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THE PAPER TRIANGLE: NATIONAL FOREST TIMBER, SOLID WASTE DISPOSAL AND RECYCLING

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I. INTRODUCTION

The paperless society is a mirage. At present, it is impossible to imagine the effective functioning of our economy, bureaucracy and academia without paper. Technological innovations,¹ geometric population growth and the emergence of the service economy have increased our dependence on paper as an essential tool in modern society. As a result, more paper is produced, used and disposed today than ever before.²

Our reliance on paper is not without cost. Paper manufacturing and disposal have a profound impact on the natural environment. First, because wood fibers constitute an integral part of all³ paper products, the paper manufacturing process relies on virgin

¹. For example, the computer and the telephone facsimile machine have added to the sum total of paper utilized and disposed of in the modern office while they have increased efficiency. See, e.g., John Burgess, *Changing the Office Landscape*, WASH. POST, June 8, 1993, at D1.

². See generally U.S. EPA, *Municipal and Industrial Solid Waste Division, Office of Solid Waste*, Characterization of Municipal Solid Waste in the United States, 1992 Update (July 1992) [hereinafter EPA CHARACTERIZATION UPDATE]. See also NATIONAL SOLID WASTES MANAGEMENT ASSOCIATION, *SOLID WASTE DISPOSAL OVERVIEW* (1991) [hereinafter OVERVIEW]. Some technological visionaries, such as William Gates, have advocated the development of a "paperless office." See Thomas McCarroll, *Ending the Paper Chase*, TIME, June 14, 1993, at 60.

³. One company, Eco Paper of Portland, Oregon, has begun the manufacture of nonwood paper. *Eco Paper Advertisement*, SIERRA, May-June 1993, at 23. The company has reverted to previous methods of paper production, and relies on the fibers of plants other than trees, such as hemp and cereal straw. *Id.* While companies such as Eco Paper may start a trend, at present, an overwhelming majority of paper products are manufactured from wood fibers. See *infra* notes 22-36 and accompanying text.

timber as a source of raw materials. Second, once a paper product has served its intended purpose, it must be discarded. Basic modern disposal techniques have not changed significantly since the development of cities thousands of years ago.⁴ Even today, most paper waste is either landfilled or incinerated. Timber logging, landfilling and incineration do not pose unmanageable environmental problems *per se*. However, the gargantuan volume of paper products generated, combined with growing concern over federal timber resources, municipal land use conflicts, and multimedia pollution, has focused national attention on paper as a significant environmental hazard.

Growing national concern over natural resource use pushed the concepts of recycling and source reduction to the forefront of environmental policy as solutions to the threats posed by paper products. At first blush, each of these methods seems to counter most of the negative environmental impacts inflicted by paper products. The first solution, recycling, decreases our reliance on virgin timber as a source of wood fibers. It also reduces the volume of paper wastes requiring disposal and thus alleviates the stress placed on landfills and incineration. The second solution, source reduction, shrinks the size of paper products entering the stream of commerce and hence preempts and complements the recycling process.

Upon close scrutiny, the present application of recycling and source reduction to paper production and disposal reveals severe imperfections. First, a high percentage of potentially recyclable paper products is not recovered.⁵ Second, a large portion of the recyclable materials recovered is not actually recycled.⁶ Third, the size of most

^{4.} WILLIAM RATHJE & CULLEN MURPHY, RUBBISH! THE ARCHAEOLOGY OF GARBAGE 32-40 (1992).

^{5.} For example, at present, consumers fail to dispose of all of their recyclable paper, glass and plastic products in recycling centers.

^{6.} While the number of recovery programs has grown from 600 in 1989 to over 4000 in 1992, much of the recovered material is never recycled. Bruce Van Voorst, *The Recycling Bottleneck*, TIME, Sept. 14, 1992, at 52. See also Frank Edward Allen, *Piling Up: As Recycling Surges, Market for Materials Is Slow to Develop*, WALL ST. J., Jan. 17, 1992, at A1, 6 (discussing increase in recovery of recyclables without concomitant increase in total recycling). For example, more newspaper is recovered than can be technologically and economically recycled by paper manufacturers. Marcia Berss, *No One Wants to Shoot Snow White*, FORBES, Oct. 14, 1991, at 40. The massive increase in recovered newsprint has

paper products has not decreased.⁷ Therefore, although recycling and source reduction have decreased paper waste generation *per capita*, their inefficient implementation has allowed, *in toto*, a voluminous increase in federal timber harvesting and solid waste generation.

At the center of the paper production and disposal dilemma lies a fundamental dichotomy in the implementation of recycling and source reduction. In one vein, recycling and source reduction are implemented as voluntary projects, based solely upon the environmentally-correct leanings of manufacturers, consumers and municipalities.⁸ For example, municipalities and environmental groups have set up a nationwide matrix of recovery centers; consumers are kindly asked to donate presorted recyclable materials; manufacturers are expected to act out of corporate philanthropy to meet their raw material needs by using materials recovered through expensive chemical treatment processes. In another vein, states have passed legislation which mandates strict recovery and minimum recycling content percentages for various paper products.⁹ As a result of these divergent approaches, consumers, municipalities and manufacturers simultaneously are asked both to obey strict command and control recycling laws and to act out of pure ecophile sentiment. Furthermore, both programs fail to recognize the cost of recycling to consumers and manufacturers of paper products.

caused a severe drop in the price of recovered newspaper, thus making it even more difficult for newspaper recovery centers to recycle their used newsprint. *Id.* For a complete analysis of prices for recyclable materials, see generally Michael Misner, *1992 Markets Picture for First Six Months*, WASTE AGE, Aug. 1992, at 107-110.

7. Thirty-nine percent of the paper wastes disposed of in landfills comes from packaging. Van Voorst, *supra* note 6, at 54. For example, compact disc packaging has generally remained as voluminous as when compact discs were introduced in the mid-1980s. The packaging of compact discs measures twice the size of the compact disc box. Certain companies have accomplished source reduction through packaging diminution. For example, the German corporate giant Lever Brothers produces highly concentrated detergent that requires less packaging than nonconcentrated detergent. *Id.* Studies estimate that the concentrated detergent has reduced plastic bottle disposal by 13 million units. *Id.*

8. Although recycling centers were instituted through the environmental goodwill and financial incentive of aluminum producers, such centers are slowly becoming requirements under state "command and control" legislation. See generally AMERICAN LEGISLATIVE EXCHANGE COUNSEL, LEGISLATIVE UPDATE, STATE SOLID WASTE POLICY (August 1992) [hereinafter STATE POLICY].

9. *Id.*

Once again, United States environmental decisionmakers have disregarded economics as the most powerful force through which to motivate sound environmental policy.¹⁰ Instead of motivating consumers, municipalities and manufacturers through market-based incentives, lawmakers and other policymakers have nurtured an expensive and ineffective implementation of otherwise highly beneficial strategies for the reduction of waste volume and timber logging reduction. The present inability of recycling and source reduction to break through the impasses presented by timber logging and waste disposal, however, is not without remedy. The consummate failure of most environmental command and control laws clearly points to the inescapable conclusion that only an incentive-based system can increase paper recovery and recycling, decrease paper waste and reduce the strain placed on national forests. Through reform legislation, federal and state governments can implement market-based incentives that will allow recycling and source reduction to unleash their powerful latent potential.

The purpose of this article is to present an overview of possible solutions to the environmental dilemma presented by paper manufacturing and disposal. Part II of the article provides a brief historical summary of papermaking and discusses the environmental impacts of paper. Part III outlines legislation enacted to decrease the strain placed on federal timber resources and to increase recycling and source reduction. Part IV describes how market-based incentives can be used to maximize recycling and source reduction efficiency, with a special focus on federal timber management and disposal cost pricing. Finally, Part V concludes with the brief observations of the author.

¹⁰. Most United States environmental laws are command and control laws that seek to achieve an intended result by means of forced goals and standards. *See, e.g.*, Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992 (1983 & Supp. 1991); Comprehensive Environmental Recovery, Compensation and Liability Act, 42 U.S.C. §§ 9601-9605 (1983 & Supp. 1991); Clean Air Act, 42 U.S.C. §§ 7401-7671 (1983 & Supp. 1991); Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387 (1983 & Supp. 1991); Safe Drinking Water Act, 42 U.S.C. § 300(f) (1983 & Supp. 1991); Toxic Substances Control Act, 15 U.S.C. §§ 2601-2692 (1982 & Supp. 1991); Federal Insecticide, Fungicide and Rodenticide Act, 7 U.S.C. §§ 136-1367 (1992).

II. PAPER AND ITS IMPACT ON THE ENVIRONMENT

A. *The History Of The Paper Manufacturing Process*

Paper was invented in China by Ts'ai Lun in 105 A.D.¹¹ Through Ts'ai Lun's process, matted rags were placed in water to interweave their fibers.¹² The fibers were then removed with a hand mold, pressed and dried to form rough paper.¹³ Paper soon replaced papyrus, tapas, rice paper, parchment and vellum as a medium for printed communication.¹⁴ The papermaking process migrated to Korea and Japan in the sixth century, then progressively to the Middle East, North Africa and Europe throughout the eighth, tenth and twelfth centuries.¹⁵

Paper production remained virtually unchanged until the invention of the Hollander in the eighteenth century.¹⁶ Until that time, stampers were used to press molded fibers into sheets of paper. The Hollander increased the speed of paper production by replacing stamped interwoven fibers with a pulp-like substance.¹⁷ Because Hollanders shortened the length of paper fibers, the paper was weaker than stamped paper.¹⁸

Until the nineteenth century, paper was manufactured exclusively from linen and cotton rags.¹⁹ In 1719, the French naturalist and physicist Rene Antoine Ferchault de Reaumur discovered that American wasps used wood fibers to construct hives

^{11.} DARD HUNTER, PAPERMAKING: THE HISTORY AND TECHNIQUE OF AN ANCIENT CRAFT 48-50 (2d ed. 1947).

^{12.} See *id.* at 48.

^{13.} See *id.*

^{14.} See generally *id.* at 3-47.

^{15.} The papermaking process migrated throughout the world as follows: From China to Korea in 600, to Japan in 610-25. RATHJE & MURPHY, *supra* note 4, at 2. From China, the process migrated Westward to Samarkand in 751, to Iraq in 793, to Syria and Egypt during the 10th century, to Morocco in 1100, to Spain in 1151, to Italy in 1276, to France in 1348, to Germany in 1390, to Poland in 1491, to England in 1494, to Austria in 1498, to Russia *circa* 1576, to Denmark in 1635, and to Oslo in 1690. *Id.* at 1-2.

^{16.} The Hollander consisted of a wooden tub, at the center of which was placed a pole fitted with approximately thirty knives. *Id.* at 162-63. Rags and water were placed into the tub. *Id.* As the pole rotated, it lacerated the rags into a pulp called "lacerated stock." *Id.*

^{17.} RATHJE & MURPHY, *supra* note 4, at 162-63.

