

DISSERTATION

DECODING THE JOLLY GREEN GIANT: AN ANALYSIS OF GREEN GENTRIFICATION IN THE  
CONTEXT OF RAILS-TO-TRAILS POLICY

by

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Presented to the Faculty of the Graduate School of  
The University of Texas at Arlington in Partial Fulfillment  
of the Requirements  
for the Degree of

DOCTOR OF PHILOSOPHY

THE UNIVERSITY OF TEXAS AT ARLINGTON

May 2019

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## Abstract

### DECODING THE JOLLY GREEN GIANT: AN ANALYSIS OF GREEN GENTRIFICATION IN THE CONTEXT OF RAILS-TO-TRAILS POLICY

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The University of Texas at Arlington, 2019

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Recent urban public policies and planning initiatives have resulted in increased efforts to improve stewardship of our limited natural resources (sustainability), increase defenses against natural stressors (resiliency), while also seeking to prevent and remedy unequal environmental burdens placed on minority, elderly, and lower-income communities (environmental justice). This research seeks first to evaluate how the intersection of these policies combine to create the urban phenomenon of Green Gentrification, where the intended effect of these actions is to improve environmental characteristics and infrastructure, but they often result in the displacement of original citizens and culture the improvement sought to help (Gould & Lewis, 2017, p. 13; Wolch, Byrne, & Newell, 2014, pp. 234-235). The Institutional Analysis and Development (IAD) Framework will be used to provide an explanation of the context within which Green Gentrification occurs (Polski & Ostrom, 1999, p. 5; McGinnis, 2011, p. 169; Schlager & Cox, 2018, p. 215). Subsequently, a quantitative analysis will be employed to analyze changes to the sociodemographic makeup of neighborhoods adjacent to the linear park before and after construction using Linear Hedonic Regression. The case study for this research will be The Katy Trail in Dallas, TX, a Rails-To-Trails project (16 U.S.C. § 1247(d)). Finally, possible solutions of practical planning applications and policy strategies will be presented to maximize environmental benefits, increase community ownership, and minimize displacement to move the field closer to making green infrastructure a reality for all communities.

**Key words:** Green Gentrification, Gentrification, Mixed Methods Analysis, Institutional Analysis Development framework, Linear Hedonic Regression, Displacement, Green Infrastructure, Housing, Rails-to-Trails, Linear Parks, Race and Parks

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## Chapter 1 - Introduction

Recent policies focused on sustainability and environmental justice have resulted in increased efforts to improve stewardship of the earth's limited resources (sustainability), prevent and remedy unequal environmental burdens imposed on communities of color, the elderly, and those with lower-incomes (environmental justice), as well as preparing for how to maintain operations in the face of environmental stresses (resiliency). Seemingly altruistic, these actions in tandem often result in a dichotomous outcome when they are co-opted by economic interests. Their positive effects manifest in the improvement of community conditions through either the addition of environmental infrastructure/amenities or the removal of an environmental hazard, referred to as Green Gentrification. Unfortunately, these policies also often result in the displacement of the original residents and culture the changes sought to help. The questions then become: How do we explain the process of Green Gentrification? Do green improvements cause gentrification? If so, are there strategies and tactics that the community and practitioners can employ to prevent the displacement effects of these actions and still reap their improvement benefits?

This research seeks first to evaluate how sustainability, environmental justice, resiliency, and economic policies combine to create the urban phenomenon of Green Gentrification. This research will also determine if there have indeed been changes to the sociodemographic makeup of neighborhoods adjacent to The Katy Trail in Dallas, TX, a Rails-To-Trails project due to Green Gentrification. The Institutional Analysis and Development (IAD) Framework will be used to provide an explanation of the context within which Green Gentrification occurs. Subsequently, a quantitative analysis will be employed to analyze the explanation gathered through the IAD process through analysis of sociodemographic characteristics reported in census data for areas directly adjacent to the linear park before and after construction using Linear Hedonic Regression. Finally, this research will seek to suggest possible solutions through the presentation of practical planning applications and policy strategies to provide thoughtful solutions that will help to make green infrastructure a reality for all communities.

## Chapter 2 – Literature Review

### A. History of Environmental Regulation in the United States of America

Throughout the course of American history, attitudes towards the environment, and its appropriate use and management, have changed drastically. During colonial times the dominant approach towards the environment was to use only those resources that were immediately needed. As time went on, new chemicals and processes were introduced that increased the amount of production, with a new focus on profit instead of immediate need. As knowledge of these actions grew, including long-term effects of the resulting pollution, public opinion began to move the government towards comprehensive regulation to remedy and mitigate environmental harms.

#### 1. Colonial Times

From its inception America's ideas toward the environment have been in a state of constant change, influenced greatly by population density and predominant economies. The very first conservation behaviors were observed at the beginning of our Nation's history when colonists congregated in small groups, maintained farms that met their personal/group needs, made their own clothes & tools, and built their own homes. These creations were made of natural materials and often produced little waste. This way of life drastically changed when mechanization was introduced in the 1700s, which required increased supplies of raw goods, intermediate resources, and larger labor forces. The Industrial Revolution ushered in a new approach to the environment, where resources were used without regard to future needs or proper disposal. The need for more labor encouraged migration to production centers, the precursors to modern cities (Levy, 2013, pp. 58-60). Industry workers normally lived very close to the factories in densely populated and cramped living quarters that lacked a standardized system to handle the vast amounts of human and manufacturing waste. Streets were often used as human and household waste repositories and served as breeding ground for contagious diseases (e.g. smallpox, typhus, and cholera), especially dangerous because of their ability to spread easily and quickly in close quarters (Kaplan et al., 2014, p. 56). Described as

“generally unpaved, rough, dirty, filled with vegetable and animal refuse, without sewers or gutter, but supplied with foul, stagnant pools ... ventilation is impeded ... many human beings here live crowded into a small space” by Friedrich Engels the health concerns of “working-men’s quarters” were the first impetus for environmental regulation to help protect water sources and limit the spread of disease (Kaplan et al., 2014, p. 56; (Gottdiener & Hutchison, 2011, pp. 44-45). This observation described the general condition of workers living in poorly constructed and poorly ventilated company provided homes adjacent to the factories where they worked. These areas also lacked government regulation that would create appropriate systems to deal with human and household waste, leaving workers (often not highly educated and very poor) with limited options and means to afford quality housing.

The lack of internal incentives for factories to abate their pollution, and absence of external formal pollution controls and sanitary standards, also contributed quickly to the environmental degradation of cities. One key example was smoke emitted from coal-powered engines in factories and exhaust from transportation sources, which radically amplified the amount of pollution and particulate matter in the air. Kaplan (2014) has mentioned that these emissions were as “black soot casting a pall over the city,” in direct contrast to the clean air associated with provincial living that preceded mass industrialization and migration to cities (Kaplan et al., 2014, p. 56). Water supplies were also negatively affected as industry grew. Rivers, lakes, and other nearby waterbodies were often used as human & industrial waste, drainage, and sewage depositories - breeding grounds for disease and sources of groundwater pollution (Kaplan et al., 2014, p. 56).

## 2. The Early Environmental Movement (Early 1900s)

As pollution and use of natural resources increased, preservationists, conservationists, and scientists began to speak out. Gifford Pinchot, the first Chief of the US Forestry Service, believed the earth was the most precious American resource, and said the population’s attitude that natural resources were inexhaustible was a “stupidly false adjective,” (Pinchot, 1910;1967, p.6). Quick to clarify that conservation was about

future and present use, Pinchot encouraged the approach of the “greatest good to the greatest number for the longest time” (Pinchot, 1910;1967, p. 48). Using biblical imagery of the prodigal son who uses up all his wealth (he provides examples of the environmental and economic impact of impaired waters and loss of timber resources) and sternly advises that once the nation’s natural resources are exhausted, they cannot be restored or replaced (Pinchot, 1910;1967, p. 8-19). Pinchot believed another solution for conservation was to maximize home-based ownership of land, and decrease land held by corporations or single actors he felt acted in ways that would damage and strain the land (i.e. land speculation, maintenance of large herds etc.) (Pinchot, 1910;1967, p. 13). His thoughts can be summarized in the following quote: “The planned and orderly development and conservation of our natural resources is the first duty of the United States. It is the only form of insurance that will certainly protect us against the disaster that lack of foresight has in the past repeatedly brought down on nations since passed away” (Pinchot, 1910;1967, p. 20). Appropriate uses could include re-use of existing infrastructure to maximize the good done while conserving resources, like the construction of linear parks discussed below.

As the Industrial Revolution’s focus on invention and technology improvements continued from the mid to late 1700s until the 1940s, technological and industrial advances abounded, where most products were a result of refining or altering naturally occurring resources (Levy, 2013, p. 59). In the 1940s a new practice of using non-naturally occurring components (synthetic, artificial, chemically/genetically modified, etc. materials) was introduced into mass production processes (Levy, 2013, p. 59). While these components greatly expanded the categories available for production, they had two important negative implications: 1. they normally possessed some “degree of toxicity” to human and animal life, and 2. they lacked a natural path or process for degradation and disposal after use (Levy, 2013, p. 59). One such product was dichloro-diphenyl-trichloroethane, more commonly known as DDT (Maguire & Hardy, 2009, p. 152). This chemical was one of the very first synthetic insecticides and was initially used to combat insect-borne diseases, such as malaria and typhus, with soldiers during World War II (Maguire & Hardy, 2009, p. 152). It was later

approved for use in civilian, livestock, and crop applications (Maguire & Hardy, 2009, p. 152). However, as time went on, evidence began to accumulate that showed a strong correlation and casual connection between the use of DDT, environmental degradation, and poisonous/toxics effects to human and animal life (Maguire & Hardy, 2009, p. 152). Two of the most noted long-term effects of DDT were its ability to persist in the environment and to accumulate in fatty tissues of living organisms (Maguire & Hardy, 2009, p. 152). These characteristics substantiated a threat to environmental health, human health, and global health.

Citizen activist were beginning to take note of these issues. In *Silent Spring*, Rachel Carson, a former researcher for the U.S. Fish and Wildlife Service, detailed the lasting detrimental effects of pesticides, such as DDT, and other chemicals on our environment. Carson's book educated the public on the risks associated with the use of these types of chemicals, fostered national concern over the proper use of pesticides, and encouraged the need for control measures using her theories that DDT was entering the food chain and would result in dire consequences to both human and environmental health (Levy, 2013, p. 59). *Silent Spring* called attention to the financial self-interest that affected environmental decision making (Lear, 1993, p.35). She advocated for a change in the way governments operated in the environmental arena (Lear, 1993, p.35). Carson advocated for a consideration of the complexities in nature in environmental decisions and increased citizen awareness of government decisions and research findings regarding the environment (Lear, 1993, p.35). This information prompted President Kennedy to instruct his President's Science Advisory Committee to investigate the risks of its use (Maguire & Hardy, 2009, p. 153).

Carson's contemporary, biologist Barry Commoner, echoed these sentiments in *The Closing Circle*. Commoner believed that everything in nature was tied to a closed loop process he referred to as *the cycle of life* (Scott, 1973, p. 82). He looked at nature as several of these self-sustaining ecospheres functioning in harmony, as a counterbalance to each other to ensure there was not waste or overuse (Scott, 1973, p. 82). According to Commoner, the only organism not in compliance with this structure was the human, due to an inability to limit growth and waste (Scott, 1973, p. 82). Commoner believed that interruptions to existing

cycles of life in water, air, and soil were caused by man's overuse of natural resources due to postwar population boom and industrial processes that produced waste (i.e. synthetic and other nonbiodegradable materials) and pollution (i.e. smoke from coal burning engines, particulates in the water, etc.) the ecospheres were not designed to handle (Scott, 1973, p. 83). Commoner posited that "environmental 'externalities' are ... a burden on society ... an economic system which is fundamentally based on private transactions ... is increasingly ineffective in managing this vital social good" (Commoner, 1971, pp. 85-86). He believed the system needed reform. His solutions to this imbalance included changing from capitalism to a rational production type (i.e. social thrift that would seek to maximize value over profit), and to globalize production to include all countries with labor inputs (to decrease mechanization) and the use of finished products (decrease waste) (Scott, 1973, p. 84).

Each of these contributors noted the role of man's impact on the natural environment. Although each had a unique vantage point and solution suggestion, they converge at the following premises: 1) man's actions must in some way be curtailed to conserve and sustain the natural environment, and 2) there are priceless intangible benefits man can receive from close proximity to a healthy natural environment. These main thoughts have been two of the guiding forces for environmental and conservation movements in the United States and worldwide. The important realization that man impacts the world around him has facilitated a change in course from solely consumption and waste production to an emphasis on conservation and compatible uses.

During this time, several negative environmental events also increased public support/further precipitated the call for increased regulation of industrial processes, waste management, water quality standards, and systematic environmental management. One such event was the breach of the Buffalo Creek coal mining refuse dams in Virginia. Coal refuse/slag from the Buffalo Mining Company nearby coal mining operation was used to create three makeshift dams that impounded water used to wash coal from the mines (Colistra, 2010, p. 80). After a heavy rain event, all three of the dams broke, flooding adjacent and downstream towns

(Colistra, 2010, p. 80). Several times before the breach, enforcement officials and community members cited the dangerous conditions of the dams, but coal mine owners refused to make necessary corrections or adjustments (Colistra, 2010, p. 89). The negligence of the owners and operators resulted in loss of life, loss of property, and a \$13.5million dollar settlement that could have been avoided with proper code compliance and enforcement.

Another example can be found in the Cuyahoga River. The Cleveland Cuyahoga River is known as the river that caught fire. Sewage, oil, and waste were regularly deposited into the river and over time, with the proper environmental conditions, those items caught fire. The most interesting fact about the June 1969 incident that gained media attention was that it was not the first time the river had caught fire (Stradling & Stradling, 2008, pp. 516-517). The August 1969 article on the incident by *Time* magazine included an image of a fire on the river that occurred seventeen years earlier and language that implied the river became so polluted that it suddenly burst into flames (Stradling & Stradling, 2008, p. 517). The river was then covered in the *National Geographic* December 1970 issue entitled “Our Ecological Crisis” (Stradling & Stradling, 2008, p. 518). The conversation continued to infiltrate media and popular culture, eventually reaching children’s literature. Noted children’s author Dr. Seuss was one of several popular writers that joined the conversation in August of 1971, with *The Lorax*. This book foreshadowed a world where all the natural resources, especially trees, are extinct due to overuse. Not only did this book present a warning, it also sought to educate impressionable young minds and encourage them change their behavior now.

### 3. The Environmental Movement and Federal Action

In the 1960s, environmentalism reached the White House. President Lyndon B. Johnson and the First Lady, Lady Bird Johnson, began some of the first federal attempts at environmental legislation. President Johnson focused on the establishment of standards and protection, while First Lady Johnson focused on roadside cleanup and beautification (Flippen, 2000, pp. 6-7). As environmental awareness and media coverage of environmental issues increased, pressure for greater federal action rose, culminating in 1969-1970, when



both Congress and President Richard Nixon began to directly address environmental policy at the federal level. In his 1970 State of the Union Address, President Nixon redefined economic growth as “desirable only if it improved the ‘quality of life’” and used both land and technology wisely. He believed one of the greatest policy issues of the 1970s would be how our nation decided to interact with nature. Nixon believed the “time has come when we can wait no longer to repair the damage already done, and to establish new criteria to guide us in the future.” (Flippen, 2000, p. 64.) Nixon went on to further the externality discussions begun by Carson and Commoner. He urged Americans to realize that a clean environment does not come without cost, and that the nation’s debt for the pollution created in the past was being called due and must be paid. One way he intended to achieve that goal was working with Congress to enact and enforce the most expansive and comprehensive federal environmental legislation package for pollution and waste in US history (Flippen, 2000, p. 64.)

Not solely left to citizen scientists, Senator Gaylord Nelson also spoke out against the declining condition of national environmental resources. During his first seven years in office he helped sponsor the Wilderness Act (which put permanent protections in place for millions of acres of federal wild lands), worked to pass the Wild and Scenic Rivers Act to protect federal rivers, the 1970 Clean Air Act, revisions to the Clean Water Act in 1972, and the Endangered Species Act. Nelson also established Earth Day, a grass roots protest/effort to bring attention to existing environmental problems and educate the public on current environmental issues on April 22, 1970, (Flippen, 2000, pp. 7-8). Earth Day’s goal was to demand “protection for overall environmental quality” (Flippen, 2000, pp. 7-8). With over twenty million participants, including 10,000 schools and 2,000 universities, and coverage by all three major news networks, Earth Day was a huge success and cemented the environmental movement as a viable political conversation (Flippen, 2000, pp. 7-8).

This increased awareness and education regarding environmental issues was also accompanied by the newly acquired affluent lifestyle of Americans after World War II (Flippen, 2000, p. 2). The American population

and gross domestic product increased at the same time the average time Americans worked decreased (Flippen, 2000, p. 2). More discretionary income and a shorter work week allowed Americans the new luxury of *leisure time*, often enjoyed through outdoor recreational activities (Flippen, 2000, p. 2). This lifestyle change, and more intimate association with nature, created a vested interest in citizens to protect their environments (Flippen, 2000, p. 2).

These facilitating factors lead Congress to create laws that would provide a system-based approach to environmental regulation. This was done through a series of general and media specific laws that sought to prevent future environmental harm, cleanup existing environmental hazards, and hold responsible polluting parties accountable. Private industry as well as individuals could be held liable under these laws to protect the nation's natural resources from commercial and household pollution. This period of community activism and congressional action is often referred to as the beginning of the Environmental Movement/Revolution.

Prior to the 1960s national environmental regulations that provided guidance on how to handle industrial, commercial, and human wastes properly did not exist. Congress changed that in 1969 with the enactment of the National Environmental Policy Act (NEPA) (42 U.S.C. Sec. 4321 et seq.). This legislation created both the first national environmental regulatory agency, the Environmental Protection Agency (EPA), and the first national governing policy body on environmental regulation, the Council on Environmental Quality (CEQ) (Levy, 2013, p. 59). This act required all federal agencies and entities receiving federal funding to evaluate the environmental effects of their actions prior to implementation. This analysis is most often completed through either an environmental assessment (EA) or environmental impact statement (EIS). If the probability of substantial environmental harm is found during the assessment process, the federal government may require remedial/mitigating actions or halted implementation altogether. This revolutionized the role of environmental consideration in government and business practices/processes.

NEPA was the first in a series of federal legislation measures aimed at protecting and cleaning the environment (Levy, 2013, p. 59). It was followed closely by several media specific laws including the Clean Water Act, 33 U.S.C. Sec. 1251 et seq., (originally the Federal Water Pollution Control Amendments of 1972, which sets protects and sets minimum standards for water quality for the nation), Clean Air Act, 42 U.S.C. Sec. 7401 et al, (which protects and sets minimum standards for air quality in the nation), and the Safe Drinking Water Act (which established minimum quality standards for drinking water). Additional environmental legislation followed that took a more general approach. These laws included the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. Sec. 9601 et seq., (which provides additional guidance on environmental cleanup and response, compensation for injured parties, and guidelines for assessing and determining liability for environmental harms), commonly known as “Superfund” because it provides financial resources to assist with cleanup. Moving beyond the scope of naturally occurring resources, Congress enacted legislation focused on protecting animals as well as requirements for the creation, management, and disposal of synthetic, chemically altered, or genetically modified materials. These acts include the Endangered Species Act (which provides protection/conservation for endangered and threatened species and their natural habitats), Resource Conservation and Recovery Act, 42 U.S.C. Sec. 6901 et seq., (which regulates the creation, transportation, treatment, storage, and disposal of hazardous waste) often referred to as “cradle to grave” guidelines because it follows hazardous waste from its creation to disposal, Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. Sec. 136 et seq., (which provides for the federal regulation of the licensing, distribution, sale, and use of pesticides), and Toxic Substances Control Act, 15 U.S.C. Sec. 2601 et seq., (which requires reporting, record-keeping, testing requirements, and restriction on chemical substances and mixtures).

