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Our Neighbor's Keeper? The United States and Canada: Coping with Transboundary Air Pollution

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Abstract

This Note will review the scientific research and evidence that support the existence of an acid rain phenomenon, and discuss the principles of international law that apply to a transboundary air pollution problem. The recognition and application of these legal principles to cases of interstate pollution and resource sharing in the United States will then be discussed. This Note will examine recent attempts to seek a solution to the North American acid rain problem through the negotiation of a bilateral treaty, and through Canadian resort to the courts of the United States. This Note will conclude that the only viable solution to this problem of transboundary acid deposition is for the United States to enact legislation in compliance with international standards.

OUR NEIGHBOR'S KEEPER? THE UNITED STATES AND CANADA: COPING WITH TRANSBOUNDARY AIR POLLUTION

Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.[1]

INTRODUCTION

Acid deposition or acid rain, as it is popularly known,[2] and its environmental impacts[3] provide an example of the ruin that the earth can suffer when nations pursue only their own short term interests and ignore the damage that their actions may inflict on neighboring States.[4] The problem of acid deposition on the North American continent is one with economic, environmental, and legal significance. Prevailing wind currents[5]

1. Hardin, *The Tragedy of the Commons*, SCI., Dec. 1968, at 1243-44. As rational beings, men seek to maximize their own gain. Rational man finds that the cost of simply releasing industrial waste products and other pollutants into the atmosphere is less than the cost of purifying these wastes before releasing them. This short-sighted pursuit of self interest locks man into a system of fouling his own nest. *Id.*

2. The term "acid rain" was first used by R.A. Smith in an 1872 study of the chemistry of precipitation and how it is influenced by combustion, decomposition of organic material, wind direction, and ocean proximity. Smith noted that the presence of sulfur in the air caused damage to plant life, textiles, and metals. Cowling, *Acid precipitation in historical perspective*, 16 ENVTL. SCI. TECH. 110A, 111A (table 1) (1982) (referring to R.A. SMITH, AIR AND RAIN: THE BEGINNING OF CHEMICAL CLIMATOLOGY (London 1872), *reprinted in* ACID PRECIPITATION: EFFECTS ON ECOLOGICAL SYSTEMS 43-44(D'Itri ed. 1982)). In a study performed in Sweden in 1734, a scientist noted the damage to the environment caused by the release of sulfur into the atmosphere and described its effects: "we felt a strong smell of sulfur, . . . rising to the west of the city . . . a poisonous, pungent sulfur smoke, poisoning the air wide around . . . corrod[ing] the earth so that no herbs can grow around it." *Id.* (quoting C.V. LINNE, DALARESA ITER DALEKARLICUM (Stockholm 1964)).

3. For a detailed review of environmental impacts of acid deposition, see *infra* notes 50-80 and accompanying text.

4. *See supra* note 1 and accompanying text.

5. Wind currents in the eastern portion of North America are primarily eastward and northeastward. UNITED STATES COMPTROLLER GENERAL, GENERAL ACCOUNTING OFFICE, PUB. NO. GAO/RCED-85-13, AN ANALYSIS OF ISSUES CONCERNING "ACID RAIN," 59 (1984) [hereinafter cited as "COMPTROLLER GENERAL'S REPORT"]; Likens, Wright, Galloway & Butler, *Acid Rain*, SCI. AM., Oct. 1979, at 43, 49 [hereinafter cited as "Likens, *Acid Rain*"]. The transboundary nature of pollution was remarked on as long ago as 1661, when the transboundary exchange of pollutants between England and France was observed and the influence of industrial emissions on the health of plants and people was noted. Cowling, *supra* note 2, at 111A (table 1) (referring to J.

drive pollutants emitted in the midwestern United States, and the acid deposition formed by these pollutants, hundreds of miles north and east, inflicting environmental damage on the northeastern United States and on Canada. Despite the severity of this shared environmental crisis,[6] the United States and Canada have been unable to adopt a unified approach.[7] Both nations have recognized their obligation to develop and implement policies to combat the impact of acid deposition under the 1979 Geneva Convention on Long-Range Transboundary Air Pollution.[8] Only Canada, however, has progressed past the developmental stage and, as a party to the 1984 Declaration on Acid Rain,[9] begun to implement policies designed to reduce the sulfur dioxide emissions that cause acid deposition.[10] Unsatisfied with the seeming wealth of scientific evidence[11] of the acid rain problem, the United States is continuing to research rather than act on the problem of acid deposition.[12] It is this

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EVELYN, FUMIFUGIUM (London 1661), *reprinted in* ACID PRECIPITATION: EFFECTS ON ECOLOGICAL SYSTEMS 43-44 (D'Itri ed. 1982)); *see also infra* notes 40-46 and accompanying text (discussion of the current evidence on the movement of pollutants).

6. *See infra* notes 50-70 and accompanying text (description of the physical and economic effects of acid deposition on aquatic and terrestrial ecosystems).

7. *See infra* notes 183-92 and accompanying text (examination of United States and Canadian efforts to negotiate a settlement to the North American acid deposition problem since the signing of a Memorandum of Intent in 1980); Memorandum of Intent on Transboundary Air Pollution, Aug. 5, 1980, United States-Canada, — U.S.T. —, T.I.A.S. No. 9856 [hereinafter cited as "Memorandum of Intent"].

8. The 1979 Convention on Long-Range Transboundary Air Pollution, Nov. 16, 1979, — U.S.T. —, T.I.A.S. No. 10541, 18 I.L.M. 1442, *reprinted in* 6 ENVTL. POL'Y & L., Feb. 15, 1980, at 37-40 [hereinafter cited as "The 1979 Convention"]. Article 3 of the Convention provides that "[t]he contracting Parties . . . shall by means of exchanges of information, consultation, research and monitoring, develop without undue delay policies and strategies . . . as a means of combating the discharge of air pollutants. . . ." *Id.*, 18 I.L.M. at 1443.

9. Declaration on Acid Rain, March 21, 1984, 23 I.L.M. 662 [hereinafter cited as "1984 Declaration"]; *see infra* note 176.

10. The Canadian cabinet ratified a federal-provincial agreement to reduce eastern Canada's sulfur dioxide emissions by 50% from 1980 levels, to 2.3 million tons by 1994. *Government Launches New Acid Rain Plan Stressing Cuts in Auto, Smelter Emissions*, INT'L ENV'T REP. (BNA) (Current Report) at 84-85 (Mar. 13, 1985).

11. The 1,660 entries in a bibliography of material published on the problem of acid deposition from the late 1800's through December, 1981, demonstrates the enormous amount of information available. UNITED STATES GEOLOGICAL SURVEY, U.S. DEP'T. OF THE INTERIOR, CIRCULAR 923, ACID PRECIPITATION: AN ANNOTATED BIBLIOGRAPHY (1984); *see infra* notes 50-80 and accompanying text (discussing scientific evidence of damage due to acid deposition).

12. The United States is without support in its contention that more research on

reluctance of the United States to take action which underlies the North American dispute.

This Note will review the scientific research and evidence that support the existence of an acid rain phenomenon,[13] and discuss the principles of international law that apply to a transboundary air pollution problem.[14] The recognition and application of these legal principles to cases of interstate pollution and resource sharing in the United States will then be discussed.[15] This Note will examine recent attempts to seek a solution to the North American acid rain problem through the negotiation of a bilateral treaty,[16] and through Canadian resort to the courts of the United States.[17] This Note will conclude that the only viable solution to this problem of transboundary acid deposition is for the United States to enact legislation in compliance with international standards.[18]

I. *A DEFINITION OF THE ACID RAIN PHENOMENON*

The popular term acid rain[19] describes only half of the problem of acid deposition.[20] The dominant precursors[21] of

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acid rain is necessary before control measures can be implemented. *See infra* notes 182, 190 and accompanying text.

13. For a definition of the acid rain phenomenon, see *infra* notes 19-39 and accompanying text.

14. *See infra* notes 91-121 and accompanying text (discussing the principles underlying the development of international environmental law).

15. *See infra* notes 138-50 and accompanying text (discussing the application of principles of international law to interstate pollution and resource sharing disputes by the United States Supreme Court).

16. *See infra* notes 183-93 (discussing United States and Canadian attempts to negotiate a treaty).

17. The Clean Air Act Amendments of 1977 provide a mechanism with which Canada may access United States courts. Clean Air Act Amendments of 1977, 42 U.S.C. § 7415 (1983); *see infra* notes 195-201 and accompanying text.

18. *See infra* notes 202-12 and accompanying text (discussing the solution exemplified by New York State legislation).

19. "Acid rain" or "acid precipitation" refers only to those acid compounds deposited in wet form, omitting dry deposition of some sulfur and nitrogen oxide gases and particulates. COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 1 n.1.

20. "Acid deposition refers to sulfur and nitrogen oxides [which] are chemically transformed in the atmosphere and fall to earth as acids in rain, snow, or fog, and as dry acid-forming particles." S. POSTEL, AIR POLLUTION, ACID RAIN, AND THE FUTURE OF FORESTS 5 (Worldwatch Paper No. 58, 1984) [hereinafter cited as "Worldwatch Paper"]; U.S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, Pub. No. OTA-O-204, ACID RAIN AND TRANSPORTED AIR POLLUTANTS: IMPLICATIONS FOR PUBLIC POLICY 4 (1984) [hereinafter cited as "OTA REPORT"]. Such deposition can occur in wet form as precipitation or in dry form as in gases and particles. COMPTROLLER GEN-

acid deposition are sulfur dioxide and nitrogen oxides,[22] which are emitted by anthropogenic and natural sources.[23] While all sulfur and nitrogen oxides emitted into the atmosphere must

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ERAL'S REPORT, *supra* note 5, at iv, 32; G.S. WETSTONE & A. ROSENCRANZ, ACID RAIN IN EUROPE AND NORTH AMERICA: NATIONAL RESPONSES TO AN INTERNATIONAL PROBLEM 12-13 (1983). Essentially, wet acid deposition occurs as sulfuric and nitric acids while dry deposition occurs predominately as sulfur dioxide that is transformed to sulfuric acid after deposition. COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 32. Acids entering the environment in a dry form, such as sulfate and nitrate particles or as sulfur dioxide gas form sulfuric acid, nitric acid and sulfates, respectively, upon contact with water. When these accumulated dry deposits mix with small quantities of water left on plants or other surfaces by fog, mist, frost or dew, the resulting acid solution can be more concentrated and therefore more destructive than acid solutions entering the environment through precipitation. While dry deposition is a serious concern, scientists have not yet developed the monitoring techniques necessary to define the scope of the damage caused by dry deposition. G.S. WETSTONE & A. ROSENCRANZ, *supra*, at 12-13.

