FROM GREEN TO RED: THE INTERSECTION OF CLASS AND RACE IN URBAN ENVIRONMENTAL INEQUALITY

By

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the dissertation of CHAD LEIGHTON SMITH find it satisfactory and recommend that it be accepted.

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Abstract

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The research presented here directly engages the issues of environmental inequality within an historical context. The research provides an accounting of landfill sites over a 50-year period and Superfund sites over a 20-year period in Portland, Oregon and Detroit, Michigan. The starting point for this research is a rare set of archival maps produced between 1935 and 1940 by the Home Owner's Loan Corporation (HOLC). With their depiction of "redlined" neighborhoods, the HOLC maps provide the initial data point for a systematic study of environmental inequality. Multiple points of data, much of it collected through archival research, when combined together, form the basis for an investigation of how race, class, and wealth have differential impacts upon landfill and Superfund siting over a sustained period of time.

In addition to the data opening a unique opportunity for a historically based environmental inequality study, this dissertation also attempts to bridge environmental inequality to the larger sociological literature. More specifically, a test of three prominent social inequality explanations with respect to their contribution to our understanding of environmental inequality comprises the main thrust of this project.

The empirical questions raised in this research combined with the substantive issues of hazardous facilities and social inequality point to an understanding of environmental inequality as a spatial relationship. The probability of living near a landfill is highest among the economically deprived, while the likelihood of living near a Superfund site is highest among the economically disadvantaged and African-Americans. These findings point to a multi-faceted understanding of social and environmental inequality in which space is an important component.

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For Grandma and in memory of Grandpa.

CHAPTER ONE

INTRODUCTION

In 2001, residents of Harlem celebrated the closing of the Fresh Kills landfill. The closing of the landfill signaled the end of a foul smelling eyesore in this predominantly African-American neighborhood in Manhattan. Subsequently, in March of 2003 the city of New York announced plans to open multiple waste transfer stations near the former location of the landfill site (Lee 2003). Despite transfer stations tabbed for placement in other neighborhoods, Harlem residents claim their neighborhood houses a disproportionate number of hazardous facilities, including two of the city's sewage treatment plants. In fact, with reference to middle class neighborhoods, a local resident remarked, "The city wouldn't dare put something like this in Chelsea, ….They still think of this as a drug-infested area" (Lee 2003: 14, 8). The obvious implication of this resident's comment paints Harlem as an intentional target for the new waste site largely based upon the social indicators of the neighborhood, especially its high poverty rate and its high percentage of African-American residents. Public officials, of course, claim that the placement of the transfer stations center upon cost/benefit analyses with equal burdens of waste storage being borne by communities across the city (Lee 2003).

New Town, Georgia stands as the toxic wasteland for the entire region surrounding the Northern area of Atlanta. In fact, New Town is home to 13 of the 15 toxic producing industries in the area (McConahay 2003). The community is predominantly African-American and the residents claim that the federal government is not adhering to its own regulations requiring mandatory studies on environmental racism

prior to the placement of toxic dumps, landfills, and polluting industries. Given this high level of industrial production in such a condensed geographical area, it is not surprising that New Town residents suffer a higher incidence of environmentally related health problems when compared to nearby communities.

Both of these examples serve as anecdotal evidence that environmental inequality exists in the United States. Local communities across the country, primarily those inhabited by poor, African-American, and Hispanic peoples, claim to be the target of intentional environmental inequality. These examples illustrate many of the dominant themes in the debate over environmental inequality, particularly the issue of minority and poor populations as intentional targets for unwanted hazardous facilities. A growing body of scholarly research supports many of the claims made by poor and minority communities with respect to the increased probability of housing unwanted hazardous facilities. Despite this growing evidence, the extant research on environmental inequality lacks a coherent and sophisticated explanation of these outcomes. In part, these insufficient explanations reflect ahistorical approaches and an inability to bridge environmental inequality outcomes to the larger theoretical debates within sociology. This research attempts to remedy both of these shortcomings in the literature by implementing an historically minded study of two cities–Portland, Oregon and Detroit, Michigan–while simultaneously testing three major explanations from the social inequalities literature.

The research presented here directly engages the issues of environmental inequality within an historical context. Although this dissertation fails to provide a detailed contextual understanding of the specific events and peoples surrounding

environmental inequality in these two cities, the research provides an accounting of landfill sites over a 50-year period and Superfund sites over a 20-year period. The starting point for this research is a rare set of archival maps produced between 1935 and 1940 by the Home Owner's Loan Corporation (HOLC) (National Archives and Record Administration, Record Group #195.3). With their depiction of "redlined" neighborhoods, the HOLC maps provide the initial data point for a systematic study of environmental inequality. Multiple points of data, much of it collected through archival research, when combined together, form the basis for an investigation of how race, class, and wealth have differential impacts upon landfill and Superfund siting over a sustained period of time.

In addition to the data opening a unique opportunity for a historically based environmental inequality study, this dissertation also attempts to bridge environmental inequality to the larger sociological literature. More specifically, a test of three prominent social inequality explanations with respect to their contribution to our understanding of environmental inequality comprises the main thrust of this project. Wilson (1978, 1987, 1996) maintains that inequality in the United States is largely a product of class dynamics as related to the processes of deindustrialization in America's inner cities–the results of this process are a distinct organization of life present only in America's urban core–the "ghetto." For Massey and Denton (1993), the major means to understanding contemporary inequality stems from past and present forms of racial discrimination. Oliver and Shapiro (1995) and Conley (1999) conceive of an intersection between race and class such that wealth, in effect, produces inequalities spanning generations. Some suggest that the larger sociological literature is important in

explaining environmental inequality outcomes, yet few empirically tie environmental inequality to these (or other) sociological explanations. Hence, this research provides some important first steps in attempting to mold together the empirical reality of environmental inequality and the theoretical explanation of social inequality.

The empirical questions raised in this research combined with the substantive issues of hazardous facilities and social inequality point to an understanding of environmental inequality as a spatial relationship. Pellow (2000) argues that environmental inequality requires an understanding of the context within which they occur. Specifically, he argues that environmental inequality forms historically between multiple stakeholders and occurs over the life course of hazardous materials. Building upon Pellow's (2000) Environmental Inequality Formation (EIF) framework, I argue that his conception of how environmental inequality develops remains essential to our understanding of environmental inequality. However, I also propose an amendment to this model so that it includes an element not accounted for in this explanation – namely, spatial processes. Because these developments are intimately tied to relations of power, access to economic resources, and the arrangement of social inequality across the social landscape it makes intuitive sense to analyze environmental inequality within the context of space. That is, "Relations of power, structures of inequality, and practices of domination and subordination are embedded in spatial design and relations" and such relations "constitute…the opportunity structure" within which individuals life chances operate (Tickamyer 2000: 806). Furthermore, Lobao argues that relationships characterized by social inequality are "contingent on time and place" and this context proves an important element of consideration (2002: 498). How environmental

inequality forms, then, must account for the spatial context within which these outcomes occur. This research addresses these spatial concerns by utilizing Geographic Information Systems (GIS) and the maps presented provide a visual account of environmental inequality.

In the chapters that follow, all of the above issues are examined. Chapter 2 introduces the literature on both environmental inequality and the theoretical issues of relevance from the social inequality literature. Chapter 3 includes an historical overview of both Detroit and Portland while also highlighting the historical development of landfills and Superfund policies and designations in the United States. The chapter ends with a series of research questions addressed in the chapters that follow. Chapter 4 is comprised of a detailed discussion of the data, measures, and methods employed in the analyses. Chapter 5 introduces the quantitative analyses and the accompanying maps depicting these results. This chapter addresses two central questions. First, are landfill and Superfund sites disproportionately located near to poor and minority communities? Second, are these poor and minority communities present prior to the placement of a facility? A secondary, but important issue rests upon an investigation of a landfill facility's influence upon subsequent socioeconomic changes. Do communities housing a landfill become havens for poor and minority populations in the decade(s) following a landfill's presence? Chapter 6 provides a summary discussion of the overall findings from this research and their relevance for ongoing theoretical debates. Finally, the chapter closes with a discussion of the limitations in the research presented and how future research may improve upon this effort.

Although the results are multi-faceted, there is evidence of the existence of environmental inequality in both Detroit and Portland. The driving forces behind this environmental inequality are comparable across cities, but in both instances, spatial inequality is an important feature.

CHAPTER TWO

SOCIAL AND ENVIRONMENTAL INEQUALITY: THE INTERSECTION OF TWO LITERATURES

One of the fundamental contributions sociology makes to the ongoing understanding of environmental problems centers upon the uneven distribution of environmental hazards across social groups (Bell 1998). Yet the connection between the social inequality and environmental inequality literatures remains incomplete. Within the larger sociological literature, there exist multiple and competing interpretations of unequal life chances; these concepts identify the manner in which social class increases or decreases the probability of attaining the tools likely to enhance one's quality of life (Weber 1946). Weber developed the term life chances to address class dynamics, but the term is often extended to include the impact of race, ethnicity, and gender (Rothman 2002). There exists a rich literature examining how class and race links to personal and institutional discrimination.

Wilson (1978), in *The Declining Significance of Race,* sparked a debate that continues today. Wilson suggests that class distinctions supercede the racism once experienced by African-Americans in the United States. Moreover, Wilson (1987, 1996) argues that the process of deindustrialization isolates African-Americans limiting their life chances. Hence, middle-class African-Americans escape the ghetto and the social ills pervading those communities, while the African-American "underclass" remains trapped behind in the segregated ghetto. Thus, Wilson claims that what appears to be differentiation based upon racial lines is actually a product of class location.

Massey and Denton (1993) dispute this explanation by providing empirical evidence of housing segregation. Both direct and institutional discrimination policies are to blame for the numerous racial inequalities in the contemporary United States (see also Feagin, Vera, and Batur 2001; Feagin 2000; Feagin and Sikes 1994).[1] For Massey and Denton, race explains housing segregation and the associated inequality in life chances.

Recently, a third explanation has emerged; some suggest that the race and class dichotomy is best understood within the context of wealth accumulation (Oliver and Shapiro 1995; Conley 1999). The uneven distribution of wealth when compared to income dramatically affects life chances. Specific to the relationship between race and class, research suggests that wealth accumulation occurs along the axis of class, but there are profound differences by race, with Whites having, on average, dramatically higher levels of household wealth (after controlling for income) (Oliver and Shapiro 1995; Conley 1999). This explanation indicates that race and class are mutually reinforcing via access to wealth through home ownership.

Although disentangling the effects of race, class, and wealth present obstacles, these explanations of larger social processes provide a useful organizing tool for understanding the dynamics underlying environmental inequality.

Several recent works explore the intersections between environmental inequality research and larger social forces (Stretesky and Hogan 1998; Stretesky and Lynch 1999; Szasz and Meuser 2000; Downey 2003; Downey forthcoming). Unfortunately, these works are the exception. This dissertation builds upon these attempts to connect the

[1] Recent research has brought about an even more radical approach to race studies. Critical race theory claims that racism is persistent and pervasive, therefore claiming the continuing significance of race. In fact, much of this literature focuses upon the notion of white privilege and the inability of white people to recognize what amounts to a previously unrecognized form of covert racism. See Bonilla-Silva 2001, Feagin et al. 2001, Bonilla-Silva 1997, Omi and Winant 1994.

issues of environmental inequality to social forces. The ensuing paragraphs provide detail on environmental inequality with an emphasis on situating this specific form of inequality into a larger context of structural process.

The Continuing Debate on Race and Class

The publication of Wilson's (1978) controversial book, *The Declining Significance of Race,* sparked a heated debate on the importance of race versus class. Still today, Wilson's thesis is critiqued, debated, and remains as controversial as it was at the time of its release.

If one closely examines his work, Wilson (1978, 1987, 1996) clearly posits race as an important and enduring feature of inequality. However, his argument is that, comparatively speaking, race becomes less important over time because of the increasing importance of class. Specifically, Wilson argues that deindustrialization disproportionately impacts the urban ghetto. Because the ghetto is predominantly African-American and deindustrialization is an economic phenomenon causing higher rates of crime, unemployment, and poverty, Wilson maintains that what appears as racial discrimination is more appropriately economic discrimination. Thus, the "underclass" bears the burden of an economic crisis. Since discrimination remains embedded in larger social forces, Wilson argues that inequalities, once associated with direct and many times confrontational instances of discrimination in the pre-Civil Rights era, are more subtle and most closely associated with class location.

Wilson (1987, 1996) maintains that the breakdown of inner cities is reflective of two simultaneous phenomena: the class effects of deindustrialization combined with the

suburbanization of middle-class African-Americans, primarily due to the effects of affirmative action. Moreover, the tenor of the policy prescriptions put forth by Wilson also focuses upon class. The solution is to re-orient policies away from race specific solutions (e.g. affirmative action) and toward class-based policies. To a large extent, this comprises a series of employment and job training programs that would be available to everyone, regardless of race. In breaking with this set of solutions Wilson calls for "aggressive enforcement" of the 1968 Fair Housing Act (1996, 200). This appears to be an admission that race is still important, especially with regards to housing segregation. This raises an important contradiction because it is on this issue, housing segregation, that Wilson remains open to criticism. Specifically, Wilson's claims regarding the suburbanization and integration of middle class African-Americans stand as a point of contention (Jargowsky 1997). Massey and Denton (1993) contend that Wilson misrepresents the rate of suburbanization of middle-class African-Americans–their research indicates that even middle-class African-Americans remain marginalized in the suburbs. Likewise, Jargowsky (1997) finds limited empirical support for Wilson's hypothesis of a growing African-American suburbanized population. Regardless of one's theoretical or ideological standpoint, Wilson's thesis is an important one for understanding the dynamics of the urban core and raises serious questions concerning the interplay between race and class.

The most visible challenge to Wilson's thesis of the "declining significance of race" is the explanation put forth by Massey and Denton (1993). They provide empirical evidence contradicting Wilson's claim that the "underclass" is a product of class

dynamics and instead maintain that the "underclass" is actually the product of racially motivated housing segregation.

In challenging Wilson's thesis, Massey and Denton (1993) introduce five dimensions of segregation. Taken as a whole, these measures suggest that an urban area experiences "hypersegregation" if it scores high on four of the five dimensions of segregation. Hypersegregation indicates that African-Americans experience an especially insidious form of segregation in which multiple types of segregation occur simultaneously. The five dimensions in evaluating hypersegregation include unevenness, isolation, clustering, concentration, and centralization. Just registering high on one of these dimensions indicates an unacceptable level of segregation in the post-Civil Rights era, but high levels on four out of five dimensions indicate extreme segregation.[2]

Analyzing thirty U. S. northern and southern metropolitan areas with the nation's largest African-American populations, Massey and Denton (1993) find that African-Americans experienced little housing integration, regardless of income, between 1970 and 1990. In fact, as late as 1990, Massey and Denton's results indicate that 67 percent of African-Americans in southern cities and 78 percent of African-Americans in northern cities would have to move to a new neighborhood in order for desegregation to occur (1993: 221-223). Massey and Denton conclude that 13 northern cities and 3 southern cities exhibit "hypersegregation" in 1980. All of this, Massey and Denton suggest, points to race not class as being the primary factor in housing segregation. The thesis put forth by Massey and Denton directly contradicts Wilson's explanation of class driven inequality.

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[2] See pages 74-78 in Massey and Denton for a comprehensive discussion of these measures.

Much historical evidence supports Massey and Denton's contention that housing segregation remains a matter of race. The post World War II era brought with it unprecedented economic growth including a boom in home ownership. Evidence indicates that a number of direct and indirect practices led to discrimination against African-Americans with regard to home ownership. These tactics include residential housing covenants, overt neighborhood violence, lending institution "redlining," and real estate agency practices of "steering" and "blockbusting" (Jackson 1985; Massey and Denton 1993; Feagin and Sikes 1994; Sugrue 1996).[3] These practices exist on a continuum from personal to institutional forms of discrimination. All of these practices comprise what Feagin (2000) refers to as "systemic racism." Overall, the effects of these practices point to the creation of an urban poor emerging out of a process of race based housing discrimination.

The debate on Wilson's thesis of economic segregation and Massey and Denton's racial segregation thesis continues. In attempting to test each of these hypotheses as it applies to "ghetto poverty," Jargowsky (1997) finds that although there is some support for the Massey and Denton thesis, the evidence more squarely supports Wilson's deindustrialization thesis. In short, Jargowsky's findings indicate that racial segregation is waning and, more importantly, contends that the Massey and Denton model is "badly flawed" (1997:143).[4] Although Jargowsky puts forth his own explanatory model that is similar to, yet distinct from Wilson's model, his findings dispute Massey and Denton's claims of continuing racial segregation. Nevertheless, Massey and Denton's results

[3] These various forms of housing discrimination will be discussed in detail in the next section below. Additionally, these practices will be fully explored as they apply to the two cities under study in this dissertation, Detroit and Portland, in Chapter three.

[4] It should be noted that Jargowsky's critique is actually of the Massey and Eggers (1990) model which serves as the basis for the Massey and Denton (1993) model.

illustrate the fact that housing segregation has both an historical legacy and a contemporary effect even if its impact is in decline.

Regardless of one's interpretation of contemporary inequality as a function of race or class, scholars conclude that home ownership is the single best indicator of wealth (Oliver and Shapiro 1995; Conley 1999). A central question centers upon the racial differences in wealth accumulation. Oliver and Shapiro (1995) find that even when accounting for other factors, African-Americans hold significantly less wealth. Hence, they argue that inequalities manifesting themselves in terms of wealth are largely a product of the historical legacy of wealth accumulation (e.g. inheritance, home equity), which they largely attribute to housing segregation. Conversely, Conley investigates these same issues and suggests that it is not race that is of direct consequence, but that the level of wealth and the "class positions that are associated with race in America" that are directly relevant (1999: 7). Because home ownership is a vital measure of wealth and because wealth has a generational impact—that is, it can be passed from one generation to another—it represents another lens through which to view inequality.

This alternative explanation of social inequality outcomes on life chances presents an approach in which class and race are not mutually exclusive, but rather the two are mutually reinforcing. This explanation is consistent with those emphasizing indirect and institutionalized discrimination as the causal mechanism of social inequality outcomes. It is argued that there exists a structural and systematic form of inequality based upon class, largely via wealth (Oliver and Shapiro 1995; Conley 1999). Because home ownership is the primary means to gaining wealth, some argue that the redlining policies of the Home Owner's Loan Corporation (HOLC), and the practices later adopted by real estate agents

and bank lenders, embedded race discrimination within already biased life chances linked to class location. The implication is that segregation may be the result of the larger dynamics of a class/race interaction—a more subtle, institutionalized form of contemporary discrimination.

The constraints one faces in choosing a residence provides an opportunity for furthering our understanding of environmental inequality. As Stretesky and Hogan (1998) argue, where one lives is constrained by numerous outside social and economic forces. If choices of residence are constrained by such structural and institutional processes, then environmental inequality may parallel such developments. Pellow (2000) argues that environmental inequality is the result of process and history. The history and development of economic segregation, racial segregation, and wealth segregation constrain life chances—namely, where one chooses to live; here it is further argued that this restraint leads to differential outcomes with respect to the probability of exposure to environmental hazards. Tying together this set of explanations provides an understanding of environmental inequality emphasizing larger social and economic forces, while suggesting that these processes are institutionalized, indirect, and hidden.

Historical Background – Redlining and Housing Segregation

The historical record points to segregation as a key component in understanding contemporary racial inequality. During the Great Depression, the federal government initiated policies meant to increase housing starts, to decrease the numbers of people defaulting on mortgages, and to increase, in general, the number of homeowners (Jackson 1985; Oliver and Shapiro 1995; Massey and Denton1993). This policy's intention was to

facilitate growth in the economy, while at the same time providing new homes or repair of homes for families across the United States – but it did so in the context of widespread and institutionalized racism. In 1933, the Home Owners Loan Corporation (HOLC) served as the federal government's mediator for this new policy. The HOLC initiated a systematic and bureaucratic model of appraising homes and thereby formalized the process of lending. HOLC policies integrated a selection procedure into their policies resulting in institutional discrimination (Oliver and Shapiro 1995; Wilson 1996; Massey and Denton 1993). Between 1935 and 1940, HOLC conducted surveys and created maps of neighborhoods for most of the nation's major metropolitan areas. In these surveys and maps, HOLC divided neighborhoods into four categories based upon urban real estate values and racial composition. The HOLC assigned neighborhoods a score of First, Second, Third, and Fourth along with a corresponding color code. Those neighborhoods most likely to receive funding were coded green (first) and those least likely were coded red (fourth) (Jackson 1985; Squires 1992). Based upon this rating system, white and wealthy neighborhoods received a disproportionate number of loans, while poor and minority neighborhoods received little or no funding.

The policies of the HOLC had profound effects. Following their lead, the Federal Housing Authority (FHA) beginning in 1934 adopted the very same policies of "redlining" that the HOLC initiated (Oliver and Shapiro 1995; Massey and Denton 1993). The FHA ushered in the modern practice of low mortgage lending and embedded discriminatory practices into the distribution of loan appropriations. These policies contributed to rapid postwar suburbanization and resulted in the concentration of poor

communities in inner cities, surrounded by largely white, affluent suburbs (Oliver and Shapiro 1995; Massey and Denton 1993; Wilson 1996).

The notion of "redlining" began as early as the 1930s and continued well into the 1980s. Systematic and comprehensive discrimination against African-Americans and the poor persisted for several generations. The migration of large populations of African-Americans from the south to the north exacerbated these conditions as southern African-Americans entered a stagnant northern housing market, thereby creating a densely populated African-American residential community (Massey and Denton 1993).

As these policies began to take hold, most industrial production, including the storage of toxic wastes, remained located in one of two areas: first within the inner cities of the nation's manufacturing cities; second, in those rural regions outside of large metropolis'. Although such facilities, especially those within large cities, may not have been initially located in minority communities, the housing policies outlined above may have established the structural conditions necessary for the disproportionate siting of toxic facilities in these areas. Whites began to move to the suburbs, and even some middle class African-Americans followed suit in the years following affirmative action (Wilson 1996). As mentioned above, these outcomes intensified with the influx of large populations of African-Americans from the south coupled with white flight. Hence, HOLC and FHA policies not only "welcomed in" the practices initiating racial segregation, but also provided the foundation for the contemporary phenomena of disproportionate toxic facility siting.

Redlining provided the foundation for housing segregation based upon race, but as African-Americans began to flourish in the post-World War II economy homeowners

and real estate agents adopted other practices. The earliest attempts at preserving housing segregation by homeowners stems from "restrictive covenants." Covenants prevented the purchase or occupancy of a home based upon race, religion, and ethnicity. These covenants emerged in the early twentieth century and by 1940 had become nearly ubiquitous (Sugrue 1996). Indeed, cities as divergent as Dallas, New Orleans, Los Angeles, Portland, Detroit, and Chicago contained neighborhoods with restrictive covenants based upon race (National Archives and Record Administration, Record #195.3). In fact, the HOLC and the FHA favored loans for those neighborhoods with restrictive covenants over those neighborhoods without such restrictions (U.S. National Archives and Record Administration, Record #195.3). Additionally, real estate brokers and developers encouraged the formation of "neighborhood improvement associations." These associations and covenants institutionalized an actual organizational tool meant to defend neighborhoods through legal channels, collude with real estate agents, and, in some instances, rely upon violence. White homeowners, then, attributed their "white-only" neighborhood success to both the legality of covenants and to the organizational structure of housing associations defending these covenants.

In the mid-1940s, several African-American families from different locations in the United States began challenging the legality of housing covenants because it violated their constitutional rights against racial discrimination. All lower federal courts ruled that restrictive covenants were legal (Sugrue 1996). Nonetheless, these separate legal challenges combined together to form one court case, *Shelly v Kraemer*, argued by NAACP lawyer Thurgood Marshall before the United State Supreme Court. The court unanimously ruled that restrictive covenants violated these citizens' civil rights and

overturned the legality of housing covenants. Thus, one of the most effective tools sanctioning housing segregation disappeared. Nonetheless, neighborhood associations continued to thrive and, when necessary, resorted to other means to maintain segregation. There are countless examples of white homeowners intimidating, threatening, and utilizing physical violence, many times with the consent of authorities, against African-American neighbors and potential homebuyers. Some of the most disturbing episodes took place in Detroit through the 1960s in which tactics included "mass demonstrations, picketing, effigy burning, window breaking, arson, vandalism, and physical attacks" (Sugrue 1996, 233). Eventually, these methods too became unacceptable and the authorities curtailed violent episodes. In the meantime, real estate brokers ushered in new methods of segregation resulting in more indirect and institutional forms of housing segregation.

Real estate agents designed several methods ensuring the persistence of housing segregation. Considered the most prominent tactic, racial "steering" consisted of real estate agents showing prospective homebuyer's neighborhoods that systematically differed in social and economic conditions, especially with respect to racial composition (Massey and Denton 1993; Feagin and Sikes 1994; Sugrue 1996). For example, real estate agents introduced African-Americans to predominantly African-American neighborhoods regardless of income—that is, African-Americans were "steered" to systematically different neighborhoods than Whites. Real estate agents in both Detroit and Portland accepted this notion of steering as so fundamental that agents literally pledged not to change the character, including racial composition, of any neighborhood (Sugrue 1996; Abbot 2001). Violation of this pledge was punishable by penalty of

expulsion from the profession or denial of access to the city's cross-listing real estate service. Numerous studies indicate that steering remained prevalent into the 1980s in cities such as Cincinnati, Memphis, Cleveland, and Detroit (Massey and Denton 1993). A 1991 federal study indicated that steering occurred in roughly one-fifth of all real estate sales (Feagin and Sikes 1994). Recent interviews with middle-class African-Americans throughout the United States reveal that some still experience what they perceive to be racial steering as many homebuyers, despite their professional and economic status, continue to be filtered towards integrated neighborhoods primarily adjacent to predominantly African-American neighborhoods (Feagin and Sikes 1994). Racial steering became an embedded and persistent feature of real estate practices following the downfall of covenants.

With the growth of open housing policies in the 1950s and 1960s opportunistic real estate brokers implemented a mechanism that exacerbated segregation while at the same time lining the pockets of real estate agents. Although there exists little proof of the institutionalization of "blockbusting," the prominence of this practice in many cities across the United States indicates widespread usage of the practice. "Blockbusting" consisted of identifying neighborhoods that were prime candidates for racial turnover and, subsequently, expedited this turnover process. These neighborhoods were generally white neighborhoods that were located near or adjacent to African-American neighborhoods consisting of substandard housing and poor families. Real estate agents purchased a few of the homes at a cheap price and, then, hand selected a few African-American families to whom to either sell or rent the property. Without the power of covenants or the ability to resort to physical violence most Whites quickly relocated to

all-white neighborhoods. Real estate agents would then quickly buy up the homes resulting from "white flight" and sell or rent the remaining homes at inflated prices to African-Americans (Massey and Denton 1993; Sugrue 1996; Feagin and Sikes 1994).

Blockbusting had several particularly deleterious effects. First, blockbusting proved to be a profitable swindle for real estate agents. As indicated above, it is not clear how institutionalized this practice became (Sugrue 1996), yet it was profitable enough to entice many real estate agents. Second, because many African-Americans could not secure loans to purchase a home or did not have access to savings for those purposes, many real estate brokers financed these homes directly. Of course, brokers did so at exorbitant interest rates further enhancing their profits. Third, and most importantly, it not only exacerbated segregation, but actually expanded inner-city ghettos while also increasing the likelihood of white flight to the suburbs. Blockbusting all but assured that Whites would move to the suburbs while African-Americans would remain isolated in the urban core. Thus, blockbusting was an especially insidious form of housing segregation as it exacerbated the division of housing along racial lines while in the process increasing real estate profits. Real estate agents knowingly discriminated and, when possible, utilized the resources of their agencies to this end.

Based upon the effects of FHA lending practices, HOLC redlining maps, and the patterns of discrimination practiced by real estate agencies across the United States, Massey and Denton (1993) argue that these discriminatory practices are largely the product of systematic racism on the part of government agencies and lending institutions. Hence, the argument put forth by Massey and Denton is consistent with an argument that housing segregation results from systematic white discrimination.

An alternative explanation attempts to illustrate the intersection of class and race. This explanation emphasizes the importance of wealth in structuring housing markets and, in emphasizing wealth, places greater emphasis on the intersection of race and class dynamics (Oliver and Shapiro 1997; Conley 1999). The argument is not that race is unimportant, but that wealth has both an historical component and a cumulative effect left unexplained solely by racism. In other words, race represents an ascriptive feature of social life. Even though sociologists also conclude that the class system, as measured by income, is technically an open system, recent work on wealth suggests that in many ways it operates like race; that is, because one generation passes wealth to the next generation it too maintains an ascriptive component. Some argue, then, that wealth is a superior measure of social class.

The decline of the inner city and its associated inequality maintains three separate possible explanations. Although I have differentiated between these explanations, there is considerable overlap between these concepts in their operation in the empirical world. Nonetheless, the changes in social inequality in recent years, and thereby the contemporary development of environmental inequality, can be attributed to some combination of institutionalized racism, the impacts of deindustrialization via class, and the historical and cumulative effects of wealth inequality. This overview of the larger debate on social inequality provides the backdrop for contextualizing a discussion on the issues of environmental inequality. Before connecting the larger issues raised in this debate, however, it is first necessary to review the concepts and literature central to an understanding of environmental inequality.

Justice, Injustice, Racism, and Inequality

In many instances, there exists little precision when referring to the terms environmental justice, environmental injustice, environmental racism and environmental inequality. However, recent research provides clarity in how to define and, hence, conceive of these concepts. Environmental *racism* "refers to any policy, practice, or directive that differentially affects or disadvantages (whether intended or unintended) individuals, groups, or communities based on race or color" (Bullard 1996, 497). Pellow (2000) concurs by arguing that environmental racism is strictly associated with those instances in which the concern is that of environmental hazards in communities of color.

Bullard contends environmental *justice* "embraces the principle that all people and communities are entitled to equal protection of environmental and public health laws and regulations" (1996, 495). The Environmental Protection Agency (EPA) extends this definition:

> The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local and tribal programs and policies (Liu 2001: 11).