Each new piece of legislation also led to increased federal regulation of commercial and civilian activities, impacting how we all work, live, and play. These environmental acts (including their subsequent

amendments) continue to work to improve our land, air, and water resources, provide safe drinking water, protect existing environmental resources (flora and fauna), and initiate the ongoing process of environmental cleanup.

## B. Evolution of Environmental Regulation

The Environmental Movement of the 1970s was just the beginning of federal influence on the regulation of the environment and wastes that could cause it harm. Over the next several decades movements to prevent undue environmental burdens on communities, increase stewardship of existing resources for the current and future generations, and protect against natural disasters began to materialize. These additions added new layers of complexity to the environmental conversation.

### 1. Environmental Justice

Although the measures of the 1960s and 1970s were a significant start to remedying past environmental missteps and mitigating the occurrence of new harms, they had a dramatic effect on production cost. Previously, companies could produce commodities without considering the environmental cost of their production processes. However, after the advent of environmental legislation, actors were obligated to internalize the cost of the environmental impact of their processes, which often significantly reduced profits. Regulated environmental impact could include excessive noise, increased sediment runoff, smoke and particulate emissions into the air, and other items or activities that interfered with or lessened environment quality. These included proper waste disposal (including proper labeling, packing, storing, transport, and disposal), adding screens to their smoke stacks to reduce air emissions, or adding in a filtration system to the end of their processes to be sure wastewater was cleaned of any banned or harmful substances before it was sent to a wastewater treatment facility.

Compliance with federal environmental regulations was mandatory, so companies began to look for other ways to minimize costs, and often found that reducing land costs was a viable way to reduce newly increased operating expenses. In some cases, firms that dealt with particularly harmful substances to the environment

frequently found available sites near minority and lower income communities (Wheeler & Batley, 2014, p. 235). Companies would purchase or lease the less expensive land and use it to open and operate environmental treatment or hazardous waste sites near minority and lower income communities (Bullard, 1990/2014, p. 238).

One of the first well-known instances of this occurred in Warren County, North Carolina, in 1982. The State selected land in Warren County, the poorest county in the state at the time, to site a commercial hazardous waste landfill that would receive industrial waste, including nearby soil that had been illegally contaminated with polychlorinated biphenyl (PCB) (Szasz & Meuser, 1997, p. 99; Colsa, Grafton, Hintzen, & Orvis, 2014, p. 8). The vast majority of the county population (65%) was African American (Szasz & Meuser, 1997, p. 99). The residents of Warren County banded together to protest the siting of the facility in their neighborhood using Civil Rights era activism and rhetoric, claiming *environmental racism* (the inequitable distribution of environmental risks in society based on race) as the motivation behind the location of the new landfill (Szasz & Meuser, 1997, p. 99). These protests led to mass arrests, including Walter Fauntroy, the Representative for the District of Columbia and leader in the Congressional Black Caucus at the time, and Dr. Benjamin F. Chavis, Jr., the Executive Director of the United Church of Christ's Commission for Racial Justice (Szasz & Meuser, 1997, p. 99). Both men went on to encourage their respective organizations to conduct research regarding the connection between race and the siting of environmental harms.

At the regional level, Representative Fauntroy requested the Congressional General Accounting Office (GAO) study the correlation of nearby demographics and economic status in the southeastern US (Region IV of the EPA) (Szasz & Meuser, 1997, p. 100; GAO, 1983, p. 1). In the neighborhoods surrounding the large commercial hazardous waste landfills existing at the time, three out of the four areas studied were located near predominantly African-American communities, and in communities where at least 26 % of the population was below the poverty line (Szasz & Meuser, 1997, p. 100; GAO, 1983, p. 1). This study was

followed by national research conducted by the United Church of Christ Commission for Racial Justice (CRJ) that compared zip codes with hazardous waste treatment, storage, or disposal facilities (TSDFs) to those without TSDFs, entitled *Toxic Wastes and Race in the United States: A National Report on the Racial and Socio-Economic Characteristics of Communities with Hazardous Waste Sites* (Szasz & Meuser, 1997, p. 100; Colsa et al., 2014, p. 9). The CRJ study found: 1) in zip codes where no TSDFs were cited the minority population was about 12%, 2) zip codes with one TSDF location had approximately 24% minority population, and 3) zip codes with multiple TSDF locations, or zip codes with one of the five largest TSDFs in the nation at the time, had approximately 38% minority population (Szasz & Meuser, 1997, p. 100; CRJ, 1987, p. xiii). The CRJ found that “[r]ace proved to be the most significant among variables tested in association with the location of commercial hazardous waste facilities” (CRJ, 1987, p. xiii). At the local level Professor and author, Dr. Robert Bullard, found that 84% (21 of the 25) of the existing solid waste facilities in the City of Houston were located within African American neighborhoods (Szasz & Meuser, 1997, p. 100). He chronicled his research in a journal article entitled “Solid Wastes Sites and the Black Houston Community” (Szasz & Meuser, 1997, p. 100).

In 1990, scholar-activists, participant observers, and government (federal and state) officials met at the *University of Michigan Conference on Race and the Incidence of Environmental Hazards*, organized by University of Michigan professors Drs. Bunyan Bryant and Paul Mohai (Szasz & Meuser, 1997, p. 100). They discussed the findings of these studies and incidences of environmental racism nationwide (Szasz & Meuser, 1997, p. 100). Bunyan and Bryant reviewed the finding of fifteen studies on environmental racism and concluded that “Where the distribution of pollution has been analyzed by both income and race ... in most cases race has been found to be more strongly related to the incidence of pollution” (Szasz & Meuser, 1997, p. 102 quoting Mohai and Bryant 1992, p. 167). In 1991, delegates to the *First National People of Color Environmental Leadership Summit* adopted the seventeen governing principles of Environmental Justice that called for substantive and procedural changes in how environmental decisions are made,

including meaningful involvement in the administrative process and redress of previous environmental wrongs (Turner, R. L., & Pei Wu, D., 2002, p.11). Following these and several similar events, in 1992 Congress created the Office of Environmental Equity (later known as the Office of Environmental Justice).

The EPA then defined environmental justice as:

[t]he 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 socio-economic 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

(Bullard, 1990/2014, p. 236).

President Bill Clinton joined the conversation on February 16, 1994, when he signed *Executive Order 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requiring that:

each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

Executive Order 12898 was an integral step towards addressing existing social harms in minority and low-income communities and gave validity to the plight of affected neighborhoods, created a policy buffer from future harms, and initiated a call to action for federal agencies. This order not only required identification of existing harms, but also required federal agencies, and those receiving federal funds, to act to address “disproportionately high and adverse human health or environmental effects” of any of its administrative policies, programmatic initiatives, and implementation activities negatively affecting minority and low-income populations. Buttressed by federal executive policy in their favor, communities of color began to become more active in Environmental Justice (EJ) initiatives pushing back against the citing of new potentially hazardous environmental facilities and the extension of existing sites (Bullard, 1990/2014, pp. 235–241).

## 2. Sustainability

The environmental movement, and accompanying regulations, led to the creation of vast amounts of new knowledge on the environment. One key area of new research focused on how human activities could impact the availability of natural resources for future generations. As with Carson's work, *Silent Spring*, this new information made the public more aware of how the long-term effects of current use or misuse of natural resource could affect their children and generations to come. As the public began to understand more about the cyclical nature of the environment, and that environmental resources are finite, new desires to properly manage resources began to take shape. The consequence of access to this knowledge was the creation of the sustainability movement. Sustainability focuses on how consumers can responsibly use resources to meet current needs and avoid the depletion, or detrimentally harm/damage, of resources for their progeny.

Although sustainability is a contemporary policy topic, it can be traced back as far as the late 1800s as a response to mass urbanization and industrialization. In his assessment of the ills of the industrial city (as discussed in detail above), Howard (1898) presented ideas of how human and urban activity could exist in harmony with nature in *Tomorrow*, later republished as *Garden Cities of To-morrow*. Howard aimed to marry the best of town (industrialized areas) with country (nature) to provide a balanced living environment with equal access to green and urban spaces (Clark, 2003, p. 88). Howard's model reframed how society organized itself by fitting human development into the natural environment in a systematic and organized way, instead of attempting to reform nature to fit human developments (Clark, 2003, p. 88). Howard's garden city design focused on limiting population, creating limited, interconnected, & clearly defined transportation routes, and exposure to nature in its undisturbed form.

Continuing in this line of thought, Aldo Leopold introduced the idea of ethics in the use of the environment in his 1949 work, "The Land Ethic." In this essay Leopold "emphasized managing natural resources for sustained yield" (Leopold, 1949/2014, p. 24). Leopold believed that ethical consideration was void in man's



relationship, and outlook, regarding land (Leopold, 1949/2014, p. 25). He asserted man still viewed land as property only, reaping the benefits of use but not acknowledging the limitations or responsibilities thereof (Leopold, 1949/2014, p. 25). Leopold encouraged the premise that “the individual is a member of a community of interdependent parts,” which includes people and all components of the land (i.e. soil, water, animals, plants, etc.). Perceiving the environment as a connected living system would require humans to change their role from that of superiority to co-member and citizen and which would require them to work towards a state of conservation, where people and land would exist in harmony and balance (Leopold, 1949/2014, pp. 25-26, 27).

J. B. Jackson, a cultural geographer, also explored this subject from a critical lens. He first addressed the idea of landscapes as a concept that had evolved from a type of painting, to a view of man’s surroundings, to a background (backdrop) of modified or created spaces for the activities of men (Jackson, 1984, p. 8). He went on to explain that although man had the ability to modify the earth, it was also an inhabitant & member subject to its natural order (Jackson, 1984, p. 11). This complexity of relationship required man to “come to terms with nature if we are to survive” (1984, p. 11). Jackson’s (1984) solution was to recognize that there had to be a compromise between the “dense vitality” of living with other people and the “wholesomeness” of being close to nature, yet he stopped short of endorsing utopias (such as the one described by Howard), and instead suggested that the two competing themes alternate (p. 12).

Favoring the interest of the environment, McHarg (1969) posited that man should allow nature to dictate the location and type of urban design in his 1969 work “Plight and Prospect”. Instead of focusing on the monetary value of a possible new development, McHarg (1969) contended that the value and quality of the natural processes of the environment should be the determining factor on whether development took place (McHarg, 1969/2014, p. 41). McHarg called on humans to be a creative steward of finding a balanced fit for both man and the environment in urban settings (McHarg, 1969/2014, p. 44). Around the same time,

Congress and the President of the United States began to craft legislation that would forever change the environmental regulatory and legal landscape in America (discussed in depth above).

As people learned to view the environment as an integrated system, world leaders began to recognize the importance of a global approach to responsible use and stewardship of natural resources. In 1983, the United Nations General Assembly created the World Commission on Environment and Development to study the interrelation of development and environmental conditions (Wheeler & Beatley, 2014, pp. 66-67). This Commission is commonly referred to as the Brundtland Commission due to its Chair, former Norwegian Prime Minister Gro Harlem Brundtland (Wheeler & Beatley, 2014, p. 66). The Brundtland Commission consisted of representatives from 21-member nations that found both developed and developing countries were in danger from improper management of the environment (Wheeler & Beatley, 2014, p. 67). In their assessment of the past century the drastic shift in human ability to permanently alter or damage the environment through development and production was outpacing the scientific community's ability to provide understanding or solution (Wheeler & Beatley, 2014, p. 67). They also highlighted long-standing, antiquated political and social institutions' inability to keep pace with the globalization of society, development, and production (Wheeler & Beatley, 2014, p. 67).

In poorer environments, the Commission found that environmental overuse was due to the need to survive, and was present in the following forms: overgrazing, overuse of marginal land, and overpopulation of nearby urban areas (Wheeler & Beatley, 2014, p. 68). In more economically prosperous areas, environmental misuse was demonstrated by increased use of natural resources, creation of synthetic materials, and pollution (Wheeler & Beatley, 2014, p. 68). The Brundtland Commission realized that operating at these extremes posed a serious risk to the health and long-term availability of global environmental resources. Proper long-term planning would adequately address poverty and inequities, meet the basic needs of all people, provide opportunities/access to achieve personal goals (i.e. economic, etc.), and ensure an equitable distribution of resources – a complete change in outlook (Wheeler & Beatley, 2014,

pp. 68-69). Their solution was the idea of sustainable development, defined as “development that meets the need of the present without compromising the ability of future generations to meet their own needs” (Wheeler & Beatley, 2014, p. 69). The Brundtland Commission included renewable resources, nonrenewable resources, and people as integral pieces to the environmental stewardship puzzle, and recommended: 1) renewable resources be used at the same capacity with which they could be replaced, 2) that nonrenewable resources be used at a rate that could be sustained until a viable replacement is available & accessible, and 3) production processes limit wastes to protect the integrity of the ecosystem (Wheeler & Beatley, 2014, p. 70). This report was followed nine years later by the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, commonly referred to as the Earth Summit (Wheeler & Beatley, 2014, p. 79). During this international meeting, several principles of sustainable development were adopted, such as a commitment to work towards eradicating poverty, protecting the environmentally vulnerable, and eliminating unsustainable production practices (Wheeler & Beatley, 2014, p. 81). Other principles focused on changing processes, such as respecting and capitalizing local environmental knowledge and including meaningful citizen participation in environmental decisions (Wheeler & Beatley, 2014, pp. 82-83). The success of these two summits led to the creation of the United Nations Commission on Sustainable Development and the United Nations Division for Sustainable Development responsible for an annual progress meeting and coordination of global sustainability efforts, respectively (Wheeler & Beatley, 2014, p. 79).

In the 34 years since the Brundtland Commission met, the definition of sustainable developments has remained a cornerstone of the sustainability movement. While the original definition is always referred to as the starting point, several authors have sought to create additional components to operationalize it for their specific purposes. This has led to several operational definitions or orientations of the base definition for disciplines and applications. Imran, Alam, & Beaumont (2014) used the Brundtland Commission’s definition as a starting point in their evaluation of current issues with sustainable development and referred

to it as the definition that has "... set the standard and become the point of reference for every debate about and subsequent definition of sustainable development" (Imran, Alam, & Beaumont, 2014, p. 135). Authors in the 2016 journal article "The Imperatives of Sustainable Development" still refer to the Brundtland Commission's definition as the point in history that can be credited with the origin of the concept of sustainability and use it as a starting point to offer applications and frameworks to operationalize the concept in the ecological context (Holden, Linnerud, & Banister, 2016, p. 214). In an in-depth analysis of the discourse surrounding sustainable development Harlow, Golub, & Allenby (2013) used the Brundtland Commission definition as their hinge-point to qualitatively analyze information and scholarly writings in the 18th, 19th, 20th, 21st centuries. In each of these papers, regardless of the discipline or application, they reference the accepted global policy definition of sustainable development agreed upon by the Brundtland Commission first, and then go on to explain how it can be tailored to meet their specific needs.

### 3. Resiliency

As sustainability became a mainstream policy consideration, the global environmental focus shifted again. The new impetus was to improve the environment's ability to face stressors and still maintain its essential functions and characteristics, commonly known as resiliency (Nelson, Adger, & Brown, 2007, p. 398). Resiliency policies and planning approaches focus on building cities and protecting the environment in such a way that would allow normal function in even the most taxing circumstances such as natural disasters, massive population influxes, and expansion. The Latin base of resilience is *resilio* or *resilare*, literally to jump back or leap backwards, alludes to the environment's ability to respond to changes within the system and return to its original state (Sapountzaki, 2007, p. 274; Nelson, Adger, & Brown, 2007, p. 398; (Cretney, 2014, p. 629). This initial approach to resilience was through an empirical, or engineering, lens which framed resilience as the ability to return to a stable state of equilibrium (Cretney, 2014, p.628). Engineering resilience looks to return structures to a stable point for safety considerations, such as a bridge's ability to sustain a shock and return to its original design conditions to ensure safe travel of passengers across its length. In 1973 C.S. Holling, often referred to as the father of resilience theory, challenged this

interpretation and presented the theory that ecosystems do not exist at a single steady point of equilibrium in his paper “Resilience and Stability of Ecological Systems” in the Annual Review of Ecology and Systematics (Cretney, 2014, p. 628; Plummer, 2010, p. 493). Instead, Holling believed ecosystems exist within a zone of stability that allows the system to reorganize on a continual basis, even in times of disturbance and change (Cretney, 2014, p. 628). This ecological perspective moved away from a narrow steady state perception of resiliency and focused instead on determining the range within which a system can undergo stress and still retain its ability to properly function before it is forced to change its structure in response (Cretney, 2014, p. 628). Plummer (2010) succinctly stated, “Resilience is also about opportunities that emerge from disturbances, systems renewal, and the appearance of new trajectories or paths; it provides adaptive capacity and the possibility for ongoing development with the presence of a dynamic interplay between stability and change” (p. 496).

Holling’s work also laid the groundwork for late connections between environmental and social conditions – socio-ecological resilience, defined as “the ability of groups, or communities to cope with external stresses and disturbances as a result of social, political and environmental change” (Cretney, 2014, p. 628). Socio-ecological resilience views social and ecological systems as independent systems interconnected by social well-being, environmental conditions, and economic decisions (Cretney, 2014, p. 628). Thirty years later Nelson, Adger, & Brown (2007) agreed with Holling, and viewed resilience as the range in which a system can undergo change and retain the same functional controls and various options to develop within a continuously changing system (Nelson, Adger, & Brown, 2007, p. 398). Nelson et al. posited that flexibility, rather than stability, was the proper approach to resilience and viewed the social and ecological systems as “related, coupled systems” that operate in tandem rather than isolation, within a certain context that produces feedbacks and continues to connect system components (Nelson, Adger, & Brown, 2007, p. 399). Nelson et al. identified three necessary components to socio-ecological resilience: the degree of susceptibility to change, the capacity to self-organize, and the capacity to learn (Nelson, Adger, & Brown,

2007, p. 399). Under this definition that ability to adapt (adaptive capacity) is influenced by both economics and technology, but also by social factors and structures including governance structures and human capital (Nelson, Adger, & Brown, 2007, p. 399). This framework included a consideration of the process and influences of actor-based process of decision making (Nelson, Adger, & Brown, 2007, p. 399). It also evaluated the systems-based implications of decisions and how they might affect the system over time (Nelson, Adger, & Brown, 2007, p. 399).

Resilience has also been viewed as a moral boundary to environmental action. Osorio (2017) frames resilience as an ecosystem's capacity to adapt to changes caused by disturbances and continue to develop, reframing the idea of environmental ethics first introduced by Aldo Leopold (discussed in detail above) (Osorio, 2017, p. 132). Osorio sums Leopold's writings into one overarching moral principle that states "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." (Osorio, 2017, p. 132). This definition realizes that there are instances where change is so dramatic that it is outside of the range of the ecosystem to recover. When this occurs, degradation to the ecosystem takes place, such as global warming due to increased air pollution (Osorio, 2017, p. 132). Again, there is a connection between human action and ecological system response (Osorio, 2017, p. 132). Due to this connection, Osorio reintroduces Leopold's principle as a new resilience principle that states: "A thing is right when it tends to preserve the resilience of the biotic community. It is wrong when it tends otherwise." (Osorio, 2017, p. 132). This principle places an emphasis on making good choices that stay within the resilience boundaries of a system and avoiding bad choices that would force the ecosystem to operate outside of its range of resilience (Osorio, 2017, p. 133). This could lead to transformation which changes the character of the system as it shifts and redefines itself with new system parameters (Cretney, 2014, p. 630).

## C. Parks

Cities are normally home to both natural and built environments. Natural environments can be found in their undisturbed state, often referred to as natural preservation areas, or utilized as parks or flood control. These designations work to find a balance between conservation and interactive use of natural resources through the development of public spaces.

