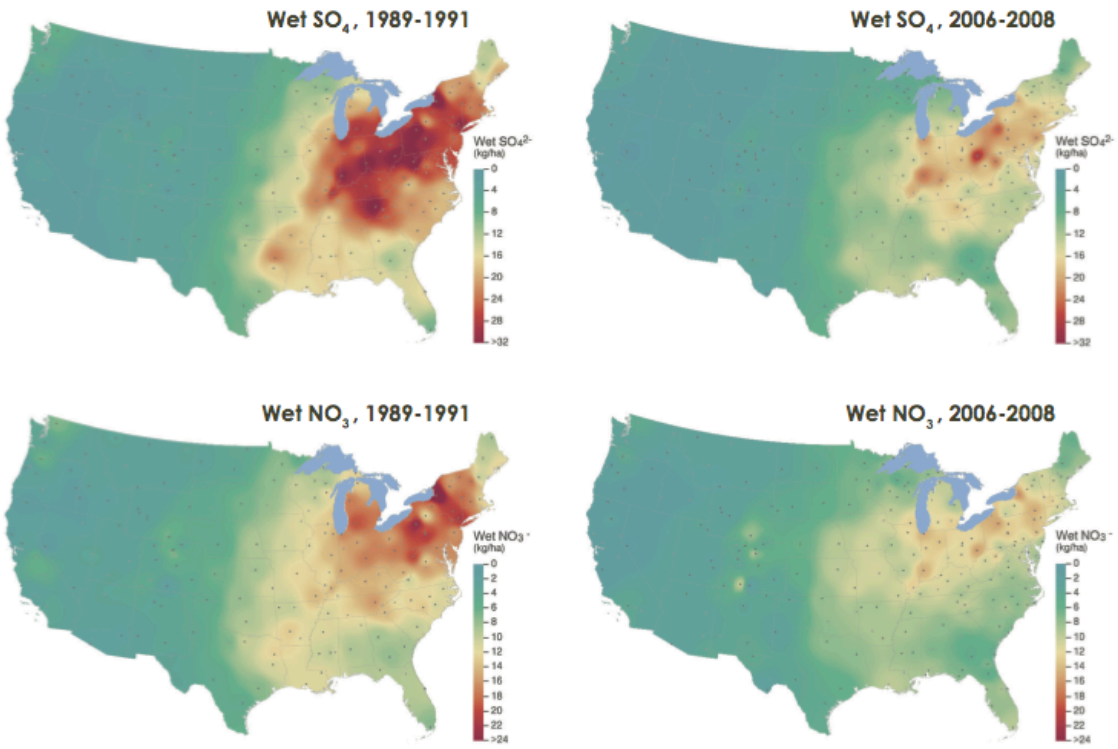

Figure 3.1: The three-year average deposition of sulfate (wet SO_4^{2-}) and nitrate (wet NO_3^-) from 1989-1991 and 2006-2008 in kg/ha ("Our Nation's Air: Status and Trends Through 2008," 2010).

The amendments implemented the first large-scale cap-and-trade approach system, which was hailed as “the greatest green success story of the decade” and “one of the most significant environmental policy successes since 1970” ("The invisible green hand," 2002; Visgilio, 2007). The cap-and-trade system allowed coal-fire power plants to meet their emissions reductions targets themselves, through any means they selected, including switching from high to low-sulfur coal. The plants were also given the option to purchase excess emissions reduction generated by other plants that had met their emission reductions. The approach led to reductions in sulfur dioxide emissions that were more large-scale than required, as well accomplishing reductions on a timeline that was sooner

than required by the amendments. Furthermore, the annual savings to electricity ratepayers nationally range from 50-80%, which amount to $1-6 billion annually (Visgilio, 2007).

3.2 OZONE DEPLETION AND CFCs

The atmosphere is divided into layers that are defined approximately by distance above the Earth's surface. The troposphere, the layer where all biological life on Earth exists and where almost all weather systems takes place, is approximately 0-10 km above the surface of the Earth. The stratosphere extends approximately 10-50 km beyond the troposphere and contains nearly 90% of ozone particles, which is referred to as the ozone layer. The ozone layer is a crucial component of the atmosphere as well as life on Earth due to its natural ability to shield the Earth's organisms from biologically harmful solar ultraviolet (UV) radiation, as well as trapping heat radiation from the Earth to regulate the planet's temperature at sustainable level for biological life.

In 1974, Richard Stolarksi and Ralph Cicerone at the University of Michigan published their findings that chlorine released in the stratosphere could create chemical processes that would continually destroy ozone for decades. Also in 1974 Drs. Frank Sherwood Rowland and Mario Molina at the University of California theorized and published the potential of chlorofluorocarbon (CFC) to deplete the ozone layer. Previously believed to be innocuous, CFCs are manmade chemicals produced solely for industrial purposes and consumer products including aerosol propellants, refrigerants, solvents, plastics, and fire retardants. At the time of the invention and introduction of CFCs in the 1920's, CFCs were an attractive new technology due to its nonreactive chemical

composition. Many varieties of CFCs exist: CFC-11, CFC-12, CFC-113, and CFC-114 being the most common compounds. CFCs are composed of chlorine, fluorine, and carbon; the chemicals are inert, inflammable, nontoxic, noncorrosive and nonreactive in the troposphere where they can remain for 50-125 years. However, the very qualities that were initially ideal for their industrial purposes allow the chemicals to remain inactive in the troposphere until they are transported to the stratosphere, where a complex set of photochemical reactions occur in which chlorine atoms react with ozone molecules, resulting in ozone depletion. A single chlorine atom is capable of breaking apart over 100,000 ozone molecules.

The total production of all CFCs reported to the Alternative Fluorocarbons Environmental Acceptability Study (AFEAS) in 2004 was less than 2% of that in the peak year, 1988, and had fallen to the level of the late 1940s. (Figure 3.2). The1974 theories became an "environmental and economic bombshell," as there had been no prior indication that CFCs were harmful to the environment (Benedick, World Wildlife Fund (U.S.), & Georgetown University. Institute for the Study of Diplomacy., 1998).

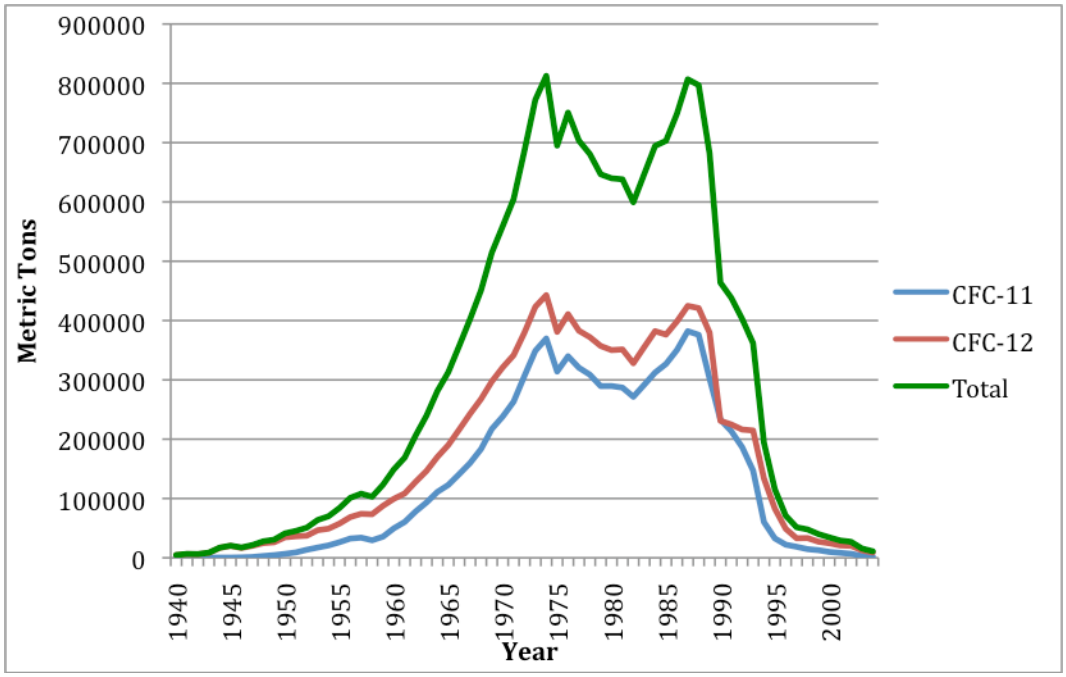

Figure 3.2: Historical Production of CFC-11 and CFC-12 Reported to AFEAS ("AFEAS Production and Sales Data for 2007,").

By 1974, approximately half of the 405 million kilograms of CFCs produced in the United States, then the world's leading producer of CFCs, were being used as aerosol propellants (World Resources Institute., et al., 1996).

Controversies quickly erupted over Rowland and Molina's theory; the CFC industry argued that no erosion of ozone had been detected and their hypothesis was a theory with no proof. However scientists corroborated Rowland and Molina's conclusions and eventually a general consensus developed among the scientific community that chlorine was indeed destroying ozone in the stratosphere, and the source of synthetic chlorine found in the stratosphere came from CFCs.

The United States became the first nation to take action to protect the Earth's ozone layer by banning the use of CFCs as propellants in most aerosol products in 1978. The regulations set by the Environmental Protection Agency, Food and Drug Administration,

and the Consumer Product Safety Commission banned the use of CFCs in "non-essential" aerosols but continued to allow "essential" uses after December 15, 1978. This ban was initially met with industrial opposition; CFC producers and aerosol makers argued that CFCs had not been proven to deplete the ozone layer, government action would create economic chaos and major job losses in the industry, and that no cost-effective CFC alternative acceptable to consumers existed (World Resources Institute., et al., 1996). However, the ban did not reduce product quality or jeopardize consumer and worker safety initially feared, and ultimately provided significant economic and environmental benefits. Both unexpected benefits and unforeseen problems associated with the ban can be connected to the extensive media coverage at the time (World Resources Institute., et al., 1996). Both print and television messages impelled consumers to prefer aerosol and non-aerosol alternatives, which were perceived to be less harmful than CFC aerosols. Producers met this attitude by providing alternatives and product differentiation. Ando and Marshall (1983) assert that the 1978 ban produced significant economic benefits and net cost savings to the U.S. economy. Significant environmental benefits also incurred due to the ban by greatly reducing the number of chlorine particles released into the atmosphere. Research estimates that the ban kept approximately 4 billion kilograms of CFCs out of the atmosphere; without the ban, levels of CFCs in the atmosphere would be significantly higher today (Ando, 1983).