^{18.} *Id.* at 167.

^{19.} *Id.* at 309.

bearing a striking resemblance to paper.²⁰ Although de Reaumur's discovery was presented to the scientific community, it was not until the mid-1700s that the German scientist Christian Schaffer mated wood fiber with paper manufacturing.²¹ Although Schaffer had demonstrated the potential of wood fiber, it took paper manufacturers until 1866 to produce paper entirely from wood pulp.²² Although paper produced from wood pulp was darker in appearance than rag-based paper, the Swedish scientist Karl Wilhelm Scheele invented chlorine and combined it with lime to bleach the pulp.²³

Another development in the papermaking industry occurred at the end of the eighteenth century. Until 1798, all paper was manufactured by hand.²⁴ The process was dramatically altered by the paper machine, invented by the Frenchman Nicolas-Louis Robert.²⁵ Robert's paper machine used a system of buckets to place pulp onto a wire grid, whose movement settled the fibers and drained excess water.²⁶ Heated rollers later were added to dry the paper as it was pressed. The paper machine found its way to Great Britain in 1809 as the Dickinson machine²⁷ and later to the United States in 1817 as the Gilpin machine.²⁸ By 1820, improvements to the Robert paper machine enabled paper manufacturers to produce sixty feet of paper

^{20.} RENE ANTOINE FERCHAULT DE REAUMUR, MEMOIRES POUR SERVIR A L'HISTOIRE DES INSECTES (Amsterdam, 1737-48).

^{21.} Schaffer used the fibers of beech, willow, asper, mulberry, spruce and poplar trees to manufacture paper. *Id.* at 318-27. See generally CHRISTIAN SHAFFER, VERSUCHE UND MUSTER OHNE ALLE LUMPEN ODER DOCH MIT EINEM GERINGEN ZUSATZE DERSELBEN PAPIER ZU MACHEN (Regensburg, 1765-71)(discussing methods of wood-based papermaking).

^{22.} The first book printed on wood-based paper was a book of poems by the Marquis De La Villette. DE LA VILLETTTE, OEUVRES DU MARQUIS DE LA VILLETTTE (London, 1786). The Smith Paper Company in Massachusetts was the first to produce paper based solely on wood fiber. HUNTER, *supra* note 11, at 378.

^{23.} *Id.* at 318.

^{24.} *Id.* at 341. Ironically, the machine was invented not so much to increase the rapidity of the manufacturing process, but rather to eliminate rowdy and quarreling paper laborers. *Id.* at 341-42.

^{25.} *Id.* at 341.

^{26.} HUNTER, *supra* note 11, at 346.

^{27.} *Id.* at 350. The Dickinson machine used vacuum rollers to form sheets of paper. *Id.*

^{28.} *Id.* at 353. The Gilpin machine allowed the manufacturer to vary the width and coarseness of the paper. *Id.*

per minute.²⁹ In addition, the use of anidine dye enabled manufacturers to offer consumers a variety of paper colors.³⁰

By the late 1800s, the paper industry had flourished into one of the largest industries in America and Europe.³¹ In 1860, paper sales in New York City alone accounted for \$5 million of consumer purchases.³² By 1868, paper transcended the printed medium and was used to manufacture clothing accessories, boxes, cups, plates, roofing materials, barrels, curtains and towels.³³

Today, more paper is being produced than ever before. Population growth, increased standards of living and technological innovations have fueled an enormous demand for paper products. In 1990, over 86 million tons of paper were consumed in the United States.³⁴ Modern society's Pantagruelian appetite for paper products, combined with an increased national awareness of natural resource use and waste disposal, has focused massive public attention on the environmental impacts of paper.

B. *The Environmental Impact Of Paper*

Paper has a dual impact on the environment. First, the production of paper impacts timber resources. Second, paper disposal impacts landfilling and incineration.

1. Impact On The Timber Resource

Since the late nineteenth century, it has been possible to manufacture paper entirely from wood fibers.³⁵ At first, the demand for timber as a raw material in paper manufacturing was minuscule when compared to the gargantuan timber resource of the United States. However, a steady increase in the demand for paper and other

^{29.} HUNTER, *supra* note 11, at 354-55.

^{30.} *Id.* at 558.

^{31.} *Id.* at 358. This became known as the "paper era." *Id.*

^{32.} *Id.* at 563.

^{33.} HUNTER, *supra* note 11, at 568. Certain eccentrics had even begun wearing paper suits. *Id.*

^{34.} See NATIONAL SOLID WASTES MANAGEMENT ASSOCIATION, RECYCLING SOLID WASTE 2 (1992) [hereinafter RECYCLING SOLID WASTE].

^{35.} *See supra* notes 22-35 and accompanying text.

wood-based products³⁶ has led to timber harvesting on such a wide scale that it poses a threat to the viability of the United States timber resource.³⁷

To understand the impact of paper on the timber resource, one must first differentiate between private and national forests. Private forests are privately owned and managed solely in accordance with the owner's policy.³⁸ In contrast, national forests are owned by the federal government and managed by the United States Forest Service (USFS) according to Congressionally imposed statutory strictures.³⁹

Timber production has been an integral part of national forest management since the creation of national forests as distinct legal entities in the nineteenth century.⁴⁰ In fact, the USFS has often considered national forests as "the nation's woodlot."⁴¹ Timber companies regularly bid for timber on national forest areas preselected by the USFS. Successful bids for public timber often

³⁶. Popular sentiment in favor of recycling has led even the construction industry to utilize recycled materials. Michael D. Lemonick, *Architecture Goes Green*, TIME, April 5, 1993, at 38. For example, floor tiles are partially manufactured from wood chips and lumber is often replaced with recycled lumber containing plastic and sawdust. *Id.* at 39. See also H. Jane Lehman, *Builders Begin to Look at Recycling*, WASH. POST, April 17, 1993, at E1 (discussing use of recyclable materials in construction).

³⁷. See *infra* notes 46-51 and accompanying text.

³⁸. The private ownership, management and use of forests for paper production is often used for advertisement purposes by forest product manufacturers who are fearful of the common misconception that all paper and wood products are manufactured from national forest timber. See, e.g., *Rules and Regulations Alone Won't Protect the Environment*, TIME, May 3, 1993 (Georgia-Pacific advertisement discussing company's use of strict, nonmandatory management of its private forests). The largest forest product companies are Georgia Pacific, Weyerhaeuser, Boise Cascade, Willamette Industries, Louisiana-Pacific and Pope & Talbot. *Corporate Scoreboard*, BUS. WK., Aug. 17, 1992, at 77 (listing companies in order of decreasing second quarter 1992 sales). The largest paper companies are International Paper, Kimberly-Clark, James River Corporation of Virginia, Champion International, Mead, Scott Paper, Union Camp, Westvaco, Manville, Bowater, Potlatch, Fort Howard, Chesapeake, Consolidated Papers and Glatfelter. *Id.* (listing companies in order of decreasing second quarter 1992 sales).

³⁹. See *infra* notes 78-108 and accompanying text.

⁴⁰. HAROLD K. STEEN, THE U.S. FOREST SERVICE: A HISTORY, 22-46 (2d ed. 1977). For a complete history of the role of wood in the United States economy and society, see generally W.G. YOUNGQUIST & H.O. FLEISCHER, WOOD IN AMERICAN LIFE 1776-2076 (1977).

⁴¹. *Id.* at 256-71. This was the U.S. Forest Service's zeitgeist in the period immediately following World War II. *Id.*

translate into a lower price per board-foot than those obtained from private forests.⁴² The low price and high availability of federal timber has led to two results. First, wood-based industries such as paper manufacturers have a special interest in obtaining as much timber as possible from national forests. Second, because of their interest, wood-based industries have continually pressured federal legislators and regulators not to restrict the available volume and price of national forest timber.⁴³ As a result, timber harvesting levels continue to grow.

High volume timber harvesting causes severe environmental impacts. First, even though timber is a renewable resource, clearcut areas take many years to rejuvenate and may only be able to support three to five episodes of clearcutting before becoming sterile.⁴⁴ Second, widespread logging generates massive debris and thus interferes with the flow of small water courses originating in, or passing through, national forests.⁴⁵ Such blockage causes ecological imbalance and decreases the recreational value of the forest.⁴⁶ Third, high volume logging accelerates slope erosion.⁴⁷ Fourth, intense timber harvesting creates wide gaps of barren land between wooded areas.⁴⁸ Because most species do not travel through such gaps, high intensity harvesting often isolates animal populations in severely limited ecosystems.⁴⁹

Federal timber plays an important role in paper production. However, it is important to dispel the common misconception that all paper products are manufactured solely from timber harvested in

⁴². *Id.*

⁴³. For example, President Clinton included a timber fee increase in his budget proposal for the fiscal year of 1994, but he quickly backed down from it under pressure from the timber industry. Michael Weisskopf & Ann Devroy, *Clinton Bows To Westerners On Higher Fees*, WASH. POST, Mar. 31, 1993, at A1.

⁴⁴. Interview with Karin Sheldon, Esq., The Wilderness Society, in Washington, D.C. (September 23, 1992).

⁴⁵. See H. MICHAEL ANDERSON & JEFFREY T. OLSON, FEDERAL FORESTS AND THE ECONOMIC BASE OF THE PACIFIC NORTHWEST 31-36 (The Wilderness Society ed., 1991).

⁴⁶. *Id.* at 32, 34-37.

⁴⁷. *Id.* at 35.

⁴⁸. *Id.* at 14-16.

⁴⁹. See *id.* at 12-23. George Perkins Marsh was one of the first scientists to warn of the negative impacts of high volume timber logging. See generally GEORGE PERKINS MARSH, MAN AND NATURE (1864).

national forests. At present, only 45 percent of paper products are manufactured from virgin timber.⁵⁰ Furthermore, 87 percent of the virgin timber used in paper production comes from timber logged in privately owned forests.⁵¹ Therefore, of the 86.5 million tons of paper produced annually, only 5.2 million tons are produced from national forest timber.⁵² Once these figures are analyzed, it becomes apparent that the paper industry has a much weaker impact on national forest timber harvesting than commonly assumed. Nevertheless, given the high annual increases in paper consumption, paper production continues to place a significant strain on national forests.

2. Impact On Solid Waste Disposal

The second major environmental impact of paper appears as an economic consideration at the disposal stage. Solid waste disposal involves two options: landfilling and incineration.⁵³ When solid waste is landfilled, it is dumped and then covered with either dirt or special chemicals.⁵⁴ When solid waste is incinerated, it is burned in

⁵⁰. See PAPER INFORMATION CENTER, KEY QUESTIONS AND ANSWERS ON PAPER RECYCLING AND ITS ROLE, in MUNICIPAL SOLID WASTE MANAGEMENT 4 (1992) [hereinafter KEY QUESTIONS].