### 1. Urban Public and Open Space

Public spaces are urban areas that are open to all regardless of physical, ethnic, or class characteristic (Sadeghian & Vardanyan, 2015, p. 120). They are intended to foster the common public good and to be used and enjoyed by all (Sadeghian & Vardanyan, 2015, p. 120). In the urban arena public spaces can be defined as any space, building, etc. that serves a public purpose. Public space has also been described as a social space with physical characteristics that can shape perspectives, bring people together, and foster physical activity (Farmer, 2016, p. 27). Public spaces should be “open, publicly accessible places” that serve to encourage and support activities that build and improve the community (Stanley, Stark, Johnston, & Smith, 2012, p. 1091, quoting Carr et al. (1992). Public spaces can include all areas that serve a public purpose including streets, parks, government buildings, hospitals, sidewalks, areas governed by public-private spaces where access to the public is open (Carmona, De Mahalhaes, & Hammond, 2008, p. 5).

Open space is a type of public space. Sinha (2014) describes an “urban park as a public good is a multidimensional concept in which the therapeutic dimension of nature is inextricably woven in the social” (p. 116). This view echoes the practices of early park designers Olmsted and Burnham who sought to use parks to solve environmental problems as well as connect places and people. Open spaces are also referred to by their physical attributes, where green space signifies areas that are full of natural vegetation, and grey spaces are areas that consist mostly of manmade structures. Open spaces have often been lauded for their positive effects on improving the states of the social, political, and physical health of urban residents and communities (Stanley, Stark, Johnston, & Smith, 2012, p. 1090). They present a space where normal

cultural barriers are eased, and spontaneous conversation encouraged between people of various backgrounds, creating connections between people and place, thereby strengthening communities. However, access to these spaces has not always been distributed equally. The meaningful access to parks, including proximity, has often been cited as an Environmental Justice issue in minority communities (Wolch, Wilson, & Fehrenbach, 2005, pp. 6-7). Also, although several open spaces are public, an open space does not always equal open and free public access (Stanley, Stark, Johnston, & Smith, 2012, p. 1091).

*a. Early Park Development*

Made popular in America by Henry Law Olmstead, public parks have been included in the planning of cities since the late 1800s. Olmsted and Calvert Vaux created the design for Central Park in New York, New York in 1858. The park was to serve as a city-wide refuge from the banality of the city and offer instead to residents a parochial escape that relieved stress and enlivened the sense (Flournoy, 1993, p. 90). Several narrow strips of land (precursors of linear parks) were used as transportation links to join other parts of the city to the park (Mazour, 1988, p. 5).

Olmsted's design falls into the category of Pleasure Grounds as defined by Galen Cranz in *The Politics of Park Design*. This park type was especially popular during 1850-1900 and focused on returning city-dwellers to a contemplative state (Cranz & Boland, 2003, p. 45). They can also be characteristic of a romantic view of nature which used parks as "pleasure grounds ... built to escape the urban ills of the city" and reflect well-known pastoral landscapes of the past (Sinha, 204, p. 115). However, they were often built on the edge of cities which made them difficult to get to, hence the use of connecting trails (linear parks) (Cranz & Boland, 2003, p. 45). The end of the nineteenth century was used to begin remedying this disconnect, primarily by creating smaller parks near the working-class neighborhoods within the city (Cranz & Boland, 2003, p.45).

The idea to reform the original system by also providing access to parks to the working-class and circulated contemporaneously with the request of playground advocates to have more places for children to play



(Cranz & Boland, 2003, p. 45; Sinha, 2014, p. 115). Those in favor of reforming urban parks saw them as a way to address the evil of the city (i.e. lawlessness, crime, etc.) (Byrn & Wolch, 2009, p. 746). These interests converged and ushered in a new era of park systems – the Reform Park, popular from the turn of the century until 1930 (Cranz & Boland, 2003, p. 45). These parks provided spaces for everyone in the family. The small, symmetrical parks had designated playground areas for children and areas for adults that allowed both recreation and socialization (Cranz & Boland, 2003, p. 45; Sinha, 2014, p. 115). A new and distinct addition was the use of a fieldhouse, intended to serve as a public clubhouse for the working-class population of cities. (Cranz & Boland, 2003, p. 45)

In 1930, famed New York Park Commissioner Robert Moses introduced the next dominant park type - the Recreational Facility (Cranz & Boland, 2003, p. 45). Instead of focusing on the altruistic, social, and health benefits they offered, Moses instead focused on the obligation of municipalities to provide recreational facilities to their constituents (Cranz & Boland, 2003, p. 45). Moses believed parks did not need to be justified to be built or supported; they were simply a recognized governmental service as fire and police protection (Cranz & Boland, 2003, p. 45). Instead of benefits, Moses focused on developing and promoting the creation, establishment, and maintenance of universal standards for park design, including sport stadiums and courts (Cranz & Boland, 2003, p. 45; Sinha, 2014, p. 115). He also worked to expand park services to areas within the city that had not yet received them (Cranz & Boland, 2003, p. 45). Moses model was popular until the early- to mid-1960s (Cranz & Boland, 2003, p. 45; Sinha, 2014, p. 115).

#### *b. Parks and Post-World War II American*

The environmental laws passed in the 1960s & 70s also had a drastic effect on park development. The Clean Water Act (CWA) coupled with the National Flood Insurance Program of 1968 (NFIP) heavily restricted the types and density of development near waterbodies (Flournoy, 1993, p. 92). NFIP protected lands in federally designated flood prone areas by creating standardized development requirements, restricting the number and types of developments (Flournoy, 1993, p. 92). The CWA furthered these protections by

restricting the ability to fill in natural wetlands (natural buffers to flooding) connected to waterbodies to protect their integrity and promote natural flood prevention (Flournoy, 1993, p. 92). Subsequent amendments to the CWA imposed more stringent stipulations with the goal of making all recreational waters “fishable and swimmable” through cleanup and limited point source pollution (Flournoy, 1993, p. 92). These Acts facilitated and encouraged alternative land uses, such as parks, open spaces, or levees, near waterbodies; linear parks became a natural solution, reminiscent of the plans of Olmsted and Burnham.

Legislative efforts during the Environmental Movement were contemporaneous with the newly acquired affluent lifestyle of Americans after World War II of increased wealth, decreased work hours (standard work weeks of 40hours), and increased free/leisure time (Flippen, 2000, p. 2). This lifestyle change, and more intimate association with nature, created a vested interest in citizens to protect their environments (Flippen, 2000, p. 2). This new luxury of leisure time was often enjoyed by engaging in outdoor recreational activities and enjoying available open and green spaces (Flippen, 2000, p. 2). The increased demand to swim in safe waters, to enjoy natural paths, and retreat to open spaces for recreation, relaxation, or rigorous conversation became synonymous with an increase in the demand for public parks (green spaces). These requests culminated in the mass creation of regional, neighborhood, linear, and pocket parks.

The 1960s & 70s welcomed another shift in park planning responsive to the new leisure culture. Now recreation had become a fixture in the urban environment and was no longer restricted to a few prototypes. Parks now were more commonly referred to as open space, park-plazas, pocket parks, and corporate park buffers (Cranz & Boland, 2003, p. 45; Sinha, 2014, p. 115). The Open Space park system used nature as a decorative tool and source of relief from the grit of the urban environment (Sinha, 2014, p. 115). These parks took on new forms such as rooftops, abandoned rail lines, and waterfronts and represented a rebellion from previous park notions of separation from urban life. Instead, parks created under this system prioritized citizen involvement, programming relative to current culture, and connection between people and between parks (Cranz & Boland, 2003, p. 45).

*c. Post-Industrial American and the Modern Movement Towards Linear Parks*

The most recent park type is the Ecological/Sustainable Park (ESP), starting to emerge in the 1990s, with a focus on improving the ecological sustainability of the city (Cranz & Boland, 2003, p. 46; Cranz & Boland, 2004, pp. 104-106; Sinha, 2014, p. 116). As American economy began to shift from industry to technology, service, and financial offerings, many cities were left with vast amounts of abandoned structures and railways (Sinha, 2014, p. 116). Many began moving to the suburbs due to improved transportation networks (Federal-Aid Highway Act of 1956) and job opportunities which left cities reeling and in need of ways to maximize the appeal of the urban experience and environment (Sinha, 2014, p. 116). The ESP was viewed as one possible solution. This park type has no defined size or shape (can be created to fit diverse needs), is self-sustaining (low maintenance costs through the use of native or regional plant types), connects several green spaces to create a green infrastructure network (building a sense of community and social connection across social spectrums), invites passive and active enjoyment (sitting, observing, walking, biking, etc.), and has a lower environmental impact (permeable pavers) (Sinha, 2014, pp. 115-116; Cranz & Boland, 2003, p. 46); Cranz & Boland, 2004, pp. 103-118.)

	<b>Pleasure Ground 1850–1900</b>	<b>Reform Park 1900–1930</b>	<b>Recreation Facility 1930–1965</b>	<b>Open Space System 1965–?</b>	<b>Sustainable Park 1990–present</b>
<b>Social Goal</b>	Public health & social reform	Social reform; children’s play; assimilation	Recreation service	Participation; revitalize city; stop riots	Human health; ecological health
<b>Activities</b>	Strolling, carriage racing, bike riding, picnics, rowing, classical music, non-didactic education	Supervised play, gymnastics, crafts, Americanization classes, dancing, plays & pageants	Active recreation: basketball, tennis, team sports, spectator sports, swimming	Psychic relief, free-form play, pop music, participatory arts	Strolling, hiking, biking, passive & active recreation, bird watching, education, stewardship
<b>Size</b>	Very Large, 1000+ acres	Small, city blocks	Small to medium, follow formulae	Varied, often small, irregular sites	Varied, emphasis on corridors
<b>Relation to City</b>	Set in contrast	Accepts urban patterns	Suburban	City is a work of art; network	Art-nature continuum; part of larger urban system; model for others
<b>Order</b>	Curvilinear	Rectilinear	Rectilinear	Both	Evolutionary aesthetic
<b>Elements</b>	Woodland & meadow, curving paths, placid water bodies, rustic structures, limited floral displays	Sandlots, playgrounds, rectilinear paths, swimming pools, field houses	Asphalt or grass play area, pools, rectilinear paths, standard play equipment	Trees, grass, shrubs, curving & rectilinear paths, water features for view, free-form play equipment	Native plants, permeable surfaces, ecological restoration green infrastructure, resource self-sufficiency
<b>Promoters</b>	Health reformers, transcendentalists, real estate interests	Social reformers, social workers, recreation workers	Politicians, bureaucrats, planners	Politicians, environmentalists, artists, designers	Environmentalists, local communities, volunteer groups, landscape architects
<b>Beneficiaries</b>	All city dwellers (intended), upper middle class (reality)	Children, immigrants, working class	Suburban families	Residents, workers, poor urban youth, middle class	Residents, wildlife, cities, planet

Figure 1. Side-by-Side Comparison of Park Typologies (Cranz & Boland, 2004, p. 103)

Although, a contemporary topic. Evidence of similar approaches date back to Olmsted’s park system for Boston in 1887, now commonly referred to as the Emerald Necklace (Flournoy, 1993, p. 90). The design created a 4.5mile linear park served as a connector between the inner-city, parks, and the Muddy River (Flournoy, 1993, p. 90). Followed twenty years later in 1909, Daniel Burnham who continued this application of linear parks in a plan he presented in Chicago (Flournoy, 1993, p. 91). The Chicago Plan was created as a solution to existing problems along the waterways (Flournoy, 1993, p. 91). Burnham’s plan centered around using linear parks and open space to reclaim and restore the waterfront on the edge of Lake Michigan (Flournoy, 1993, p. 91). Benton MacKaye also saw linear trails as a solution to urban ails. In his

1928 book *The New Exploration: A Philosophy of Regional Planning*, a regional trail was presented as a solution to the stem urban sprawl to connect, allow travel, and places for camping. This basic characteristic of this trail system can be seen in the well-known Appalachian Trail (Flournoy, 1993, p. 91).

Modern American linear parks, such as the New York High Line and Dallas Katy Trail, also fall perfectly into the ESP model. Several are conversions of old rail lines through the Rails to Trails program. The Rails-to-Trails program was created under the National Trails System Act (16 U.S.C. § 1247(d)) (and subsequent amendments,) which addressed the issue of shrinking in-use railway. The Act authorized the Interstate Commerce Commission (ICC) to achieve a two-fold goal: 1) allow railroad companies to preserve their future rights to reactive existing railways, and 2) promote park creation by allowing railroad companies to work with local entities to use the land as recreational trails in the interim. Section 8(d) of the National Trails System Act encouraged the ICC to work with the Secretary of the Interior and state & local authorities to establish trails to protect rail corridors and encourage energy efficient transportation. The federal desire to help commerce and expand the park system married perfectly with the desire of Americans for increased access to parks.

## 2. People and Public Space

People use public spaces in very different ways. This is often attributed to differences in background and experience, heavily influenced by race, class, age, ethnicity, and gender (Byrne & Wolch, 2009, p. 744). Conflicts occur when these competing interests meet in the physical space or in the planning process when determining what design will be chosen, the type of amenities included, and the size and location of new park space.

### *a. History in Context*

Parks, although often neutral in their appearance, “are rarely innocuous”, and have been used as tools of separation in America (Byrne & Wolch, 2009, p. 743). In recent years, researchers have begun to evaluate parks through an environmental justice and political ecology lens to understand how race and power have

shaped park-making (Byrne & Wolch, 2009, pp. 744-745). Byrne & Wolch (2009) present parks as ideologically charged spaces that have an active role in shaping how they are perceived, approached, and used by the public (p. 745). One example of park ideology can be attributed to reform parks (those added to expand park access to the working class as discussed above). These spaces are representative of the ideology that parks are a tool to limit crime and immorality while “uplifting” or improving the intelligence, financial acumen, and morality of nearby communities/park users who are often working class and minorities (Byrne & Wolch, 2009, pp. 746). Reform parks reflect a wider park-making construct that positioned parks as “natural, wholesome, and White” against a “artificial, profane, ... and colored” city (Byrne & Wolch, 2009, pp. 747). Audirac (2018) has described this as *spatial stigma* where the representation of urban areas is vilified in both its social and physical characteristics, resulting in reductions in the level and quality of local public service delivery, such as limited public transit stops near parks in minority communities (Audirac, 2018, pp. 14-16; Byrne & Wolch, 2009, p. 749). Smiley, Sharma, Steinberg, Hodges-Coppie, Jacobson, & Mateeva (2016) also noted that the presence of friends of the park associations can create higher quality parks, but these groups overwhelmingly serve white and more affluent neighborhoods, further increasing the disparity in parks (p. 2).

This lens was used to justify the razing of minority/lower income communities, locating parks away from public transit, and design that catered to Caucasian American preferences (Byrne & Wolch, 2009, pp. 747). However, even this extension of park access did not guarantee minority access to park spaces. Racial tensions regarding access continued to build over time and instead of serving as spaces where all were welcome, they became locations of racial conflict (Byrne & Wolch, 2009, pp. 746).

#### *b. Race and Access to Parks*

Affluent white Americans have been consumers of public space since the opening of Central Park (as discussed above). These Pleasure Ground parks were constructed on the edge of towns away from the working-class, later requiring Reform Parks to expand park use to those in the innermost parts of the city.

America also has a history of separating public facilities (including park facilities) by race, actions that were sanctioned by the US Supreme Court in *Plessy v. Ferguson*, 163 US 537 (1896). This practice was later overturned in *Brown v. Board of Education of Topeka*, 347 U.S. 483 (1954), which declared separate public facilities were inherently unequal and required integration of public spaces. Black authors like W.E.B. DuBois and Booker T. Washington in the late 1800s/early 1900s believed parks could also be an important tool towards equality (Smith, 2007, p. 91). They believed that access to and the ability to cultivate a beautiful environment (in contrast to the “bare, dull, unlovely places” they had been forced to become accustomed to) was essential to the health of Blacks’ sense of wellbeing and cultural acceptance (Smith, 2007, p. 91). The National Association of Colored Women also took this charge and advocated for progressive environmental reform, calling for positive changes for Blacks regarding access to parks, city-wide beautification measures, which coincided with the Reform Park movement (Smith, 2007, p. 92). It continued during Jim Crow laws of segregation, especially in the South, which often denied the rights of Blacks to enjoy and use local parks, relegating them to grey areas devoid of green spaces (Smith, 2007, p. 102). In other cases, minorities were not able to access parks at all, or the separate parks were unequal in their size, funding, and facilities (Byrne & Wolch, 2009, p. 747). The ability of “escaping to ‘pristine’ nature [was] largely reserved for whites” (Smith, 2007, p. 102).

Even when parks were accessible to minorities, park management was used to impose strict rules and dress codes that limited and/or deterred their use of park spaces (Byrne & Wolch, 2009, p. 747). Perceived hostile environments, the presence of law enforcement, and discrimination in uses may also deter minorities from using/accessing parks (Byrne & Wolch, 2009, p. 749). Signage denoting acceptable uses may also deter minorities if the prohibited activities are those that are common in their communities (i.e. no basketball goals for black patrons or no soccer/futbol for Hispanic families) further perpetuating a white norm or normative behavior for the trail and fostering a sense of otherness or not belonging for minorities (Byrne & Wolch, 2009, p. 752). Austin Allen and Gloria House, with interviews from Landscape Architects Walter

Hood & Diane Jones Allen, frame these issues from the context of the black park goer/user in their documentary “*Claiming Open Spaces.*” The series of interviews and history of various park spaces brings to light a context and perspective that is contrary to the dominant planning themes and practices at the time. The documentary chronicles the history of blacks and parks in Columbus, New Orleans, Detroit, Oakland, Montgomery, and Gullah Island. The consensus of activity in each place is that these groups are not included in the planning of park space and programming which ultimately results in them being not included in their use. In each city there is a similar pattern – previous enjoyable use of the park space, altered by a change in use or design, followed by uncomfortable use, presence, policing, or regulation in the same park spaces. These same themes of shifting of park rules around green resources as a result of gentrification continues with cases like Lake Merritt in Oakland, CA, where in 2018, two black men (one of which was a lifelong resident of the area) were reported to the police for barbequing at Lake Merritt, a neighborhood tradition for years, by a white woman that had recently moved to the area. This resulted in a social and cultural movement in Oakland. After the incident occurred, hashtags and social media accounts were created (#BBQingWhileBlack and #BBBQnWhileBlack) in protest. Two weeks after the incident a *BBQ’n While Black* event was held in the same park; starting a movement to reclaim the park as a space where everyone in the community felt welcome.

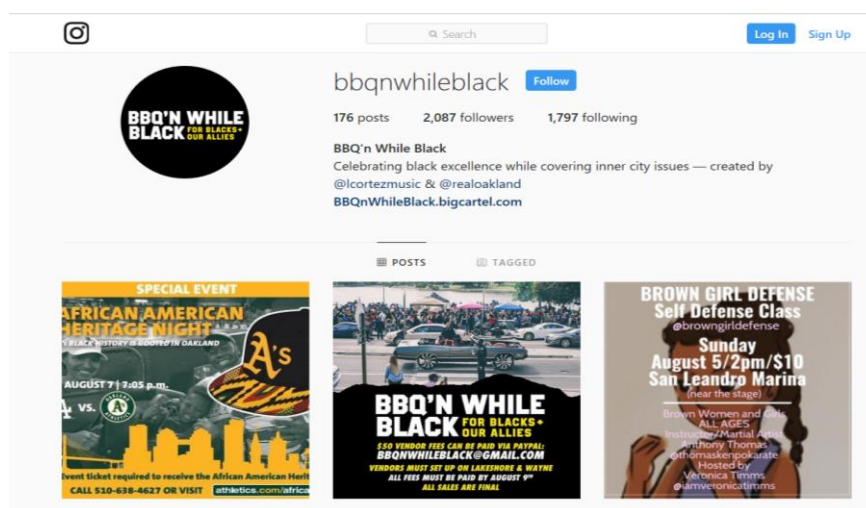


Figure 2. Community Response to Reclaim Lake Merritt "BBQ'n While Black" Incident



*c. Differing Racial Perceptions of Park Users*

Byrne & Wolch (2009) note several differences between races and contemporary park use. Blacks are observed as viewing parks as places to gather that foster social relationships and allow for sports play & recreation, while Whites are seen to view parks as a place for solitude, individual reflection, or exercise (p. 748). Asian park users have been noted as primarily using park space for walking, and Latinos are observed as seeking out park spaces for their natural beauty, adequate space for large family gatherings, and with structures such as tables and restrooms (Byrne & Wolch, 2009, p. 748). In reviewing these generalized typologies, minorities seem to view parks as gathering places, while Whites view parks as a place for individualized enjoyment. These differing vantage points are often the basis of conflict as areas with new green amenities begin to gentrify.