In light of the success of the ban, British researchers reported a mass reduction in the concentration of ozone was occurring over Antarctica in 1985; data from 1984 indicated as much as a 40 percent loss of ozone particles compared to measurements recorded 20 years earlier. Satellite data supported these results and indicated significant

reductions since the late 1970's. These findings raised considerable interest among scientists and the media, and the loss of ozone was commonly referred to as the ozone hole. Scientific research and assessments were linking the correlation between ozone depletion and CFCs; it became evident that a strong worldwide response was needed to reduce the production and consumption of ozone depleting substances. Figure 3.3 illustrates a historical trend of ozone depletion over Antarctica.

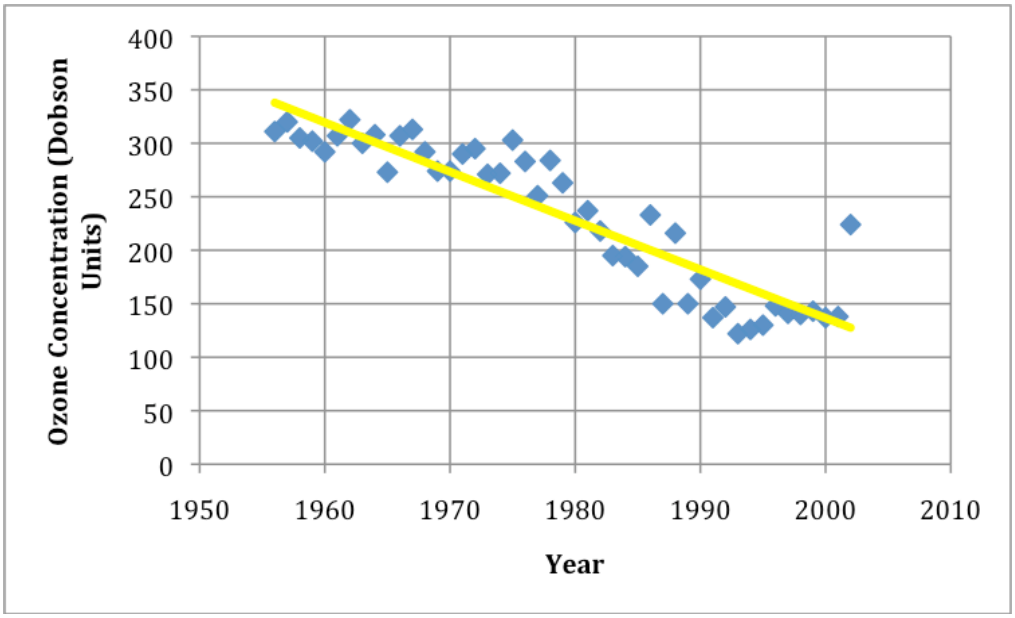

Figure 3.3: Ozone depletion over Antarctica represented by the October mean values at Halley Station ("Environmental Indicators: Ozone Depletion,").

On September 16, 1987, a treaty was signed that would prove instrumental in addressing the international consequences of CFCs and ozone depletion. The Montreal Protocol on Substances That Deplete the Ozone Layer mandated significant reductions in the use of several industrial chemicals such as CFCs and other ozone-depleting substances such as halons. At the time, 24 countries signed the treaty, compared to today's 191 nations—nearly all the countries in the world. At the time, signatory participants agreed to

halt production of CFCs at 1986 levels and to reduce the production of CFCs by 50 percent by 1999. Developing countries were given a grace period to meet the limits and industrialized nations assumed the incremental costs of meeting those targets (Benedick, et al., 1998). The treaty was hailed as "the most significant international environmental agreement in history," and "unparalleled as a global effort" in testimonies before the U.S. Senate in 1988. The Montreal Protocol has been considered a significant international environmental success due to the rapid decline in global emissions of CFCs, and the Protocol has been used as a model for other agreements based on its accomplishments (Grafton, 2004). The success has been attributed partially to the availability of substitutes that took the place of CFCs, as well as the Protocol's threat of trade restrictions for non-signatory countries. Due to the small number of manufacturers of CFCs, the development of a system that could effectively monitor and enforce phased reductions in production was possible.

In 1990 under Title VI, the Clean Air Act was amended to include provisions for phasing out ozone-depleting chemicals, paralleling the schedule outlined by the Montreal Protocol. The law was based on a market-based structure and requires a complete phase-out of CFCs, as well as other chemicals, with interim reductions. Under the provisions, the EPA was required to phase out CFCs, halons, and carbon tetrachloride by 2000; methyl chloroform by 2002; and hydrofluorocarbons (HCFCs) by 2030.

By 1996, U.S. production ended for many of the chemicals capable of doing the most serious harm such as CFCs, halons, and methyl chloroform. Worldwide production and consumption of ozone depleting substances has been progressively eliminated due to the success of the Montreal Protocol and Clean Air Act Amendments. Over time, reducing

atmospheric contributions of ozone depleting substances is expected to result in global increases in stratospheric ozone.

CHAPTER 4

METHODOLOGIES

4.1 IDENTIFICATION OF MEDIA SOURCES

Historically, much of the U.S. environmental information and opinion available as been provided by major mass media (Ostman, 1987). A study in the mid 1980's by Ostman and Parker (1987) indicated that respondents identified books as being the most believable medium of scientific information concerning environmental topics provided by the mass media, followed by magazines, newspapers, pamphlets, television, and radio. The study also found that heavy newspaper readers tend to rely on magazines for supplementary environmental information, and that environmental activists ranked magazines third as a source of information on the most important environmental issues. Based upon the previous findings involving the time period for this study, national consumer magazines as one component of mass media were chosen for this research. Additionally, due to the large amounts of studies involving newspapers, especially the *New York Times*, this research focuses solely on magazines to address this weakness of previous research.

News accounts in the press during the 1980's paralleled two trends: the spreading public concern about environmental issues and the progressive destruction of the EPA's credibility through internal mismanagement, budget cuts, and proposals to weaken or eliminate regulations (N. J. Vig & Kraft, 1984). This study focuses on how information was provided by the press involving acid rain and the role of CFCs in ozone depletion as a

concern to the American public, as well as analyzing the legislative process presented by the media involving these specific issues involving the EPA.

4.2 COMPILING ARTICLES INVOLVING ACID RAIN

Acid rain was one of the most controversial environmental issues of the 1980's and of Ronald Reagan's two-term presidency from 1981-1989 (Sullivan, 1984; N. J. Vig & Kraft, 1984; N. J. Vig, Kraft, M.E., 1984; Visgilio, 2007). The 1980's were also a period of mistrust and diplomatic differences between the United States and Canada due to the inflow of U.S. pollutants across the Canadian border, which resulted in forest decline for eastern Canada. Therefore we restrict our analysis to articles found in journals with publication dates from January 1980 to December 1989. Due to the vast number of articles found in journals involving acid rain from 1980-1989, additional parameters were set to narrow down the number of articles researched. Following McGeachy (1989) the initial phase of collecting articles involved indexing articles from journals using the *Readers' Guide Retrospective* online database and *Reader's Guide to Periodical Literature*.[1] From the years 1980-1982, articles were indexed and collected from the online database. From 1983-1989, articles indexed under "Acid rain," "Acid rain: conferences," Acid rain: International aspects," "Acid rain: Laws and regulations" were collected from *Readers' Guide Retrospective* reference

[1] *Readers' Guide Retrospective* and *Reader's Guide to Periodical Literature*, published by The H.W. Wilson Company, is a database containing comprehensive indexing of over 365 of the most popular general-interest periodicals published in the United States and is a reflective source of the history of 20th century America ("University of Georgia Libraries," 2007).

books for each respective year.[2] A total of 351 articles were indexed; from this compilation, only articles found in journals listed as leading U.S. magazines based on total average paid circulation by *The World Almanac and Book of Facts* for each respective year were included in the following research to include the most widely circulated magazine articles. A total of 76 articles (APPENDIX A) regarding acid rain were indexed and analyzed by categorical design using the content analysis model.

4.3 COMPILING ARTICLES INVOLVING CFCs

Concerns over the depletion of the ozone layer began to rise during the 1970's and were commonly found in the popular press in the late 1970's and 1980's. Molina and Rowland's publication in the 1974 issue of *Nature* is credited as creating the first significant surge in interest in CFCs' contribution to ozone depletion; the article credited CFCs as weakening the ozone layer which could contribute to the number of cases of skin cancer, as well as causing an unnatural fluctuation in the stratosphere's temperatures. Public awareness quickly followed the scientific community's interest in CFCs potential role in depleting the ozone layer, unconfirmed at the time. In 1985, an announcement by the British Antarctic Survey of a hole in the ozone layer over Antarctica created controversy among the scientific community regarding the continued use of CFCs and their potential to deplete the ozone layer, as well as arising the public's interest in the dangers of ultraviolet radiation. In 1987, public concern was met with political action when the United Nations Environment Programme convinced a large majority of the industrialized nations to sign the Montreal

[2] The online database of *Readers' Guide Retrospective* is comprehensive of articles from 1890-1982, therefore the *Reader's Guide to Periodical Literature* reference books were used for indexing articles from 1983-1989.

Protocol, which called for a cut in consumption of CFCs by 50% and a cut in production by 35% by the year 2000. The news media is credited with being an integral component of the Montreal Protocol policy process (Benedick, et al., 1998; Howland, et al., 2006). Benedick, a principal architect and chief U.S. negotiator of the protocol writes:

> The U.S. media played an important role in keeping the issue before the American public through press and television coverage of the scientific theories and warnings over use of CFCs. After the diplomatic negotiations began in 1986, media attention intensified; the ozone threat was featured in such widely circulated magazines as *Time* and *Sports Illustrated*.

In 1990, the Clean Air Act was amended to include provisions for the implementation of the Montreal Protocol, as well as including explicit, separate rights for the EPA to regulate ozone-depleting chemicals under Title VI. Therefore articles found in publications with dates from January 1980 to December 1989 were considered to evaluate the media content of the years leading up to legislative action. From the years 1980-1982, articles indexed under "Fluorocarbons" from the online database, *Readers' Guide Retrospective*, were collected. From the years 1983-1989, articles indexed under "Chlorofluorocarbons" and "Fluorocarbons" were collected from *Readers' Guide Retrospective* reference books for each respective year. A total of 118 articles were indexed; articles found in journals listed as leading U.S. magazines based on total average paid circulation by *The World Almanac and Book of Facts* for each respective year were included in the study. A total of 38 articles (APPENDIX B) regarding CFCs were indexed and analyzed by content based on categorical design.