⁵¹. *Id.*

⁵². *Id.*

⁵³. Currently, integrated waste management is composed of landfilling, incineration, source reduction and recycling. ENVIRONMENTAL PROTECTION AGENCY, THE SOLID WASTE DILEMMA: AN AGENDA FOR ACTION EPA/530-SW-89-019 16-21 (1989) [hereinafter SOLID WASTE DILEMMA]. At present, however, landfilling and incineration are the only two disposal techniques available. Although source reduction and recycling play an important role in integrated waste management, these methods constitute reduction techniques rather than disposal techniques. Source reduction involves the diminution of waste volume through a reduction in size of products before they enter the stream of commerce. *Id.* at 18. Recycling involves the reuse or composting of recovered waste. *Id.*

Although dumping once constituted an integral part of waste disposal, dumping was progressively replaced by landfilling as a disposal strategy. RATHJE & MURPHY, *supra* note 4, at 85. In its current form, the Solid Waste Disposal Act prohibits open dumps. 42 U.S.C. §§ 6944-6945 (West 1992).

⁵⁴. There are two types of landfills in existence today: sanitary landfills and dry landfills. In a sanitary landfill, waste is dumped and then covered with approximately six inches of nondecomposing material, such as dirt, crushed glass or a common chemical known as Sanifoam. RATHJE & MURPHY, *supra* note 4, at 85. The coverage provided by this material reduces disease and odors. *Id.* at 83-85. The problem with sanitary landfills is that

high temperature kilns.⁵⁵ Each of the two solid waste disposal techniques dates back thousands of years.⁵⁶

Although the solid waste disposal methods of dumping, landfilling and incineration have been in practice for millennia, geometric population growth has increased solid waste generation.

they generate methane gas through decomposition and often leak a liquid waste residue known as "leachate" into groundwater. *Id.* at 88. For example, the Fresh Kills landfill in New York dumps over one million gallons of leachate into New York Harbor each day. *Id.* at 122. Dry landfills, currently preferred by the Environmental Protection Agency, provided a solution to this problem. *Id.* at 88. Dry landfills consist of excavated pits twenty-five to fifty feet in depth, and are lined with several feet of clay and heat-sealed plastic. *Id.* at 87-89. Dry landfills collect the leachate and either treat it on site or dispose of it at the local waste sewage plant. *Id.* at 88. In addition, the methane gas generated by the waste piles are collected and burned off. *Id.* at 88-89. In some landfills, the methane is combusted to generate electricity. *Id.* at 89. After the excavated pit has been filled to capacity with solid waste, it is capped with dirt and then with clay or some other waterproof substance. *Id.* at 90.

Modern landfills do not pose an appreciable health risk. The Environmental Protection Agency estimates that 83 percent of American landfills pose a risk of cancer for less than one per million people. Report to Congress: Solid Waste in the United States (Environmental Protection Agency), 1988, at Volume I. Six percent of the incinerators pose an appreciable cancer risk, equivalent to one in 100,000 or one in 10,000. *Id.* These landfills are being closed pursuant to modern statute. See Solid Waste Disposal Act, 42 U.S.C. §§ 6944-6945 (West 1992) (listing requirements for sanitary landfills and upgrading of open dumps), and 40 CFR § 257.1 (listing criteria for solid waste disposal facilities).

⁵⁵. Properly operated incinerators do not pose an appreciable health risk to populations located nearby. Dr. Bruce Ames, a professor of biochemistry at the University of California, Berkeley, estimates that "the risk of contracting cancer from an incinerator is equivalent to the risk of getting cancer from drinking one beer every eight years." Angela Logomasini, *How To Manage America's Trash: Private Solutions to a Public Problem*, 3 ENVTL. PERSP. 7 (Citizens For The Environment ed., 1991). However, the incineration strategy has become more problematic due to current concerns over dioxin generation and hazardous incinerator ash. See Scott Allen, *Arkansas Incinerator Woes Stir Worry On Cleanup Of Toxic Massachusetts Sites*, BOSTON GLOBE, Feb. 23, 1993, at 16. Modern incinerators remove 97 to 99 percent of total dioxin emissions. Logomasini, *supra*, at 7 (citing Office of Tech. Assess., *Facing America's Trash* 232).

⁵⁶. The ancient city of Troy, excavated in the 1950s by C. W. Blegen, rests on the accumulation of centuries of landfill. RATHJE & MURPHY, *supra* note 4, at 34-35. In Biblical times, the residents of Jerusalem incinerated their garbage in pits from which emanated natural gas. *Id.* at 37. The Mayans used a combination of dumping and incineration. Their waste dumps were kept burning so that their waste would be in a perpetual state of reduction. *Id.* at 33.

While there is no shortage of available land for landfill siting,⁵⁷ and modern incinerators and landfills are relatively free from health risks,⁵⁸ disposal costs have dramatically increased due to the combination of rising aversion to local landfill sites—the “NIMBY” problem⁵⁹—and increased technological requirements of landfill design.⁶⁰ Because landfill disposal fees are generally paid by municipalities through general tax revenue, these increases have severely depleted municipal coffers at a time when most municipalities are mired in recessionary woes.⁶¹ Similarly, popular concern over potentially hazardous emissions and waste ash generated by municipal incinerators has made incineration less available as an

⁵⁷. RATHJE & MURPHY, *supra* note 4, at 90-107. Although most people visualize landfills as perpetually noxious dumps, dry landfills are soon landscaped after closure and their land area developed into residential or commercial property. *Id.* at 90. As such, landfills do not result in a “net” loss of land area. The common rallying cry of popular environmentalists is that half of the landfills in present operation will close within five years. *Id.* at 106-07. What most people fail to realize is that such a statement has been true since before the 1960s. *Id.* at 107. In effect, there is no shortage of land for landfill siting. Current estimates by Resources for the Future reveal that at the present level of municipal solid waste growth, the entire volume of American solid waste generated during the next 1000 years could fit into a forty square mile pit 120 feet deep. *Id.* at 108.

⁵⁸. See *supra* note 49 and accompanying text.

⁵⁹. The “Not In My Back Yard” problem has had a severe impact on landfill siting. Today, local opposition to landfills causes certain communities to ship their waste to locations thousands of miles away, at an astronomical cost. Some New York municipal waste, for example, is shipped to New Mexico. See Interstate Shipment of Municipal Solid Waste, National Solid Wastes Management Association, reprinted in RATHJE & MURPHY, *supra* note 4, at 108-09. Landfill disposal costs are proportional to the severity of local NIMBY concerns and the availability of land area near particular municipalities. Landfill disposal costs range from \$6 per ton, in the municipality of Las Vegas, Nevada, to over \$100 per ton, as in the municipality of East Lyme, Connecticut. SOLID WASTE DILEMMA, *supra* note 53, at 16-17. The U.S. Environmental Protection Agency estimates that the annual cost of municipal solid waste disposal amounts to approximately \$30 billion, and will likely reach \$75 billion by the end of the 1990s. *Van Voorst*, *supra* note 6, at 54. For a discussion of common NIMBY zoning strategies, see generally Nicolas M. Kublicki, *Land Use By, For and Of the People: Problems with the Application of Initiatives and Referenda to the Zoning Process*, 19 PEPP. L. REV. 99 (1991).

⁶⁰. See Solid Waste Disposal Act, 42 U.S.C. §§ 6944-6945 (West 1992) (stating requirements for sanitary landfills and upgrading of open dumps). See also 40 C.F.R. § 257.1 (listing criteria for solid waste disposal facilities).

⁶¹. See RATHJE & MURPHY, *supra* note 4, at 109.

alternative disposal strategy.⁶² As a result of these concerns, the United States is in the midst of a solid waste disposal crisis.

Paper wastes have an enormous impact on solid waste disposal. Paper and paperboard constitute the single largest substance in United States landfills and account for approximately 34 percent of total landfill volume.⁶³ In 1960, paper products contributed 29.9 million tons of waste to the solid waste stream.⁶⁴ The figure rose to 44.2 million tons in 1970, to 54.7 million tons in 1980 and to 73.3 million tons in 1990.⁶⁵ Of these 73.3 million tons, approximately 48 million were disposed of in landfills, 11.1 million were burned in nonenergy producing incinerators, and 800 thousand were burned in energy-producing incinerators.⁶⁶

Industry and environmentalists presented waste recovery and recycling as solutions to natural resource overuse and high solid waste disposal costs.⁶⁷ Because paper products are recyclable and constitute such a large portion of the waste stream in proportion to other solid waste constituents, paper products quickly became the principal targets of national waste recovery and recycling programs. Paper waste recovery and recycling have increased steadily. In 1970, only 16.7 percent of all paper products were recovered. This figure

⁶². The Clean Air Act requires that incinerators remove 99.9999 percent of the dioxin contained in or generated by solid waste. 42 U.S.C. §§ 7412, 7429 (West 1992). *See generally* 40 C.F.R. § 61.01 (codifying emissions standards for hazardous pollutants). Incinerator ash is classified either as subtitle D (nonhazardous waste) or subtitle C (hazardous waste) under the Solid Waste Disposal Act. *See* Solid Waste Disposal Act, 42 U.S.C. §§ 6922-6941 (West 1992) (listing requirements for hazardous solid waste).

⁶³. *See* OVERVIEW, *supra* note 2, at 1. U.S. landfills contain about 400 million cubic yards of waste. *Id.* at 3.

⁶⁴. *See* EPA CHARACTERIZATION UPDATE, *supra* note 2, at 2.

⁶⁵. *Id.* Paper represented 36.3 percent of total materials generated in 1970, 36.1 percent in 1980, and 37.5 percent in 1990. *Id.*

⁶⁶. *Id.* at 2-3.

⁶⁷. Conventional wisdom visualizes recycling as a relatively new strategy. In fact, however, recycling is very old. Paper recycling is as old as paper itself. When paper was manufactured from rags, used rags were recovered and recycled. Paper became such an important item that rags became a valuable commodity. In 1666, the British Parliament ensured a supply of cotton fiber for paper production by decreeing that only wool could be used to bury the dead. *See* HUNTER, *supra* note 11, at 311. In 1776, the Massachusetts General Court ordered that each community appoint a "rag collector." *Id.* at 310.

rose to 21.8 percent in 1980 and to 28.6 percent in 1990.⁶⁸ At present, paper is the most recovered recyclable material, accounting for approximately 78 percent of all recovered materials by weight.⁶⁹ After decades of steady increases in recycling, paper manufacture is now 45 percent virgin timber, 28 percent recovered paper wastes and 27 percent recovered wood debris, such as wood chips from logging installations.⁷⁰ Notwithstanding the significant improvements made in paper recovery and recycling, paper products continue to exercise a powerful impact on timber harvesting and solid waste disposal. This impact and present-day under recycling point to the need for reforms that will unleash the latent potential of recycling and source reduction.