From the perspective of activism and social movements, the EPA and Bullard definitions of environmental *justice* amount to what these movements are attempting to repair or prevent (Pellow 2000). Environmental justice should be distinguished from environmental *injustice*, which refers to any social group disproportionately affected by environmental hazards (Pellow 2000). Furthermore, environmental *racism* stands as a

specific example—one involving the explicit issues of race—of the larger phenomenon of environmental *injustice.* Within the literature, the distinction between these terms remains problematic.

Pellow (2000) argues that in order to move towards an historical understanding and ultimately to provide broader explanations, it is necessary for environmental justice research to embrace what he terms environmental *inequality*. Pellow (2000) explains that environmental inequality, as opposed to environmental racism, injustice, and justice, requires a structural approach because the processes and the mechanisms underlying the unequal distribution of hazards are socially structured. Environmental *inequality* has the advantage of focusing upon the broad connections "between environmental quality and social hierarchies" (Pellow 2000). With an emphasis upon these broader dimensions of social disparity, environmental inequality research provides a point of departure that places particular attention upon explanations and causes being structural in nature. With these clarifications in mind, the focus of this research is upon the structural relationships involved in environmental inequality.

Environmental Inequality—An Overview of the Literature

Until recently, the phenomenon of environmental inequality primarily captured the attention of journalists as opposed to social scientists. However, in the middle 1990s there emerged a growing number of social scientific studies correlating a relationship between noxious facilities with minority and poor communities. Following this research and the journalistic accounts that brought this issue into the public eye, environmental inequality cemented itself as a legitimate area of research across several disciplines.

Two studies that appeared simultaneously in 1983 initially raised concerns about the distribution of environmental "bads." A congressional study authorized by the U.S. General Accounting Office (1983) found that three of the four largest commercial hazardous waste landfill sites in the southeastern United States were located in minority communities. Likewise, Bullard (1983) found minorities, particularly African-Americans, more likely to live near landfills and incinerators in Houston, Texas when compared to Whites. These two regional studies led to a more widespread investigation of these issues. The first comprehensive national study bolstered the claims concerning the proximity of minority communities to landfills and waste sites (United Church of Christ 1987). The United Church of Christ (UCC) study underscored the importance of race as it found that 60 percent of African-Americans and Latinos live in communities with one or more hazardous waste sites. Because the UCC study included nationwide analysis, it suggested environmental inequality was more than a regional phenomenon and appeared to be a more widespread outcome than indicated by previous studies. On the heels of the UCC study, there followed a flurry of environmental inequality research.

Mirroring the larger debates in sociology, the major debate in environmental inequality centered upon the relative importance of race and class. Bullard's (1990) *Dumping in Dixie* provides a set of case studies of communities of color in the south that not only experienced environmental inequality, but that organized in an effort to bring about environmental justice. Eventually, these social movements opposing the locating of noxious facilities in communities of color led to the popularization of the NIMBY phenomenon–"not in my backyard" (Bullard 1990). A more recent series of case studies focuses upon the impacts of both the distribution of hazardous facilities and the reactions

of communities of color in the chemical corridor of Louisiana (Roberts and Toffolon-Weiss 2001).

Mohai and Bryant (1992) provide evidence that the phenomenon is more widespread and indicative of inequality in a Northern industrial city – Detroit. Both race and income predict the siting of hazardous facilities in Detroit, yet their analysis indicates that race, independent of income, is the primary predictor of existing or proposed commercial hazardous waste treatment or storage facilities. In looking at Superfund sites, Hird (1993) finds that counties with a higher proportion of nonwhites do indeed have more National Priorities List (NPL) sites but, in contrast, wealthier communities are more likely to receive priority in clean-up.[5] Hird's findings suggest an ironic and asymmetrical relationship: nonwhites are more likely to live near an NPL site, yet less likely to secure government sanctioned removal of hazardous materials. Although using a different level of analysis (U.S. Census Places) Zimmerman (1993) provides further evidence of inequalities in siting and clean-up priorities. Although each of these analyses differ methodologically, the underlying argument pinpoints race as a significant indicator of environmental inequality.

In contradiction to these findings of environmental inequality, Anderton et al. (1994a, 1994b) and Oakes et al. (1996) argue that the location of toxic facilities is not a race or class based outcome. Rather, this line of research argues that the distribution of

[5] The National Priorities List (NPL) is a designation that is placed upon toxic facilities by the Environmental Protection Agency (EPA). Sites receive a score and if this score reaches a specific threshold (28.50) then the site is prioritized for clean-up and placed on the National Priorities List (NPL). However, because of the politically charged nature in which Superfund sites are debated, Superfund sites on the NPL may not be determined purely based upon scientific criteria. For this reason, it should not be assumed that Superfund sites are evenly distributed and, thus, some of the methodological concerns associated with quantitative analysis may be violated. It is usually assumed in the environmental inequality literature that the distribution of hazardous facilities, regardless of the type of facility under scrutiny, is randomly distributed – this assumption cannot be assumed in addressing Superfund NPL sites.

hazardous facilities is a function of industrial development and manufacturing employment.[6] Furthermore, these findings suggest a lack of environmental inequality because, in their interpretation, the placement of facilities in these communities stands apart from an intent to discriminate. The UMass researchers argue that the overall evidence on environmental inequality does not establish a time ordered sequence explaining the siting process itself. For example, if neither the intention to target minority communities nor a time ordered sequence of events explaining whether the people or the facility arrived first can be provided, then it is suggested that the unequal distribution of environmental hazards is simply due to market forces (Been 1993). Of course, the reliance upon a market-based interpretation as indicative of an absence of inequality assumes that markets are not discriminatory; however, much evidence contradicts this market-based explanation by indicating that there are both race and class based elements of discrimination in the distribution of housing. The UMass studies, though rigorous, are unique in their extensive claims denouncing the empirical reality of environmental inequality. As Szasz and Meuser (1997) point out, these findings are more ambiguous than the UMass researchers imply or acknowledge. Although it may be argued that there is no intentional problem in siting, these findings indicate that there is a larger issue of structural inequality underlying minority populations and their nearness to toxic facilities. That is, environmental inequality remains present even if an explanation lacks ties to intentional racism.

Although much of the above research focuses upon the disproportionate environmental impacts on the African-American community, a growing number of

[6] Hereafter these three studies will be referred to as the UMass studies because of their association with a core group of researchers with ties to the University of Massachusetts.

studies focus upon other minority populations. An increasing number of studies pay particular attention to the plight of Latinos and find a pattern consistent with those associated with African-American populations – that is, Hispanics are more likely to reside near hazardous facilities (Szasz and Meuser 2000; Pena 1998; Pulido 1996; Lester et al. 2001). A handful of studies conclude that the risks borne by Native Americans are startling (Hooks and Smith 2004). Grinde and Johansen (1993) characterize current dynamics as the "ecocide of Native America"; Kuletz (2001) refers to state-sanctioned environmental violence by the United States military as "nuclear colonialism" (see also Bullard 1994; Gedicks 1993; Small 1994; Sachs 1996; The Akwesasne Task Force on the Environmental Research Advisory Committee 1997; Marshall 1996; Roberts and Toffolon-Weiss 2001; Kuletz 1998). The research on Native Americans reveals a unique pattern in which the major culprit of environmental inequality is the federal government, primarily the military, rather than private corporations. Because many of the instances of environmental inequality against Native Americans include unexploded ordnance and toxic nuclear residue, Kuletz (2001) refers to these Native American lands as "national sacrifice areas."

Although race is recognized as a significant variable and the impacts upon multiple minority groups have been investigated, others indicate class is the more persuasive explanation in understanding environmental inequality. In assessing Toxic Release Inventory (TRI) data at the nationwide level, Gould (1986) determines that class is the most important factor in environmental inequality. Yandle and Burton's (1996) study at the SMSA level in assessing the distribution of Texas landfills finds that, at the time of siting, poverty provides the best predictor; therefore, Yandle and Burton (1996)

argue that race only became a significant factor after the original siting. These explanations, some emphasizing race and others emphasizing class, underscore the tight coupling of race and class. Because of this tightly joined relationship, many suggest that the juxtaposition of race and class as competing explanations may prove to be a false dichotomy.

Because race and class prove difficult to unpack, some propose that more structural level processes are of significance. Renquist's (1997) national study of TRI data at the neighborhood level indicates that although both race and class have effects, general background characteristics (such as market rationality, political power) are the best predictors of both the distribution and density of airborne pollutants. In a national analysis of multiple pollutants at the county level, Hird and Reese (1998) found that both race and class are important factors. However, they also discovered that political mobilization, population density, and manufacturing density were significant contributors indicating that demographic and process-oriented features of communities play an important role. Whereas earlier research focused almost exclusively upon the impacts of race and/or class, these more sophisticated studies indicate that these inequalities may be part of a larger set of processes. Furthermore, this preoccupation with the location of facilities in relation to residential communities left uninvestigated the location where most people spend a majority of their day: the workplace.

Pellow (2002) explores the relationship between minorities and the workplace by comparing a community oriented recycling center (The Resource Center) and that of the largest solid waste corporation in the world (Waste Management, Incorporated) in Chicago. Pellow uncovers an increase in the physical and environmental hazards at the

corporate venue, while detecting a decrease in recycling efficiency. Tying the role of worker hazards into the global economy, Pellow and Sun-Hee Park (2002) find that the risks borne by workers in the "clean" production of high-tech equipment are extremely hazardous. Despite society's tendency to stereotype the Silicon Valley as a haven for secure, middle class employment, their research reveals an underbelly on the production floor of Silicon Valley. The production necessary for the new technologies of the global economy produce environmental inequalities at the workplace harming a workforce primarily comprised of women from the Far East and Central America.

This combination of studies reveals ample evidence of the phenomenon known as environmental inequality. However, a majority of these studies primarily consist of an attempt to provide evidence for or against the existence of environmental inequality. Thus two major gaps in the research remain. The first major problem stands as one in which cross-sectional design remains the most commonly used methodology making it impossible to determine causality. In a similar manner, the fixation upon attempting to identify the existence of environmental inequality, and doing so largely based upon cross-sectional designs, leaves unresolved the mechanisms underlying the outcome of environmental inequality. Neglecting the larger issues involved in the generation of inequality proves a major weakness in the extant research.

Environmental Inequality as Process

Environmental inequality research began to move beyond the cross-sectional and case studies approach dominant in the literature by attempting longitudinal analysis more appropriate for understanding the process of environmental inequality. Hurley (1995)

provides one of the most comprehensive and detailed historical accounts of environmental inequality in his study of Gary, Indiana. By looking at a number of socio-demographic phenomena, including housing segregation, white flight, and industrialization, Hurley finds that there is a process to environmental inequality. In Gary, class explains little for the African-American population as the pollution of the steel mills disproportionately affects both poor and middle-class African-Americans. However, for Whites, class is of vital importance as only poor Whites experience similar pollution exposure. Hence, Hurley provides a more nuanced explanation that offers multiple, layered social and demographic impacts. Likewise, in analyzing chemical release sites at the census tract level in Florida between 1991 and 1994, Stretesky and Lynch (1999) account for the sequencing of events (i.e. the time of chemical release); thus, they provide an important display of causality in environmental inequality research. Within this model, they find income to be the salient explanation. Additionally, they argue that there is a structural component to this phenomenon that remains uninvestigated – specifically, Stretesky and Lynch suggest that institutional discrimination underlies these findings.

To date, Pellow (2000) offers the most detailed and sophisticated theoretical explanation of environmental inequality as a process. Pellow argues that the majority of environmental justice research approaches its subject from the perpetrator-victim model. He contends that this is misleading as viewing poor and minority communities as the target of corporations or the government overlooks the fine distinctions of how environmental inequality emerges. Instead, Pellow argues that environmental inequality forms – that is, it is part of a larger sociohistorical process. There are three major

components to his theoretical orientation: 1) environmental inequality is a sociohistorical process not a discrete event; 2) environmental inequality reflects multiple stakeholders who are a part of this sociohistorical process; and 3) environmental inequality analysis must underscore the importance of hazards throughout their life cycle from extraction to consumption. Pellow (2002) provides an empirical analysis utilizing the Environmental Inequality Formation (EIF) framework in *Garbage Wars*. He provides a rich historical study of waste facilities over several generations both at home and at the workplace on minority and poor communities. Thus, he provides a sociohistorical explanation that signifies multiple stakeholders involved in environmental inequality over a series of years, sites, and locations.

Szasz and Meuser (2000) utilizing TRI data in Santa Clara county at the census tract level from 1960 to 1990 find that there are indeed environmental inequalities both in terms of race and class (especially for Hispanics), but that these inequalities are largely unintended. Szasz and Meuser bolster Pellow's contention that environmental inequality is complex and many times unintentionally embedded in a larger set of historical and structural processes. These studies indicate that the "perpetrator-victim scenario" is outdated and embraces the more appropriate methods of historical analysis and accounting for the structural features of inequality. Thus, the literature has moved away from proving the existence of environmental inequality via cross-sectional quantitative analyses and qualitative case studies towards longitudinal approaches attempting to identify the sources of environmental inequality.

Although Pellow's explanation is far superior to the conceptions of environmental inequality preceding it, this explanation leaves unexplained an important component to

the formation of this inequality. One aspect of an historical approach to EIF recognizes that this process takes place across time, with multiple stakeholders, and throughout the life cycle of any given toxic output. However, a fourth process considers how people and the toxic places they create are distributed. The analyses that follow indicate that there is spatial inequality with respect to people's housing and the location of landfills and Superfund sites.

Although the analyses here cannot account for all aspects of this spatial process, the results provide evidence of the importance of understanding the spatial dynamics involved in environmental inequality. That is, the probability of housing a landfill or Superfund site is not equal across census tracts. Likewise, the dispersion of people relative to these sites is also not equitable. Because of a number of economic, racial and wealth segregation mechanisms, some persons are more likely to live near these locations, while others are empowered to escape such conditions. This indicates that the physical and social space that one inhabits, in this case as related to the distribution of race, class, and wealth with respect to hazardous facilities, stand as "marker[s] of stratification" (Lobao and Saenz 2002). Hence, it is proposed here that the EIF model be amended to include a spatial component – that is, in addition to the formation of environmental inequality within the process described by Pellow (2000) a fourth component including space is needed to fully embrace the breadth of the EIF model.

Methodological Debates

Within the environmental inequality literature there exists a spirited debate on methodological issues primarily because of the political, economic, and social stakes of

this debate. It stands to reason that methodological debates are of great importance as choices regarding the definition of community, the unit of analysis, and the selection of comparison populations result in disputed empirical results. Nonetheless, many times methodological choices are constrained by the substantive issues of interest and the data available for a given research agenda.

Of central concern in the methodological debates on environmental inequality is the scope of analysis (Mennis 2002). Labeled the modifiable areal unit problem (MAUP), this debate focuses upon how the scale of one's data aggregation greatly influences the outcomes of environmental inequality due to the uniquely spatial relationships involved. In essence, the empirical question at stake here is how one measures "community." Generally speaking, community reveals itself in three major forms: as a neighborhood representing a distinct cultural identity; as a political representation (city, county…etc); or as a constructed data measure (census tract, zip code…etc) (Williams 1999). These wide-ranging operational definitions many times result in disputed claims and Williams (1999) argues that this has both theoretical and empirical implications. These different conceptions of community and the measure of areal units concern the "nature of burdens, the types of inequity, and the methodological means by which to assess inequity" (Williams 1999: 315). To alleviate these concerns, Williams (1999) advocates the usage of multiple units of analysis; however, even this solution is not without problems as it may lead to incomparable units of analysis within the same study.

A divisive issue related to the definition of community is that of the appropriate unit of analysis. The extant literature includes a range of possible geographic units of

analysis; these units of analysis include counties (Hird 1993; Hird and Reese 1998), ZIP codes (Gould 1986; UCC 1987), concentric circles (Mohai and Bryant 1992; Zimmerman 1994), communities or neighborhoods (GAO 1983; Bullard 1983; Renquist 1997), Standard Metropolitan Statistical Areas (SMSA) (Yandle and Burton 1996), and census tracts (Zimmerman 1993; Szasz 1993; Anderton et al. 1994; Oakes et al. 1996; Stretesky and Hogan 1998; Stretesky and Lynch 1999; Szasz and Meuser 2000).

Originally, those studies utilizing larger units of analysis, such as counties, ZIP codes, and concentric circles, were more likely to find environmental inequality. In disputing the findings of environmental inequality research utilizing these larger units of analysis, the UMass (1994) research group argued that larger units of analysis conceal "ecological fallacies" and "aggregation errors" – that is, they argue that there are no clear guidelines for understanding the distance or range of the potential impacts of hazardous facilities on a surrounding community. Although they make this argument specific to Treatment, Storage, and Disposal Facilities (TSDFs) the implication is that the same argument holds true for other waste storage facilities.[7] Based upon this logic, the UMass researchers propose utilizing the smallest unit of analysis, the census tract, in order to capture the spatial point most likely to contain the adverse health effects of waste storage. If necessary, they maintain that census tracts can then be aggregated into larger areal units. Conversely, Mohai (1995) critiques the UMass study on the ground that the census tract is too small and, thus, unable to capture the larger impacts of pollution beyond the boundaries of census tracts. At first, empirical results suggested that using smaller units of analysis mask instances of environmental inequality. In recent years, a number of

[7] A TSDF is a commercial waste facility where hazardous wastes are destroyed, stored, or held for later transport to another location.

studies at the census tract level provide ample evidence of environmental inequalities (Been 1995; Stretesky and Hogan 1998; Stretesky and Lynch; Szasz and Meuser 2000). Thus, it is argued that one's unit of analysis should be determined based upon the substantive issues of concern and that multiple measures should be employed when both theoretically and empirically valid (Liu 2000; Williams 1999). Although not a foolproof solution to these problems, many argue that the use of Geographic Information Systems (GIS) alleviates many of these methodological concerns because it allows the implementation of multiscale analysis (Mennis 2002).

Another controversial methodological debate concerns the use of control populations. Mohai (1995) argues that the differences in control groups between the UCC (1987) and the UMass (1994a, 1994b, 1996) studies explain the contradictory findings. The UCC study compared ZIP codes with at least one commercial waste site to all residential ZIP codes that did not contain a facility. The UMass researchers compared census tracts within SMSAs with at least one commercial TSDF. In essence, the UMass study limited their sample such that they eliminated ALL census tracts outside of SMSAs from the analysis; furthermore, any census tract inside an SMSA that did NOT contain a TSDF was also excluded from the analysis (Mohai 1995). The net result of this comparison population procedure is the exclusion of 32% of all possible census tracts in the United States (Mohai 1995). Thus, these two distinct control populations produce very different sets of research questions:

> Namely, the UMass study's comparison population may be appropriate to the question: Among metropolitan areas already containing TSDFs, where are TSDFs most likely to be placed? This is distinctly different from the question posed by the UCC study: Where in the nation, regardless of whether they are rural or urban areas, are TSDFs most likely to be placed? In effect, the UMass study treats as unimportant the fact that metropolitan areas currently hosting TSDFs are also

> places with high concentrations of people of color. The UCC study's analysis does not treat this as an unimportant relationship (Mohai 1995: 627).

Been (1995) analyzed the UMass data and the consequences of excluding these tracts from the final results. Been's analysis indicates that excluding these tracts produces a significant difference in the findings. Liu (2001) substantiates this point more broadly by arguing that both the differences in units of analysis and comparison groups produce significantly different results; hence, one should pay close attention to both issues in designing a study of environmental inequality.

A final concern focuses upon the measurement and definition of minority populations. Here, there are two methodological issues: 1) the definition of minority populations in the Census; and 2) the operational definition of race as an independent variable. The first issue is a matter of data availability. The Census contains a fluid conception of race and ethnicity that has changed dramatically over time (Liu 2001; Szasz and Meuser 2000). For example, people of Hispanic ethnicity may be of any race; yet, traditionally, most Hispanics have chosen to identify themselves as White or to leave unanswered their racial identity (Jargowsky 1997). Additionally, the number of combinations of race and ethnic categories increased with each successive census making comparability of data over time problematic. There are corrective measures, although imperfect, to limit these differences, yet it is an ongoing problem for any longitudinal analysis.

How to measure minority populations sparked a debate between Mohai (1995) and the UMass researchers. The UMass researchers only include African-Americans and Hispanics in their sample. Mohai (1995) argues that this conception of minority

populations excludes a significant proportion of minority populations (e.g. Asian-Americans, Native Americans). Largely, this seems to be a debate about semantics – the UMass researchers' definition of minority populations only excludes 2.3% of the United States' minority population. Liu (2001) contends that this probably had no significant impact upon the analyses. Nonetheless, because of the dramatic differences from decade to decade in how the Census classifies race, one must be clear in their operationalization of the independent variable of race.

Much of this debate within environmental inequality research mirrors the methodological concerns that sociologists generally face. Within sociology there is an ongoing debate concerning qualitative and quantitative methods. Like the larger discipline, environmental inequality research continually grapples with these issues. The earliest orientations of environmental inequality research included two major trends: 1) case studies focusing upon the existence of environmental inequality, but with a larger eye to environmental justice movement responses to this inequality and; 2) statistical analyses meant to establish the existence of environmental inequalities. Although these research methods can be seen as complementary, neither one pinpoints the explanations behind the causes of environmental inequality. More recently, there are encouraging signs of progress beyond this narrow scope.

Pellow's (2000) call for interpreting environmental inequality as a process moves beyond the quantitative/qualitative divide. By taking an historical approach, one can favor either qualitative or quantitative methods, yet still uncover the underlying social factors of environmental inequality. In fact, Pellow's call for a process-oriented approach to environmental inequality embraces a method of research including both qualitative and

quantitative analysis. Szasz and Meuser (2000) represent a clear example of this emerging framework, while Pellow's (2002) own historical work on the city of Chicago also fits into this field. The larger issue is one of moving environmental inequality research forward in terms of understanding its historical development, multi-layered and complex explanations and bridging the gap between environmental inequality and the larger theories and explanations that are of concern in the sociological literature. This dissertation is an undertaking in the latter with an exploration of the competing explanations of deindustrialization, housing segregation, and access to home ownership as applied to environmental inequality outcomes.

Linking Environmental Inequality to the Spatial Distribution of People

Pellow's (2000) EIF model argues that the major weakness in environmental inequality research is that the current research stands as relatively atheoretical. To date, most environmental inequality research makes little effort to contextualize features of siting inequalities within the larger conceptual frameworks in sociology. Some acknowledge that environmental inequalities are embedded in larger social inequalities (Szasz and Meuser 2000; Stretesky and Hogan 1998; Stretesky and Lynch 1999) and point to a number of environmental "bads," including environmental inequality, that stand as a negative consequence of economic growth (Pellow 2002; Weinberg et al. 2000). Recently, Downey (forthcoming) has made a concerted effort to move beyond this by incorporating environmental inequality processes within the larger sociological literature.

Pellow's (2000) EIF model provides the blueprint for how to address and conceive of environmental inequality in a theoretical manner. By viewing environmental inequality within its larger historical context, understanding the stakeholders involved in that process, and recognizing that environmental inequalities span the entire life cycle of environmental hazards (from extraction to output) enables one to fully embed environmental inequality within larger social forces (Pellow 2000). Here I propose that environmental inequality within the urban areas of Detroit, Michigan and Portland, Oregon is best understood through the processes of deindustrialization, housing segregation, and wealth accumulation.

The Treadmill of Production

Although much of the environmental inequality research is atheoretical, many accounts of environmental inequality, either explicitly or implicitly, acknowledge that the outcome of environmental inequality is a product of the "treadmill of production." The treadmill of production explanation (Schnaiberg 1980; Schnaiberg and Gould 1994) recognizes capitalism as an ever-expanding economic system. This economic expansion results in dual outcomes detrimental to a society; that is, there is the unintended consequence of increases in social inequality while there is the simultaneous introduction of environmental problems due to the ever-increasing mining of natural resources and their subsequent disposal. In focusing upon these two outcomes, environmental inequality research draws upon the intersection of social inequalities and the production of environmental hazards in attempting to understand the disproportionate distribution of environmental "bads."

The "treadmill of production" (Schnaiberg 1980; Schnaiberg and Gould 1994) casts a long shadow over environmental sociology, including attempts to understand environmental inequality. Schnaiberg (1980) calls attention to capitalism's expansionary tendencies and to the associated use of natural resources and the wastes, many times toxic, that must be disposed. These expansionary tendencies capture two fundamental dynamics of capitalism; one of these dynamics points to a positive set of economic consequences, the other as a set of negative consequences associated with economic growth. The treadmill of production identifies an "economic growth coalition" including business, labor, and the government, all of whom benefit from economic expansion. The benefits of this economic system—increased profits, higher wages, and an increased tax base—are touted and rarely questioned. This stems from the fact that the treadmill of production is culturally accepted and institutionally organized (Schnaiberg and Gould 1994). Nonetheless, the social and economic benefits of the treadmill are unevenly distributed in favor of business, while the environmental risks associated with the treadmill are disproportionately concentrated among specific groups of people: "the most vulnerable groups [are] the poor, unskilled laborers, and the skilled blue collar" residents (Gould, Schnaiberg and Weinberg 1996: 13). Individual choices, as expressed and constrained in the context of a housing market, result in the uneven distribution of people relative to environmental dangers. As explained above, there are several sorting mechanisms through which the residential market operates; mainly it is suggested that race, class, or wealth provide the driving mechanisms behind residential discrimination (Wilson 1978, 1987, 1996; Massey and Denton 1993; Oliver and Shapiro 1995; Conley

1999). Through these processes, racial minorities and poor people are more likely to live in proximity to environmental dangers as a function of the treadmill of production.

The treadmill of production approach provides valuable insights where environmental hazards are the result of capitalist production and the unequal exposure to these dangers is a function of housing markets. It is my intention to underscore the historical processes, as related to the distribution of housing and environmental "bads" that account for environmental inequality. However, even within the larger theoretical conception of the treadmill of production there are competing explanations and this dissertation weighs the explanatory power of each of these interpretations as applied to Detroit and Portland from 1940 to 1990.

Specifying The Treadmill of Production and Three Types of Segregation: Economic, Racial and Wealth Based Segregation

The theoretical discussion above combined with the extant literature in environmental inequality suggests three explanatory models. Each of these models represents a competing explanation of the emergence of environmental inequality out of larger, but distinctive social processes in independent geographical locations. Within the treadmill of production explanation, it is possible to have multiple causes of environmental inequality as related to the sorting mechanisms associated with housing. Although each one of these occur within the realm of industrial production each, in turn, indicates a specific explanatory variable that is of relevance. Each of the models reveals its own primary reliance on a variable associated with the larger theory outlined above. Specifically, Wilson's (1978, 1987, 1996) thesis is primarily an explanation in which

poverty is the defining explanatory variable. Because of the process of deindustrialization, the demarcation between the urban core and the suburban rings is consistent with an explanation based upon large-scale inequalities along class lines. Massey and Denton's (1993) explanation of housing inequalities as related to both an historical legacy of overt racism and institutionalized housing segregation suggest race, as measured through the dissimilarity and isolation indices, should be the primary cause of inequalities. Although Oliver and Shapiro (1995) and Conley's (1999) explanations point to an interconnection between race and class dynamics, the underlying explanatory variable should be that of home ownership. The treadmill of production simultaneously produces both environmental hazards and social inequality. Within the larger framework of the treadmill of production, there are multiple sorting mechanisms – economic segregation, racial segregation, and wealth segregation – responsible for inequalities as related to differential life chances regarding opportunities for housing. Although each of these sorting mechanisms is part of the larger treadmill of production system, each has its own particular mechanisms and effect. Situating environmental inequality within the distinct effects of each of these sorting mechanisms is the theoretical contribution of this research.

These sorting mechanisms maintain a dimension related to urban processes driven by space. As mentioned above, the EIF framework neglects the importance of space, but the three types of segregation operate in a spatial manner. That is, an economically or racially segregated community necessarily inhabits a space defined by inequality. The probability of inhabiting this space is a function of multiple causes that are historical, social, political, and economic. Thus, spatial inequality reveals itself through the sorting

mechanisms that distribute people across urban landscapes. This occurs via economic, racial, and wealth segregation as described in Table 1.

Table 1: Distinct Sorting Mechanisms in Environmental Inequality Formation Along Dimensions of Spatial Inequality

	DIMENSION OF SPATIAL INEQUALITY		
TYPE OF SEGREGATION MODEL	Economic Segregation	Racial Segregation	Wealth Segregation
EXPLANATORY VARIABLE OF INTEREST	Economic Deprivation	Percent Minority	Percent Owner-Occupied Housing

The economic segregation model posits the location of toxic facilities as highly correlated with urban poverty due to the deindustrialization process in the latter half of the 20th century. For the most part, then, environmental inequality would be a product of poverty (as measured here by economic deprivation)[8] as the mechanism cementing African-Americans to inner cities, while sorting Whites and some middle class African-Americans to the suburbs (Wilson 1978, 1987, 1996). With deindustrialization and the movement of many industries to either the suburbs or foreign countries one might expect the shift of the associated environmental hazards along with the transplant of those industries. However, one could predict that the historical legacy of the industrial manufacturing sector in the urban core of Northeastern and Midwest cities, such as Detroit, leaves in its wake environmental hazards. Wilson's (1978, 1987, 1996) thesis, although applied to an entire host of socially degenerative processes ranging from unemployment to an increased crime rate, is consistent with this model and would predict that the remnants of many of these industries would remain within this urban core even

[8] The explanation of how economic deprivation is measured is presented in the data and methods discussion in Chapter 4.

though the economic opportunities provided by these industrial facilities have long disappeared. Here, the associated housing segregation and the environmental inequalities left in the urban area are primarily a function of the deindustrialization process and the poverty of the "underclass."

