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THE LOCATION AND COMMUNITY DEMOGRAPHICS OF TARGETED ENVIRONMENTAL HAZARDOUS SITES IN FLORIDA

Submitted in Part to the Florida Environmental Equity and Justice Commission

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> The founding principle upon which this nation was established is that all persons were initially created equal and are entitled to have their individual human dignity respected. This guarantee of equal treatment has been carried forward in explicit provisions of our federal and state constitutions. It is not by chance that the words "Equal Justice Under Law" have been placed for all to see above the entrance to this nation's highest court.[1]

I. INTRODUCTION

On a basic level, notions of justice and equity are fundamental principles to which our legal and political systems aspire. Likewise, in facing environmental concerns, justice and equity are emerging standards.[2] In response to a question on what "environmental equity and justice" is, Representative Josephus Eggelletion, Jr., said: "It is a debate about everyone having equal access to environmental protection."[3] Thus, the goal of environmental justice is to administer the protections afforded by our legal and political systems justly and equally to all individuals and communities, not to distribute pollution.

In 1994, the Florida Legislature created the Environmental Equity and Justice Commission (Commission).[4] The seventeen member commission, appointed by Governor Lawton Chiles, included representatives from the state legislature, state and local government agencies, business and industry, environmental advocacy groups, and grass-roots community organizations.[5] The enabling legislation charged the Commission with the task of determining whether environmental hazards are disproportionately located in minority and low income communities in Florida.[6] Thus, Florida became one of

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1. Powell v. Allstate Ins. Co., 652 So. 2d 354, 358 (Fla. 1995) (Anstead, J., writing for the majority).

2. *See* PAT COSTNER & JOE THORNTON, PLAYING WITH FIRE: HAZARDOUS WASTE INCINERATION (A GREENPEACE REPORT) 49 (1991) ("Protection of public health and the environment is, in its entirety, a matter of political and social justice.").

3. Maribel N. Nicholson & Ralph A. DeMeo, *Air of Equality: An Analysis of Florida's Environmental Equity and Justice Act*, 68 FLA. BAR J. 112, 112 (Oct. 1994). The Legislature found that "the term `environmental equity' generally refers to consideration of the distribution of environmental risks across population groups and to governmental policy responses to such risk distribution." 1994 Fla. Laws 94-219 (whereas clause of session law).

4. 1994 Fla. Laws ch. 94-219 (codified at FLA. STAT. §§ 760.85-.853 (1995)).

5. *See* FLA. STAT. §§ 760.85(2)(a)-(k) (1995). The members of the Commission were Representative Josephus Eggelletion, Jr., Eugene Ravenel, Lee Ann Clements, President Frederick Humphries, Charlan Jackson-Sanders, Cynthia Laramore, Pepe Menendez, Marible Nicholson-Choice, Julian Perez, Stan Posey, Debbie Romanello, Suzi Ruhl, Andree Sanders, Dan Thompson, Senator William Turner (co-sponsor), Peter Ware, and Margaret Williams. Representative Eggelletion, co-sponsor of the enabling legislation, served as chairperson of the Commission.

6. *See* 1994 Fla. Laws ch. 94-219. The Legislature declared

the first states to sponsor and fund a state-wide study into the issues of environmental justice. The Commission was organized into six reporting subcommittees: (1) Rules and Non-Rules Policies of the Florida Department of Environmental Protection (DEP); (2) Health Effects and Risks; (3) Enforcement and Evaluation; (4) Local Government Site Placement; (5) Case Studies; and (6) Proximity and Demographic Analysis.[7]

This article comprises the proximity and demographic analysis report to the Commission. Accordingly, Part II of this article reviews the environmental justice movement in the United States and cites previous research on environmental equity and justice issues in Florida. Part III discusses the methodology that the Commission used for the proximity and demographic analysis. Part IV presents and discusses the results of the Commission's analyses, discussing the demographic characteristics of Florida, the blockgroup proximity to targeted sites, and the relationship between proximity and demographics. Finally, this article concludes that targeted environmental hazardous waste sites are disproportionately located in minority and low income areas in Florida and urges that further research is necessary to expand the scope of the Commission's analyses.

II. BACKGROUND

A. Environmental Equity and Justice Issues

The environmental justice movement can be traced backed to the late 1970s and early 1980s. Large-scale tragedies—such as the poisoning of the entire community of Love Canal[8] by 21,800 tons of buried toxic chemicals in 1978[9] and Union Carbide's 1984 release of a

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> there is an affirmative interest in determining within Florida whether penalties assessed against violators in sites located in white communities are disproportionately larger than penalties assessed against polluters in minority communities; whether hazardous waste site evaluations are conducted more slowly and start of cleanup efforts are delayed longer in minority communities; and whether containment as opposed to cleanup is more frequently selected in minority communities.

Id. (whereas clause of session law).

7. Section 760.85(5), *Florida Statutes* (1995) requires that "[t]he commission shall conduct a scientific analysis, including case studies, and submit a written report to the Speaker of the House of Representatives . . . ." FLA. STAT. § 760.85(5) (1995). It is this scientific analysis that is presented in this article.

8. *See* MICHAEL H. BROWN, LAYING WASTE: THE POISONING OF AMERICA BY TOXIC CHEMICALS 24-27 (1980); *see also* Sidney M. Wolf, *Public Opposition to Hazardous Waste Sites: The Self-Defeating Approach to National Hazardous Waste Control Under Subtitle C of the Resource Conservation and Recovery Act of 1976*, 8 B.C. ENVTL. AFF. L. REV. 463, 467 n.13 (1980) (describing the Love Canal tragedy).

9. *See* LOIS M. GIBBS, DYING FROM DIOXIN: A CITIZEN'S GUIDE TO RECLAIMING OUR HEALTH AND REBUILDING DEMOCRACY xvii (1995); *see also* Ronald A. Christaldi, *Book Review, Dying from Dioxin: A Citizen's Guide to Reclaiming Our Health and Rebuilding Democracy*, 11 J. LAND USE &

highly toxic pesticide in Bhopal, India which killed more than 2000 people and injured over 200,000 others[10]—raised world-wide consciousness to the potential magnitude of environmental tragedies in the modern world.[11] But it was not only wide-scale tragedies, such as those in Love Canal or Bhopal, that concerned many Americans; many began to realize the potential for negative effects from many of the facilities that existed in their own communities.[12] On a fundamental level, questions concerning the value of human health and the environment in relation to monetary and industrial interests arose.[13] In an effort to respond to these concerns,[14] Congress passed the Emergency Planning and Community Right to Know Act of 1986 (EPCRA),[15] empowering citizens with critical information, raising environmental awareness, and purporting to offer environmental protections.[16]

In 1983, the federal government, led by the District of Columbia delegate and the chairman of the Congressional Black Caucus, Walter Fauntroy, directed the United States General Accounting Office (GAO) "to determine the correlation between the location of hazardous waste landfills and the racial and economic status of

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ENVTL. L. 467, 467-68 (1996) (offering background on the Love Canal tragedy and reviewing Gibbs' book).

10. *See* Paul Shrivastava, Bhopal: Anatomy of a Crisis 64-67 (1987); *see also* WARD MOREHOUSE & M. ARUN SUBRAMANIAM, THE BHOPAL TRAGEDY: WHAT REALLY HAPPENED AND WHAT IT MEANS FOR AMERICAN WORKERS AND COMMUNITIES AT RISK vii (1986); Symposium, *The Bhopal Tragedy: Social and Legal Issues*, 20 TEX. INT'L L.J. 267, 269 (1985).

11. *See generally* Viki Reath, *The Media's Perspective*, 9 ST. JOHN'S J. LEGAL COMMENT. 531 (1994) (commenting that "the media will have an impact on the environmental justice movement . . . [because] there is a sense of reality that comes through the television, newspapers, and magazines").

12. *See* Douglas L. Anderton et al., *Hazardous Waste Facilities: "Environmental Equity" Issues in Metropolitan Areas*, 18 EVALUATION REV. 123, 123-24 (1994).

13. *See, e.g.*, Heather Fisher Lindsay, *Balancing Community Needs Against Individual Desires*, 10 J. LAND USE & ENVTL. L. 371, 373 (1995) (presenting a radical challenge to traditional views on property and questioning the current level of significance placed on human health and the environment where profits are concerned); *cf.* Frank B. Cross, *Natural Resource Damage Valuation*, 42 VAND. L. REV. 269, 302-09 (1989) (describing how market valuation operates).

14. *See Carbide Accident May Speed Controls, Right-to-Know, Emergency Response Rules*, 16 Envtl. Rep. (BNA) 635 (Aug. 16, 1985).

15. Pub. L. No. 99-499, tit. III, § 300(a), 100 Stat. 1729 (1986) (codified as amended at 42 U.S.C. §§ 11001-11050 (1988 & Supp. V 1993)); *see* Sidney M. Wolf, *Fear and Loathing About the Public Right to Know: The Surprising Success of the Emergency Planning and Community Right-to-Know Act*, 11 J. LAND USE & ENVTL. L. 217, 218-19 (1996); *see also* Steven J. Christiansen & Stephen H. Urquhart, *The Emergency Planning and Community Right to Know Act of 1986: Analysis and Update*, 6 B.Y.U. J. PUB. L. 235, 235-36 (1992).

16. EPCRA has two main objectives. The first objective is "to provide the public access to information concerning hazardous chemicals in the community." Christiansen, *supra* note 15, at 236. The second objective is "to use [the provided information] to formulate and administer local emergency response plans in case of hazardous chemical release." *Id.*

surrounding communities."[17] This was the first wide-scale review of environmental justice studies.[18] The GAO study concluded that three out of four communities where hazardous waste landfills were sited contained a majority of African Americans.[19]

In 1987, the United Church of Christ Commission for Racial Justice (CRJ) found a significant correlation between the number of minorities in a community and the existence of a toxic waste site exists in that area.[20] The CRJ report stated that "three out of every five Black and Hispanic Americans live[] in communities with uncontrolled toxic waste sites."[21] This led some to conclude that minorities were disproportionately harmed both at their jobs and in their communities.[22]

However, despite the resounding conclusions of the CRJ study and the fact that it has been revisited with similar results,[23] critics have consistently challenged the findings of the CRJ study. Some have suggested that market dynamics, not race or poverty, is the most significant factor in the siting of these undesirable land uses.[24] Others studies have challenged the methodology of the CRJ study,[25] the reliability of the data used,[26] and even the conclusions of the study.[27]

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17. *See* Anderton et al., *supra* note 12, at 126.

18. *See id.*

19. *See* U.S. GENERAL ACCOUNTING OFFICE, SITING OF HAZARDOUS WASTE LANDFILLS AND THEIR CORRELATION WITH RACIAL AND ECONOMIC STATUS OF SURROUNDING COMMUNITIES 3 (1983); *see also* Anderton et al., *supra* note 12, at 126.

20. *See* UNITED CHURCH OF CHRIST COMMISSION FOR RACIAL JUSTICE, TOXIC WASTES AND RACE IN THE UNITED STATES 13 (1987) [hereinafter United Church of Christ].

21. *Id.* ("This figure represents more than 15 million African Americans and 8 million Hispanics. Approximately 2 million Asian/Pacific Islanders and 700,000 American Indians lived in such communities.").

22. *See* Robert D. Bullard, *Anatomy of Environmental Racism and the Environmental Justice Movement, in* CONFRONTING ENVIRONMENTAL RACISM, VOICES FROM THE GRASSROOTS 15 (R. Bullard ed., 1993); *see also* Luke W. Cole, *Empowerment as the Key to Environmental Protection: The Need for Environmental Poverty Law*, 19 ECOLOGY L.Q. 619, 620 (1992).

23. *See generally* BENJAMIN A. GOLDMAN & LAURA FITTON, TOXIC WASTES AND RACE REVISITED: AN UPDATE OF THE 1987 REPORT ON THE RACIAL AND SOCIOECONOMIC CHARACTERISTICS OF COMMUNITIES WITH HAZARDOUS WASTE SITES (1994).

24. *See, e.g.*, Vicki Been, *Locally Undesirable Land Uses in Minority Neighborhoods: Disproportionate Siting or Market Dynamics?*, 103 YALE L.J. 1383, 1388-92 (1994) (discussing market dynamics and the distribution of undesirable land uses).

25. *See* Vicki Been, *Analyzing Evidence of Environmental Justice*, 11 J. LAND USE & ENVTL. L. 1, 2-8 (1995). *Contra* Colin Crawford, *Analyzing Environmental Justice Evidence: A Suggestion for Professor Been*, 12 J. LAND USE & ENVTL. L. 104 (1996).

26. *See* Been, *supra* note 25, at 8-12; *see also* Vicki Been, *What's Fairness Got to do With It? Environmental Justice and the Siting of Locally Undesirable Land Uses*, 78 CORNELL L. REV. 1001, 1009 n.39 (1993).