⁶⁸. See EPA CHARACTERIZATION UPDATE, *supra* note 2, at 2. These figures translate into 5.4 million tons of paper recovered in 1960, 7.4 million tons recovered in 1970, 11.9 million tons in 1980 and 20.9 million tons in 1990. *Id.*

⁶⁹. AMERICAN PAPER INSTITUTE, INC., PAPER RECYCLING, THE INDUSTRY'S 40% RECOVERY GOAL, 1992 Progress Report 1 (1992). It is generally misleading to discuss solid waste in terms of either volume or weight. Both classifications can result in confusion. RATHJE & MURPHY, *supra* note 4, at 47. Certain wastes are voluminous but almost entirely composed of air, such as styrofoam. Other wastes are less voluminous but very heavy, such as batteries. In addition, the weight of solid waste can vary dramatically depending on humidity and rainfall. *Id.* The following volume to weight ratios should be considered when discussing either the weight or volume of solid waste:

Paper and Paperboard	1.0
Plastics	2.2
Yard Wastes	0.05
Ferrous Materials	1.4
Rubber and Leather	2.3
Textiles	2.1
Wood	1.0
Food Wastes	0.4
Aluminum	2.1
Glass	0.3

EPA CHARACTERIZATION OF MUNICIPAL SOLID WASTE IN THE UNITED STATES: 1990 Update (U.S. EPA), 1990, at ES-11. Ironically, disposal fees do not take these ratios into account, and are generally levied based on tonnage. RATHJE & MURPHY, *supra* note 4, at 47. Because paper has an equal volume to weight ratio, paper waste can be characterized interchangeably in terms of both weight and volume.

⁷⁰. See KEY QUESTIONS, *supra* note 50, at Question 23. The question presented, however, is whether these wood chips are byproducts or come into existence intentionally as raw materials for paper production.

III. SOLUTIONS TO PAPER PRODUCT IMPACTS ON NATURAL RESOURCE USE AND SOLID WASTE DISPOSAL TO DATE

States and the federal government have enacted a variety of laws to reduce the environmental impacts of paper production and disposal. These laws are divided into two categories: national forest legislation and state recycling laws. Although Congress proposed federal recycling legislation, it has not yet been passed.⁷¹

A. National Forest Regulation

The history of national forest⁷² legislation is characterized by two distinct periods. The first period, starting in 1897 and ending in 1960, emphasized timber production above all other resources. The second period, which began in 1960 and continues into the present, evidenced the national legislature's intent to adopt a more conservationist stance with respect to timber harvesting. Unfortunately, the first six decades of pro-logging Congressional mandates became institutionalized in the highly professional USFS, which benefits directly from high volume timber sales.⁷³ Although the USFS is adjusting to legislative mandates and popular concerns over natural resource use, many environmental commentators still

⁷¹. See *infra* notes 137-146 and accompanying text.

⁷². There are 156 national forests in the United States, dispersed throughout 42 states. Richard Rice, *The Uncounted Costs Of Logging*, in 5 NATIONAL FORESTS POLICIES FOR THE FUTURE (The Wilderness Society ed., 1989), vii. The total land area of the national forest system exceeds 190 million acres and contains most of the natural resources in the United States, including one half of the western water reserves, one quarter of the nation's energy reserves, one quarter of the nation's softwood timber and one third of all federally listed endangered and threatened species. *See id.* For information concerning deforestation rates in U.S national forests, see generally Michael Williams, *The Death and Rebirth of the American Forest: Clearing and Reversion in the United States, 1900-1980*, reprinted in JOHN F. RICHARDS & RICHARD P. TUCKER, WORLD DEFORESTATION IN THE TWENTIETH CENTURY 211-29 (1988).

⁷³. Under the Knutson-Vandenberg Act of 1930, the United States Forest Service can keep \$0.50 of each dollar of timber sales. 16 U.S.C. § 576(b) (West 1985). As such, the act is an incentive for the USFS to allow the maximum cut allowable on national forests. In 1958, USFS Forest Service Chief Richard E. McArdle stated that to meet U.S. timber demand requirements, the USFS would require removal of "the full allowable cut from practically every working circle" of the national forests. DAVID A. CLARY, TIMBER AND THE FOREST SERVICE 158 (1986) (citing Edward P. Cliff Mason, *National Forest Timber Management*).

criticize the Service for its apparent failure to shift from high volume logging to timber conservation.⁷⁴

The 1897 Organic Act⁷⁵ was the first federal legislation to regulate national forests comprehensively. After many failed proposals, Congress passed the Act to preserve water flow critical to the development of the West and to ensure a continuous source of timber for the nation.⁷⁶ The Organic Act authorized the President to create national forests on federal land and created the USFS as an agency within the Department of Agriculture.⁷⁷

The next major statutory change in national forest management did not occur until 1944, when Congress passed the Sustained Yield Act.⁷⁸ The Act pushed timber harvesting to new heights in response to the national housing boom that followed World War II.⁷⁹

A significant modification of national forest timber policy occurred in 1960. In that year, Congress apparently altered its fixation on timber production and passed the Multiple Use Sustained Yield Act (MUSY).⁸⁰ Central to MUSY was its requirement that the USFS maintain a sustained output of timber, in perpetuity, without "impairment of the productivity of the land."⁸¹ MUSY attempted to slow the pace of logging in national forests. Although MUSY did not replace the Organic Act of 1897, it directed the USFS to consider the fish, wildlife, range, mineral, recreation and aesthetic resources present in national forests in addition to timber when determining timber harvest quantities.⁸² Much to the frustration of environmentalists, however, the statutory language of MUSY was so vague that it could be interpreted to allow a wide variety of behavior

⁷⁴. See, e.g., ANDERSON & OLSON, *supra* note 45.

⁷⁵. Forest Service Organic Act of 1987, 16 U.S.C. § 471, repealed by Pub. L. 94-579, 90 Stat. 2792 (West 1985).

⁷⁶. See STEEN, *supra* note 40, at 34-37.

⁷⁷. 16 U.S.C. § 471 (repealed 1976).

⁷⁸. Sustained Yield Act, 16 U.S.C.A. §§ 583-583(i) (West 1985).

⁷⁹. See STEEN, *supra* note 40, at 246-77.

⁸⁰. Multiple Use Sustained Yield Act of 1960, Pub. L. 86-517, 74 Stat. 215 (codified as amended at 16 U.S.C. §§ 528-31 (West 1992)) [hereinafter MUSY].

⁸¹. *Id.* § 531.

⁸². *Id.* § 528.

on national forests.⁸³ In addition, the statute deferred so much to the USFS that almost any decision made by the Service became unalterable on review.⁸⁴

A revolution in national forest management occurred when Congress passed the National Forest Management Act (NFMA) in 1976.⁸⁵ The NFMA repealed the 1897 Organic Act and reapplied the MUSY principle of due consideration to nontimber forest resources.⁸⁶ The NFMA made planning the central focus of national forest management.⁸⁷ After 1976, the USFS was directed to prepare management plans for all national forest resources, including

⁸³. See *National Forest Preservation Group v. Butz*, 485 F.2d 408 (9th Cir. 1973). Although the Ninth Circuit required the USFS to give some due consideration to other resources other than timber, it did not define the meaning of “due consideration.” *Id.* at 414. As such, the *Butz* decision confused, instead of clarified, the statutory strictures of MUSY.

⁸⁴. In *Sierra Club v. Hardin*, 325 F. Supp. 99 (D. Alaska 1971), the District Court for Alaska held that, unless there is evidence in the record to demonstrate that the USFS acted in contravention of MUSY, the court must presume that the USFS action was valid. *Id.* at 123. Such a presumption, combined with the general *Chevron* standard of high agency discretion in environmental matters, acts almost as an imprimatur of virtually all USFS actions. See *Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, 842-45 (1984) (holding the agency’s construction of a delegated enforcement statute entitled to deference if it is reasonable and not in conflict with express congressional intent).

⁸⁵. National Forest Management Act of 1976, Pub. L. 93-378, 90 Stat. 2949 (codified as amended at 16 U.S.C. §§ 1600-1614 (West 1992)) (*amending* Forest and Rangeland Renewable Resources Planning Act of 1974, 16 U.S.C. §§ 1600-1614 (West 1992)).

⁸⁶. *Id.* § 1604(e), (g). In its *Butz* decision, the Fourth Circuit held that under the Forest Service Organic Act of 1897, timber could only be clearcut if the USFS marked, identified and appraised dead, matured or large growth trees in order to preserve and stimulate the growth of young trees. *West Virginia Div. of the Izaak Walton League of America, Inc. v. Butz*, 522 F.2d 945 (4th Cir. 1975). The decision made clearcutting very difficult to use as a timber harvesting technique. *Id.* at 949-55. The court, however, suggested that the Organic Act might be outdated. It stated:

We are not insensitive to the fact that our reading of the Organic Act will have serious and far-reaching consequences, and *it may well be that this legislation enacted over seventy-five years ago is an anachronism which no longer serves the public interest*. However, the appropriate forum to resolve this complex and controversial issue is not the courts but the Congress.

Id. at 955 (emphasis added).

The harshness of the court’s decision, combined with its statement concerning the potential obsolescence of the Organic Act prompted Congress to repeal the Organic Act and enact the National Forest Management Act in 1976.

⁸⁷. See *supra* note 85.

timber.⁸⁸ Management plans are implemented through specific project proposals.⁸⁹ Because the National Environmental Policy Act of 1969 (NEPA) requires the preparation of an environmental impact statement (EIS) pursuant to any federal proposal that “significantly affect[s] the human environment,” both USFS plans and project proposals must comport with the EIS requirement.⁹⁰

The NFMA requires the USFS to incorporate four key concerns into each timber plan.⁹¹ First, the plan must ensure that slopes will not be damaged, that the timber removed can be restocked within five years, that wetlands will be protected and that the timber harvest will not destroy the water flow.⁹² Furthermore, the Secretary of Agriculture must identify areas not suitable for timber harvesting.⁹³ Second, the USFS must limit timber production to quantities which allow sustained yield in perpetuity, as originally provided by the MUSY statute.⁹⁴ Pursuant to NFMA jurisprudence, the USFS cannot allow clearcutting unless it can demonstrate that clearcutting is essential for silviculture.⁹⁵ Third, USFS plans must ensure that timber sales are economically suitable.⁹⁶ To fulfill this requirement, timber prices must be set according to one of two methods: either by the price at which a reasonably efficient operator would make a profit or by the price of similar timber.⁹⁷ Hence, it is not mandatory for the USFS to sell timber at a profit or even at cost. In fact, the USFS has consistently sold timber below cost since it

^{88.} 16 U.S.C. § 1604 (1992).

^{89.} *Id.*

^{90.} National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-4361 (1992) [hereinafter NEPA].

^{91.} *Id.* § 4332(C). See National Forest Management Act, 16 U.S.C. § 1604(g)(1) (1992) [hereinafter NFMA] (specifying accordance with NEPA).

^{92.} *Id.* § 1604(g)(3)(E)(i)-(iv).

^{93.} *Id.* § 1604(k). The effect of this provision, however, is to allow the Secretary to authorize timber harvesting in all areas not identified as improper for harvesting.