In contrast, the development of hypersegregation suggests an historical legacy and contemporary displacement of African-Americans based upon a process of systematic housing inequalities via racial segregation. The racial segregation model predicts a clustering of unwanted facilities around enclaves of all nonwhite minorities, but particularly African-Americans because of the comparatively higher level of housing segregation experienced by African-Americans (Massey and Denton 1993). Those explanations of environmental inequality that most favor race as the overriding variable would be consistent with this model (Bullard 1983, UCC 1987, Mohai and Bryant 1992, Hird 1993, Zimmerman 1993). The historical legacy of housing segregation, redlining, and the prevalence of African-Americans being isolated in the urban core—coupled with "white flight" to the suburbs—provides the larger context for understanding race-based environmental inequality. The differentiation of the inner city in terms of racially segregated housing practices rather than because of other processes such as deindustrialization is consistent with Massey and Denton's (1993) conception of race as fundamental in understanding inequality. Although the outcomes may resemble the class variant (i.e. poor, African-American communities disproportionately affected), the process underlying this outcome is one almost entirely based upon housing segregation along racial lines, rather than the flight of industry and the accompanying employment

opportunities. All else being equal, facilities cluster around African-American communities.

The final explanation is labeled here as the wealth segregation model. It suggests that wealth is of primary concern because, like race, wealth maintains a generational effect. Just as people are ascribed a race, research indicates that wealth influences life chances in a similar manner. Thus, the measure used here conceives of wealth as a superior measure of social class. This model predicts the distribution of toxic facilities along an axis of wealth. Although there exists no "pure" test of this model, many argue that there are underlying processes attached to both race and class that would be consistent with this model. This series of explanations might be consistent with features of both the economic segregation (Wilson 1978, 1987, 1996) and racial segregation (Massey and Denton 1993) models if independently considered. However, the wealth segregation model differs in its attempt to disassociate the impact of wealth as separate from the usual measures of income and poverty. Wealth, measured via the prevalence of home ownership, holds within it a deep, cumulative effect that operates in a distinct manner from both race and poverty/income. Thus, it stands to reason that environmental inequality is organized along similar lines in which wealth, as defined by prevalence of owner-occupied housing, is the relevant explanation. Thus, this explanation predicts a distribution of facilities in a manner in which neither race nor poverty plays a decisive role, but in which the two are overlapping and mutually reinforcing via wealth accumulation.

All three of the models above will be tested for their power in explaining the dynamics underlying the location of unwanted hazardous facilities. Each of these models

provides a conceptualization of how environmental inequality outcomes stand to be related to the larger social process of the treadmill of production and the history of its associated sorting mechanisms.

Although much of this proves to be untidy and overlapping, distinctions between these explanations should emerge at different times and in different locations. In order to speak to the distinctive contribution of each of these explanations, the sociohistorical development of environmental inequality of landfill and Superfund siting in Detroit, Michigan and Portland, Oregon is investigated. I address the following questions in the chapters that follow: How does the process of environmental inequality empirically fit in with the larger sociological processes ascribed to the three types of segregation? What are the connections, analytically and conceptually, between these larger processes of inequality and the production of environmental inequality in urban areas? What are the distinguishing and intersecting features of these explanations both in terms of historical time and in terms of the disparate logic driving the organization of each urban area?

CHAPTER THREE

TWO HISTORIES: DETROIT, MICHIGAN AND PORTLAND, OREGON

In order to compare and contrast the two cases involved in this research, Detroit, Michigan and Portland, Oregon, it is necessary to provide the historical context within which each urban area developed. Detroit and Portland each have elements in common, but each is also distinctive. These features of overlap and difference, especially with respect to the historical development of economic segregation, housing segregation, and wealth segregation, provide the foundation for the analysis of environmental inequality that follows. Although a detailed history of each city would be useful, the aim here is to provide a general, albeit brief, background history with a focus upon the major theoretical issues of interest: economic segregation, racial segregation, and wealth segregation. Additionally, I provide an overview of the developments in landfill and Superfund sites in each city.

A brief justification for Detroit and Portland as the selected cases is necessary. Although there are similarities between all large U.S. metropolitan areas, each city maintains its own unique economic, social, and political dynamic. McCall (2001) argues that the most interesting points of comparison between U.S. metropolitan areas lie in those cities representing the "old" and the "new" economy.[9] Detroit represents a classic case of an old, industrial city. Its history is one closely tied to the issues of both economic and racial segregation (Sugrue 1996), while it is also noted as having "one of

[9] McCall claims that the two best points of comparison are Detroit and Dallas. Although I had hoped to replicate her case selection, the landfill data for Dallas is unavailable at this time. After weighing all options in lieu of accessible data, Portland has been selected as my comparison case.

the most complex configurations of inequality" (McCall 2001). Portland also sustains a complicated history, albeit a very different one. Like other western and southwestern cities, its economy is more closely associated with that of the post-industrial economy, while the physical and geographic layout resembles that of the traditional western city (Lansing 2003).[10] Additionally, Portland's economy has transformed from one largely based upon its surrounding abundance of natural resources to one in which high-technology provides a large basis for its economic success (Abbot 2001). For these reasons, we should find both similarities and differences in looking at the possible underlying causes of environmental inequality, yet we should also be able to recognize the larger trends that overlap between Detroit and Portland.

These economic differences provide one important justification for a comparison of Detroit and Portland, but availability of data plays a significant role as well. Originally, the main criteria for case selection centered upon the availability of HOLC data in the National Archives combined with available data for landfill and Superfund sites. Although other cities certainly meet the criteria, these two cities provide an interesting contrast, while still providing complete sets of data, on all data points, for the entire time period under consideration.

This chapter summarizes the distinctions between Detroit and Portland while a snapshot on some crucial statistics provides evidence of the striking differences between the two cities on several socio-demographic characteristics in 1990. Detroit ranked as the 9th largest city in the United States in 1990, despite a trend in which the city's population

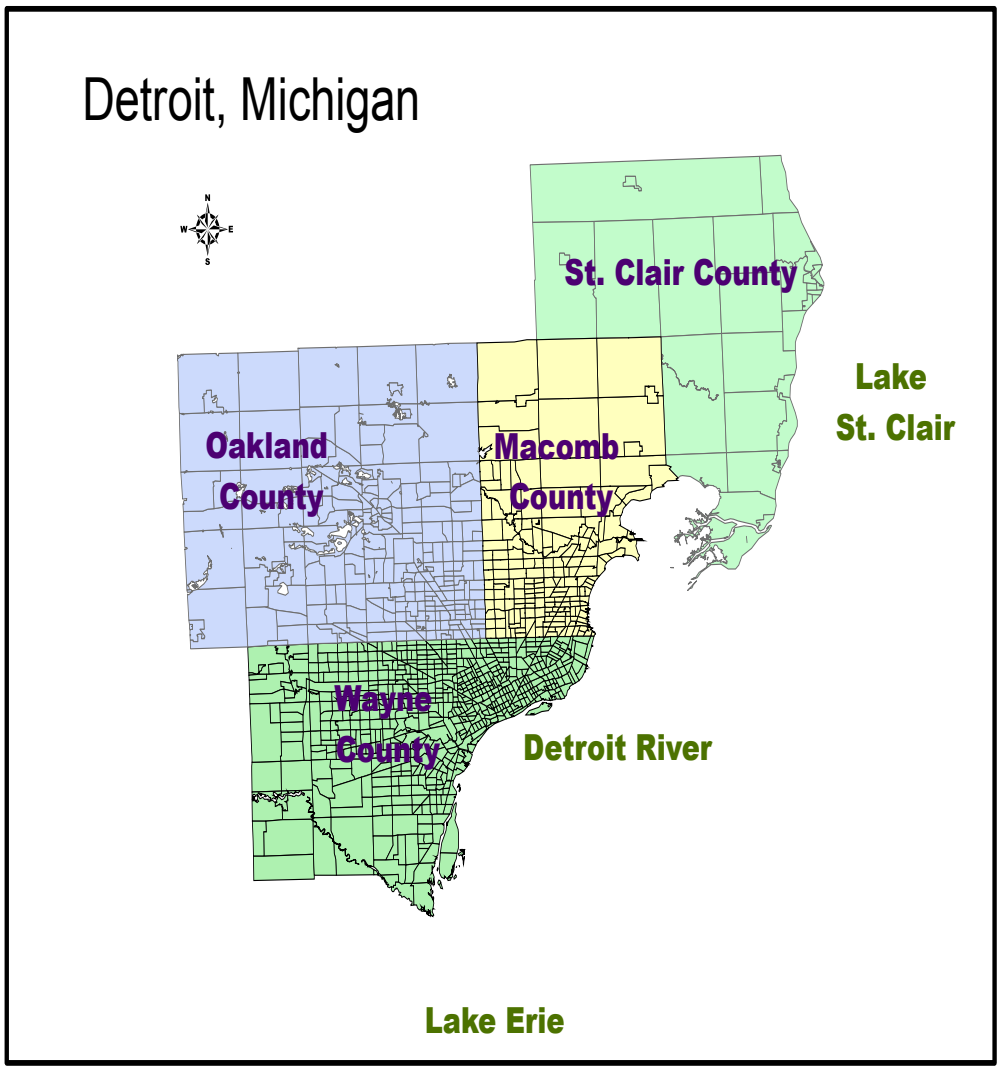
[10] It should be noted that the same could be said of other cities. However, Los Angeles is noted as an outlier on several important points as its representation of a western city (McCall 2001). Seattle may be the most well-known western city representing the "new economy," however the HOLC documents do not contain Seattle's full records on redlining.

was slowly shrinking from 1970 to the present (Farley, Danziger, and Holzer 2000). In contrast, the city of Portland was a growing one in 1990, yet its population pales in comparison to Detroit as it ranks near the middle of larger American cities with roughly 437,000 people (Abbot 2001). Detroit has been described as the "quintessential underclass city" as in 1990 it ranked 1st in the country in poverty, in percent of households receiving public assistance, and 2nd to last with comparable urban cities in median income (Farley et al. 2000). Portland's development as a "new economy city" contradicts the trends in Detroit as it contains fewer and less concentrated numbers of poor people than most urban areas, while having an above average median income (Abbot 2001).

The contrasts between these cities is further highlighted with a comparison of their minority populations: in 1990 the percentage of African-American residents in Detroit's Metro area was 26% which is roughly more than twice the national average, while all racial/ethnic minority groups in Portland comprise, at most, 15% of the population (Farley et al. 2000; Abbot 2001).

Detroit and Portland represent very different cities that are moving in seemingly opposite directions. The distinctions between these two urban areas raise several important questions. First, what led to these very different socio-demographic characteristics? Second, how do these differences reflect the importance of historical trajectories in comparing the two cities across time and space? Lastly, how might the separate historical developments of each city affect the prevalence and likelihood of environmental inequality? Investigating each city's history provides the context for answering this set of questions.

Figure 1: Detroit, Michigan[11]



[11] All maps that follow, unless otherwise noted are derived from the following data and map source: Geolytics, Inc. (2001).

Figure 2: Portland, Oregon

Detroit and Portland – Water Cities

In 1701, Antoine Cadillac founded and settled the city of Detroit along the Detroit River between Lake St. Clair and Lake Erie. Although the original purpose of the French settlement was to prevent westward expansion by the British in New England, it later became an important trading post for the newly formed United States because of its access to waterways. The confluence of water made Detroit a "natural metropolis" (Farley et al. 2000).

By the mid-19th century, events in Detroit forewarned of issues destined to mark its 20th century history. First, because of its strategic location Detroit became an important center of manufacturing – this trend, of course, would become increasingly important with the onset of the automobile age. Although there are several logistical reasons why Detroit became a center of manufacturing, in part, Detroit's development as a manufacturing haven rests upon its strategic location as a supplier and equipment storage facility for the Union Army during the Civil War. Out of this development, Detroit had the footing it needed to grow into a major manufacturing center.

Second, Detroit's modern history is pocketed with instances of "race riot." Detroit's first race riot, in 1833, stands as one of the early examples of this phenomenon in the United States. Ironically, this race riot preceded the major influx of African-Americans into Detroit, but it proved to be an important foreshadowing event for the city's later history. Indeed, an analysis of race riot prevalence in the United States finds that only seven cities in the United States (out of a total of 55) experienced more race riots than Detroit from 1960 to 1993 (Olzak, Shanahan, and McEneanyey 1996). Taken

together, the history of manufacturing employment and the volatility of race relations constitute important features of the Detroit community.

Detroit, known as the "motor city" because of its association with the automobile industry, secured its place within this manufacturing sector early in the 20th century. In 1908, Detroit produced only 6,400 automobiles; however, just four years later in 1912 the production of automobiles in Detroit expanded to 78,000 (Farley et al. 2000). On the heels of this industrial development, a "Great Migration" of African-Americans ensued. Because Detroit's automobile production industry stood as one of the few places where "black men got industrial jobs" it is not surprising that an influx of southern African-Americans coincided with the initial boom of the automobile industry (Farley et al. 2000). From 1916 to 1929, the percentage of African-Americans in Detroit swelled from less than 2% to almost 10% (Sugrue 1996). This migration of southern African-Americans to northern cities is not an insignificant development as Blalock (1967) contends that as minority percentages increase in the population, discrimination is also likely to increase. This combination of historical circumstances served as the foundation for the economic segregation, housing segregation, and wealth segregation that emerged as the dominant themes of social inequality in the decades to follow.

Like Detroit, water access plays a prominent role in the history of Portland, Oregon. Downtown Portland sits at the southwestern edge of the confluence of two major western rivers – the Columbia River runs East and West, while the Willamette River runs North and South. These two rivers played an important role not only in the early history of Portland, but greatly influenced its later economic development. Originally, Portland served as a stopover point halfway between the larger metropolis of

Oregon City, Oregon and the major regional center of trade and supplies in Fort Vancouver, Washington. The early distinctions between Oregon City and Portland are revealed in the fact that in 1850 Oregon City boasted a population of 933 residents (including its own suburb of Linn City), while it was noted that with respect to Portland, "No one lived there and the place had no name; there was nothing to show that the place had ever been visited…" (Jesse Applegate as quoted in Abbot 2001: 36). Despite this apparently slow start, in 1849 William Overton and Asa Lovejoy claimed downtown Portland. With the onset of the California Gold Rush in 1848, Portland vied with other cities in the region as a major port city and destination for steamers traveling North of San Francisco. Portland became a major port city in the Pacific Northwest, but the city maintained its place as a regional, rather than a national or international, destination. Whereas Detroit's location made it a "natural metropolis" for manufacturing and an important player in the national economy, Portland's economic emphasis centered upon its rich, natural resources and its ties to the regional economy. Timber, wheat, grain, and farm products would, for several generations, play a dominant role in Portland's economy as a northwest port city (Abbot 2001).

Detroit went from being a wartime storage and producer for the military during the Civil War to a privatized industrial manufacturing base, while Portland's only major industry is directly tied to World War II. In 1941, the Oregon Shipbuilding Company (also known as the St. John's Kaiser Shipyards) opened for production of warships. Thus, because of these direct ties to the war effort the major industry to reach Portland by 1944 resulted in the employment of more than 91,000 defense workers (Lansing 2003). For the first time, Portland had become a "boom town" and claimed a significant

manufacturing base. However, the boom was short lived and soon after the war's end Portland returned to its regionally based economy, one with a continued emphasis upon natural resources. As Portland developed in the post World War II era it kept intact its regional city character; however, in the latter part of the 20th century Portland slowly entered the global economy. In order to increase its economic base, Portland moved beyond its reliance upon natural resources and by the 1990s Portland entered into a new economic phase – it quickly emerged as part of the growing high-technology economy.

Whereas automobile production dominates the history of Detroit, a parallel industry is not identifiable in Portland. The two cities' histories also diverge with respect to the issue of race relations. Detroit stands as characterized by volatile race relations that maintain a prominent role in its 20th century history, while Portland's history lacks a comparable record on racial matters. Partly this may be a function of the low percentage of minorities present in the Portland area, but it also masks an underlying racial tension. Some argue that the small proportion of African-Americans in the Portland area creates insensitivity to racial differences and this insensitivity fosters a hidden form of racism (Lansing 2003; Abbot 2001). Therefore, on this crucial issue there is indeed a distinct difference between Detroit and Portland making the comparisons especially stark.

This brief sketch of Detroit and Portland provides some major distinctions between the two cities. The major theoretical issues center upon economic segregation, racial segregation, and wealth segregation and these cities' histories on these particular issues reveal both important similarities and differences.

Deindustrialization in Detroit and the New Economy of Portland

The history of economic growth is usually ascribed an important place in 1950s histories of the United States. Generally, Detroit is considered one of the premier examples of this economic development as the automobile industry represents an important sector of the economy. However, Sugrue (1996) argues that historians neglect the economic restructuring that began as early as the mid-1940s, ultimately leading to the decline of northern industrial cities such as Detroit. When considering the impacts of deindustrialization most accounts point to the 1970s as the tipping point—the moment when industrial jobs and the larger economic slowdown began. There is evidence, however, that even as America claimed to be at the apex of the "affluent society" the conditions for economic restructuring were already set in motion. Starting in the 1950s, the industrial cities of the North and Midwest lost hundreds of thousands of entry level manufacturing jobs to automated technology, relocation of manufacturing plants to rural regions of the United States, and the eventual shift to underdeveloped regions of the world to cut wage costs (Sugrue 1996).

The traditional portrait of deindustrialization argues that the restructuring of the economy is a trend associated with the 1970s and 1980s. For example, Wilson (1996) notes that between 1967 and 1987 Detroit lost 108,000 manufacturing jobs. This certainly represents a significant loss of jobs; however, Sugrue (1996) argues that this process actually began in earlier decades. For example, between 1947 and 1963 Detroit lost a staggering 134,000 manufacturing jobs which surpasses the total job losses for the 1970s and 1980s (Sugrue 1996). During roughly the same time, 1949 to 1960, Detroit suffered four major recessions (Sugrue 1996). Although some dispute the time frame for

the onset of deindustrialization, the devastating impacts of deindustrialization upon northeastern and midwestern cities is unmistakable.

The intersection of two trends – automation and the relocation of plants – completely reorganized the landscape of Detroit and its role as a major supplier of manufacturing employment. Although much analysis condemns the relocation of auto facilities to the suburbs, to the Southern United States, and to lesser-developed countries, Sugrue (1996) argues that automation may have had the most profound impact in hastening deindustrialization. As the three major car manufacturers, Ford, General Motors, and Chrysler, all moved towards a heavy reliance upon machinery and automation these changes significantly impacted the Detroit workforce. The Ford River Rouge Plant represented one of the most important symbols in the auto manufacturing economy as it was a major employer in Detroit. In 1945, for example, the River Rouge Plant employed 85,000 workers; by 1960 that number had fallen to 30,000 (Sugrue 1996). Keeping in mind that this coincided with an economic boom and a general trend in which car sales increased every year, analysis indicates that most of the job losses at the River Rouge Plant were due to automation (Sugrue 1996). That is, in just 15 years 55,000 well-paying jobs at a single plant disappeared. Automation, then, greatly expanded corporate profits while decreasing job security for those on the shop floor.

Although the impact upon the workforce of the major plants such as the River Rouge plant was significant, an indirect casualty of automation were the other connecting parts of the industry that were unable to afford the initial investment in technology. Generally, Detroit stands as the picturesque home of the “Big Three” automakers; however, Detroit was the home to nearly all domestic automakers and prior to the onset

of automation there were large numbers of independent automakers. Packard, Hudson, Nash, and Studebaker (among others) were all viable players in the auto industry. In fact, the share of the market for independent automakers was roughly 18% in 1945 (Sugrue 1996). However, because of the shift to automation these independent companies were unable to afford the technologies to match the production of the "Big Three." The result is that by 1955 the independent share of the market had fallen to only 4% (Sugrue 1996). Of course, a reduction in the overall market share by the independent automakers meant fewer sources of employment for Detroit residents. In addition to the impacts upon the independent auto industry is the domino effect upon the local suppliers whose economic feasibility directly links to the industry. Increased automation necessitated an increased reliance upon integrated parts that resulted in less dependence upon the local distributors whom had provided the majority of parts for many generations. Hence, automation greatly altered the economy of Detroit and reduced not only the chances for employment within the "Big Three" but also those independent automakers and local suppliers for whom the competition passed over.

Despite the effects ushered in by automation, there were also major changes in the geographical location of the auto plants themselves. Much of the change in locating new plants was a function of the growing power of the autoworkers' unions who gained bargaining power during the New Deal era. Partly in response to this growing power and the increasing demands made by unions, many firms sought to relocate their facilities where unions lacked the same power as those in Detroit. The result is that many production facilities moved to places where there was cheap, non-union labor. This signaled the construction of new plants primarily in small, rural communities in the South

and West. These developments, of course, were devastating for the core source of employment in Detroit – in 1950, 56% of all automobile employment was in Detroit, but just 10 years later in 1960 Detroit accounted for less than half (40%) of all automobile employment in the United States (Sugrue 1996). For the local suppliers these relocations, combined with automation, had a ruinous effect as suppliers closer to the new plants emerged as the major source for parts.

For those plants remaining in the Detroit area, the owners argued that the tax rates inside the city of Detroit were exorbitant and the plants threatened to leave Detroit city proper. The automakers demanded fewer taxes and in due time many facilities relocated to the suburbs of Detroit, while simultaneously the city cut corporate taxes in an attempt to keep those plants from leaving the central city (Sugrue 1996). Eventually, these developments led to a greatly reduced tax base in Detroit. Likewise, this relocation of plants to the suburbs meant that there was a growing mismatch between residence and employment for those left behind in the inner city (Wilson 1996; Sugrue 1996). These developments had the greatest impact upon African-Americans: a study of Detroit revealed that a disproportionate number of African-Americans were unable to move to the suburbs when plants relocated increasing their likelihood of quitting a job (Zax and Kain 1996). A similar trend was not evident for Whites. Only later was it clear that this mismatch meant a "permanent class of underemployed and jobless blacks" in the inner city of Detroit (Sugrue 1996: 144). For example, by 1960 the unemployment gap between Whites and African-Americans was clear: only 5.8% of Whites were unemployed, yet almost 16% of African-Americans were unemployed in Detroit. Within the auto industry the contrast was even more stark as only 6% of Whites were

unemployed while nearly 20% of African-Americans were unemployed (Sugrue 1996). This feature of enduring unemployment, more than any other, is the lasting effect of deindustrialization and clearly indicates decreased life chances for African-Americans due to economic reorganization.

Eventually deindustrialization took on an international scope as many plants relocated to lesser-developed countries. International treaties, such as The North American Free Trade Agreement (NAFTA), accelerated this practice. However, the international portion of deindustrialization is beyond the scope of this research because much of this restructuring occurred in the 1990s and because the effects of international deindustrialization impacted regions beyond Detroit. Nonetheless, the influence of deindustrialization stood not only as pervasive for Detroit as a whole, but it profoundly affected those in the inner city, primarily the African-American population.

The lasting impacts of deindustrialization on the economic decline of Detroit remain apparent, yet a similar pattern is not detectable in Portland. In part, this is because Portland never stood as a major industrial city or as a major manufacturing center. One might find it surprising then that as many as 150,000 Portlanders are currently employed in manufacturing jobs, which is more than the traditional centers of industrial employment in places such as Cincinnati and Pittsburgh (Abbot 2001). Portland's ability to escape many of the economic woes affecting the rust belt arises out of Portland's economic standing as a regional center of trade, rather than a city of international trade.

A full appreciation of Portland's place as a regional city becomes apparent in a brief comparison with Seattle (rather than a direct comparison with Detroit). Although

commonly grouped together as similar cities, Seattle and Portland maintain startling economic differences. Seattle far surpassed Portland in the value of both imports and exports from 1967 to 1977 (Abbot 2001). In fact, Seattle is internationally recognized as a comprehensive and important port of call, whereas Portland serves a regional purpose. The value of exports from each city in 1986 reflects these contrasts: those exports from Seattle carried an average value of 36 cents per pound, while the comparable figure for Portland was only 8 cents per pound (Abbot 2001). These figures are telling because they indicate Seattle's place as a "networked city," while clearly indicating Portland's status as a "northwest city" (Abbot 2001). The distinctions between Seattle and Portland are drawn when one considers the major corporations for which each city is recognized. Microsoft situates itself as one of the largest corporations in the world and makes its home in Seattle, while the athletic shoe producer, Nike, calls Portland home. The major difference is that the majority of the employees for Microsoft actually live and work in the Seattle area, while the manufacturing facilities for Nike are almost exclusively an overseas operation.

In recent years, Portland has emerged as a major player in the "new economy" associated with high-technology industries. Although its role in this emerging trade pales in comparison to the other regional economic powerhouse, Seattle, it indicates the very different economic bases of Detroit and Portland. Portland's attempt to maintain its place in the new, global economy introduces a continued tension in Portland – a tension that keeps one foot in place as a regional city and all that accompanies this tag (smaller urban populations, less international business, slower pace of life). Yet many in Portland long for a place in the growing global economy and its emergent high-technology professions.

Portland, when compared to Detroit, greatly differs on this score. For example, by 1996 Portland ranked 10th in the nation in metropolitan areas with high-technology employment (Abbot 2001). The transition from a regional economy mostly related to the abundance of natural goods to a "new economy" city reveals itself in the fact that of the 150,000 manufacturing jobs in the Portland area, roughly one-third of those jobs relate to the building of computer and electrical equipment (Abbot 2001). Portland entered the new economy as early as 1976 when Intel opened a branch plant in the city. In the years that followed many companies, including Hewlett-Packard, Fujitsu, and NEC followed suit (Abbot 2001). Overall, the electronics industry had invested nearly $10 billion into the Portland metropolitan area by 1997. Similarly, high-technology employment surpassed timber-related employment and its value of exports (as related to high-technology production) increased such that Portland ranked 10th in the nation in the value of its exports (Abbot 2001).

Detroit and Portland, then, represent contrasting stories of economic development. Detroit stands as one of the exemplars of an industrial economy left behind in the wake of the new global economic system. The results are not only that the city has seen a marked decline in its economic production, its population, and its overall standard of living, but the impacts upon inner city African-Americans are startling. This is in contrast to Portland which has, for most of its history, been a regionally based economy centered upon an economic base of natural resources and whose history does not contain the same kind of spectacular instances of racial disparity displayed in Detroit. Yet, as the high-technology global economy has been set in motion, Portland has situated itself within that growing sector of economic production. In short, the economic trajectories of Detroit

and Portland hold within them disparate qualities, largely due to historical circumstances. Although the economies of each city provide much of the context for understanding each city, the differences between Detroit and Portland are especially glaring with regard to the issues of race and housing.

Racial Segregation in Detroit and Portland

Detroit's image as the "motor city" places it on a pedestal in terms of its standing in industrial economies; however, Detroit is ascribed the iniquitous role as the model city for racial segregation. Detroit stands as unique with respect to segregation as it has actually increased in segregation over time while most cities have decreased on this measure (Farley, Steeh, Krysan, Jackson, and Reeves 1994; Massey and Denton 1993). This relationship is illustrated in Detroit's unique geography where there is an urban core that is almost exclusively African-American while the suburbs of Detroit are overwhelmingly White. Although this trend appears in other cities, Detroit is an extreme example where 76% of the residents in the urban core of Detroit are African-American (Harris 1998).

A combination of factors came together to limit the opportunities for African-Americans in the housing markets of 1940s Detroit. Noted as one of the few places African-Americans could obtain a job earning a decent wage, we should be careful not to paint too optimistic a picture of the employment situation in Detroit. Though opportunities existed in Detroit, African-Americans still held the lowest paid positions and thus were at a large income disadvantage. This coupled with the fact that the available housing options were small in number meant that property owners could charge

exorbitant rental rates (Sugrue 1996). For example, in 1947 there were only 47,000 available housing units for an African-American population of 545,000 (Sugrue 1996). In addition, African-Americans were systematically excluded from the real estate market (Massey and Denton 1993; Sugrue 1996; Jackson 1985).

In Detroit, the automobile industry boom led to an influx of African-Americans from the south even though the employment opportunities for those migrants were limited. The reaction to such trends resulted in a white population who protected their advantaged life chances with regards to housing. The parallel development in Portland stems from the influx of people who came to work in the World War II shipyards. This increase in population led to a major housing shortage in the Portland area. For example, the vacancy rate for Portland housing fell from 6 to 2 percent, while the number of new Portland residents arriving in 1941 alone surpassed (nearly doubled) the number of new residents that came to Portland between 1930 and 1940 (Lansing 2003). In response to these developments, Portland created the Housing Authority of Portland (HAP) in 1941 (Lansing 2003). Additionally, Henry Kaiser, who owned the shipyards, privately funded a housing project near the shipyards along the Columbia River to help alleviate the housing shortage. His project resulted in the Vanport neighborhood that included over 9,000 apartment and housing units. With more than 42,000 residents in Vanport, it stood as the single largest housing project in the United States during World War II (Lansing 2003).

Just as the shipyard brought a migration of Whites to Portland, the employment opportunities of the shipyards also brought a migration of African-Americans from Oklahoma, Arkansas, Texas, and Louisiana (Abbot 2001). The acute housing shortage,

in conjunction with the increased number of African-American migrants, caused Portland to enact policies of segregation not unlike Detroit. A memo from HAP clearly indicates the inherent discriminatory intent of these policies: "It has always been our impression that the [HAP] Commissioners' desire in the matter of housing Negroes was to segregate them, and this policy has been followed by the staff from the beginning" (as quoted in Lansing 2003: 342). Just as Detroit experienced a growing African-American population with only a limited number of neighborhoods accepting of minority populations, Portland's African-American population jumped from an estimated 2,000 prior to the opening of the shipyards to an African-American population near 21,000 – an astounding 10-fold increase in the African-American population (Lansing 2003). Just as in Detroit, however, the limited housing opportunities for African-Americans in Portland confined African-Americans to only two neighborhoods – Vanport and Guild's Lake. So even with a much smaller proportion of African-Americans, Portland segregated in a manner similar to Detroit.