27. *See* JOHN MICHAEL OAKES ET. AL., SOCIAL AND DEMOGRAPHIC RESEARCH INSTITUTE (SADRI), ENVIRONMENTAL INEQUITY, INDUSTRIAL SITING, AND THE STRUCTURE OF AMERICAN CITIES 2-3 (1994) [hereinafter SADRI study]; *see also* Douglas L. Anderton et al., *Environmental*

The Environmental Justice movement has created two paths of inquiry. The first considers the distribution of both benefits and burdens.[28] Regardless of the process, if the outcome results in a disproportionate number of LULUs in disadvantaged or minority communities, then an injustice exists.[29] The second investigative level focuses on the process and concerns itself with whether the same criteria are applied in each siting.[30] If the same criteria are applied at each site, no injustice exists.[31] However, these levels are not mutually exclusive. The Environmental Justice movement is concerned with both the process and the outcome.[32] Given this dual concern, those concerned with issues of environmental justice and equity gather data on "the distributional implications of the way in which our society seeks to manage environmental threats and improve and protect environmental quality."[33] The Environmental Justice movement sought a fair distribution of those hazards.[34]

To the extent that the environmental justice debate has focused on why hazardous facilities are disproportionately located in minority or other disadvantaged communities, it has missed the mark. There are four relevant questions from a societal viewpoint. The first is whether disproportionate sitings exist. If so, the second question is whether these disproportionate sitings have detrimental effects on

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Equity: Evaluating TSDF Siting Over the Past Two Decades, Waste Age, July 1994, at 100. Although the SADRI study found no significant correlation between race and the siting of locally undesireable land uses (LULUs), it has been criticized because it was funded in part by the waste management industry. *See* Anderton et al., *supra* note 12, at 123-24 (authors' note).

28. *See* Michael Greenberg, *Proving Environmental Inequity in Siting Locally Unwanted Land Uses*, 4 RISK: ISSUES IN HEALTH & SAFETY 235, 236 (1993).

29. *See id.* Mr. Greenberg identifies "inequities" rather than "injustices" in his discussion of the movement.

30. *See id.*

31. *See id.* (commenting that if "appropriate environmental, health, physical, legal, economic, and political criteria are applied to every area, then the results are fair even if they disproportionately burden some groups and benefit others").

32. *See* Symposium, *Race, Class, and Environmental Regulation*, 63 U. COLO. L. REV. 839, 840 (1992). For an overview of the general goals and concerns of the Environmental Justice Movement, see Bullard, *supra* note 22, at 15, 17-19

33. Been, *supra* note 25, at 1; *see also* Richard J. Lazarus, *Pursuing "Environmental Justice:" The Distributive Effects of Environmental Protection*, 57 NW. U. L. REV. 787, 787-88 (1993). The impetus of these investigations into the distributional impacts is often traced to the protests against the siting of a landfill in an African American community in Warren County, North Carolina in 1982. *See, e.g.*, Rachel D. Godsil, Note, *Remedying Environmental Racism*, 90 MICH. L. REV. 394 (1991) (commenting that while the protesters' campaign failed, the protest "focused national attention on the relationship between pollution and minority communities").

34. *See* Richard J. Lazarus, *The Meaning and Promotion of Environmental Justice*, 4 MD. J. CONTEMP. LEGAL ISSUES 1, 1 (1993) ("'Environmental Justice' focuses on the distribution of environmental hazards across society and seeks a fair distribution of those hazards."); *see also* Richard J. Lazarus, *Distribution in Environmental Justice: Is There a Middle Ground?*, 9 ST. JOHN'S J. LEGAL COMMENT. 481, 483-84 (1994).

their host communities. If both of these questions are affirmatively answered, then one must ask whether the disproportional siting is due to a problem in the process, the outcome, or both. Finally, if it is established that such a problem exists, that its effects are negative, and that the locus of the problem is located, then potential solutions to that problem must be explored.

B. Environmental Equity and Justice Issues in Florida

In a report to the Public Interest Law Section of the Florida Bar, Dr. M. Elliot Vittes presented findings on the proximity of minority groups to Toxic Release Inventory (TRI)[35] facilities (SWS).[36] Demographic information was identified at the census block group summary level.[37] The proximity of Florida's block groups to the closest TRI reporting facility was measured by triangulation and reported in units of miles.[38] Dr. Vittes reported that race, ethnicity, and income are critical in explaining proximity.[39] Minority and low income households were found to be over-represented at closer proximities and under-represented at farther proximities.[40] The same results held true even when other contributing factors, such as (1) urban versus overall population; (2) manufacturing versus all workers; (3) median house age; and (4) median house value were controlled for using regression analysis.[41] When Dr. Vittes included other pollution sources, such as (1) air point source emissions; (2) treaters, storers and disposers (TSDs) of Resource, Conservation and Recovery Act (RCRA)[42] hazardous waste; and (3) National Priority

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35. Section 313 of EPCRA requires manufacturing facilities that surpass threshold levels measured in quantity of toxic chemicals to submit an annual report outlining that facilities use, manufacture, or processing of several hundred toxic chemicals. *See* 42 U.S.C. § 11023 (1988 & Supp. V 1993). This data is compiled by the United States Environmental Protection Agency (EPA) and is collectively known as the TRI. *See* Wolf, *supra* note 15, at 229-30. Because of the critical information that this report provides to the general public, section 313 has been called "[t]he most far-reaching, important and controversial right-to-know provision in EPCRA." *Id.* at 229.

36. *See* M. ELLIOT VITTES & PHILLIP H. POLLOCK, III, POVERTY, POLLUTION AND SOLID AND HAZARDOUS WASTE SITING: HOW STRONG ARE THE LINKS? (1994). Dr. Vittes conducted that study at the University of Central Florida in Orlando. *See* Nicholson & DeMeo, *supra* note 3, at 113.

37. *See* VITTES, *supra* note 36, at 4. The 1990 census data, the most recent data available, was used. *See id.*; *see also* MARK T. MATTSON, ATLAS OF THE 1990 CENSUS (1992) (outlining the data collected in the 1990 census).

38. *See* VITTES, *supra* note 36, at 4.

39. *See* M. ELLIOT VITTES & PHILLIP H. POLLOCK, III, RESEARCH ON ENVIRONMENTAL EQUITY ISSUES IN FLORIDA (1994).

40. *See id.*

41. *See* VITTES, *supra* note 36, at 6.

42. The Resource, Conservation and Recovery Act of 1976, Pub. L. No. 94-580, 90 Stat. 2795 (1976) (codified as amended at 42 U.S.C. §§ 6921-6939e (1988 & Supp. V 1993)). RCRA is

List (NPL)[43] and non-NPL sites, his previous findings were reinforced.[44] TRI facilities represented "the closest facilities for three-quarters of the households in Florida, making them an important indicator of potential pollution exposure."[45] Black households were over-represented at close distances to each source, and low income Black households were at a higher ratio compared to low income White households.[46] With communities ostensibly suffering detrimental environmental and health consequences,[47] the time has come for action. It is with this background that the Florida Legislature charged the Commission with the examination of the possible disproportionate location of targeted environmental hazardous sites in minority and low income communities in Florida.

C. *Targeted Environmental Hazardous Sites*

The term environmental hazard can refer to a wide variety of phenomena that have the potential to cause adverse health effects by emitting toxic and/or hazardous chemical and substances into the environment.[48] Targeted environmental hazardous sites were defined by the enabling legislation as "a representative sample of sites in both minority and low-income neighborhoods, as well as other socioeconomic neighborhoods."[49] Other targeted sites included businesses and facilities regulated by DEP.[50] DEP-regulated businesses included government-owned facilities, facilities regulated by

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actually an amendment to the Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992k. *See* Robert L. Rhodes, *Federal Resource Conservation and Recovery Act, in* FLORIDA ENVIRONMENTAL AND LAND USE LAW 11-1, 11-3 (1991 & Supp. 1995) (outlining RCRA).

43. The NPL is a list of hazardous substance releases that are prioritized over other sites for long term evaluation and response. *See* 40 C.F.R. § 300.5 (1995). For a discussion of the NPL, see WILLIAM H. RODGERS, JR., ENVIRONMENTAL LAW: HAZARDOUS WASTES AND SUBSTANCES 573-77 (1992 & Supp. 1996). By 1990, the NPL had 1246 sites listed, with governmental estimates that 1700 sites could be added by the year 2020. *See id.* at 573 (1992), 68-69 n.73 (Supp. 1996).

44. *See* M. ELLIOT VITTES & PHILLIP H. POLLOCK, III, POVERTY, POLLUTION, AND SOLID AND HAZARDOUS WASTE SITING: THE LINKAGE FOR DIFFERENT SOURCES 44 (1994).

45. *Id.* at 50.

46. *See id.* at 46.

47. For example, the community of Pensacola, Florida has been suffering horrible effects from continual toxic poisoning. *See* Bill Kaczor, *Residents Live and Die Under the Shadow of Mount Dioxin*, TALLAHASSEE DEM., Feb. 18, 1996, at 10B; *see also EPA to Move Families from Toxic Site*, TAMPA TRIBUNE, Oct. 4, 1996, at Florida/Metro 7; Christaldi, *supra* note 9, at n.20; Luke W. Cole, *Environmental Justice in the Classroom: Real Life Lessons for Law Students*, 96 W. VA. L. REV. 1051 (1994); Crawford, *supra* note 25 (discussing a case study in Mississippi); Greenburg, *supra* note 28, at 247-50 (discussing a New Jersey case study).

48. *See* H. STEVEN DASHEFSKY, ENVIRONMENTAL LITERACY 118 (1993). Hazardous waste "refers to all substances that pose an immediate or long-term danger to the health or well-being of humans or to the environment . . . ." *Id.*

49. FLA. STAT. § 760.85(5)(a) (1995).

50. *See id.*

DEP through delegation to any local governments or water management districts, and Superfund NPL sites.[51]

The Commission subsequently selected six different types of hazardous sites for review: (1) landfills, disposal, reduction, and resource recovery sites (FLS); (2) large quantity generators (LQG); (3) NPL sites; (4) solid waste facilities (SWF); (5) TRI reporting facilities; and (6) TSD facilities. In all, 3,287 targeted environmental hazardous sites were identified and located in Florida. (*See* Table 1).

1. National Priority List

The most serious environmental hazardous waste sites in Florida are those listed by the EPA on the Superfund NPL. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)[52] was extended and amended by the Superfund Amendments and Reauthorization Act (SARA)[53] in 1986. This legislation classifies priority sites eligible for federally-funded clean-up and remediation.[54] Most of the NPL sites have multiple contaminants and contaminated media.[55] The primary contaminants found at the fifty-nine NPL sites in Florida include: heavy metals such as arsenic, cadmium, chromium, lead, manganese, nickel, and zinc at 78% of the sites; volatile organic compounds (VOCs) at 64% of the sites; polychlorinated biphenyls (PCBs) at 17% of the sites; pesticides and herbicides at 17%; creasotes at 16% of the sites; petrochemicals and explosives at 7% of the sites; and a broad category of other chemicals including cyanide, fluoride, nitrate, sulfate and ammonia at 5% of the sites; dioxin, acids, and gases at 2% of the sites.[56] Contaminated media include groundwater at 93% of the sites, soil at 84%, surface water at 44%, sediments at 28%, and air at 3%.[57]

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51. *See id.*

52. Pub. L. No. 96-510. tit. I, § 101, 94 Stat. 2767 (1980) (codified as amended at 42 U.S.C. §§ 9601-9675 (1988 & Supp. V 1993)). One of the principle purposes of CERCLA was "to achieve prompt cleanup of hazardous waste sites and to impose the cost of cleanup on those responsible for contamination." Richard L. Bradford, *The Personal Injury Endorsement: An Unwarranted Straining To Obtain Insurance Coverage for Environmental Damage*, 11 J. LAND USE & ENVTL. L. 111, 115-16 (1995); *see also* City & County of Denver v. Adolph Coors Co., 829 F. Supp. 340, 344 (D. Colo. 1993).

53. Pub. L. No. 99-499, 100 Stat. 1613 (1986) (codified as amended at 42 U.S.C. §§ 9601-9675 (1988 & Supp. V 1993)). For an overview of the SARA amendments, see Timothy B. Atkeson et al., *Analysis of the Superfund Amendments and Reauthorization Act of 1986, in* SUPERFUND DESKBOOK 1-58 (1986).

54. *See* 40 C.F.R. § 300.5 (1995).

55. *See* FLORIDA CENTER FOR PUBLIC MANAGEMENT, COMPARING FLORIDA'S ENVIRONMENTAL RISK: RISK TO FLORIDA AND FLORIDIANS, Technical Appendix 102 (Sept. 1995) [hereinafter Florida's Risk].