4.4 CATEGORICAL DESIGN AND CONTENT ANALYSIS

Issue categorization acts as a means in which to constrain the ways in which environmental issues are framed; the ways in which the news media frame a given subject depend upon how it is categorized according to preconceived ideas and divisions of labor within the news organization (Anderson, 1997). Because it is too simplistic to solely characterize articles based on broad categories, each article was analyzed by content according to multiple, specific categories to better gain an understanding of the overall message intended by the author. Each category must be explicitly defined to set parameters to perform a detailed analysis; the following section each summarize a particular category by subject and list the associated attributes of the study. APPENDIX C and APPENDIX D provide examples of articles coded by the content analysis model.

4.5 CONTENT ANALYSIS FOR ARTICLES INVOLVING ACID RAIN

ACID RAIN CATEGORY 1: NORMATIVE, POSITIVE, AND NEUTRAL STATEMENTS (AR 1)

Economic analysis commonly refers to statements as being normative or positive; positive statements are factual and attempt to convey a reality (what is) while normative statements are idealistic and convey a more subjective viewpoint (what should be). For the purpose of this research, the term "nature" refers to articles written with a more environmental and ecological aspect, "industry" focuses on the economical aspects of the issue at hand, and "neutral" are articles in which both environmental and economical aspects are evenly distributed or articles that focus on conveying events in the manner in which they occur. Each article was listed under one of the following classes: (1) Normative Nature; (2) Positive Nature; (3) Neutral; (4) Normative Industry; (5) Positive Industry. Articles classified as "Normative Nature" contain characteristics in which normative

statements were found in favor of protecting the environment from acid rain through management, legislation, or action of the reader. “Positive Nature” articles focus more on the scientific attributes and findings of acid rain. “Neutral/News-based” are articles in which no normative statements are found, a balance between environmental and economical topics are discussed, or news involving acid rain unrelated to ecological or business events is conveyed. “Normative Industry” articles contain normative viewpoints in which statements are made that focus on what should, or should not happen, to protect businesses from the economic costs of acid rain, specifically legislation that would require industries to add scrubbers, switching from high to low-sulfur coal, etc. “Positive Industry” is descriptive of articles stating realities and actualities of the problems concerning the management of acid rain from a business standpoint.

ACID RAIN CATEGORY 2: ECONOMIC, ECOLOGICAL AND HEALTH PREDICTIONS (AR 2)

Due to the economic, political, social and ecological implications of environmental decisions, many stakeholders are interested in scientifically based and mathematical models predictions assessing the future of the environment. Because the environment is highly variable in time and space, risk and uncertainty are commonly used terms when predicting the future of the environment due to unforeseen disturbances, shocks, and surprises (Grafton, 2004; White & Hooke). Risk controversies represented by the news media are understood to have a major structuring effect upon public opinion (Wilkinson, 1999). Predictions provided by the academic community, policy makers, economists, and other invested stakeholders are a common tool in which the media presents the risks, or consequences of a decision, to the public. This study evaluates three forms of predictions found in the popular press: (1) Economical Predictions; (2) Ecological Predictions; (3)

Health Predictions. Any article inclusive of one or more of the previously listed predictions was recorded.

ACID RAIN CATEGORY 3: SOURCES OF ACID RAIN (AR 3)

Acid rain originates from the emissions of variety of pollutants that are subsequently converted into sulfur dioxide (SO_2) and nitrogen oxides (NO_x) that form acid rain. Primary sources of SO_2 emissions include: fossil fuel power plants, ore smelters, industrial burners, refineries, and paper and pulp mills. Automobiles and other vehicles are the primary sources of NO_x emissions. Natural processes such as: volcanic eruptions, forest fires, and the bacterial decomposition of organic matter also produce both sulfur and nitric compounds found in the atmosphere. Due to differing opinions of the causes and sources of acid rain found in the media, each article was further classified by statements indicating the causes of acid rain as being: (1) Human Induced; (2) Natural; (3) Combination of Manmade and Natural Sources; or (4) Not Enough Information Known.

ACID RAIN CATEGORY 4: CONSEQUENCES OF ACID RAIN (AR 4)

The National Acid Rain Precipitation Program began an extensive long-term study in 1980 to identify the consequences of acid rain, along with the Commission of the European Communities and the World Conservation Union. The following consequences of acid rain have been identified by these programs (1) increased acidity of lakes; (2) increased acidity of soils which reduces the number of flora that may be grown; (3) forest destruction; (4) adverse human health effects (5) building and infrastructure erosion (Perman, 2003). However, this is a limited listing; articles indicated one, if not multiple, general consequences that could occur from acid rain. Due to the numerous specific examples that were found in articles citing the consequences of acid rain, these seven classifications were

developed as more broad generalizations to better organize and classify the consequences of acid rain: (1) Ecological Consequences; (2) Economic Consequences; (3) Health Problems; (4) International Problems; (5) Structural Damage; (6) Problems Unforeseen at the Time; (7) Acid Rain Poses No Problems. Any article including specific examples of any of the listed classifications was identified and recorded. The following section better describes the analysis used to determine if an article included the standards to meet the requirements of each classification.

(1) Ecological Consequences

Decades of research has shown that the ecological consequences of acid rain are significant due to the deposition of acidifying compounds delivered to the Earth's surface, creating adverse effects on many ecological ecosystems. Due to the interdependence of the natural environment and the biological organisms, disruptions can create multiple, adverse ecological effects on ecosystems. Ecological ecosystems that acid rain can affect include but are not limited to: forest soils and vegetation, surface waters including lakes and streams, coastal waters, aquatic organisms, and terrestrial ecosystems. All popular press articles inclusive of a possible or proven ecological consequence from acid rain were listed under this classification.

(2) Economic Consequences

The economic implications of addressing acid rain were commonly found in popular press articles. Costs imposed on utility companies, the mining community, and households by the possible means to reduce SO_2 in the atmosphere were commonly associated with the acid rain debate. Economic costs associated with crop damage such as declines in timber and agricultural production were substantially discussed as well. Legislative implications,

unemployment, and structural damage estimates were included under economic consequences of acid rain. Any article inclusive of possible or proven economic costs was listed under this classification.

(3) Health Problems

The pollutants that cause acid rain, SO_2 and NO_x, have been proven to damage human health. When these two pollutants interact in the atmosphere, fine sulfate and nitrate particles are formed that can be transported long distances and inhaled by human lungs. Many scientific studies have identified a relationship between increased levels of fine particles and premature death from lung and heart disorders such as asthma and bronchitis; ozone impacts on human health from NO_x include a number of morbidity and mortality risks associated with lung inflammation, including asthma and emphysema ("Effects of Acid Rain - Human Health,"). In the 1980's, uncertainties remained about the health effects of acid rain, however many authors recognized the possibility of adverse effects that could be inflicted. Any article stating the possibility of health consequences of acid rain was included in this classification.

(4) International Problems

Acid rain is an environmental problem in which the adverse effects cross regional, state, and international boundaries. In the late 1960's, Scandinavia first identified acid rain as a significant, environmental issue with transboundary implications due to the acquisition of downwind acid-producing emissions from Europe, particularly from the United Kingdom and Germany. In the 1970's and 1980's, northeastern United States electric-generating facilities were producing excessive amounts of SO_2 and NO_x, which were reaching and severely damaging eastern Canadian forests; this caused strained diplomatic relations

between the two countries in which the United States struggled to find a bilateral agreement with Canada (Visgilio, 2007). In the 1980's, differences of opinion and a lack of trust between Canadian and American scientists were consistently relayed to the public (Alm, 1997). It was not until 1990 that the United States began to forcefully take action to curb acid rain; newly elected President George Bush signed the 1990 Clean Air Act Amendments, with Title IV specifically detailing acid rain requirements. Two months later, President Bush and Prime Minister Brian Mulroney signed the Air Quality Accord in May 1991, which was found to be as extremely successful in reducing transboundary pollution from the United States to Canada. The regions that most notably dealt with acid rain implications include the heavily industrialized regions of Europe, North America, eastern Asia (more specifically China and Japan), and the former Soviet Union. This research analyzes the number of articles in which international implications of acid rain were acknowledged.

(5) Structural Damage

Acid rain and the dry deposition of acidic compounds have been observed and accurately attributed to cause considerable damage to buildings and materials, primarily in urban areas, as a consequence of relatively high concentrations of SO_2. Acid rain is known to contribute to the corrosion of metals, such as bronze, and the deterioration of paint and stone, such as limestone and marble. These effects significantly reduce the societal value of buildings, bridges, cars, and cultural objects such as statues, monuments, and tombstones

("Effects of Acid Rain - Materials; Newbery, Siebert, & Vickers, 1990). Any article citing structural damage was included in this category.[3]

(6) Problems Unforeseen at the Time

While it is possible to observe whether an ecosystem is resilient after a disturbance has taken place, ex ante we cannot know whether a system will be resilient to future shocks and disturbances that it will be subject to (Perman, 2003). While mathematical models and global observations are useful tools in forming predictions, unforeseen variables can alter outcomes, which accounts for uncertainty and risks affecting environmental decision-making. Authors which recognized the uncertainty of unforeseen futuristic problems that could possibly arise from acid rain were noted under this classification.

(7) Acid Rain Causes No Problems

With any field involving social, political, economic and environmental interests, conflicting views are certain to exist due to differing personal values. Significant differences exist in individual perceptions about the seriousness of environmental threats, their origins, relative importance, and the action needed to address the respective issue; in many instances, extremely different conclusions can be drawn based on the same basic scientific evidence (Goldfarb, 1997). In the 1980's, the scientific community was not entirely convinced that acid rain was to blame in causing adverse ecological consequences. In a widely controversial 1983 article in *Science*, soil scientist Edward Krug, who helped conduct a ten-year federal study on acid rain, argued that while acid rain was popularly believed to be responsible for acidifying soil and water sources in eastern North America

[3] The estimated costs of acid rain on structural objects are high, therefore any article citing costs on structural objects was also included in the listed category: (2) Economic costs.

and eastern Europe, in actuality it was natural processes causing ecosystems susceptible to increased acidification (Krug & Frink, 1983). Krug later spoke at seminar on acid rain during 1983 and told the audience that acid rain was an "environmental nuisance, not a catastrophe." Due to the complexity and divisive political nature of the issue, political differences arose, the coal industry was divided, and different regions of the United States were sided against each other (Yanarella & Ihara, 1985). Industry stakeholders and politicians commonly conveyed that acid rain was not an issue of significance as claimed by scientists and researchers. Based on the differences in opinion during the time period, any article citing that acid rain did not pose any problems was included in this classification.