In addition to the housing shortages and the increased numbers of African-Americans in both Detroit and Portland, a larger set of corporate and government policies contributed to housing segregation. The Home Owner's Loan Corporation documents (National Archives and Record Administration, Record Group #195.3) indicate the prevalence of discrimination in housing in the pre-Civil Rights era. Real estate agents in both Detroit and Portland organized the surveys and maps.[12] The documents classify neighborhoods into four distinct graded categories of First, Second, Third, and Fourth with corresponding letter codes (A, B, C, D, respectively) as well as corresponding color

[12] The HOLC program was a national one. Although it did not include every city in the United States, the grading of neighborhoods did comprise nearly all major metropolitan areas from 1935-1940.

codes (Green, Blue, Yellow, and Red, respectively). The scoring of a neighborhood followed the criteria as described below:

> In establishing the grade of an area, such factors as these are considered: intensity of the sale and rental demand; percentage of home ownership; age and type of building; economic stability of area; social status of the population; sufficiency of public utilities, accessibility of schools, churches, and business centers; transportation methods; topography of the area; and the restrictions set up to protect the neighborhood. The price level of the home is not the guiding factor. (National Archives and Record Administration, Detroit, Record Group #195.3: 2).

In some respects, these criteria remain in consideration when real estate and lending institutions provide loans; however, many of these criteria are recognized as discriminatory. The HOLC documents contain numerous qualitative descriptions providing insights into the built-in discrimination of their grading techniques. For example, the 1948 Supreme Court ruling in *Shelly v Kraemer* unanimously identified housing covenants to be unconstitutional. A decade earlier, however, it was an important marker for the HOLC analysis. A disproportionate number of neighborhoods with a grade of "A" contained such housing covenant restrictions and, not surprisingly, these neighborhoods were 100% White occupied in both Detroit and Portland. Figures 3 and 4 below provide examples of redlining maps for Detroit in 1939 and Portland in 1938.

Figure 3: Home Owner's Loan Corporation "Redlining" Map (1939): Detroit, Michigan (National Archives and Record Administration, Record Group #195.3)

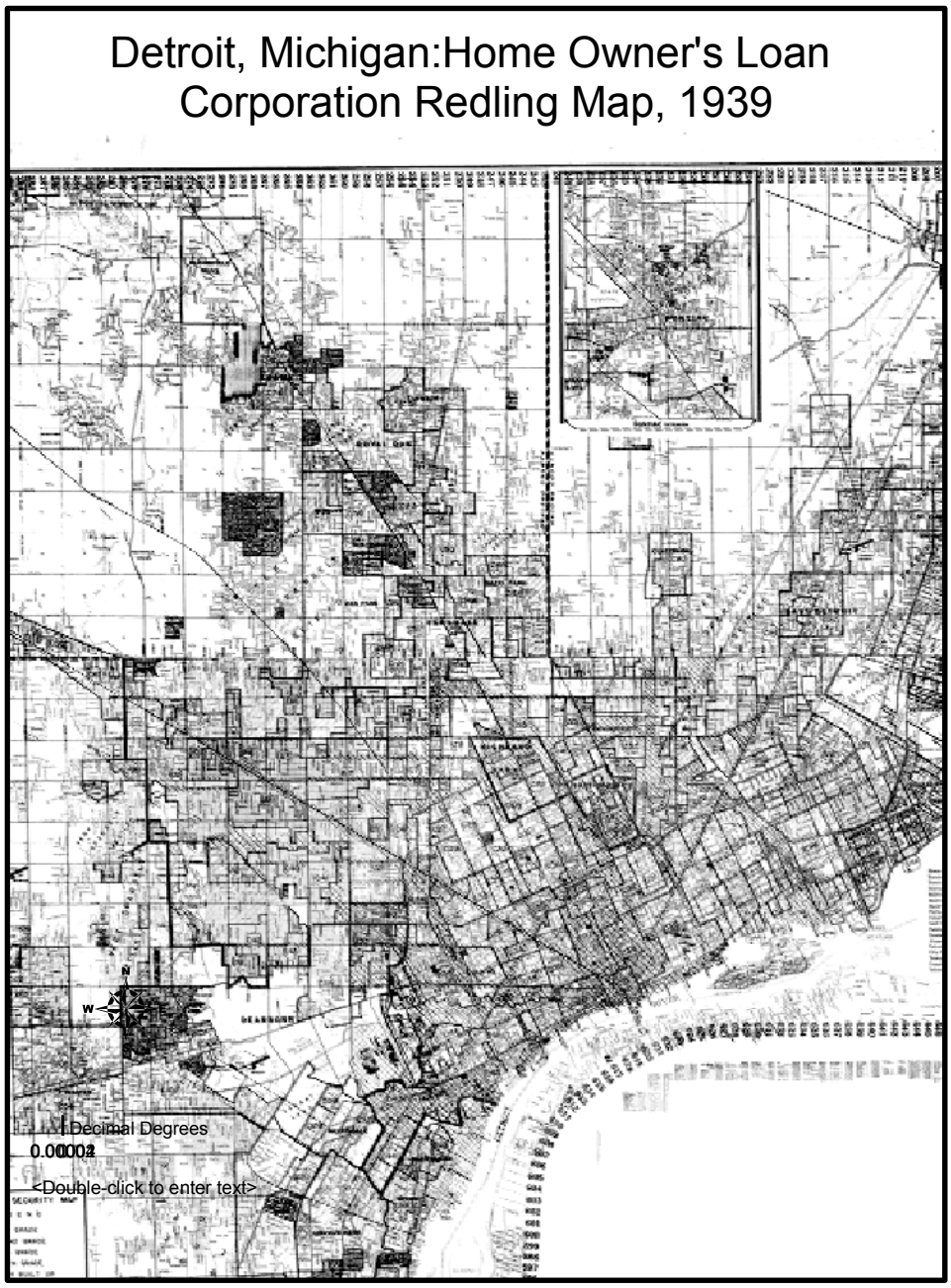
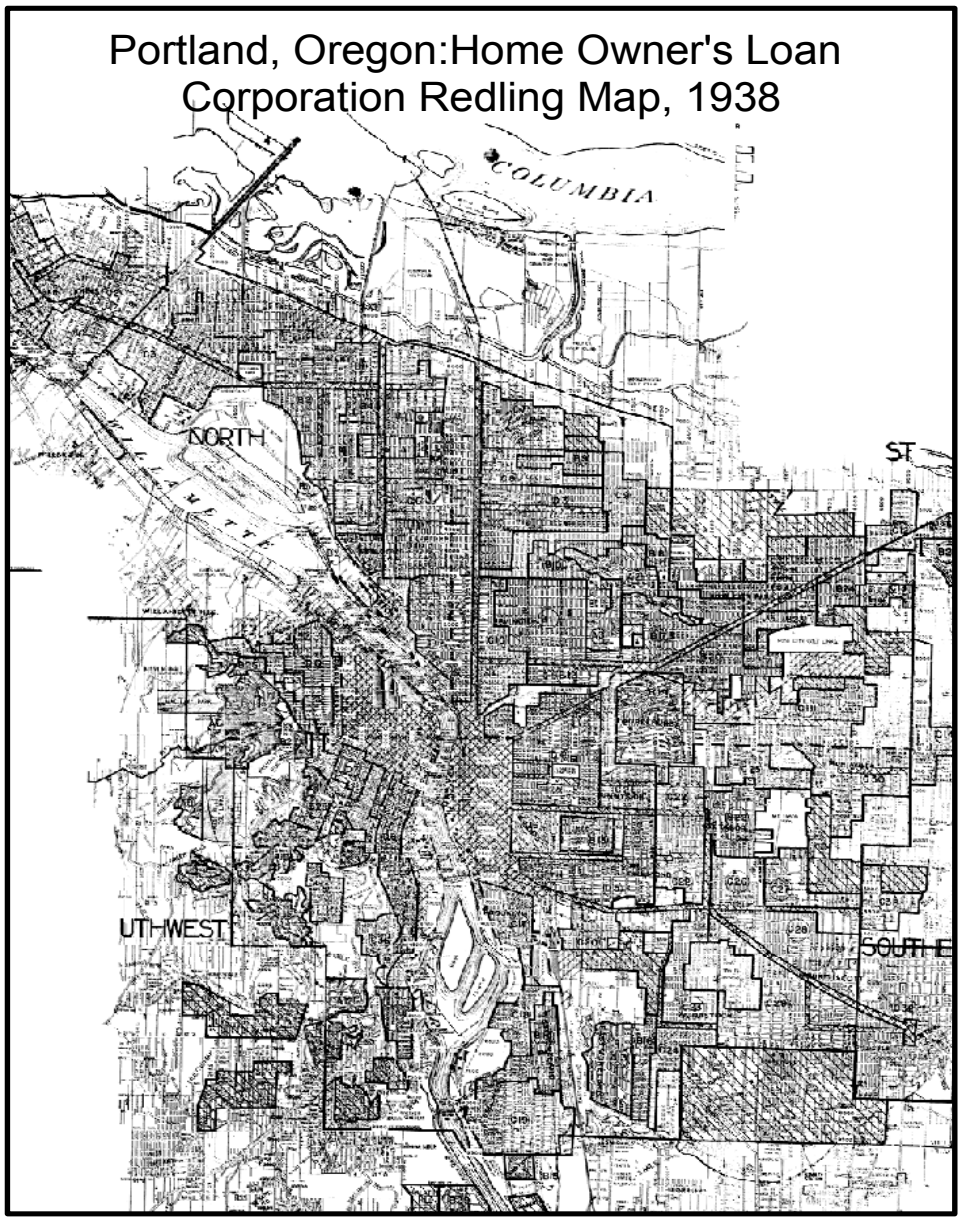


Figure 4: Home Owner's Loan Corporation "Redlining" Map (1938): Portland, Oregon (National Archives and Record Administration, Record Group #195.3)



Although it is dangerous to apply contemporary values to past behaviors, there existed a clear bias in the assessment of the "social status of the population." A majority of neighborhoods in Detroit that were given the lowest grade ("D") and, thus "redlined," contained reference to "Negro concentration." Portland's HOLC documents reveal a similar pattern, yet these descriptions take on a more subtle face. For example, in Portland redlined areas there are references to the "racial situation" or the "racial composition" while the overtly racist terminology of "colored races" is much more limited than in the Detroit documents.

The HOLC document descriptions also contain more subtle social distinctions. For example, in Detroit there are many instances in which a neighborhood is graded "C" or "D" because it contained "cheap construction" or "shack type" of housing. Of course, the occurrence of these types of housing conditions usually parallel the prevalence of racial minorities in a neighborhood and the connection is usually made obvious in the real estate agents' assessment of the area. The Portland documents contain similar remarks concerning "shack type" housing although these references are not as prominent. However, the Portland assessments continually mention the presence of "dilapidated" housing in which both the residents and the homes are of "low quality grade."

The social status of the neighborhood also includes ethnic distinctions with an emphasis upon "alien" populations. One distinguishing characteristic of this ethnic divide is the awarding of a higher grade for ethnic neighborhoods when compared to African-American neighborhoods ("C" as compared to "D"). For example, a Detroit neighborhood rated as a "C" noted its "Polish" population while simultaneously acknowledging the neighborhood's "pride of ownership." Other descriptions of

neighborhoods are more nuanced as a neighborhood given a "C" grade included an "infiltration of inharmonious" and "mixed elements" in Detroit. The same patterns appear in the Portland assessments as the "infiltration of subversive elements" is recognized. Interestingly, a neighborhood rated "B" is noted for its residents "constantly on the alert to prevent anything of a subversive nature which would affect their area." Clearly, then, the analysis of neighborhoods was not simply based upon economic factors, but rather they had built into them both racial and class discrimination. By definition, this means that African-Americans entered the housing market with a large disadvantage and with little hope of escaping the segregated sections of Detroit and Portland.

The efficacy of using these social characteristics to distinguish between neighborhoods becomes clear when one considers the fact that the HOLC documents and their "redlining" eventually served as the criteria for government sponsored FHA loans. There is a direct link between the HOLC documents and the actions of the federal government, real estate agents, and local bank lenders (Sugrue 1996). The result was that the FHA enforced a separate and unequal form of money lending such that racial homogeneity was of paramount importance in the decision-making process of home lending. Perhaps the most striking example of this policy and its effects stems from the development of an all-white neighborhood in Northwest Detroit near the Eight Mile Road-Wyoming district. The Eight Mile Road-Wyoming district consisted of an almost entirely African-American population and was considered a "slum" area to be cleared for the purposes of new home construction. This was the official position of the FHA in the 1940s, yet it realized that it could not approve the construction of the new homes under

its current policies requiring racial homogeneity. To solve this problem the builder proposed a unique, albeit insidious, solution: in exchange for the guarantee of loans and mortgages for the new, white homeowners the developer built a half-mile long, six foot high concrete wall clearly separating the white neighborhood and the existing African-American neighborhood. The concrete barrier solved the racial question for the FHA, the loans were approved, and new home construction followed the building of the concrete barrier (Sugrue 1996; Farley et al. 2000).

In addition to the institutionalized discrimination contained in HOLC and FHA policies, real estate policies of "steering' and "blockbusting" were perfected in cities like Detroit. In fact, Detroit real estate lenders were contractually obligated to adhere to the rules of racial steering or face penalties, fines, and expulsion. Furthermore, this practice was so common in Detroit that as late as the middle 1970s African-Americans, when compared to Whites, were more likely to be shown homes in less expensive areas and homes in locations much closer to existing African-American residential areas (Massey and Denton 1993). Likewise, Whites received favorable treatment in all northern cities with respect to rental and sales units; however, the percentage of Whites receiving preferential treatment regarding rental and sales units is among the highest in the nation in Detroit. Also in Detroit, 67% of Whites when seeking rental units and 64% of Whites when seeking sales units receive favorable treatment from real estate agents when compared to African-Americans (only Cincinnati, with regard to sales units, ranks higher than Detroit) (Massey and Denton 1993).

Whereas racial steering appeared to have been part of the larger, institutionalized form of discrimination, "blockbusting" in Detroit appeared to be somewhat anomalous.

In fact, because of the aggressive tactics on the part of real estate brokers in the process of "blockbusting," it many times turned the white residents against a real estate agent. However, once a neighborhood started to "turn over" toward integration, all real estate brokers began to take notice and were more than willing to take the financial advantages associated with blockbusting. For example, in a Detroit neighborhood that slowly transitioned into an integrated one, more than 60 real estate agents aggressively vied for the sales of white homes. The tactics used included daily phone calls, flyers, and home visits by real estate agents inquiring as to whether the white family is ready to sell (Sugrue 1996). Although blockbusting may have been an example of individual level discrimination by real estate brokers, once the transition had begun the potential profits encouraged most real estate agents to take-up the tactic, thereby exacerbating its effects.

Although racial steering and blockbusting appear less important in Portland's history of housing, the fact that the local agency in charge of housing (HAP) advocated racial segregation indicates that we should not dismiss racial tension as unimportant in Portland. Some observed, "Portland was the most prejudiced [city] in the west and discriminated just as any city in the South would" (Lansing 2003: 343). Although no comparable studies of Portland's proclivity for racial steering, blockbusting, and discrimination exist, observations verify an underlying racial tension in Portland housing. In fact, following World War II and the slow-down at the shipyards the thorny issue of Vanport and its high percentage (roughly 25%) of African-American residents point to discrimination at the highest levels of the local government. Mayor Earl Riley advocated demolishing Vanport with the intent that the African-American population housed within the neighborhood would permanently leave the Portland metro area (Lansing 2003).

In 1948 Vanport flooded in just a few minutes as the water overflow from the Columbia quickly and surprisingly left the homes in the neighborhood uninhabitable (Abbot 2001; Lansing 2003). Following this event, Albina in northeast Portland replaced Vanport as the default African-American community. In essence, Albina had become "shorthand for the neighborhoods into which the real estate market was pushing African Americans" (Abbot 2001: 96). Although the information on racial steering in Portland is limited and though the proportion of African-Americans in Portland was comparatively smaller than in Detroit, many of the same patterns emerged.

While loan policies insured racial homogeneity by preventing African-Americans from obtaining new home loans and "steering" and "blockbusting" assured white advantages, powerful housing associations played a more direct role in maintaining segregation. In part, this reflected local elected officials' determination to turn elections into a mandate on segregation. Dearborn Mayor Orville Hubbard, elected to 13 consecutive terms, endorsed policies protecting what amounted to "white only" suburbs from 1943 to 1971. One of Hubbard's election slogans was "Keep Dearborn Clean" which was clearly a racist euphemism for "Keep Dearborn White" (Farley et al. 2000). The neighborhood associations in the Detroit area bolstered this sentiment with signs in communities reading, "we want white tenants in our white community" (Sugrue 1996: 74). Meanwhile, hastily organized association meetings appeared anytime fears about maintaining an all-white neighborhood reached high levels. For example, an "emergency meeting" was organized when a home was sold to an African-American family because the neighborhood was "invaded by colored purchase" (Sugrue 1996: 230).

Like Detroit, Portland too maintained deed restrictions and the housing associations played an especially important role in Portland politics. In essence, Portland is comprised of distinctive neighborhoods with their own identifiable character. For example, "progressive Portland" is a series of neighborhoods marked by its high level of participation in civic matters. Part of this activism stems from its reliance upon restrictive deed covenants meant to "maintain social and ethnic uniformity" (Abbot 2001). After finding such covenants to be unconstitutional in *Shelly v Kraemer,* as in much of the country, neighborhood associations rose to prominence. This is especially true in Portland in the 1960s and 1970s as neighborhood associations played vital roles in major city decisions concerning mass transit and urban development. And though there are no comparable racial overtones in these associations as in Detroit, the very existence of these associations point to the ideal of maintaining social boundaries, even if those boundaries are not racially motivated.

When neighborhood associations failed to maintain the segregation line, intimidating African-Americans after the legitimate purchase of a home served as a final and direct means of discrimination. In one especially disturbing incident in Detroit in 1955, an African-American family purchased a home on the west side of Dequindre Avenue in the Courville district near the Dodge Main plant (Sugrue 1996). Unbeknownst to the homeowner, Easby Wilson, he had crossed an invisible line of segregation; there was a rapidly growing African-American residential district on the east side of Dequindre, but the white residents on the west side considered their neighborhood off-limits to African-Americans. After moving into their new home, the Wilsons faced demonstrations from the neighborhood residents in which hundreds of residents

protested. Despite the protests, the Wilsons refused to leave their new home and, eventually, the homeowners association resorted to violence. On multiple occasions, despite the presence of police officers watching the home 24 hours a day, rocks were thrown through the windows and sheetrock of the home. After months of harassment, the Wilsons abandoned the home as their child developed emotional problems associated with the constant threats. The Wilsons' story is only one of many examples in the Detroit area in which this type of harassment occurred across the city. These tactics were largely successful, at least in the short term, when neighborhood associations managed to be as organized as the one in Courville. Despite the rise of working class African-Americans in the area, the Courville neighborhood was only 2.9% African-American five years after driving the Wilsons from the neighborhood (Sugrue 1996).

What is striking about this situation is the continual apprehension of Whites to live in integrated neighborhoods. Unfortunately, this tendency is not simply a relic of the past as the divisions along racial lines with regard to choosing to live in integrated neighborhoods remain largely intact. Massey and Denton (1993) argue that racial stereotypes provide an important explanation for the continuing significance of racial segregation. Recent longitudinal research indicates that the values associated with the segregation of the 1950s continue to linger even in contemporary Detroit. Even though the opposition of Whites to integrated neighborhoods has lessened, the vast majority of Whites continue to express little more than a preference for "token" integration (Farley et al. 1994). Exacerbating this tendency to self-segregate, African-Americans are less inclined to state a preference for integrated neighborhoods than in previous decades (Farley et al. 1994). This indicates that even in the post-Civil Rights era there persists a

disconnect between the ideal of housing integration and the actual preferences for living near people like ourselves.

The notion that segregation is due to stereotypes and preferences indicates an explanation of segregation detached from the one centered upon policies. One explanation argues that segregation is due to individual choices, while the other argues that this discrimination is socially structured. The HOLC and FHA policies served as the guidelines for home ownership and determined the eligibility rules in attaining home loans. Likewise, the practices by real estate brokers with respect to "steering" and "blockbusting" further indicate the widespread and codified incidence of housing segregation. However, an explanation stressing stereotypes overlooks the socially structured forms of discrimination tied to larger social processes. The point to keep in mind is that there is extensive evidence indicating that both Detroit and Portland experienced high levels of housing segregation, albeit within quite different contexts. Furthermore, many of the practices overlap such that even though the two cities vary on some important characteristics – major economic conditions and percent of African-American population – they have remarkably similar patterns of housing segregation. The defining difference seems to be the scope and magnitude of this segregation as Detroit stands as probably the premier example of a segregated city, while Portland is segregated but to a far less extent.

Wealth Segregation in Detroit and Portland

Because the research upon wealth segregation is relatively new and because much of the data used in the analysis of wealth is difficult to obtain, the historical evidence

concerning wealth inequality in individual cities is limited. However, some general observations concerning wealth segregation are available.

First, wealth includes multiple definitions. Some consider net worth—the value of assets in addition to income (ownership of automobiles, homes, real estate) —to be the most appropriate measure of wealth (Oliver and Shapiro 1995; Conley 1999). However, it can be argued that this is a misleading measure of wealth because there can be very different interpretations as to why these assets are valued. For example, someone whose home mortgage is paid may not value their home in terms of assets the same as one whom has recently purchased a home. The latter purchase may be a short-term buy in which the value of the home, and the profit made upon the future turnaround sale of the home, may be used to upgrade to a larger or more luxurious home. In short, assuming that home equity necessarily reflects a financial resource to every homeowner in the same manner represents an empirical inaccuracy (Oliver and Shapiro 1995). An alternative measure of wealth is net financial assets. Oliver and Shapiro (1995) indicate that net financial assets are those assets available for cash liquidation. Specifically, net financial assets exclude the equity associated with home ownership and vehicle ownership. The resulting difference between the two measures of wealth is that those resources associated with net financial assets could serve as a means to immediate income. Although both depict measures of wealth, net assets represent a type of wealth linked to inheritance for future generations, while net financial assets are the best estimate of immediate wealth (Oliver and Shapiro 1995).

Recent research indicates that White and African-American families hold drastically different amounts of wealth. For example, the poorest white households

control nearly as much wealth as do the wealthiest African-American households (Oliver and Shapiro 1995). In fact, the distribution of net worth is so unbalanced that African-American net worth would have to increase threefold to equal that of White net worth (Oliver and Shapiro 1995). Conley argues that this disparity is so powerful because wealth "has the ability to pick up both the current dynamics of race and the legacy of past inequalities that may be obscured in simple measures of income, occupation, or education" (1999: 6). All of this indicates that there is a racial component to wealth and that the effects of wealth inequality accumulate over time because the very nature of wealth, as opposed to income, is intergenerational. Because of this generational component, some argue that wealth is an advantageous measure when compared to income because it more precisely captures social class.

As the discussion above notes, Detroit's history of deindustrialization and housing segregation has specific impacts upon African-Americans. The prevalence of home ownership exhibits a similar pattern. In Detroit in the late 1930s, a comparison of two African-American communities reveals home ownership levels of 37% and 10% (Sugrue 1996). These statistics are important when one considers that the figure of 37% is from the African-American part of the west side, which was considered the African-American middle-class suburb. These figures are compared to rates of those neighborhoods graded "A," which were inevitably white neighborhoods—the HOLC records indicate home ownership never falls below 60% in these neighborhoods (National Archives and Record Administration, Detroit, Record Group #195.3). This is not to say that there are no African-American neighborhoods with high rates of home-ownership (in fact, some have rates of nearly 100%) but this is indeed a rare occurrence when compared to the levels of

home ownership in white neighborhoods. The HOLC records document that a majority of the "D" rated neighborhoods fall below the 40% mark in home ownership.

The HOLC documents for Portland reveal a similar pattern but do so in perhaps more striking terms. For the neighborhoods receiving a grade of "A" there is no neighborhood falling below a home ownership rate of 70%. In comparison, in those neighborhoods with a rating of "D" the highest rate of home ownership is 58%, while the lowest is a meager 8% (National Archives and Record Administration, Portland, Record Group #195.3). Although these estimates are only crude summaries, these rates of home ownership indicate the vast differences in home ownership largely along racial lines in both Detroit and Portland in the late 1930s. If wealth, as expressed in home ownership, accumulates over time, then these initial data points serve as precursors of wealth inequality in both cities.

Recent census data indicates that the differences in home ownership between races continue. Statistics reveal an interesting trend in which Whites maintain a stable rate of home ownership, while African-Americans are losing ground. For the years 1960-1980 in Detroit 73% of residences consisted of owner-occupied dwellings and this figure remained relatively unchanged for the period 1970-1990 at 72%. From 1960-1980 68% of white homes were owner-occupied and this increased to 69% in the period from 1970-1990. For the same time periods, the percentage of owner-occupied dwellings decreased among African-Americans from 58% to 53%.

The trends in Portland are nearly identical, but the drop in African-American owner-occupied housing is even more striking. From 1960-1980 roughly 64% of homes were owner-occupied and this fell, slightly, to 61% between 1970 and 1990. For Whites,

the percentage of owner-occupied dwellings remained relatively stable over these time periods with the figures being 64% and 63%, respectively. What is striking is the extreme drop in the percentage of owner-occupied dwellings between 1960-1980 and 1970-1990 among Blacks: there is a 9% decrease in the percentage of owner-occupied homes from 58% to 49%. The statistics over the entire time period under consideration for this research indicate differences among home ownership between African-Americans and Whites and that these differences continue even into contemporary times.

Although poverty is a distinct phenomenon and, many argue, maps directly onto the economic segregation of deindustrialization, it also represents an absence of wealth. Although it is possible that wealthy individuals within a community exhibit high levels of poverty it is not likely and, in fact, it would be anomalous in comparison to the rest of the neighborhood. Thus, the trends of increasing poverty in Detroit in the 1970s and 1980s may be directly attributable to the combination of deindustrialization and the intergenerational effects of wealth accumulation. In Detroit, between 1970 and 1980, those tracts qualifying as high-poverty tracts more than doubled in size from 22 tracts to 44 tracts (Sugrue 1996). It is not surprising then that the percentage of poor living within the tracts increased from 10.8% to almost 20% from 1970 to 1980 (Sugrue 1996). Although these figures are not race specific, the fact that a high proportion of Detroit's inner city population is African-American assures that Blacks feel poverty's most severe effects.

Portland, historically speaking, is geographically divided into "the haves" and "the have-nots" – the west side of Portland is considered the affluent section of the city, while the east side is largely seen as less affluent (Abbot 2001: 68). More specifically,

the Albina neighborhood, which houses the largest proportion of African-Americans, stands as the least affluent section of the city. However, despite the HOLC home ownership documents indicating a racial divide on this measure, Abbot notes the intersection of poverty and race in Portland: "Poverty is a problem for black Portlanders, but Portland poverty is largely white" (2001: 99). The implication of this statement is that whereas in Detroit there are distinct demarcations between the races on indicators of wealth and poverty, the divisions in Portland, though containing racial markers, are structured more by class.

Although wealth is difficult to measure and there are few historical examples of research interrogating the development of wealth in specific cities, this snapshot provides an indication of how wealth operates within the context of the historical development of urban areas in the 20th century. These issues will be more fully developed in the results section as a longitudinal analysis of wealth and its association with the development of environmental inequality will be assessed.

Landfills in Detroit and Portland

Even though the social histories of Portland and Detroit greatly diverge from one another in certain respects, the history of landfill and superfund sites overlap considerably. These commonalties reflect the fact that all municipalities are forced to deal with the common problem of where to dispose of waste. Furthermore, it points to the importance of federal regulations regarding what is considered a public health nuisance. Nonetheless, there are some important distinguishing features between Detroit and Portland.

The amount of waste a person produces in a year sheds insight onto the growing problem created by waste. In the 1950s the average American citizen created roughly 2.5 pounds of waste per day, while that number had risen to 4.4 pounds by 1997 (HomeEcology.org 2004). It is not a surprise, then, that as the amount of solid waste increased there was a corresponding increase in the number of regulations imposed upon the storage of wastes.

Prior to 1965, there existed no federal regulations guiding the oversight of what were then called "dumps." Despite this lack of regulation, there were nearly uniform practices in dealing with the waste generated by humans on a daily basis. In the 1930s and 1940s, the most prominent mode of disposing of wastes was in "open dumps." Here there were two major practices: simply providing an open space for the storage of garbage left relatively unattended and the practice of open burning of refuse (Hickman, Jr. and Eldredge 2001). Both types of disposal created unintended consequences. The major problem associated with open dumps was that they required immense tracts of lands. Because the waste was simply dumped on top of the land and required no compaction, the space needed for such an undertaking raised the early question of land space availability for future landfill operations (Metro Solid Waste and Recycling Department 2003). Open burning presented its own problems as it not only created air pollution, but also increased the spread of communicable disease (Metro Solid Waste and Recycling Department 2003).

In Portland, the most persistent example of an open dump (later transformed into a sanitary landfill) was St. Johns Landfill along the Columbia River. When originally opened and operated by the City of Portland in 1932 it comprised a body of water that

was “infilled” until the waste reached the edge of the surrounding dike (Metro Solid Waste and Recycling Department 2003). This open dump accepted oil sludge, incinerator ash, and all household and commercial waste (Metro Solid Waste and Recycling Department 2003). Because of the enormity of the site, it eventually became a sanitary landfill regulated under federal guidelines, but its existence as an open dump in a major water supply underscores the possible health problems associated with the nation’s early waste facilities. Likewise, the Marlowe and Sons open dump which began operation in 1947 in Detroit had a “long history of complaints” related to its “history of smoke, rodent, and odor problems” (Michigan Department of Environmental Quality, internal documents).

Unauthorized dumps that incinerated waste were prominent in all cities, but the records on these facilities are incomplete in many instances. Perhaps the most egregious example of a burning dump in Detroit is the Mendrick dump. Despite the nuisance of the dump and “numerous complaints” a court order dated from 1968 provided the legal means to allow the dump to accept waste and incinerate parts of that waste despite having never been licensed to do so by the Michigan Department of Environmental Quality (MDEQ) (Michigan Department of Environmental Quality, internal documents).