56. *See id.*

57. *See id.*

Different activities are responsible for hazardous waste site contamination, including recyclers, storage and disposal facilities, and landfills responsible for 43%; manufacturing facilities responsible for 22%; chemical and pesticide manufacturers responsible for 14%; petroleum and refining operations responsible for 9%; federal facilities responsible for 7%; and electroplating operations responsible for 5%.[58]

2. *Florida List Sites*

Thirty-nine state-funded action sites (FLS) in Florida are managed and remediated by DEP's Bureau of Waste Cleanup.[59] Designation as a state-funded site is based upon the measurement of the relative risk to public health, the likelihood of groundwater contamination, and the potential for harmful contamination of the environment.[60] Twenty-one of these state-funded sites are active sites with on-going remediation, while eighteen have been remediated to the point where they no longer pose a threat to humans or the environment.[61] Most "active sites have contaminants which have significantly impacted ground water quality."[62] These sites include landfills and dumps, gas and/or petroleum sites, chemical manufacturers and/or processors, industrial solvent disposal sites, pesticide disposal sites, electroplaters, wood preserving sites, waste oil disposal sites, battery recyclers, and other lead recovery sites.[63] The multiple contaminants found in the groundwater and soil at these sites include but are not limited to polycyclic aromatic hydrocarbons (PAHs) such as benzo[a]pyrene, PCBs, perchloroethylene (PCE), dichlorodiphenyltrichloroethane (DDT), and its metabolite dichlorodiphenyldichloroethane (DDD), and metals such as arsenic, chromium, copper, lead and zinc.[64] Activities responsible for the contamination are primarily former industrial and manufacturing facilities, and gasoline service stations.[65]

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58. *See id.* at 338.
59. *See id.* at 220.
60. *See id.* at 338.
61. *See id.* at 42.
62. *Id.*
63. *See id.* at 102.
64. *See id.* at 103.
65. *See id.*

3. Toxics Release Inventory

EPCRA mandated TRI reporting.[66] Over 500 TRI facilities in Florida are required to submit estimates of their permitted and accidental release emissions to the TRI database, which provides release information for entire geographic areas.[67] Five compounds account for over 60% of the TRI releases and transfers in the state: phosphoric acid (24%), methanol (16%), ammonia (10%), hydrochloric acid (6%), and ammonium nitrate solution (4.8%).[68] The main sources for these releases and transfers are phosphate mining and the manufacture and production of fertilizer, pulp paper, and aluminum.[69] Based upon volume estimates, the most commonly released chemicals in Florida are ammonia, sulfuric acid, and chlorine.[70] Facilities which "typically use or store these chemicals include refrigeration facilities (e.g., beverage plants and supermarket warehouses), wastewater treatment plants, drinking water plants, wholesalers and chemical manufacturers" and utilities.[71] In 1992 approximately 16,175 pounds of ammonia, 410 pounds of chlorine, and 96,631 pounds of sulfuric acid were accidentally released, above permitted levels, into the environment.[72] Based upon the TRI emissions data for 1993, approximately 24,856,630 pounds of phosphoric acid, 7,398,672 pounds of ammonia, 6,576,113 pounds of methanol and 6,203,007 pounds of hydrochloric acid were released by permit into the environment.[73] Other chemicals emitted included sulfuric acid, chlorine, acetone, and toluene.[74]

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66. *See* discussion *supra* Part II.B.

67. In 1993, there were 512 reporting facilities in Florida. ENVIRONMENTAL PROTECTION AGENCY, TOXICS RELEASE INVENTORY: FLORIDA SUMMARY (1993) [hereinafter 1993 TRI]; *see also* Wolf, *supra* note 15, at 323, Appendix 5.

68. *See* 1993 TRI, *supra* note 67; *see also* Wolf, *supra* note 15, at 323, Appendix 5.

69. In 1993, the top ten facilities for total releases in Florida according to the TRI data from highest to lowest were IMC Fertilizer, Inc., Occidental Chemical Corp., Mansanto Co., Kaiser Aluminum & Chemical, IMC-Argico Co., Cargill Fertilizer Inc., U.S. Agri-Chemicals Corp., ITT Rayoner Inc., CF Industries Inc., and Buckeye Florida L.P. *See* 1993 TRI, *supra* note 67; *see also* Wolf, *supra* note 15, at 324, Appendix 6.

70. *See* 1993 TRI, *supra* note 67.

71. FLORIDA'S RISK, *supra* note 55, at 29.

72. *See id.*

73. *See* 1993 TRI, *supra* note 67; *see also* Wolf, *supra* note 15, at 323, Appendix 5.

74. *See* FLORIDA'S RISK, *supra* note 55; *see also* VITTES & POLLOCK, *supra* note 39.

4. *Large Quantity Generators, Treaters/Storers/Disposers and Solid Waste Facilities*

LQG, TSD, and SWS sites may legally store, use, or treat toxic or hazardous substances.[75] Only some of these sites are known to have released hazardous materials into the environment. These sites are regulated and monitored by DEP to prevent accidental releases or spills and to mandate notification upon such release or spill.[76]

D. Potential Adverse Health Effects

A broad range of potential adverse acute and chronic health effects are associated with exposure to the contaminants found in media at NPL and FLS, TSD, LQG, and SWS sites and toxic emissions from TRI facilities.[77] These health effects include aggravation of respiratory diseases, such as bronchitis and asthma; skin, eyes, ear, nose, mouth, and respiratory tract irritation and sensitization; damage to brain, kidneys, lungs and liver; known and possible cancer causing agents mainly via inhalation; headache, convulsions, coma, central nervous system depression and toxicity.[78]

III. DATA COLLECTION AND ANALYSIS

A. Demographic Variables

Many of the prior environmental justice research studies defined the affected area in overly-broad geographic terms.[79] As a result, the studies reached conclusions from data that would not be valid if a smaller, more consistent geographic unit were examined. The Census Bureau reports demographic information in a summary form that varies according to geographic area,[80] e.g., state, county, census tract, census blockgroup, and census block.[81] Blockgroups generally contain between 250 and 550 housing units, with the ideal size being 400 housing units. The Commission report was performed using the

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75. *See* FLA. STAT. § 403.707(1) (1995) ("[n]o solid waste management facility may be operated . . . without an appropriate and currently valid permit issued by the department"); *see also* FLA. ADMIN. CODE r. 64-701 (1995) (containing DEP regulations for permitting most solid waste management facilities).

76. *See* FLA. STAT. § 403.708(1) (1995) (prohibiting disposal of a waste other than in a manner approved by DEP); *see also* FLA. STAT. § 403.726 (1995) (allowing DEP to seek judicial or injunctive relief on the occurrence of an imminent hazard caused by hazardous waste).

77. See FLORIDA'S RISK, *supra* note 55, at 108.

78. *See id.*

79. *See, e.g.*, Mark Monmonier, *Zip Codes, Data Compatibility, and Environmental Racism*, 2 GIS L. 4, 4-5 (1994).

80. *See* MATTSON, *supra* note 37.

81. *See id.*

blockgroup summary level because the blockgroups offered the smallest geographic area in which all the demographic variables selected by the Commission were reported by the Census Bureau. In conducting their analysis, the Commission selected twelve demographic variables having a potential impact on the proximity and surrounding community demographics of environmental hazardous sites. (*See* Table 2).

B. Fifteen Study Counties

From each of the five water management districts across the state of Florida,[82] three counties with the highest, lowest, and median population density (number of persons per square mile) were selected. (*See* Table 3). The fifteen selected study counties contain 1589 census blockgroups and 571 targeted environmental hazardous sites. (*See* Table 4).

The enabling legislation[83] specifically charged the Commission with the task of examining whether environmental hazardous sites in Florida were disproportionately located in minority and low income communities or other socioeconomic communities.[84] To answer this question, the density, minority, and poverty variables were stratified into three categories: high, medium, and low. Cut-off points for the categories were determined by ranking the 1589 census blockgroups in ascending order, by the %Minority, %Poverty, and #Density populations and by determining the percentages or numbers separating the lower, middle, and upper third ranges of the blockgroups. (*See* Table 5). The three categories allowed for a comparison of differences in proximity and demographics among blockgroups and communities with respect to environmental hazardous sites.

C. Proximity and Demographic Analyses

The proximity analysis was performed by measuring the distance from the center of a census blockgroup to the nearest targeted environmental hazardous sites. (*See* Figure 1). This analysis was completed for the 1589 block groups in the fifteen study counties and

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82. The Water Management Districts are drawn along hydrologic boundaries. *See* FLA. STAT. § 373.069 (1995); *see also* Ronald A. Christaldi, *Sharing the Cup: A Proposal for the Allocation of Florida's Water Resources*, 23 FLA. ST. U. L. REV. 1063, 1073 (1996); Donna R. Christie, *Florida, in* WATER AND WATER RIGHTS 289 (1991 & Supp. 1995); Sidney F. Ansbacher & Doug Brown, *A Proposal for Regional Water Management Districts to Regulate Consumptive Use in Minnesota*, 10 HAMLINE J. PUB. L. & POL'Y 235, 248 (1989).

83. *See* discussion *supra* Part I.

84. *See* FLA. STAT. § 760.85 (1995).

the 3287 targeted environmental hazardous sites. Distance or proximity was characterized in terms of high, medium, and low Minority (MIN), Poverty (POV), and Density populations.

The demographic analysis was performed by calculating the community demographics of persons and households within 0.5, 1.0, and 2.0 miles of an environmental hazardous site. (*See* Figure 2). This analysis was completed for the 3287 targeted environmental hazardous sites using the twelve demographic variables in Table 1. Blockgroups were weighted proportionately according to the area within the mile perimeter and the number of persons or households within the blockgroup. A weighted average of the census demographic variables was then calculated for each site. Demographics were characterized in terms of high, medium, and low Minority (MIN), Poverty (POV), and Density populations.

All raw data was generated from the Florida Department of Environmental Protection Geographical Information Systems (GIS) databases, and the Census of Population and Housing, 1990: Summary Tape File 3A (Florida), provided by the United States Bureau of the Census (1992). The GIS databases contained information on environmental hazardous sites and census blockgroups identified by geographic coordinates. The data was analyzed by regression analysis, analysis of variance, and comparison of means and was graphed using Statview Integrated Data Analysis & Presentation System, Abacus Concepts, Inc.

IV. RESULTS AND DISCUSSION

A. Selected Demographic Characteristics of Florida and the Fifteen Study Counties

In 1990, the minority and poverty populations of Florida were 26.7% and 12.8% respectively. Eighty-six percent of the households were not connected to a public sewer, and 56% of the population older than twenty-five held a high school degree or less. Fourteen percent of the households were not connected to a public or private water company, and 32% were renter-occupied. (*See* Table 6).

In the fifteen study counties, the lowest density counties were 86.4% rural, medium minority (20.4%), and high poverty (20.3%), with over 50% of households not connected to public or private company water. Seventy-five percent of the residents did not have a college degree, and 42.4% were employed in farming, forestry, fishing, precision production, craft, repair, operator, fabricator, and laborer occupations. These demographics were generally less for the median density counties and even smaller for the highest density counties. The average percent Minority, Rent, Language, and Origin

for the study counties were lower than the state averages. The average percent Poverty, Water, Sewer, Occupation, Rural, and Education were higher. (*See* Table 6).

1. Population Density of 1589 Blockgroups

Population density may be a factor in the degree of exposure. Previous studies citing the proportion of minority or low income residents in a given host community did not provide information about how many people are actually exposed to environmental hazards.[85] For example, given that African Americans presently comprise 12.4% of the nation's populations,[86] a host community of 1000 residents, 20% of whom are African American, would be considered "minority," while a host community of 6000 residents, 10% of whom are African American, would not. By overlooking population density, the studies fail to point out that more African Americans, 600 versus 200, would be exposed to the pollution in the second, non-minority community, than in the first.

Figure 3 shows the average population density of the blockgroups in the selected study counties characterized by high, medium, and low minority and poverty blockgroup populations. There was an average of 5,900 persons per square mile in the high density blockgroups, 3,000 in the medium, and 500 in the low. (*See* Figure 3b). High minority blockgroups had an average of 4,000 persons per square mile, medium minority blockgroups 3,000, and low minority blockgroups 2,600. (*See* Figure 3a). High and medium poverty blockgroups had a population density of 3,200, and low poverty blockgroups had a population density of 2,800 persons per square mile. (*See* Figure 3c).[87]

2. Minority and Poverty Populations of the 1589 Blockgroups

Figure 4 shows the average percent minority populations of the minority blockgroups. The high minority blockgroups were 60% minority and 27% poverty; the low minority blockgroups averaged were 2% minority and 8% poverty; and the medium minority blockgroups were 12% minority and 10% poverty. (*See* Figures 4a and 4b). Figure 5 shows the average percent poverty populations of

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85. *See* UNITED CHURCH OF CHRIST, *supra* note 20; *see also* SADRI study, *supra* note 27.

86. *See* U.S. NEWS & WORLD REPORT, NEW WORLD OF NATIONS: TODAY'S ALMANAC 46 (1995).

87. Florida Department of Environmental Protection Geographical Information Systems (GIS), databases [hereinafter GIS database]; United States Bureau of the Census, Census of Population and Housing, 1990: Summary Tape File 3A (Florida) (1992) [hereinafter Census database].

the poverty blockgroups. The high poverty blockgroups were 45% minority and 30% poverty; the low poverty blockgroups were 8% minority and 4% poverty; and the medium poverty blockgroups were 13% minority and 10% poverty. (*See* Figures 5a and 5b). The results in Figures 4 and 5 show that the high minority and high poverty blockgroups have twice the average levels of %Minority and %Poverty populations compared to the state levels shown in Table 6.