^{94.} *Id.* § 1604(e) & (g).

^{95.} National Wildlife Fed'n v. United States Forest Serv., 592 F. Supp. 931, 937-39 (D. Oregon 1984).

^{96.} See NFMA, *supra* note 91.

^{97.} See Rice, *supra* note 72, at 5.

began its accounting procedures in 1988.⁹⁸ Fourth, USFS timber plans must take biological diversity into account.⁹⁹ This signifies that the USFS must plan for biological communities by focusing on "indicator species."¹⁰⁰ Indicator species act as representatives for a multitude of other species that would be affected by excessive timber harvesting.¹⁰¹

In sum, while the Organic Act and the Sustained Yield Act increased national forest timber harvesting, MUSY and NFMA constrained federal timber harvesting procedurally by directing the USFS to consider other forest resources in fixing allowable sale quantities of timber. Although NFMA planning has increased the procedural requirements of timber harvesting in national forests, it has failed to require the sale of timber at or above cost. This omission, in conjunction with the high level of discretion accorded to USFS decisions and the pro-logging institutional persona of the USFS, has allowed timber harvesting to continue almost unfettered in national forests.

B. *Mandatory Recycling Laws*

The second attempt to curb the environmental impacts of paper has come in the form of state recycling laws and proposed federal recycling legislation.

⁹⁸. See *Clinton Won't Cut Enough*, U.S. NEWS & WORLD REP., Feb. 22, 1993, at 26. The Congressional Research Service estimates that below cost sales of national forest timber have resulted in a \$7 billion loss to the United States Treasury between 1978 and 1992. *Id.*

⁹⁹. 16 U.S.C. § 1604(g)(3)(B) (1992).

¹⁰⁰. Indicator species are used to represent the impact of national forest management practices on other species so numerous that the USFS could not accurately track them individually. Interview with Dr. David Blockstein, biologist, Committee for the National Institutes on the Environment, in Washington, D.C. (Nov. 14, 1992). The Spotted Owl is one of many indicator species under the National Forest Management Act. *Id.* In the words of Secretary of the Interior Bruce Babbitt, an indicator species is a "warning light about the decline in productivity of an ecosystem." Ted Gup, *It's Nature, Stupid*, TIME, July 12, 1993, at 39.

¹⁰¹. Because the number of indicator species might be too small, the USFS is expanding its species control group to include sensitive species in addition to indicator species. Interview with Dr. David Blockstein, biologist, Committee for the National Institutes on the Environment, in Washington, D.C. (Nov. 14, 1992).

1. State Recycling Laws

Most states have enacted at least one law governing waste recovery and recycling. These recycling laws can be divided into two major philosophical groups: "command and control" laws and incentive laws. Whereas command and control laws require strict adherence to recycled content goals, incentive laws give manufacturers and consumers economic motivations to increase paper recycling. While state recycling laws are diverse in their substantive and procedural requirements, most of these laws can be grouped into the following categories: mandatory and nonmandatory recycling goals, recycling incentives, state purchasing preferences, advance packaging disposal fees, product and packaging restrictions, packaging taxes, disposal restrictions on recyclable wastes and product labeling.

i. Mandatory Recycling And Waste Reduction Goals

Thirty-eight states require the reduction of waste stream volumes.¹⁰² The specifics of these laws vary widely from state to state. Generally, the laws accomplish their purpose either by requiring source separation and recyclable materials recovery¹⁰³ or by banning certain types of disposal altogether.¹⁰⁴ In many instances, mandatory recycling laws fix minimum content percentages for recycled products over time.¹⁰⁵ Failure to meet these percentages results in civil liability for the manufacturer. Although cost-benefit

¹⁰². See STATE POLICY, *supra* note 8, at 3-12. These states are: Arizona, California, Connecticut, Delaware, Florida, Hawaii, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Texas, Utah, Vermont, Virginia, Washington, West Virginia and Wisconsin. *Id.* For an in-depth analysis of state recycling laws, see generally NATIONAL SOLID WASTES MANAGEMENT ASSOCIATION SPECIAL REPORT: RECYCLING IN THE STATES 1990 REVIEW (1991).

¹⁰³. For example, Arizona requires that 50 percent of all office paper be separated and collected. STATE POLICY, *supra* note 8, at 3.

¹⁰⁴. In Delaware, solid waste cannot be dumped in the ocean waters of Delaware, in the Delaware Bay, in the Inland Bays or in the Waters of Ecological Significance. *Id.* at 4.

¹⁰⁵. In Minnesota, metropolitan areas must recycle 45 percent of their municipal solid waste. *Id.* at 7. Nonmetropolitan areas must recycle 30 percent of their waste. *Id.*

analyses may have been performed at the drafting stage, cost is not considered as a factor in the application of mandatory recycling laws.

ii. Nonmandatory Recycling Goals

Eight states have enacted nonmandatory recycling goals.¹⁰⁶ While unenforceable by definition, nonmandatory recycling goals announce state recycling policy and may constitute models for future mandatory goals. States that possess nonmandatory goals may have opted for a positive incentive system rather than the disincentive system presented by mandatory goals.¹⁰⁷ Of the eight states that have established nonmandatory recycling goals, five states have also enacted mandatory recycling goals.¹⁰⁸ In these instances, the nonmandatory goals provide guidance on how the mandatory goals may be achieved.¹⁰⁹

iii. Recycling Incentives

Thirty-three states have incorporated positive incentives into their recycling laws.¹¹⁰ These states encourage paper recycling by providing economic incentives to manufacturers who use recycled materials as raw materials in paper production. While the laws share a common incentive philosophy, they utilize a variety of different incentive mechanisms, including income tax credits,¹¹¹ sales tax

¹⁰⁶. The states are Alabama, Delaware, Georgia, Mississippi, Montana, New Mexico, North Dakota and Texas. *Id.* at 13.

¹⁰⁷. New Mexico has adopted a nonmandatory recycling goal of 25 percent by July 1995 and 50 percent by July 2000. STATE POLICY, *supra* note 8, at 3.

¹⁰⁸. These states are Delaware, Mississippi, New Mexico, North Dakota and Texas. *Id.* at 2.

¹⁰⁹. Texas, for example, has adopted a mandatory recycling goal of 40 percent by 1994, with a nonmandatory recycling goal of 10 percent for newsprint. *Id.* at 10-11, 13.

¹¹⁰. These states are: Arkansas, Arizona, California, Colorado, Florida, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, New Jersey, New Mexico, New York, North Carolina, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Utah, Virginia, Washington, West Virginia and Wisconsin. *Id.* at 13-18.

¹¹¹. Arizona offers an income tax credit of 10 percent of the cost of installation for recycling equipment, up to a maximum based on the lesser of either 25 percent of tax liability or \$5000. *Id.* at 13.

exemptions,¹¹² property tax exemptions¹¹³ and tax exempt financing.¹¹⁴

iv. State Purchasing Preferences

Thirty-nine states currently discriminate in favor of recycled materials when purchasing state supplies.¹¹⁵ Perhaps because state agencies purchase relatively stable quantities of paper products, state purchasing preference laws place a heavy emphasis on recycled paper. State purchasing preferences are generally implemented by restricting state purchases to products with minimum recycled contents.¹¹⁶ Other mechanisms include artificial price reductions of recycled paper products in state purchasing bids.¹¹⁷

v. Advance Packaging Disposal Fees

Eleven states impose refundable fees on recyclable products.¹¹⁸ If the product is discarded, the fee serves as an offset to state or municipal disposal fees. If the product is recovered, the fee is returned to the manufacturer.¹¹⁹ Perhaps because of the wide

¹¹². Florida exempts purchasers of recycling equipment from state sales tax. STATE POLICY, *supra* note 8, at 14.

¹¹³. Indiana exempts property owners from property tax on real and personal property used for recycling. *Id.*

¹¹⁴. Massachusetts provides a total of \$150 million in tax-exempt financing for the development of recycling centers. *Id.* at 15.

¹¹⁵. These states are: Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia and Wisconsin. *Id.* at 18-24.

¹¹⁶. The state of Alaska restricts its paper product purchases to products manufactured with a minimum of fifteen percent recycled content. *Id.* at 18.

¹¹⁷. Arizona gives a five percent purchase price preference to recycled products. STATE POLICY, *supra* note 8, at 18.

¹¹⁸. The states are: California, Connecticut, Delaware, Florida, Iowa, Maine, Massachusetts, Michigan, New York, Oregon and Vermont. *Id.* at 24-27.

¹¹⁹. California levies a \$0.02 fee on each aluminum or glass container under 24 ounces, a \$0.03 fee on plastic or tin containers under 24 ounces and a \$0.04 fee on any container, regardless of recycling potential, over 24 ounces. *Id.* at 24.

diversity of paper product types and volumes, however, none of these laws impose fees on paper products.

vi. Product And Packaging Mandates

Forty states restrict packaging.¹²⁰ These states focus on paper principally. Packaging restrictions are implemented either as outright bans or as gradual phase-ins of recycled products.¹²¹ Many of these laws dictate what certain industries can and cannot purchase.¹²² As a result, these laws often provide exceptions for certain recycled products that cannot be obtained at comparable prices or qualities, such as paper.

vii. Taxes On Packaging And Materials

Nine states impose product taxes, levied either at the time of manufacture or at the time of purchase.¹²³ Although several states tax recyclable products if they are not manufactured with a certain recycled content,¹²⁴ seven of the nine states levy a tax on products regardless of their recycling potential.¹²⁵ Essentially, these laws constitute disposal cost pricing mechanisms as they increase the cost of products based upon the materials and packaging utilized.

¹²⁰. These states are: Alaska, Arizona, California, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia and Wisconsin. *Id.* at 27-40.

¹²¹. Alaska has banned nonbiodegradable plastic rings. *Id.* at 27. California requires that commercial publishers purchase 30 percent recycled newsprint in 1994, 35 percent in 1996, 40 percent in 1998 and 50 percent in 2000. STATE POLICY, *supra* note 8, at 27.

¹²². See STATE POLICY, *supra* note 8.

¹²³. These states are: Florida, Nebraska, New Jersey, New York, North Carolina, Ohio, Rhode Island, Virginia and Washington. *Id.* at 40-42.