ACID RAIN CATEGORY 5: LEGISLATIVE ATTITUDE (AR 5)

The 1980's involved a decade of political debate involving the legislation surrounding acid rain, especially the Clean Air Act. In 1970, the passage of the Clean Air Act marked the first substantial control programs that established a system of local air quality standards, and granted powers to the states to enforce emissions quantity regulations. However the program was considered a disappointment and consequently contributed to the transboundary issues of acid rain. The legislation led to taller emissions stacks intended to disperse pollutants further from the point source, which was successful in achieving local air quality standards, but subsequently increased the inflow of acidic deposition to nearby regions. It was not until 1990 when the Clean Air Act would be amended to affectively address acid rain, specifically through the requirements mandated by Title IV. The 1980's included a time period of misreading of public opinion, unrealistic expectations on Congress to be receptive of proposals for comprehensive change, and difficulty in developing and presenting proposals for legislative change (N. J. Vig & Kraft, 1984).

Numerous bills and proposals went before Congress to amend the Clean Air Act, however the lack of success of such legislative acts is due to the complexity of the acid rain debate among the many stakeholders involved. Over the decade, significant scientific evidence had mounted in favor of action against acid rain while environmental groups continuously pressed for a stronger Clean Air Act (Visgilio, 2007). From the early 1980's to the end of the decade, debates in Congress shifted from whether or not acid rain was a problem to how to manage acid rain and allocate the costs of doing so. Proponents of regulatory action, primarily representatives from northeastern states as well as many environmental groups, argued that the volume of scientific evidence clearly identifies acid rain as a significant problem in need of increased regulation through legislative means, as well as benefits of regulatory action outweighing costs. Opponents of regulatory action, primarily representatives of the industrial Midwestern and Appalachian states as well as electric companies, coal companies and coal miners, argued that restrictions on such industrial companies posed unreasonable costs and burdens which outweighed the benefits of cleaning up acid rain. This research analyzes articles in which the authors' legislative attitude surrounding regulatory action was observable; any article involving legislative attitude was further divided noting the following observations: 1) Author believes costs imposed on industry due to stricter regulations will be unreasonable; 2) Author believes additional regulation might possibly be beneficial but that the costs of doing so will be substantial; 3) Author believes that benefits outweigh any costs associated with legislative action.

ACID RAIN CATEGORY 6: TONE OF ARTICLE (AR 6)

A study by Sandman et al. (1986) designated magazine articles as "environmental" based on characteristics fitting into certain categories as defined by the researcher, this study takes the same approach in order to categorize each article under the following classes: (1) Highly Environmental; (2) Somewhat Environmental; (3) Neutral; (4) Somewhat Industrial; (5) Highly Industrial. Articles under each listed class contained characteristics associated with the following descriptions in order to designate the specific category: (1) Highly Environmental: Articles focusing on the ecological, economical, international, structural, and/or health consequences of acid rain. When discussing legislation, author clearly asserts that legislative action is crucial in abating problem. (2) Somewhat Environmental: Articles focusing on the consequences of acid rain, however, the author is more apt to acknowledge problems also facing the industrial sector. When discussing legislation, author asserts that legislative action will produce benefits, but acknowledges costs as well. (3) Neutral: Articles focusing on portraying current events surrounding the acid rain debate, or author poses both sides of the debate with no preference observably stated. (4) Somewhat Industrial: Articles focusing mainly on economical implications of stricter regulations involving acid rain legislation on the industrial sector, however author more apt to acknowledge the adverse implications of acid rain on the environment, economy, structures, transboundary issues, etc. (5) Highly Industrial: Articles focusing on the economical implications of acid rain legislation on the industrial sector. When discussing legislation, author firmly asserts that legislation will result in numerous problems for industry, policy, and households.

4.6 CONTENT ANLAYSIS OF ARTICLES INVOLVING CFCs

CFCs CATEGORY 1: NORMATIVE, POSITIVE, AND NEUTRAL STATEMENTS (CFC 1)

Applying the parameters previously used in categorical design from ACID RAIN CATEGORY I: NORMATIVE, POSITIVE, AND NEUTRAL STATEMENTS, each CFC article was listed under one of the following classes: (1) Normative Nature; (2) Positive Nature; (3) Neutral/News-based; (4) Normative Industry; (5) Positive Industry. Articles classified as "Normative Nature" contain characteristics in which normative statements were found in favor of actively preventing the depletion of the ozone layer by restricting the use of CFCs through management, legislation, or action of the reader. "Positive Nature" articles focus more on the scientific nature and findings of CFCs and the ozone layer. "Neutral/News-based" are articles in which no normative statements are found, a balance between environmental and economical topics is discussed, or news involving CFCs unrelated to ecological or business events is conveyed. "Normative Industry" articles contain normative viewpoints in which statements are made that focus on what should, or should not happen, to protect businesses from the economical costs of restricting the use of CFCs in products or costs to find substitutes. "Positive Industry" is descriptive of articles stating realities and actualities of the problems concerning the restriction, bans, and substitutes involving CFCs from an industrial standpoint.

CFCs CATEGORY 2: ECONOMIC, ECOLOGICAL AND HEALTH PREDICTIONS (CFC 2)

Applying the parameters used in categorical design ACID RAIN CATEGORY II: ECONOMIC, ECOLOGICAL AND HEALTH PREDICTIONS, each CFC article inclusive of one or more of the following predictions was classified according to: (1) Ecological Predictions (2) Economical Predictions and (3) Health Predictions.

CFCs CATEGORY 3: SOURCES ATTRIBUTED TO THE DEPLETION OF THE OZONE LAYER (CFC 3)

The scientific community launched a major research campaign following the 1974 theories to learn more about the role of CFCs and their potential to deplete the ozone layer, including the National Academy of Sciences as well as prominent chemists, meteorologists, physicists and space scientists from NASA, the National Oceanic and Atmospheric Administration, and universities. The scientific, political, and industrial community vigorously disputed the connectivity of CFCs and the ozone layer; even though laboratory and modeling research confirmed the validity of the chlorine-ozone linkage, they could not prove definitively what was occurring in the atmosphere. Because ozone particles are dynamic variables of the atmosphere, natural variations and fluctuations involving complex natural forces, including solar radiation and interactions, occur on a daily, seasonal, and solar cyclical basis. The detection of manmade influence on zone is difficult because of large, natural variations in the amount of total ozone (Cumberland, Hibbs, & Hoch, 1982). Industrialists continuously denied any connection between the depletion of the ozone layer and CFCs as well as launching their own research and public relations efforts to place doubt on the theory (Benedick, et al., 1998). Due to differing opinions of the correlation of CFCs and the ozone layer found in the media, each article was further classified by statements indicating the depletion of the ozone correlated to: (1) Human Induced Sources, specifically CFCs; (2) Natural Sources; (3) Combination of Manmade and Natural Sources; (4) Not Enough Information Known.

CFCs CATEGORY IV: CONSEQUENCES OF OZONE DEPLETION (CFC 4)

Because the ozone layer protects the Earth from harmful UV-B radiation, a decrease in ozone particles results in more radiation reaching the Earth's surface and could have damaging effects in several areas including: human health, crops and natural terrestrial

ecosystems, aquatic plants and ecosystems, and materials—effects expected on a global level, with latitudinal variations (Brunnée, 1988). Due to the numerous specific examples that were found in articles citing the consequences of ozone depletion, these seven classifications were developed as broad generalizations to better organize and classify the consequences of ozone depletion: (1) Ecological Consequences; (2) Economic Consequences (3) Health Problems; (4) International Consequences; (5) Agricultural Damage; (6) Atmospheric Disturbances; (7) Problems Unforeseen at the Time; (8) CFCs Cause No Problems. Any article including specific examples of any of the classifications, or lack of, was identified and recorded. The following section better describes the analysis used to determine if an article included the standards to meet the requirements of each classification.

(1) Ecological Consequences

Anthropogenic destruction of the ozone layer was first liked with potential negative impacts upon non-human nature in 1977; by the 1980's, research was indicating that enhanced UV-B could reduce leaf area on certain plant species by up to 50%, as well as causing difficulties in cell growth and biosynthesis difficulties in other plant species (Gillespie, 2006). Despite mechanisms to reduce or repair effects and a limited ability to adapt to increased levels of UVB, physiological and developmental processes of plants are adversely affected by enhanced UV-B radiation, as well as generating implications for plant competitive balance, herbivory, plant diseases, and biogeochemical cycles (EPA).

Enhanced UV-B has been demonstrated as having potential lethal and sub-lethal effects on a number of species of non-human animals, such as frogs, especially when at

embryonic stages. Studies indicated observed cases of cancer, cataracts, and other diseases from enhanced UV-B in species such as cattle and sheep.

It has long been realized that enhanced UV could have a negative effect on a number of aquatic species (Gillespie, 2006). Phytoplankton is the foundation of aquatic ecosystems; exposure to UV-B radiation has been shown to affect both orientation mechanisms and motility in phytoplankton, resulting in reduced survival rates for these organisms (Newton and EPA). Scientists have demonstrated a direct reduction in phytoplankton production due to ozone depletion-related increases in UVB; these findings are troublesome due to aquatic organisms' dependence on phytoplankton in a complex food chain (EPA and Newton). UV-B radiation can also directly affect aquatic organisms by damaging developmental stages in species that include: larval crabs, shrimps, fish and amphibians.

(2) Economic Consequences

Economic costs of addressing industrial decisions involving CFCs, as well as costs associated with consequences of ozone depletion were vigorously discussed in the ozone debate. Industrialists cited costs imposed on implementing new technologies and substitutes, as well as job losses, which would be associated with legislative action. In 1973, industry sources calculated that aerosols alone were a $300 billion per year industry, with CFC related employment between 200,000 and one million (Taubes, 1987). Other economic costs associated with CFCs and ozone depletion included crop damage, structural damage to plastics and other materials, and health costs. Any article inclusive of potential or proven economic costs due to CFCs and ozone depletion was included in this category.

(3) Health Problems

Depletion of the ozone layer results in excess ultraviolet (UV) radiation reaching the Earth's surface, UV-B in particular; a link between UV-B radiation and skin cancer has been established over the years (Benedick, et al., 1998). Laboratory and epidemiological studies demonstrate that UV-B causes non-melanoma skin cancer and contributes to malignant melanoma development. In addition to skin cancer, UV-B has been linked to cataracts as well as suppressing the human immune system, resulting in human susceptibility to infectious diseases. Ozone depletion increases the amount of UV-B that reaches the Earth's surface, which will then increase the risk of health effects. However, uncertainties remained about the health effects of ozone depletion during the 1970's and 1980's, especially since such cancers take decades to develop. However many authors acknowledged the potential of ozone depletion resulting in damaging health effects, therefore any article stating the possibility of health consequences of ozone depletion was included in this classification.