Checker (2011) explains this concern as a set of circumstances where the greening of neighborhoods is presented as an apolitical process, but in fact it uses sustainability as a façade to gain support for capital development under the guise of remedying environmental justice issues (Checker, 2011, p. 212). Using these two approaches in tandem, adding more green space to cities has often been implemented as a cure-all for many urban ails. However, in her research urban greening has been shown to be a precipitating factor for gentrification and alienation of existing residents and culture. In a meeting with the representatives of Mayor Bloomberg's PlaNYC 2030 sustainability plan, Harlem residents asked pointed question about the possible addition of the new park. They wanted to know why the design was chosen when it did not meet the community's needs, was the purpose of the park to support commercial development or sustainability, and who would look out for the "winos' and homeless people that currently populated the park" when the changes were made (Checker, 2011, pp. 210-2110). Their concerns varied much from the city government and evidenced a distrust of the local government's use of "sustainability" to achieve or "improve" their neighborhood. Residents had seen the culture of other area neighborhoods change with the additions of parks and did not want the same cultural and residential changes to occur in theirs.

## D. Gentrification

On their face, these policies have altruistic ends in mind to improve stewardship of the earth's limited resources (sustainability and resiliency) while seeking to prevent and remedy unequal environmental burdens imposed on minority, elderly, and lower-income communities (environmental justice). However, these actions in tandem often result in a dichotomous outcome. Their positive effects manifest in the improvement of community conditions through the addition of environmental infrastructure/amenities or the removal of environmental hazards, referred to in this paper as Green Gentrification. Unfortunately, these policies also have a negative outcome, which is often the displacement of the original citizens and culture.

### 1. Definition of Gentrification

Gentrification was first recognized as a result of programs aimed at urban renewal, slum clearance, and post-war reconstruction during the 1950s and 1960s (Schaffer & Smith, 1986, p. 347). First coined by sociologist Ruth Glass in 1964, gentrification was initially described as a violent process by which working class neighborhoods were invaded by members of the middle class, changing the nature of the communities to those characteristic of expensive and elegant tastes, which ultimately lead to the displacement of the previous residents and the social character/fabric of the neighborhood (Schaffer & Smith, 1986, pp. 347-348). Twenty years later Smith & Williams presented gentrification as a "process which operates in the residential housing market" that "refers to the rehabilitation of working-class and derelict housing and the consequent transformation on an area into a middle-class neighborhood" (Smith & Williams, 1986, p.1). Along these same lines, Zukin (1987) further described the characteristics of the gentry as residential choices, desired amenities, and educational & occupational statuses that were culturally distinct/distinguishable from the original inhabitants (p. 131). Gentrification was also described as the invasion and takeover of a working-class neighborhood by the gentry (or upper classes), as an attack on existing culture, class, and community within a specific geographical area (Banzhaf & McCormick, 2007, p. 4). In older urban planning models of the city, gentrification was often identified as occurring around the

Central Business District CBD). In the Chicago School model of urban space allocation, these areas of gentrification were concentric to the CBD and were known as the zone of transition – both of people and housing stock (Schaffer & Smith, 1986, p. 348). Beauregard (1986) agreed and noted that the focus on the CBD was due to certain “peculiar amenities” as parks, historical buildings, or views of the city (Beauregard, 1986, p. 37). He went on to define gentrification as a process focused on existing, deteriorated housing stock that “involves the purchasing of buildings by affluent households or by intermediaries such as speculators or developers, the upgrading of the housing stock, governmental investment in the surrounding environment, the concomitant changeover in local retail facilities, the stabilization of the neighborhood and the enhancement of the tax base” (Beauregard, 1986, p. 38).

Although gentrification often happens in residential areas, Schaffer & Smith pointed out that it can also occur in nonresidential areas where the existing housing stock is sound enough for revitalization (Schaffer & Smith, 1986, p. 347). Smith & Williams saw the rehabilitation of existing housing stock as only one facet of profound changes and restructuring of urban economic, social, and spatial conditions (Smith & Williams, 1986, pp. 2-3). In their understanding, gentrification was not limited to changes in housing stock, but included the result of social and spatial changes, such as the redevelopment and repurposing of existing urban waterfronts for recreational use, the decline of manufacturing, the rise of hotel/convention complexes, and the emergence of trendy new districts within cities (Smith & Williams, 1986, p. 3). These changes are resulting from shifts in our orientation as a society regarding a change in economic focus (moving away from manufacturing towards service industries), transformation of the working class, and change in state ideology in how services are delivered (including public and private partnerships) (Smith & Williams, p. 1986, p. 3).

Moving into the 21st Century, Slater (2009) again expands the notion of gentrification to include commercial assets and redefines gentrification as “the transformation of a working-class or vacant area of a city into middle-class residential and/or commercial use” with no reference to the CBD (Slater, 2009, p.

294). Essoka (2010), citing Vigdor (2002), also notes that gentrification normally occurs in urban areas where neighborhoods are declining, and high vacancy rates exist (Essoka, 2010, p. 304). Neither of these definitions requires a focus on the CBD; just inclusion as part of an urban area. No matter the author or location, gentrification consistently has three hallmarks - construction that revitalizes or builds something new, increased property values, and a change of surrounding demographics to a more educated and/or higher earning population (Banzhaf & McCormick, 2007, p. 4).

## 2. Displacement

One of the most predominant consequences of gentrification is the displacement of existing residents. Marcuse (1985) digs deeper to explain this consequence and begins first with a foundational definition developed by George and Eunice Grier that describes displacement as an urban phenomenon that occurs when any household is forced to move due to new conditions beyond the household's control (outside of previous requirements for occupancy) that make continued residence not viable due to economic limitations, safety concerns, or impossibility (Marcuse, 1985, p. 205). Using this foundation, he framed the several ways displacement can manifest - direct displacement, exclusionary displacement, and displacement pressure.

Direct Displacement refers to the dislocation of a family from the residence where they currently reside, characterized either as the last resident displaced from the unit (last-resident displacement) or as the displacement of earlier residents of the unit due to economic pressures or deterioration of the unit/amenities of the building (chain displacement) (Marcuse, 1985, p. 205). These displacements are facilitated in two ways. The first occurs when landlords make living conditions unbearable for tenants such as the lack of heat and/or air and is referred to as "physical displacement" (Marcuse, 1985, p. 205). The second type occurs when landlords raise the rent beyond what the tenants can afford to pay, referred to as "economic displacement" (Marcuse, 1985, p. 205). Both forms create conditions where the existing tenants are forced to move and are displaced from their current living conditions due to gentrification.

Displacement also applies to the limitation of housing choice. In a normal housing market when a tenant voluntarily vacates a housing unit another similarly situated applicant can secure the unit for their dwelling place (Marcuse, 1985, p. 206). However, gentrification pressures may hinder a tenant who voluntarily vacates a unit from securing similarly located housing. (e.g. the property being sold, increases in rent, hazardous conditions, etc.) (Marcuse, 1985, p. 206). The inability to secure the unit reduces the housing options available to the prospective tenant and excludes them from access to units that would have previously been available to someone in their similar economic situation. This is exclusionary displacement (Marcuse, 1985, p. 206).

The final form of displacement seeks to explain how changing conditions in a gentrifying neighborhood affect and effect existing tenants. Gentrification is not instantaneous; it takes place over time and gradually changes the characteristics and culture of a neighborhood as it continues. When existing families notice the changing fabric of the community, they feel uncomfortable, and pressure begins to build for them to move (Marcuse, 1985, p. 208). As their friends and neighborhood stores leave the area pressure for them to follow suit increases (Marcuse, 1985, p. 208). When new stores catering to a different clientele open replacing former neighborhood stores their needs are no longer met and the pressure to move continues to mount (Marcuse, 1985, p. 208). As new neighbors move in with requirements for new/different support services and transportation patterns the area becomes “less and less livable” for the existing families (Marcuse, 1985, p. 208). The change in culture sends the message that their displacement is inevitable; they are no longer a part of the fabric of the community wherein they reside (Marcuse, 1985, p. 208). Instead of waiting for additional signals to move, the families plan to move “as soon as they can, rather than wait for the inevitable” (Marcuse, 1985, p. 208). Although the families may make the decision to move, it is not a decision made solely of their own choosing; it is the effect of the “pressure of displacement” from changes in their existing community (Marcuse, 1985, p. 208). If a tenant does choose to stay, they will be forced to

make sacrifices that could severely limit their quality of life, such as sacrificing any extra-curricular activities for their children to be able to afford the increase in rent.

### 3. Cooptation of Gentrification

As gentrification became more common the discourse surrounding it began to change. At its beginning in the 1960s, gentrification was a new concept more sporadic than systematic in application (Quastel, 2009, p. 698). The 1970s saw a shift to it becoming a more widespread urban phenomenon present in both large and small cities, and often resulting in spaces where artist communities developed and flourished (Quastel, 2009, p. 698). The 1990s saw an increase in gentrification as well as new approaches to achieving it. At this time, gentrification shifted to larger scale developments that were regulated through new governmental policies that leveraged public-private partnerships, instead of the government or private industry acting alone (Quastel, 2009, p. 698).

No longer was gentrification defined as a violent, unwanted restructuring and displacement of communities, as Ruth Glass had originally done (Schaffer & Smith, 1986, p. 347). It was now seen as social goodwill, a way to remediate existing harms, or a positive action for the entire urban community. This was achieved through what I call “re-” literature. Governments no longer opted to use the term, or acknowledge the presence of, gentrification, and instead have moved to employing terms such as regeneration or reurbanisation [sic] (Quastel, 2009, p. 699 citing Smith, 2008, p.196). Slater (2009) offers a more comprehensive list of these terms, which includes: “revitalization, renaissance, regeneration, renewal, redevelopment, rejuvenation, restructuring, resurgence, reurbanisation [sic], and residentialisation [sic]” (2009, p. 294). These terms are distinctly different in the picture they paint of the gentrification process. They appear more neutral, less invasive, less controversial, and focus more on the development than resulting displacements. They present a picture that shows gentrification as a social good with benefits for everyone in the city. Who wouldn’t want to rejuvenate their city or want a resurgence of its glory days? This change in the discourse around gentrification has allowed its image to be reformed from one that

focused on the displacement effects of those currently present in the gentrifying community to a discourse highlighting those that are external, and likely to move into, the gentrifying space. Changing the focus has changed the politics of the process and removed the previous stigma of gentrification, all under the cloak of capital reinvestment and development. One of the newest avenues for this practice has been green infrastructure.

#### 4. The Greening of Gentrification

Using the popularity of support for greening urban environments with green infrastructure from the sustainability and resiliency movements, as well as the push from the government to redress past environmental harms brought to light during the environmental justice movement, the conversation around urban space has transformed yet again. Recent research in the field has studied the connection between environmental improvements and resulting gentrification in urban communities. This research area primarily focuses on inner city neighborhoods suffering from a deficit of open, public green space (i.e. urban gardens, parks, athletic fields, etc.), where, after green infrastructure improvements to remedy the deficit are made, those of higher income and education levels find these neighborhoods more desirable (Wolch, Byrne, & Newell, 2014, p. 235). The improvements normally tend to enhance the overall quality of the area, increasing the appeal to those outside the community, resulting in increased local land values (Wolch et al., 2014, p. 235). These changes also often result in the displacement of the population the improvements initially sought to help, dispersing them to other communities where rents and property taxes are cheaper, but where they also suffer from lack of urban green space, described as the green space paradox (Wolch et al., 2014, p. 235).

Other authors have applied gentrification as a result of greening in more narrowly defined contexts. One example of this practice has been defined as *Ecological Gentrification*. Dooling (2009) pulling from David Harvey's *Justice, Nature and the Geography of Difference*, explores the connections between concepts of home, homelessness, and green space to show how regulations and planning can be used to displace or

uninvite the homeless from using public spaces (Dooling, 2009, pp. 621-622). Her research explores how the narrative around the proliferation of green spaces, due to recent interest and trends increasing environmental planning efforts by cities, often excludes those with alternative definitions of home (Dooling, 2009, pp. 626-629). This often occurs in favor of the traditional interests of the prototypical American homebuyer representing an owner of a single-family detached home (Dooling, 2009, p. 631). Dooling (2009), pulling from Aldo Leopold's notions of land ethic discussed in detail above, then coins the term ecological gentrification to explain the urban phenomena that occurs when "the implementation of an environmental planning agenda related to public green spaces that leads to the displacement or exclusion of the most vulnerable human population – homeless people – while espousing an environmental ethic" (Dooling, 2009, p. 630). Dooling posits that the public good of green space is limited in its use to those that are the preferred audience and participants of governance, not those who may need access to the space the most – the homeless.

Another framework of gentrification is, *Environmental Gentrification* explained by Checker (2011) as "the convergence of urban redevelopment, ecologically-minded initiatives and environmental justice activism in an era of advanced capitalism," (Checker, 2011, p. 212). Under this definition, gentrification is an unintended consequence of the environmental justice activism of communities. Checker (2011) posits that the greening of neighborhoods is presented as an apolitical process, but, in reality, it uses sustainability as a façade to gain support for capital development under the guise of remedying environmental justice issues (Checker, 2011, p. 212). As discussed in detail above, sustainability is a universal concept that seeks to protect and properly steward the environment for all, without regard to protected class, ethnicity, or gender group (Checker, 2011, p. 212). Environmental justice seeks to identify and remedy past environmental harms disproportionately affecting minorities and those in lower economic classes (Checker, 2011, p. 212). Using these two approaches in tandem, adding more green space to cities has often been implemented as a cure-all for many urban ails. Checker (2011) has warned that because sustainability is so fluid, it is



extremely vulnerable to misuse by those who might skew its central purpose of environmental improvement to a focus on “profit-minded development” (Checker, 2011, p. 212-213).

Dooling and Checker used their research to highlight gentrification facilitated by green initiatives on two very precise sets of circumstances – homelessness and environmental justice activism by disenfranchised communities. Although, these definitions are accurate in their specific applications, they lack the broad applicability needed to thoroughly explain gentrification as a result of a wide range of greening initiatives. Smith and Williams (1986) warned against narrow definitions and advised that as gentrification is a “highly dynamic process, it is not amenable to overly restrictive definitions; rather than risk constraining our understanding of this developing process by imposing definitional order, we should strive to consider the broad range of processes that contribute to this restructuring, and to understand the links between seemingly separate processes.” (Smith & Williams, 1986, p.3)

Green Gentrification does just that. It considers all actions that are conducted with the express intent of making cities greener (couched within an environmental justice framework) and seeks to explain how the battle for justice in an environmental setting often results in an environmentally unjust outcome (Gould & Lewis, 2017, p. 13). Traditional ideas on environmental justice center on the inequitable distribution of the siting of environmental harms and the battle to prevent them from being approved, to have them removed, or to have them remediated. The interesting notion with Green Gentrification is that it is inclusive of all greening activities. This involves the siting of both environmental “bads” and “goods” in an urban area, including those situations examined under ecological and/or environmental gentrification (Gould & Lewis, 2017, pp. 12-13, 24-25). This more general definition seeks to explain how gentrification occurs from a facilitating green event, and how it can lead to the displacement of its original residents in an unjust manner (Gould & Lewis, 2017, p. 13).

Two concepts were integral in the development of the concept *Green Gentrification*. The first concerns differences in access to environmental goods. Looking to explain the disparity in location of environmental

goods, Gould & Lewis (2017) referenced the 2011 work of Park & Pellow, *The Slums of Aspen: Immigrants vs. The Environment in America's Eden*. Park & Pellow (2011) examine the intersection of economic, political, and cultural power of some groups that allows them to have use, exclusive use, of environmental goods such as parks, coastal properties, and elite neighborhoods that are protected from the different types of ecological harm that other – often less wealthy and minority – are forced to deal/live with every day (Park & Pellow, 2011, p. 4). This could include access to clean air and the availability of organic foods in certain neighborhoods while pollution and less healthy food choices proliferate in others (Park & Pellow, 2011, p. 4). Park & Pellow (2011) use the term *environmental privilege* to describe the disparity in access to environmental harms based on economic class, where environmental goods accrue to the few and the burdens are dispersed to the many.

The second concept focuses on economic appropriation. Gould & Lewis (2017) referred to Tom Angotti's 2008 book, *New York for Sale*, to understand how external actors appropriate the accrued value in a neighborhood. Angotti (2008) explained gentrification as the circumstance when residents and small business owners work to upgrade their neighborhoods gradually using their own time and money (p. 108). These improvements then attract the attention of outside investors eager to appropriate the value generated by their work and investments (Angotti, 2008, p.108). Angotti (2008) noted that this process is not only the demographic shift normally appropriated to gentrification, but it is also “the appropriation of economic value by one class from another” (p.108). One specific instance of this value appropriation occurs when local environmental justice advocacy to remove environmental hazards is successful. The removal of the undesirable land use improves the quality of life for existing residents, while simultaneously making the neighborhood more attractive to outsiders, which increases land values, and in turn makes it difficult for the advocates that fought for the changes to stay and enjoy them (Angotti, 2008, p. 30). Tailoring Angotti's definition, Gould & Lewis (2017) defined this in the Green Gentrification context as “*the appropriation of*

*the economic values of an environmental resource by one class from another*” (emphasis from original authors) (p.25).

### 5. Theoretical Approaches to Green Gentrification

Gentrification from greening has also been explained under varying theoretical lenses. *Growth Machine* theory connotes the collaboration of pro-development government actors and private interest groups that work together to foster expansion in a selected area (Logan & Molotch, 1987, p. 114). This can include local & federal governments, “merchants, bankers, financiers, real estate developers, planners, and even labor unions” that work together towards the common interest of revitalizing urban areas (like downtowns) through new and redevelopment, very rarely taking into consideration the effects of the endeavor on the nearby communities (Kaplan et al., 2014, p. 132; Logan & Molotch, 1987, p. 114). Gottdiener & Hutchinson (2011) describe cities as growth machines pushed by current residents to improve the quality of life and pulled to keep up with the forward motion of developers and financiers by making city development and growth top priority (p. 87). When the quality of life concern is more green space, urban greening initiatives are employed to address the issue but often increases fiscal burdens beyond the scope of affordability for existing residents leading to gentrification (Logan & Molotch, 1987, p. 114). Unable to adjust to these increases, many residents are often displaced from the neighborhoods they sought resources to improve. Green Gentrification parallels this theoretical approach as it focuses on external forces impacting the character of the neighborhood with the intent to appropriate economic value (i.e. growth, redevelopment, added value, improved quality of life, etc.) from the location. A specific example can be found in Dooling’s (2009) assessment of the lack of priority and consideration given to homeless populations in environmental city planning as compared to the concepts of profit (tourism), expansion, the dominant single-family home owner narrative/preferences, and development which pushed and informed the type and kind of development that would come to the city.