B. Blockgroup Proximity to Targeted Sites

1. Average Blockgroup Distance to 3287 Hazardous Sites

Figure 6a shows that the average distance in miles from the center of a blockgroup to a targeted environmental hazardous site was: 15 miles to an FLS site, 12.5 miles to an NPL site, 8.5 miles to a TSD site, 3.5 miles to a TRI site, 3.0 miles to an LQG site, and 2.0 miles to a SWS site. When blockgroup distance was characterized by blockgroup density (*See* Figure 6b), there was an increase in the average distance from low density blockgroups to hazardous sites and a decrease in the average distance from high and medium density blockgroups to hazardous sites. The results in Figure 6 show that blockgroups tend to be closest to solid waste facilities (SWS) and furthest from FLS sites. Thus, blockgroup density can be a factor in the distance from a blockgroup to a hazardous site.

Figure 7 shows average blockgroup distance, characterized by the minority and poverty blockgroup populations. Figure 7a shows that the high and medium minority blockgroups were closer to hazardous sites than the low minority blockgroups. Figure 7b shows that characterization of blockgroup distance by the blockgroup poverty population did not affect the blockgroup distance to a targeted site. The results in Figure 7 show that blockgroup minority populations may be a factor in the blockgroup distance to a hazardous site.

2. Relationship Between Proximity and Demographics

The relationship between the proximity of the 3,287 targeted sites and 1,589 census blockgroups demographics is shown in Table 7. The results indicate that, except for FLS sites, as the percent minority population of the blockgroup increased the distance from the blockgroup to the nearest targeted environmental hazardous site decreased. This means that blockgroups with high minority populations have a higher number of hazardous sites located in the area and, conversely, that blockgroups with low minority populations have fewer hazardous waste sites located nearby. This relationship

was also true between persons who were foreign born (%Citizen) and LQG and NPL sites; persons speaking a language other than English at home (%Language) and SWS, TRI, and TSD sites; renter-occupied households (%Rent) and FLS, LQG, NPL, and TRI sites; households not connected to public or private company water (%Water) and FLS and NPL sites; and population density per square mile (%Density) and LQG, TRI, and TSD sites. The percent of households located in a rural area (%Rural) showed the opposite relationship. The %Rural decreased as the distance from the blockgroup to the site decreased for all of the targeted sites. Thus, blockgroups with a high percentage of rural households have a lower number of hazardous sites located in the area and, conversely, blockgroups with low percentages of rural households have a higher number of hazardous sites located nearby. This relationship was also true between %Poverty and LQG sites; %Citizen and FLS sites; %Sewer and FLS sites; and %Water and TSD sites. The regression results also showed that the no relationship between blockgroup %Poverty, %Occupation, and %Sewer and their proximity to hazardous sites, except for FLS, LQG, and SWS sites.

C. Community Demographics Around Targeted Sites

1. 3287 Targeted Environmental Hazardous Sites

This analysis calculated the demographic characteristics of communities within 0.5, 1.0, and 2.0 mile perimeters around targeted environmental hazardous sites. Perimeter circles were drawn around each site (*See* Figure 2), and the percentages of the twelve demographic variables, defined in Table 1, were calculated for those populations and households within the perimeter. Results are reported for communities within two mile perimeters around the 3287 targeted sites in Florida. (*See* Table 8).

Table 8 shows that, except for %Education, %Occupation, and %Sewer, community demographics within two miles around the targeted sites were disproportionately represented compared to the state demographics in Table 6. %Origin, %Language, %Minority, and %Rent demographics were substantially higher for communities within the two mile perimeters. %Rural and %Sewer were substantially lower. %Poverty was somewhat higher.

The summation of the total number of persons (#Persons) within two mile perimeters around each of the 3,287 sites (*See* Table 8) equaled 20,102,609 people which was 7,155,540 more people than the total state population of 12,947,069. This means that people and households within two miles of the targeted sites were exposed to multiple sites.

2. 571 Selected Targeted Sites in the Fifteen Study Counties

Multiple exposure occurred to a greater extent in the fifteen study counties. The summation of the total number of persons (#Persons) within two mile perimeters of the targeted sites was 15,549,333 compared to a total population of 2,862,495 in the fifteen study counties. (*See* Table 9).

3. 571 Sites Characterized by Minority and Poverty Demographics

Table 9 shows the community demographic within two mile perimeters around the six types of targeted sites. Figures 8 through 17[88] show the same community demographics characterized by high, medium, and low minority and poverty populations. Figure 8 shows that when community demographics around targeted sites were characterized by high, medium, and low minority populations a disproportionate representation of %Minority (*See* Figure 8a) and %Poverty (*See* Figure 8b) populations in the high minority communities existed around the targeted sites compared to the average %Minority and %Poverty within two mile perimeters shown in Table 9.

Figure 9 shows that when community demographics around targeted sites were characterized by high, medium, and low poverty populations, there was a disproportionate representation of %Minority (*See* Figure 9a) and %Poverty (*See* Figure 9b) populations in the high poverty communities existing around the targeted sites compared to the average %Minority and %Poverty within two miles shown in Table 9.

Figure 10b shows that %Occupation was disproportionate within two miles for high and medium poverty communities compared to low poverty communities and was also higher than %Occupation in Table 9. Figure 11a shows that the %Renter-occupied households were disproportionate in high and medium minority communities compared to low minority communities for all site types and was also higher than %Rent in Table 9. Figure 12b shows a similar disproportion for high and medium poverty communities around FLS, LQG, and NPL sites. Figure 11b shows disproportion in %Education for high and medium poverty communities compared to low poverty communities for all hazardous site types and was also higher than %Education in Table 9. Figure 13b shows disproportion in %Water for high poverty communities around SWS sites compared to

88. In Figures 8 through 17, any absence of bars for a particular statistic indicates a lack of data for that population-type within two miles of the specified hazardous waste site.

medium and low poverty communities and was also higher than %Water in Table 9. Figure 14b shows the same disproportion for %Rural. %Sewer in Figure 15 was comparable to the results in Table 9. Figure 16a shows disproportion in %Origin around FLS, TRI, SWS, and LQG sites. Figure 17a shows the same disproportion for %Language.

V. SUMMARY

The proximity analysis shows that the distance from census blockgroups to the nearest targeted environmental hazardous sites increased in the following order: SWS, LQG, TRI, TSD, NPL, and FLS. High and medium population density blockgroups were closer in proximity to targeted sites than in low population density blockgroups. The population density was higher in high and medium minority and poverty blockgroups than in low minority and poverty blockgroups and was closer in proximity to targeted sites than low minority blockgroups.

The %Minority population increased as the distance from the center of the blockgroup to the targeted hazardous site decreased for all sites except FLS sites. This means that blockgroups with a high percentage of minority populations had a higher number of hazardous sites located in the area and conversely in blockgroups of low minority concentrations. The same relationship held true for %Language with SWS, TRI, and TSD sites and %Renter-occupied households with FLS, LQG, NPL, and TRI sites. There was no relationship between poverty and distance, except for LQG where %Poverty decreased as the distance to the nearest targeted site decreased. The %Households in a rural area decreased as the distance from the blockgroups to all of the targeted sites decreased. This means that blockgroups with a high percentage of rural households had a lower number of hazardous sites located in the area and conversely in blockgroups with a low percentage of rural households.

The demographic analysis shows that minority and low income populations were disproportionately represented within two miles around targeted environmental hazardous sites and that they were exposed to multiple sites. Characterization of populations by high, medium, and low minority, poverty, and density levels give a more accurate representation of those populations disproportionately represented in neighborhoods around environmental hazardous sites in Florida.

VI. CONCLUSIONS

The results of the proximity and demographic analysis report show that minority and low income communities are disproportionately impacted by multiple targeted environmental hazardous sites in Florida. Minority, poverty, and density factors can impact the distance, location, and the surrounding community demographics of targeted environmental hazardous sites. Having established these conclusions, further research is necessary.[89] First, the results indicate the critical need for health and risk exposure assessments of minority and poverty populations around environmental hazardous sites in Florida. Next, further research is necessary to expand the scope of this analysis to include the environmental hazardous site types, counties, and blockgroups not covered in this report. Finally, an analysis must be performed to determine why these disproportions exist. Is the problem in the process, the outcome, or both? Only then can solutions or remedies to any environmental injustices or inequities be implemented.

89. The Legislature specifically requested that the Commission's report include "[c]onsideration of the advisability of creating a permanent institutional review entity to deal with environmental equity issues." FLA. STAT. § 760.85(5)(j) (1995).

VII. APPENDIX: TABLES AND FIGURES

Table 1. 3287 Selected Targeted Environmental Hazardous Sites in Florida[90]

Site Type	Number	Description
FLS	39	Florida List Sites—landfills, disposal, reduction, and resource recovery sites
LQG	858	Large Quantity Generators—generators of RCRA designated hazardous waste or acute hazardous waste
NPL	59	National Priority List—hazardous sites designated by the EPA for receipt of federal funds to assist in cleanup under the Superfund Act
SWS	1647	Solid Waste Facilities—for the collection, source separation, storage, transfer, transportation, processing, treatment,or disposal of solid waste, including toxic and hazardous waste
TRI	569	Toxic Release Inventory—facilities that manufacture, import, process, or otherwise use above threshold quantities of substances on the federal chemical list
TSD	115	Treatment/Storage/Disposal—facilities that treat, store or dispose of hazardous waste

90. Census database, *supra* note 87; GIS database, *supra* note 87.

Table 2. Twelve Demographic Variables[91]

Name	Attribute
%Minority	Percent of persons who are Black, Black Hispanic, White Hispanic, and American Indian, Eskimo, Aleutian Islander, Asian, Pacific Islander and Other Race of Hispanic origin and not of Hispanic origin
%Poverty	Percent of persons below the 1990 poverty level
%Education	Percent of persons older than 25 with only a high school degree or less education
%Sewer	Percent of households not using a public sewer
%Occupation	Percent of persons who are employed in farming, forestry, fishing, precision production, craft, repair, operator, fabricator, and laborer occupations
%Rent	Percent of households which are renter-occupied
%Rural	Percent of households located in a rural area
%Origin	Percent of persons who are foreign born
%Language	Percent of persons older than 5 who speak a language other than English at home
%Water	Percent of households not receiving water from a public or private company
# Persons	Total number of persons
# Density	Number of persons per square mile

Table 3. Location and Density of Fifteen Study Counties[92]

Florida Water Management Districts	Population Density Per Square Mile		
	Highest	Median	Lowest
Northwest	Escambia	Holmes	Franklin
Suwannee River	Bradford	Hamilton	Lafayette
St. Johns River	Seminole	Indian River	Baker
Southwest Florida	Pinellas	Hernando	Hardee
South Florida	Broward	Osceola	Glades

91. Census database, *supra* note 87.
92. GIS database, *supra* note 87.

Table 4. Selected Targeted Sites Fifteen in Study Counties[93]

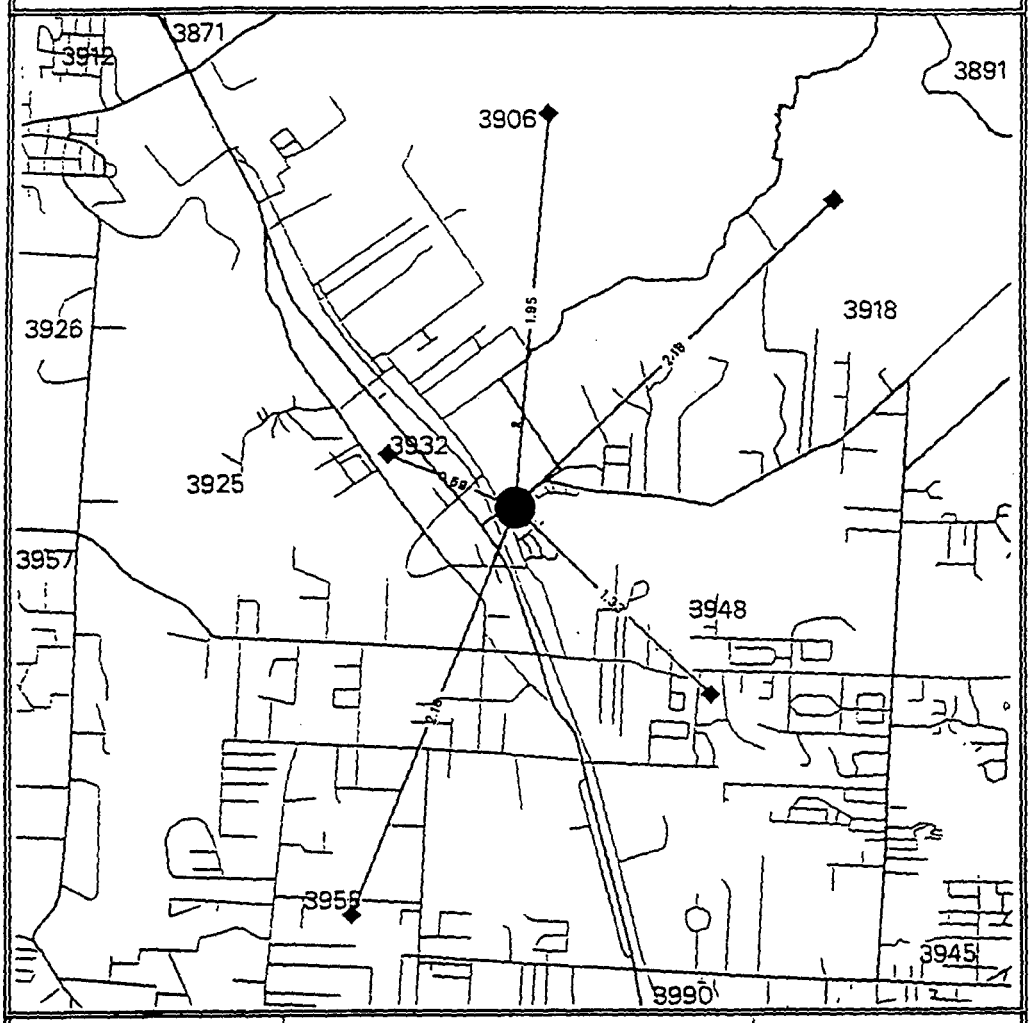
County Population Density Per Square Mile	Environmental Hazardous Site						
	FLS	LQG	NPL	SWS	TRI	TSD	TOTAL
5 Highest	5	86	14	202	110	14	432
5 Median	1	6	1	70	7	1	86
5 Lowest	0	2	0	46	5	1	53
TOTAL	6	94	15	318	122	16	571