21. OTA REPORT, *supra* note 20, at 265.

22. Burning fuel produces two different types of nitrogen oxides: nitric oxide and nitrogen dioxide. Since nitric oxide in the atmosphere is rapidly transformed to nitrogen dioxide, no distinction is made between the two and they are jointly referred to as nitrogen oxides. COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 34.

23. Sulfur dioxide and nitrogen oxides are emitted by fossil fuel burning power plants, smelters, vehicles and other anthropogenic and natural sources. OTA REPORT, *supra* note 20, at 265; COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 1, 34; Worldwatch Paper, *supra* note 20, at 13; G.S. WETSTONE & A. ROSENCRANZ, *supra* note 20, at 14; Glass, Arnold, Galloway, Lee, McFee, Norton, Powers, Rambo & Schofield, *Effects of Acid Precipitation*, 16 ENVTL. SCI. TECH. 162A, 162A (1982) [hereinafter cited as "Glass, *Effects of Acid Precipitation*"]; Likens, *Acid Rain*, *supra* note 5, at 43.

The sulfur dioxide and nitrogen oxide emission source breakdown for the United States and Canada is as follows:

United States (1980)		Canada (1980)	
Sulfur dioxide	Nitrogen oxide	Sulfur dioxide	Nitrogen oxide
TOTAL EMISSIONS	(million metric tons/year)		
24.1	19.3	4.77	1.83
SOURCES OF EMISSIONS			
ELECTRIC UTILTIES	(percent)		
66	29	16	13
INDUSTRIES			
22	22	32	20
HOMES, BUSINESSES			
3	4	4	5
SMELTERS			
6	1	45	1
TRANSPORTATION			
3	44	3	61

Worldwatch Paper, *supra* note 20, at 15-16 (tables 2 and 3); *see also* COMPTROLLER

eventually return to the earth's surface in either a gaseous or dry form,[24] the longer these oxides remain in the atmosphere, the more likely they are to oxidize[25] into sulfuric and nitric acids, the primary acids in "acid rain."[26] As a result, precipitation becomes acidic, and causes physical damage to the environment.[27] Such damage has been documented as far as 500 miles from emission sources.[28] Because the movement of pollutants in the atmosphere is not constrained by political boundaries, pollutants emitted in the United States not only cause serious domestic damage but also contribute greatly to environmental damage in Canada.[29]

A. *The Effect of Sulfur and Nitrogen Oxides on the Chemistry of Rain and Snow*

While precipitation is naturally acidic and natural sources can contribute to the lowering of the pH of rain,[30] man's con-

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GENERAL'S REPORT, *supra* note 5, at 35 (emissions are expressed in metric ton per source rather than percent of total per source).

The majority of the oxides involved in acid deposition are emitted by anthropogenic sources. COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 34. In fact, ninety percent of the oxides causing pollution in the Northeast come from anthropogenic sources. R.H. BOYLE & R.A. BOYLE, ACID RAIN 11-12 (1983); Shabecoff, *Acid Rain Attacks Environment Beyond Northeast*, N.Y. Times, Jan. 29, 1985, at C1, col. 4.

24. COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 33; Worldwatch Paper, *supra* note 20, at 17.

25. Oxidation is the process of adding oxygen to a chemical. Oxidizing agents are chemicals that supply the extra oxygen needed to convert sulfur dioxide to sulfate or nitrogen oxide to nitrate. When sulfate and nitrate combine with water, sulfuric acid and nitric acid are formed. OTA REPORT, *supra* note 20, at 265 n.2.

26. Worldwatch Paper, *supra* note 20, at 17.

27. The resulting physical damages are enumerated *infra* at text accompanying note 50.

28. *See infra* notes 40-48 and accompanying text (discussing the movement of acid deposition).

29. *Id.* The United States' contribution to Quebec's total acid rain problem averages 60%. *Pollution From U.S., Ontario Said Responsible For 80 Percent of Acid Rain Problem in Quebec*, INT'L ENV'T REP. (BNA) (Current Report) at 98 (Mar. 13, 1985).

30. Natural sources such as volcanic eruptions, mud flats, and sea spray can contribute to the lowering of the pH of rain. Likens, *Acid Rain*, *supra* note 5, at 43; R.H. BOYLE & R.A. BOYLE, *supra* note 23, at 11-12; G.S. WETSTONE & A. ROSENCRANZ, *supra* note 20, at 9.

The pH scale is related to acidity; it is a measure of hydrogen ion concentration. The lower the pH of a solution, the greater the concentration of hydrogen ions and the greater the acidity. Decreasing pH corresponds to increasing acidity. The pH scale is logarithmic rather than linear; therefore, a drop of one pH unit reflects a tenfold increase in acidity. The pH of chemically pure water is 7. Above 7 solutions are basic while below 7 solutions are acidic. A solution of pH 6 is ten times more

tribution to atmospheric pollution since the Industrial Revolution has caused the greatest change in the chemistry of precipitation.[31] As a result, rain has evolved, in the past two centuries, from a nearly neutral solution to an acidic one,[32] with the pH of precipitation in North America now averaging between 4 and 4.5.[33]

The water present in the atmosphere is essentially pure.[34] At normal concentrations and pressures of carbon dioxide in the atmosphere, the pH of rain and snow is 5.6.[35] However, the addition of other substances to the atmosphere shifts the "normal" pH of precipitation.[36] The addition of sulfur and nitrogen oxides, and their transformation[37] into sulfuric and nitric acids has altered the chemistry of precipitation[38] and created a pH approximately ten to thirty times more acidic than the precipitation of the pre-Industrial Revolution era.[39]

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acidic than a neutral solution of pH 7, while a solution of pH 5 is 100 times more acidic, and a pH 4 solution is 1,000 times more acidic. OTA REPORT, *supra* note 20, at 266 n.1; P. Roth, C. Blanchard, J. Harte, H. Michaels & M.T. El-Ashry, *The American West's Acid Rain Test*, WORLD RESOURCES INSTITUTE RESEARCH REP. 1, at 36 app. 1 (1985).

31. Worldwatch Paper, *supra* note 20, at 18; Likens, *Acid Rain*, *supra* note 5, at 43-44. Precipitation in the pre-Industrial Revolution era generally is believed to have had a pH of above 5. In fact, ice discovered in Greenland that originated as snow some 180 years ago was found to have a pH of approximately 7 or neutral. Likens, *Acid Rain*, *supra* note 5, at 43.

32. Likens, *Acid Rain*, *supra* note 5, at 43. In one severe episode in 1974 in Scotland, a rain with the pH level of 2.4, the acidic equivalent of vinegar, was recorded. *Id.*

33. Worldwatch Paper, *supra* note 20, at 18. A measurement of the pH of a snowfall in Maine in 1939 was recorded as 5.9. Likens, *Acid Rain*, *supra* note 5, at 48. In the decades following this measurement, sulfur dioxide emissions increased 40% in the United States and Canada from their pre-1950 levels with the resulting lowering of the pH of precipitation to 4-4.5. Worldwatch Paper, *supra* note 20, at 15, 18.

34. Likens, *Acid Rain*, *supra* note 5, at 43. Water is present in the atmosphere as a result of evaporation or transpiration. *Id.* Transpiration is the process whereby plants lose water vapor. *Id.*; WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 2430 (1976).

35. Likens, *Acid Rain*, *supra* note 5, at 43. Carbon dioxide is one of the predominant atmospheric gases; when water combines with carbon dioxide, carbonic acid, a weak acid, is formed. *Id.*

36. *Id.*

37. Sulfur and nitrogen oxides are transformed through oxidation into sulfuric and nitric acids. *See supra* note 25 (defining oxidation).

38. Likens, *Acid Rain*, *supra* note 5, at 43.

39. Worldwatch Paper, *supra* note 20, at 18; Likens, *Acid Rain*, *supra* note 5, at 45-46; *see also* COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 185 app. V (map depicting the acidity of precipitation on North America).

B. *The Movement of Acid Deposition*

Pollutants may travel long distances through the atmosphere.[40] The main effects of sulfur dioxide emissions are displaced, on the average, 200-500 miles from emission locations, in the direction of the prevailing air movement.[41] Wind currents in the eastern portion of North America are primarily east and northeast.[42] This wind pattern and the facility with which pollutants spread over long distances support assertions that the Ohio River valley and midwestern emissions are sources of deposition in the northeastern United States and Canada.[43]

Precisely which kind of pollutants may be transported,[44]

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40. Likens, *Acid Rain*, *supra* note 5, at 45. For the first time, a study recently prepared by scientists from the Environmental Defense Fund directly links changes in the acidity of rainfall to changes in pollution emissions hundreds of miles from the deposition site. The study of smokestack emissions from smelters in the southwestern United States reports that as copper production and as a byproduct sulfur dioxide emissions rose and fell, sulfate concentrations in precipitation in downwind states rose and fell in direct proportion. Eckholm, *Distant Pollution Tied To Acid Rain*, N.Y. Times, Aug. 23, 1985, at A1, col. 3.

41. COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 64. Back trajectory analysis has been used to determine acid deposition transport directions. This type of analysis uses recorded wind data to determine the previous path of air parcels from which individual precipitation events come. This type of analysis has two limitations: 1) it must depend on often sparsely available meteorological data and 2) it cannot consider all the complexities of atmospheric behavior in some types of precipitation events. While it is reasonable to assume that uncertainties will balance out when averages are taken of back trajectories for a number of events, there is still a limitation on the accuracy of the technique for any single event. *Id.* at 57.

42. Likens, *Acid Rain*, *supra* note 5, at 49; COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 59. Wind currents in Europe place the Scandinavian countries in the same unfortunate receptor state position as northeastern United States and southwestern Canada. *See* G.S. WETSTONE & A. ROSENCRANZ, *supra* note 20, at 21, figure 6.

43. COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 59; *see* Likens, *Acid Rain*, *supra* note 5, at 49.

44. The current studies are concerned with wet deposition rather than dry deposition since adequate means of studying dry deposition are not yet available. *See* COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 64-65; G.S. WETSTONE & A. ROSENCRANZ, *supra* note 20, at 13. Due to the complexity of nitrogen oxide transformation, the information available on the deposition and movement of nitrogen compounds is less than that available on sulfur compounds. *See* COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 65. The lack of information on the dry deposition and the deposition of nitrogen compounds is of little consequence in a consideration of the long range effects of acid deposition, since both of these components of acid deposition have mainly local effects. *See* COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 64-65; OTA REPORT, *supra* note 20, at 265. Sulfur dioxide, the most prominent pollutant in acid rain, has a known long range effect. *See* OTA REPORT, *supra* note 20, at 265-66. In the eastern portion of the United States approximately two-thirds of the

the distances they may travel, and whether their sources can be adequately identified,[45] have been topics of intensive scientific research.[46] This research is not precise enough to quantify how much of the sulfur dioxide emitted from a given factory is eventually deposited on and damages a particular forest.[47] However, this research does support the conclusion that acid deposition is an environmental problem of international scope. Unlike other environmental controversies, the problem of acid deposition is not contained by traditional territorial or political boundaries.[48]

C. *The Physical and Economic Effects of Acid Deposition*

Sulfur oxide, or its conversion products,[49] can cause a wide array of environmental impacts, including:

1) direct damage to vegetation and animal life from short-term exposure to high levels of gaseous sulfur oxides,
2) damage to vegetation exposed to acid rains,
3) reduced productivity of soils exposed to acid rains,
4) reduced survival of young fish or amphibians in watersheds acidified by rain,

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acid deposited results from sulfur compounds while only one-third results from nitrogen compounds. *Id.* at 265.

45. Back trajectory analysis cannot be used to determine the distance that deposition from a particular source travels, since an air parcel traveling over land may pass over several emission locations sequentially and all could conceivably contribute pollutants to the air parcel. As a result, it is impossible to determine what proportion of pollutants was contributed where and how far it traveled. The problem of sequential emissions is eliminated when back trajectory analysis is used on an air parcel traveling over water. A study in Nova Scotia using a back trajectory over water, found that the majority of nonlocal deposition came from an area in the United States, at least 400 miles from the deposition site. *See* COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 59, 63. The Nova Scotia study appears in Shaw, *Deposition of Atmospheric Acid from Local and Distant Sources at a Rural Site in Nova Scotia*, 16 ATMOSPHERIC ENVT. 337.

46. *See* G.S. WETSTONE & A. ROSENCRANZ, *supra* note 20, at 26-27. Monitoring programs are or have been carried on by the Multistate Atmospheric Power Production Pollution Study funded by the United States Environmental Protection Agency; the Utility Acid Precipitation Study Program managed by the Electric Power Research Institute; the National Atmospheric Deposition Program funded by numerous federal agencies; The Canadian Network for Sampling Precipitation; the Ontario Ministry of the Environment; and The Canadian Air and Precipitation Monitoring Network. *Id.*

47. *See* Shabecoff, *Acid Rain Attacks Environment Beyond Northeast*, N.Y. Times, Jan. 29, 1985, at C1, col. 4.

48. *See* E.P. ECKHOLM, DOWN TO EARTH 118 (1982); *supra* notes 40-47 and accompanying text.

49. *See supra* notes 20, 25 and accompanying text.

5) deterioration of building materials exposed to acid rains,
6) impairment of human health resulting from the inhalation of sulfates,
7) reduced atmospheric visibility resulting from smog created by sulfates, and
8) possible reduced growing seasons.[50]

These effects may be divided into four basic areas of concern: aquatic ecosystems, terrestrial ecosystems,[51] man-made materials and human health.[52] Of these, the most significant are acid rain's effects on aquatic and terrestrial ecosystems, due to the possible long-term repercussions of lake acidification and potential changes in forests and forest soils.[53]

1. Aquatic Ecosystems

Of all the known effects of acid rain, its impact on aquatic ecosystems is the best understood and the most easily quantified.[54] Acid deposition can harm freshwater lakes and streams, and possibly ground water, by shifting the acid-base balance of the water, making the water more acidic.[55] The acid level of a body of water determines the type and number of organisms that can live and reproduce within its bounds.[56] The acidification of a lake can eliminate the lake's fish populations,[57] de-

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50. Williams, *Air Pollution Control: National and International Perspectives: Technical Aspects of Sulfur Oxide Emissions and Transport*, 1980 A.B.A. STAND. COMM. ENV. L. 48.

51. Terrestrial ecosystems include forests, crops, and soils. COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 9.

52. *See* COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 9.

53. G.S. WETSTONE & A. ROSENCRANZ, *supra* note 20, at 28.

54. COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 9.

55. *Id.* at 9-10.

56. *Id.* at 10.

> For example, crayfish are reported only rarely in waters below pH 6; shellfish species drop sharply at pHs below 7, and only a few are found at pHs below 5.7; the numbers of water plant, snail, and insect species present in a body of water decrease as pH goes below 7; and different fish species will not reproduce, or will even be killed directly, at pHs ranging downward from about 6 to 4.

Id. See generally, R.H. BOYLE & R.A. BOYLE, *supra* note 23, at 37-43 (describing the effect of lake acidification on the reproductive cycle of fish).

57. *See* COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 13. In some astonishing episodes, spring snow melts causing sudden and severe changes in acidity have resulted in large scale fish kills. *See id.* at 12; R.H. BOYLE & R.A. BOYLE, *supra* note 23, at 23-24. Acids can be stored in snow and ice for three to four months, thus the coming of the spring snow melt has been described as a pack-a-day smoker who has given up cigarettes for four months making up for that period by smoking 120 packs

form any surviving fish,[58] or stimulate the overgrowth of choking vegetation.[59]

Severe physical damage to aquatic ecosystems has already occurred in the United States and Canada[60] and, because large areas of both countries are sensitive to acid rain, more damage is probable.[61] Damage to aquatic life has been estimated at U.S. $250 million in the United States[62] and a study of New England and the Adirondack region[63] placed the cost at U.S. $20-50 million for those areas alone.[64] If the harm to aquatic life recorded in other nations may be viewed as a precedent, the future of North American aquatic ecosystems is indeed bleak.[65]

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in ten days. *Id.* at 24; *see also*, G.S. WETSTONE & A. ROSENCRANZ, *supra* note 20, at 30 (descriptions of dramatic fish kills in Norway and Eastern Canada).

58. *See* R.H. BOYLE & R.A. BOYLE, *supra* note 23, at 37; E.P. ECKHOLM, *supra* note 48, at 118-19.

59. R.H. BOYLE & R.A. BOYLE, *supra* note 23, at 41. In lakes with pHs below 4.5, all fish are dead and "the only remaining life in the body of water is a mat of algae, moss and fungus." E.P. ECKHOLM, *supra* note 48, at 119.

60. In the Adirondack mountain region of New York State, more than 200 lakes are devoid of fish, while fish have disappeared from at least 140 Canadian lakes in the Ontario region. It is feared that as many as 48,000 of Canada's lakes could become fishless. E.P. ECKHOLM, *supra* note 48, at 119; *see* R.H. BOYLE & R.A. BOYLE, *supra* note 23, at 55. The damage already recorded in North America is of serious concern because of the precedent of the very severe and progressive damage in Scandinavia. *See* COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 14.

61. Lakes in the northeastern United States and southeastern Canada have a particular sensitivity to acid deposition. *See* COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 12-13. Waters in these regions have little capacity to neutralize deposited acid since the areas have little or no limestone or other basic rock to serve as buffering agents. *Id.* Additionally, waters in areas with steep and rocky terrains are also sensitive to acid deposition because rainfall runs over the terrain too swiftly to be neutralized. OTA REPORT, *supra* note 20, at 41-42.

62. E.P. ECKHOLM, *supra* note 48, at 121 (referring to a study performed for the United States government in 1978).

63. The Adirondack mountain region lies in the northeastern third of New York State. N.Y. ENVTL. CONSERV. LAW § 9-0101 (McKinney 1984). Six million acres of this region comprise the Adirondack park. Forty percent of the land in the park is forest preserve land. N.Y. EXEC. LAW § 801 (McKinney 1982). Under the New York State Constitution, forest preserve lands "shall be forever kept as wild forest lands." N.Y. CONST. art. XIV, § 1.

64. E.P. ECKHOLM, *supra* note 48, at 121 (referring to a study by the New England River Basin Commission).

65. *See* COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 14. In a 1971 study, Swedish scientists projected that if the acid deposition problem continued unabated, one-half of Sweden's rivers would be unable to support life within 50 years. ROYAL MINISTRY FOR FOREIGN AFFAIRS & ROYAL MINISTRY OF AGRICULTURE, AIR POLLUTION ACROSS NATIONAL BOUNDARIES: THE IMPACT ON THE ENVIRONMENT OF SULFUR IN AIR

2. Terrestrial Ecosystems

The agricultural effects of acid deposition are more difficult to measure than the effect of acid rain on aquatic ecosystems. In general, because agricultural effects may be mitigated, many commentators view the impact of acid rain on agriculture as less serious than its impacts on forests.[66] While some observers claim that evidence of damage to forests caused by acid rain is circumstantial, there is a correlation between areas receiving high levels of acid deposition and those suffering damage.[67] The physical damage to forests translates into serious economic damage in both the United States and Canada. Acid rain has caused an estimated U.S.$1.75 billion in damage to the forest products industry in the United States.[68] In Canada, one half of the nation's productive forest lies in areas particularly sensitive to acid rain.[69] With one out of every ten jobs in Canada dependent on the forest industry, and annual forest products valued at more than U.S.$20 billion, it is clear that the results of acid deposition in Canada are potentially disastrous.[70]

3. Man-made Materials

Acid deposition has also adversely affected man-made materials, especially building stone, painted surfaces and metals.[71] The most recent study available estimates that acid rain has caused U.S.$5 billion in damages annually in a seventeen

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AND PRECIPITATION: SWEDEN'S CASE STUDY FOR THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT 56 (1971).

66. *See* G.S. WETSTONE & A. ROSENCRANZ, *supra* note 20, at 35-36; E.P. ECKHOLM, *supra* note 48, at 120; Shabecoff, *Acid Rain Attacks Environment Beyond Northeast*, N.Y. Times, Jan. 29, 1985, at C1, col. 4; *see also*, COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 18-19 (there is sparse evidence of direct impact of acid deposition on crop plants and there are readily available methods with which to offset the impact on agricultural soils).

67. *See* Worldwatch Paper, *supra* note 20, at 5-7.

68. E.P. ECKHOLM, *supra* note 48, at 121 (referring to a study performed for the United States Government in 1978).

69. Worldwatch Paper, *supra* note 20, at 25. For an explanation of the serious impact of acid rain on watersheds with little buffering capacity, see *supra* note 61.