Because of numerous studies recognizing the potential risks associated with open dumps, the Solid Waste Disposal Act was passed in 1965 by the federal government (Hickman, Jr. and Eldredge 2001; Pellow 2002) which marked the transition from open dumps to “sanitary landfills.” Although the act contained little in the way of actual authority over garbage disposal, it afforded provisions and grant opportunities for research, training, site surveys, and the demonstration of proper construction technique

for waste facilities (Pellow 2002). With the creation of the Environmental Protection Agency (EPA) in 1970, control and oversight of landfill activities shifted to this federal agency. However, there was still little in the way of regulations for landfill sites until the federal government passed the Resource Conservation and Recovery Act (RCRA) of 1976. With this legislation, the EPA provided the guidelines for waste disposal with communities and municipalities bearing the largest burden in the responsibility of waste disposal. Even though the EPA set guidelines meant to decrease health hazards associated with landfills, the EPA still lacked enforcement authority over these guidelines (Hickman, Jr. and Eldredge 2001). In denying this power to the EPA, the idea of "sanitary landfills" existed in name only. Not until 1984, under the Solid Waste Amendment of RCRA, was the EPA granted this regulatory authority; this authority was strengthened in 1993 when "subtitle D" of RCRA included the governing steps in the construction and operation of sanitary landfills (Metro Solid Waste and Landfill Department 2003).

The guidelines stemming from this set of government regulation of landfills included venting of methane gas to reduce its potential hazards, testing and prevention of leachite into groundwater by the use of plastic liners, and the compaction of waste with the use of 6 inch groundcover over the compacted waste on a daily basis (Metro Solid Waste and Landfill Department 2003; Hickman Jr. and Eldredge 2001). Despite these practices, even those facilities considered"state-of-the-art" raised health concerns. For example, the Killingsworth Fast Disposal (KFD) in Portland was operated as both a sand and gravel mine pit for close to 30 years and then was refurbished as one of the most modern disposal facilities ever constructed in Portland (Metro Solid Waste and Recycling

Department 2003). Yet despite these precautions, monitoring of the KFD facility continues because of the hazards produced by methane gas. Methane gas stands as one of the major hazards of landfill sites–even those constructed under heavy regulation and oversight–because the methane becomes combustible as it accumulates underground. If methane gas levels go unmonitored and unvented, they can spread to nearby residential neighborhoods causing severe health hazards (Metro Solid Waste and Recycling Department 2003).

The four county area comprising the Detroit metroplex (Wayne, Oakland, St. Clair, and Macomb Counties) contains a total of 136 former and current landfill and dump sites for which the Michigan Department of Environmental Quality has records (Michigan Department of Environmental Quality, internal documents). However, the amount of information available on each site varies greatly. For the purposes of this dissertation only 76 of these sites will be analyzed.[13] Likewise, in the three county area comprising the Greater Portland Metro Area (Multnomah, Washington, and Clackamas Counties) a total of 42 former and current landfill locations have been identified. Of these, 29 sites include enough contextual information to be included in the analysis.

The history and development of the sanitary landfill and its role as the main storage facility for solid waste reveals not only the fact that the regulations needed were long in coming, but also that even when implemented the policies cannot guarantee the

[13] The historical records at the MDEQ contain useful information on each site including its location, start date (i.e. date that dumping began regardless of regulations), stop date, permit date, and the year capped. However, many files are incomplete and do not contain the most important types of information such as a location or the start dates. The same types of missing information apply to the Metro Solid Waste and Recycling Department documents as well. The discrepancy in both cities between the total number of landfills and the number included in the analyses here are based upon the crucial information needed; this includes the landfill location and the open/close date. If this information could not be determined then the landfill was not included in the analyses. Here, however, I wanted to give an overall assessment of the landfill situation for each metro area despite missing information.

prevention of possible health hazards associated with solid waste. Given that the possible health concerns associated with landfills can persist for up to three decades after a landfill has closed its doors an understanding of these facilities and their connections to environmental inequality requires historical analysis (Metro Solid Waste and Recycling Department 2003).

Superfund Sites in Detroit and Portland

Although the history of landfills is one in which there are many commonalties between cities, the development of "Superfund" sites stem from a single hazardous event. Love Canal still stands as one of the most evocative examples of the detrimental effects of environmental pollution. After having spent more than a decade using a closed canal as the dumping grounds for its toxic chemical waste, The Hooker Plastic and Chemical Company covered over its dump site with clay and sold the land to the Niagara Falls, New York School Board for $1. It is worth mentioning that the contract contained a clause relieving the Hooker Plastic and Chemical Company of any liability for injury or property damage on the land (Harper 2004). On top of the very site where the company had dumped toxic chemicals for decades, the city of Love Canal built an elementary school with houses surrounding the school. By the 1970s the pervasive odor, the skin irritation of both children and dogs, and an alarming cancer rate sparked community action. Eventually, the site's toxic waste was uncovered and, after much denial, the executives of the company admitted to having illegally dumped chemicals in the canal. In 1979, President Jimmy Carter declared the entire town a federal disaster area and all the families who remained were relocated. This single incident and its devastating

consequences led to the passage of the legislation that became known as Superfund in 1980 -- the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Because the clean-up was so expensive and Love Canal presented a clear-cut example of corporate malfeasance, the fund called for oil and chemical companies (the main contributors to this type of toxic production) to pay a tax for the future clean-up of orphaned facilities. Since its inception, the Superfund Act has changed, but the main tenets remain intact–polluters pay for the clean-up of what many regard as the most egregious examples of industrial waste.[14]

Superfund is a constantly changing list due to sites added or deleted from the list along with those marked for remediation. In all, the federal government has placed over 32,000 sites on the Superfund list since 1980. Of these sites, the National Priorities List (NPL) includes more than 1,300. These NPL sites receive priority in remediation and their placement upon this list is based upon acquiring a threshold score of 28.5 on the Hazardous Ranking System (HRS). This score is comprised of three main categories: 1) the existing or potential release of hazardous material into the environment; 2) the toxicity and quantity of the waste involved; 3) the surrounding natural environments and the surrounding communities in danger (U.S. Environmental Protection Agency 2003). Of the more than 1,300 sites placed on the NPL between 1980 and 2000, the federal government touts 757 sites as remediated.[15]

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[14] It should be noted that the Bush Administration has refused to reinstate the polluter pays tax of oil and chemical companies that has served as the funding source for Superfund. The tax expired in 1995 while Congress was controlled by Republicans and the Bush Administration has steadfastly refused to reinstate it. The implications are that a higher proportion of Superfund clean-up costs will be transferred to taxpayers (U.S. PIRG Education Fund and the Sierra Club 2004).

[15] Love Canal was recently removed from the Superfund list. After 21 years and $400 million the site has been determined to be clean by the EPA (DePalma 2004).

Because of its standing as an industrial base, it is not surprising that many toxic places remain in Detroit's wake after deindustrialization. There are 98 locations in the four county Detroit area on for the Superfund list. Of these 98 sites, 87 are considered non-NPL sites (i.e. the HRS score is below 28.5), while 3 facilities have been deleted from the NPL list, and the remaining 8 are on the Final NPL list. In contrast, and partly due to its lack of an industrial past, Portland has only 29 sites on the current Superfund list. Of these 29 sites, 22 are non-NPL sites, 2 have been deleted from the NPL list, and 5 remain on the final NPL list (U.S. Environmental Protection Agency 2003).

Although it is premature to make sweeping statements concerning these cities based upon the number of landfills and Superfund sites, an overview of these facilities, and their numbers, provides a measuring stick for the amount of waste and toxic residue left behind in the latter half of the 20th century in these two cities.

Research Questions

This chapter concludes with a brief discussion of the questions that I will address in the chapters that follow and a brief explanation of how I will approach the analyses that follow.

The first set of research questions address the major issue in environmental inequality research: are landfill and Superfund sites disproportionately placed in those communities comprised of higher percentages of minorities and poor people? The implication of this question is that minority and poor populations are targeted for unwanted hazardous facilities. Unlike most previous studies, the analyses address this question over multiple years from 1940 to 1990 in both Portland and Detroit. Although it

is impossible to address the contextual and historical explanations for these locations' selection as waste sites over alternative locations, the patterns within each city suggest explanations for the selection of these locations. Within this context, I will evaluate the impact of economic segregation, racial segregation, and wealth segregation in predicting landfill and Superfund presence. The analyses that follow are organized into historically relevant panel designs. Chapter 5 presents the results from this set of research questions.

A secondary set of analyses attempt to answer the question of the time ordering of landfill sitings.[16] After a landfill is in place, how does the surrounding community change? Although this is a secondary aspect of the analyses, it is not an inconsequential matter. The implication is that unintentional siting removes all responsibility from those determining the landfill's location and can be interpreted as an absence of environmental inequality (Been 1993). However, this same set of circumstances suggests a deeper level of inequality in which the market itself is inequitable–that is, life chances empower the affluent to move away from a landfill, while the less affluent are constrained to remain near (or move nearby to) a landfill. However, to address this set of issues the empirical question of which appears first – the landfill or the people – must first be resolved. Thus, for each city analyses investigate whether sociodemographic changes occur after the siting of a landfill. Chapter 5 concludes with a brief explanation of this secondary set of questions.

[16] For reasons explained below, it is not possible to provide a comparable set of analyses for Superfund sites.

CHAPTER FOUR

DATA AND METHODS

The major debate in environmental sociology centers upon the inequitable siting of hazardous facilities near minority and poor populations in urban centers. The analyses focus upon the location of landfill sites in the period spanning 1940 to 1990. Because of data limitations, an investigation of Superfund sites is possible only for the years 1970 to 1990. The contribution of the analyses is threefold: 1) a longitudinal analysis of the factors predicting landfill and Superfund location; 2) a test of the theoretical contributions of racial, economic, and wealth segregation explanations on environmental inequality outcomes; 3) an accounting of the changes in socioeconomic conditions following the siting of a landfill.

The empirical results that follow weigh the relative predictive importance of racial segregation, economic segregation, and wealth segregation models in explaining the subsequent siting of landfill and Superfund sites. Measuring the racial effects in the inequitable siting of unwanted hazards traditionally includes the percentage of African-Americans as the major independent variable (see Mohai 1995; Szasz and Meuser 1997). This measure, along with the percentage of Hispanics (when available), is included in the analyses that follow. Massey and Denton (1993) assert that much of contemporary inequality stems from institutionalized forms of segregation—the redlining procedures enforced and enacted by the HOLC stand as one such example of historically institutionalized racial discrimination. Because of the institutional influence of the HOLC redlining procedures and their subsequent impact upon federal lending

procedures, those census tracts originally redlined are indicative of racial segregation. Thus, the logistic regression models that follow utilize three measures of racial segregation: percent African-American, those tracts originally redlined, and percent Hispanic (when available).

Although race plays a role in the formation of inequality, Wilson (1978, 1987, 1996) argues that racial segregation has declined in significance in the face of increased economic segregation. As the earlier discussion of deindustrialization indicates, especially with respect to Detroit, there are multiple indicators of this process. Wilson argues that economic segregation is associated with multiple outcomes: these include, but are not limited to, increased rates of poverty, increased rates of unemployment, increased numbers of families on welfare, fewer educational opportunities and increased numbers of female headed households (Wilson 1996). Unfortunately, all of the indicators associated with Wilson's conception of economic segregation are unavailable for all years under consideration for this research. Additionally, the variables of importance identified by Wilson are highly correlated thereby presenting issues of collinearity. To reduce collinearity, the construction of an index of economic deprivation includes a series of variables associated with economic segregation (a detailed accounting of these procedures appears in the next section). If Wilson's thesis is applicable to environmental inequality, one expects that landfill and Superfund sites will be located in those tracts suffering from higher levels of economic deprivation.

Oliver and Shapiro (1995) and Conley (1999) argue that wealth, as exhibited by home ownership, captures the cumulative effects of wealth segregation and provides a more precise measure of social class over income. This cumulative effect encapsulates

both historical racial inequality (segregation) as well as the structured access to wealth affecting life chances. There exist limits to wealth—however, because there is agreement that home ownership characterizes a reliable indicator of wealth, the percentage of owner-occupied housing units in a census tract is employed as a proxy for wealth segregation. The wealth segregation explanation of environmental inequality predicts that those locations exhibiting lower levels of owner-occupied housing are more likely to house a landfill or Superfund facility.

Structure of the Data

One of the reasons many environmental inequality studies eschew longitudinal analyses is because of the complexity of organizing such a data set. This challenge is particularly severe when featuring a small unit of analysis such as census tracts. The strength of census tracts is that they represent relatively stable demographic measures over time–that is, census tracts change boundaries over time so that the total population within a census tract maintains relative stability. For example, in both Detroit and Portland the average census tract contains roughly 3,200 people between 1940 and 1990. There exist tracts that have far more (e.g. a tract in Detroit averages 15,000 residents between 1940 and 1990) and some that have far fewer (e.g. a tract in Portland averages 185 persons between 1940 and 1990). However, the very strength of this unit of analysis creates complexities in using this data longitudinally if the physical land in question becomes of significance. In order to maintain this stability within census tracts, the Census Bureau finds it necessary to change the physical boundaries of a census tract from year to year. For example, as urban tracts became more populous between 1960 and

1980 a single tract separated into multiple tracts in an attempt to keep consistent demographic features over time even though the actual geographic boundaries changed.

Changing geographic boundaries creates some unique problems in this study. Because this study queries a specific piece of land over time it is necessary to find some means of "normalizing" a tract of land over time and then to match census boundaries to this piece of land. For this study, I have normalized all census tracts between 1940 and 1980 to 1990 census tracts. In many suburban tracts this is a relatively straightforward process as the tracts in these areas change little. However, in urban areas this creates some challenges. To resolve this problem 1990 census tracts are identified and used as the piece of physical land to match all previous decades based upon their geographic location.

In order to illustrate the structure of the data in overcoming this problem I will provide a hypothetical example. A tract that is a single tract in 1980 (Tract 1) becomes two tracts in 1990 (Tract 1.1 and Tract 1.2). First, a geographical link between the single tract in 1980 with the two tracts in 1990 is necessary—Geographic Information Systems provides an easy means to complete this task. After making these geographic matches, it is then necessary to recalculate the data values so the data for the single census tract in 1980 can be "normalized" to meet the 1990 boundaries. To meet these criteria, I match up the census tracts and then systematically split the single tract's data values into two—that is, I divide the tract's raw numbers in half. In our hypothetical example, we assume that Tract 1 in 1980 contains 400 people. Thus, splitting this tract allows the ability to normalize it to 1990 standards such that these 400 people are divided into two groups of

200. Thus, the organization for the total population for Tract 1 in 1980 takes on the following characteristics:

Table 2: Hypothetical Example of Census Tract Changes

1980 Tract	Total Population	1990 Tract	Total Population
Tract 1	200	Tract 1.1	375
Tract 1	200	Tract 1.2	348

This procedure was followed for both cities in organizing the data from 1940-1980 so that the quantitative data could be matched with the geographic boundaries for 1990. It is fully recognized that this system of organizing the data could bias the estimates of the values in a given census tract. For example, it is entirely possible that tract 1 in 1980, if divided along the lines of the 1990 tract, contained 350 persons in part 1.1 while part 1.2 contains only 50 persons. However, it is impossible to determine the actual values. Thus, I have systematically organized the data in this way – the estimates may be inaccurate at times but the systematic organization of the data allows comparisons across time and space.

It is worth noting that Portland census tracts only contract geographically – that is, as tracts become more populated a single tract later becomes multiple tracts. This is also true of Detroit with some exceptions. Following 1970 (and especially 1980) there are some tracts, especially within the inner city, that geographically change in the opposite direction because of depopulation—multiple tracts become a single tract. In this case, I follow the reverse procedure adding together, rather than dividing, the raw data values. Based upon the procedures described above, both Detroit and Portland are "normalized"

to 1990 geographic boundaries. The analyses that follow are based upon the total number of census tracts in existence in each city for 1990—a total of 268 census tracts in Portland and 1117 census tracts in Detroit.

Tables 3 and 4 display summary statistics, by decade, using variable means and standard deviations for Detroit and Portland over the period of the analyses presented in this dissertation. These charts also indicate the multiple sources of data, but a brief overview is in order. As previously mentioned the redlining material stems from archival data collected from the National Archives. The collection of the Superfund data occurred via the internet from the Environmental Protection Agency. The two sources for landfill data are agencies within Oregon and Michigan. Portland's landfill data is culled from records provided by the Metro Solid Waste and Recycling Department, while I gathered Detroit's landfill data on site from the Michigan Department of Inequality. The remaining data are Census data organized through a geographic data source: Geolytics, Inc.

Additionally, it is important to recognize that these data contain missing values in many instances – a common problem in data spanning multiple decades. When possible, I imputed data for missing cases – the statistical package used in this analysis is able to predict missing data values based upon subsequent values on the same variable. For example, some tracts in 1940 and 1950 contained missing values on the percentage of African-Americans. The basis for the imputation of values rests upon the values that occurred in the same tract in subsequent years. It is not possible to impute values for a variable that is entirely missing – such as percent Hispanic prior to 1970 – and so imputed values are applicable only in those cases where a variable is present, but that

contains missing cases. During the imputation of these values, I created a dummy variable for those cases with missing data. In order to alleviate concerns over bias using these imputed values all models were run to check for bias. First, all models were run with the imputed values and with the dummy variables for missing cases. The dummy variables for missing cases were not statistically significant indicating the stability of the imputed values. Additionally, models containing imputed values and models without these additional values indicate that the direction and significance of theoretically relevant variables remains unchanged. Both of these tests suggest greater confidence in the imputed values as non-biased.

Table 3: Summary Statistics for Detroit, 1940-1990[17]

			1940		1950		1960		1970		1980		1990	
Variable	**Unit**	**N**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Dependent Measures														
Landfill Present *	Dummy; Present = 1	1117	.001	.03	.004	.06	.02	.12	.03	.17	.03	.17	.02	.15
Superfund Present **	Dummy; Present = 1	1117	---	---	---	---	---	---	---	---	--	--	.08	.26
Independent and Control Measures														
African-American***	Percentage of census tract total population	1117	.03	.11	.05	.16	.10	.23	.14	.29	.21	.34	.26	.38
Hispanic***	Percentage of census tract total population	1117	---	---	---	---	---	---	.01	.02	.02	.03	.02	.04
Redlined Community****	Dummy; Redlined in 1939 = 1	1117	--	--	--	--	--	--	--	--	--	--	.11	.31
Economic Deprivation***	Economic Deprivation Index	1117	-.17	.64	-.36	.64	-.30	.80	-.20	.90	-.10	.94	-.004	.96
Owner-Occupied Housing***	Percentage of homes occupied by owner in census tract	1117	.60	.17	.72	.20	.73	.21	.73	.24	.72	.23	.68	.23
Total Population*** (natural log)	Total population within census tract	1117	7.70	1.28	7.99	.95	7.86	.88	8.08	.70	8.12	.56	8.08	.58
Waterways	Dummy; Tracts contiguous to navigable waterway	1117	--	--	--	--	--	--	--	--	--	--	.02	.04
Railroad/Highways	Dummy; Tracts contiguous to railroad and/or highways	1117	--	--	--	--	--	--	--	--	--	--	.16	.36

*Michigan Department of Environmental Quality. 2003. Internal Records.
**U.S. Department of Environmental Protection Agency. 2000.
***Geolytics, 2001.
****U.S. National Archives and Record Administration (Record Group #195.3).

[17] In the two tables that follow, economic deprivation is an index derived from factor analyses. It includes the z-score for a number of variables that are collinear. Additionally, the variables percent African-American, economic deprivation, percent owner-occupied, and total population all include imputed values for missing data.

Table 4: Summary Statistics for Portland, 1940-1990

			1940		1950		1960		1970		1980		1990	
Variable	**Unit**	**N**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Dependent Measures														
Landfill Present *	Dummy; Present = 1	269	.01	.12	.04	.20	.05	.21	.07	.26	.03	.18	.01	.10
Superfund Present **	Dummy; Present = 1	269	---	---	---	---	---	---	---	---	--	--	.07	.26
Independent and Control Measures		269												
African-American***	Percentage of census tract total population	269	.003	.009	.02	.05	.02	.09	.03	.11	.04	.11	.05	.12
Hispanic***	Percentage of census tract total population	269	---	---	---	---	---	---	.01	.01	.02	.02	.03	.03
Redlined Community****	Dummy; Redlined in 1939 = 1	269	--	--	--	--	--	--	--	--	--	--	.10	.29
Economic Deprivation***	Economic Deprivation Index	269	-.08	.72	-.22	.76	-.08	.94	-.10	.97	-.10	.96	-.03	.92
Owner-Occupied Housing***	Percentage of homes occupied by owner in census tract	269	.58	.15	.69	.19	.69	.19	.65	.20	.63	.20	.60	.20
Total Population*** (natural log)	Total population within census tract	269	8.00	.49	8.22	.41	7.72	.66	7.95	.56	8.16	.51	8.23	.62
Waterways	Dummy; Tracts contiguous to navigable waterway	269	--	--	--	--	--	--	--	--	--	--	.14	.35
Railroad/Highways	Dummy; Tracts contiguous to railroad and/or highways	269	--	--	--	--	--	--	--	--	--	--	.16	.37

*Metro Solid Waste and Recycling Department. 2004.
**U.S. Department of Environmental Protection Agency. 2000.
***Geolytics, 2001.
****U.S. National Archives and Record Administration (Record Group #195.3).

Dependent Measures

Total Exposure of Landfill Presence. This dependent measure rests upon two criteria: 1) presence of a landfill in a census tract and; 2) a tract lying contiguous to a tract housing a landfill. With these criteria in mind, I created a dummy variable measuring those tracts housing a landfill and those tracts directly surrounding that tract. Since landfills create hazardous odors and contaminate water and land beyond the boundaries of a census tract this measure captures the impacts of landfills beyond its physical borders. In most instances, this variable is straightforward—if a landfill was present in Detroit in 1970 then it is coded as present (present = 1) in the tract it occupies for that year.[18] Additionally, those tracts that directly touch a tract housing a landfill are also coded as 1 to account for the impact of a landfill on nearby tracts.[19] In essence, this measure captures the total exposure of a landfill to the tract encompassing that landfill and the nearest surrounding areas. Table 5 provides information, for each decade, on the number of landfills along with the number of census tracts housing a landfill – this second point of information provides one dimension of the clustering of landfills in a given decade. Landfills increased in both Detroit and Portland up until 1970 with a steady decline in the number of active landfills in each subsequent decade.[20] Over the historical time period

[18] However, there are instances in which a landfill opens and subsequently closes between Census collection years. For example, the Saltarelli Landfill in Detroit opened in 1976 and closed in 1979; thus, this landfill does not fit into either 1970 or 1980. However, on the assumption that a landfill leaves behind some remnants after its closing I have coded these landfills in the year following their closure. In the case of the Saltarelli Landfill it was coded as present in 1980. For Detroit, there exist a total of 9 landfills coded in such a manner comprising 12% of the data. In Portland, this is not as prevalent as only 2 in 29 landfills are coded as such (for a total of 6% of the data).

[19] Multiple coding schemes were utilized, but the results for alternative coding schemes are not used here. For example, one coding scheme provided a score of 1 to those tracts housing a landfill and a score of .5 to those contiguous to tracts housing a landfill, while all other tracts were coded 0. The results of these various coding schemes do not differ greatly so the simplest coding scheme is utilized.

[20] It should be noted that the large increase in the number of landfills, especially apparent in Detroit, in 1970 is partially due to changes in federal laws – the Solid Waste Disposal Act of 1965 produced a more systematic accounting of "sanitary landfills."

under consideration, Detroit contains 76 total landfills while Portland houses 29 total landfills.[21]

Table 5: Presence of Landfills by Decade in Detroit and Portland[a]

City	1950	1960	1970	1980	1990
Detroit	5 (4)	20 (17)	41 (32)	38 (33)	24 (24)
Portland	11 (11)	13 (13)	21 (20)	10 (9)	3 (3)

[a]Numbers in parentheses indicate the number of census tracts containing landfills.

Total Exposure of New Landfills. One of the historical questions largely neglected in the existing literature deals with the time ordering of landfills. With the data collected for this research, it is possible to account for the presence of new landfills. A second dependent measure on landfills is created to identify the processes underlying the selection of a new landfill site as separate from the overall presence of a landfill (whether new or existing). The coding scheme of these landfills mirrors that utilized in the total exposure of a landfill.

Total Exposure of Superfunds. As a point of comparison to landfills, a presentation of analyses on Superfund sites is also included. The construction of this dependent measure is identical to the coding scheme described above for landfills. Due to lack of data availability, the facility start and close dates are unavailable for all cases, thus the analyses for this dependent measure are only applicable for facilities present in 1990. In 1990, 10% of tracts in Detroit and 11% of tracts in Portland contained a Superfund site. There are 79 total census tracts housing a total of 120 Superfund sites in Detroit, while 19 census tracts contain a total of 29 Superfund sites in Portland.

[21] However, the total number of landfills is not reflected in Table 4 because a landfill can persist for a number of decades thus the summed total across decades does not equal the overall total number of landfills for each city.

Change Scores – Percentage Change in African-Americans, Percentage Change in Hispanics, Percentage Change in Owner-Occupied Housing, and Change in the Economic Deprivation Index. In order to assess the impact of a landfill upon subsequent changes in socio-demographic characteristics, the construction of four measures to reflect change scores is utilized. In accounting for changes in the presence of African-Americans, Hispanics, and owner-occupied housing following the presence of a landfill the analyses include change scores for each of these variables. For example, to measure the changes in the presence of Blacks after a landfill's presence in 1960, I subtract the percentage of African-Americans in 1980 from the percentage of African-Americans in 1990. The result is a change score for the percentage change in African-Americans between 1990 and 1980. The same method is utilized to calculate a percentage change score for Hispanics and owner-occupied housing, while a change score (though not a percentage change) is calculated for the increase or decrease in the economic deprivation index.

Independent and Control Measures

Percent African-American and Percent Hispanic. This variable reflects the percentage of African-Americans and Hispanics within a census tract. The percentage of African-Americans in Detroit slowly increases through the decades as it starts at a low of 3% in 1940 with an increase to 26% by 1990. In contrast, the percentage of African-Americans in Portland is well below 1% in 1940 and reaches 5% in 1990.

Until recently, acquiring consistent data on the percentage of Hispanics in census tracts proved difficult. However, from 1970-1990 these data became more reliable and readily available. Hence, for those analyses from 1970-1990 the impacts upon Hispanics are measured with the percentage of Hispanics in a census tract out of the total population for a census tract.[22] Both Detroit and Portland have similar percentages of Hispanic persons. In neither city does the percentage of Hispanics ever rise above 3%.

Because the analyses below include multiple decades in each panel, the percentage of African-Americans is averaged together for the decades under consideration. That is, when the analysis centers on the years from 1940-1990 the average percentage of African-Americans between 1940 and 1990 is utilized as the independent measure. The same average measure is utilized for Hispanics.

Redlined Tract. Those neighborhoods originally redlined by the HOLC in 1938 and 1939 provide the basis for a historically and theoretically important variable – that is, a dummy variable (1 = redlined neighborhood) is constructed to pinpoint those tracts originally marked as redlined by the HOLC.[23] Redlined neighborhoods represent those neighborhoods least likely to receive HOLC loans and those neighborhoods containing a much higher proportion of racial and ethnic minorities. Because of the "normalization" of all tracts to 1990 census tracts, there exists only a single measure for all years under study. That is, the tract of land in existence in 1990 comprising redlined areas for the

[22] It should be noted that it is not possible, with these data, to divide the Hispanic population into racial subgroups. This is problematic because this could lead to double counting some individuals; thus, the results using percent Hispanic should be viewed cautiously.

[23] Constructing this variable required some approximations because the 1938 and 1939 neighborhoods for Portland and Detroit, respectively, do not completely overlap with those census tracts in the years that follow. The 1938/39 neighborhoods represent geographically larger areas than census tracts; therefore, those tracts that overlapped with a redlined neighborhood, by approximately 50%, were coded as redlined in 1938/39.

maps of Portland in 1938 and Detroit in 1939 are coded as 1. All codes for the remaining tracts equal zero.

Urban Center/Suburbs. In addition to a variable for redlining, some models include an alternative set of dummy variables in helping predict landfill and superfund sites when these facilities are not located within redlined tracts. In both Detroit and Portland, ALL of the redlined tracts are located within the urban center of the city – this larger urban center comprises the "old city." Even though there were non-redlined areas within the city limits in 1940, both cities underwent growth to suburban areas in subsequent years. To account for these geographical and historical changes those tracts that were located within the city in 1940 but that were NOT redlined are coded as 1. Additionally, a second dummy variable identifying those tracts that appear AFTER 1940 and that are outside the city proper as defined in 1940 are coded as 1. In the models that follow, one of these three dummy variables is absent from the model to provide a comparison – that is, some models include the redlined tracts from the "old city" along with the suburban tracts that appeared after 1940 while other models include tracts from the "old city" that were NOT redlined along with the suburban tracts appearing after 1940. This provides a way to determine whether landfills are located within the urban center or the surrounding suburban area and, if included within the "old city," whether there is a relationship between redlined or non-redlined census tracts.

Percent Owner-Occupied Housing. Because there is no direct measure of wealth in census data, the percentage of homes occupied by the owner serves as a proxy for wealth.

The summary tables above indicate that in both Detroit and Portland home ownership follows a curvilinear pattern. That is, home ownership rises dramatically through the 1970s, then slowly begins to decline, and then stabilizes by 1990. Both cities exhibit similar trends in owner-occupied housing. As described above, the percentage of owner-occupied housing is averaged over multiple decades to provide a measure of owner-occupied housing over multiple decades.