Table 5. Classification of Minority (MIN), Poverty (POV), and Density Categories

Category	MIN	POV	Density
High	23.9-100%	15.6-100%	4129-16,961
Medium	6.0-23.8%	6.5-15.5%	1647-4128
Low	0.0-5.9%	0.0-6.4%	0.47-1646

93. GIS database, *supra* note 87.

Figure 1. Measuring Proximity



The map displays one of the 63 selected environmental hazards investigated by Florida A&M University Environmental Sciences Institute in support of the Florida Legislature's Environmental Equity & Justice Commission.

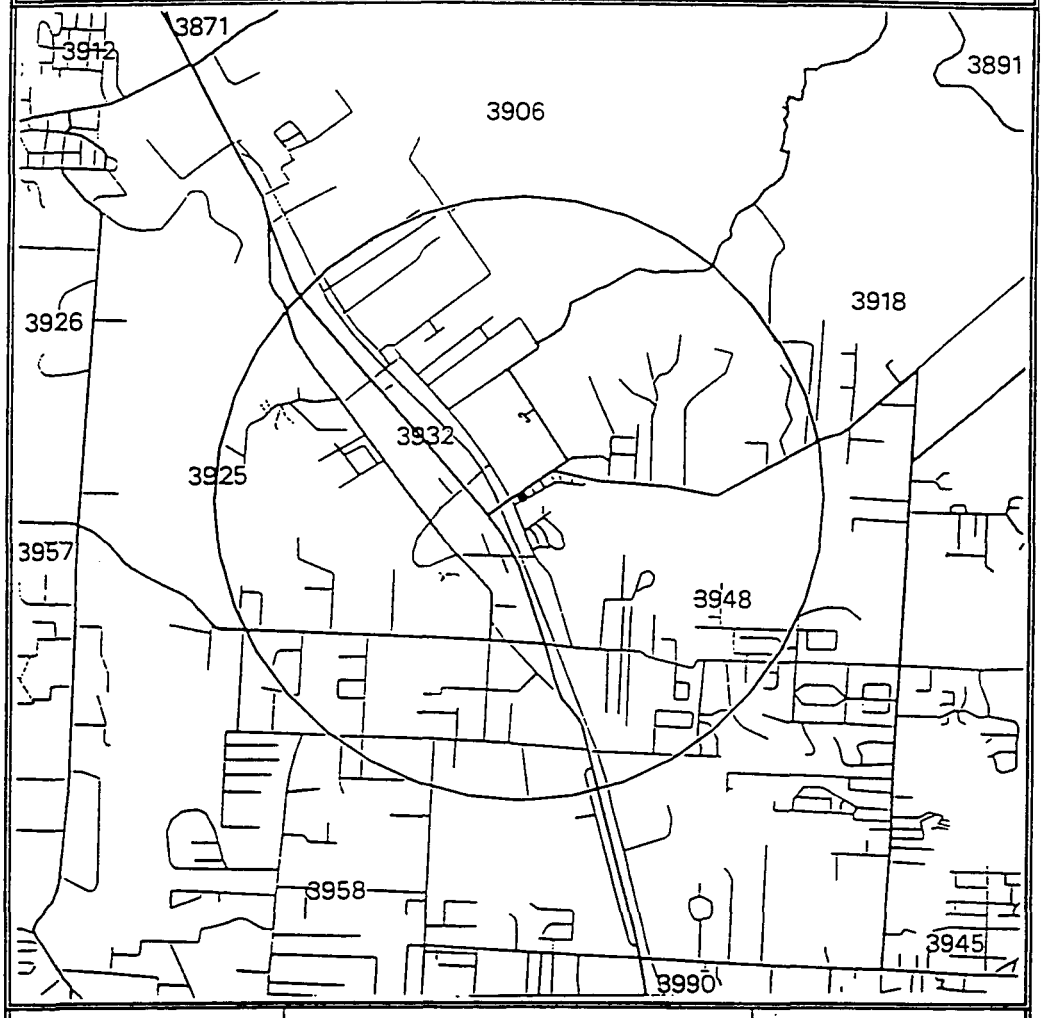
Map was created by the Florida Department of Environmental Protection, Bureau of Information Systems. Funding was provided by Bueau of Solid and Hazardous Waste.

Environmental Equity and Justice

3948 Blockgroup ID
• Site Location
◆ Center of Blockgroup
—— Blockgroup Boundary
—— Roads and Streets

Map depicts the distance measurements made as a part of the proximity analysis of the EEJ Commission.

Figure 2. Defining the Community



The map displays one of the 63 selected environmental hazards investigated by Florida A&M University Environmental Sciences Institute in support of the Florida Legislature's Environmental Equity & Justice Commission.

Map was created by the Florida Department of Environmental Protection, Bureau of Information Systems. Funding was provided by Bueau of Solid and Hazardous Waste.

Environmental Equity and Justice

3948 Blockgroup ID
• Site Location
○ Radius Around Site
— Blockgroup Boundary
— Roads and Streets
— Radius Lines

The map depicts 2 mile radii around a potential hazardous waste sites. Census blockgroups were used to define the community inflenced by the site.

Table 6. Demographics of Florida and the Fifteen Study Counties Demographics[94]

	Counties					
	Florida (67)	Highest Density (5)	Median Density (5)	Lowest Density (5)	Total	Study Counties Average
# Blockgroups	9144	1272	264	53	1589	
# Persons	12,947,069	2,476,615	325,758	60,121	2,862,495	
% Origin	12.8	5.8	4.3	3.5		4.5
% Education	56.0	56.9	68.3	75.7		66.9
% Occupation	26.3	27.2	35.2	44.2		35.5
% Language	17.4	7.9	7.4	8.7		8.0
% Minority	26.7	18.1	17.7	20.4		18.7
% Poverty	12.8	13.1	16.2	20.3		16.5
% Rural	15.1	29.6	53.8	86.4		56.6
% Water	14.3	15.2	39.7	52.5		35.8
% Sewer	86.2	87.0	87.6	90.0		88.2
% Rent	32.2	28.6	23.0	21.2		24.3

94. *See* FLA. STAT. § 760.85 (1995).

Figure 3. Blockgroup Population Density

Number of persons per square mile in the 1,589 Blockgroups (Fig. 3b) Characterized by High(H), Medium(M) and Low(L) Minority (MIN Fig. 3a) and Poverty (POV Fig. 3c) Blockgroup Populations

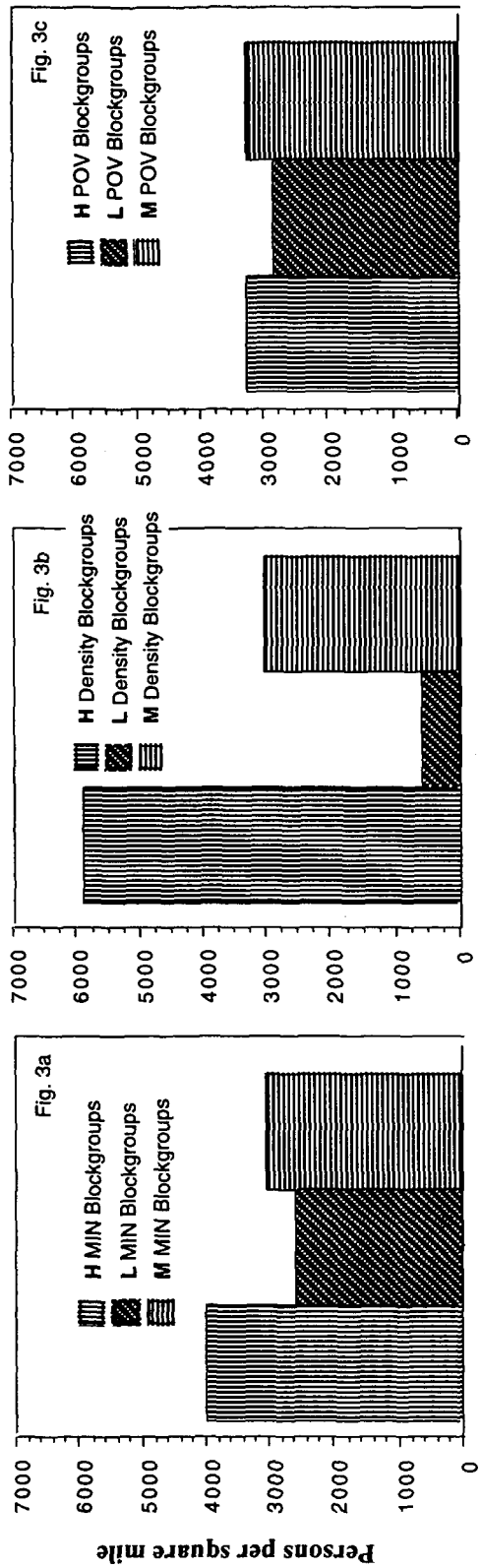


Figure 4. Blockgroup Minority Populations

Percent Minority and Poverty in the 1,589 Blockgroups
Characterized by High (H), Medium (M) and Low (L) Minority (MIN Fig. 4a and 4b)

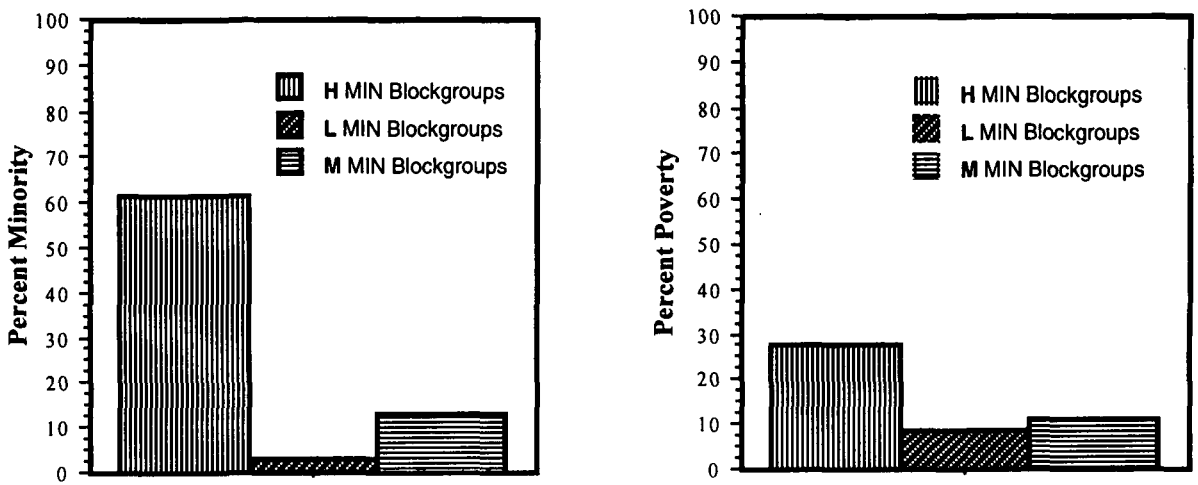


Figure 5. Blockgroup Poverty Populations

Percent Minority and Poverty in the 1,589 Blockgroups
Characterized by High (H), Medium (M) and Low (L) Poverty (POV Fig. 5a and 5b)