(4) International Consequences

In the 1980's, the wintertime hole over Antarctica gave the world an insight to the effects of human activity on the atmosphere on a global scale. Since then research has shown that ozone depletion occurs over latitudes that include North America, Europe, Asia, Africa, Australia and South America. Because of the international implications resulting from the use of CFCs, ozone depletion gained recognition in the media as a global issue, not just a concern subjected to the Antarctic region. Any article acknowledging that ozone depletion is of international concern, affecting regions and nations other than Antarctica, was included in this classification.

In addition to the atmospheric consequences possible at an international level, many nations were capitalizing on the production of CFCs at the time; U.S decisions involving CFCs would affect economic and industrial aspects of other countries. Articles inclusive of possible effects on non-U.S. countries were also included in this classification.

(5) Agricultural Damage

Damage to crops intensifies with increased UV-B radiation; numerous experiments indicated that UV-B radiation adversely affects two thirds of the 200 plant species tested including: peas, cabbage, melons and cotton (Benedick, et al., 1998; Brunnée, 1988). Any article inclusive of agricultural and crop damage was included in this classification.

(6) Atmospheric Disturbances

The depletion of the ozone layer is highly interconnected with another global environmental concern, climate change, due to the redistribution of ozone at different altitudes and to the result of CFCs as heat absorbing gases. At the time of the ozone debate in the media, there was an increasing scientific consensus that CFCs in the atmosphere could create implications for increasing global temperatures, sea level rise, and alterations in weather patterns. Any article inclusive of atmospheric disturbances due to CFCs and the ozone layer was included in this classification.

(7) Problems Unforeseen at the Time

Brunnée (1988) acknowledges that at the time, the future growth rates and concentration of CFC emissions were critical areas of uncertainty, as was the difficulty in predicting to what degree and how quickly the depletion of the ozone layer would occur. Because loss of stratospheric ozone takes place in distant parts of the atmosphere at a relatively slow rate, any health or environmental problems it produces may not show up for years or decades

(Newton, 1995). Authors that recognized the uncertainty of unforeseen futuristic problems that could possibly arise from ozone depletion were noted under this classification.

(8) CFCs Not Proven to Cause Harm

Differences of opinion involving ozone depletion emerged as scientific research intensified to determine if a correlation between CFCs and the hole in the ozone layer existed. Industrial representatives continually expressed doubts about the reality of problems with the ozone layer as well as claiming that sufficient scientific data could not prove that CFCs were contributing to ozone depletion. A direct relationship between causes and effects is not immediately obvious when studying ozone scenarios; human knowledge stems from a laboratory hypothesis, or some co-variation, and no physical, causal link is demonstrated (Leroux, 2005). (Newton, 1995) outlines industrialists' motivation in raising doubts involving the interconnectivity of CFCs and ozone depletion:

> The opposition of industries to policies such as those outlined in the Montreal Protocol and the Clean Air Act Amendments of 1990, are, therefore, easy to understand. Companies can point to specific dollar and job losses that will occur if and when they are required to abandon the use of commercially vital compounds like the CFCs.

Any article that acknowledges that CFCs had yet to be proven to cause harm was included in this category.

CFCs CATEGORY 5: LEGISLATIVE ATTITUDE (CFC 5)

This research analyzes articles in which the authors' legislative attitude surrounding regulatory action was observable; any article involving legislative attitude was further divided noting the following observations: 1) Author believes costs imposed on industry due to stricter regulations will be unreasonable; 2) Author believes additional regulation might possibly be beneficial but that the costs of doing so will be substantial; 3) Author believes that benefits outweigh any costs associated with legislative action.

CFCs CATEGORY 6: TONE OF ARTICLE (CFC 6)

The approach follows that under AR: CATEGORY 6 to categorize each article under the following classes: (1) Highly Environmental; (2) Somewhat Environmental; (3) Neutral (4) Somewhat Industrial; (5) Highly Industrial.

4.7 CLASSIFYING MAGAZINES INTO GENRES

After compiling articles according to the parameters as stated, 76 acid rain articles and 38 CFC articles were collected. From the combined total of these 114 articles, 26 magazines titles were identified as contributing magazine sources. The initial phase of creating genres to classify magazine titles involved referencing the detailed Subject Index of *Magazines for Libraries*, a source of magazine information from 1965-1992 that annotatively summarizes information of over 6,600 periodicals (Katz, 1992).[4] All but two magazines (*Popular Science* and *Science Direct*) in this study were included in the subject heading listings found in *Magazines for Libraries*. The magazines from this research yielded the following 12 subject headings: "Alternatives", "Business", "Environment, Conservation, and Outdoor Recreation", "Fishing, Hunting, and Guns", "Gardening", "General Editorial", "Home", "News and Opinion", "Recreational Projects", "Science", "Sports", and "Women". To create broader categories, these 12 given subject headings were reclassified into 5 genres: Business and Industry, Editorials, News, Science and Sports and Recreation. Table 4.1 lists the genre given by the researcher in the first column, the subject listing as given by *Magazines for*

[4] The 7th edition of this book was chosen for this study opposed to the most current edition due to the time span of this study.

Libraries in the second column, with the respective magazine titles listed in the third column.

Table 4.1: Magazine Genres

Genre as given by researcher	***Magazine for Libraries* Subject Listing**	**Magazine Title**
Sports and Recreation	Environment, Conservation, and Outdoor Recreation	*Audubon*
	Fishing, Hunting, and Guns	*Field and Stream* *Outdoor Life*
	Recreational Projects	*Popular Mechanics*
	Sports	*Sports Illustrated*
Business and Industry	Business	*Business Week* *Forbes* *Fortune*
General Editorial	General Editorial	*Esquire* *Life* *National Geographic* *Reader's Digest* *Smithsonian*
	Alternatives	*Mother Earth News*
	Women	*Good Housekeeping* *Glamour*
	Home	*Home and Garden*
	Gardening	*Organic Gardening*
News	News and Opinion	*Newsweek* *Time* *U.S. News & World Report*
Science	Science	*Discover* *Scientific American* *Popular Science** *Science Direct**

*Note: The magazines *Popular Science* and *Science Direct* are not listed in *Magazines for Libraries*; these magazines were placed in the Science genre according to the discretion of the researcher.

CHAPTER 5

RESULTS

This chapter presents the results from the content analysis model and addresses the research questions of this study. Sections 5.1 and 5.2 report the percentages of each classification according to magazine genre by subject matter of acid rain and CFCs.

5.1 ACID RAIN FREQUENCIES

AR 1: NORMATIVE, POSITIVE AND NEUTRAL STATEMENTS

Of the 76 articles analyzed according to AR 1, 28.9% were classified as containing environmental normative characteristics, 34.2% contain environmental positive characteristics, 21.1% were classified as neutral, 6.6% contain normative characteristics from an industrial standpoint, and 9.2% contain positive characteristics from an industrial standpoint. Table 5.1 presents the percent of each AR 1 classification by magazine genre.

Table 5.1: Percentage of Articles Analyzed According to AR 1: Normative, Positive and Neutral Statements

		Classification				
		Normative Nature	Positive Nature	Neutral	Positive Industry	Normative Industry
Genre	Sports and Recreation (n=20)	45.0	45.0	5.0	5.0	0.0
	Business and Industry (n=13)	7.7	0.0	15.4	38.5	38.5
	General Editorial (n=11)	45.5	45.5	9.1	0.0	0.0
	News (n=24)	16.7	29.2	50.0	4.2	0.0
	Science (n=8)	37.5	62.5	0.0	0.0	0.0
All Genres (n=76)		28.9	34.2	21.1	9.2	6.6

AR 2: ECONOMIC, ECOLOGICAL AND HEALTH PREDICTIONS

The content analysis indicates that 40.8% of the 76 acid rain articles included economic predictions, 18.4% included ecological predictions, and 3.9% included health predictions. It is important to note that articles could be inclusive of one or more types of predictions, and that this is not a cumulative percent (in comparison with Table 5.1). Table 5.2 presents the percentages by magazine genre.

Table 5.2: Percentage of Articles Analyzed According to AR 2: Economic, Ecological and Health Predictions

		Classification		
		Economic Predictions	Ecological Predictions	Health Predictions
Genre	Sports and Recreation (n=20)	25.5	15.0	5.0
	Business (n=13)	61.5	15.4	0.0
	Editorial (n=11)	54.5	45.5	9.1
	News (n=24)	45.8	12.5	4.2
	Science (n=8)	12.5	12.5	0.0
All Genres (n=76)		40.8	18.4	3.9

Note: Articles in the study could be inclusive of multiple predictions; therefore, it is important to acknowledge that the rows do not sum to 100% (as compared to Table 5.1).

AR 3: SOURCES OF ACID RAIN

Of the 76 articles analyzed according to AR 3, 32.9% of articles asserted that the precursors of acid rain were human induced, 1.3% asserted that the precursors formed from natural origins, 19.7% attributed the precursors to a combination of manmade and natural sources, 3.9% claimed that not enough information was known at the time, while 42.2% did not include information on the sources of acid rain. Table 5.3 presents the percentages by magazine genre.

Table 5.3: Percentage of Articles Analyzed According to AR 3: Sources of Acid Rain

		Classification				
		Human Induced	Natural	Combination	Not Enough Information Known	Not Inclusive
Genre	Sports and Recreation (n=20)	45.0	0.0	20.0	0.0	35.0
	Business and Industry (n=13)	7.7	7.7	7.7	7.7	69.2
	General Editorial (n=11)	63.6	0.0	18.2	0.0	18.2
	News (n=24)	25.0	0.0	20.8	4.2	50.0
	Science (n=8)	25.0	0.0	37.5	12.5	25.0
All Genres (n=76)		32.9	1.3	19.7	3.9	42.1

AR 4: CONSEQUENCES OF ACID RAIN

Of the 76 articles analyzed according to AR 4, 82.9% of the articles included ecological consequences, 32.9% economic consequences, 25.0% health problems, 51.3% international consequences, 21.1 % structural damage, 14.5% unforeseen problems, while 2.6% of articles claimed that acid rain causes no problems. Articles could be inclusive of multiple classifications, as this is not a cumulative percent. Table 5.4 presents the percentages by magazine genre.

Table 5.4: Percentage of Articles Analyzed According to AR 4: Consequences of Acid Rain

		Classification						
		Ecological Conse-quences	Economic Conse-quences	Health Problems	Inter-national Problems	Structural Damage	Unfore-seen Problems	No Problems
Genre	Sports and Recreation (n=20)	90.0	50.0	25.0	50.0	10.0	5.0	0.0
	Business and Industry (n=13)	30.8	7.7	0.0	23.1	0.0	46.2	15.4
	Editorial (n=11)	100.0	45.5	54.5	63.6	63.6	18.2	0
	News (n=24)	91.7	29.2	29.2	62.5	16.7	4.2	0
	Science (n=8)	100.0	25.0	12.5	50.0	37.5	12.5	0
All Genres (n=76)		82.9	32.9	25.0	51.3	21.1	14.5	2.6

Note: Articles in the study could be inclusive of multiple consequences of acid rain; therefore, it is important to acknowledge that the rows do not sum to 100%.