70. Worldwatch Paper, *supra* note 20, at 25. Because forestry is the single largest industry in Canada, there is a great fear that by the time it is proven by more than circumstantial evidence that acid rain is damaging forests, it will be too late to save the remaining trees. *See* R.H. BOYLE & R.A. BOYLE, *supra* note 23, at 79.

71. G.S. WETSTONE & A. ROSENCRANZ, *supra* note 20, at 36-37; Worldwatch Paper, *supra* note 20, at 41.

state region by corroding buildings and other structures.[72] This study has been termed conservative because it does not consider all possible resulting material damage, and does not calculate the value of esthetic losses to cultural or historical structures.[73] However, because this type of damage is caused by local pollution, the international significance of this deterioration is less than that of other types of damage caused by acid deposition. In an international context, this local effect is noteworthy only for the significantly large dollar amount of the resulting damage.[74]

4. Human Health

The effect of acid deposition on human health is not clear.[75] However, a study of the eastern United States found 21,000 extra deaths in one year in areas with increased sulfur oxide emissions.[76] While a direct relation between sulfur oxide emissions and ill effects on human health has not yet been made, an indirect relation may exist.[77]

Acid rain leaches aluminum, mercury, and other metals from the soil into water, contaminating the water and possibly

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72. Shabecoff, *Draft Study Puts Acid Rain Damage at $5 Billion for 17 States*, N.Y. Times, July 18, 1985, at A12, col. 1. The study was conducted for the United States Government by the Environmental Protection Agency, the Brookhaven National Laboratory and the Army Corps of Engineers. *Id.* Full scientific review of the draft study is expected to be completed by the end of 1985. *Id.* at col. 3.

73. *Id.* at col. 3. Industrial pollutants have generally accelerated the erosion of historic structures around the world. Among those affected are the Parthenon in Athens, the Taj Mahal in India, and the Colosseum in Rome. G.S. WETSTONE & A. ROSENCRANZ, *supra* note 20, at 36-37; *see* Scholle, *Acid Deposition and the Materials Damage Question*, 25 ENV'T. 25, 25-26 (1983). Historic structures suffering damage due to acid rain in the United States include the Statute of Liberty, the Field Museum in Chicago, the Washington Monument, and the Capital. R.H. BOYLE & R.A. BOYLE, *supra* note 23, at 83.

74. *See* COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 24-26.

75. *See* Shabecoff, *Acid Rain Attacks Environment Beyond Northeast*, N.Y. Times, Jan. 29, 1985, at C1, col. 4; COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 26-29.

76. The study, performed by Brookhaven National Laboratory, reveals a positive correlation between the deaths in a geographic area and the amount of sulfur dioxide pollution in that area. Shabecoff, *Acid Rain Attacks Environment Beyond Northeast*, N.Y. Times, Jan. 29, 1985, at C1, col. 4. This observation of a higher number of deaths or extra deaths in an area where sulfur dioxide pollution is high tends to demonstrate that acid deposition has harmful effects on human health, but it does not establish this conclusion as a fact. *Id.*; *see* A.L. COMREY, ELEMENTARY STATISTICS: A PROBLEM SOLVING APPROACH 111 (1975).

77. *See supra* note 76 and accompanying text.

food supplies.[78] Water in sections of the Adirondacks contains unsafe levels of various heavy metals.[79] While the effects of acid deposition on public drinking water may be mitigated fairly inexpensively,[80] the effect of acid deposition on our water and food supplies nevertheless illustrates the widespread and insidious nature of the acid rain phenomenon.

D. *The Transboundary Problem of Acid Deposition*

The transboundary effects of acid deposition are significantly serious in nature, long-term effect, and cost to merit international attention and reaction.[81] Current scientific research demonstrates that the sulfur and nitrogen oxides, generated by man from various industrial sources and released into the atmosphere, acidify precipitation.[82] The effects of this acidification are not limited to the area where the emissions originate;[83] indeed, wind currents carry the pollutants and the resulting acidified precipitation hundreds of miles from their source.[84] This transported acid deposition has severe adverse impacts on the environment:[85] It has caused the death[86] of at least 340 lakes in the northeastern United States and in Canada,[87] may seriously threaten the forests of North America,[88] and has caused several million dollars worth of structural damage to buildings in the United States alone.[89] In addition, acid deposition may impair human health.[90] Clearly, acid deposi-

78. Worldwatch Paper, *supra* note 20, at 41; Shabecoff, *Acid Rain Attacks Environment Beyond Northeast*, N.Y. Times, Jan. 29, 1985, at C1, col. 4.

79. E.P. ECKHOLM, *supra* note 48, at 121; *see* R.H. BOYLE & R.A. BOYLE, *supra* note 23, at 79-80; COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 27.

80. COMPTROLLER GENERAL'S REPORT, *supra* note 5, at 28. In public water supply systems, the heavy metal contamination caused by acidification can be avoided for a modest cost by simply adjusting the water acidity before distribution. Acidity is regulated by the addition of lime to the water supply. In New England, the annual cost of this adjustment has been estimated at $1 million. *Id.*

81. International action taken to date on acid rain is discussed *infra* at notes 167-82 and accompanying text.

82. *See supra* notes 30-39 and accompanying text.

83. *See supra* notes 40-46 and accompanying text.

84. *Id.*

85. *See supra* notes 50-80 and accompanying text.

86. *See supra* notes 56-59 and accompanying text.

87. *See supra* notes 60-61.

88. *See supra* notes 68-70 and accompanying text.

89. *See supra* notes 72-73 and accompanying text.

90. *See supra* notes 75-80 and accompanying text.

tion presents an international problem that North Americans must resolve.

II. *THE DEVELOPMENT OF INTERNATIONAL ENVIRONMENTAL LAW*

International law, including customary international law,[91] contains no rules or standards related specifically to the protection of the environment which can be applied directly to the acid rain phenomenon and its effects on relations between the United States and Canada.[92] However, well-recognized principles of international law, such as the doctrines of international responsibility[93] and territorial sovereignty,[94] provide a framework for developing standards of international environmental law.[95] International tribunals[96] and the International Court of

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91. Article 38 of the Statute of the International Court of Justice is generally regarded as a complete statement of sources of international law. I. BROWNLIE, PRINCIPLES OF PUBLIC INTERNATIONAL LAW 3 (3d ed. 1979); *see* Statute of Permanent Court of International Justice, Dec. 16, 1920, 6 L.N.T.S. 379, 403-05. Article 38 lists the following as sources of international law:

> (1) International conventions, whether general or particular, establishing rules expressly recognised by the contesting States; (2) International custom, as evidence of a general practice accepted as law; (3) The general principles of law recognized by civilised nations; [and] (4) [J]udicial decisions and the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law.

Id. Article 38 refers to international custom as evidence of a general practice accepted as law. I. BROWNLIE, *supra*, at 3. The material sources of custom include: diplomatic correspondence, policy statements, press releases, the opinions of official legal advisors, official manuals on legal questions, comments by governments on drafts produced by the International Court of Justice, state legislation, international judicial decisions, recitals in treaties and other international instruments, a pattern of treaties in the same form, the practice of international organs, and resolutions relating to legal questions in the United Nations General Assembly. I. BROWNLIE, *supra*, at 5.

92. *See* Brownlie, *A Survey of International Customary Rules of Environmental Protection*, 14 NAT. RESOURCES J. 179, 179 (1973).

93. For a discussion of the principle of international responsibility, see *infra* notes 101-07 and accompanying text.

94. For a discussion of the principle of territorial sovereignty, see *infra* notes 118-21 and accompanying text.

95. *See* Brownlie, *supra* note 92, at 179.

96. *See e.g.*, Trail Smelter Arbitration (U.S. v. Can.), 3 R. Int'l. Arb. Awards 1905 (1949) [hereinafter cited as "Trail Smelter Arbitration"]; Lake Lanoux Arbitration (Fr. v. Spain), 12 R. Int'l Arb. Awards 281 (French), 24 I.L.R. 101 (English) 1957); *see also infra* text accompanying notes 123-30, 151-54.

Justice have already drawn such analogies.[97] The first international tribunal[98] to make the analogy based its conclusions on early twentieth century United States Supreme Court cases that addressed interstate pollution controversies.[99] The primary international statement of the responsibility of States to assure that their actions do not cause damage to the environment of another State was made in Principle 21 of the 1972 Declaration of the United Nations Conference on the Human Environment.[100]

A. *The Underlying Principles of International Law*

Responsibility is a fundamental principle of international law.[101] It implies that a State has an obligation to repair the damage caused by an offense committed in its jurisdiction.[102] Such responsibility[103] may be based on either treaty or cus-

97. *See* Nuclear Tests Case (Austl. v. Fr.), 1973 I.C.J. 99 (Interim Protection Order of June 22); *infra* text accompanying notes 155-58.

98. Trail Smelter Arbitration, *supra* note 96, at 1963.

99. *Id.* at 1964-65. The tribunal relied on the following cases: New Jersey v. New York City, 283 U.S. 473 (1931) (concerning the pollution of New Jersey coastal waters by the disposal of sewage at sea by New York); New York v. New Jersey, 256 U.S. 296 (1921) (concerning the pollution of New York Bay); Georgia v. Tennessee Copper Co., 237 U.S. 474 (1915) (providing an example of a remedy appropriate in cases of air pollution); Georgia v. Tennessee Copper Co., 206 U.S. 230 (1907) (concerning air pollution in Georgia caused by a copper smelter operated in Tennessee); Missouri v. Illinois, 200 U.S. 496 (1906) (concerning the pollution, within the boundaries of Illinois, of a river flowing into a waterway shared with Missouri).

100. Report of the United Nations Conference on the Human Environment, U.N. Doc. A/Conf. 48/14 and Corr. 1, *reprinted in* 11 I.L.M. 1416 (1972) [hereinafter cited as "The 1972 Declaration on the Human Environment"]; *see also* Wetstone & Rosencranz, *Transboundary Air Pollution: The Search for an International Response*, 8 HARV. ENVTL. L. REV. 89, 92 (1984).

101. A breach of duty resulting in a loss to another State may be termed an international tort or delict but the preferred term is international responsibility. I. BROWNLIE, *supra* note 91, at 433-34. The word delict taken in its most general sense is wider than the term tort; it includes those wrongful acts which, although directly affecting some individual or his property, extend in their injurious consequences to the peace or security of the community at large. The term also includes injurious actions which transpire without any malicious intention on the part of the doer. BLACK'S LAW DICTIONARY 384-85 (5th ed. 1979).

102. *See* C. EAGLETON, THE RESPONSIBILITY OF STATES IN INTERNATIONAL LAW 21 (1928).