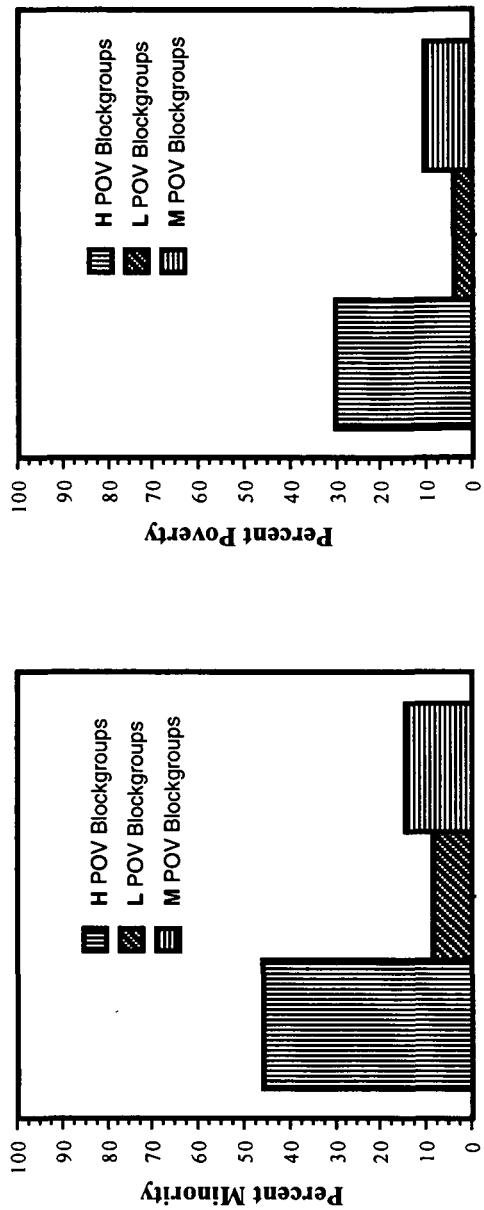
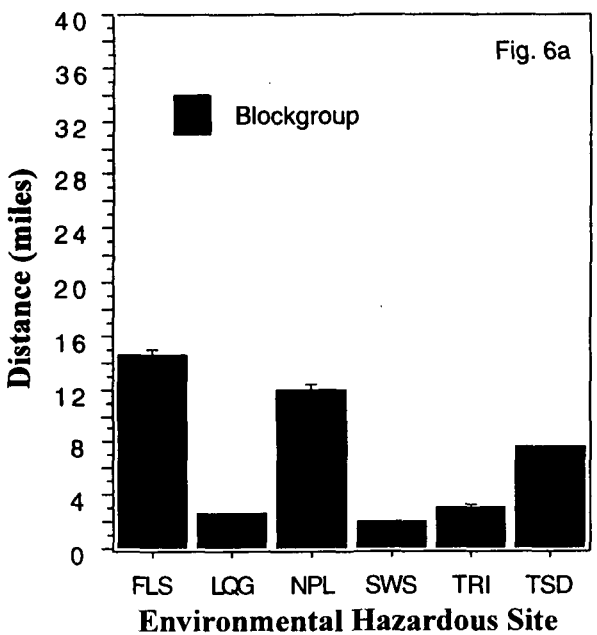


Figure 6. Distance Characterized by Density

Average Distance From the Center of a Census Blockgroup To a Targeted Environmental Hazardous Site (Fig. 6a) Characterized by High (H), Medium (M) and Low (L) Blockgroup Density (Fig. 6b)



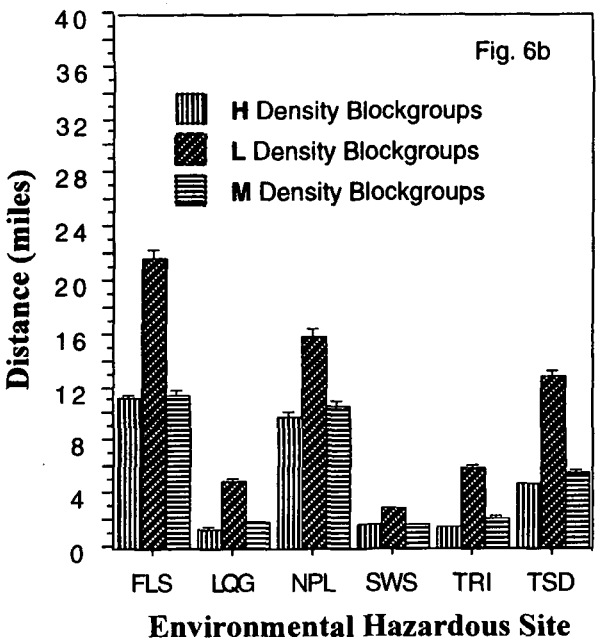
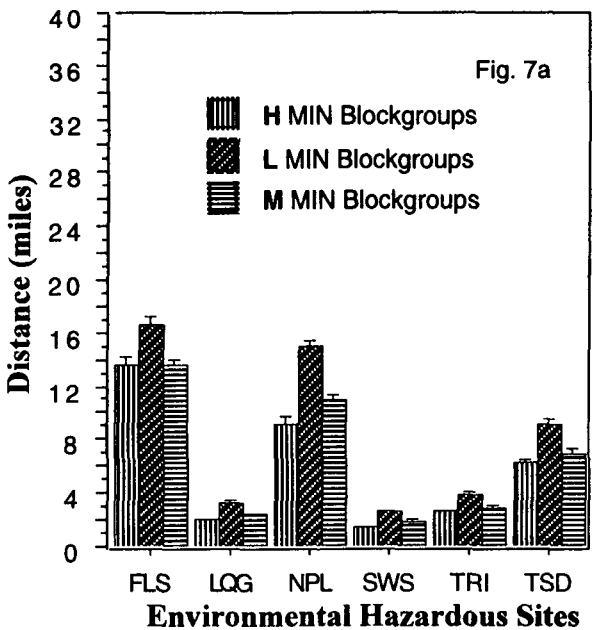


Figure 7. Distance Characterized by Minority and Poverty

Average Distance From the Center of a Census Block Group To a Targeted Environmental Hazardous Site Characterized by High (H), Medium (M) and Low (L) Minority (MIN Fig. 7a) and Poverty (POV Fig. 7b) Populations of the Blockgroups



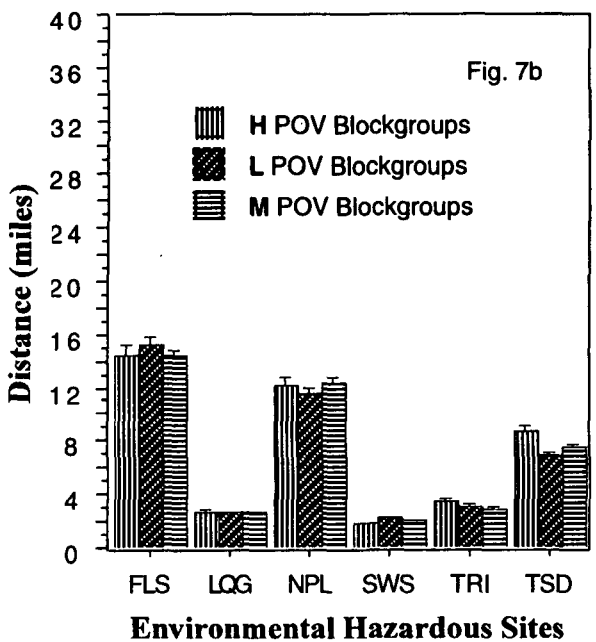


Table 7. Relationship Between Blockgroup Demographics and Distance to the Nearest Targeted Site

1589 Census Blockgroups Demographics	3287 Targeted Environmental Hazardous Sites					
	FLS (39)	LQG (858)	NPL (59)	SWS (1647)	TRI (569)	TSD (115)
%Minority	0 0 0	+ + +	+ + +	+ + +	+ + +	+ + +
%Poverty	0 0 0	_ _ _	0 0 0	0 0 0	0 0 0	0 0 0
%Origin	_ _ _	+ + +	+ + +	0 0 0	0 0 0	0 0 0
%Language	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	+ + +
%Occupation	0 0 0	0 0 0	0 0 0	+ + +	0 0 0	0 0 0
%Rent	+ + +	+ + +	+ + +	0 0 0	+ + +	0 0 0
%Rural	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
%Sewer	_ _ _	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
%Water	+ + +	0 0 0	+ + +	0 0 0	0 0 0	_ _ _
#Density	0 0 0	+ + +	0 0 0	0 0 0	+ + +	+ + +

Legend (Table 7)

+ + +	Blockgroup demographic increases as the distance to the nearest hazardous site decreases.
_ _ _	Blockgroup demographic decreases as the distance to the nearest hazardous site decreases.
0 0 0	No relationship between blockgroup demographic and distance to the nearest hazardous site.

Table 8. Community Demographics Within Two Miles Around the 3287 Targeted Environmental Hazardous Sites in Florida and Regulated by the Florida Department of Environmental Protection[95]

Community Demographics	Targeted Environmental Hazardous Sites					
	FLS(39)	LQG(858)	NPL(59)	SWS(1,647)	TRI(569)	TSD(115)
#Persons	505,804	5,444,841	1,138,883	6,872,920	4,869,934	1,270,227
% Origin	26.8	17.9	17.0	15.4	15.2	14.6
% Education	62.7	59.1	58.7	59.6	62.3	57.6
% Occupation	30.6	26.8	27.0	27.8	29.7	26.7
% Language	32.9	23.4	22.0	20.1	21.9	19.4
% Minority	54.1	38.8	36.4	36.2	43.7	31.4
% Poverty	17.6	17.7	15.9	15.7	18.5	14.0
% Rural	2.4	3.5	3.4	4.1	5.2	8.7
% Water	4.7	5.9	5.4	5.9	6.6	9.3
% Sewer	80.3	84.7	83.5	83.8	82.1	85.7
% Rent	39.4	40.9	39.3	38.7	40.7	35.0

95. Census database, *supra* note 87; GIS database, *supra* note 87.

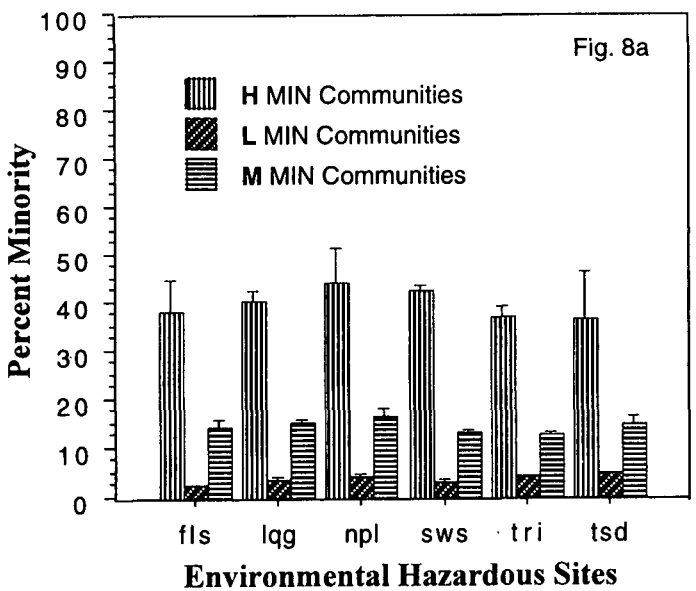
Table 9. Community Demographics Within Two Miles Around the 571 Selected Targeted Environmental Hazardous Sites in the Fifteen Study Counties and Regulated by the Florida Department of Environmental Protection[96]

Community Demographics		Targeted Environmental Hazardous Sites				
		LQG(94)	NPL(15)	SWS(318)	TRI(122)	TSD(16)
# Persons	120,941	3,473,516	432,032	5,477,903	3,680,454	364,487
% Origin	3.8	9.2	9.6	6.6	8.5	7.1
% Education	60.2	59.4	60.1	62.1	57.8	55.9
% Occupation	35.6	26.6	29.5	32.1	27.1	26.8
% Language	6.3	11.7	12.0	9.4	10.9	10.5
% Minority	20.4	23.9	28.1	20.1	17.3	15.8
% Poverty	14.8	14.4	15.3	14.4	11.4	10.1
% Rural	16.9	7.9	13.5	36.9	11.3	17.0
% Water	19.6	4.7	3.9	22.7	8.6	10.7
% Sewer	92.1	81.2	79.3	88.2	86.9	84.0
% Rent	34.5	33.1	32.9	26.7	32.3	33.3

96. Census database, *supra* note 87; GIS database, *supra* note 87.

Figure 8. Percent Minority and Poverty

Percent Minority and Poverty
Within Two Miles of the 571 Selected Hazardous Sites in the Fifteen Study Counties
Characterized by High (H), Medium (M) and Low (L)
Minority Populations (MIN Fig.8a and Fig.8b)