AR 5: LEGISLATIVE ATTITUDE

Of the 76 articles analyzed by AR5, 19.7% percent of authors suggested that costs imposed on the industry due to stricter regulations will be unreasonable, 9.2% suggest that additional regulation might be beneficial, but acknowledges the substantial cost of implementing regulation, while 17.1% of authors asserted that the benefits of legislative action would outweigh any costs associated with legislative action. Table 5.5 presents the percentages by magazine genre.

Table 5.5: Percentage of Articles Analyzed According to AR 5: Legislative Attitude

		Classification		
		Unreasonable costs resulting from regulations	Costs resulting from legislation will be substantial but provide benefits	Benefits outweigh any costs associated with legislation
Genre	Sports and Recreation (n=20)	5.0	5.0	30.0
	Business (n=13)	38.5	7.7	0.0
	Editorial (n=11)	27.3	18.2	45.5
	News (n=24)	25.0	12.5	8.3
	Science (n=8)	0.0	0.0	0.0
All Genres (n=76)		19.7	9.2	17.1

Note: Articles in the study could be inclusive of statements illustrating opposing views of the issue; therefore, it is important to acknowledge that the rows do not sum to 100%.

AR 6: TONE

Of the 76 articles analyzed by Acid Rain Category VI, 35.5% of articles were classified as highly environmental, 28.9% were classified as somewhat environmental, 23.7% classified as neutral/news-oriented, 6.6% classified as somewhat industrial, and 5.3% classified as highly industrial. Table 5.6 presents the percentages by magazine genre.

Table 5.6: Percentage of Articles Analyzed According to AR 6: Tone

		Classification				
		Highly environ-mental	Somewhat environ-mental	Neutral	Somewhat industrial	Highly industrial
Genre	Sports and Recreation (n=20)	65.0	25.0	5.0	5.0	0.0
	Business and Industry (n=13)	7.7	7.7	23.1	30.8	30.8
	General Editorial (n=24)	54.5	36.4	9.1	0.0	0.0
	News (n=11)	16.7	33.3	50.0	0.0	0.0
	Science (n=8)	37.5	50.0	12.5	0.0	0.0
All Genres (n=76)		35.5	28.9	23.7	6.6	5.3

5.2 CFCs FREQUENCIES

CFC 1: NORMATIVE, POSITIVE AND NEUTRAL STATEMENTS

Of the 38 articles analyzed, 26.3% were classified as containing environmental normative characteristics, 47.4% contain environmental positive characteristics, 18.4% were classified as neutral or were news-based, 7.9% contain normative characteristics from an industrial standpoint, and none contain positive characteristics from an industrial standpoint. Table 5.7 presents the percentages by magazine genre.

Table 5.7: Percentage of Articles Analyzed According to CFC 1: Normative, Positive and Neutral Statements

		Classification				
		Normative Nature	Positive Nature	Neutral	Positive Industry	Normative Industry
Genre	Sports and Recreation (n=1)	100.0	0.0	0.0	0.0	0.0
	Business and Industry (n=4)	25.0	50.0	0.0	0.0	25.0
	General Editorial (n=3)	66.7	0.0	33.3	0.0	0.0
	News (n=20)	30.0	45.0	20.0	0.0	5.0
	Science (n=10)	0.0	20.0	10.0	0.0	2.6
All Genres (n=38)		26.3	47.4	18.4	7.9	100.0

CFC 2: ECONOMIC, ECOLOGICAL AND HEALTH PREDICTIONS

The research indicates that 18.4% of the articles included economic predictions, 10.5% included ecological predictions, and 34.2% included health predictions. It is important to note that articles could be inclusive of one or more types of predictions, and that this is not a cumulative percent. Table 5.8 presents the frequency statistics from the articles organized by magazine genre according to CFC 2: Economic, Ecological and Health Predictions.

Table 5.8: Percentages of Articles Analyzed According to CFC 2: Economic, Ecological and Health Predictions

		Classification		
		Economic Predictions	Ecological Predictions	Health Predictions
Genre	Sports and Recreation (n=1)	100.0	100.0	100.0
	Business (n=4)	50.0	25.0	50.0
	Editorial (n=3)	0.0	0.0	66.7
	News (n=20)	20.0	10.0	40.0
	Science (n=10)	0.0	0.0	0.0
All Genres (n=38)		18.4	10.5	34.2

Note: Articles in the study could be inclusive of multiple predictions; therefore, it is important to acknowledge that the rows do not sum to 100%.

CFC 3: SOURCES ATTRIBUTED TO THE DEPLETION OF THE OZONE LAYER

Of the 38 articles analyzed according to CFC 3, 57.9% of articles asserted that the depletion of the ozone layer correlated with human induced sources (specifically CFCs), 7.9% attributed ozone depletion to natural sources, 18.4% attributed ozone depletion to a combination of manmade and natural sources, while 7.9% stated that not enough information was known at the time. Table 5.9 presents the percentages by magazine genre.

Table 5.9: Percentage of Articles Analyzed According to CFC 3: Sources Attributed to the Depletion of the Ozone Layer

		Classification				
		Human Induced Sources	Natural	Combination	Not Enough Information Known	Not Included
Genre	Sports and Recreation (n=1)	0.0	0.0	100.0	0.0	0.0
	Business and Industry (n=4)	100.0	0.0	0.0	0.0	0.0
	General Editorial (n=3)	66.7	0.0	33.3	0.0	0.0
	News (n=20)	60.0	10.0	15.0	10.0	5.0
	Science (n=10)	40.0	10.0	20.0	10.0	20.0
All Genres(n=38)		57.9	7.9	18.4	7.9	7.9

CFC 4: CONSEQUENCES OF OZONE DEPLETION

The results indicate that of the 38 articles analyzed according to CFC 4, 36.8% of the articles included ecological consequences, 5.2% economic consequences, 78.9% health problems, 55.3% international consequences, 21.1 % agricultural damage, 94.7% atmospheric disturbances, 15.8% unforeseen problems, while 18.4% of articles claimed that CFCs had not been proven to cause harm. Articles could be inclusive of multiple classifications, as this is not a cumulative percent. Table 5.10 presents the percentages by magazine genre.

Table 5.10: Percentage of Articles Analyzed According to CFC 4: Consequences of Ozone Depletion

		Classification							
		Eco-logical Conse-quences	Eco-nomic Conse-quences	Health Problems	Inter-national Problems	Agri-cultural Damage	Atmo-spheric Distur-bances	Unfore-seen Problems	No Problems
Genre	Sports and Recreation (n=1)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
	Business and Industry (n=4)	25.0	0.0	75.0	75.0	75.0	100.0	0.0	25.0
	Editorial (n=3)	33.3	0.0	100.0	0.0	0.0	100.0	0.0	0.0
	News (n=20)	30.0	5.0	80.0	55.0	20.0	100.0	20.0	15.0
	Science (n=10)	50.0	0.0	70.0	60.0	0.0	80.0	10.0	30.0
All Genres(n=38)		36.8	5.3	78.9	55.3	21.1	94.7	15.8	18.4

Note: Articles in the study could be inclusive of multiple consequences of ozone depletion; therefore, it is important to acknowledge that the rows do not sum to 100%.

CFC 5: LEGISLATIVE ATTITUDE

The results indicate that of the 38 articles analyzed by CFC 5, 28.9% of authors suggested that costs imposed on industry due to stricter regulations will be unreasonable, 26.3% suggest that additional regulation might be beneficial, but acknowledges the substantial cost of implementing regulation, while 13.2% of authors asserted that the benefits of legislative action would outweigh any costs associated with legislative action. Table 5.11

presents the percentages by magazine genre.

Table 5.11: Percentages of Articles Analyzed According to CFC 5: Legislative Attitude

		Classification		
		Unreasonable costs resulting from regulations	Costs resulting from legislation will be substantial but provide benefits	Benefits outweigh any costs associated with legislation
Genre	Sports and Recreation (n=1)	0.0	0.0	0.0
	Business (n=4)	75.0	100.0	25.0
	Editorial (n=3)	0.0	0.0	33.3
	News (n=20)	25.0	25.0	15.0
	Science (n=10)	30.0	10.0	0.0
All Genres (n=38)		28.9	26.3	13.2

Note: Articles in the study could be inclusive of statements illustrating opposing views of the issue; therefore, it is important to acknowledge that the rows do not sum to 100%.

CFC 6: TONE

The results indicate that of the 38 articles analyzed by CFC 6, 36.8% of articles were classified as pro-environmental/pro-action, 42.1% were classified as somewhat environmental, 13.2% classified as neutral/news-oriented, 0.0% classified as pro-industry/anti-action, and 5.3% classified as somewhat industrial. Table 5.12 presents the percentages by magazine genre.

Table 5.12: Percentage of Articles Analyzed According to CFC 6: Tone

		Tone				
		Highly Environ-mental	Somewhat Environ-mental	Neutral	Somewhat Industrial	Highly Industrial
Genre	Sports and Recreation (n=1)	100.0	0.0	0.0	0.0	0.0
	Business and Industry (n=4)	25.0	50.0	0.0	25.0	0.0
	General Editorial (n=3)	66.7	0.0	33.3	0.0	0.0
	News (n=20)	40.0	40.0	15.0	5.0	0.0
	Science (n=10)	20.0	60.0	10.0	10.0	0.0
All Genres (n=38)		36.8	42.1	13.2	7.9	0.0

5.3 EVALUATING THE QUALITITATIVE TRENDS OF MASS MEDIA COVERAGE

I hypothesized that journalists will frame information with an environmental or industrial tone based upon magazine genre. From the information provided by the content analysis, articles classified by tone as "Highly Environmental", "Somewhat Environmental", "Neutral", "Somewhat Industrial", and "Highly Industrial" were given values of 2, 1, 0, -1, and -2, respectively, for both acid rain and CFC articles. A genre with a mean closer to 2 will be highly environmental leaning, while a mean closer to 0 is considered neutral, and a mean of -2 will be highly industrially leaning. The test procedure for evaluating the research hypothesis that the media frames issues in a certain tone is as follows:

$H_0 : \mu = 0$ (that is, the tone of magazine genres will be neutral)

$H_1 : \mu \neq 0$ (that is, the tone of magazine genres will not be neutral)

ANALYSIS OF TONE BY GENRE FOR ACID RAIN

For the Sports and Recreation, General Editorial, and News genre, we reject the null hypothesis and conclude that the tones of these genres are environmentally leaning. For the Business and Industry genre, we reject the null hypothesis and conclude that the tone is industrially leaning. The t-test results are shown in Table 5.13.