¹²⁴. For example, Florida imposes a \$0.10 per ton tax on newsprint, regardless of recycled content. *Id.* at 40. Because this constitutes a tax on all newsprint, both recycled and virgin, this levy bears no rational nexus to recycling. If the minimum content of recycled newsprint fails to reach 50 percent by October 1992, the tax increases to \$.50 per ton. *Id.*

¹²⁵. New Jersey levies a tax of \$300 per \$1 million sales on litter-generating products. *Id.* Retailers are taxed at a lower \$225 per \$1 million rate. *Id.*

viii. Disposal Facility Restrictions

Forty-two states place some form of restriction against municipal solid waste disposal.¹²⁶ Many of these restrictions focus on potentially hazardous substances, such as lead-acid batteries¹²⁷ and used oil.¹²⁸ Other laws impose moratoria on new waste disposal facilities or on disposal volume increases.¹²⁹ The great majority of disposal facility restrictions, however, prohibit landfilling or incineration of recyclable or compostable waste such as paper,¹³⁰ yard debris¹³¹ or recyclable aluminum.¹³²

ix. Product Labeling

Seven states have adopted "green labeling" statutes, which mandate the application of state-approved labels on products manufactured with recycled materials.¹³³ These statutes were enacted as deterrents to false or misleading claims concerning the environmental impacts of certain products, such as claims that a product is "recycled,"¹³⁴ "recyclable"¹³⁵ or "biodegradable."¹³⁶

¹²⁶. These states are: Alabama, Alaska, Arizona, Arkansas, California, Connecticut, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin and Wyoming. *Id.* at 42-49.

¹²⁷. Louisiana law prohibits, *inter alia*, the disposal of lead-acid batteries in municipal disposal facilities. STATE POLICY, *supra* note 8, at 45.

¹²⁸. Minnesota law prohibits, *inter alia*, the disposal of used oil in municipal disposal facilities. *Id.*

¹²⁹. Maine has placed a moratorium on new waste disposal facilities. *Id.* Alabama has adopted a moratorium on municipal solid waste disposal facilities within coastal regions of the state. *Id.* at 42.

¹³⁰. Connecticut law prohibits recyclable waste landfilling and incineration. *Id.* at 43.

¹³¹. Florida law prohibits the disposal of yard waste, lead-acid batteries, used oil or waste tires. STATE POLICY, *supra* note 8, at 43.

¹³². Massachusetts law prohibits the disposal, *inter alia*, of all paper products after December 31, 1994. *Id.* at 45.

¹³³. These states are: Arizona, California, Connecticut, Illinois, New Hampshire, Rhode Island and Wisconsin. *Id.* at 50-51. All paper products sold in Arizona must display a state-approved recycling logo. *Id.* at 50. See also AMERICAN FOREST AND PAPER ASSOCIATION, STATE ENVIRONMENTAL LABELING ADVERTISING LAWS AND REGULATIONS (1992) (summarizing state environmental labeling laws).

¹³⁴. In New Hampshire, for example. See STATE POLICY, *supra* note 8, at 50.

2. Proposed Federal Recycling Legislation

Although federal law does not currently set mandatory recycling limits,¹³⁷ Congress has proposed legislation which would have preempted state recycling goals by fixing minimum recycling percentages for solid waste.

On February 7, 1992, members of the United States Senate proposed a bill, S. 976,¹³⁸ as an amendment to the Solid Waste Disposal Act.¹³⁹ The bill would have imposed waste stream reduction and mandatory recycling goals for all solid waste in the United States.¹⁴⁰ The compliance schedule provided by the bill set a 25 percent waste stream reduction goal for 1995.¹⁴¹ The percentage would have doubled to 50 percent by the year 2000.¹⁴² In addition, the bill would have imposed a fixed utilization schedule for recyclable materials.¹⁴³ For example, all grades of paper would have been

¹³⁵. In Wisconsin, for example. *Id.* at 51.

¹³⁶. In Rhode Island, for example. *Id.*

¹³⁷. Although there exists no federal statute that sets mandatory recycling goals for paper, President Clinton in October 1993 announced that the federal government—including all federal agencies—must henceforth purchase and utilize paper that contains 20 percent recycled paper waste, a figure which is required to increase to 30 percent by 1999. *White House Paper Chase*, TIME, Nov. 1, 1993, at 71. The federal government purchases over 300,000 tons of paper each year, which constitutes 2 percent of all U.S. sales of paper. *Id.* As such, the President's order likely will have a positive impact on the market for paper waste.

¹³⁸. S. 976, 102d Cong., 2d Sess. (1991). The bill was introduced by Senator Baucus (D-MT) and sponsored by Senators Chafee (R-RI) and Burdick (D-ND). *Id.* No vote was taken on the bill. Interview with Cliff Rothenstein, Legislative Assistant, Senate Committee on Environment and Public Works. Instead, the bill was merely reported out of committee. *Id.* The Senate does not plan to take up mandatory recycling in the second session of the 103rd Congress. *Id.*

¹³⁹. 42 U.S.C. §§ 6901-6992 (1983 & Supp. 1991).

¹⁴⁰. S. 976, 102d Cong., 2d Sess. § 310 (1991). In addition, the bill would have mandated collection programs in each state. *Id.* § 303.

¹⁴¹. *Id.* § 302.

¹⁴². *Id.*

¹⁴³. See generally *id.* §§ 301-307. The bill would have mandated a minimum recycled content for all paper materials fabricated in the United States by December 31, 1995, as follows:

- 52 percent for newsprint,
- 66 percent for corrugated paper products,
- 20 percent for mixed paper grades,

forced to contain 40 percent recycled materials by 1995, 45 percent by 1998 and 50 percent by 2000.¹⁴⁴ The bill would have required the performance of all federal contracts equal or greater to \$1000 through the use of materials with a minimum recycled content of 50 percent, and would have directed each federal agency to appoint a waste reduction officer.¹⁴⁵ Senate bill S. 976 sought to facilitate the implementation of its mandated paper recycling percentages by providing a variety of options. Under the bill, manufacturers could have: 1) used a percentage of recovered materials directly in their own products, 2) ensured that recovered materials were utilized in the manufacture of another product, 3) reused packaging for its original purpose and 4) reduced the weight of the materials covered under the bill.¹⁴⁶

In sum, the bill S. 976 would have provided a command and control statute for the recovery and recycling of certain materials, such as paper. The proposed legislation would have imposed mandatory recycling percentages without providing incentives and without considering additional costs incurred by manufacturers and consumers. Although the bill was defeated, similar versions of the bill are certain to reappear in future Congresses.

3. Problems Posed By Mandatory Recycling Laws

At first blush, mandatory recovery and recycling laws seem to solve the dilemma posed by the incomplete recovery and recycling of recyclable products, such as paper. Upon closer scrutiny, however, mandatory recovery and recycling laws force the acceleration of a process which is incompatible with the market for recovered recyclable waste. As such, mandatory recycling laws disregard the very reason for which recyclable materials are not fully recovered or incorporated into new products—economics.

-
- 100 percent for pulp substitutes, and
 - 40 percent for all grades of paper products.

S. 976, 102d Cong., 2d Sess. § 302.

¹⁴⁴. *Id.* The bill would have mandated an annual increase of 2 percent minimum recycled content for all paper product categories. *Id.*

¹⁴⁵. *Id.* § 306.

¹⁴⁶. *Id.* § 102.

First, the concepts of recovery and recycling are separate and distinct.¹⁴⁷ Recovery is the process whereby recyclable materials are removed from the solid waste stream. In contrast, recycling is the actual process by which recovered materials are incorporated into new products.¹⁴⁸ Although individual, corporate and municipal goodwill can force the recovery of virtually all recyclable paper products from the waste stream, economics and technology place real limits on society's ability to recycle recovered products. Current studies estimate the present recycling rate of United States industry at somewhere near sixteen percent.¹⁴⁹ If this rate is representative of capacity, the market for recovered waste is limited. Ironically, mandatory recycling laws have increased recyclable materials recovery to such an extent that they have induced an oversupply of recyclable materials.¹⁵⁰ In turn, this oversupply of recovered materials has caused a dramatic decrease in recyclable material prices.¹⁵¹ Between 1990 and 1991, for example, the market for used newspaper fell 200 percent.¹⁵² The price for used white sorted ledger paper dropped 62 percent during the same period.¹⁵³ Price decreases have been so significant that many recovery centers have been forced to pay waste companies or recyclers to remove recovered newsprint.¹⁵⁴

¹⁴⁷. Common impressions of synonymity between these two concepts cause misunderstanding, as people often equate high waste recovery figures with much lower recycling figures.

¹⁴⁸. See *CHARACTERIZATION OF MUNICIPAL SOLID WASTE*, *supra* note 69, at ES-2.

¹⁴⁹. CITIZENS FOR THE ENVIRONMENT ACTION FUND, COMMENTS TO THE 7 FEBRUARY 1992 DRAFT OF S. 976, TITLE III 1 (statement of Dr. Harvey Alter) (1992) [hereinafter LEGISLATIVE COMMENTS]. This figure does not include yard waste recycling. *Id.*

¹⁵⁰. See *infra* notes 157-160 and accompanying text.

¹⁵¹. Between January 1990 and December 1991, prices for recovered recyclable materials decreased severely, as follows:

- aluminum down 39 percent
- clear glass down 70 percent
- white sorted paper down 62 percent
- newspaper down 200 percent
- plastic down 49 percent.

NATIONAL SOLID WASTES MANAGEMENT ASSOCIATION, LOCAL RECYCLING PROGRAMS IN ECONOMIC JEOPARDY 1 (1992).

¹⁵². *Id.*

¹⁵³. *Id.*

¹⁵⁴. See *infra* notes 157-160 and accompanying text.

The second problem that plagues mandatory recycling laws is conceptual in nature. The national obsession with recycling has engendered a tendency, in the minds of many regulators and environmentalists, to replace all forms of waste disposal with recycling. However, recycling cannot provide a complete solution to the solid waste disposal crisis.¹⁵⁵ Although recycling possesses the dually advantageous effect of reducing natural resource use and solid waste volume, the economic and technological mechanism of recycling does not operate in a vacuum. Instead, recycling must be considered as a solid waste disposal option holistically with landfilling and incineration. Furthermore, recycling must be considered in conjunction with the availability and price of virgin raw materials.¹⁵⁶

In the case of paper, the reasons for this are twofold. First, the paper recycling process is often more expensive than landfilling or incineration. While it is true that higher landfilling and incineration costs have increased the economic feasibility of recycling, the recycling process is not without cost. Landfilling and incineration are expensive due to NIMBY siting problems and high technological design requirements. Recycling is expensive because it is energy-intensive and produces large amounts of sludge from de-inking and de-gumming. Second, virgin timber is often cheaper than recycled paper.¹⁵⁷ Heavy federal timber subsidies offer a considerably cheaper resource, as below-cost timber sales readily demonstrate. Third, mandatory recycling laws fail to take into consideration certain issues that transcend simple cost analyses. Health and product quality are two such issues. Whereas it may be desirable to recover and

¹⁵⁵. Recycling is limited by economic and technological factors. *See generally* RECYCLING SOLID WASTE, *supra* note 34, at 3 (stating "Limits to recycling are both technological and economic.").

¹⁵⁶. *See* LEGISLATIVE COMMENTS, *supra* note 149, at 1.