Economic Deprivation Index. In addition to accounting for the significance of race in landfill and Superfund siting, it is necessary to weigh multiple socioeconomic indicators. These socioeconomic indicators broadly represent social class measures consistent with Wilson's (1978, 1987, 1996) conception of economic disadvantage in inner cities. However, these independent variables present collinearity issues. Specifically, the percent unemployed, percent living below the poverty line, percent without a high school diploma, the percent employed as an executive, and average income all produce high correlations with each other across the decades under study.[24] Principal components factor analysis provides the baseline for the construction of an index. Based upon this factor analysis, I combine those variables associated with deindustrialization to form an index of economic deprivation. This deprivation index represents a more thorough and concise measure of economic inequality (Mosher 2001). Table 6 (below) presents the results of the principal components factor analysis which reveals that all the economic

[24] During some decades these same variables are also highly correlated with both percent African-American and the percentage of owner occupied housing. However, since both of these independent variables are theorized to account for other dimensions of segregation, racial and wealth segregation respectively, they are not included in the economic deprivation index. There exists no data for poverty prior to 1963. However, using the U.S. Census Bureau (2003) "Historical Poverty Table" I was able to estimate these values for 1950 and 1960 and they are included in the estimates for the economic deprivation index.

deprivation variables load at .65 (+ or -) or higher.[25] A factor loading for percent living below the poverty line in 1940 is unavailable and is not included in the deprivation index for that year. Likewise, average income data is not available for the years 1940, 1950, and 1960 and is not included in the index for those decades.

Based upon these factor loadings an economic deprivation index is created that represents a more comprehensive, though not all inclusive, measure of deindustrialization indicators while simultaneously reducing the problem of collinearity. In constructing this index each variable in the deprivation index is multiplied by its specific factor loading in order to weigh each specific variable, thereby creating a z-score which accounts for the different metrics involved (Mosher 2001). These scores are then combined to form a single measure of economic deprivation across multiple dimensions of socioeconomic status.

For those analyses below in which several decades are included in the model the average of the economic deprivation index is included in the analysis. This is consistent with the measures of race and owner-occupied housing as described above.

[25] It should be noted that there are three exceptions to the .65 loadings. For Portland in 1960, percent unemployed loads at .61. In 1950 Detroit, percent unemployed (.62) and percent poverty (.49) both have a principal component loading below .65. Despite these exceptions, these variables are included in the deprivation index for these years because of the overall trend of collinearity among these variables in other years and to maintain consistency in the deprivation index across the years of analysis.

Table 6: Factor Loadings of Economic Deprivation Index

	1940		**1950**		**1960**		**1970**		**1980**		**1990**	
Variable	Detroit	Portland	Detroit	Portland	Detroit	Portland	Detroit	Portland	Detroit	Portland	Detroit	Portland
Percent Unemployed	.76	.80	.62	.84	.82	.61	.70	.77	.86	.68	.87	.67
Percent Living Below the Poverty Line	---	---	.49	.74	.80	.82	.75	.77	.80	.77	.89	.77
Percent without a High School Diploma	.85	.90	.65	.91	.88	.92	.86	.88	.88	.86	.89	.77
Percent Employed as Executive	-.76	-.66	-.70	-.82	-.74	-.69	-.76	-.74	-.75	-.75	-.79	-.70
Average Income	---	---	---	---	---	----	-.88	-.88	-.82	-.79	-.81	-.76
Eigenvalue	1.89	1.90	1.54	2.76	2.63	2.38	3.14	3.27	3.39	2.99	3.63	2.70

Total Population. The natural log of total population of a census tract is utilized as a control variable to account for variations in population amongst census tracts.[26] However, because much toxic waste generated by Superfund sites and waste comprising landfills is associated with industrial production one expects that both landfill and Superfund sites are likely to occur in less populous tracts.[27] As in other variables, the average of the total population is utilized when multiple decades are under consideration.

Social Ecology Influences. Park, Burgess, and McKenzie (1967) argue that both the natural and built landscape within an urban area influences the location of a number of processes related to industrialism. For example, it is not uncommon to find industrial sites located along train tracks in major urban areas. Likewise, for those cities with navigable waterways, these areas serve as a hub for both industrial shipments and industrial production. To account for how the spatial distribution of landfill and Superfund sites might be influenced by these larger geographical and industrial processes two dummy variables reflecting natural social ecology processes and another representing built social ecology processes is constructed for each decade of each city. Those census tracts contiguous to waterways are identified for each city. For example, those tracts lying along either the Columbia or Willamette River in Portland are established as having a social ecological influence (social ecological influence = 1). Similarly, a separate social ecology measure captures those aspects of the built environment thought to impact

[26] Please note that the only variable that is transformed is total population. Other variables are also skewed including percentage African-American, percentage Hispanic, percentage owner-occupied housing. All models that follow in Chapter 5 were run in alternate models with transformed variables, but the substantive findings presented in the following tables did not change.

[27] Additionally, landfills may also be likely to be placed in rural regions away from industrial production – this too, however, would indicate an increased likelihood of landfill presence near less populous tracts.

industrial processes. Those tracts lying along either Interstate 84 (which runs East and West) or Interstate 5 (the major North/South Interstate) are also coded as 1. The selection of Interstates as a major indicator of industrial thoroughfares rests on the fact that these routes mirror major railroad lines and, therefore, produce a measure of social ecology providing historical continuity for both highways and railroads. The tracts in Detroit displaying the same tendencies – along the navigable waterways and those Interstates paralleling traditional railroad routes – were identified and coded in the same manner.

Landfill Processes. A control measure accounting for the clustering of landfills is constructed. The possibility exists that a tract becomes stigmatized such that it attracts additional landfills in subsequent years and that multiple landfills remain in operation. To account for this process a dummy variable is created for those tracts containing multiple landfills (multiple landfills = 1). This sparing use of this measure reflects the few number of tracts containing multiple facilities.

The presentation of the analyses involving the measures described above occurs in the following chapter. In Chapter 5, the major relationship under consideration for this research is addressed—the question of whether racial minorities, those who are economically deprived, and those with lower amounts of home ownership are more likely to be exposed to landfill and Superfund sites. This is the traditional conception of environmental inequality that racial minorities and the poor are the targets of an unequal siting process. The investigation of this relationship occurs through quantitative data tables and with the use of maps generated through Geographic Information Systems.

A secondary question addresses the changes that occur in a census tract in the decade(s) following a landfill's existence. Although it is not possible to perform the equivalent analyses for Superfund sites, the analyses and maps for landfill sites provides a more comprehensive historical account of the processes surrounding landfills in Detroit and Portland.

CHAPTER FIVE

TOTAL EXPOSURE TO LANDFILL AND SUPERFUND SITES IN DETROIT AND PORTLAND

Overview of the Analyses

The results for predicting total exposure to landfill and Superfund sites are situated within relevant historical eras—thus, multiple panel designs pointed towards relevant theoretical questions follow. The panels differ according to the dependent variable under consideration—some models consist of existing landfills (all landfills present) while others consider new landfills only. Additionally, a presentation of a small subset of analyses on Superfund sites as a comparison to landfills is also included. Finally, each section includes models in evaluating the impacts of landfill siting on Hispanics. All tables and figures that follow clearly identify the differences between models. With the exception of the final series of analyses assessing subsequent changes in socio-demographic indicators after the siting of a landfill, which uses ordinary least squares regression, all other analyses performed utilize logistic regression and are reported as maximum-likelihood estimates.

In historical terms, we can expect the onset of landfills to coincide with industrial processes. Thus, the first set of analyses (Tables 7-10) investigates the total exposure of landfills over two extended time periods: the first investigates where landfills are located in the post-redlining era (1940-1990) and the second narrows this time period to those landfills in place during the post-industrial years (1970-1990). In each case, the analyses

interrogate whether landfills are more likely to be located in redlined, minority (African-American and Hispanic), economically deprived, or homeowner deprived communities.

The second set of analyses (Tables 11-15) asks a separate question. Although it is important to understand the long-term trends, the patterns associated with NEW landfills may hold a different arrangement altogether. In these analyses, the total exposure to new landfills investigates two specific time periods. First, I investigate the location of landfills during the first half of the Post-Redlining era. Theoretically, the Industrial Era (1940-1960) represents an important historical context point in this research. Given the literature on economic development during this time period, especially in Detroit, and the racial tension representative of these years one would expect race and redlining to play a prominent role in predicting the presence of landfills. Likewise, the second half of this time period, the Post-Industrial Era from 1970-1990, is marked by deindustrialization and the expectation is that social class plays a more important role in landfill location in these years. Thus to account for these two time periods I have constructed dependent variables of total exposure to landfills specific to each of these time periods. These measures allow a specific accounting of <u>new</u> landfills above and beyond existing landfills. These analyses include African-Americans in both eras and Hispanics in the Post-Industrial Era.

The final set of logistic regression analyses (Tables 16-19) investigates the prediction of an alternative source of environmental contamination: Superfund sites. Here I investigate the total exposure of Superfund sites in the final time period under consideration—the Post-Industrial Era. Because of limited data access, it is only possible to interrogate Superfund sites for these years; nonetheless, these analyses provide an interesting and decisive comparison with exposure to landfill facilities.

This chapter concludes with a brief discussion of the results from ordinary least squares regression in which I assess changes in socio-demographic characteristics AFTER the placement of a landfill in a census tract (Tables 20-21). These analyses provide evidence that the impacts of unequal landfill siting are exacerbated in the decades that follow.

Within each of the sections that follow a series of maps are presented to illustrate the constellation of landfills and the theoretically relevant variables. The maps aid in deciphering the statistical results. It should be noted, however, that the maps do not precisely mirror the logistic and OLS results. For example, most maps depict only one explanatory variable – although more complicated maps can be developed (and in some cases, this occurs) – the maps attempt to pinpoint the most relevant variable for a given model. The maps present a single point within a census tract in order to identify a landfill or Superfund site – the reader is reminded that the dependent variable is total exposure and includes not only that specific tract but all the contiguous tracts as well. Nonetheless, this form of presentation pinpoints the location of the actual facility.

The models presented below are the "final" model – that is, previous models included subsets of the independent variables (i.e race without economic deprivation or home ownership added to the model). The models presented here do not test for interaction effects. However, all models were run with multiple interaction effects that were thought to be theoretically important, but none of these additional models yielded results altering the findings presented here and are not included. Diagnostic tests of correlation, collinearity, Pearson chi-square, variance inflation factor and Hosmer-Lemeshow goodness-of-fit were performed where appropriate. The results below do not

include the results from these diagnostics—these diagnostics indicate that the models, though not without problems, did not present major obstacles for the results presented below. Finally, there exists a high likelihood that the results presented here suffer from spatial autocorrelation – that is, the value of a variable in one census tract is likely associated with the values on the same variable in a neighboring census tract (see Oakley and Logan forthcoming). Although GIS alleviates some of these problems, I will return to these concerns in the conclusion and provide suggestions in accounting for spatial autocorrelation in future research.

Total Exposure to Landfills

The long-term trends for exposure to landfills in both Detroit and Portland provide several points of comparison across the two cities. Tables 7 and 8 provide the results for both Detroit and Portland across two time periods. The first model depicts the relationship between total exposure to landfills across the entire time period under study in this project – the Post-Redlining era – while the second model provides a subset of these results for the Post-Industrial era from 1970-1990. That is, the first model estimates the total exposure to landfills sited between 1940 and 1990 while accounting for all socioeconomic changes for the entire time period from 1940-1990. The second model estimates the impacts of socioeconomic changes from 1940-1990 on those landfills only sited in the post-industrial era.

In Detroit, the trends are identical for both models. Those census tracts with fewer people, navigable waterways, located outside the central city, fewer African-Americans, but higher amounts of economic deprivation are significantly more likely to

experience exposure to a landfill. These results hold regardless of the time period under consideration.

Table 7: Total Exposure to Landfills: Detroit

Variable	*Post-Redlining Era Landfills: 1940-1990* **ML Coefficients**	*Post-Industrial Era Landfills: 1970-1990* **ML Coefficients**
Average Total Population 1940-1990 (natural log)	-1.247** (.165)	-.841** (.154)
Navigable Waterway	2.401** (.639)	2.200** (.585)
Highway/Railroad	-.199 (.201)	.107 (.202)
Urban Core Not Redlined	.245 (.310)	.143 (.321)
Suburban	.868* (.325)	.661** (.335)
Average Percent Black 1940-1990	-4.097** (.622)	-4.422** (.677)
Average Economic Deprivation 1940-1990	1.540** (.176)	1.278** (.179)
Average Percent Owner-Occupied 1940-1990	.117 (.614)	-.961 (.625)
N	1103	1103
Pseudo R^2	.20	.15

*p<.10
**p<.05
Standard Errors in parentheses

The results for Portland maintain some similarities with the results of Detroit. Across both eras, those tracts with navigable waterways, highways or railroads, higher amounts of economic deprivation, and higher amounts of home ownership are significantly more likely to face exposure to a landfill. In both Detroit and Portland economic deprivation stands as the most conclusive and important predictor of landfill sites.

Table 8: Total Exposure to Landfills: Portland

Variable	*Post-Redlining Era Landfills: 1940-1990* **ML Coefficients**	*Post-Industrial Era Landfills: 1970-1990* **ML Coefficients**
Average Total Population 1940-1990 (natural log)	-.572 (.441)	-.917** (.448)
Navigable Waterway	.719* (.414)	.740* (.414)
Highway/Railroad	.727** (.372)	.909** (.376)
Urban Core Not Redlined	-.240 (.675)	-.398 (.686)
Suburban	-.013 (.694)	-.194 (.705)
Average Percent Black 1940-1990	-2.634 (2.382)	-2.562 (2.403)
Average Economic Deprivation 1940-1990	.719** (.224)	.708** (.226)
Average Percent Owner-Occupied 1940-1990	5.227** (1.324)	5.445** (1.359)
N	268	268
Pseudo R^2	.09	.09

*p<.10
**p<.05
Standard Errors in parentheses

In addressing these same questions for Hispanics, data is available only for the Post-Industrial era. In Detroit, we see that the model yields results similar to those models only including African-Americans. Hispanics are less likely to experience landfill exposure, but this is not a statistically significant relationship. Consistent with the model for African-Americans we see that economic deprivation remains a statistically significant factor and the location of landfills continue to fall in tracts outside of the urban center.

Table 9: Total Exposure to Landfills in Post-Industrial Era Including Hispanics: Detroit

Variable	*Post-Industrial Era Landfills: 1970-1990* **ML Coefficients**
Average Total Population 1940-1990 (natural log)	-.825** (.155)
Navigable Waterway	2.203** (.583)
Highway/Railroad	.128 (.203)
Urban Core Not Redlined	.069 (.328)
Suburban	.572* (.346)
Average Percent Black 1940-1990	-4.644** (.719)
Average Percent Hispanic 1970-1990	-2.462 (2.550)
Average Economic Deprivation 1940-1990	1.304** (.183)
Average Percent Owner-Occupied 1940-1990	-1.076* (.636)
N	1103
Pseudo R^2	.15

*p<.10
**p<.05
Standard Errors in parentheses

The results for Portland indicate similar trends, but they indicate that Hispanics are more likely to experience exposure to landfills even though this relationship is not statistically significant. We do however see that both social ecology variables are statistically significant and that both economic deprivation and home ownership are statistically significant predictors of landfill exposure in the Post-Industrial Era.

Table 10: Total Exposure to Landfills in Post-Industrial Era Including Hispanics: Portland

Variable	*Post-Industrial Era Landfills: 1970-1990* **ML Coefficients**
Average Total Population 1940-1990 (natural log)	-.928** (.449)
Navigable Waterway	.757* (.416)
Highway/Railroad	.947** (.380)
Urban Core Not Redlined	-.442 (.693)
Suburban	-.267 (.714)
Average Percent Black 1940-1990	-3.195 (2.557)
Average Percent Hispanic 1970-1990	8.810 (8.830)
Average Economic Deprivation 1940-1990	.649** (.234)
Average Percent Owner-Occupied 1940-1990	5.748** (1.416)
N	268
Pseudo R^2	.10

*p<.10
**p<.05
Standard Errors in parentheses

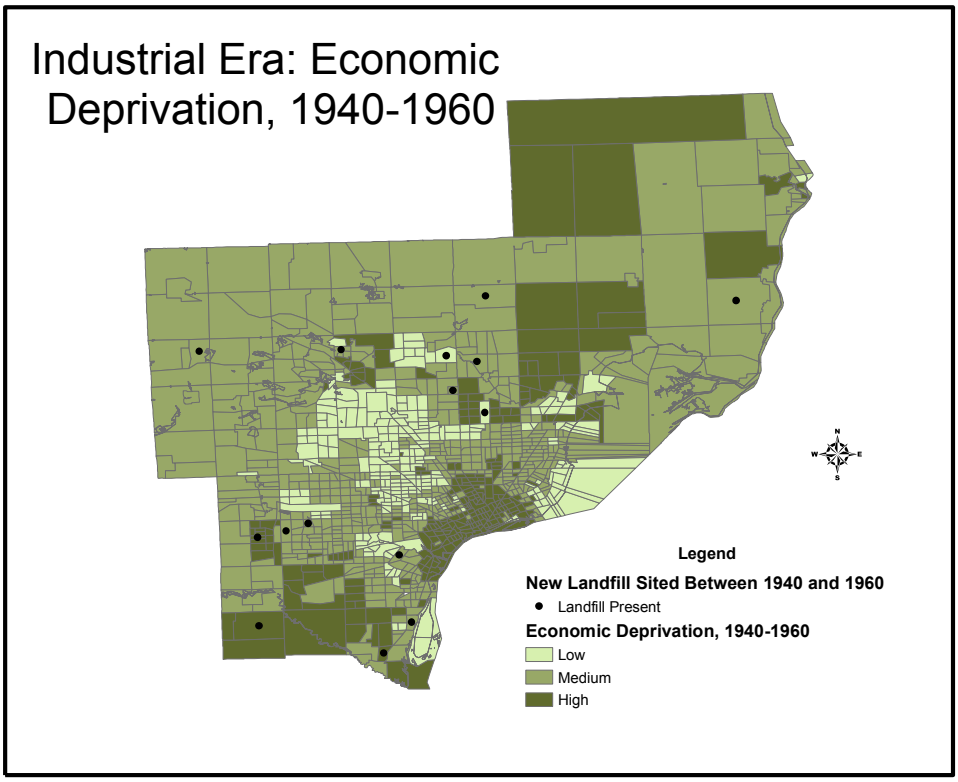
Total Exposure to New Landfills

The results in predicting new landfills are presented below. Although these results are similar to those in the previous analyses, by focusing upon a smaller set of years – the industrial and post-industrial eras – the most important features of exposure to landfills become clear.

The results for the industrial era from 1940-1960 in Detroit are not provided. In this model, the only statistically significant predictors of landfill exposure are total population and those census tracts located along navigable waterways. However, it is worth noting that those tracts suffering from higher amounts of economic deprivation are more likely to experience landfill exposure even though this relationship is not

statistically significant—Figure 5 clearly illustrates the constellation of new landfills within those areas with "medium" and "high" amounts of economic deprivation. Even though landfills are not situated in the urban core, the area hardest hit by economic deprivation, we do see that the pockets of affluence are far less likely, geographically speaking, to receive a new landfill. Even though the relationship with economic deprivation is not statistically significant, there is a substantive finding of note uncovered by studying the spatial relationship held within this map.

Figure 5: New Landfills and Economic Deprivation in Industrial Era, Detroit



The model for Portland yields similar results as Table 11 indicates. Navigable waterways stand as an important predictor of total exposure to new landfills and, as in previous models, those tracts beyond the urban core remain of significance. Likewise,

economic deprivation stands as a significant indicator of new landfill exposure. Figure 6 illustrates this relationship as we see that both economic deprivation and landfills occur together. Even though a majority of the landfills is actually located within tracts comprised of a "medium" level of economic deprivation, the map clearly indicates that ALL of these facilities are bordered by high levels of economic deprivation. In fact, only one of these facilities is situated within an affluent census tract and this particular facility is bordered by high economic deprivation tracts within the urban core.

Table 11: Predicting New Landfills in Industrial Era: Portland

	Industrial Era: 1940-1960
Variable	**ML Coefficients**
Average Total Population 1940-1960 (natural log)	.943 (.789)
Navigable Waterway	1.524** (.705)
Highway/Railroad	.717 (.883)
Urban Core Not Redlined	Dropped
Suburban	2.333** (1.065)
Average Percent Black 1940-1960	-28.730 (49.582)
Average Economic Deprivation 1940-1960	1.082* (.594)
Average Percent Owner-Occupied 1940-1960	-.317 (2.610)
N	268
Pseudo R^2	.15

*p<.10
**p<.05
Standard Errors in parentheses

Figure 6: New Landfills and Economic Deprivation in Industrial Era, Portland

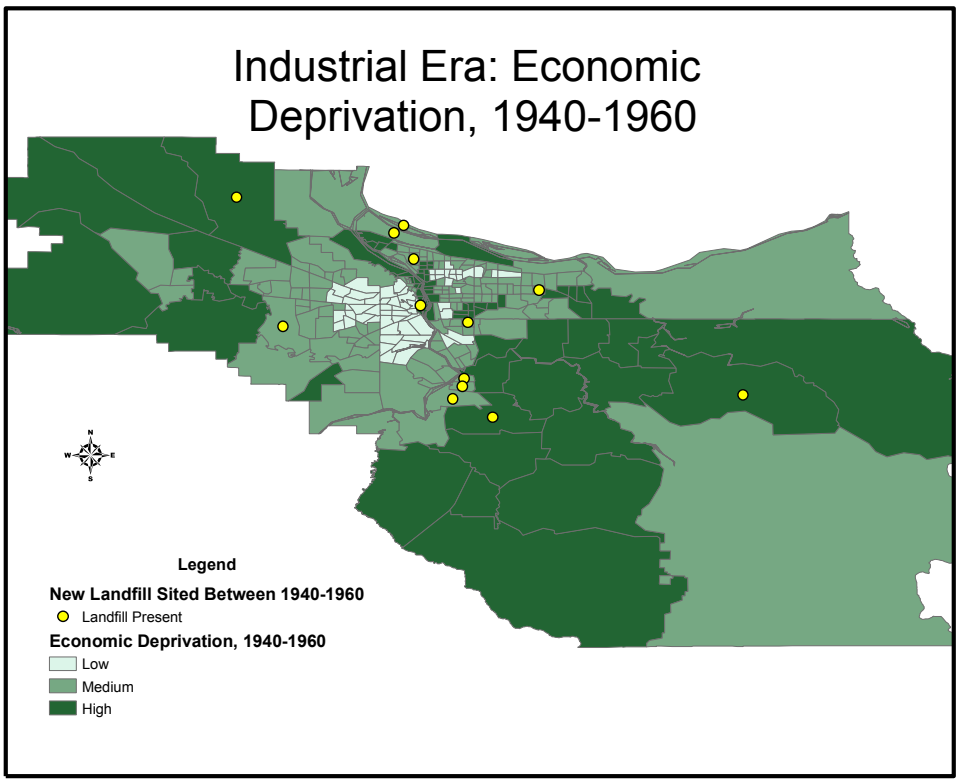


Table 12 presents the results of new landfills appearing in Detroit between 1970 and 1990. Most independent variables reflect similar patterns exhibited in previous models. Economic deprivation continues to be a statistically significant predictor of landfill exposure, while the results also point to multiple landfills as a robust predictor of landfill exposure.

Table 12: Predicting New Landfills in Post-Industrial Era: Detroit

	Post-Industrial Era: 1970-1990
Variable	**ML Coefficients**
Average Total Population 1940-1990 (natural log)	-.491 (.310)
Multiple Landfills Present	2.971** (1.513)
Previous Landfill Present 1940-1960	1.436 (1.181)
Navigable Waterway	1.249 (.795)
Highway/Railroad	-.042 (.471)
Urban Core Not Redlined	-.352 (.707)
Suburban	.730 (.730)
Average Percent Black 1940-1990	-2.271 (1.412)
Average Economic Deprivation 1940-1990	1.340** (.452)
Average Percent Owner-Occupied 1940-1990	-.024 (1.413)
N	1103
Pseudo R^2	.09

*p<.10
**p<.05
Standard Errors in parentheses

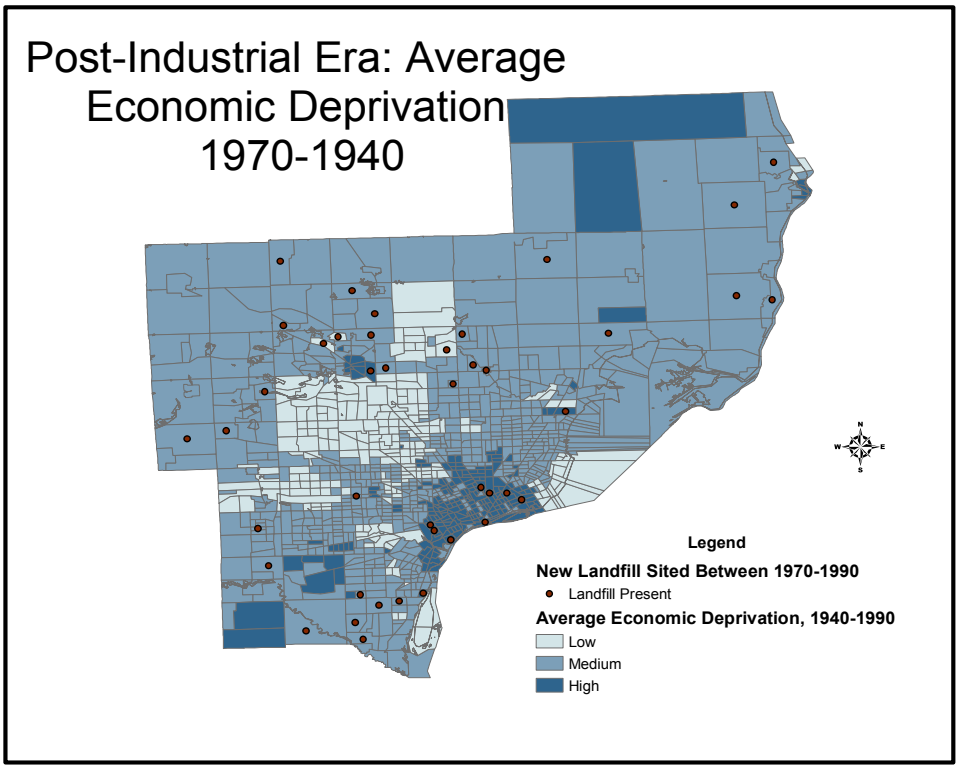
When investigating total exposure to new landfills for Hispanics in the Post-Industrial Era we again see the importance of economic deprivation – it is a robust predictor and is statistically significant. Given the pervasiveness of economic deprivation in predicting landfills in Detroit, Figure 7 provides a visual illustration of this relationship when considering new landfills in the post-industrial years. We see that new landfills sited between 1970 and 1990 tend to be located in those neighborhoods suffering from either medium to high amounts of economic deprivation.

Table 13: Predicting New Landfills in Post-Industrial Era Including Hispanics: Detroit

	Post-Industrial Era: 1970-1990
Variable	**ML Coefficients**
Average Total Population 1940-1990 (natural log)	-.489 (.312)
Multiple Landfills Present	2.969** (1.514)
Previous Landfill Present 1940-1960	1.440 (1.182)
Navigable Waterway	1.254 (.800)
Highway/Railroad	-.040 (.472)
Urban Core Not Redlined	-.362 (.723)
Suburban	.719 (.751)
Average Percent Black 1940-1990	-2.300 (1.481)
Average Percent Hispanic 1970-1990	-.289 (4.564)
Average Economic Deprivation 1940-1990	1.344** (.458)
Average Percent Owner-Occupied 1940-1990	-.036 (1.424)
N	1103
Pseudo R^2	.09

*p<.10
**p<.05
Standard Errors in parentheses

Figure 7: New Landfills and Economic Deprivation in Post-Industrial Era, Detroit



Tables 14 and 15 clearly indicate that social ecology processes are the driving forces behind the location of landfills between 1970 and 1990 whether we consider African-Americans or Hispanics. The major departure in the analyses for Portland's new landfills during the Post-Industrial era is that none of the explanatory variables is statistically significant. Figure 8 below illustrates this relationship: 8 of the 12 landfills sited between 1970 and 1990 lay along the navigable waterways and, to a lesser extent the highways and railroads of Portland. It appears that almost exclusively social ecology processes drive the spatial distribution of new landfills during this time. Figure 8 below illustrates this relationship as the connection between navigable waterways and new landfills is striking.