103. The law of responsibility is concerned with the incidence and consequences of illegal acts, and particularly the payment of compensation for loss caused. Responsibility can be thought of as generally equivalent to liability. *See* I. BROWNLIE, *supra* note 91, 431-32.

tom.[104] Acts that are domestically lawful but have injurious consequences in another State may result in responsibility, if such acts violate a custom or generally recognized international principle.[105] Responsibility may then be based on either the principle of abuse of rights[106] or the principle of liability without fault.[107]

Generally, a finding of fault or culpa is necessary for responsibility to exist;[108] no finding of fault or culpa, however, can occur without showing that the State knew of, and was able to prevent, wrongful acts within its jurisdiction.[109] This principle was applied by the International Court of Justice in *The Corfu Channel Case*.[110] In *Corfu Channel*, two British destroyers were damaged by mines while passing through the channel between Corfu and Albania in October 1946.[111] One month later, Great Britain sent mine-sweepers into the Channel and removed a mine field.[112] Although Albania protested that this action was a violation of its sovereignty, Great Britain claimed compensation for the damages it suffered while in the Alba-

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104. *Id.* at 435.

105. *See id.* at 443-45.

106. According to Brownlie, the doctrine of abuse of rights is exemplified by article 1912 of the Mexican Civil Code: "When damage is caused to another by the exercise of a right, there is an obligation to make it good if it is proved that the right was exercised only in order to cause the damage, without any advantage to the person entitled to the right." *Id.* at 443-44.

107. *Id.* For a discussion of the principle of liability without fault, see C. EAGLETON, *supra* note 102, at 208-13 and *infra* text accompanying notes 107-16.

108. C. EAGLETON, *supra* note 102, at 209.

109. Corfu Channel Case (U.K. v. Alb.), 1949 I.C.J. 4, 18 (Judgment of Apr. 9). The Court there stated: "[I]t cannot be concluded from the mere fact of the control exercised by a State over its territory . . . that that State necessarily knew, or ought to have known, of any unlawful act perpetrated therein, nor . . . that it necessarily knew or should have known, the authors." *Id. But see* C. EAGLETON, *supra* note 102, at 210 n.6 (citing W.E. HALL, A TREATISE ON INTERNATIONAL LAW 64 (8th ed. 1924)).

> Foreign nations have a right to take acts done upon the territory of the state as being *prima facie* in consonance with its will; since, where uncontrolled power of effective willing exists, it must be assumed in the absence of proof to the contrary that all acts accomplished within the range of the operation of the will are either done or permitted by it.

Id.

110. Corfu Channel Case (U.K. v. Alb.), 1949 I.C.J. 4 (Judgment of Apr. 9); *see* Brownlie, *supra* note 92, at 180.

111. Corfu Channel Case, 1948-1949 I.C.J.Y.B. 57, 58-59 (Judgment of Apr. 9) (1949).

112. *Id.* at 59.

nian-controlled channel.[113] The parties referred the dispute to the International Court of Justice for consideration of Albania's responsibility for the damage to life and property inflicted on the British Navy.[114] The Court found that Albania was responsible.[115] This finding establishes a prima facie liability for the harmful effects of conditions existing within a State, when the State knows or should know of the hazardous conditions.[116] Since the decision in *Corfu Channel*, international legal scholars have concluded that a State may not, with actual or imputed knowledge, allow its territory to be used so that it harms another State.[117]

Because the doctrine of international responsibility includes responsibility for conditions of which a State may have only imputed knowledge, it is logical to assume that it also includes responsibility for extraterritorial damage caused by acid deposition. Under this analysis, the United States' responsibility to Canada for damage caused by pollutants emitted in the United States may be said to include the obligation to impose emission controls that curb or substantially eliminate acid deposition.

The principle of territorial sovereignty[118] also may support the existence of State responsibility for causing or failing to control a source of injury to another State.[119] Although

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113. *Id.* at 60-61, 62.

114. *Id.* at 60.

115. *Id.*

116. Brownlie, *supra* note 92, at 180.

117. *See, e.g., id.*; *see* I. BROWNLIE, *supra* note 91, at 436-39.

118. Sovereignty is the power to do everything in a State without accountability. P. JESSUP, A MODERN LAW OF NATIONS 40-41 (1968); *see* H. MORGENTHAU, POLITICS AMONG NATIONS: THE STRUGGLE FOR POWER AND PEACE 321 (rev. 5th ed. 1978). Sovereignty includes the power to make laws, to execute and apply them, to impose and collect taxes and levy contributions, to make war or peace, to form treaties of alliance or of commerce with foreign nations, and the like. It implies the international independence of a State, combined with the right and power of regulating its internal affairs without foreign dictation. *See* H. MORGENTHAU, *supra*, at 316-17.

The fullest measure of sovereign powers is traditionally exercised by a State over its territory. Territorial sovereignty extends principally over land, the sea appurtenant to the land, and the seabed and subsoil of the territorial sea. Additionally, in accordance with customary international law, the airspace above and the subsoil beneath state territory are included in the concept of territory over which a State may exercise its sovereignty. I. BROWNLIE, *supra* note 91, at 109; L. HENKIN, R.C. PUGH, O. SCHACHTER & H. SMIT, INTERNATIONAL LAW: CASES AND MATERIALS 256-79 (1980).

119. Brownlie, *supra* note 92, at 179.

States are free to conduct their internal affairs as they see fit, they may not use their territorial sovereignty to resist any liability imposed by international law.[120] In addition, despite a State's territorial supremacy, it may not alter the natural conditions of its own territory to the disadvantage of the natural conditions in the territory of a neighboring State.[121] Under the international legal theory of responsibility, existing domestic regulation of pollutant emissions in the United States cannot be raised as a bar to the United States' responsibility to Canada.[122]

B. *Origin and Application of the The Trail Smelter Award*

In *The Trail Smelter Arbitration*,[123] the first international case concerning acid deposition, an international tribunal applied the principles of international responsibility and territorial sovereignty.[124] The *Trail Smelter* dispute arose between the governments of the United States and Canada. The United States alleged that sulfur dioxide fumes emitted from a smelter located in Trail, British Columbia were causing environmental damage in Washington State.[125] After several failed attempts at settlement, both countries agreed to form a tribunal to resolve the dispute.[126]

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120. C. EAGLETON, *supra* note 102, at 206.

121. *See* I. BROWNLIE, *supra* note 91, at 285-86, 443-45.

122. *See supra* notes 120-21 and accompanying text.

123. Trail Smelter Arbitration, *supra* note 96.

124. *Id.* at 1963.

125. *Id.* at 1941-48.

126. Trail Smelter Arbitration, *supra* note 96. The subject of the sulfur emissions and the alleged resulting damage was referred by the governments of the United States and Canada to the International Joint Commission under Article IX of the 1909 Boundary Waters Treaty between the United States and Great Britain. *See id.* Under article IX, the contracting parties agree that:

> any other questions or matters of difference arising between them involving the rights, obligations, or interests of either in relation to the other or to the inhabitants of the other, along the common frontier between the United States and the Dominion of Canada, shall be referred from time to time to the International Joint Commission for examination and report.

Boundary Waters Treaty of 1909, United States-Great Britain, 36 Stat. 2448, T.S. No. 23.

On February 28, 1931, the International Joint Commission, in a unanimous report, recommended that the smelter company erect the units necessary to reduce the amount and concentration of sulfur dioxide fumes drifting to the United States until the amount is reduced to a point where it will do no damage in the United States. Trail Smelter Arbitration, *supra* note 96, at 1945. Both governments rejected the

Basing its decision on principles of international responsibility and territorial sovereignty, the Tribunal held Canada responsible under international law for the conduct of the smelter at Trail.[127] The Tribunal further held that it was Canada's duty to see that the conduct of the smelter conformed with Canada's obligations under international law.[128] The award required the smelter at Trail to refrain from causing any further damage in the United States and imposed a regime, or measure of control, on the smelter's operations to prevent it from causing additional damage.[129] "[N]o State," the Tribunal concluded, "has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another. . . ."[130]

1. The Origins of *Trail Smelter*[131]

The award of the *Trail Smelter* arbitral tribunal[132] is important to the development of international environmental law because it examined and relied on the United States Supreme Court cases concerning interstate pollution.[133] At the time the

report of the Commission. In 1933, the United States Government made representations to the Government of Canada that damage was still occurring. The two countries entered into diplomatic negotiations which resulted in the signing of a Convention in 1935. *Id.* at 1946. Under the Convention, Canada deposited $350,000 in the United States Treasury in payment of all damages occurring in the United States prior to 1932. Both governments agreed to form a tribunal for the purpose of deciding, among other questions, whether indemnity should be paid for the damage caused by the operation of the smelter and whether the smelter should be required to refrain from causing damage in the future. Convention for the Settlement of Difficulties Arising from Operation of Smelter at Trail, B.C., Apr. 15, 1935, United States-Canada, 49 Stat. 3245, T.S. No. 893.

127. Trail Smelter Arbitration, *supra* note 96, 1965-66.

128. *Id.*

129. *Id.* at 1974-78. Under the regime or measure of control imposed by the Tribunal on the operation of the smelter, the company was required to install instruments for recording emissions and measuring meteorological data; to compile data on sulfur dioxide concentrations and to send such data to both Governments on a monthly basis; to discharge sulfur dioxide into the atmosphere only from smokestacks of a certain height; and finally, to comply with restrictions on the maximum hourly permissible emission rate of sulfur dioxide as set by the Tribunal. *Id.*

130. *Id.* at 1965.