¹⁵⁷. It costs between \$100,000 and \$600,000 to recycle a single ton of paper. KEY QUESTIONS, *supra* note 50, at Question 22. An eighty-acre dry landfill costs approximately \$33 million to construct. RATHJE & MURPHY, *supra* note 4, at 92. Such a landfill would provide solid waste disposal for a community of 500,000 for twenty years. *Id.* An actual product cost comparison of recycled paper and virgin wood-based paper cannot be made because each type of paper product requires a varying amount of virgin paper fiber in order to maintain strength. *See generally* KEY QUESTIONS, *supra* note 50, at 4. Also, recovered paper wastes differ in price depending on municipal geography. *See supra* note 57.

recycle food packaging from the standpoint of natural resource use, it may not be desirable to do so unless the safety of recycled food packaging is demonstrated to be on par with that of virgin paperboard.¹⁵⁸ At present, no such proof exists. In addition, because paper requires a certain minimum strength to accomplish its various purposes, virgin fibers must always be used in the production of new paper.¹⁵⁹ Therefore, whereas paper can only be manufactured from recycled paperboard partially, the manufacture of paper products can only utilize a fixed percentage of recycled paper, above which the quality of the final product decreases.¹⁶⁰ Although current minimum content laws do not require recycled paper content greater than this fixed percentage, state recycling laws have established the command and control minimum content matrix necessary to impose such a requirement in the future.

Regardless of its cost, health and quality limitations, recycling often remains a desirable substitute to landfilling and incineration. However, the problems caused by state mandatory recycling laws demonstrate that recycling can only become an effective solid waste disposal strategy if it maximizes the efficient use of natural resources in light of landfilling and incineration. Recycling must be incorporated into the solid waste disposal process pursuant to economic efficiency, not statutory fiat. In the case of paper, manufacturers must be given incentives to utilize recovered recyclable materials instead of virgin timber fibers. Similarly, consumers must be provided with incentives to purchase recycled paper products. Because such incentives imply economic choices between recycling and virgin timber use, and between recycling and

¹⁵⁸. Food may have a higher shelf life if packaged in virgin wood-based paper than if packaged in recycled paper. LEGISLATIVE COMMENTS, *supra* note 149, at 3. In addition, according to Dr. Harvey Alter, U.S. Chamber of Commerce, "as the use of packaging is increased, the fraction of food waste decreases." Harvey Alter, *The Origins of Municipal Solid Waste: The Relations Between Residues from Packaging Materials and Food*, 7 WASTE MGMT. & RES. 110 (1989). Studies by the University of Arizona's Garbage Project found that, because food in Mexico is generally not packaged, the average Mexican household generates more food wastes than the average American household. William L. Rathje & W.W. Hughes, Household Garbage and the Role of Packaging: The United States-Mexico City Household Refuse Comparison, Solid Waste Council of the Paper Industry, University of Arizona, Department of Archaeology, Garbage Project (July 1985).

¹⁵⁹. KEY QUESTIONS, *supra* note 50, at 4.

¹⁶⁰. *Id.*

other waste disposal techniques, recycling incentives must not be implemented simply as penalties for making the “wrong choice,” but rather as market-based incentives to motivate environmentally sound choices.

IV. INCREASING PAPER PRODUCT RECYCLING EFFICIENCY THROUGH MARKET-BASED INCENTIVES

A. *Market-Based Incentives Generally*

Market-based incentives mix economics and fixed regulation to motivate desirable conduct through self-interest. This mixture results in more than mere compliance with the law. Efficiency is the necessary goal of all market-based incentive strategies. Market-based incentives minimize natural resource waste by fostering the efficient use of resources.¹⁶¹

To achieve efficiency in the context of paper, the mission of legislators and regulators is simple. Lawmakers must ensure that present artificial price structures are modified to reflect the true value of virgin timber and the true cost of landfilling, incineration and recycling. These changes will adjust the supply and demand matrix and naturally force consumers and the paper industry to recycle as much paper as is efficient. Although the law offers a virtually unlimited menu of market-based incentives for paper recycling, the elimination of federal timber subsidies and the implementation of full cost pricing are two strategies which would accomplish a majority of the price structure reforms sought.

B. *Elimination Of Federal Timber Subsidies*

At present, the United States government subsidizes national forest timber harvesting. The subsidy is implemented through two different methods. First, federal timber is sold—below cost—at a loss to taxpayers of hundreds of millions of dollars each year.¹⁶² Second,

¹⁶¹. See LEGISLATIVE COMMENTS, *supra* note 149, at 1.

¹⁶². See Rice, *supra* note 72, at 5. Exact calculations of annual below cost timber sale figures depend on the definition of “cost.” For environmentalists, cost tends to include all environmental impacts. *See id.* at 11. For the USFS, certain costs, such as road construction expenses, are considered benefits to recreation and are therefore not always included as real costs. *Id.* The following is a comparison of regional timber receipts and expenditures, based

the federal government uses taxpayer funds to construct timber access roads in national forests for the benefit of timber harvesting. Over the years, the USFS has constructed a national forest timber access road network which totals eight times the mileage of the interstate highway system.¹⁶³ This network dramatically reduces the transportation costs of timber harvesters. Together, these two subsidies result in an artificially lower price for federal timber than for private timber. As a result, federal subsidies make recovered paper wastes less attractive than virgin timber as raw materials in paper production.

The two timber subsidies find different bases of authority in the NFMA. While the access road network is expressly authorized in

on the 1988 United States Forest Service Annual Report, in thousands of 1988 United States dollars:

<u>Region</u>	<u>Timber Receipts</u>	<u>Timber Expenditures</u>	<u>Net Receipts</u>
Northern	68,430	93,107	-24,678
Rocky Mountain	14,017	23,826	-9,809
Southwestern	37,336	31,817	+5,518
Intermountain	20,261	35,905	-15,644
Pacific			
Southwest Pacific	262,419	194,732	+67,687
Northwest	859,722	481,729	+377,993
Southern	109,297	101,335	+7,962
Eastern	29,030	39,834	-10,804
Alaska	10,990	20,574	-9,584

Rice, *supra* note 72, at A-1 to A-4. Reforestation and road costs are amortized into the USFS budget, often over hundreds of years. *Id.* at A-4, n.3. The expenditures reported by the USFS in the above figures include reforestation and road construction expenditures in their amortized value. If represented as annual expenditures, road construction and reforestation costs would cause a severe cost imbalance. The United States General Accounting Office found that costs exceeded revenues by 27 percent in 1981 and by 42 percent in 1982. General Accounting Office, Congress Needs Better Information on Forest Service's Below-Cost Timber Sales (1984). National forest timber sales are not the sole focus of USFS below cost sales. The General Accounting Office recently reported that the USFS allowed ski slope operators to pay national forest lease fees much lower than fair market value. See Tom Kenworthy, GAO: *Ski Areas Underpay U.S. for Slopes*, WASH. POST, May 12, 1993, at A5.

¹⁶³. Rice, *supra* note 72, at 11. By 1986, the USFS access road network totaled 356,000 miles. *Id.*

the NFMA,¹⁶⁴ below cost pricing of national forest timber is not. In fact, the NFMA expressly states that the Secretary must consider “economic factors” in its development of land management plans and in its determination of timber unsuitable for harvesting.¹⁶⁵ Below cost timber sales have occurred in derogation of this statutory requirement. Congress apparently predicted this when it drafted section 1604(l) of the NFMA, which requires that the USFS “provide a comparison of [estimated] expenditures to the return to the Government resulting from the sale of timber.”¹⁶⁶ Although the USFS defines “fair market value” for timber as “the price acceptable to a willing buyer and seller, both with knowledge of the relevant facts and not under compulsion to deal,” the two timber appraisal methods base timber prices on what a reasonably efficient operator can afford to pay while still making a profit.¹⁶⁷ As such, the USFS disregards its own costs and bases the entire timber pricing mechanism on the operator’s economic framework, a framework which is rooted in cheap national forest timber.

The federal government could eliminate federal timber subsidies by an increase in federal timber prices to their real fair market value and by a shift—partial or complete—in the cost of access road construction to timber operators, who are the primary beneficiaries of the federally funded national forest road network. The termination of federal timber subsidies would remove the artificial price barrier against recovered paper wastes and make recovered paper wastes more economically attractive to paper manufacturers as a source of raw materials.

The elimination of federal timber subsidies would not contravene national forest policy. National forests are held in trust by the federal government for the people of the United States as beneficiaries. This policy dictates that national forest resources should be available for use by all, including timber operators, whose labor supplies American wood-based industries. However, the policy does not require an economic loss by the U.S. Treasury on timber

¹⁶⁴. 16 U.S.C. § 1608 (1992).

¹⁶⁵. *Id.* § 1604(k).

¹⁶⁶. *Id.* § 1604(l).

¹⁶⁷. United States Forest Service, United States Forest Service Manual § 2421.3. See Rice, *supra* note 72, at 5.

sales. The termination of federal timber subsidies would not foreclose upon the ability of timber operators to use federal timber. Instead, it would merely ensure that the price received from the sale of federal timber is one of fair market value.

President Clinton and Vice President Gore were vocal supporters of federal timber price increases during the 1992 presidential campaign.¹⁶⁸ Although the Clinton Administration included higher timber fees in its fiscal year 1994 budget proposal, the administration soon backed down from the proposed increases after heavy lobbying by the timber industry.¹⁶⁹ Instead, the administration announced a logging plan in July 1993 that replaces a price increase with a reduction in available sale quantity.¹⁷⁰ The timber plan limits the allowable harvest quantity to 25 percent of its 1980s levels in the Pacific Northwest, establishes certain protected reserves for indicator species and requests that the Congress authorize and appropriate \$1.2 billion between 1994 and 1999 in economic aid to the region.¹⁷¹ A decrease in federal timber subsidies would have increased timber prices and harnessed market forces to maximize the efficient use of timber. Unfortunately, the plan uses the unsophisticated mechanism of an outright percentage ban to achieve a goal that can only be solved effectively through the use of market economics. As a result, the plan does not appeal to environmentalists, labor groups, or timber companies, as it fails to address fully the concerns of these three interest groups.¹⁷²

¹⁶⁸. See Michael Weisskopf & Ann Devroy, *Clinton Bows To Westerners On Higher Fees*, WASH. POST, Mar. 31, 1993, at A1.

¹⁶⁹. *Id.* See also Jack Anderson & Michael Bilstein, *Forest Fallout in the Pacific Northwest*, WASH. POST, June 7, 1993, at C14.

¹⁷⁰. Melissa Healy, *Clinton Logging Plan Runs Into a Buzz Saw of Foes*, L.A. TIMES, July 2, 1993, at A1, 24. See Ted Gup, *It's Nature, Stupid*, TIME, July 12, 1993, at 38 (discussing the Clinton administration's timber plan and logging problems).