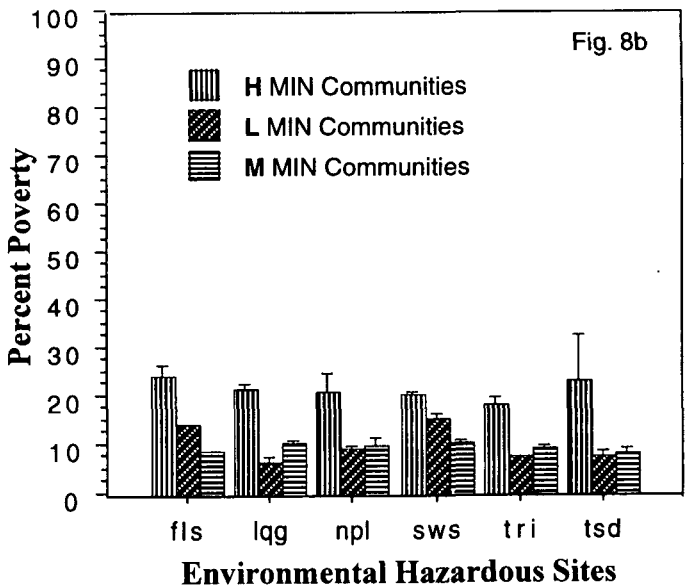
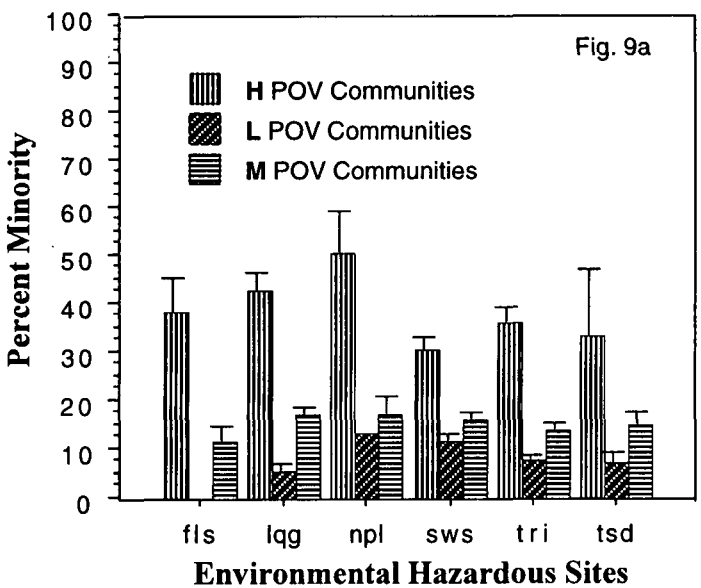


Figure 9. Percent Minority and Poverty

Within Two Miles of the 571 Selected Hazardous Sites in the Fifteen Study Counties Characterized by High (H), Medium (M) and Low (L) Poverty Populations (POV Fig. 9a and Fig. 9b)



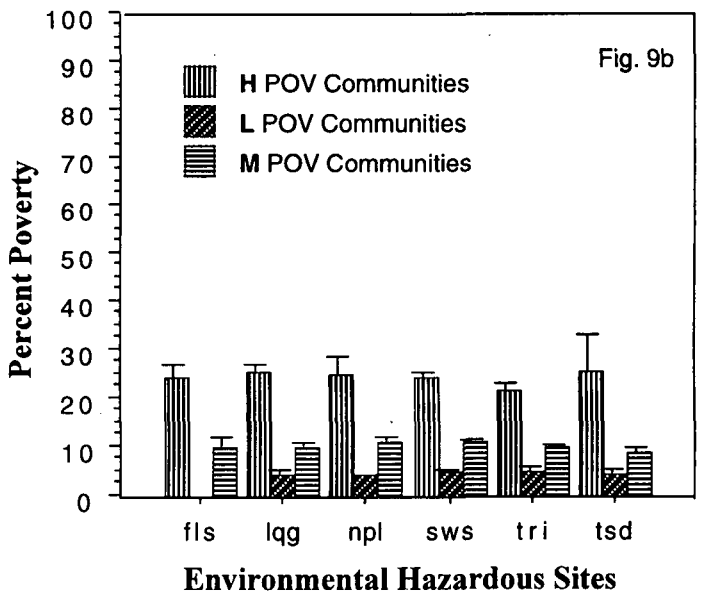
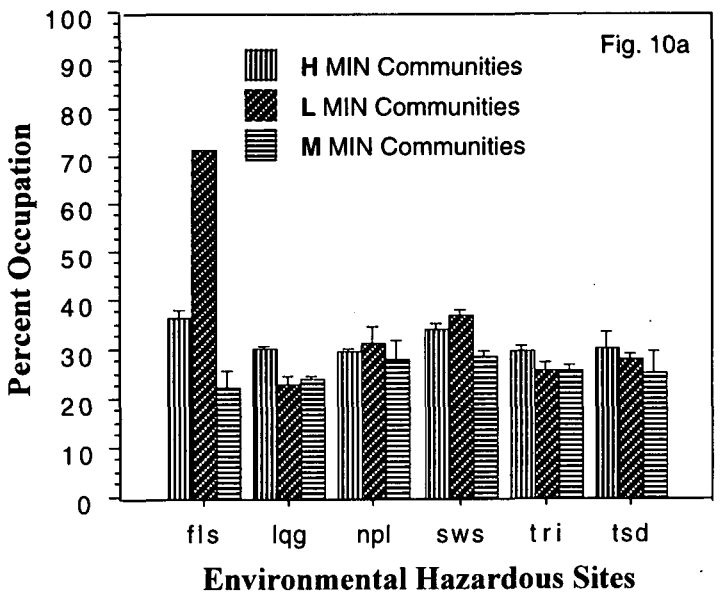


Figure 10. Percent Occupation

Percentage of Population Employed in Farming, Forestry, Fishing, Precision Production, Craft, Repair, Operator, Fabricator, and Laborer Occupations Within Two Miles of the 571 Selected Hazardous Sites in the Fifteen Study Counties Characterized by High (H), Medium (M) and Low (L) Minority (MIN Fig. 10a) and Poverty (POV Fig. 10b) Populations



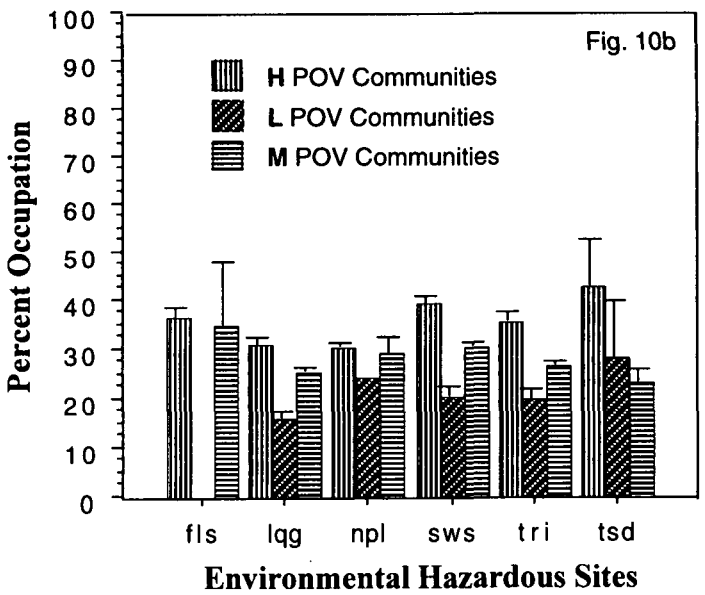
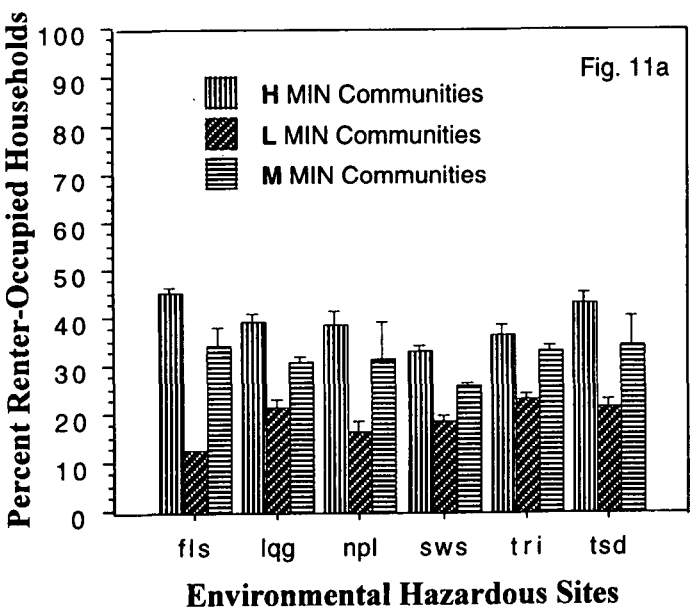


Figure 11. Percent Renter-Occupied Households

Percentage of Rented Households
Within Two Miles of the 571 Selected Hazardous Sites in the Fifteen Study Counties
Characterized by High (H), Medium (M) and Low (L)
Minority (MIN Fig. 11a) and Poverty (POV Fig. 11b) Populations



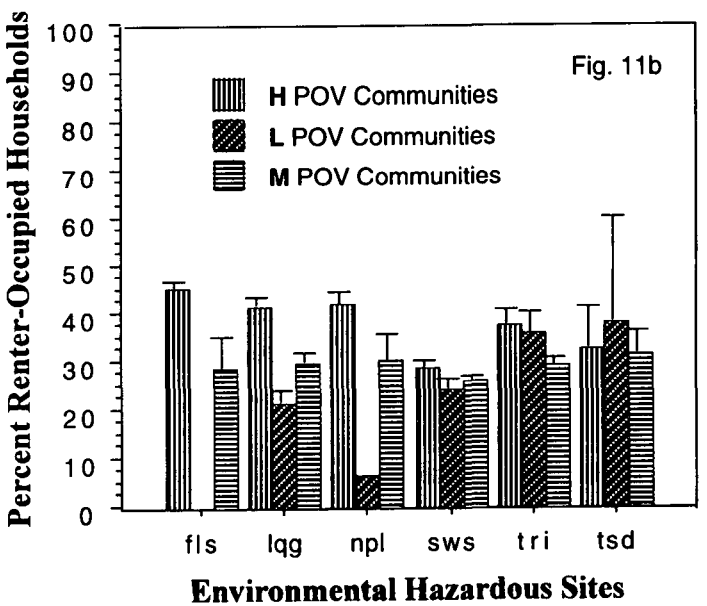


Figure 12. Percent Education

Percentage of Population Over Twenty-Five with a High School Degree or Less Within Two Miles of the 571 Selected Hazardous Sites in the Fifteen Study Counties Characterized by High (H), Medium (M) and Low (L) Minority (MIN Fig. 12a) and Poverty (POV Fig. 12b) Populations

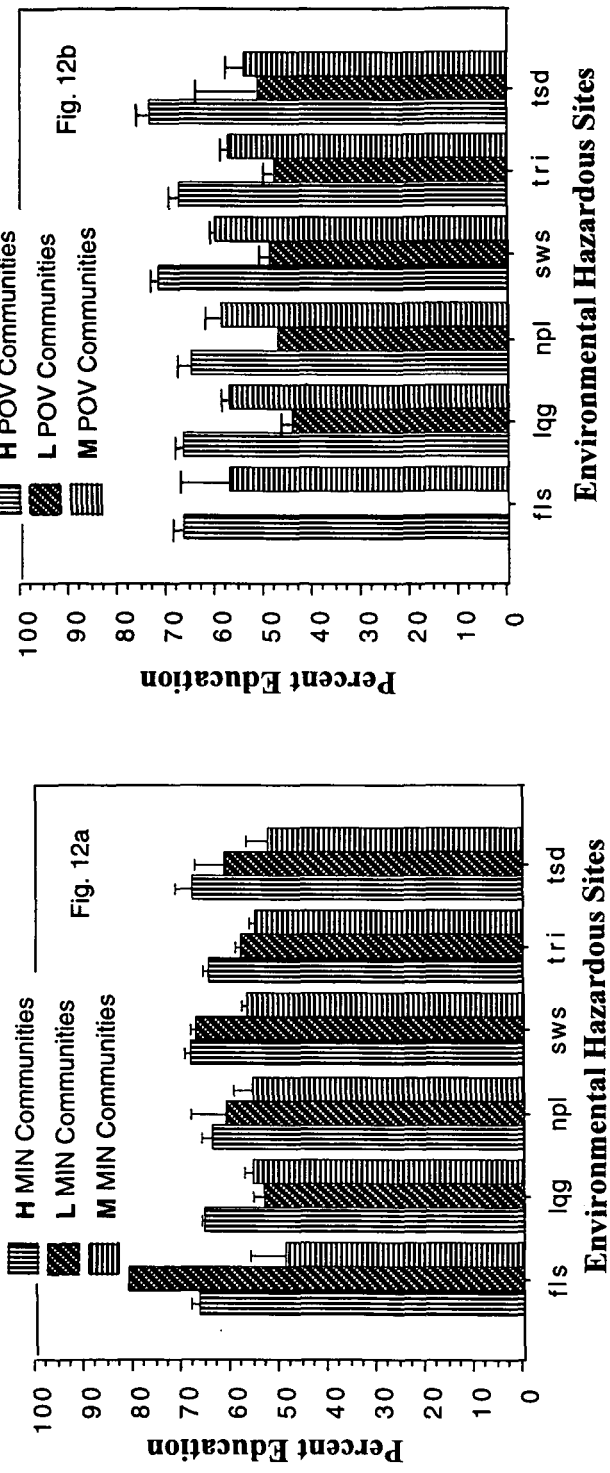
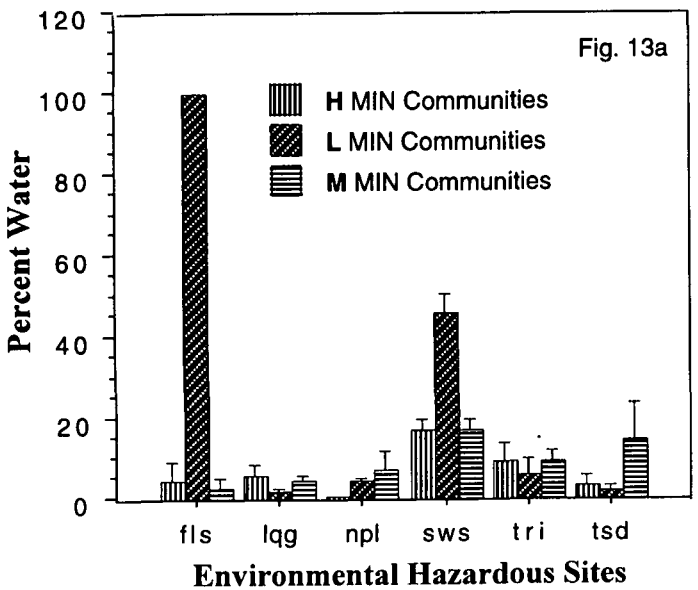