Table 14: Predicting New Landfills in Post-Industrial Era: Portland

	Post-Industrial Era: 1970-1990
Variable	**ML Coefficients**
Average Total Population 1940-1990 (natural log)	-.211 (.931)
Previous Landfill Present 1940-1960	.202 (1.246)
Navigable Waterway	2.313** (.752)
Highway/Railroad	1.694** (.754)
Suburban	.521 (.834)
Average Percent Black 1940-1990	.174 (6.023)
Average Economic Deprivation 1940-1990	.686 (.607)
Average Percent Owner-Occupied 1940-1990	6.141 (3.847)
N	268
Pseudo R^2	.14

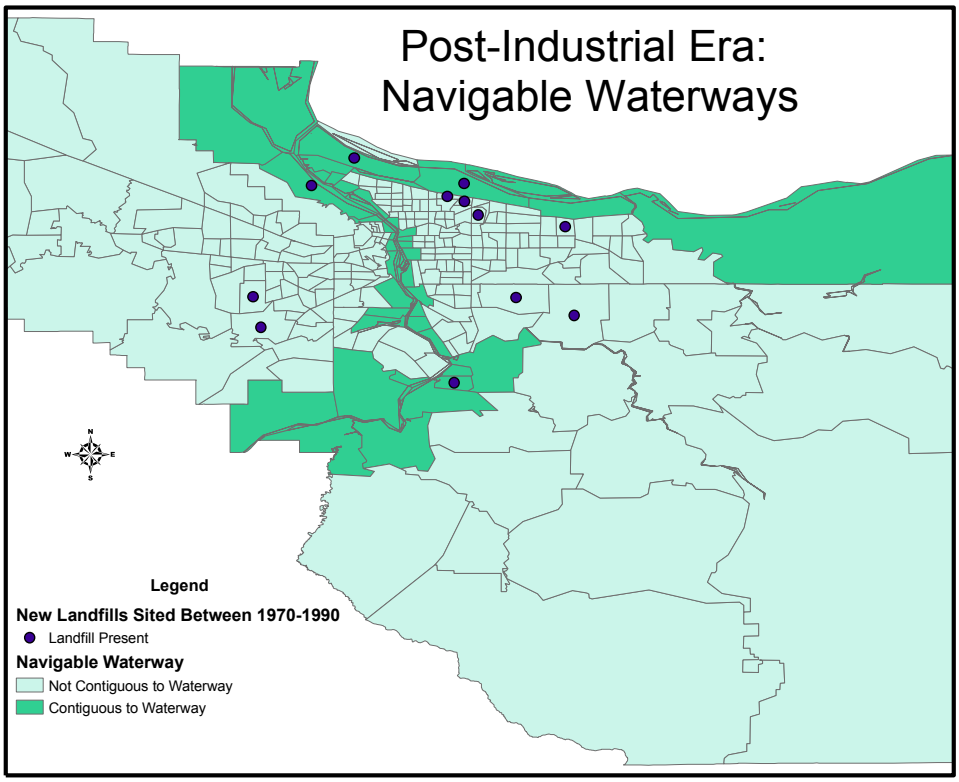
*p<.10
**p<.05
Standard Errors in parentheses

Table 15: Predicting New Landfills in Post-Industrial Era Including Hispanics: Portland

	Post-Industrial Era: 1970-1990
Variable	**ML Coefficients**
Average Total Population 1940-1990 (natural log)	-.159 (.939)
Previous Landfill Present 1940-1960	.114 (1.263)
Navigable Waterway	2.265** (.759)
Highway/Railroad	1.663** (.756)
Suburban	.537 (.837)
Average Percent Black 1940-1990	.824 (6.170)
Average Percent Hispanic 1970-1990	-12.813 (28.462)
Average Economic Deprivation 1940-1990	.775 (.640)
Average Percent Owner-Occupied 1940-1990	5.700 (3.902)
N	268
Pseudo R^2	.15

*p<.10
**p<.05
Standard Errors in parentheses

Figure 8: New Landfills and Waterways in Post-Industrial Era, Portland



Total Exposure to Superfund Sites

The analyses from the previous section indicate that regardless of the historical epoch under consideration, landfills tend to be placed outside of the urban core. A number of social ecology forces drive this process. Landfills, it is proposed here, require large and preferably cheap tracts of land. Geographically, these large and cheap tracts of land are more prevalent near those suffering from economic deprivation outside the urban core. However, this same set of circumstances is not necessarily true when considering Superfund sites. Superfund sites directly arise from industrial processes–many times industrial accidents–and because of this association we would expect these facilities to be

located within the urban core. Furthermore, we would expect these locations to be near the indicators of racial segregation captured by the several variables utilized in this study–namely, the percentage of African-Americans present, tracts originally redlined, and the percentage of Hispanics.

Tables 16 and 17 provide the results for the Superfund analyses for Detroit. The first indication that Superfund sites are more prominent in the urban core is the reversal in the suburban indicator. In these analyses, we see that Superfund sites are less likely to be in those areas outside the original city center. Although it is not statistically significant, these results indicate that Superfund sites are more likely to be located within the urban core. Figure 9 provides a snapshot of 1990 Superfund sites within the urban core of Detroit. Of those facilities within the core, the map indicates that Superfund sites tend to be in the non-redlined areas–this relationship is clear when the redline area of Detroit is mapped. The same appears to be true for the percentage of African-Americans–that is, African-Americans are located in the area within and contiguous to the redlined area as depicted in Figure 10. As in the findings for landfills, the economically deprived areas are again a statistically significant predictor of Superfund sites. These results are indicative of Superfund sites being concentrated in the urban core of Detroit and, though the relationship is not statistically significant, the maps indicate a relationship of substantive significance for African-Americans.

Table 16: Total Exposure to Superfund Sites: Detroit

	Post-Industrial Era: 1970-1990
Variable	**ML Coefficients**
Average Total Population 1940-1990 (natural log)	.151 (.146)
Navigable Waterway	1.688** (.589)
Highway/Railroad	.613** (.177)
Urban Core Not Redlined	.107 (.258)
Suburban	-.198 (.285)
Average Percent Black 1940-1990	.054 (.437)
Average Economic Deprivation 1940-1990	.654** (.149)
Average Percent Owner-Occupied 1940-1990	-.400 (.523)
N	1103
Pseudo R^2	.09

*p<.10
**p<.05
Standard Errors in parentheses

Figure 9: Superfund Sites and Redlining in the Urban Core, Detroit

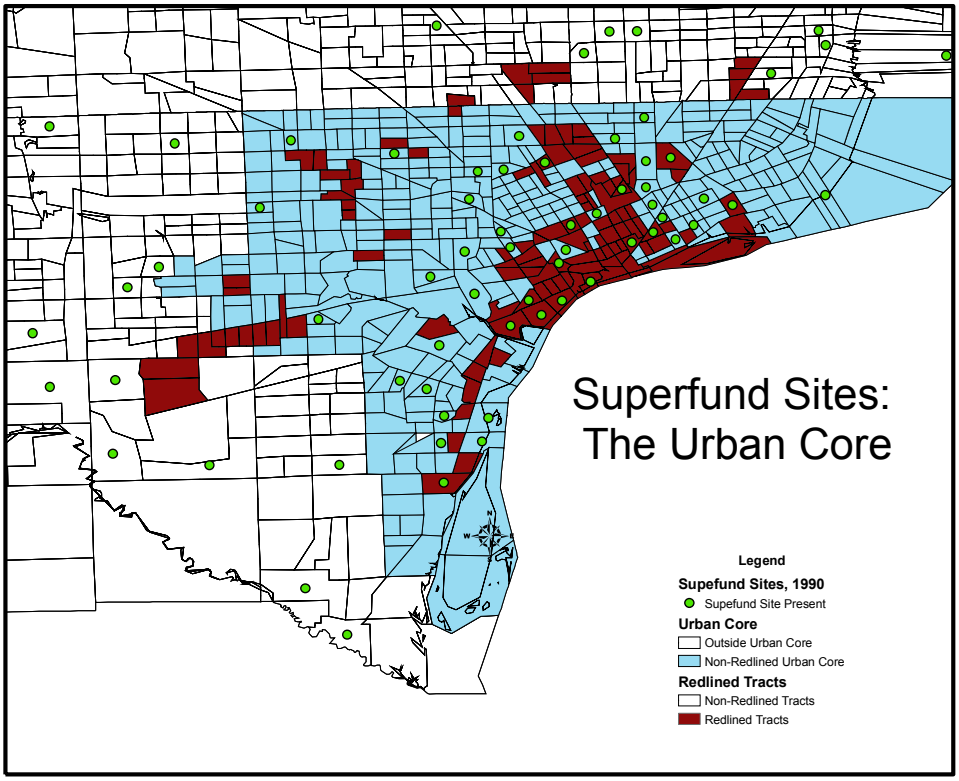


Figure 10: Superfund Sites and the Percentage of African-Americans in the Urban Core, Detroit

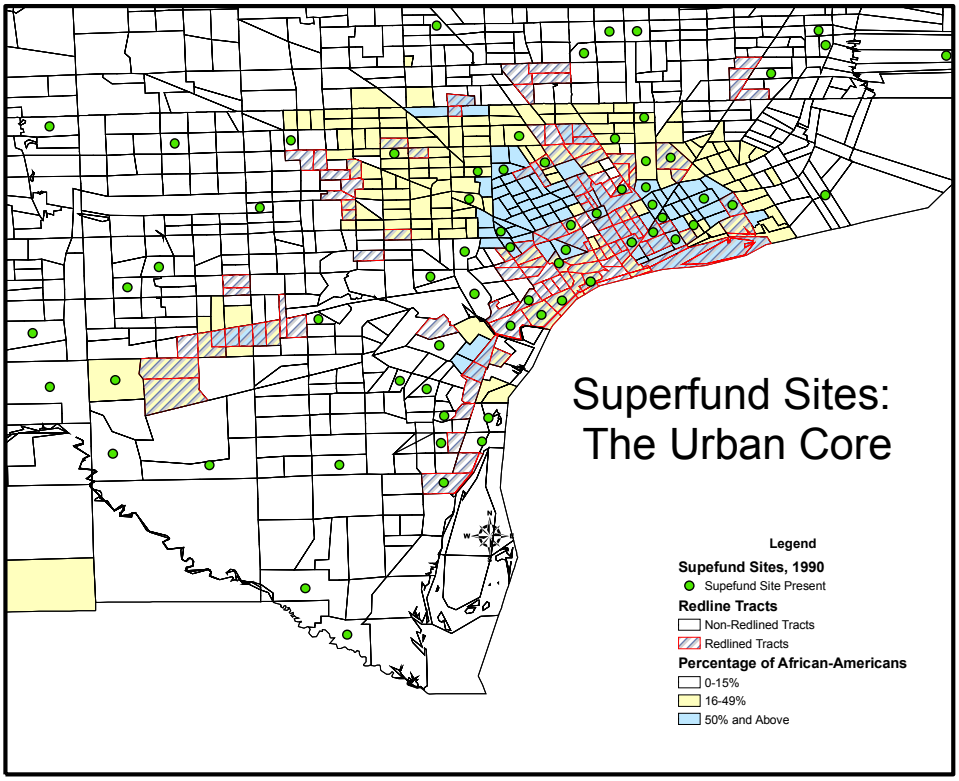


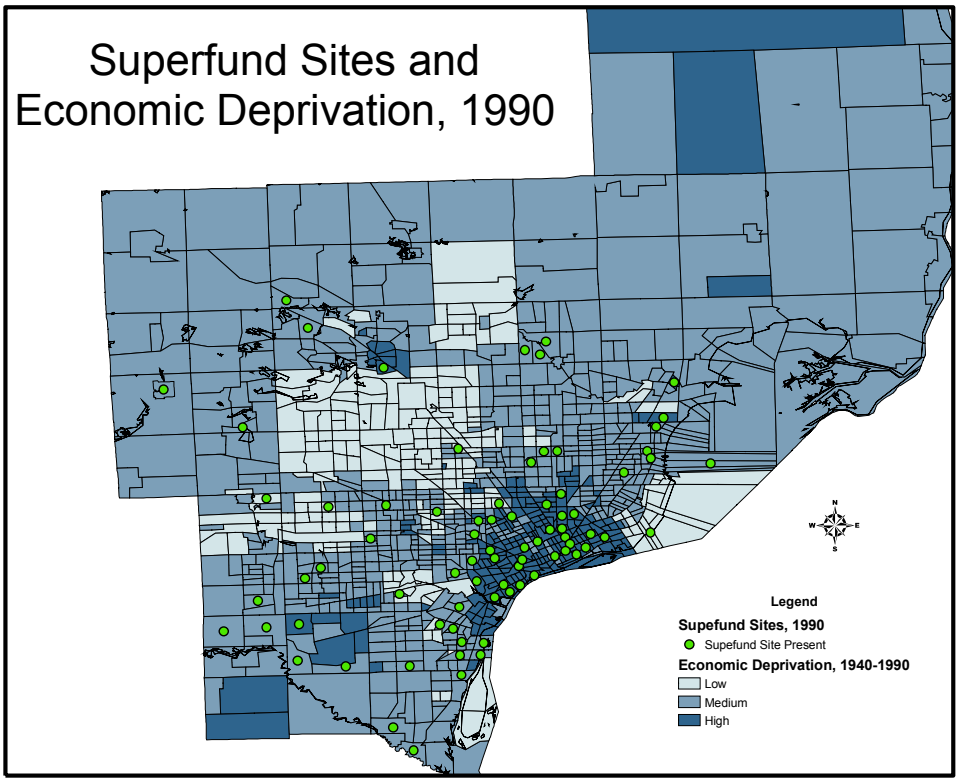
Table 17 presents the analyses when Hispanics are included in the model for Superfund sites. The results indicate that Superfund sites tend to be located within the urban core and though Superfund exposure tends to be in those tracts with higher percentages of Hispanics this relationship is not statistically significant. Again, economic deprivation is the major socio-demographic indicator associated with Superfund sites as depicted in Figure 11.

Table 17: Total Exposure to Superfund Sites Including Hispanics: Detroit

	Post-Industrial Era: 1970-1990
Variable	**ML Coefficients**
Average Total Population 1940-1990 (natural log)	.131 (.147)
Navigable Waterway	1.683** (.591)
Highway/Railroad	.595** (.178)
Urban Core Not Redlined	.168 (.263)
Suburban	-.117 (.294)
Average Percent Black 1940-1990	.265 (.471)
Average Percent Hispanic 1970-1990	3.300 (2.815)
Average Economic Deprivation 1940-1990	.624** (.150)
Average Percent Owner-Occupied 1940-1990	-.285 (.531)
N	1103
Pseudo R^2	.09

*p<.10
**p<.05
Standard Errors in parentheses

Figure 11: Superfund Sites and Economic Deprivation, Detroit



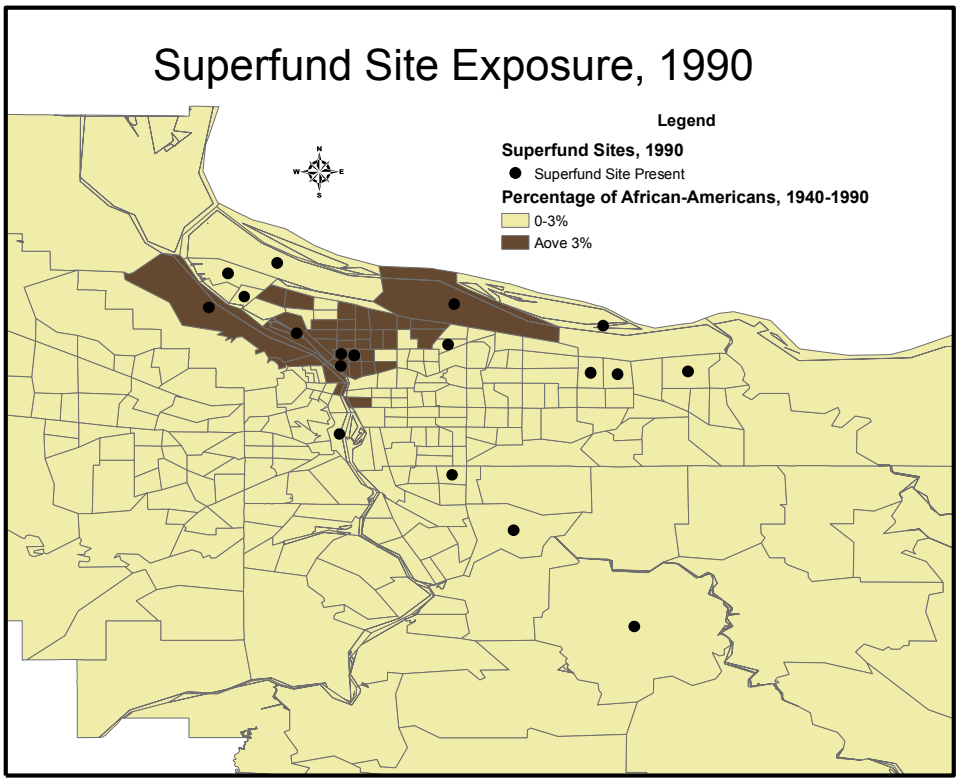
As is the case in Detroit, Portland Superfund exposure also tends to be located within the urban core of the metro area. In this case, the results are even more decisive as we find that Superfund exposure is more likely to occur in those tracts originally redlined. In Table 18, even though the relationship is not statistically significant those residing in tracts previously redlined are positively associated with Superfund exposure. Furthermore, Superfund exposure is significantly more likely to impact those tracts containing higher percentages of African-Americans, higher levels of economic deprivation, and higher amounts of owner-occupied housing. The association with African-Americans is an important finding and it is depicted in Figure 12.

Table 18: Total Exposure to Superfund Sites: Portland

	Post-Industrial Era: 1970-1990
Variable	**ML Coefficients**
Average Total Population 1940-1990 (natural log)	-.674 (.511)
Navigable Waterway	1.388** (.432)
Highway/Railroad	2.314** (.415)
Redlined Urban Core	.873 (.603)
Suburban	.190 (.390)
Average Percent Black 1940-1990	5.534** (2.819)
Average Economic Deprivation 1940-1990	.913** (.285)
Average Percent Owner-Occupied 1940-1990	4.465** (1.521)
N	268
Pseudo R^2	.20

*p<.10
**p<.05
Standard Errors in parentheses

Figure 12: Superfund Sites and Percent African-American, Portland



When investigating the relationship between Hispanics and Superfund exposure a similar pattern is evident in Table 19 that appears in Table 18. The percentage of Hispanics is not a statistically significant relationship and Superfund exposure is less likely to occur in Hispanic neighborhoods. Furthermore, Figure 13 illustrates the relationship between Superfund exposure and redlined tracts. Although there are many Superfund sites beyond the borders of the redlined tracts, a very small geographic area, there are 4 Superfund sites tightly clustered within this area. Thus, we see that Superfund exposure is more likely to occur in African-American tracts and in those tracts suffering higher amounts of economic deprivation.

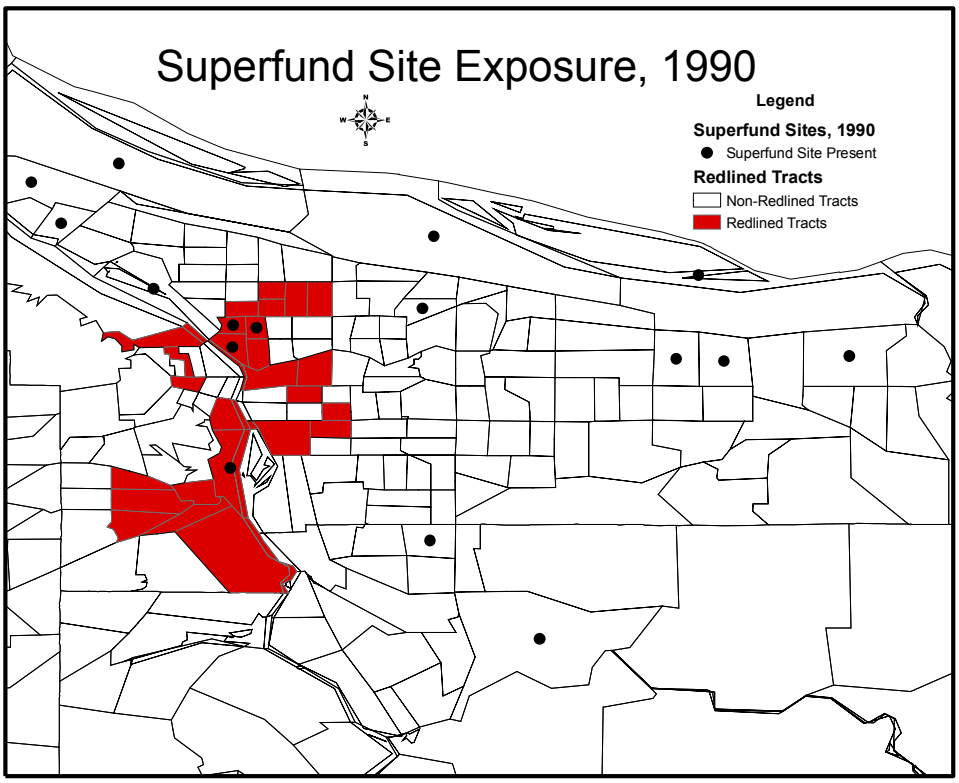
The results for both Detroit and Portland indicate that Superfund sites are arrayed across a different set of spatial inequalities than are landfills. The main contributor of this appears to be the fact that Superfund sites are located within the urban core because of their links to industrial processes. This provides an interesting counterpoint to the findings on landfills, which, though related to economic deprivation, are driven largely by the acquisition of relatively large and cheap tracts of land. The overlaps and differences between these two types of facilities will be further investigated in the chapter that follows, but it is worth noting that whether a facility is located within the core (Superfund sites) or outside the "old city" (landfills) both appear in economically deprived areas.

Table 19: Total Exposure to Superfund Sites Including Hispanics: Portland

	Post-Industrial Era: 1970-1990
Variable	**ML Coefficients**
Average Total Population 1940-1990 (natural log)	-.660 (.512)
Navigable Waterway	1.366** (.433)
Highway/Railroad	2.296** (.416)
Redlined Urban Core	.859 (.603)
Suburban	.200 (.390)
Average Percent Black 1940-1990	5.676** 2.843
Average Percent Hispanic 1970-1990	-5.283 (11.878)
Average Economic Deprivation 1940-1990	.951** (.297)
Average Percent Owner-Occupied 1940-1990	4.308** (1.548)
N	268
Pseudo R^2	.21

*p<.10
**p<.05
Standard Errors in parentheses

Figure 13: Superfund Sites and Redline Tracts, Portland



Changes in Socio-demographic Indicators After Landfill Siting

One of the questions plaguing environmental inequality research is the time-ordering of events – that is, whether poor and minority communities reside in areas near to landfill facilities prior to the placement of the facility or whether the socioeconomic status of neighborhoods change subsequent to a facility's presence. The analyses on landfills presented above indicate that the most important factor in predicting landfill facilities is economic deprivation. All else being equal landfills tend to be situated in those areas in which the residents suffer from higher amounts of poverty, unemployment and lower amounts of income and education. However, there is some evidence supporting an explanation of environmental inequality that disproportionately affects

Hispanics in Detroit in the Post-Industrial era. The following analyses investigate the question of how census tracts change after the appearance of a landfill. Although not all the results are included here, the general tenor of these analyses indicates that economic deprivation increases in those tracts exposed to landfills. Additionally, there is limited evidence that the percentage of minorities increases after a landfill's presence, while owner-occupied housing tends to decrease.

Between 1939 and 1959 a total of 15 landfills were placed in Detroit and all of these landfills were located outside of the urban core of the city. Figure 6 above indicates that the landfills sited during this time period tended to occur in those tracts with "medium" to "high" amounts of economic deprivation. The analyses below indicate that after the initial siting of these landfills socio-demographic conditions worsened in the direction one might expect – that is, in the years between 1950 and 1960 these tracts increased in the percentage of African-American residents, economic deprivation, while witnessing a decrease in owner-occupied housing. Because none of these findings is statistically significant, the results are not presented; however, the maps that follow underscore these changes. Figure 14 indicates the general trend that the percentage of African-Americans, although concentrated in the urban core, increased in those areas near landfills placed in the previous two decades. This is especially true of the area just southwest of the urban core. Figure 15 provides further support for the importance of economic deprivation. There is a clear relationship between landfill sites and a subsequent increase in economic deprivation. And, finally, Figure 16 provides a map of owner-occupied housing following landfill presence. There is a decrease or a minor increase (below 10%) in owner-occupied housing in ALL census tracts housing a landfill

from a previous decade, while NONE of the tracts experiencing large increases in owner-occupied housing (above 10%) contain a landfill.

Figure 14: Landfills and Percentage Change in African-Americans in Detroit, 1950-1960

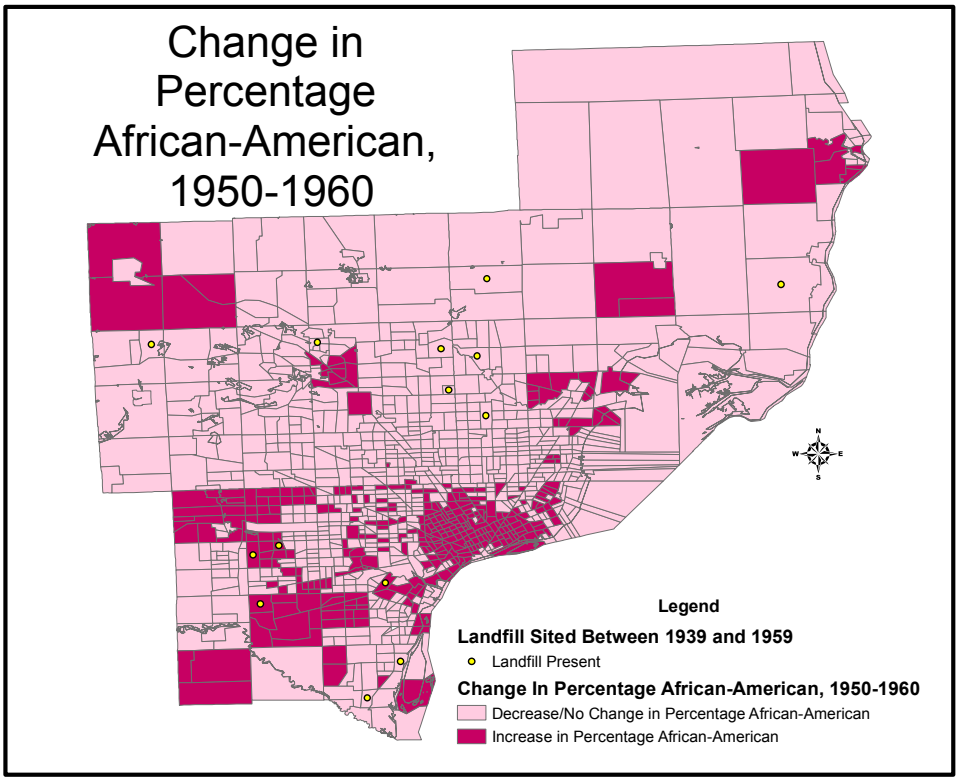


Figure 15: Landfills and Change in Economic Deprivation in Detroit, 1950-1960

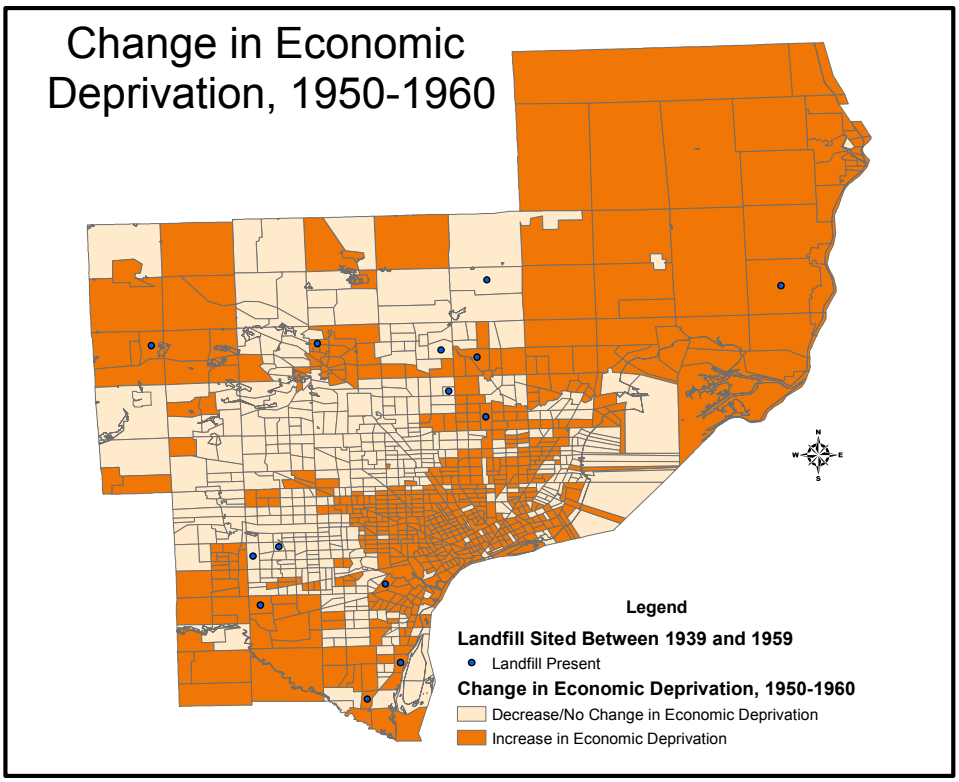
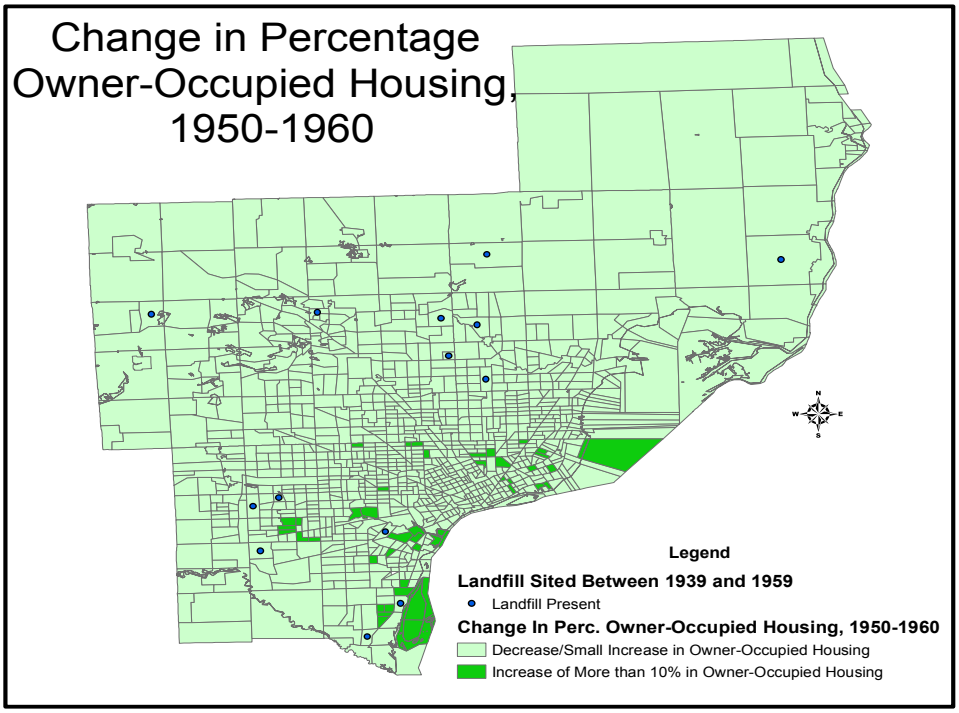


Figure 16: Landfills and Percentage Change in Owner-Occupied Housing in Detroit, 1950-1960



The most convincing results indicating a decline in socioeconomic status in those tracts housing a landfill occurs in Portland. Prior to 1970, the three counties comprising the Portland Metro area contained a total of 13 landfills. As in Detroit, the original siting of these landfills centered upon economically deprived areas. The post-siting ordinary least squares regressions indicate that after these landfills were present economic deprivation increased and owner-occupied housing decreased from 1980 to 1990. This relationship is not a statistically significant one and so the tables are not presented. However, the exposure of a landfill prior to 1970 is positively associated with an increase in the percentage of African-Americans and Hispanics. Table 20 indicates that exposure to a landfill prior to 1970 is statistically significant and associated with a subsequent

increase in African-American populations. This significant relationship does not hold, however, for Hispanics.