¹⁷¹. *Forest Protection Plan*, L.A. TIMES, July 2, 1993, at A24. The plan also calls for the elimination of a subsidy to companies that export raw logs so as to stimulate the growth and prosperity of domestic timber mills. *Id.*

¹⁷². See Healy, *supra* note 170, at A24. For example, the American Forest and Paper Association has vowed to contest the plan in court on a minimum of ten issues. *Id.* The Sierra Club has called the plan "a plan to continue logging in the last remaining ancient forests." *Id.* The California Forestry Association asserted that the plan would "devastate rural California," citing the fact that the region has already experienced a closure of 67 timber mills. *Id.*

C. Full Cost Pricing

At the other end of the paper production spectrum lies disposal. At present, municipalities bear the responsibility of solid waste disposal.¹⁷³ Property taxes and other revenues are used as a source of funding for solid waste disposal.¹⁷⁴ Disposal fees present a very real cost to municipalities. Recent landfill siting problems and costly technological requirements in landfill design have increased landfill disposal fees.¹⁷⁵ Because paper waste constitutes 34 percent of all landfill volume, paper products bear a heavy impact on municipal disposal costs.¹⁷⁶

Disposal fees are not currently incorporated into the manufacturing costs or retail prices of paper products. As a result, disposal costs are not a basis for selecting between recyclable paper waste and virgin timber as raw materials or between large and small sized product containers and packaging. Consumers of paper products are not impacted by higher prices when they purchase paper products that will be disposed in landfills or incinerators. For example, a heavily packaged retail good does not cost more to the consumer than a relatively unpackaged supplementary good merely by virtue of its greater volume of packaging. Similarly, paper manufacturers do not suffer from their choice of virgin timber over recovered paper waste as a raw material.¹⁷⁷ Therefore, paper manufacturers who currently recycle paper wastes are forced to bear the cost of recycling but fail to realize economic benefits from the savings of landfilling and incineration fees incurred when paper wastes used in the production process are diverted from the waste stream. Hence, manufacturers have no incentive to utilize recovered paper wastes that reduce or eliminate landfill and incineration costs.

¹⁷³. RATHJE & MURPHY, *supra* note 4, at 41. Founding Father Benjamin Franklin developed the first municipal streetcleaning service in 1757 in Philadelphia. *Id.*

¹⁷⁴. Property taxes often constitute the only major source of municipal revenue. Interview with Charles I. Nelson, Professor of Property and Land Use Law, Pepperdine University, in Malibu, Cal. (April 1991). At times, special projects are financed through special or emergency assessments. *Id.*

¹⁷⁵. See *supra* notes 61-64.

¹⁷⁶. See *supra* note 65 and accompanying text.

¹⁷⁷. Actually, the concept envisions that by using virgin wood fibers in the manufacture of a paper product, the manufacturer allows waste which should be recycled to enter a landfill instead.

The lack of disposal cost pricing encourages the use of virgin timber by failing to discourage the use of recovered paper wastes. Simply stated, the absence of disposal cost pricing results in a blind municipal subsidy of landfilled and incinerated products.

Disposal cost pricing would make paper recycling and source reduction more cost-effective. Through disposal cost pricing, manufacturers would be charged for the amount of virgin paper used in packaging, based on phased-in standards developed by the individual state, in close cooperation with industry. Paper product prices would then reflect the true cost of manufacture and disposal, while they would incorporate the different packaging requirements of various products for reasons of consumer information, health and safety. Pursuant to the new pricing system, a manufacturer who decides not to use any recovered paper in its production process would be faced with the cost of disposing of otherwise recycled material. Similarly, a manufacturer who decides to offer its product in voluminous packaging would incur higher disposal costs than if it decided to concentrate its product and shrink its packaging. These costs would either be passed along to the consumer or be absorbed by the manufacturer. In either situation, it would not be competitive for the manufacturer to rely solely on virgin timber in its production process. Instead, paper manufacturers would seek to decrease their costs by increasing their use of recovered paper wastes and reducing product packages. Disposal cost pricing would reflect the true cost of paper products. Such an incorporation would foster the efficient use of resources and thereby minimize natural resource waste.¹⁷⁸

In sum, the elimination of federal timber subsidies and municipal disposal subsidies would drastically reduce the overuse of natural resources by destroying artificial price mechanisms. Furthermore, the elimination of these subsidies would accomplish cost-effectiveness without imposing pseudo-corporatist command and control regulations such as restrictions on timber sales, mandatory recovery percentages and minimum content requirements.

¹⁷⁸. See generally LEGISLATIVE COMMENTS, *supra* note 149.

V. CONCLUSION

Most United States environmental laws are crafted as command and control regulations.¹⁷⁹ For example, pollution laws set specific limitations on permissible pollution levels, and thus grant a federal imprimatur to pre-quantified amounts of emissions.¹⁸⁰ The major flaw in such command and control laws is that they motivate conduct through the threat of enforcement.¹⁸¹ In so doing, command and control regulations do not encourage environmentally sound conduct but instead discourage environmentally unsound conduct. Command and control regulations therefore offer disincentives rather than incentives. Although command and control regulations are fully capable of achieving their goals, they must rely on broad and vigorous enforcement mechanisms to ensure that environmentally unsound conduct is punished, either civilly or criminally. Absent the threat of enforcement, command and control regulations crumble because of their inherent inability to motivate conduct. Due to both the enormous number of potential polluting sources in the United States and the very limited amount of federal and state funds available for enforcement, environmental command and control regulations are ineffective.¹⁸²

Market-based incentives present a viable alternative to environmental command and control regulations. Economic motivation is the central mechanism of market-based incentives. Whereas command and control regulations create a disincentive for certain conduct, market-based incentives modify the free market so that environmentally sound conduct equates with financial self-interest. The enormous advantage of a market-based regulatory scheme is that it is self-enforcing. Furthermore, because market forces can be modified by statute, a market-based system is flexible and allows regulators to progressively decrease pollutant discharge.

¹⁷⁹. See *supra* note 13 and accompanying text.

¹⁸⁰. *Id.* The Clean Water Act, for example, requires water permits for point source discharges of pollutants into the waters of the United States. 33 U.S.C. § 1342 (1992). A permit from the United States Army Corps of Engineers thus constitutes a license to pollute. *Id.*

¹⁸¹. See, e.g., 33 U.S.C. § 1319 (1992)(entitled Clean Water Act enforcement).

¹⁸². See Thomas W. Lippman, 'Earth Budget': *Waste Not, Want Not*, WASH. POST, Feb. 4, 1993, at A19.

Finally, because market-based incentives function on economic principles, their success is not linked to public knowledge of complex rules and inscrutable regulations. Instead, a market-based scheme functions properly as long as consumers and manufacturers seek to minimize their costs.

Title IV of the Clean Air Act (CAA) amendments of 1990 remains the most spectacular example of environmental market-based incentives.¹⁸³ Simply stated, CAA Title IV allows large preexisting electric utilities to trade emissions credits on a commodity exchange if they decrease their emissions below the statutory minimum.¹⁸⁴ Demand for these credits is generated by new electric utilities that must purchase emissions credits equal to their projected pollutant discharges.¹⁸⁵ The lure of profit fosters a reduction in air pollution by encouraging large electric utilities to decrease their emissions below the legal minimum. Emissions are progressively reduced by a decrease in the allowable emissions floor.¹⁸⁶

In the context of paper, market-based incentives translate the use of recovered paper wastes into economic self-interest for paper manufacturers. First, an increase in federal timber prices and a shift in the cost of timber access roads to the timber industry will give paper manufacturers an incentive to recycle more paper wastes. Second, the incorporation of landfilling and incineration costs into the price of paper products will increase the price of paper products manufactured either without recycled paper or with a low recycled paper content and products sold in voluminous paper packages. The resultant jump in nonrecycled paper costs will motivate paper manufacturers to increase paper recycling. Furthermore, enforcement is unnecessary since both market-based systems accomplish their

¹⁸³. 42 U.S.C. § 7651b (1992) (Sulfur Dioxide); 42 U.S.C. § 7651f (1992) (Nitrogen Oxides).

¹⁸⁴. *Id.* The emissions floors are progressively raised over several statutory phases of the Clean Air Act. 42 U.S.C. § 7651c (1992) (Sulfur Dioxide Phase I); § 7651d (1992) (Sulfur Dioxide Phase II).

¹⁸⁵. 42 U.S.C. § 7651b(a)(1) (1992). This demand will be fueled by the enormous growth in the international demand for electric power. Thomas W. Lippman, *An Electrifying Opportunity, U.S. Utilities Join Charge to Power International Markets*, WASH. POST, April 20, 1993, at D1.

¹⁸⁶. See *supra* note 185.

goals through the economic self-interest of both the regulated and affected communities.

Many environmentalists and economists have discussed the establishment of a tax-based regulatory scheme for paper recycling. Tax incentives and disincentives function on the same principle as market-based incentives. The theory is that recycling can be encouraged through positive taxes, such as tax credits and deductions, and that virgin timber use can be discouraged through negative taxes, such as higher taxes on undesirable products. This framework has already been enacted in many states.¹⁸⁷

While the tax approach has great procedural merit, its substance fails to maximize the efficient use of natural resources. Instead, tax incentives merely create a subsidy by establishing an artificially skewed price structure. Whereas the goal of market-based incentives is to maximize the efficient use of natural resources, the goal of tax incentives and disincentives is merely to focus on particular conduct, such as recycling. As such, tax incentives and disincentives constitute a command and control regulatory scheme through different means. In the context of paper manufacturing and recycling, for example, paper manufacturers who produced paper products with a 50 percent recycled content could receive a tax credit. Such a tax would cause an artificial bias in favor of recycling when the efficient use of natural resources might dictate a recycled content percentage of 30 or 40 percent. Yet, recycling is not a perfect solution. Recycling is a high-energy process which produces large quantities of sludge.

Many environmentalists argue that the efficient use of natural resources is unimportant and that the goal of environmental law is to decrease the use of natural resources as much as possible. This argument, however, is based on the common misperception that the United States is a free market economy.¹⁸⁸ Much to the contrary, the United States is so replete with command and control regulations and vast subsidies for special products that the real value of natural

¹⁸⁷. See *supra* notes 106-109 and accompanying text.

¹⁸⁸. See AL GORE, EARTH IN THE BALANCE 182-83 (1992). Vice President Gore visualizes present-day American capitalism as "blind" to the value of natural resources. *Id.* What the Vice-President fails to acknowledge is that it is governmental regulation and subsidy that has blinded the free market, not any inherent failure of the capitalist system.

resources is far removed from the prices currently transacted. Artificially low federal timber prices, free timber access roads and unincorporated disposal costs provide just three examples of the unrealistic pricing of natural resources. The failure to take real values of natural resources into consideration is what causes the United States to waste its natural resources. Free market adjustments would force manufacturers to find alternatives to the high cost of natural resources if subsidies were eliminated and real costs considered.

In sum, environmental market-based incentives are self-enforcing mechanisms which motivate environmentally sound conduct by maximizing the efficient use of natural resources. While critics of the methodology might have cause for skepticism, it is quite clear that the current command and control regulatory system has failed in our national environmental policy. When faced with the failed price regulations and subsidies active today, the United States cannot afford to disregard an opportunity to establish a free market solution to the environmental crisis.