In another theoretical approach, sociospatial analysis, the focus is on the human experience, interaction, and response to the environment in relation to cultural, political, economic, and social forces (Gottdiener & Hutchinson, 2011, pp. 19-21). These factors come into play as residents in communities undergoing green or environmental gentrification realize a need to be more informed about how to navigate the political processes of zoning and plan approval (to understand or thwart proposals in their communities), the shift in the social and cultural makeup of their communities (as upper- and middle-class residents with different preferences move in), and the economic effect of improvements in their community (Gottdiener & Hutchinson, 2011, pp. 19-21). Green Gentrification aligns well with this explanation also and focuses on the complex set of factors that impact and effect a neighborhood's ability to influence the siting of environmental goods and or bads in their vicinity. A specific example can be found in Checker's (2011) environmental gentrification, which tucks neatly into this approach, with a focus on the environmental activism of communities as a result of efforts to remedy, mitigate, and correct past environmental harms.

## Chapter 3 – Research Methodology

This research seeks to examine the sociodemographic changes in neighborhoods affected by Green Gentrification. This research will also examine how the removal of an eyesore and addition of an environmental amenity has affected the sociodemographic and cultural makeup of the surrounding neighborhood. Green Gentrification has both quantitative (i.e. land value changes, demographic changes, changes in renters versus owners, etc.) and qualitative (i.e. quality of life, impressions of the residents, reflections of the developers, etc.) aspects. Both perspectives are crucial for a full evaluation and accurate understanding of the impact of the addition of green infrastructure or the removal of environmental hazards in communities. Therefore, this research will employ a mixed methods approach to provide proper context to the analysis. A case study will be selected to evaluate the geographical impact of Green Gentrification in Dallas, TX.

### A. Research Question

Recent policies focused on sustainability and environmental justice have resulted in increased efforts to improve stewardship of the earth's limited resources (sustainability), prevent and remedy unequal environmental burdens imposed on communities of color, the elderly, and those with lower-incomes (environmental justice), as well as preparing for maintaining operations in the face of environmental stresses (resiliency). Seemingly altruistic, these actions in tandem often result in a dichotomous outcome when they are co-opted by economic interests and negatively influenced by race. Their positive effects manifest in the improvement of community conditions through either the addition of environmental infrastructure/amenities or the removal of an environmental hazard, referred to as Green Gentrification. Unfortunately, these policies also often result in the displacement of the original residents and culture the changes sought to help. My goal in this research is to understand the process of Green Gentrification and then to offer feedback on how the benefits of raising the standard of living can be maximized, while minimizing the displacement and economic pressure effects. The questions then become:

- How do we explain the process of Green Gentrification?
- Is there a correlation between green improvements and noted markers of gentrification?
- If so, are there strategies and tactics that the community and practitioners can employ to prevent the displacement effects of these actions and still reap their improvement benefits?

## B. Projected approach and data sources

Green Gentrification lends itself to a mixed methods analysis to both identify and understand changes in the neighborhood within the proper context. Qualitative Analysis will be completed using the *Institutional Analysis and Development Framework* to explore and explain the role institutions and relationships play in the outcome of who is able to enjoy environmental benefits. Quantitative Analysis will be completed using *Linear Hedonic Regression (LHR)* to evaluate sociodemographic changes in the census tracts near the trail such as race, income, education level, family size, tenure, and occupation as a factor of housing price before the trail and after construction covering the census years of 1970, 1980, 1990, 2000, and 2010.

### 1. Qualitative Analysis: The Institutional Analysis & Development Framework

The IAD Framework allows for thorough evaluation of policy in action. It considers not only the physical world, but the players making decisions, the effect of existing norms (formal and informal), the role of relationships and interactions (including issues of power inequities often present in policy implementation) and provides a list of evaluative criteria to assess the process from varying lenses. Green Gentrification is a complex concept that includes not only policy but historical issues of allocation and economic equity as well as the effects of power imbalances and lack of inclusive public engagement in Environmental Planning. The IAD Framework will allow me to peel back the layers and analyze the why, how, who, and what of Green Gentrification. Items such as existing laws and initiatives, community interaction, and usage guidelines of the trail will be used to frame the context within which the trail was built and how it currently operates. IAD is unique in its consideration of not only decisions, but the factors that affect current actions as well as their implications for future decisions and how we can learn from the process. This is what makes

it the ideal fit for my analysis. The following is an example of the framework could be applied to the urban phenomenon of Green Gentrification.

*a. A Proper Explanation: The New Institutional Economics*

If Green Gentrification is an economic process, there must be an economic explanation that can clarify the phenomenon. Traditional methods of economic theory would lead to the use of Neoclassical Economic explanations of rising land costs to explain the changes that take place during gentrification. However, I introduce the notion that if social, political, and cultural forces are catalysts for the change in the structure, ethos, and demographics of a neighborhood due to gentrification, they should also be a part of the analysis to explain how and why it happens. In this section I use New Institutional Economics (NIE), especially the Institutional Analysis and Development Framework (IAD), to explore how exogenous and endogenous influences can affect the process and lasting results of Green Gentrification.

*b. General Definition*

Neoclassical Economics provides some valuable insight into this urban situation (as discussed above in Marcuse's explanation of precipitating factors for displacement due to economic pressures), but it does not give attention to the social, cultural, or institutional factors that may affect and effect the ability of an individual to choose where they live. Neoclassical Economics centers on a rational individual, with complete information, making choices to maximize the use of their existing resources. The principles and ideals of this economic theory have infiltrated modern culture and have been used to explain countless urban phenomenon. One instance of this is using increasing/decreasing land rent to describe conditions that precipitate and/or exacerbate gentrification. It does not consider how previous events or initiatives may affect and effect the availability of resources or steer actions in a certain direction.

In the early 1930s the economics community began to question and reevaluate the major assumptions of Neoclassical Economics (Hass, 2007, p. 93). Early discussions sought to address the impact of laws on economic choices and to define economic actors in clear, consistent, and accessible terms (Hass, 2007, p.

93; Coase, 1937, pp. 386-387). New Institutional Economics (NIE) (initially suggested by John Commons and Ronald Coase) was the result of these deliberations (Hass, 2007, p. 93). NIE had two important distinctions from Neoclassical Economics. NIE refuted the prevailing notion that the market is guided by “the invisible hand” tasked with automatically equalizing supply and demand without regard to historical or social factors (Ankarloo, 2002, p. 10). It challenged the Neoclassical assumptions being true in real world conditions (Ankarloo, 2002, p. 10). Secondly, NIE was intentional about considering the impact of history on current economic decisions (Ankarloo, 2002, p. 10). These two distinctions sought to make economics more “realistic, more social, and historical in its approach” (Ankarloo, 2002, p. 10).

NIE was further developed by the work of Oliver Williamson and Douglass North in three major categories: bounded rationality, transaction costs, and property rights. Instead of accepting the premise that rational actors operate with full information, Williamson (1985) presented the concept of bounded rationality (p. 45). Under bounded rationality actors must account for transaction costs, uncertainty, and limited information which prevents them from making a completely rational decision (Ankarloo, 2002, p. 12). Bounded rationality is an attempt to explain that actors never have access to complete or totally accurate information. The search for the most accurate version of information possible leads to additional costs in the process of making economic decisions, referred to as transaction costs. In several cases, even when abundant information is available, the actor may not be able to accurately understand and comprehend it. To minimize the uncertainty of navigating transactions with incomplete information, individuals create rules (ways of thinking or approaching decisions or definitions of rights and responsibilities of members facing common social problems) that are consistent from decision to decision to help them maximize their utility and decrease their costs (Ankarloo, 2002, p. 12; Lee, 2003, p. 4). Coase (1937) believed that firms were created to address this problem and stated that, “The main reason why it is profitable to establish a firm would seem to be that there is a cost of using the price mechanism (p. 390). This is more commonly referred to as transaction cost, which represents the associated prices and expenditures in decision making



and market actions, in contrast to the cost/friction free Neoclassical explanation (Ankarloo, 2002, p. 13). If the cost of economic decisions can be limited, the rational actor can achieve a greater utility with the same economic resources, if they cannot the rational actor has a difficult time maximizing their utility.

This is extremely important when it comes to property rights. Furubotn and Richter (1991) define property rights “as the right to use, derive an income from and sell an asset” (p.6). Property transactions are unique in that property rights must first be defined, ownership changes based on the content of a contract, and is routinely enforced by the state (Ankarloo, 2002, p. 14). North (1981) eloquently states that “[a] theory of the state is essential because it is the state that specifies the property right structure. Ultimately it is the state that is responsible for the efficiency of the property right structure, which causes growth or stagnation and economic decline” (p. 17). Yet again the need for government intervention, regulation, or stabilization of the market is considered a necessity for proper functioning. This third change also goes to the principle question of market solutions needing the proper context from real, social, and historical considerations. Institutions address this problem.

Institutions (formal and informal rules) are society’s efforts to create order by increasing predictability in social interactions (Ostrom & Ahn, 2007, p. 16). Institutions can be informal (e.g. social customs, norms, traditions, etc.) or formal (e.g. legal restrictions, employment contracts, etc.) and they represent “the humanly devised constraints that shape human action” (North, 1990, p. 3, Ankarloo, 2002, p. 15). Institutions also provide guidance on what actions are “required, prohibited, or permitted” by actors in the action arena, and even prescribe punishment or sanctions when actors step outside of those guidelines (Bravo, 2002, 6; Ostrom, Gardner, & Walker, 1994, p. 38 – double check citation). Simply stated institutions are the rules of the game in action. The historical context of institutions is also important when actors employ organization rules of in economic decision-making economic decisions (Ankarloo, 2002, p. 15). North (1990) eloquently ties together these concepts in the following quote:

History matters. It matters not just because we can learn from the past, but because the present and the future are connected to the past by the continuity of a society's institutions. Today's and tomorrow's choices are shaped by the past. And the past can only be made intelligible as a story of institutional evolution

(p. vii). Governance, a related concept, is the “process by which the repertoire of rules, norms, and strategies that guide behavior within a given realm of policy interactions are formed applied, interpreted, and reformed” (McGinnis, 2011, p. 171). Similar to institutions, governance can be formal and/or informal (Lee, 2003, pp. 4-5). Governance can also be considered a “wide variety of ways to solve common problems including organizational, social, national, and international problems” (Lee, 2003, p. 4). Governance generally considers questions about forms of power and authority, patterns of interaction (relationship and rights and obligations) among people facing common problems, the ability of citizens to voice their concerns, and the process of decision making on issues of public concern (Lee, 2003, pp. 4-5). This makes governance inherently political in nature because it “determines who can do what to whom, and on whose authority” [original emphasis] (Lee, 2003, p. 5; McGinnis, 2011, p. 171).

New Institutional Economics identified several deficiencies in Neoclassical Economics and sought to provide a rational solution. Realizing the impossibility of perfect information, NIE presented instead the idea of bounded rationality, that actors have access to limited information and encounter transactions costs in the process of making decisions. Actors comprehend this information in line with a set of guidelines, whether formal or informal, that outline the way they are to interact and respond in decision making. These decisions are also influenced by historical factors and issues of power or the implications of power inequity. The question was then raised, “How can NIE be applied in a policy setting?” Elinor & Victor Ostrom and others began to address this question with the creation of the Institutional Analysis and Development (IAD) framework.

### *c. A New Policy Tool Created: The Institutional Analysis and Development Framework*

There has been much discussion regarding institutions, but one theoretical framework prevails – the IAD Framework credited to Vincent and Elinor Ostrom and other scholars related to the *Workshop in Political*

*Theory and Policy Analysis* (McGinnis, 2011, p. 169). The IAD framework is most commonly used to “evaluate, design or reform policy” through the comparison of existing systems/institutions (Polski & Ostrom, 1999, p. 5). IAD is most useful in situations where an explanation is needed for how institutions guide and constrain rational actors’ behavior and how the actions of actors influence the shape and form of institutions (Schlager & Cox, 2018, p. 215).

IAD has several components that allow for a thorough analysis of the interaction between rational actors and their limited choice environment. These various components allow the user to simplify complex policy and social situations into more manageable sets of information (Polski & Ostrom, 1999, p. 6). They are the *biophysical conditions, attributes of community, rules-in-use, action situations, interactions, outcomes, and evaluative criteria* (McGinnis, 2011, p. 172). These seven components – Material Conditions, Attributes of the Community, Rules-In-Use, Action Situations, Interactions, Outcomes, and Evaluative Criteria work together to influence both current and future actions. A visual summary of these concepts and their interactions is courtesy of McGinnis’ (2011) introduction to the IAD Framework according to Elinor Ostrom (p. 172).

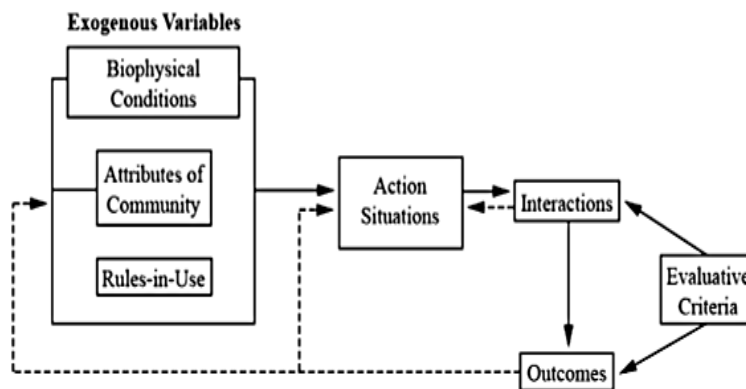


Figure 3. Basic Components of the IAD Framework

**Biophysical Conditions** (physical world) describe the inputs from physical and material surroundings (the physical environment). These resources can be categorized by distinguishing between the cost of excluding

actors from a good/the degree to which an actor can control access to a good (excludability) and the circumstance when one actor's use of a good removes it from possible use by others (subtractibility) (Polski & Ostrom, 1999, p. 10). The two most researched conditions by IAD are public goods and common pool resources, which both have a high cost of exclusion, but differ greatly when it comes to the concept of subtractibility. Common pool resources have subtractable characteristics meaning once an actor uses the good it is no longer available to other actors (i.e. once my goat grazes a corner of the public pasture that section is no longer available to other herds of goats), while public goods are not considered subtractible because more than one actor can access and use the good at one time (i.e. a park where several actors engage in different activities at the same time and do not preclude others from doing the same).

**Attributes of Community** (community) includes the social and cultural aspects surrounding the issue (McGinnis, 2011, p. 175). This area has not been covered as extensively by scholars but carries a diverse set of considerations to understand the actors tasked with making a decision including socioeconomic status, presence/absence of accountable leadership, level of social capital, level of poverty, and the interplay of power (Schlager & Cox, 2018, p. 230). This area requires an analysis of how actors relate and engage with each other. There must be some level of trust for reciprocal action and respect (McGinnis, 2011, pp. 175-176). A common understanding of social norms/values and the possession of a common cultural repertoire (e.g. strategies, rules, practices, etc.) helps facilitate conversations and concerted action (McGinnis, 2011, p. 176). While a difference in social capital can exacerbate existing power disparities (McGinnis, 2011, p. 176).

**Rules-in-Use** encompasses the institutional setting within which the actors must function (McGinnis, 2011, p. 175). This portion of the framework evaluates both informal and formal rules. Informal rules are the collection of ideas, societal norms, and strategies commonly used by the actors (McGinnis, 2011, p. 175). Formal rules represent traditional "rules-on-paper" that structure the possible range of actions (McGinnis, 2011, p. 175). Although both types are important, IAD chooses to focus more on identifying the relevant

rules currently operational in the community and then using them to complete the analysis (Polski & Ostrom, 1999, p. 15).

**Action Situations** are where policy and economic choices are made by bounded rational actors. McGinnis (2011) describes this portion of the framework as the place where “individuals ... observe information, select actions, engage in patterns of interaction, and realize outcomes from their interaction” (p. 173). As Polski & Ostrom (1999) note, “it is where the policy action is!” (p. 20). The action situation includes both the location of the action and the actors that are making the decisions (Polski & Ostrom, 1999, p. 20). The action situation specifies who the relevant actors are, what obstacles in decision making they face, and is the first instance where the outcomes from their decisions are realized (McGinnis, 2011, p. 173).

**Interactions** (patterns of interactions) refers to the evaluation of how actors conduct themselves within the action arena, including how actors relate and engage with one another (Polski & Ostrom, 1999, p. 24). This portion of the framework analyzes interactions in light of community norms and serves as a basis for policy inferences and identification of behavior patterns (Polski & Ostrom, 1999, p. 24). Example behaviors could be organizing, cooperation, or conflict. Polski & Ostrom (1999) give the example of an action situation where a common pool resource is available for use without an established limit on consumption (p. 24). A policy analysis examining this scenario would likely find that the resource would diminish rapidly due to the lack of parameters on overuse and lack of cooperation between actors to preserve the good for future use (p. 24).

**Outcomes** are the results of the decisions in the action situation. They are determined through an analysis of the patterns of interaction (Polski & Ostrom, 1999, p. 25). The process of analyzing outcomes is the critical examination of how well the current policy system(s) (the institutions in place) performed and responded to needs in the action situation (Polski & Ostrom, 1999, p. 25). The overall goal is to determine where the existing rules produce a satisfactory outcome and where they need to be improved (McGinnis,

2011, p. 176). Outcomes can be shaped by the both the decisions in the action arena and the patterns of interactions as well as exogenous factors (McGinnis, 2011, p. 172).

The evaluation of the effectiveness of the policies can be completed using **Evaluative Criteria**. Some of the most common evaluative measures are economic efficiency, fiscal equivalence, distributional equity, accountability, general morality, and adaptability/resilience/robustness/sustainability (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). Economic efficiency refers to the effective use of resources (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). Fiscal equivalence, or proportionality, is the premise that actors who benefit from the use of a good should pay a proportion of the cost for providing it based on their use (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). Distributional equity requires actors to contribute to the maintenance of a good on a sliding scale based on ability to pay (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). Accountability is the ability to easily and cheaply share information, evaluate the actions of co-actors, and to monitor and check the behavior of co-actors to prevent opportunistic behavior (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). General morality represents conformance to the moral values that protect the actors from harm and keep co-actors honest in their dealings (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176).

Adaptability/resilience/robustness/sustainability all refer to the ability to adapt and innovate in the face of stressors, where robustness is the most accurate term to use in situations regarding systems designed by human (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176).

These components work together to form a qualitative process of analysis that examines not only the outcome, but the actions, institutions, and goods along the way that influence the result. IAD is especially helpful in situations where power inequities may exist. It helps bring to light how power imbalances may influence interactions and final decisions, and as well as assisting in determining if voices outside of the majority were heard and incorporated into the final decision and implementation.

## 2. Quantitative Analysis: Linear Hedonic Regression

Quantitative analysis will evaluate the changes in sociodemographic characteristics (i.e. age, income, race, etc.), changes in tenure (i.e. percentage of renters versus percentage of owners), and the change in the nearby land value (i.e. increase or decrease in median and average home value) using both Geographical Information Systems (GIS) analysis and *Hedonic Price Modeling (HPM)* within the *Hedonic Linear Regression analysis* framework. This will be visualized using GIS overlays to show the sociodemographic makeup of the neighborhoods before park implementation, at park implementation, and after park implementation. The HPM provides a well-suited solution for quantifying the value added of environmental amenities/infrastructure and has been used widely in the US to answer this question (Jim & Chen, 2006, p. 422). The HPM allows an abstract/difficult to quantify good (park spaces) to be measured by proxy through a good that is easily quantifiable (housing price). One of the most common models of HPM is using housing or land value to observe and determine the influence of the surrounding environmental, structural, and neighborhood attributes on the overall cost/price of the home (Bolitzer & Netusil, 2000, p. 186). As Rosen (1974) explained, each commodity purchased is a unique bundle of utility maximizing attributes specific to that spatial location (p. 34), or as Jim & Chen (2006) stated “a residential property is a composite good composed of a complex bundle of multiple characteristics, each of which contributes to its selling price” (p. 425). Another goal of the HPM is to identify the cost associated with each attribute, which, if applied, would also result in quantifying elusive environmental goods (Jim & Chen, 2006, p. 425). While current methods to evaluate the benefits and value of green space have been in the abstract (e.g. social value, etc.), home sale prices (producers’ cost/buyers’ utility) are the result of a market transaction (Jim & Chen, 2006, p. 425). Using a concrete and respected method like the sale price of homes would give validity to the measurement for environmental spaces in the capitalist system in America (Jim & Chen, 2006, p. 425). The housing market is established and respected objective market, which would also offer further validity to the derived value amounts. This standardization would make it easier to compare homes close to the amenity to those that are further out. This would allow for a location rent analysis (the difference in sale price of a

home close to an amenity compared to the sale price of a comparable home at some distance away from the amenity) to determine a dollar amount that the amenity adds to sale prices (More et al., 1988, p. 142). The HPM also is best suited to concentrate analysis on one area at a time, which would be extremely useful for evaluating effects of the unique community around a green amenity (such as a linear park) in isolation for the surrounding city neighborhoods (Waltert & Schlapfer, 2010, p. 143). Although limited in scale, the HPM is well-suited for an in-depth, multi-variate, longitudinal (panel data) analysis of the selected area allowing researchers to include sufficient options to determine the factors that make a significant impact on housing price and those that have a negligible effect (Waltert & Schlapfer, 2010, p. 143).