Table 20: Change in Percentage African-American After Exposure to a Landfill (1980-1990): Portland

Variable	**Coefficient**
Average Total Population 1980-1990 (natural log)	-.018* (.001)
Navigable Waterway	-.042** (.016)
Highway/Railroad	.004 (.015)
Urban Core Not Redlined	-.144** (.022)
Suburban	-.184** (.023)
Landfill Exposure Prior to 1970	.021* (.011)
Average Economic Deprivation 1980-1990	.052** (.007)
Average Percent Owner-Occupied 1980-1990	.104** (.034)
N	268
R^2	.42

*p<.10
**p<.05
Standard Errors in parentheses

Table 21: Change in Percentage Hispanic After Exposure to a Landfill (1980-1990): Portland

Variable	**Coefficient**
Average Total Population 1980-1990 (natural log)	-.006** (.003)
Navigable Waterway	.001 (.004)
Highway/Railroad	-.005 (.004)
Urban Core Not Redlined	-.006 (.006)
Suburban	.003 (.006)
Landfill Exposure Prior to 1970	.004 (.003)
Average Economic Deprivation 1980-1990	.012** (.002)
Average Percent Owner-Occupied 1980-1990	-.013 (.009)
N	268
R^2	.24

*p<.10
**p<.05
Standard Errors in parentheses

Figures 17 and 18 provide a clear picture of the relationships presented in Tables 20 and 21. We see that all tracts housing a landfill prior to 1970, with one exception, are either within or contiguous to a tract experiencing an increase in African-Americans between the years 1980 and 1990. Even though the results are not statistically significant, the map of this relationship of Hispanics to past landfill sites are even sharper – 10 of the 13 tracts housing a landfill prior to 1970 are within a tract in which the Hispanic population increased between 1980 and 1990. In both cases, we see that there is an increase in minority population in those tracts experiencing landfill exposure from previous decades.

Figure 17: Landfills and Percentage Change in African-Americans in Portland, 1980-1990

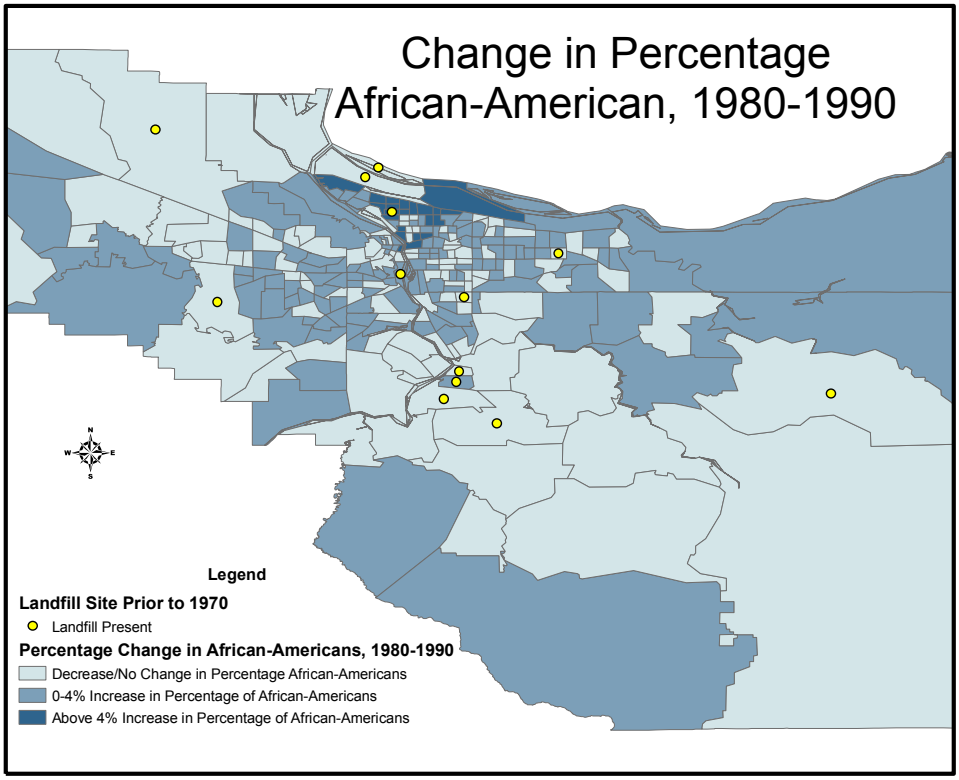


Figure 18: Landfills and Percentage Change in Hispanics in Portland, 1980-1990

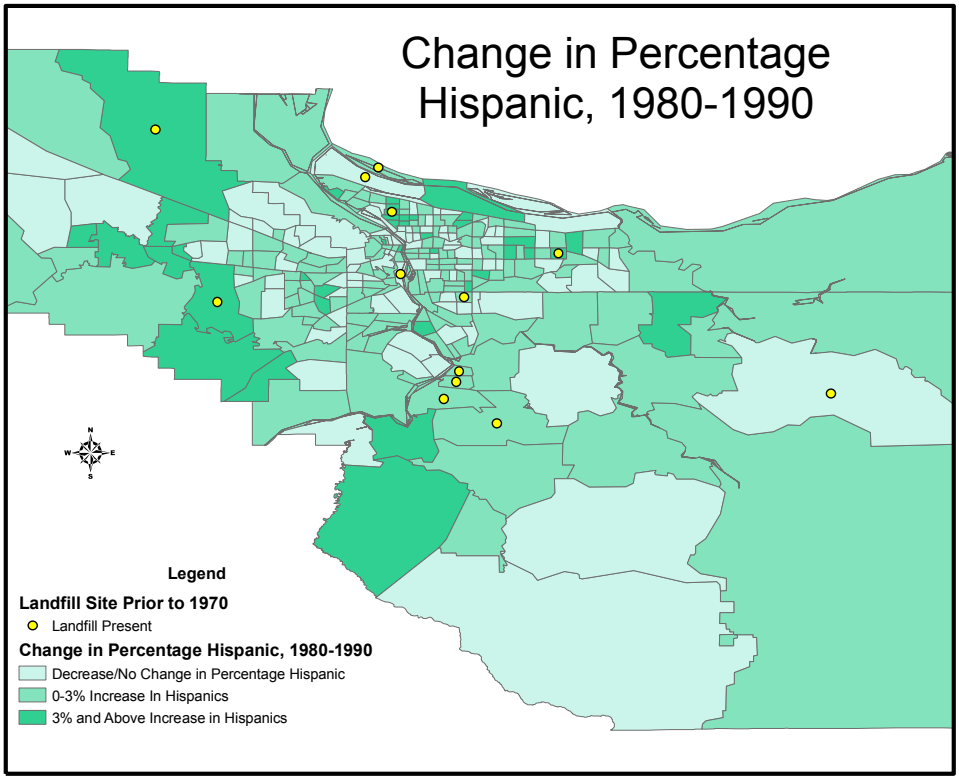
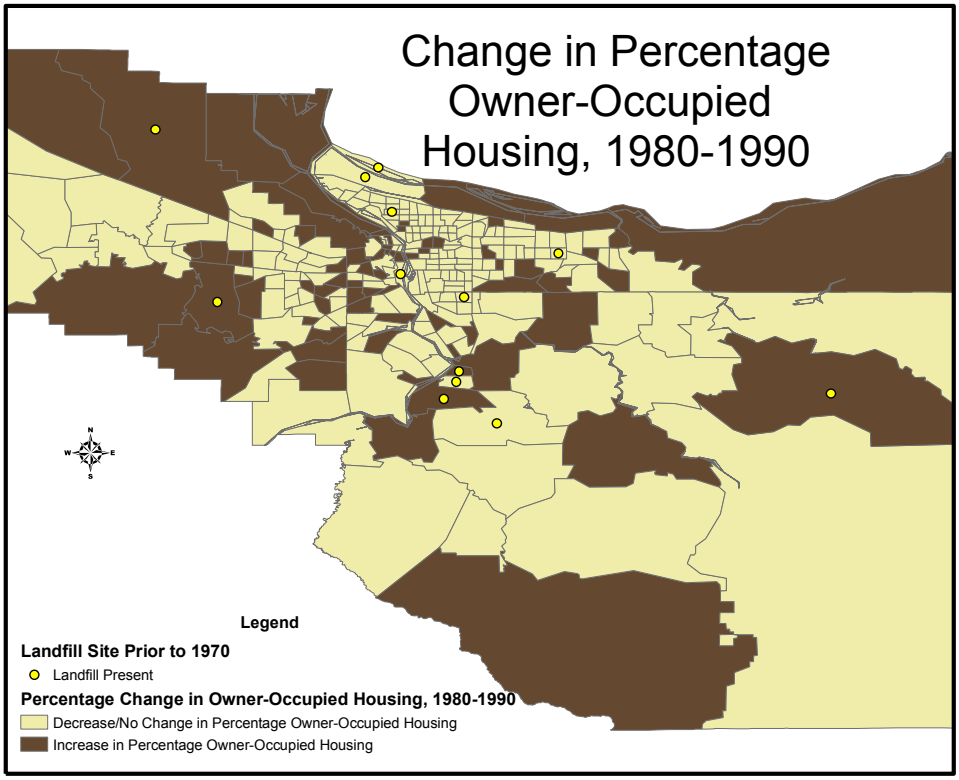


Figure 19, below, indicates the changes in owner-occupied housing in the decade following landfill placement. There is a decrease or no change in the percentage of owner-occupied housing in 8 of the 13 tracts exposed to landfills prior to 1980. Even though these results are not statistically significant, they are informative of a larger trend in which home ownership declines following exposure to landfills in Portland.

Figure 19: Landfills and Percentage Change in Owner-Occupied Housing in Portland, 1980-1990



Results Summary

The results presented in this chapter, though far-ranging in some respects, underscore some important patterns evident across time and space. When predicting landfill presence the overriding trends point to economic deprivation, tracts beyond the urban core, and social ecology processes as playing the most prominent role. This inclination holds across the different historical time periods and in both Detroit and Portland.

The analyses investigating the changes following landfill exposure provide support for these findings while also pointing to changes in the minority population in

those tracts. Given that landfill facilities tend to occur in economically deprived areas and given the disproportionate number of minorities who are economically deprived, it is not surprising to uncover this relationship. This points to two processes: the economically deprived are unable to escape the onset of landfills at their original siting time and because of limits to life chances minorities gravitate towards these cheaper lands in subsequent decades. Although data limitations prevent the consideration of the intent of landfill siting, the time-ordering of events indicates that both before and after a landfill's presence those without access to economic resources are disproportionately impacted. With the exception of Hispanics in Detroit in the Post-Industrial years, we find a disproportionate exposure for minorities to landfills following the siting process.

Superfund sites provide a different trajectory. Because an ecological process of needing large, cheap tracts of land does not drive Superfund sites, we find associations between Superfund sites and the urban core. As with landfills, Superfund sites tend to be associated with the economically deprived. The race effects yield a statistically significant relationship between African-Americans and Superfund sites in Portland, while the association between minorities and Superfund sites is a positive one in Detroit for both African-Americans and Hispanics. By modeling an alternative type of facility, it underscores both the spatial distribution of industrial and landfill processes and the distribution of inequality across the urban landscape. A discussion of these issues follows in the final chapter of this dissertation.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

The process of environmental inequality reveals itself as a multifaceted and complex process. The findings clearly point to sociohistorical developments that are unique to each city. In essence, each city exhibits its own internal dynamics related to the unequal distribution of people living near to landfills and Superfund sites. Even though these outcomes point to specific outcomes in each city, what remains constant across the two cities is that the sorting of people and toxic facilities is the product of processes related to spatial inequalities. These spatial inequalities provide insights into the development of environmental inequality in Portland and Detroit while revealing a new layer to our understanding of the EIF model – space matters.

The discussion that follows returns to the analyses presented in Chapter 5 and provides an extension of these findings. This dissertation indicates that the probability of a census tract housing a landfill is not equal across census tracts within a city. In fact, those tracts along the water and highway/railroad corridors, experiencing higher levels of economic deprivation, and, in some cases, containing higher percentages of minorities have a higher likelihood of containing a landfill or a Superfund site. Thus, the results indicate that the spatial organization of a city maps over the distribution of hazardous facilities.

The Importance of Spatial Inequality – Economic Deprivation

One sorting process at work in the distribution of people indicates that exposure to a landfill or Superfund site is associated with economic deprivation. This relationship is a robust one – those areas suffering from economic deprivation are more likely to attract a new landfill and once a landfill is present these locations increase in economic deprivation. Just as landfill and Superfund sites are not equally distributed across the urban landscape, the economically disadvantaged and minorities are also not equally distributed across cities. Even though the most economically deprived and African-Americans are spatially located nearer the urban core, these results reveal that whether inside or outside the "old city" the economically deprived are most likely to bear the burdens associated with both landfill and Superfund sites.

Overall, the results indicate that Wilson's thesis concerning deindustrialization and its associated economic deprivation provide the most consistent explanation for environmental inequality in both Detroit and Portland. Though the urban core consists of both high levels of economic deprivation and isolation for African-Americans, it appears that African-Americans do not monopolize this economic condition. Indeed, poor Whites and Hispanics, more evenly spread amongst the urban landscape, bear the largest burdens when it comes to the environmental consequences of landfill facilities.

Sugrue (1996) argues that the deindustrialization process in Detroit started earlier than is usually recognized. Furthermore, Sugrue (1996) identifies the first wave of this process in Detroit as being one in which the city's auto companies moved from the industrial core to the outskirts of the city. The distribution of landfill sites in Detroit presented in this research tends to support Sugrue on this account. If Wilson (1996) is

correct, his explanation should gain power over time and should be most important in the later year of the analyses presented here, especially in the analyses for the Post-Industrial years. In fact, economic deprivation is significant in both the Industrial and Post-Industrial years. This indicates that the deindustrialization process, as reflected in the associated increase in economic deprivation, began earlier than is usually posited. Secondly, Sugrue's (1996) acknowledgment of the deindustrialization process moving auto plants to the suburban rings is supported by the distribution of landfill facilities in the Detroit metro area. Although the analyses here does not distinguish auto plants, the processes Sugrue describes appears to also explain the distribution of landfills and their increased presence in the areas beyond the urban core in both Detroit and Portland. There is, however, support for Sugrue's historical account of Detroit and the specific deindustrialization process that he points to as early as the middle 1940s and the results in Chapter 5 suggest a similar process in Portland.

The spatial distribution of landfills includes a second process. Although these analyses do not contain a measure for land values or for the land area within a census tract, the results seem to point to each of these as being decisive in landfill siting decisions. The results provide overwhelming support for economically deprived areas as disproportionately impacted by landfills. Yet, the MOST economically deprived areas within the urban core do not experience the same extent of environmental inequality as do those poor census tracts beyond the "old city." Thus, the results suggest that those tracts comprised of "medium" levels of economic deprivation are not only most likely to experience landfill exposure but they must have some other common element. I propose that the ecology of landfills demand large tracts of land and since most landfills are

municipally managed, they also require cheap land. Thus, I would suggest that those areas that are economically deprived AND outside the urban core meet both of these requirements.

There is a spatial segregation related to environmental inequality and it points to a fourth dimension to consider within the EIF framework—space. Wilson (1987, 1996) describes the entrapment of African-Americans within the urban core and this results in a number of economic disadvantages within the "ghetto"–that is, because African-Americans are unable to escape the urban core life chances are limited. In most interpretations, this results in negative consequences such as increased crime rates, increased rates of female-headed households, increases in unemployment and poverty. However, as Downey (forthcoming) notes this isolation prevents African-Americans from experiencing much of the environmental inequality associated with landfills because African-Americans are "shielded" from the consequences of landfills. This argument is also applicable to Portland where the African-American community is also highly concentrated within the northeastern portion of the urban core. Though this effect of being trapped might shield African-Americans from landfills, this is less so when Superfund sites are considered.

The Limits of Redlining and Segregation

One unforeseen finding in this research is the limited predictive ability of the formerly redlined areas. Prior to data analysis, I hypothesized the importance of race and redlined communities in explaining contemporary environmental inequality with a particularly salient role in Detroit. However, several factors limit the importance of race

in Detroit with respect to hazardous facilities. First of all, the distribution of landfills fails to center upon the urban core in Detroit where the overwhelming percentages of African-Americans reside. Because Detroit is traditionally a large industrial city its urban processes span the city, thereby producing hazardous facilities spread across the entire city. This process, it appears, was exacerbated by the desire for cheap, large tracts of land for landfill use. Despite the lack of findings regarding the importance of redlining, the maps clearly indicate the spatial isolation experienced by African-Americans in Detroit. Tickemyer (2000) stresses the spatial inequalities embedded in larger structures of power. Though the isolation of African-Americans in both Detroit and Portland lacks the presence of landfills, it nonetheless presents an example of the structured nature of life chances for those occupying this social space.

There is limited support for Massey and Denton's (1993) explanation of environmental inequality via racial segregation. The maps presented in Chapter 5 clearly indicate the spatial isolation of African-Americans in the redlined areas of both cities. Spatial inequality again stands as the driving force behind this outcome. Portland maintains a smaller than average African-American population, yet the clustering of this population centers upon the neighborhoods contiguous to the area originally "redlined" in Portland. Meanwhile, Detroit is popularly recognized as the "most segregated" city in the United States and though the African-American population is heavily concentrated in the urban core of Detroit, landfills are scattered about the metro area. Despite the spatial isolation of African-Americans consistent with Massey and Denton's (1993) explanation of racial discrimination there is very little support for a race-based explanation for environmental inequality – at least, this explanation is lacking for African-Americans.

Again, this appears to reflect the "shielding" effect. Yet, there is support for an explanation for environmental inequality related to race when we consider Hispanics.

It appears that between 1970 and 1990 the Hispanic population began to inhabit the area contiguous to the formerly redlined areas of Detroit, especially those directly west and southwest of the urban core. This then helps explain how new landfills came to be associated with the Hispanic population, but not with African-Americans in the Post-Industrial years. Additionally, the Hispanic population is not clustered in the same way as the African-American community. The maps above indicate that in addition to the area just southwest of the urban core, there is a prominent Hispanic enclave in the midst of Oakland County, an enclave heavily impacted by the presence of landfills. Again, this indicates a very complex process of environmental inequality, which is only apparent when the spatial component is accounted for. Furthermore, this illustrates Lobao and Saenz' (2000) explanation that spatial inequalities are time and space contingent – in this case, explanations that are not relevant at one point in time one are relevant at time two.

Wealth and Home Ownership

The final explanation under question deals with inequality as expressed in home ownership (Oliver and Shapiro 1995; Conley 1999). Detroit and Portland diverge on the findings on this score. That is, in Detroit landfill exposure is more likely (though not statistically significant) to occur in those areas with lower amounts of owner-occupied housing, while the reverse is true in Portland. If my intuition is correct about the need for cheap, large tracts of land for landfill facilities this explains the results in Detroit. That is, the cheapest and most open tracts of land lie away from those associated with high

percentages of home ownership, which is generally correlated with urban tracts of land and suburban communities. The puzzle of Portland, however, presents a more difficult explanation – why would landfills be more likely to occur in those locations with higher amounts of home ownership? As mentioned previously, Portland maintains very distinctive neighborhoods and these neighborhoods are traditionally comprised of cohesive, and sometimes very powerful, neighborhood associations. Given the importance that these associations have had on land development in Portland with respect to freeway and housing construction (Abbot 2001; Lansing 2003) it would not be surprising to find that these same neighborhood associations prevented landfill constructions near their neighborhoods. Bullard (1994) famously describes the "NIMBY" phenomenon in which some communities prevent the installation of noxious facilities through the "not in my backyard" tactic. Hird (1993) finds that, all else being equal, white and wealthy communities command clean-up of Superfund sites more quickly than do minority and poor communities. Given these circumstance, it is not surprising that locations with higher percentages of home ownership along with higher amounts of economic deprivation are more likely to house landfills than are those tracts with both high amounts of home ownership and high amounts of affluence. For example, the southwest hills of Portland are a highly affluent region in Portland as is the area just south (the Hawthorne District) of the Albina district where African-Americans primarily reside. Both of these communities, over the years, maintained powerful homeowners associations and points to how the local political power these areas might wield in preventing landfill and/or industrial development near to their neighborhoods.

The brief discussion of the impacts of socio-demographic indicators after landfill exposure indicates that environmental inequality occurs on two fronts. Whereas the economically deprived are most likely to experience the initial burdens and consequences associated with landfill exposure, after these facilities are in place indications are that not only is there continued economic deprivation, but also there is a subsequent increase in minorities and a decrease in owner-occupied housing. Although the results here are not definitive, they do indicate this general pattern. So even though those tracts in Portland with high amounts of home ownership are more likely to house landfill sites, once a landfill is present there is a subsequent decrease in home ownership. This tends to support the political power argument described in the previous paragraph – the associations in these neighborhoods are weak meaning that there is a subsequent decrease in home ownership as those who are able to do so move. Eventually, higher percentages of renters occupy these areas.

Intent and the Structure of Life Chances

Been (1993) and Anderton et al. (1994a, 1994b) claim that the time-ordering of events is paramount to uncovering environmental inequality. The argument is that without proof of the targeting of poor and minority communities for noxious facilities then it is not possible to establish a claim of environmental inequality. However, an overwhelming amount of research on life chances indicates that access to a whole number of "social goods" is limited and, therefore, results in inequality. In this case, the inability of the economically deprived to move away from landfill exposure supports the notion of impediments to life chances – specifically, to escape the possible health

consequences of living near a landfill. The fact that owner-occupied housing decreases and that minority population increases follow a landfill's presence, lends further support of an interpretation of limits to life chances. Because race and class are so tightly coupled it is not surprising to find that both the number of minorities and of the poor increase in the years following landfill exposure. Stretesky and Hogan (1998, 1999) propose that structural factors limit the abilities of minorities and the poor to avoid these kinds of facilities and the analyses here support this conclusion–the socio-demographic changes indicate limited life chances structured by the political, social, and economic institutions in American society.

Sources of Contamination

Finally, the Superfund results point to the importance of investigating multiple sources of contamination. The major difference we see in Superfund and landfill locations is their distribution pattern. Spatially, landfills tend to be away from the urban core, while Superfund sites tend to be more closely associated, though not exclusively, with this section of the city. This finding holds for both Detroit and Portland. The results again indicate that economic deprivation is the most important indicator and those areas most associated with economic deprivation in the urban core closely parallel the city's industrial areas. Furthermore, Superfund sites are more closely associated with minority populations, especially African-Americans, and redlined tracts. This indicates, again, the importance of understanding the spatial distribution of people and the type of facility across the urban landscape. The results are fairly straightforward and are tied to many of the processes described above. As Wilson (1987, 1996) explains, African-Americans are

relegated to the "ghetto" and unable to escape. Whereas this shields African-Americans from landfills (Downey forthcoming) it actually has the reverse effect when Superfund sites are considered.

The findings here indicate some important contributions. First of all, it indicates the importance in considering a spatial component in evaluating the development of environmental inequality. Specifically, the quantitative results indicate that landfill and Superfund sites are not equally likely to be distributed across census tracts and that specific groups of people are simultaneously sorted inequitably across the urban landscape. Second, we find that each city develops its own unique pattern of landfill and Superfund distribution as well as its own spatial patterning of people. At the same time, there are commonalties across cities as well, such as the importance of economic deprivation. These findings clearly indicate that Pellow's (2000) emphasis upon history is important as each of these cities develop in unique patterns. Finally, we find evidence of environmental inequality with most of the evidence pointing to the importance of economic and class dynamics, although race plays an important role for Hispanics in Detroit and, more generally, for African-Americans when considering Superfund sites. The contribution of redlining is disappointing and proves to be the least important of the explanatory variables.

Limitations of the Results and Directions for Future Research

Although these findings are thought provoking, they leave important questions unresolved. First, as in any social research, issues of measurement stand as an important limitation. In some cases there are variables or indicators that are not available, that are

available only at certain times in the analyses, or that simply capture one dimension of some larger phenomenon. There are numerous variables that are missing from the models presented—in part, this is reflected in low R-squares. For future research projects collecting data on land values, land area, and perhaps specific industry generators would prove important. The issue of land values and land area seems especially pressing in understanding the distribution of landfills – although I have intuitively argued that these conditions underlie the distribution of landfills, without data on these measures it is only a hypothesis.

Nonetheless, most of the major variables utilized in previous studies are replicated in this research. As mentioned above there are aspects of the data that are available for only part of the analyses. This presents some limitations, especially with respect to the findings related to Superfund sites and the discussion of an emergent minority group in the United States, Hispanics. The matter of only capturing one dimension of a phenomenon reveals itself in the measures of wealth segregation and racial segregation. Owner-occupied housing may serve as a poor measure for wealth. This may explain, in part, the findings that home ownership is highly related to landfill exposure in Portland. Refining the measure of wealth utilizing alternative data stands as a central component of future research endeavors. For example, as data on wealth becomes more accessible utilizing the median cost of a home would prove a more precise measure of wealth. A similar lack of information may also be present in the findings for race. In this dissertation, percent African-American, percent Hispanic, and the historical legacy of redlining represent the only measures for racial segregation. The most accepted measures of racial segregation are the five measures developed by Massey and Denton (1993).

However, to utilize these measures requires data from a smaller unit of analysis (the block group) than the one being utilized and these data were unavailable for this research. Future research, however, should attempt to incorporate such measures to assure more precise indicators of racial segregation.

One concern in this research is the likelihood that the models suffer from spatial autocorrelation. The "First Law of Geography" states: "everything is related to everything else, but near things are more related than distant things" (Tobler 1970: 3). Given that the unit of analysis in this study is the census tract it is likely that variables are not only related at time 1 and time 2 (e.g. 1950 and 1960), but that contiguous census tracts are spatially autocorrelated. In future research, a means to addressing this problem lies in utilizing "local indicators of spatial association" (LISA). These indicators provide a measure of place that takes into account the spatial clustering of variables and limits the impacts of spatial autocorrelation (Oakley and Logan forthcoming). Additionally, Oakley and Logan (forthcoming) suggest avoiding predetermined samples. In their study of service providers in urban locations the cases are selected by locating clusters of high and low income census tracts. Using these clusters, they then compare the types of services that are available in each set of clusters. In future research, utilizing a similar research design provides a method of alleviating spatial autocorrelation while allowing an amendment to the research questions addressed in this research. Instead of interrogating whether or not landfill and superfund sites are more likely to appear in neighborhoods with higher amounts of economic deprivation or higher percentages of African-Americans, this research design would compare high income and low income clusters (also predominantly Black and predominantly White clusters) with respect to hazardous

facilities. By utilizing LISA, I would simultaneously alleviate concerns over spatial autocorrelation while also broadening the scope of possible questions.

The number of cities under consideration also proves to be a limiting factor. Although these findings provide insights into both Detroit and Portland, it is not clear that these two cities are necessarily representative of a larger set of cities in the United States. Although these two cities maintain both similarities and differences, they also have peculiarities not present in other urban locations. One remedy to such a problem is to perform the same analyses on an additional set of cities. Selection of the additional cities, of course, is vital in providing more generalizable results. Nonetheless, the generalizability of the findings here would be greatly enhanced with the inclusion of additional cities.

The specific historical context within which landfill placement and the actual circumstances leading to Superfund designation remains unaccounted for in this research. That is, although there is evidence that the economically deprived are more likely to experience landfill exposure, without knowledge of the specific dynamics underlying the actual siting process it is impossible to make claims about intentional environmental inequality. As Pellow (2000) makes clear, the formation of environmental inequality always entails multiple stakeholders – uncovering the roles these stakeholders played in the actual siting process is essential to a full accounting of these historical developments. Tending to this weakness with the use of qualitative data in the historical accounting of these outcomes would greatly improve our understanding of the outcomes revealed in these quantitative results.

The analyses presented here ends in 1990. Although utilizing 2000 census data presents some problems, the addition of this data would prove advantageous. For example, the data on minority populations is more specific (though this creates additional measurement issues) in the most recent census. There is limited data available on the Hispanic population extending this out for another decade may help in understanding the trends suggested in this research. Thus, the 2000 Census data, if added to this existing dataset, may prove an important extension of this research.

Finally, I propose a spatial component to the EIF framework. Even though evidence of this spatial inequality is presented here, future research tackling the underlying mechanisms for this spatial inequality should be further addressed. Although explanations for this spatial inequality are explained in this research – that is, deindustrialization, redlining, housing segregation, owner-occupied housing – teasing out these spatial relationships would prove to be an important extension of the results in this dissertation and their place in the EIF framework.

Conclusion

This dissertation brings new insights into our understanding of environmental inequality. First, an historical study utilizing original data from multiple sources points to interesting, although complicated relationships between landfill and Superfund sites and the communities surrounding these facilities. Second, three explanations central to our understanding of social inequality provide an increased and nuanced understanding of environmental inequality. Finally, the increasing importance in understanding social relationships with respect to spatial distributions of people contributes to a more precise

understanding of environmental inequality specifically and social inequality more generally. Only by embracing these larger theoretical, conceptual, and methodological concerns can we further our understanding of the relationships between humans, their environment, and social inequality.

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