Table 5.13: T-Test Results for AR 6: Tone

Genre	N	Mean	Standard Deviation
Sports and Recreation*	20	1.50	0.83
Business and Industry*	13	-0.69	1.25
General Editorial*	11	1.45	0.69
News*	24	0.67	0.76
Science*	8	1.25	0.71

Note: Genres denoted by: (*) indicate significance from 0 at the 0.1 level.

ANALYSIS OF TONE BY GENRE FOR CFCs

For the News and Science genre, we reject the null hypothesis and conclude that the tone of these genres is environmentally leaning. For the Business and Industry and General Editorial genre, we cannot reject the null hypothesis, indicating these genres present a more neutral tone. The Sports and Recreation genre was not included in this test based on the quantity of one article found in the study. The t-test results are shown in Table 5.14.

Table 5.14: T-Test Results for CFC 6: Tone

Genre	N	Mean	Standard Deviation
Business and Industry	4	0.75	1.26
General Editorial	3	1.33	1.16
News*	20	1.15	1.56
Science*	10	0.90	0.876

Note: Genres denoted by: (*) indicate significance from 0 at the 0.1 level.

ANALYSIS OF NORMATIVE, POSTIVE AND NEUTRAL STATEMENTS FOR ACID AND CFCs

I hypothesized that the diction used by journalists will not depend on magazine genre. Similarly to the analysis of tone by genre, articles classified as using terminology described as "Normative Nature", "Positive Nature", "Neutral", "Positive Industry", and "Normative Industry" were assigned values of 2, 1, 0, -1, and -2, respectively. A genre with a mean closer to 2 will use diction with a more persuasive tone in favor of the environment, a mean closer to 1 will use diction more objectively stated that is more environmentally based, a mean closer to 0 is considered more neutral, a mean closer to -1 will use diction more objectively that is more industry-based, and a mean of -2 will use diction with a more persuasive tone in favor of industrial standpoints. Acid rain articles and CFCs articles were combined to evaluate this issue collectively. The test procedure for evaluating the research hypothesis that the diction used by the media is not neutral is as follows:

$H_0 : \mu = 0$ (that is, the diction of magazine genres will be neutral)

$H_1 : \mu \neq 0$ (that is, the diction of magazine genres will not be neutral)

For the Sports and Recreation and General Editorial genre, we reject the null hypothesis and conclude that the diction falls between "Normative Nature" and "Positive Nature" with mean values of 1.55 and 1.35, respectively. For the News and Science genre, we reject the null

hypothesis and conclude that the diction can be classified as "Positive Nature" with mean values of 0.75 and 0.89, respectively. It is important to note that these results are affected by the sample size. For the Business and Industry genre, we reject the null hypothesis and conclude that the diction can be classified as more "Positive Industry". No genres resulted in diction described as "Normative Industry". The t-test results are shown in Table 5.15.

Table 5.15: T-Test Results for Diction

Genre	N	Mean	Standard Deviation
Sports and Recreation*	21	1.33	0.80
Business and Industry*	17	-0.65	1.41
General Editorial*	14	1.36	0.75
News*	44	0.75	0.92
Science*	18	0.89	0.90

Note: Genres denoted by: (*) indicate significance from 0 at the 0.1 level.

CHAPTER 6

DISCUSSION

6.1 EVALUATING JOURNALSTIC NORMS: OVERALL OBSERVATIONS

This section addresses the general conclusions from the results presented in sections 5.1 and 5.2. The purpose of the section is to address the most telling observations from the research results. These findings can be combined with the analysis of the tone and diction further discussed to observe parallels in the frames found in environmental coverage.

By looking at the results from AR 2 and CFC 2, there is some evidence that journalists use predictions to engage their readership; these scientific predictions exhibit the ability of the media to turn a general audience member into a potential stakeholder. With regard to acid rain, the general public showed concern over the ecological outcomes, as reflected by their acceptance of bearing regulatory costs in order to protect a region's ecological heritage (Visgilio, 2007). The AR 2 results indicate that 40.8% of all genres include economic predictions and 18.4% include ecological predictions. Comparatively the public's concern revolved around the health threats involving CFCs' role in ozone depletion, specifically that of skin cancer (Mazur, 2006). The CFC 2 results indicate that 34.2% of all genres include health predictions, while only 18.4% and 10.5% include economic and ecological predictions, respectively. While environmental risks presented by the news media do not possess actual news value, risks are an abstraction about the possibility of damage that will occur from environmental threats (Allan, et al., 2000).

This research seeks to determine how journalists convey accusations of environmental threats whether as human induced or attributed to natural factors. This is particularly relevant currently as the debate about the definitive causes of global warming is currently being played out in the media. Overall, uncertainties are evident in the more divisive issue of acid rain as 32.9% of all genres contributed the sources of acid rain as human induced, while a larger majority of 57.9% of articles cited human induced sources, specifically CFCs, to the destruction of the ozone layer. However only 1.3 and 7.9% contributed environmental consequences occurring from natural sources for acid rain and ozone depletion, respectively. While a large majority of magazines did not take an obvious stance on the source of acid rain and ozone depletion, it is evident that journalists were more likely to attribute sources as human induced as opposed to natural causes.

Similarities can be identified in the means in which journalists convey the consequences of acid rain and CFCs. The AR 4 and CFC 4 results indicate that a high percentages of journalists addressed ecological, health, and international consequences that could emerge from the respective issue. Specifically, articles on acid rain included threats of structural damage while articles on CFCs concentrated on agricultural damage and atmospheric disturbances. By focusing on the threats of environmental issues in the media, journalists are able to raise apprehension among audiences. While additional research, with more diversity on subject matter, is needed to support any broad inferences, the findings of this study suggest a form of journalistic writing in which consumers are presented with information with the ability to turn audiences into invested stakeholders.

6.2 EVALUATING JOURNALISTIC NORMS: TONE

Our results indicate that the articles on acid rain in most magazine genres were environmentally leaning in tone. The Sports and Recreation genre was the most environmentally leaning with a mean of 1.50, followed by General Editorial (1.45), Science (1.25), and News (0.67). Business and Industry had a mean of -0.69, indicating an industrial leaning tone. For articles involving CFCs, all articles were environmentally leaning in the following ascending order: General Editorial (1.33), News (1.15) and Science (0.90). Unlike for acid rain, Business and Industry magazines exhibited an environmental tone of CFC coverage.

It is not surprising that the Sports and Recreation mean tone value fell between highly and somewhat environmental; articles in this category emphasized the threats of acid rain to recreational activities, especially fishing with some inferences to hiking and camping. With headlines and stories describing the apparent "doom" arising to fishing as a recreational activity, readers were left with an overall impression that the ecological effects of acid rain would devastate their recreational livelihoods (Boyle, 1984). For this genre, we conclude that readers were provided with information that would raise apprehension about acid rain, affecting their position as a stakeholder. Because the risks of CFCs and ozone depletion were not associated with recreational activities, only one article was found under the Sports and Recreational genre involving CFCs.

The General Editorial genre resulted in similar means of 1.45 and 1.33 for acid rain and CFCs, respectively. This genre was inclusive of magazines that have a broad audience base, as well as magazines in which no other category was deemed appropriate. Our results imply that the news media will frame issues in a manner that favors the environment when presenting messages to a more general audience. The mass media is a key source of

information involving environmental issues to the general public; the media acts as a translator between the scientist and the reader (Boykoff & Boykoff, 2007). The overall message was environmentally leaning to audience members that might not be as observably invested as other specific stakeholder groups. Our research raises the question of whether journalists intentionally frame information in an environmentally favoring tone, or does it occur consequently because journalists receive information from scientists that study the environment and thus already an underlying bias favorable to the environmental view?

Our research indicates that the Science genre was environmentally leaning with a mean value of 1.25 for acid rain, which is not surprising given the research from the scientific community at the time indicated that acid rain adversely affected the environment. Consensus among ecological scientists at the time was largely due to high quality of time series analysis of both rainfall pH and surface water acidity, which was of high value for demonstrating the trends in acid deposition and surface water pH (Visgilio, 2007). My research reflects the consensus of the scientific community, as well as the results from the research at the time, to the high mean value for the Science genre involving acid rain. The Science genre, as applied to articles for CFCs, was noticeably lower, which is surprising in the context of this research. The conflict involving CFCs was far less controversial than acid rain; we would have expected this genre to have a higher mean value. Ozone depletion generated less policy conflict, and policies to control CFCs were implemented with far less objections compared to acid rain. Because acid rain was a more controversial issue at the time, we suggest that scientific journalists were more compelled

to advocate with a stronger environmental tone compared to CFCs, which would account for the differences within the mean values.

For the magazines that were included in the News genre, we find that journalists framed information that was slightly more leaning in favor of the environment than neutral. While it would be expected for this middle-ground genre of media sources to report on issues with a more objective and neutral tone, again we find that more general audiences were provided with messages that were environmentally leaning.

The Business and Industry genre was the only genre to frame information in an industrial leaning tone and only in the case of acid rain. This tendency is indicative of the industry's opposition to legislation that would create technological costs to the clean up problem caused by acid rain. Contrary to acid rain, the Business and Industry genre was more environmentally leaning for articles involving CFCs with a mean value of 0.75. Interestingly, not one article fell under the classification of "Highly Industrial". We attribute these findings to the less divisive nature of the industry's standing involving CFCs and ozone depletion; industry producers were presented with the opportunity to find technological innovations to gain competitive advantages in response to the challenge of phasing out CFCs (World Resources Institute., et al., 1996).

My research seeks to determine what we can be inferred about the means in which the media provides information to its readers. From studying the tone in which environmental issues are framed, I posit that general audiences are provided with more environmentally leaning messages, as opposed to being given a more general, objective point of view, when it comes to environmental messages in the news media. These findings complement the studies by Boykoff & Boykoff (2007), which concludes that the explicit

principles of journalism such as: objectivity, fairness, balance, and comprehensiveness have proven to be more of an ideal than an actual practice. They further iterate that media coverage involving anthropogenic climate change has been biased due to journalistic norms such as: dramatization, personalization, novelty, balance and authority-order.

Whether or not journalists intentionally frame issues in favor of a certain position, some competing viewpoints are emphasized in the media while others are excluded; members of these competing stakeholder groups become claims-makers when they articulate their perspective (Allan, et al., 2000). Therefore, information is presented to the public about how to view certain issues, rather than being presented with the facts of news-oriented events, which we associate with media coverage. The question is then raised if the media is a more environmentally leaning entity, or are journalist simply influenced by the scientists providing the evidence, which results in scientific matters in the media being framed in a more environmentally leaning tone? Further research is needed in this area to address these topics. Regardless of journalists' intentions, I posit that the majority of journalism involving magazine publications will provide generalized audiences with information that favors the environment when studying environmental issues with policy processes.