*a. Quantitative Methodology - Linear Hedonic Regression*

As far back as the 1800s, American culture has lauded parks for their environmental, psychological, social, and ecological benefits (discussed in detail above). Parks have created a common social ground, served as connectors in and between cities, and even helped to prevent flooding. Although advantageous, the benefits of green amenities are notoriously difficult to measure due to the lack of a designated marketplace that assigns an objective value to fresh air, crystal clear water, or clean soil. There is no dollar value on being able to take a quick five-minute walk to a soccer park or on the peace felt from walking along a trail or watching the water wash upon the shore. However, it has been shown that environmental amenities (e.g. parks, lakes, open spaces, etc.) have a positive effect on nearby property values, up to a 147% increase for a property that fronts the ocean (Benson, Hansen, Schwartz, Jr, Smersh, 1998, pp. 56-58). Yet the question remains, “How do we measure the positive fiscal impact of parks on their surrounding communities?” One possible approach is the *revealed preference method*, also referred to as the *hedonic price method/model (HPM)*. In this analysis framework, the value of an amenity would be inferred from the sale price or estimated value of a house as a function of the characteristics of the attributes of the green amenity itself and the neighborhood (Jim & Chen, 2006, p. 425).



*b. LHR and Green Amenities*

Hedonic pricing allows a user to infer the value of a good that is hard to measure (an intangible) by evaluating a proxy (a tangible that implicitly includes the nonmarket good) as it is traded in the marketplace (More, Stevens, & Allen, 1988, p. 141; Kong, Yin, & Nakagoshi, 2007, p. 241). One common application of this concept is to use housing price (tangible) to evaluate the value nearby of environmental, structural, and neighborhood amenities (Waltert & Schlapfer, 2010, p. 143; Bolitzer & Netusil, 2000, p. 186). Where  $P_i$  is the price of the selected home and is a function of unique  $S_i$  structural characteristics,  $Q_i$  environmental characteristics, and  $N_i$  neighborhood characteristics (is a vector containing both  $G_i$  green space and  $ON_i$  all other neighborhood characteristics):

$$P_i = P(S_i, Q_i, G_i, ON_i)$$

*Equation 1. Hedonic Price Model (Bolitzer & Netusil, 2000, p. 186)*

Where

$$P(S_i, Q_i, G_i, ON_i) = P(a)$$

*a = locational amenities*

$$P_i = P(a)$$

*Equation 2. Hedonic Price Model (Dale, Murdoch, Thayer, & Waddell, 1999, p. 313)*

To calculate the individual price of an amenity, the partial derivative of the price function  $P_i = P(a)$  is taken with respect to that characteristic:

$$P_{a_i} = \frac{\partial P}{\partial a_i}$$

*Equation 3. Marginal Cost of Additional Unit of a Particular Characteristic in the Hedonic Price Model (Dale et al., 1999, p. 313)*

### *c. Hedonic Price Model Limitations*

Although useful, the Hedonic Price Model (HPM) has some limitations to its application. First, the model assumes a competitive equilibrium between buyers and seller (Rosen, 1974, p. 35). This assumption envisions a sufficiently large market of choice/options where each location (point) is a bundle of amenities specific in quality and quantity to that point, creating a diverse market of unique bundles of amenities (Rosen, 1974, pp. 35-37). To reach equilibrium the bundle of goods offered at each point by a seller must match a desired bundle of goods of a buyer so that each utility is maximized for both (Rosen, 1974, p. 35). The goods at each point cannot be separated, substituted, or repackaged (Rosen, 1974, p. 38). The prices chosen must be a function of the buyer's preferences and the seller's cost on the points as they are found and resale (secondhand markets) are not considered and purchasing a bundle is seen as an act of complete consumption (removal from the market for any future sale) (Rosen, 1974, pp. 35-37). A sufficient market (a large enough number of houses) is necessary to ensure statistically significant results. The model offers the ability for granular coverage of consumer preferences, but it comes at the cost of limited scale in analysis (e.g. only one country, or neighborhood at a time) (Waltert & Schlapfer, 2010, p. 143). The HPM also does not consider any interdependence or correlation between variables and requires the analysis to be "fit" to each research project and can result in several iterations (Wu, Jiao, Yu, Li, Peng, Liu, & Zeng, 2018, p. 1676).

The best fit applications for this model would be cases that need flexibility in the creation of the model, amenities that are hard to otherwise quantify, and areas with a boundary for isolation of analysis, and any (dis)amenities that are located nearby housing can be evaluated. This could include the quality of schools, the removal of a plant operation, proximity to jobs, access to transit, or proximity to nearby entertainment, or environmental dis/amenities.

### C. Data Sets

Two distinct data sets were used to complete both the qualitative and quantitative portions of the analysis.

The first data set was used to describe both municipalities and provide context for the setting of the trail.

The second data set was used to analyze the change in housing prices related to the Katy Trail.

#### 1. Qualitative Data

The first data source for this research were the US Census Bureau's 2017 QuickFacts tool. These databases contained census records for the municipalities of Dallas and Highland Park, including the 15 tracts directly adjacent to or one census tract removed from Phase I & II 3.5mi sections of the Katy Trail. QuickFacts data provides information from the U.S. Census Bureau's Population Estimates Program (updated annually) and the 2010 Census of Population (updated every 10 years) in the form of a summary table for all states, counties, and municipalities with 5,000 residents. This data was used to provide a quick snapshot of similarities and differences between the City of Dallas and Highland Park regarding population, household income, educational attainment, poverty, and age, sex, race, and housing for the entire municipality in the Qualitative Analysis.

#### 2. Quantitative Data

The second database used in this research was the 2010 Neighborhood Change Database (NCDB). The NCDB is a data product that provides US Census Bureau data of decennial censuses from 1970-2010 at the census tract level. The NCDB also has an option to normalize all data to 2010 census tract boundaries to assist with longitudinal analysis of census level data. The NCDB provides a broad range of data including

race, ethnicity, tenure (own/rent), household income, housing value, housing characteristics (number of bedrooms, total number of units, etc.), educational attainment, occupation type (i.e. professional, sales, service, technical, etc.), poverty, and population. Information is provided using the Federal Information Processing Series (FIPS) system of state, county, city, and census tract number coding. This data was used to perform the LHR analysis.

#### D. Rails to Trails Case Study - Katy Trail

In reviewing possible locations for a case study, the Katy Trail in Dallas, Texas, was deemed a good fit for this analysis because as a Rails-to-Trails project it meets both options for Green Gentrification by removing an environmental hazard (reclaims and cleans up an abandoned section of railway) and also creating a new environmental amenity (repurposes abandoned rails to be used as a public linear park).

The Rails-to-Trails program was created under the National Trails System Act (The Act) (16 U.S.C. § 1247(d)) (and subsequent amendments) which addressed the issue of shrinking in-use railway as cities began experiencing dramatic shifts in their primary economic bases, moving from large industrial scale projects, and the accompanying support economies (including transportation systems), towards technology, service, and financial offerings (Sinha, 2014, p. 116). Section 8(d) of the Act authorized the Interstate Commerce Commission (ICC) to allow railroad companies to preserve their future rights to reactive existing railways, promoting park creation in partnership with local entities to use the land as recreational trails, resulting in new pathways that offered energy efficient modes of transportation.

Rails-to-Trails projects were also often Ecological/Sustainable Parks (ESP) that could be created to: 1) fit diverse needs, 2) prioritize the use of native plant types to reduce maintenance costs, 3) serve as a connector between other green spaces to create a green network and social connectivity between different areas of the city, and 4) encourage visitors to engage in both active and passive enjoyment of the facility (Sinha, 2014, p. 116; Cranz & Boland, 2003, p. 46; Cranz & Boland, 2004, pp. 103-118). The flexible nature of these parks was often a preferred solution for cities seeking ways to reclaim and reframe abandoned spaces in a

constructive way. Modern American linear parks, such as the New York High Line and Dallas Katy Trail, fall perfectly into the combined Rails-to-Trails and ESP model.



*Figure 4. The KATY Caboose 115 and Trail Marker directly adjacent to Katy Trail in Uptown, Dallas, TX*

One of the most well-known Rails-to-Trails projects is the New York High Line in New York’s Chelsea neighborhood. It is also the first project in the United States to use this program to create an elevated linear park (inspired by the Promenade Plantee’ in Paris) for the nearby community that included two low-income housing facilities. The idea for the park started with a grassroots effort by neighborhood residents, and quickly became one of the most toured (and duplicated) parks in the United States. With this newfound popularity came new residents, rising prices, and increasing displacement pressure for existing residents and businesses (those present at the time of the park construction). The New York City Economic Development Corporation conducted a study in 2011 to estimate the impact of the park on the nearby economy. Major findings from the study related to the impact of The Highline included:

- As *proximity to a park* increases residential property land values increase as well. (This was especially true for lower priced properties.)
- *Median values* for properties also increase with proximity to park, specifically properties within a 5min walk are 11% higher than those between a five- and ten-minute walk from the park.
- When comparing *property values* from 2003 to 2011, those properties closest to parks escalated more quickly over time than those in neighborhoods bordering the park.
- Before construction on the Highline started in 2003 surrounding residential properties fell 8% below the median for Manhattan. In 2011 the values of those surrounding properties had outpaced the borough-wide median property values, showing *up to a 103% increase in homes* within 5min walking distance of the park.

Median Market Value PSF by Walking Distance from Parks, 2011 \$ and % change from 2003				
Walking Distance from the Park	Central Park West		Central Park East	
	2011 \$ psf	% change from 2003	2011 \$ psf	% change from 2003
Within 5 minutes	\$474	73%	\$801	44%
5 to 10 minutes away	\$421	71%	\$714	50%
Over 10 minutes	N/A	N/A	\$1,826	96%
Walking Distance from the Park	Prospect Park		Highline – Hudson Yards to Union Square	
	2011 \$ psf	% change from 2003	2011 \$ psf	% change from 2003
Within 5 minutes	\$305	410%	\$301	103%
5 to 10 minutes away	\$313	421%	\$144	19%
Over 10 minutes	\$142	470%	\$200	33%

Figure 5. NYC 2011 Mean Market Value by Walking Distance from Parks  
(New York Department of Finance, New York Economic Development Corporation)

These findings show the inherent value in the removal of hazards and the creation of environmental amenities. With so many parks following this model, questions arise as to how their original residents have fared. Although one of the most well-known and studied trails, the New York Highline exists in an urban

condition very different than the rest of America. Would the results be the same? Would other cities using the Rails-to-Trails model have similar outcomes?

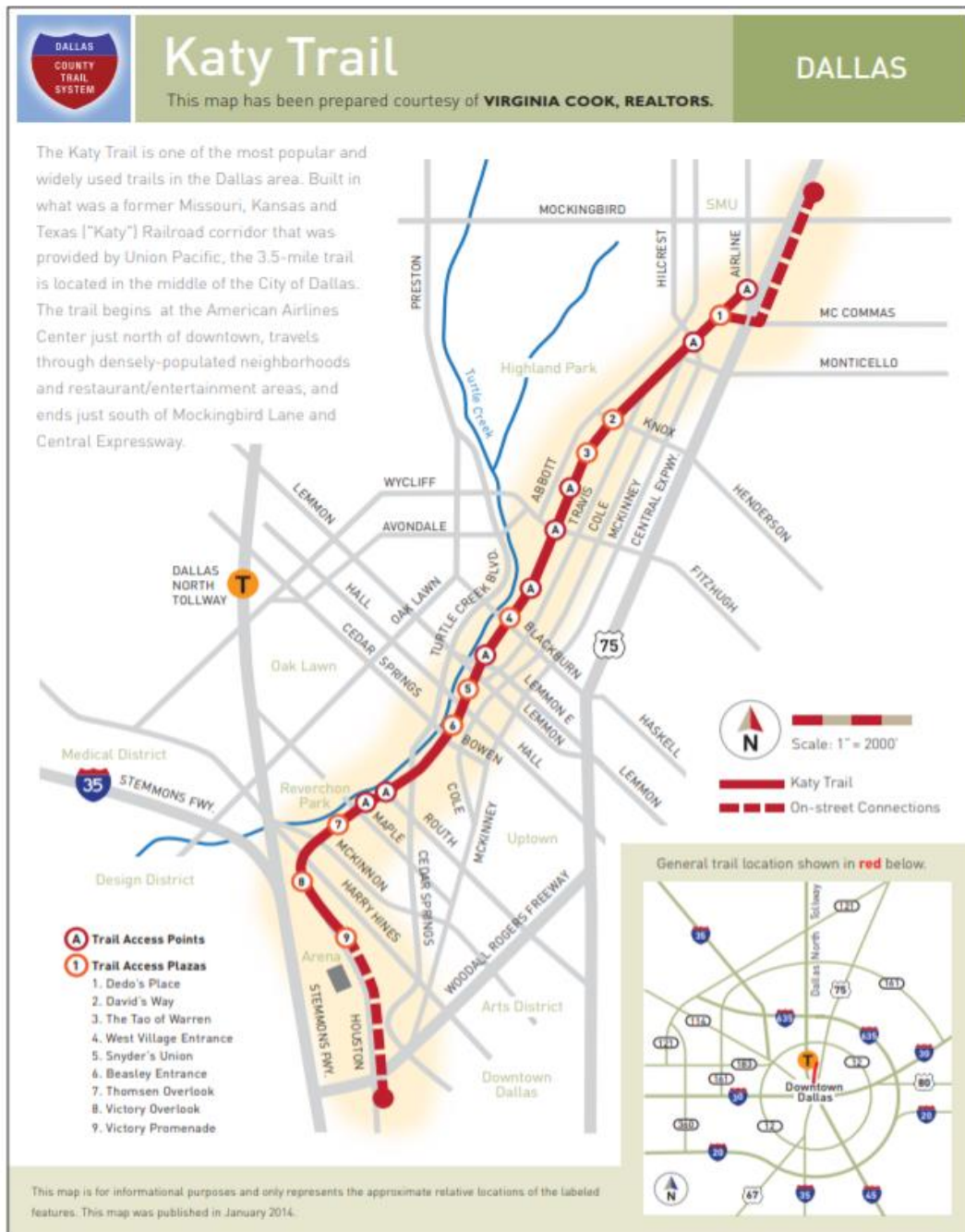


*Figure 6. The New York Highline*  
(Photo by Timothy Schenck, <https://www.thehighline.org/blog/2017/11/24/optoutside-instead-this-black-friday/>)

This research seeks to expand the analysis on the impact of Rails-to-Trails parks to a southern urban center that is car-dependent, suburban in nature, and considerably less dense – a Katy Trail located primarily in the Uptown Public Improvement District of Dallas, Texas. The goal is to provide a better understanding of the effects of linear park development in other portions of the United States. The analysis will use the IAD to examine the institutions in place that either facilitated or hindered the development of the trail and determined who would be able to enjoy the new amenity. It will evaluate the changes in sociodemographic factors that are often included in gentrification analysis in the census tracts surrounding the Katy Trail, relative to changes in housing costs through Linear Hedonic Regression using 1970, 1980, 1990, 2000, and 2010 census data.

# Chapter 4 – Qualitative Analysis – IAD Framework

The analysis will use the IAD to examine the institutions in place that either facilitated or hindered the development of the trail and determined who would be able to enjoy the new amenity.





*Figure 7. Map of Katy Trail in Dallas, Texas (Courtesy of Dallas County Planning Department <https://www.dallascounty.org/Assets/uploads/docs/plandev/trails/14-KatyTrail.pdf>)*

## A. Biophysical Conditions

In 1993, after initially being considered for the new Dallas Area Rapid Transit (DART) light-rail system, Union Pacific Railroad gave the abandoned portion of the Missouri-Kansas-Texas rail line to the City of Dallas to be used for a new linear public park/trail. The City of Dallas, Dallas County, the North Central Texas Council of Governments, and the Friends of the Katy Trail all contributed to the design, funding, and construction of the trail. The City of Dallas is the primary owner of the trail and has partnered with the Friends of the Katy Trail, a non-profit organization, to manage the trail.

### 1. The Trail Itself

Now known as the Katy Trail, the public trail is located primarily in Dallas, TX and is approximately 3.5 miles in length (Phase I & II) and travels from the Uptown neighborhood to the American Airlines Center (home to two Dallas professional sports teams), ending just shy of downtown. The trail has concrete and asphalt sections on the trail. The asphalt portions are marked “Pedestrian Only” while the concrete portions are open to pedestrians, bikers, skaters, rollerbladers, skateboarders, and any other non-motorized form of transportation. The Trail has been extended to include several new connections, overpasses, and on street connectors. For the purpose of this analysis the main 3.5mi section of the trail will be analyzed.



*Figure 8. Southern Section of the Katy Trail*

Another characteristic of the biophysical condition is determining if the resource in question has high or low subtractability. Common pool resources are highly subtractable, because once an actor uses a portion of the good it is no longer available to other actors that desire to do so (i.e. once my goat grazes a corner of the public pasture that section is no longer available to other herds of goats). In contrast, public goods have low subtractability because they can sufficiently support more than one actor using the good at a time (i.e. a park where one actor engages in recreation activities does not preclude others from coming to the park and doing the same).

The Katy Trail would be considered a public good under IAD analysis. Several users are often present at once using the trail for active recreation, quiet reflections, or active transportation to any of the several destinations along the trail. One actor enjoying the trail does not remove the possibility of another actor using the same trail for the same or another recreational use (Polski & Ostrom, 1999, p. 10). Another characteristic of public goods is distinguishing between the cost of excluding actors from a good (excludability) (Polski & Ostrom, 1999, p. 10). A good that is classified as having high excludability means that access to the good can be controlled easily (Polski & Ostrom, 1999, p. 10). However, in the case of public goods excludability is low, which means that “free-riders” can access and use the good without

contributing directly to its upkeep (Polski & Ostrom, 1999, p. 10). This also means that it is difficult to exclude additional actors from using the good without incurring substantial cost. In instances where one actor would like to prohibit the use of the public good from others, the cost to do so is quite high (Polski & Ostrom, 1999, p. 10). One example of this is the annual **Katy 5K** that requires each participant to pay to use the trail. The most recent cost per runner was **\$50** for the 20<sup>th</sup> annual run in 2018. (See the advertisements listed below for the event). DoMore Race Services, Inc., a company that recorded the finishing times of each participant, clocked **3,269** participants (not including those that registered but did not attend the race) showing a cost to limit the use of the trail as **\$163,000** for a 3hour event.