Figure 13. Percent Water

Percentage of Households not Receiving Public System or Private Company Water Within Two Miles of the 571 Selected Hazardous Sites in the Fifteen Study Counties Characterized by High (H), Medium (M) and Low (L) Minority (MIN Fig. 13a) and Poverty (POV Fig. 13b) Populations



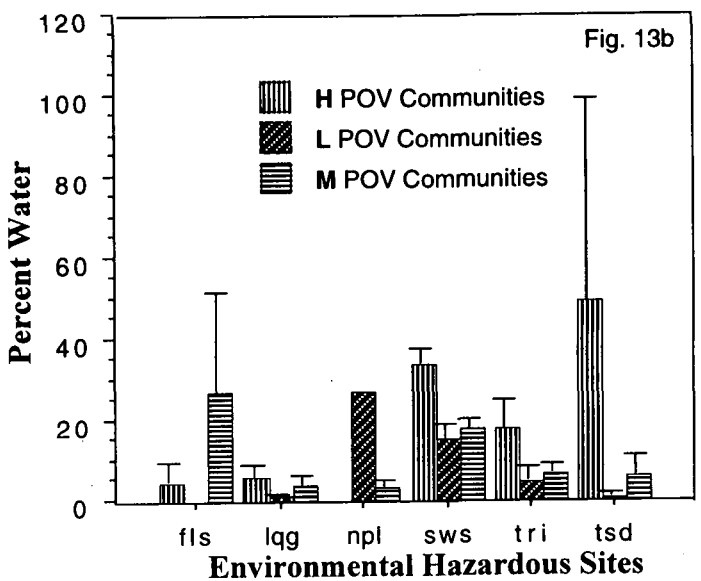


Figure 14. Percent Rural

Percentage of Households Located in a Rural Area Within Two Miles of the 571 Selected Hazardous Sites in the Fifteen Study Counties Characterized by High (H), Medium (M) and Low (L) Minority (MIN Fig. 14a) and Poverty (POV Fig. 14b) Populations

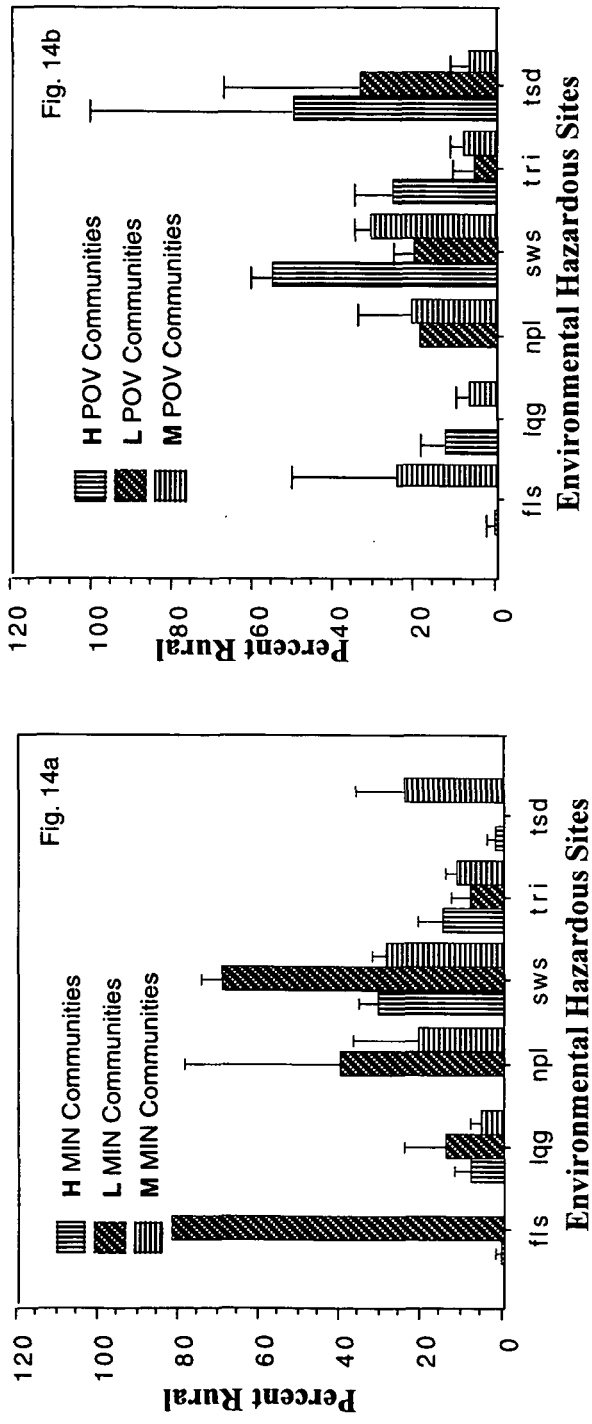
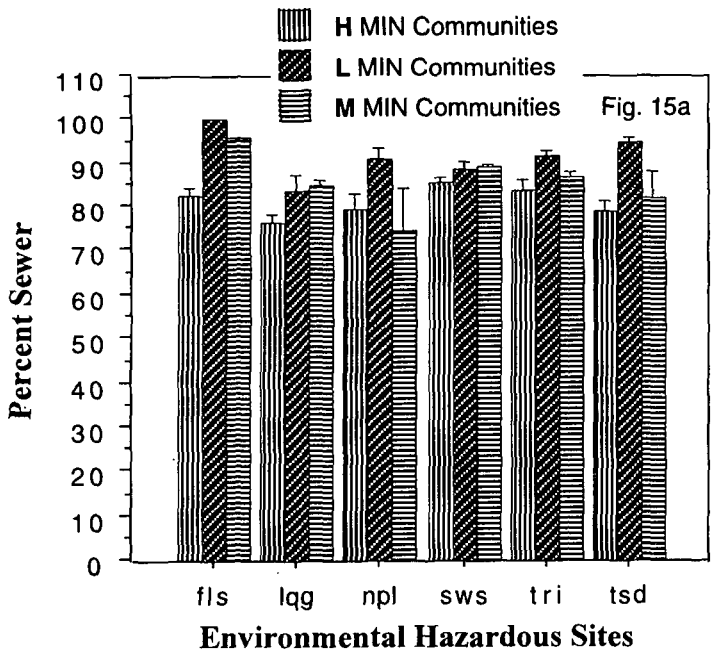


Figure 15. Percent Sewer

Percentage of Households Not Using a Public Sewer Within Two Miles of the 571 Selected Hazardous Sites in the Fifteen Study Counties Characterized by High (H), Medium (M) and Low (L) Minority (MIN Fig. 15a) and Poverty (POV Fig. 15b) Populations



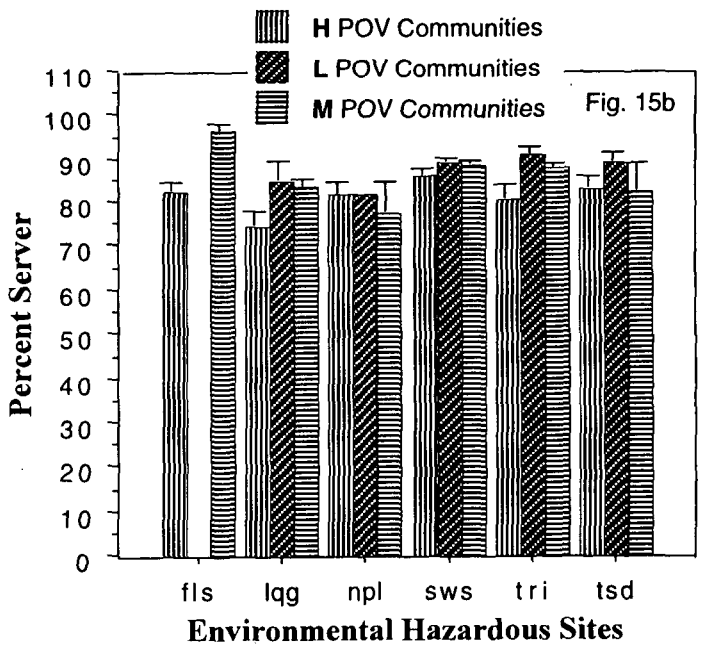
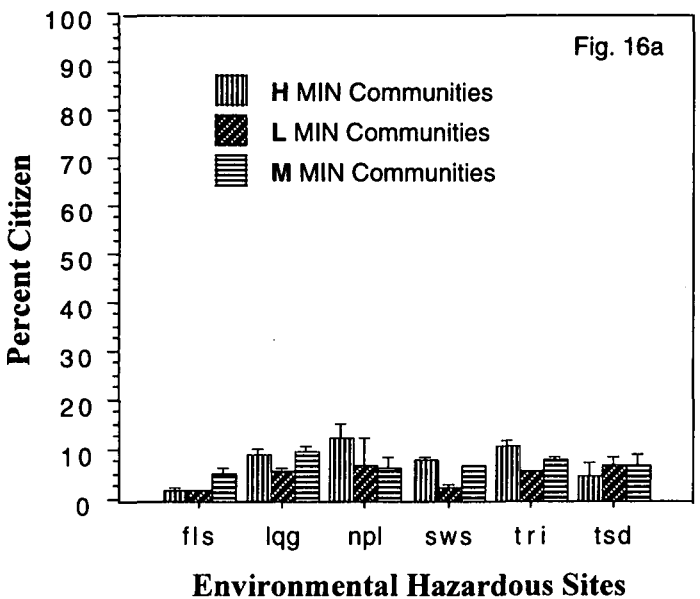


Figure 16. Percent Origin

Percentage of Population Foreign Born
Within Two Miles of the 571 Selected Hazardous Sites in the Fifteen Study Counties
Characterized by High (H), Medium (M) and Low (L)
Minority (MIN Fig. 16a) and Poverty (POV Fig. 16b) Populations



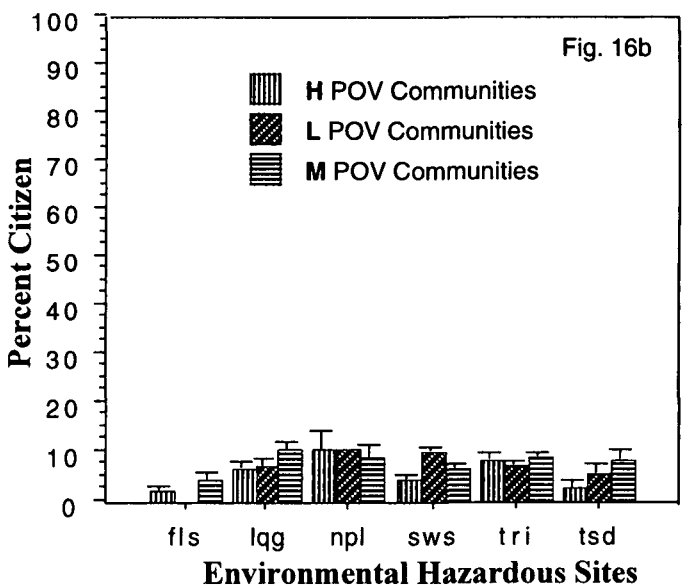


Figure 17. Percent Language

Percentage of Population Over Five that Speaks a Language other than English at Home Within Two Miles of the 571 Selected Hazardous Sites in the Fifteen Study Counties Characterized by High (H), Medium (M) and Low (L) Minority (MIN Fig. 17a) and Poverty (POV Fig. 17b) Populations