Additionally, my study finds that more targeted audiences are provided with information in which explicit framing occurs that further enhances their position as invested stakeholders, as seen in the Science genre for acid rain and CFCs, as well in the Sports and Recreation and Business and Industry genres for acid rain. While these results suggest that journalists do in fact tailor information to its readers based upon assumed stakeholder positions, it is also important to consider how the public gathers information

surrounding environmental issues. Psychological literature asserts that individuals seek information that confirms pre-existing beliefs, ideals, and expectations, termed confirmation bias (Klayman, Jerome Busemeyer, & Douglas, 1995; Nickerson, 1998). Recent research illustrates this phenomenon by showing that consumers want to read and watch news that is consistent with their prior beliefs and tastes (Xiang & Sarvary, 2007). My study contributes to the discussion involving confirmation bias in the means that information sources such as the media present information in a limited, specifically framed manner, so that the reader is consistently provided with reaffirming information rather than given multiple viewpoints.

Combining my study with confirmation bias research, I suggest that a cycle exists in which audiences seek information sources, such as magazines, that are best tailored to their invested interests; these information sources then provide information in such a manner that continually reaffirms initial values. Therefore, for a reader to acquire a different argument on a subject matter, he or she must actively pursue another source as a means to obtain new ideologies. Future research is needed to study the relationship between media messages and reader's tendencies and preferences concerning reaffirming ideologies to fully understand the media's role in confirmation bias.

6.3 EVALUATING JOURNALISTIC NORMS: NORMATIVE, POSITIVE AND NEUTRAL STATEMENTS

My research aimed to study framing in an additional manner by evaluating the diction used by journalists to convey environmental messages. My study shows that the media phrase environmental issues in a more normative and positive manner that is environmentally

leaning for certain consumers, rather than using neutral terminology or diction that illustrates industrial viewpoints. The Sports and Recreation and General Editorial genres contained normative writing that was environmentally leaning, while the News and Science genres' diction fell between positive and neutral writing in favor of the environment. No articles resulted in diction described as writing in a normative or positive manner in favor of industry arguments.

Comparing my analysis of diction with the analysis of tone within the study, I can see parallels in framing used by journalists to convey environmental messages. The Sports and Recreation and General Editorial genres were the most environmentally leaning in tone; it reasons that these two genres employed the most subjective form of writing. As for the News and Science genres, the writing was more indicative of positive statements that were environmental in nature, however this still does not signify a more objective form of journalism due to the exclusion of industrial arguments. According to the source used to classify the genres, the News genre can be considered a more impartial source in which news events are duly reported while the Science genre is source of information for the scientific community in which research results are generally provided (Katz, 1992).While the Science and News genres refrained from using a subjective form of writing and reported information in a positive manner, again it is representative of framing used in an environmentally leaning manner.

Both the tone and diction emphasized by the journalists can be defined as "frames of communication," a form of conveying information from what the writer sees as relevant to the topic at hand (Cappella, 1997; Druckman, 2001). Implications of frames of communication are that they influence "frames of thought" upon the reader; this process is

referred to as the "framing effect" (Druckman, 2001). Again we see that the journalism frames evaluated in this study provides consumers with the means of how to view the environmental issue at hand. Journalists using normative terminology assert a powerful ideology of what "should be"; in the context of my study this translates into "what should be done" to prevent harm from the threats of acid rain and CFCs. Journalists using positive terminology focused on "what is" involving the events surrounding acid rain and CFCs; while this is a more objective form of writing, again only the environmental side of the dispute was portrayed. While my study can assess frames of communication provided by the media, additional research in this field is necessary to determine how frames of thought evolve surrounding environmental issues to understand the overall framing effect.

6.4 CONCLUSION

This study confirms the importance of studying journalistic norms found in mass media outlets such as magazines. By critically reviewing qualitative information found in the media using content analysis, this research illustrates how the dynamics of journalistic framing can be an influential tool in public perception and policy formation. By studying the frames found in environmental media coverage, my study concludes that general audiences are provided with more environmentally leaning messages, while more specific audiences are provided with messages that affirm their positions as stakeholders. Additionally I find that journalists consistently use normative and positive diction in a manner exclusive of environmental viewpoints. These findings can aid policy makers understand the types of messages that are being conveyed to the public, and what structure the messages take relative to the issue at hand. Overall, it appears that the media provides

consumers with the values of how to view respective issues rather than providing more objective messages, which can have serious implications for policy formation and implementation.

In conclusion, while there is an existing need for further research to study the qualitative and quantitative trends of environmental media coverage, this research provides a methodology for doing so. My content analysis model can be expanded and modified to evaluate other environmental issues, as well as social and political sciences in the media. Further analyses of media coverage, environmental issues, policy processes and public perception will give us a better overall understanding of the interconnectivity and implications of these matters at hand.

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APPENDIX A

ACID RAIN ARTICLES INCLUDED IN STUDY

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APPENDIX B

CFC ARTICLES INCLUDED IN STUDY

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Much of the damage is already done (1988). *U.S. News & World Report, 105*, 63.

Ozone defense (1989). *Time, 133*, 63.

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The hole in the ozone: can it have been the cans? (1986). *Discover, 7*, 8+.

The search for ozone-friendly refrigerants (1988). *Discover, 9*, 24+.

Try convertibles (1989). *Time, 133*, 92.

Wellborn, S. N. (1986). Putting a freeze on Freon. *U.S. News & World Report, 101*, 72.

APPENDIX C

EXAMPLES OF ACID RAIN ARTICLE CODING

Article: Boyle, R. H. (1982). When it rains. [Feature]. *Sports Illustrated, 56 part Sp Issue*, 72.

Genre: Sports and Recreation

AR 1	• Normative, Positive and Neutral Statements: Positive Nature
AR 2	• Economic Predictions: Not inclusive • Ecological Predictions: Not inclusive • Health Predictions: Not inclusive
AR 3	• Source of Acid Rain: Not Inclusive
AR 4	• Ecological Consequences: Inclusive • Economic Consequences: Not inclusive • Health Problems: Not inclusive • International Problems: Not inclusive • Structural Damage: Not inclusive • Problems Unforeseen at the Time: Not inclusive • Acid Rain Causes No Problems: Not inclusive
AR 5	• Unreasonable Costs Resulting from Legislation: Not inclusive • Costs Resulting from Legislation will be Substantial but Provide Benefits: Not inclusive • Benefits Outweigh Any Costs Associated with Legislation: Not inclusive
AR 6	• Tone: Somewhat Environmental

Article: Michelmore, P. (1984). Our trees are dying. *Reader's Digest, 125*, 157-161.

Genre: General Editorial

AR 1	• Normative, Positive and Neutral Statements: Normative Nature
AR 2	• Economic Predictions: Not inclusive • Ecological Predictions: Not inclusive • Health Predictions: Not inclusive
AR 3	• Source of Acid Rain: Not Inclusive
AR 4	• Ecological Consequences: Inclusive • Economic Consequences: Inclusive • Health Problems: Not inclusive • International Problems: Not inclusive • Structural Damage: Not inclusive • Problems Unforeseen at the Time: Not inclusive • Acid Rain Causes No Problems: Not inclusive
AR 5	• Unreasonable Costs Resulting from Legislation: Not inclusive • Costs Resulting from Legislation will be Substantial but Provide Benefits: Inclusive • Benefits Outweigh Any Costs Associated with Legislation: Not inclusive
AR 6	• Tone: Highly Environmental

Article: Brown, W. M. (1986). Hysteria about acid rain. *Fortune, 113*, 125-126.

Genre: Business and Industry

AR 1	• Normative, Positive and Neutral Statements: Normative Industry
AR 2	• Economic Predictions: Not inclusive • Ecological Predictions: Not inclusive • Health Predictions: Not inclusive
AR 3	• Source of Acid Rain: Not Inclusive
AR 4	• Ecological Consequences: Not inclusive • Economic Consequences: Not inclusive • Health Problems: Not inclusive • International Problems: Not inclusive • Structural Damage: Not inclusive • Problems Unforeseen at the Time: Not inclusive • Acid Rain Causes No Problems: Inclusive
AR 5	• Unreasonable Costs Resulting from Legislation: Inclusive • Costs Resulting from Legislation will be Substantial but Provide Benefits: Not inclusive • Benefits Outweigh Any Costs Associated with Legislation: Not inclusive
AR 6	• Tone: Highly Industrial

APPENDIX D

EXAMPLES OF CFC ARTICLE CODING

Article: Beck, M. (1988). More bad news for the planet. *Newsweek, 111*, 63+.

Genre: News

CFC 1	• Normative, Positive and Neutral Statements: Positive Nature
CFC 2	• Economic Predictions: Not inclusive • Ecological Predictions: Not inclusive • Health Predictions: Inclusive
CFC 3	• Sources Attributed to Ozone Depletion: Human Induced
CFC 4	• Ecological Consequences: Inclusive • Economic Consequences: Not inclusive • Health Problems: Inclusive • International Problems: Inclusive • Agricultural Damage: Inclusive • Atmospheric Disturbances: Not inclusive • Problems Unforeseen at the Time: Not inclusive • CFCs Causes No Problems: Not inclusive
CFC 5	• Unreasonable Costs Resulting from Legislation: Not inclusive • Costs Resulting from Legislation will be Substantial but Provide Benefits: Not inclusive • Benefits Outweigh Any Costs Associated with Legislation: Not

	inclusive
CFC 6	• Tone: Highly Environmental

Article: Citron, M. (1988). The hole truth. *Discover, 9*, 72-73.

Genre: Science

CFC 1	• Normative, Positive and Neutral Statements: Positive Nature
CFC 2	• Economic Predictions: Not inclusive • Ecological Predictions: Not inclusive • Health Predictions: Not inclusive
CFC 3	• Sources Attributed to Ozone Depletion: Human Induced
CFC 4	• Ecological Consequences: Not inclusive • Economic Consequences: Not inclusive • Health Problems: Inclusive • International Problems: Inclusive • Agricultural Damage: Not inclusive • Atmospheric Disturbances: Not inclusive • Problems Unforeseen at the Time: Not inclusive • CFCs Causes No Problems: Not inclusive
CFC 5	• Unreasonable Costs Resulting from Legislation: Not inclusive • Costs Resulting from Legislation will be Substantial but Provide Benefits: Not inclusive • Benefits Outweigh Any Costs Associated with Legislation: Not inclusive
CFC 6	• Tone: Somewhat Environmental