131. Trail Smelter Arbitration, *supra* note 96.

132. *Id.*

133. Although the Trail Smelter award has been described as "overworked" and "a rather modest contribution to the jurisprudence," it must be examined for its reliance on the United States Supreme Court cases. Brownlie, *supra* note 92, at 180. While the early United States Supreme Court cases listed *supra* at note 99 take an

Tribunal decided *Trail Smelter*, no other international tribunal had considered a case of air or water pollution.[134] In its search for guiding precedents, the Tribunal applied United States law on interstate pollution.[135] Explaining the appropriateness of applying United States Supreme Court precedents, the Tribunal noted that "it is reasonable to follow by analogy, in international cases, precedents established by [the Supreme Court] in dealing with controversies between States of the Union or with other controversies concerning the quasi-sovereign rights of such States."[136] The Tribunal further reasoned that "[w]hat is true between States of the Union, is at least equally true concerning the relations between the United States and the Dominion of Canada."[137]

The Supreme Court, in deciding disputes between states of the Union over shared natural resources and interstate pollution, sits as an international tribunal as well as a domestic tribunal, applying Federal, state, and international law.[138] The

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enlightened approach to the environmental issues presented, international environmental law had an inauspicious start in the United States with the declaration in 1895 of Attorney General Harmon that "[t]he fundamental principle of international law is the absolute sovereignty of every nation, as against all others, within its own territory." 21 Op. Att'y. Gen. 274, 281 (1895). In applying this doctrine to a dispute between Mexico and the United States regarding riparian rights, Harmon determined that activity of the United States on the upper stretches of a river to which both States had rights of use, was not a matter with respect to which Mexico could have a valid claim against the United States. *Id.* at 280-83. Harmon asserted that the recognition of a valid claim asserted by Mexico would be "entirely inconsistent with the sovereignty of the United States over its natural domain." Harmon concluded that the "rules, principles and precedents of international law impose no liability or obligation" on the part of the United States. *Id.* For a further discussion of the Harmon doctrine, see Wilson, *Canada-United States Treaty Relations and International Law*, in CANADA-UNITED STATES TREATY RELATIONS 14-19 (Deener ed. 1963); D.R. DEENER, THE UNITED STATES ATTORNEYS GENERAL AND INTERNATIONAL LAW 253-56 (1957). This use of a claim of sovereignty to bar a claim of harm due to the alleged misuse of a shared natural resource is contrary to the current trend of developing environmental law. Wilson, *supra*, at 16. Today the Harmon doctrine is rarely applied. *Id.* It has been termed "irrationa[l]" and a "poor barrier against the death of oceans or the contamination of the atmosphere or the impoverishment of man's global environmental heritage." Caldwell, *Concepts in Development of International Environmental Policies*, 13 NAT. RESOURCES J. 190, 199 (1973).

134. Trail Smelter Arbitration, *supra* note 96, at 1963.

135. *Id.* at 1964; *see supra* note 99 (list and synopsis of the cases relied on).

136. Trail Smelter Arbitration, *supra* note 96, at 1964.

137. *Id.*

138. Kansas v. Colorado, 185 U.S. 125, 146-47 (1902). In the early twentieth century the Supreme Court, in arbitrating disputes regarding interstate pollution and the sharing of natural resources considered the states as sovereigns. *See* Missouri v.

Court has long recognized that "[i]nternational law, in its widest and most comprehensive sense . . . is part of our law."[139] In addition, such law "must be ascertained and administered by the courts . . . as often as questions of rights depending on it are duly presented for . . . determination."[140] Where the Court has before it no treaty, and no controlling executive or legislative act or judicial decision, it must resort to the "customs and usages of civilized nations" to render a decision.[141]

The Court applied principles of international law in arbitrating a dispute over a shared waterway between Kansas and Colorado.[142] The Court determined that the principle of equality of rights underlies all relations between the states.[143] Under this principle, while each state cannot impose its legislation on another, it is also not bound to yield its own view to another.[144] However, the Court's definition of equality of rights was not limitless.[145] Whenever "the action of one state reaches through the agency of natural laws into the territory of another State," the limit is reached and the Court must recognize the equal rights of both states and establish justice between them.[146]

The Court further limited the equality of rights principle in *Georgia v. Tennessee Copper Co.*,[147] a case concerning a dispute over noxious sulfur dioxide fumes discharged from a plant in Tennessee and deposited in Georgia.[148] Ordering an injunc-

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Illinois, 180 U.S. 208, 241 (1901). In *Missouri*, the case initially establishing the Court's authority to adjudicate such disputes, the Court acknowledged its position as the appropriate arbiter of disputes between states which, had they arisen between independent and sovereign nations, could only be remedied through negotiation or use of force. 180 U.S. at 241. The Court noted that since diplomatic powers and the right to make war had been surrendered to the general government, the general government was obligated to provide a remedy. *Id.* It was therefore necessary to establish a new branch of jurisdiction because the extinguishment of diplomatic relations between the states, with the enactment of the Constitution, had left no forum or mechanism for the resolution of interstate pollution disputes. *Id.*

139. Hilton v. Guyot, 159 U.S. 113, 163 (1895).

140. The Pacquete Habana, 175 U.S. 677, 700 (1900).

141. *Id.* at 700.

142. *See* Kansas v. Colorado, 206 U.S. 46, 97 (1907).

143. *Id.* at 97.

144. *Id.*

145. *Id.* at 97-98.

146. *Id.*

147. 206 U.S. 230 (1907).

148. *Id.*

tion that required the Tennessee corporation to cease discharging fumes from its plant into Georgia, the Court stated that "a state . . . has the last word as to whether its mountains shall be stripped of their forests and its inhabitants shall breathe pure air."[149] In defining how the limit on equality of rights applies to transboundary air pollution cases, the Court went on to state:

> It is a fair and reasonable demand on the part of a sovereign that the air over its territory should not be polluted on a great scale by sulphurous acid gas, and that the forests on its mountains, be they better or worse, and whatever domestic destruction they have suffered, should not be further destroyed or threatened by the act of persons beyond its control. . . .[150]

2. The Application of *Trail Smelter*

A tribunal arbitrating a dispute between Spain and France[151] also voiced support of the principles applied in *Trail Smelter*.[152] In this arbitration, which resolved a dispute over the effect in Spain of the proposed use of a lake by France, the tribunal noted that international law "prohibit[ed] the upstream State from altering the waters of a river in such a fashion as seriously to prejudice a downstream State."[153] The tribunal further noted that under "the rules of good faith, the upstream State is under the *obligation* to take into consideration the various interests involved . . . and to show . . . it is genuinely concerned . . . [with reconciling] the interests of the other

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149. *Id.* at 237.

150. *Id.* at 238.

151. Lake Lanoux Arbitration (Fr. v. Spain), 12 R. Int'l Arb. Awards 281 (French), 24 I.L.R. 101 (English) (1957). The dispute between France and Spain was settled by a tribunal set up under a *Compromis* dated November 19, 1956, pursuant to a July 10, 1924 Arbitration Treaty between France and Spain. *See* 24 I.L.R. 101, 101 n.1.

152. *See* Lake Lanoux Arbitration (Fr. v. Spain), 24 I.L.R. at 129, 139.

153. *Id.* at 129. The language used by the Lake Lanoux tribunal is similar to language used by the United States Supreme Court in arbitrating a dispute between two states over the use of a river. Wyoming v. Colorado, 259 U.S. 419 (1922). There the Court found that a state may not "fully divert and use, as [it] may choose, the waters [of an interstate stream] flowing within [its] boundaries . . . , regardless of any prejudice that this may work to others having rights in the stream below her boundary." *Id.* at 466.

riparian State with its own."[154]

In another international environmental dispute, the International Court of Justice supported the principles enunciated in *Trail Smelter*[155] by granting, at the request of Australia, an interim order of protection advising the French Government to avoid nuclear tests that deposit radioactive fallout on Australian territory.[156] Australia claimed that the deposit of radioactive fallout on its territory, and the dispersion of radioactive fallout in its airspace without its consent, violated Australia's right "to determine what acts shall take place within its territory and in particular whether Australia . . . shall be exposed to radiation from artificial sources."[157] While the Court did not expressly follow *Trail Smelter*, it applied the analysis used in that case, relying on the principles of international responsibility and territorial sovereignty expressed in Australia's request for protection.[158]

C. *Principle 21 of the 1972 Declaration on the Human Environment*

The principles of international environmental law applied in the *Trail Smelter* arbitration have been expressed in several international forums.[159] The first international statement of these principles is the 1972 Declaration of the United Nations Conference on the Human Environment,[160] which proclaims that "[t]he protection and improvement of the human environment is . . . the *duty* of all Governments."[161] The Declaration also notes that "the acceptance of *responsibility* by citizens and communities and by enterprises and institutions at every level" is necessary to achieve the Declaration's goal of environmental preservation.[162] Principle 21 of the Declaration specifically refers to the principles of international responsibility and territorial sovereignty that underlie international environmental law:

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154. Lake Lanoux Arbitration (Fr. v. Spain), 24 I.L.R. at 139 (emphasis added).

155. Nuclear Tests Case (Austl. v. Fr.), 1973 I.C.J. 99 (Interim Protection Order of June 22).

156. *Id.* at 106.

157. *Id.* at 103.

158. *Id.*

159. *See infra* notes 167-73, 176 and accompanying text.

160. The 1972 Declaration on the Human Environment, *supra* note 100.

161. *Id.* (Proclamation 2 at 1416 (emphasis added)).

162. *Id.* (Proclamation 7 at 1417 (emphasis added)).

> States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the *responsibility* to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.[163]

The 1972 Declaration, however, was not intended to formulate legally binding provisions.[164] Instead the Declaration was intended to be "inspirational and concise" and to that end it contains expressions of "broad goals and objectives."[165] This global action, however, did serve as the prelude to the adoption of treaties on acid deposition and as the inspiration to developing municipal legislation.[166]

III. *IMPLICATIONS OF THE DOCTRINE OF INTERNATIONAL RESPONSIBILITY FOR THE ACID DEPOSITION PROBLEM*

The problem of acid deposition came to the world's attention in 1972 at the United Nations Conference on the Human Environment.[167] The United States and Canada attended the conference,[168] and both are signatories to the Conference Declaration proclaiming that "[t]he protection and improvement

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163. *Id.* (Principle 21 at 1420 (emphasis added)).

164. Sohn, *The Stockholm Declaration on the Human Environment*, 14 HARV. J. INT'L L. 423, 426-27 (1973) (quoting the Conference Preparatory Committee Report).

165. *Id.* at 426.

166. *See infra* notes 171-79 and accompanying text (global action); *infra* note 207 (summary of municipal legislation); *see also* Brown, *The Conventional Law of the Environment*, 13 NAT. RESOURCES J. 203, 203, 233 (1973).

167. *United Nations Conference on the Human Environment*, 26 Y.U.N. 318 (1972). On November 25, 1970, the Secretary-General of the United Nations invited member governments to present their views and ideas concerning case studies to be conducted in connection with the United Nations Conference on the Human Environment. In reply Sweden proposed to do a study on problems related to pollution by sulfur in air and precipitation. The study prepared by Sweden was presented at the Conference on the Human Environment which was held on June 5-16, 1972, in Stockholm. *See* ROYAL MINISTRY FOR FOREIGN AFFAIRS & ROYAL MINISTRY OF AGRICULTURE, AIR POLLUTION ACROSS NATIONAL BOUNDARIES: THE IMPACT ON THE ENVIRONMENT OF SULFUR IN AIR AND PRECIPITATION: SWEDEN'S CASE STUDY FOR THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT 3 (1971).