Figure 9. Cost of Excludability - 2018 Katy Trail Annual 5K Entry Fee



The 2018 Michelob Ultra Katy Trail 5K Run will be held on the streets in your neighborhood on Thursday, June 7th, 2018, from 7:00 P.M. to 10:00 P.M. The 5K race will start at the intersection of Turtle Creek and Fairmount. The event will affect the following streets in your area on this listed course: The 5K will proceed by traveling northeast and north on Turtle Creek Blvd., east on an eastbound barricaded lane on Blackburn, north on a southbound coned-off lane on Cole, west on Cambrick, and it will then proceed south and west on the Katy Trail passing over Maple Avenue and finishing on the Katy Trail inside Reverchon Park. The runners will utilize the curb lane on each street listed and these lanes will be coned off. Dallas Police Officers will be on hand to facilitate traffic flow with temporary delays.



katytraildallas Reminder about tomorrow evening's street closures. Thank you all for your cooperation as we strive to keep all of our #katy5k participants safe. #uptowndallas #trafficnotice #streetclosures

prillydawn @alindenvo don't let me forget to remind you about this tomorrow so you're not stuck in the traffic!

micky\_and\_jax @katytraildallas at what time do the streets closure starts?

katytraildallas @micky\_superstar the closures will happen just before 7pm, but traffic will start getting heavy at 5pm as people make their way to the event.



Figure 10. Cost of Excludability - Route and Timing of the 2018 Katy Trail Annual 5K

## 2. Nearby Neighborhoods Conditions

The Katy Trail is bordered by two cities: Dallas, TX and Highland Park, TX. Though geographically close, these cities vary greatly in size, population (size and characteristics), as well as in land area that abuts the trail. The existing housing stock surrounding the trail varies and includes large homes, modest older single-family and multi-family homes, renovated homes, and newly constructed single-family homes and multifamily structures including apartments, townhomes, and condos. Nearby business offerings range greatly, and include upscale furniture, apple device services, restaurants, and yoga apparel.

### a. Dallas, Texas

As the principal city for the Dallas-Fort Worth-Arlington metropolitan statistical area, Dallas has a population of 1,341,075 as of 2017 (Census, 2017). The City of Dallas borders the Katy Trail on both sides from start to finish, except at the far north end of the trail where Highland Park borders on the west side. Dallas has an eclectic mix of people, homes, and businesses throughout the city. The area around the Katy Trail is an example of that mix. There are condos, apartments, townhomes, well-kept older homes, larger new homes, office buildings, and an open-air shopping district with restaurants, retail, and tailor service abuts the trail on Knox Street. At the border of Dallas and Highland Park a pedestrian crosswalk has been constructed to facilitate safe travel across the roadway for trail users and has a chime installment that helps

to signal when someone is close to the intersection on the south side. As the trail continues to wind through Dallas, it moves through the Uptown neighborhood with concrete paths (and a few parallel asphalt paths) and bridges ending near the American Airlines Arena (home of Dallas Mavericks Basketball and Dallas Stars Hockey) just north of downtown on Houston Street.

*b. Highland Park, Texas*

Highland Park is a small suburban community of approximately 9,208. It is a predominantly residential city surrounded on three sides (south, east, and west) by the City of Dallas, is home to very few businesses, and only has residential units abutting the trail (Census, 2017). One luxury shopping development is located at the corner of Preston Road and Mockingbird Lane, Highland Park Village, that offers designer brands, with a nearby cluster of banking institutions. In the southeastern section at Oak Lawn Ave and Wycliff Ave another development offers restaurants, a hair salon, and a sports store. The southwestern corner of the city has a Whole Foods across the street from another small strip mall offering restaurant, clothing, dry cleaner, and medical services at the intersection of Lemmon Ave and Lomo Alto Drive. A small number of additional businesses are located within the residential areas. Moving closer to the trail, at the border of Dallas and Highland Park a pedestrian crosswalk has been constructed to facilitate safe travel across the roadway for trail users.

**B. Attributes of Community**

As noted above although close in location, Dallas and Highland Park are very different cities. According to data from 2017 estimations by the US Census Bureau, Dallas is the largest city in the metroplex with over 1.3 million residents, while Highland Park falls on the opposite end of the spectrum with a 2017 population of less than 10,000. Dallas is also more diverse with significant representation of Whites (29.1%), Blacks (24.3%), and Hispanics (41.7% - regardless of race), while Highland Park is overwhelming White (90.5%) with minimal presence of Black residents (0.2%). Both municipalities have similar Asian populations (2.6% in Dallas and 1.9% in Highland Park) (Census, 2017). Higher percentages of Highland Park adult residents

25yrs and older have graduated from high school (99.9%) and finished college (85.9%), compared to Dallas high school graduation rate of 75.9% high school graduates and 31.6% of residents with a bachelor's or higher (Census, 2017). These differences continue when housing stock is examined. The majority of housing units in Dallas are rental units, with only 41.5% of housing units occupied by owners compared to Highland Park's 82.7% of owner-occupied housing stock. As a larger city, Dallas has more room for income variation among its residents when compared a smaller city like Highland Park that can tend toward economic homogeneity. In 2017 Census estimates Dallas' median household income was \$47,285, while the more affluent Highland Park's median income equals more than quadruple that amount, totaling \$200,208. This difference in economic status can also be evidenced in the median value of owner-occupied units (a proxy for individual purchasing power/individual ability to maximize utility) for each city. Dallas 2017 Census median home value for owner-occupied units is \$154,000, close to one tenth of the median home value in Highland Park of \$1,413,900.

All Topics	Dallas city, Texas	Highland Park town, Texas
<b>Population estimates, July 1, 2017, (V2017)</b>	<b>1,341,075</b>	<b>9,208</b>
<b>PEOPLE</b>		
<b>Population</b>		
<b>Population estimates, July 1, 2017, (V2017)</b>	<b>1,341,075</b>	<b>9,208</b>
Population estimates base, April 1, 2010, (V2018)	NA	NA
Population estimates base, April 1, 2010, (V2017)	1,197,824	8,563
Population, percent change - April 1, 2010 (estimates base) to July 1, 2018, (V2018)	NA	NA
Population, percent change - April 1, 2010 (estimates base) to July 1, 2017, (V2017)	12.0%	7.5%
Population, Census, April 1, 2010	1,197,816	8,564
<b>Age and Sex</b>		
Persons under 5 years, percent	△ 7.8%	△ 6.7%
Persons under 18 years, percent	△ 25.5%	△ 26.6%
Persons 65 years and over, percent	△ 9.8%	△ 20.6%
Female persons, percent	△ 50.4%	△ 51.8%
<b>Race and Hispanic Origin</b>		
White alone, percent	△ 61.8%	△ 93.7%
Black or African American alone, percent (a)	△ 24.3%	△ 0.2%
American Indian and Alaska Native alone, percent (a)	△ 0.3%	△ 0.2%
Asian alone, percent (a)	△ 3.4%	△ 3.5%
Native Hawaiian and Other Pacific Islander alone, percent (a)	△ 0.0%	△ 0.0%
Two or More Races, percent	△ 2.6%	△ 1.9%
Hispanic or Latino, percent (b)	△ 41.7%	△ 3.7%
White alone, not Hispanic or Latino, percent	△ 29.1%	△ 90.5%
<b>Housing</b>		
Housing units, July 1, 2017, (V2017)	X	X
Owner-occupied housing unit rate, 2013-2017	41.5%	82.7%
Median value of owner-occupied housing units, 2013-2017	\$154,000	\$1,413,900
Median selected monthly owner costs -with a mortgage, 2013-2017	\$1,526	\$4,000+
Median selected monthly owner costs -without a mortgage, 2013-2017	\$525	\$1,500+
Median gross rent, 2013-2017	\$937	\$2,401
<b>Families &amp; Living Arrangements</b>		
Households, 2013-2017	497,622	3,570
Persons per household, 2013-2017	2.58	2.54
Living in same house 1 year ago, percent of persons age 1 year+, 2013-2017	81.7%	85.8%
Language other than English spoken at home, percent of persons age 5 years+, 2013-2017	43.4%	7.2%
<b>Education</b>		
High school graduate or higher, percent of persons age 25 years+, 2013-2017	75.9%	99.0%
Bachelor's degree or higher, percent of persons age 25 years+, 2013-2017	31.6%	85.9%
<b>Income &amp; Poverty</b>		
Median household income (in 2017 dollars), 2013-2017	\$47,285	\$200,208
Per capita income in past 12 months (in 2017 dollars), 2013-2017	\$31,260	\$142,525
Persons in poverty, percent	△ 21.8%	△ 3.1%

Figure 11. Excerpts of Summary Census Data for the Cities of Dallas & Highland Park (Courtesy of the US Census Bureau 2017 QuickFacts <https://www.census.gov/quickfacts/fact/table/dallascitytexas,highlandparktowntexas/PST045217>)

It is important to note that the Uptown neighborhood in Dallas is now one of the most affluent areas in the city, as of March 2016 (and after the opening of the Katy Trail) property values near the trail had increased nearly 80%, reaching \$3.4billion in value and by 2018 the property values in the area (Uptown) had increased to \$5.5billion from the original \$525million before the public improvement district and opening of the Katy Trail (ULI, 2016, p. 5; UDI, 2018).

Part of what is now Uptown was previously known as the State-Thomas neighborhood - the first suburban style streetcar neighborhood with affluent White families separated by a street that was home to a Freedman's town (also referred to as North Dallas) where Black families of domestic workers to the wealthy families on Thomas street and porters/laborers in the downtown district lived (Residents of State Thomas, 1984, Background Page One). After the presentation of the first comprehensive plan for the City of Dallas, the Kessler Plan, in 1910 and advent of automobiles, white affluent families began moving northward leaving the State-Thomas area to growing Black (Hall Street) and Mexican (El Barrio) communities (Residents of State Thomas, 1984, Background Page Three). Former single-family homes were converted to multi-family housing, while others were abandoned and fell into a state of disrepair (Residents of State Thomas, 1984, Background Page Three). In the 1950s the creation of the Central Expressway bisected the Black community serving as a facilitator for further isolation and decline of the neighborhood (Residents of State Thomas, 1984, Background Page Three). The 1970s and the Woodall Rodgers Freeway further isolated the area, yet residents built a strong sense of community and place (Residents of State Thomas, 1984, Background Page Four). Later, others would rediscover the community and begin to migrate back to the area and later pushed for revitalization (Residents of State Thomas, 1984, Background Page Four). Mexican and Mexican American families also called this area home. Frogtown near the MKT rail line was one of the settlements due to the steady supply of jobs with the railroad (Robinson Ellis, 1996, p. 20). These families were able to "secure housing in abandoned or donated railroad cars" creating a "barrio boxcar shantytown" (Robinson Ellis, 1996, p. 20). The neighborhood was also bordered by the MKT railroad and



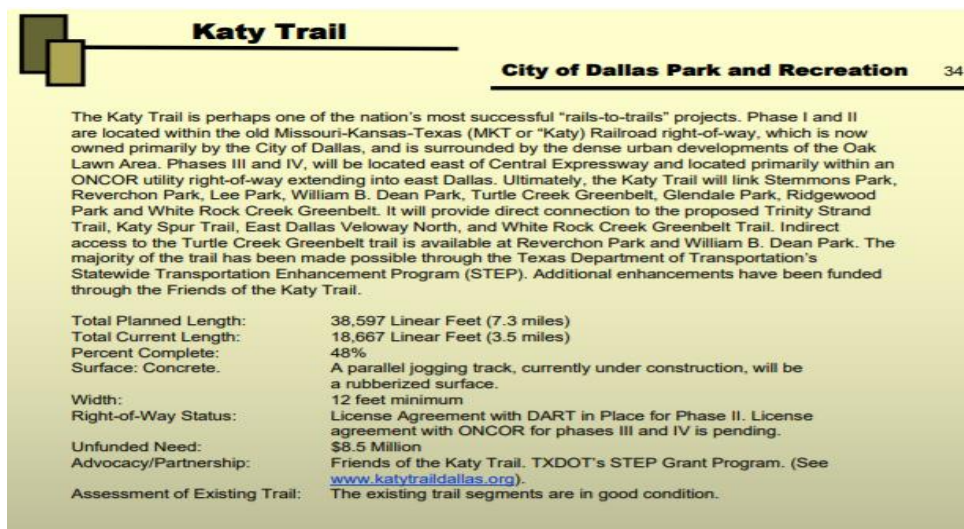
the Woodall Rodgers Freeway, as well as Bowen Street to the north and McKinney Ave to the east (Robinson Ellis, 1996, pp. 31-32). The rapid influx of Mexican families, and limited housing stock, again lead to the conversion of single-family homes into multi-family units. Within the community were unofficial zones signifying status. Zone 1 was primarily migrant farm workers, Zone 2 was literally a step up as it sat on slightly higher ground signifying a slightly higher economic status, the final step was Zone 3 reserved for the leaders, educated, bi-lingual (Spanish/English), and successful business owners of the neighborhood (Robinson Ellis, 1996, pp. 37-38). Lower incomes remained in the area and the 1980s were considered a time of blight in the area now known as Uptown.

It is evident from the area's beginning there have been differences in social and economic capital laying the groundwork for conditions that could exacerbate existing power disparities (McGinnis, 2011, p. 176). One example of that evidenced above is the disregard to maintaining the fabric of established minority communities in Dallas by choosing to locate Woodall Rodgers Freeway in a way that bisected and/or isolated these communities, leading to further divestment. This difference in social capital can also be seen in the decision on the use of the abandoned Missouri-Kansas-Texas ("The Katy") railway. According to W.J. "Bud" Melton's (one of the primary citizens behind raising initial funding for the Katy Trail) personal account of the history of the trail, Union Pacific Railroad initially approached the City of Dallas about using the abandoned line for the new Dallas Area Rapid Transit (DART) system that 13 area cities had agreed to support (Melton, 2019). Highland park was not one of the partner cities that agreed to support the trail (Melton, 2019). As the plans for the line began to take shape opposition from the residents of Highland Park rose tremendously (Melton, 2019). Although Highland Park abuts only one side of the most northwestern section of the trail, their refusal to support the DART line resulted in the halting of the plan and the relocation of the proposed line (Melton, 2019). Access to public transit, or the lack thereof, may have been an instrumental factor influencing the economic makeup of the area surrounding the trail. Audirac (2018) discusses such *spatial stigmas* in depth, such as limited public transit stops near parks in minority

communities like the proposed DART line that would have served as a connector to several city parks (Audirac, 2018, pp. 14-16; Byrne & Wolch, 2009, p. 749). Union Pacific instead donated the right of way to the Dallas Parks and Recreation Department (Melton, 2019). Local citizen support for a new linear trail grew and culminated in the creation of the Friends of the Katy Trail nonprofit organization, an early community champion of the park project. The new park plan was approved by the City of Dallas and Highland Park.

### C. Rules-in-Use

The IAD considers formal (official, laws, regulations, etc.) and informal rules (societal norms, local practices, etc.) both of which are present in the Katy Trail context (McGinnis, 2011, p. 175). The City of Dallas is responsible for most of the formal rules surrounding the trail. In Goals for Dallas former Dallas Mayor Erik Jonsson, in collaboration with residents of Dallas, drafted a list of emphasis areas for development in the city. One of those topics was ‘Recreation and Entertainment’ (Goals for Dallas, 1967, pp. 24-25). The vision for city parks was that each person “have access to a wide range of recreational activities ... active or passive ... [and they] should be accessible” (Goals for Dallas, 1967, pp. 24-25). Specific Goal 5 under this topic called for the City to “[l]ocate new recreation facilities so they are readily accessible and can be reached through safe and convenient approaches that will add to the citizens’ enjoyment of these facilities” (Goals for Dallas, 1967, p. 25). The City of Dallas continued similar ideals in their subsequent park and trail plans. *A Renaissance Plan for Dallas Parks and Recreation in the 21<sup>st</sup> Century: Dallas Park and Recreation Department Long Range Development Plan* expressed a desire to create a “premier park system” and to “recover, regain, and reposition” the park system through several measures including actions to “[i]mplement a regional trail network throughout the city (Carter & Burgess, 2002, Executive Summary). The 2008 Dallas Trail Network Plan continued this vision and crafted more detailed approaches for existing and planned trails for the city, with an ultimate desire for a trail network that would connect the city.



**Katy Trail**

**City of Dallas Park and Recreation** 34

The Katy Trail is perhaps one of the nation's most successful "rails-to-trails" projects. Phase I and II are located within the old Missouri-Kansas-Texas (MKT or "Katy") Railroad right-of-way, which is now owned primarily by the City of Dallas, and is surrounded by the dense urban developments of the Oak Lawn Area. Phases III and IV, will be located east of Central Expressway and located primarily within an ONCOR utility right-of-way extending into east Dallas. Ultimately, the Katy Trail will link Stemmons Park, Reverchon Park, Lee Park, William B. Dean Park, Turtle Creek Greenbelt, Glendale Park, Ridgewood Park and White Rock Creek Greenbelt. It will provide direct connection to the proposed Trinity Strand Trail, Katy Spur Trail, East Dallas Veloway North, and White Rock Creek Greenbelt Trail. Indirect access to the Turtle Creek Greenbelt trail is available at Reverchon Park and William B. Dean Park. The majority of the trail has been made possible through the Texas Department of Transportation's Statewide Transportation Enhancement Program (STEP). Additional enhancements have been funded through the Friends of the Katy Trail.

Total Planned Length:	38,597 Linear Feet (7.3 miles)
Total Current Length:	18,667 Linear Feet (3.5 miles)
Percent Complete:	48%
Surface: Concrete.	A parallel jogging track, currently under construction, will be a rubberized surface.
Width:	12 feet minimum
Right-of-Way Status:	License Agreement with DART in Place for Phase II. License agreement with ONCOR for phases III and IV is pending.
Unfunded Need:	\$8.5 Million
Advocacy/Partnership:	Friends of the Katy Trail. TXDOT's STEP Grant Program. (See <a href="http://www.katytraildallas.org">www.katytraildallas.org</a> ).
Assessment of Existing Trail:	The existing trail segments are in good condition.

Figure 12. Katy Trail Plan in the Dallas Trail Network Plan (City of Dallas, 2008, p. 34)

In the 1980s the area had fallen into decline which was exacerbated by the real estate market collapse (UDI, 2019). Local business owners began buying property and working with the City to make improvements to infrastructure (UDI, 2019). In 1988 the first Tax Increment-Financing (TIF) district was created in Dallas in the Uptown area, the revenues of which would continue to fund infrastructure improvements (UDI, 2019). In 1992 residents formed Uptown, Inc. with the State of Texas and in 1993 petitioned the City to create a Public Improvement District (PID) (UDI, 2019). This was a result of a majority (not all) of property owners (residential and commercial) agreeing to a special assessment to cover additional improvements to the area (UDI, 2019). In contrast to this, one of the most well-known neighborhood organization's (Uptown Dallas, Inc.) Board of Directors has included economic diversity on its board where 70% property owners (30-40% commercial and 30-40% residential) and 30% renters (20-25% commercial and 5-10% residential). No information on racial or ethnic makeup was listed on the website. The Uptown PID was renewed in 2000, 2005, & 2012, and will be up for renewal again in December of 2019 (UDI, 2019). Beauregard (1986) aptly characterized this gentrification process as "the purchasing of buildings by affluent households or by intermediaries such as speculators or developers, the upgrading of the housing stock,

governmental investment in the surrounding environment, ... the stabilization of the neighborhood and the enhancement of the tax base” (p. 38).



Figure 13. Victory Park Trail Marker

The marker above (placed along the trail) shows environmental remediation along the southern-most portion of the trail near the Victory Park development near the original minority and lower-income neighborhoods, would lead to the inference that Environmental Justice actions helped lead to some of the cleanup initiatives in the area. Notions of sustainability and resiliency policy are also evident in the trail design and use. The decision to repurpose an existing rail is in line with the sustainable premise of stewarding existing resources well so that future generations will have access to the same resources (Wheeler & Beatley, 2014, p. 69). It also appears in the use of native vegetation that requires little additional watering which preserved water reserves in a state prone to drought. Resiliency policy is evidenced through the increase of vegetation which helps to soak up excess water (i.e. large storm events, etc.) as well as soil stabilization with the increase of pervious surfaces. The change in economic focus and predominant transportation type also triggered the rules of socio-ecological resilience, or “the ability of groups, or

communities to cope with external stresses and disturbances as a result of social, political and environmental change” (Cretney, 2014, p. 628).