168. The Conference was attended by representatives of 113 State Members of the United Nations, who adopted the Declaration on the Human Environment by acclamation at the Conference. *United Nations Conference on the Human Environment*, 26 Y.U.N. 318, 321 (1972).

of the human environment . . . is . . . the duty of all Governments."[169] Principle 21 of the Declaration also contains the admonition of Principle 21: Don't pollute your neighbor.[170]

These principles first appeared in a legally binding document seven years after the Conference, in the 1979 Geneva Convention on Long-Range Transboundary Air Pollution.[171] Both the United States and Canada are contracting parties[172] to the 1979 Convention, under which both agreed to develop policies to combat the discharge of air pollutants.[173] Subsequently, in 1980, the United States and Canada agreed separately to develop policies to lessen the impact of acid deposition and to arrive at a bilateral agreement addressing transboundary air pollution.[174] However, despite their expressed intent, the United States and Canada have not yet reached an agreement.[175]

In March of 1984, Canada hosted a conference on the problems of acid deposition. Several European nations attended the conference but the United States was conspicuously absent.[176] The Declaration on Acid Rain (the 1984 Declara-

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169. The 1972 Declaration on the Human Environment, *supra* note 100 (Proclamation 2 at 1416).

170. *Id.* (Principle 21 at 1420).

171. Progress toward a solution to the acid deposition problem under the 1979 Convention, *supra* note 8, has been slow. While the convention did come into force in March 1983, it has been weakened by a failure of its Executive Body to agree on how to finance its research programs. *Signs Indicate Long, Hard Battle Ahead In Forging Air Pollution Controls In Europe*, INT'L ENV'T REP. (BNA) (Special Report) at 121 (Apr. 11, 1984).

172. The 1979 Convention, *supra* note 8. The Convention entered into force on March 16, 1983 and the following nations are parties: Austria, Belgium, Bulgaria, Byelorussian Soviet Socialist Republic, Canada, Czechoslovakia, Denmark, European Economic Community, Finland, France, German Democratic Republic, German Federal Republic, Greece, Hungary, Iceland, Ireland, Liechtenstein, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, Ukrainian Soviet Socialist Republic, Union of Soviet Socialist Republics, United Kingdom, and the United States.

173. In article 3 of the 1979 Convention, *supra* note 8, "[t]he Contracting Parties [agreed to] develop without undue delay policies and strategies which shall serve as a means of combating the discharge of air pollutants. . . ." The 1979 Convention, *supra* note 8.

174. The 1980 Memorandum of Intent, *supra* note 7.

175. *See infra* notes 183-94 and accompanying text.

176. The conference, hosted by Canada, was held in Ottawa on March 20-21, and was attended by delegates from Australia, Denmark, Finland, France, The Netherlands, Norway, Sweden, Switzerland, and West Germany. All the attending parties were signatories to the resulting Declaration and agreed thereunder to: 1) re-

tion or the Declaration),[177] adopted at the conference is the most recent international action taken on acid deposition. The parties[178] to this Declaration have agreed that they will cut emissions of sulfur compounds by at least thirty percent by 1993.[179] This goal reflects a commitment to the principle of responsibility that these States acknowledged in the 1979 Convention.[180] In addition, the parties have established a consensus of States on the issue of acid deposition. This common agreement sets the standard for emission controls that domestic regulations must now meet.[181] Although Canada has agreed to these standards, the United States has not. The United States refuses to join the Declaration, steadfastly claiming that further research on acid deposition is necessary before the United States will commit to establishing new standards for

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duce sulfur emissions by at least 30 percent from 1980 levels "as soon as possible and at the latest by 1993," recognizing that further reduction may prove necessary "where environmental conditions warrant;" 2) take measures to decrease emissions of nitrogen oxides from stationary and mobile sources within the same period of time; 3) call on other parties to The 1979 Convention to achieve these same reductions of sulfur emissions affecting their own or neighboring countries; and 4) stress the need for taking further action within the framework of the 1979 Convention to reduce emissions of other pollutants, especially nitrogen oxides. *Summit Calls For 'International Solidarity' In Seeking 30-Percent Reduction In Emissions*, INT'L ENV'T REP. (BNA) (Current Report) at 101 (Apr. 11, 1984). The original nine signatories were later joined by the Soviet Union, Bulgaria, Byelorussian Soviet Socialist Republic, East Germany, Belgium, Lichtenstein, Luxembourg, and Ukrainian Soviet Socialist Republic after the Munich Conference of the Executive Body of the 1979 Convention on Transboundary Air Pollution. *'30-Percent Club' Grows*, INT'L ENV'T REP. (BNA) (Current Report) at 212 (July 11, 1984). To date the United States has not joined the so-called "30 percent club." *See The 30% Club: A Treaty To Curb Acid Rain*, TIME, Apr. 2, 1984 at 32.

177. The 1984 Declaration, *supra* note 9.

178. *See supra* note 176.

179. The 1984 Declaration, *supra* note 9, declaration (1) at 663.

180. *See supra* notes 171-73.

181. This concept of "common consensus" was referred to by the Supreme Court in The Pacquete Habana, 175 U.S. at 711, when the Court took judicial notice of what had through the common consent of mankind become the law of the sea and a rule of general obligation. The Court resorted to "customs and usages of civilized nations" for its decision since there was "no treaty, and no controlling executive or legislative act or judicial decision" applicable to the case before it. *Id.* at 700. The Court noted that such resort did not give "the statutes of any nation extra-territorial effect [or treat them as general laws] . . . but [instead] it is recognition of the historical fact that by common consent of mankind these rules have been acquiesced in as of general obligation." *Id.* at 711 (quoting Strong, J. in The Scotia, 14 Wall. (U.S.) 170, 187-88 (1871)).

emission controls.[182]

A. *United States and Canadian Attempts to Solve the North American Acid Deposition Problem*

The 1980 Memorandum of Intent,[183] signed by the United States and Canada, represented an important first step toward solving the acid rain problem on the North American continent. In the Memorandum,[184] both nations stated their determination to combat the problem of transboundary air pollution, "in keeping with their . . . *obligations* . . . set forth in . . . the 1972 Stockholm Declaration on the Human Environment[185] . . . and the 1979 ECE Convention on Long-Range Transboundary Air Pollution."[186] However, despite their resolve "to develop and implement policies . . . to combat [acid deposition's] impact,"[187] and four treaty negotiating sessions, no agreement on the subject has been reached.[188] At the final negotiating session, the United States rejected a Canadian draft agreement, based on the Great Lakes Water Quality Agreement, which proposed a fifty percent reduction in sulfur dioxide emissions by 1990.[189] The final position taken during the negotiations by the United States was that more research was necessary before any controls on sulfur dioxide emissions could be imposed.[190]

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182. *See The 30% Club: A Treaty To Curb Acid Rain*, TIME, Apr. 2, 1984 at 32. At the June 27, 1984, Munich Conference of the Executive Body of the 1979 Convention on Long-Range Transboundary Air Pollution, all the chief delegates attending the meeting, except United States Environmental Protection Agency Administrator Ruckelshaus, agreed that most damage to forests is caused by acid rain and that much of it crosses international borders. *Munich Conference Concludes With Pledge To Press For Greater International Efforts*, INT'L ENV'T REP. (BNA) (Current Report) at 212 (July 11, 1984).

183. The 1980 Memorandum of Intent, *supra* note 7.

184. *Id.*

185. The 1972 Declaration on the Human Environment, *supra* note 100, preamble iii.

186. The 1979 Convention, *supra* note 8.

187. The 1980 Memorandum of Intent, *supra* note 7, preamble.

188. *Roberts Threatens To Withdraw From Talks After U.S. Calls Canadian Plan 'Premature'*, INT'L ENV'T REP. (BNA) (Current Report) at 280 (July 14, 1982). At the fourth negotiating session held under the 1980 Memorandum of Intent, the United States rejected the Canadian proposal calling for a 50 percent reduction in sulfur emissions, terming it scientifically premature and too costly. *Id.*

189. *See id.*

190. *U.S., Canadian Scientists Fail To Agree On Immediate Action To Combat Acid Rain*, INT'L ENV'T REP. (BNA) (Current Report) at 95 (Mar. 9, 1983). In the final report

In spite of this negotiating deadlock, the March, 1985 appointment of special United States and Canadian envoys on acid rain has generated new hope for reaching an agreement on the problem of acid rain.[191] The special envoys will present a report on acid rain at a bilateral summit to be held in the United States in 1986.[192] However, it is unlikely that the special envoys' report will provide the solution to the North American acid deposition controversy. The position of the current United States administration, as expressed by President Reagan in his 1984 State of the Union Address, is to limit federal action on acid rain to research.[193] While both the Memorandum of Intent and the agreement appointing special envoys point toward the recognition by the United States and Canada of their shared responsibility for acid rain, neither agreement has led to any concrete resolution of the problem. In light of the present administration's stance on acid deposition, it is unlikely that the United States and Canada will implement these agreements in the near future.[194]

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issued by the United States Work Group, created under the 1980 Memorandum of Intent, the United States scientists concluded that more research on acid rain was needed before controls could be imposed. While they acknowledged that damage had occurred in areas receiving acid deposition, they concluded that "cause and effects relationships ha[d] often not been clearly established." *Id.* In contrast, Canadian scientists termed the relationship between acid rain and damage to the acquatic environment as clear and called for immediate action to cut emissions. *Id.*

191. *Naming Of Special Envoys On Acid Rain Ends U.S.-Canadian Deadlock, Mulroney Says*, INT'L ENV'T REP. (BNA) (Current Report) at 110 (Apr. 10, 1985). The United States special envoy had indicated he would propose a program costing approximately $1 billion to lessen acid rain damage. *Acid rain: Incontestable origins*, ECONOMIST, Sept. 21, 1985, at 22. In January 1985, the special envoy proposed a $5 billion program to develop clean ways to burn coal, a major source of the pollution that causes acid rain. While this proposal is not equivalent to a targeted emissions reduction program to control acid rain, it has been termed a "step forward." Shabecoff, *Reagan Aide, Citing Problems From Acid Rain, Urges U.S. Action*, N.Y. Times, Jan. 18, 1986, at B6, col. 3.

192. *Naming of Special Envoys on Acid Rain Ends U.S.-Canadian Deadlock, Mulroney Says*, INT'L ENV'T REP. (BNA) (Current Report) at 110 (Apr. 10, 1985).

193. *See Transcript of Message by President on the State of the Union*, N.Y. Times, Jan. 26, 1984, at B7, col. 4. Canadian Environment Minister Caccia described the decision to limit action on acid rain to research as a "setback [and noted that] it in a very serious way disregards the letter and spirit of the Memorandum of Intent signed in 1980." *Canada 'Shocked' By U.S. Announcement That Action Will Be Limited To Research*, INT'L ENV'T REP. (BNA) (Current Report) at 56 (Feb. 8, 1984).

194. *See supra* note 193. For a scathing review of the Reagan administration's approach to environmental policy, see FRIENDS OF THE EARTH, NATURAL RESOURCES DEFENSE COUNCIL, THE WILDERNESS SOCIETY, SIERRA CLUB, NATIONAL AUDUBON SO-

B. *Remedial Mechanisms Available to Canada Under the Clean Air Act Amendments of 1977*[195]

As attempts to negotiate a solution to the North American acid rain problem have failed, so too would any Canadian attempt to seek a remedy to the problem in United States courts under the appropriate sections of the Clean Air Act Amendments of 1977 (Clean Air Act).[196] Section 115 of the Clean Air Act provides foreign States that are affected by pollutants emitted in the United States with the right to appear at any public hearing on the revision of the polluting state's implementation plan.[197] The right to intervene is triggered by the notification the Environmental Protection Agency (EPA) administrator is required to give to the Governor of the polluting state when the EPA administrator has determined that there is reason to believe that air pollutants emitted in a state are causing harm

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CIETY, ENVIRONMENTAL DEFENSE FUND, ENVIRONMENTAL POLICY CENTER, ENVIRONMENTAL ACTION, DEFENDERS OF WILDLIFE, & SOLAR LOBBY, RONALD REAGAN AND THE AMERICAN ENVIRONMENT: AN INDICTMENT, ALTERNATE BUDGET PROPOSAL AND CITIZEN'S GUIDE TO ACTION (1982).

195. 41 U.S.C. § 7415 (1983).

196. *Id.* Section 7415 provides in pertinent part that:

> (a) Endangerment of public health or welfare in foreign countries from pollution emitted in United States. Whenever the Administrator . . . has reason to believe that any air pollutant or pollutants emitted in the United States cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare in a foreign country . . . the Administrator shall give formal notification thereof to the Governor of the State in which such emissions originate.
>
> (b) Prevention or elimination of endangerment. The notice of the Administrator shall be deemed to be a finding . . . which requires a plan revision . . . of the applicable implementation plan . . . to prevent or eliminate the endangerment referred to in subsection (a). . . . Any foreign country so affected by such emission of pollutant or pollutants shall be invited to appear at any public hearing associated with any revision of the . . . applicable implementation plan.

Id.

For a very thorough discussion of section 115 of the Clean Air Act, see Comment, *The Applicability of Clean Air Act Section 115 to Canada's Transboundary Acid Precipitation Problem*, 11 B. C. ENVTL. AFF. L. REV. 539 (1984).

197. Clean Air Act Amendments of 1977, 42 U.S.C. § 7415(b) (1983). Under § 7407(a) of the Act, each state has the primary responsibility for assuring air quality within the entire geographic area comprising such state. Each state must submit an implementation plan specifying the manner in which national primary and secondary ambient air quality standards will be achieved and maintained within each air quality control region in the state. Clean Air Act Amendments of 1977, 42 U.S.C. § 7407(a) (1983).

in a foreign nation.[198] Any right to intervene, therefore, depends on whether the EPA administrator determines that pollutants emitted in the United States are causing harm in a foreign nation, and whether he decides to give notification to the offending state or states.[199] Because the executive branch of the United States controls EPA policy,[200] it is unlikely, considering the current administration's position on environmental issues, that a solution to the acid rain problem can be reached through the mechanisms of section 115.[201]

C. *New York State Legislation Provides a Model Solution*

The state of New York has recently enacted its own acid deposition plan, which, like the 1984 Declaration, requires a thirty percent reduction in the state's sulfur dioxide emissions by the 1990's.[202] In enacting this plan, New York has attempted to fill the void created by the lack of federal action on this issue and has recognized its responsibility to act to cut sulfur dioxide emissions.[203] This action takes on special meaning in light of the recent United States and Canadian attempts to solve the North American acid deposition problem through the negotiation of a treaty, and the apparent futility of Canadian use of remedial mechanisms under section 115 of the Clean Air Act.[204]

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198. *See supra* note 196.

199. *See supra* note 196.

200. L.M. LAKE, ENVIRONMENTAL REGULATION: THE POLITICAL EFFECTS OF IMPLEMENTATION 15 (1982). The Environmental Protection Agency (EPA) was created by the Nixon administration and brought together pollution control programs from several different departments under the control and direction of a single administrator. Presidential control of the agency is maximized because the agency has a single head rather than the traditional multi-member commission, and EPA regional offices are staffed with presidential appointees to serve as his representatives to the regions. This structure suggests a "perception of environmental regulation as a political rather than quasi-judicial activity, and the desire of the president to retain control over environmental policy." *Id.*

201. *See supra* note 200.

202. *See* N.Y. ENVTL. CONSERV. LAW §§ 19-0901 — 19-0923 (McKinney Special Pamphlet Covering Chs. 785-983 1984).

203. *See* 1984 N.Y. Laws 3661. When Governor Cuomo approved the sulfur dioxide emission control program he noted the need for a comprehensive emissions program at the federal level. *Id.*

204. *See supra* notes 183-201 and accompanying text. The environmental counselor to the Canadian Embassy in Washington has said that he does not believe that "any U.S. Government can negotiate a treaty with Canada on acid rain that would give to Canadian provinces more than [the United States Government] is willing to

The United States has a "fantastic moral responsibility" to act on the acid rain problem.[205] Despite this responsibility, the United States has fallen behind the global community's effort to combat acid deposition by failing to enact legislation consistent with the 1984 Declaration.[206] In contrast to the United States, several signatories to the 1984 Declaration have enacted legislation designed to reach the Declaration's goal of reducing annual sulfur emissions by at least thirty percent by the 1990's.[207] For example, the Canadian federal government recently enacted stricter automobile emission restrictions and committed Can. $150 million to aid smelters in financing pollution controls.[208] In addition, the Canadian Cabinet ratified a federal-provincial agreement to reduce eastern Canada's sulfur dioxide emissions by fifty percent from 1980 levels.[209]

In 1985, legislation consistent with the 1984 Declaration was introduced in both houses of the United States Congress.[210] Enactment of either of these proposed plans would

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give to U.S. states—downwind states." Instead he concludes that "[t]here has got to be movement domestically in the U.S. to deal effectively with acid rain. . . ." *Economic Troubles, Domestic Politics Said to Affect U.S., Canadian Diplomacy*, INT'L ENV'T REP. (BNA) (Current Report) at 220 (May 11, 1983).

205. *Summit Calls for 'International Solidarity' in Seeking 30-Percent Reduction in Emissions*, INT'L ENV'T REP. (BNA) (Current Report) at 102 (Apr. 11, 1984) (quoting Kurt Steyer, Austrian Minister for Health and Environmental Protection, at March 20-21 Canadian sponsored summit on acid rain).

206. Bills which proposed reductions in sulfur dioxide emissions in excess of 30 percent of the 1980 emission levels were introduced in both houses of Congress in the first session of the 99th Congress. S. 283, 99th Cong., 1st Sess. (1985); H.R. 1030, 99th Cong., 1st Sess. (1985). Neither of these bills had been acted upon at the close of the first session.

207. For a summary of legislation enacted or proposed, see *Signs Indicate Long, Hard Battle Ahead in Forging Air Pollution Controls in Europe*, INT'L ENV'T REP. (BNA) (Special Report) at 121 (Apr. 11, 1984); *see also Comprehensive Five-Year Plan Links Environmental, Other Government Policies*, INT'L ENV'T REP. (BNA) (Current Report) at 306 (Oct. 10, 1984) (new regulations in the Netherlands are designed to cut emissions from new power plants and refineries); *Official Predicts Two-Thirds Reduction in Sulfur Emissions from State Power Plants*, INT'L ENV'T REP. (BNA) (Current Report) at 289 (Sept. 12, 1984) (new regulations in West Germany are designed to reduce sulfur dioxide emissions produced by electric power plants); *Air Pollution Law Expected to Cut Emissions of Sulfur Dioxide by 40 Percent Over 10 Years*, INT'L ENV'T REP. (BNA) (Current Report) at 181 (June 13, 1984) (Danish Parliament approves legislation designed to cut sulfur dioxide emissions by 40 percent over the next ten years).

208. *Government Launches New Acid Rain Plan Stressing Cuts in Auto, Smelter Emissions*, INT'L ENV'T REP. (BNA) (Current Report) at 84 (Mar. 13, 1985).

209. *Id.*

210. *See supra* note 206.

have enabled the United States to meet the international responsibility that it acknowledged in the 1979 Convention.[211] However, at the close of the first session of the 99th Congress, legislators had not yet taken action on either bill.[212]

CONCLUSION

Environmental and economic ruin, in the form of dying forests and acidified lakes, will be the certain result of the United States' failure to take action on acid deposition.[213] The acid rain phenomenon is sufficiently well defined at present to begin implementing policies to combat its devastating effects.[214] Recognition of this responsibility is all that stands in the way of resolving the acid deposition problem in North America.[215] Nations are unquestionably responsible for assuring that activities within their jurisdiction or control do not damage the environments of other nations.[216] The United States Supreme Court has historically recognized this principle of international law.[217] In theory, the United States has already applied the doctrine of responsibility to the problem of transboundary acid deposition by signing the 1980 Memorandum of Intent with Canada.[218] However, in practice, by its refusal to comply with the standards set forth in the 1984 Declaration on Acid Rain, the United States is failing to fulfill its obligations under the doctrine of responsibility.[219]

Any nation seeking to satisfy its obligations as a member of the world community must meet the target thirty percent reduction rate set by the 1984 Declaration. To meet its responsibility to Canada and to comply with international law, the United States must enact legislation that conforms to the current international standard.

Elizabeth Knapp

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211. The 1979 Convention, *supra* note 8; *see also supra* notes 171-72.

212. *See supra* note 206.

213. *See supra* notes 54-70 for a description of the effects of acid deposition on forests and lakes.

214. *See supra* notes 19-48 for a definition of the acid rain phenomenon.

215. *See supra* text accompanying notes 205-09.

216. *See supra* notes 101-21 and accompanying text.

217. *See supra* text accompanying notes 138-50.

218. *See supra* notes 173-75 and accompanying text.

219. *See supra* text accompanying notes 181-82.