The informal rules in the area relate to the events discussed in the Attributes of Community section above – regarding the ability of residents to decide what is the *right* type of development for the area. The desire to be separate goes back to 1913, when the City of Highland Park petitioned the City of Dallas for annexation and was refused (Maxwell, 2017). Highland Park then quickly voted to incorporate and completed the process in 1915 (Maxwell, 2017). A few years later the City of Dallas sought to annex Highland Park and was dealt a final decision of defeat in 1945 (Maxwell, 2017). This history of not being wanted or welcomed on the part of both municipalities may likely influence current interactions.

Another set of rules is related to the history of race and parks in the City of Dallas. Parks have been a place of refuge, community, and recreation as well as tension, fear, and violence. In the 2016 article, “The Lost History of Dallas’ Negro Parks”, Peter Simek chronicles the history of race and parks in the city. The article chillingly quotes that “In early 20<sup>th</sup>-century Dallas, segregation was so ingrained in the city’s culture that it didn’t require legislation” (Simek, 2016). The article goes back as far as the 1910s and mentions the two neighborhoods within the city that Black residents were allowed to reside – North Dallas (also known as State Thomas) and Deep Ellum (Simek, 2016). It goes on to speak of attempts of Black residents to buy and/or petition the City for land for parks, and continuously being denied the right to do so (Simek, 2016). However, the first parks built specifically for the Black Dallas population were built in 1915 (Simek, 2016). In the 1930s the parks became a political home-base to register voters and hold fundraisers to raise money to pay for poll taxes for the Black community (Simek, 2016). As the use of parks became more comfortable for the Black community, it also became a place where racially charged attacks could be carried out. Several reports of white teenagers throwing firecrackers at Black parkgoers were recorded (Simek, 2016).

In *Race and the Control of Parks*, buildingcommunityWorkshop ([bc]) (2015) also chronicles the use and designation of parks by race from 1910 through 2013. Their report notes that park components can impact

how parkgoers access and perceive park spaces. A few of those factors are presented below. The first major category includes design components such as landforms (i.e. rivers, streams, etc.) and infrastructure (i.e. highway, road, etc.) which can create physical and psychological barriers to entry into park spaces for residents in the surrounding community ([bc], 2015). In other situations, certain types of gatherings are only allowed for special celebrations or designated holidays which can make nearby residents feel like they are visitors or not welcomed in their local park spaces on a regular basis ([bc], 2015). This also occurs when park programming (i.e. passive versus active space, etc.) caters to one use and does not designate space for, or encourage, other activities in the park space ([bc], 2015). Another barrier discussed is one of access (i.e. mobility barriers, physical & psychological barriers, financial barriers, etc.) that can limit use of the space or prevent entry all together ([bc], 2015). All of these conditions can affect whether members of different races, ethnicities, and income groups feel welcomed in park space. (For a more detailed discussion on these issues refer to the Race and Parks section above.)

#### D. Action Situations

The action situation is where we see decisions and choices made by relevant actors regarding the public good in question. The Uptown area in Dallas was considered blighted in the 1980s and early 1990s, leading to a designation as a Public Improvement District (PID) in 1993 by the City of Dallas (discussed in detail above). Also, during this time in the 1980s the Missouri-Kansas-Texas Railroad line, which ran through the City of Dallas and Highland Park, was abandoned by Union Pacific Railroad. Seeking an alternative use for the trail Union Pacific first sought to donate the rail line to the new Dallas Area Rapid Transit system for light passenger rail. The nearby community of Highland Park lobbied against the use and the plan was abandoned. Union Pacific then elected to participate in the Rails-to-Trails program created under the National Trails System Act (The Act) (16 U.S.C. § 1247(d)) (and subsequent amendments) which allows railroad companies to provide their railway rights-of-way for use as linear trails, while also preserving their future rights to reactive existing railways. Area community members lobbied in support of using the land

to create an elevated linear park instead of a DART extension. This group of concerned citizens formed the Friends of the Katy Trail, a nonprofit that was later tasked by the City of Dallas to handle the day-to-day management of the trail. The City of Dallas, Dallas County, the Texas Department of Transportation, and The Friends of the Katy Trail worked to contribute funds to the creation of the trail (Dallas County, 2019; Lockwood, 2007, pp. 189-190). There is no record of Highland Park contributing any funds to the trail construction in reviewed City of Dallas, Friends of the Katy Trail, or Dallas County records. Their approved 2018-2019 budget also does not list any expenditures to assist with upkeep of the park (Lindley & Alexander, 2018). Another concept to consider in the action situation is how the meaningful access to parks, including proximity, for minorities is prioritized and achieved (which is often cited as an Environmental Justice issue), in light of the history of US park spaces being open to the public not always equating to everyone having open and free access (Wolch, Wilson, & Fehrenbach, 2005, pp. 6-7; Stanley, Stark, Johnston, & Smith, 2012, p. 1091). In cases where parks were open and accessible, park management was used to impose strict rules and dress codes that limited and deterred minority use of park spaces (Byrne & Wolch, 2009, p. 747). Perceived hostile environments, the presence of law enforcement, and discrimination in allowable or approved park uses may also serve as a deterrent to minority use and access of public park spaces (Byrne & Wolch, 2009, p. 749). Signage and design denoting acceptable uses may also deter minorities if the prohibited activities are those that are common in their community's use of public park space, further perpetuating a white norm or normative behavior for the trail and fostering a sense of otherness or not belonging for minorities (Byrne & Wolch, 2009, p. 752).

#### E. Interactions

Now the analysis turns inward and examines how actors conduct themselves within the action arena, including how actors relate and engage with one another (Polski & Ostrom, 1999, p. 24). The first example discussed in detail above is organizing. This research has well documented the organizing and campaigning behavior for certain trail outcomes by the both the Friends of the Katy Trail (raised over \$11 million dollars

for initial park construction) and the Highland Park community in favor of a linear park instead of a passenger rail line. However, there were no records found that recorded the voice of other property owners that may have been in the minority vote or the minority race/ethnicity populations regarding the use of the rail line. The decision to move from a DART line to an active rail could have also placed displacement pressure on existing residents who needed access to transit for work and other social services. That decision plus the rhetoric behind not wanting “that type” of development nearby could easily compound to create a feeling of otherness, of being unwelcomed and unwanted in a space existing resident had already grown to call home. There is evidence of cooperation in DART’s relinquishing the right-of-way to the Dallas Parks Department as discussed above and between the City of Dallas, Dallas County, the Texas Department of Transportation, and the Friends of the Katy Trail organizations in collectively raising or contributing funds to the initial construction of the trail (also discussed above), but no other voices were found recorded in this research process.

A new interaction to consider is the role of race and police in parks. The Katy Trail is owned by the City of Dallas, managed by the Friends of the Katy Trail, and *open for public use* as a City of Dallas park. It has much higher programming than the average city park (i.e. the Katy 5k noted above). There trail also has significantly more signs directing park use (i.e. walk this way, slower traffic to the right, etc.), and there is a patrol force that monitors the area. These factors are more comparable to a *private good* (Polski & Ostrom, 1999, p. 11). The signage appears to users as an official governing rule (formal) instead of a trail norm (informal) (Lee, 2003, p. 4). This perception of power works to tailor behavior and may very well curtail use by some in the population as discussed in detail above (i.e. those who are not comfortable in the presence of police bodies, or who do not want to remember a number of rules to enjoy green space, etc. which are often disproportionately minorities). The Trail itself also does not have designated spaces and infrastructure for group play, although it does link to several city parks that offer space for such activities. These governing actions and lack of group/family spaces could be considered *political acts*, in essence giving the Friends of



the Katy Trail the power to determine “*who can do what to whom, and on whose authority*” within the park with the City’s consent to serve as managers of the park [original emphasis] (Lee, 2003, p. 5; McGinnis, 2011, p. 171).

## F. Outcomes

Outcomes examine the results of decisions and choices by actors in the action situation (Polski & Ostrom, 1999, p. 25). The decision by the City to use the area as a public park has resulted in large financial dividends. Since the Uptown PID creation in 1993, the property value in Uptown has increased from \$525 million to \$5.5 billion, including home and commercial properties (more than tenfold) (Uptown Dallas, Inc., 2018, p. 2). The rapid increase in property values also increased tax revenue. This increase in annual tax bills likely put displacement pressure on existing families to move and likely displaced several families as the prices rose. This type of displacement was likely either from a combination of economic displacement (when landlords raise the rent beyond what the tenants can afford to pay), limitation of housing choice (fewer units available at a similar price point than before), or displacement pressure (loss of community and pressure to feel for lack of feeling wanted or welcomed) (Marcuse, 1985, pp. 205-206, 208). When this happened, an in-moving population was able to appropriate the economic value of the Katy Trail from the existing (and displacing/ed) population – the definition of Green Gentrification (Gould & Lewis, 2017, p. 25). This result can also be seen in the change in demographics of the neighborhood (discussed in more detail in the quantitative analysis below). There was an overall decrease in Mexican population, an increase in educational attainment, which tends to a higher income and lower minority share neighborhood. Katy Trail is also one of the most popular and visited parks in the city. So much so that several extension plans have been completed and several others are planned for the future according to the 2008 Dallas Trail Plan. This research review was not able to find any data regarding racial composition of users to see if the park is used and feels welcoming to all races. There was also no data found that corresponded to existing residents’ thoughts regarding the trail.

## G. Evaluative Criteria

Evaluative Criteria looks past relative change in variable amount (increased educational attainment) and examines economic efficiency, fiscal equivalence, distributional equity, accountability, general morality, and adaptability/resilience/robustness/sustainability (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). Each criterion is discussed below.

Economic efficiency refers to the effective use of resources (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). For Union Pacific this was an efficient allocation because the Rails-to-Trails program provides for both a present and a future use. For the City of Dallas, the trail increases the efficiency of the park system by serving as a connector between trails, neighborhoods, and between other park spaces. The DART system could also consider this an efficient use of their former right-of-way as the space still provide a form of transit, albeit active, for residents.

Fiscal equivalence, or proportionality, is the premise that actors who benefit from the use of a good should pay a proportion of the cost for providing it based on their use (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). This was discussed in part above. Highland Park benefits tremendously from the bordering amenity of the trail. However, in the research collected, Highland Park is not recorded as a contributing entity to the construction, maintenance, and programming on the trail. Trail users are also within this category. Access to the park is free, but upkeep is not. A subset of trail users, Friends of the Katy Trail members, donate to the upkeep of the trail through donations or by participating in several fundraising activities throughout the year, such as the Katy 5k. All other users receive the benefit of the trail without bearing the burden of the upkeep costs. The City of Dallas as the owner of the trail is responsible for the main contributions to the maintenance, management, and extension of the trail, and as the recipient of the increased property taxes, the City benefits from its continued investment annually.

Distributional equity requires actors to contribute to the maintenance of a good on a sliding scale based on ability to pay (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). This is not in place. If a system like

this was in place, it would result in Highland Park paying for the majority of the upkeep of the trail. Instead the City of Dallas and Friends of the Katy Trail bear the burden of financial support, along with those users who elect to donate to the trail.

Accountability is the ability to easily and cheaply share information, evaluate the actions of co-actors, and to monitor and check the behavior of co-actors to prevent opportunistic behavior (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). In this research there was no evidence of a check-in system between users and the City of Dallas and/or the Friends of the Katy Trail or between the two municipalities. However, there is an accountability system between the FOTKT and the City of Dallas on maintenance needs, trail usage, implementation of existing city park ordinances, and needed improvements.

General morality represents conformance to the moral values that protect the actors from harm and keep co-actors honest in their dealings (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). There was no evidence found in this research that suggests there is a conformance to a similar moral code between municipalities or organizations. However, the use of signs on the trail suggests that there is a belief that people will follow the guidelines provided so that everyone can enjoy the trail safely. The City of Dallas, as a governmental entity offering a service does have an obligation to protect and provide for the general welfare of its citizenry.

Adaptability/resilience/robustness/sustainability all refer to the ability to adapt and innovate in the face of stressors, where robustness is the most accurate term to use in situations regarding systems designed by human (Polski & Ostrom, 1999, p. 25; McGinnis, 2011, p. 176). The trail itself is an adaptive use and evidence of a solution to the City's need to supply additional park and transit services. The addition of more vegetation along the trail increases the areas ability to respond to heavy rainfall without flooding, while the use of native and renewable plant species helps to reduce maintenance costs and watering requirements.

## H. Summary of IAD Framework Analysis of Green Gentrification Along the Katy Trail

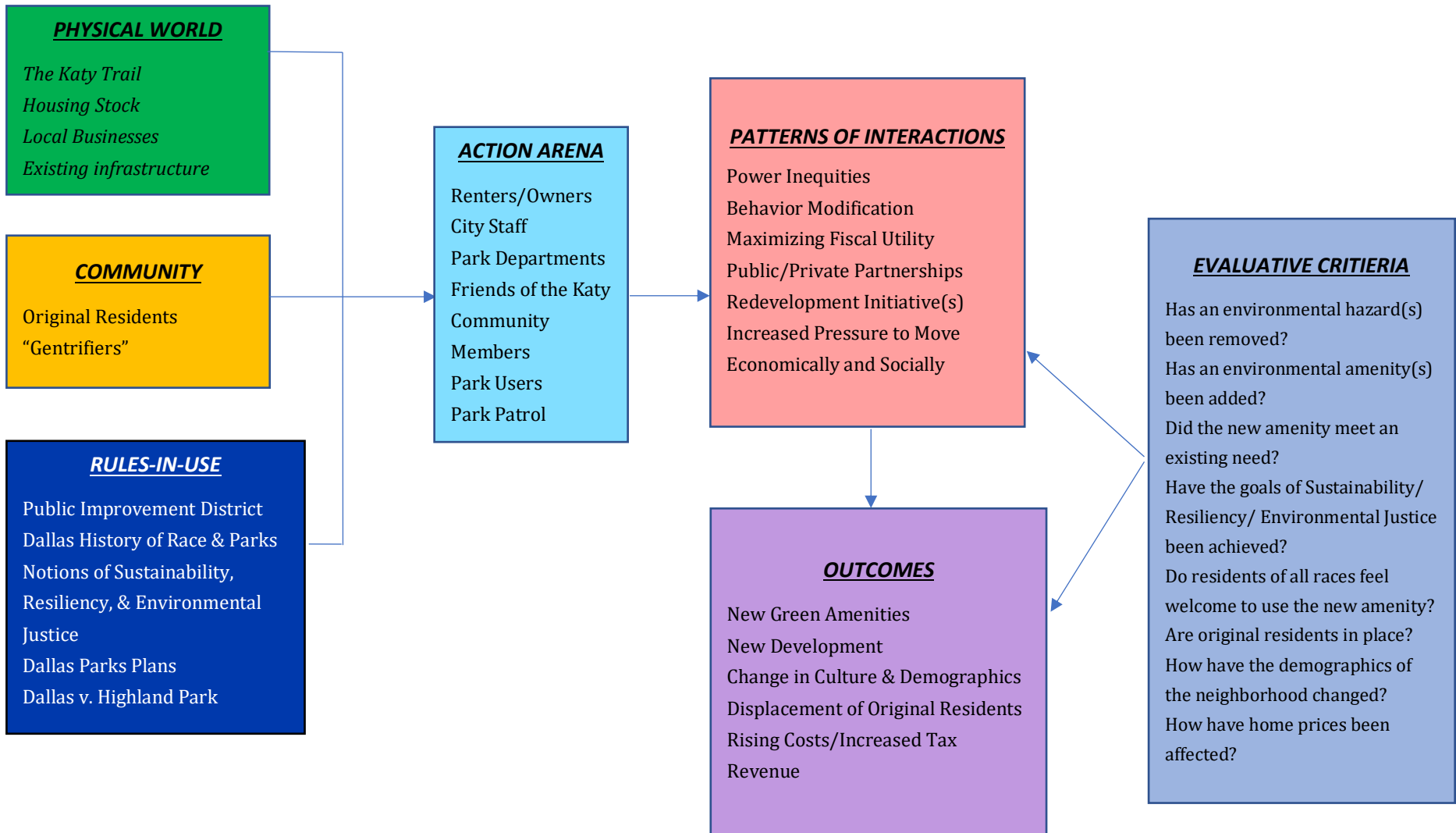


Figure 14. Green Gentrification Explained Using the Institutional Analysis & Development Framework

## Chapter 5 – Quantitative Analysis – Linear Hedonic Regression

The following is a limited quantitative analysis that examines the changes in aggregate housing value and related sociodemographic factors in census tracts near the Katy Trail over forty years.

### A. Panel Data/Longitudinal Studies

This analysis seeks to provide a preliminary explanation of the changes in 15 census tracts directly adjacent to, or one census tract removed, from the Katy Trail for the years of 1970, 1980, 1990, 2000, and 2010 – covering the pre- and post-trail construction conditions of the neighborhood. The research model seeks to determine if there is a causal relationship between the existence of the trail and an increase in housing price. Analyses such as this, that include repeated observations of the same cross section of variables (race, population, educational attainment, etc.) over time, are referred to as *panel data* or *longitudinal data* (Wooldridge, 2002, p. 7). A complete panel of data consists of all time and variable variations for a location over the set observation time period (i.e. Census Tract 4.01's panel would include variable amounts for 1970, 1980, 1990, 2000, and 2010).

#### 1. Data and Analysis Type

There are two types of panel data – balanced and unbalanced. Balanced panel data sets have entries for all variables in every year (Wooldridge, 2002, p. 250). Unbalanced panel data sets have most but not all variables for every year (Wooldridge, 2002, p. 250). This model is unbalanced as some information is withheld for privacy reasons by the US Census Bureau and NCDB. However, out of 75 possible observations (15 census tracts multiplied by 5 time periods) 73-75 observations were recorded/analyzed for each variable.

Two approaches can be used to analyze panel data – **Random Effects Estimation** and **Fixed Effects Estimation**. Random effects estimation is looking for the effect of the variables within and between each other, especially those that do not vary over time (i.e. race and sex), while fixed

effects examines the effect of the variables that vary over time (i.e. total population and income) (Johnson & Wu, 2002, p. 214). Fixed effects estimation was chosen for this analysis because it will facilitate the examination of sociodemographic factors and housing value as they change over time in each census tract. [For a full discussion of panel data please see Wooldridge (2002).]

## 2. Selection of Variables

In identifying which data set and variables to select, close attention was paid to find variables that showed consistent calculation from 1970-2010. Linear Hedonic Regression (LHR) does not require a set type of characteristics to model but does provide guidelines regarding variable categories such as *environmental, neighborhood, and structural* variables should be included (Jim & Chen, 2006, pp.425-426; Waltert & Schläpfer, 2010, p. 143). This flexibility allows the researcher to find variables that are a best fit for the current research question and physical condition. This research has followed the guidelines listed above and each category of variables suggested is included in the research model (explained in detail below).

In the 1970 and 1980 censuses certain records were not shared publicly as to protect the privacy of the small number of households present in the census tract, while others were not recorded at all. Unfortunately, this caused holes in several variable data sets regarding housing price, which prevented them from being selected for this analysis. Further review of available variable data sets within the NCDB showed that **AggVal** for a census tract (total aggregate value for owner specified housing units), a proxy for home value, was consistent from 1970-2010. This variable was then chosen as the dependent variable for the LHR analysis. To provide context for the rising home value in each census tract the variable of **Pop** (total population for the census tract) was included because an increase in population growth will likely lead to an increase in aggregate property values. Next, variables for race and ethnicity were chosen based on the historical population of the

area as discussed in detail above: **PercentBlack2010** (share/percent of the total census tract population that was calculated as Black) and **PercentMexican2010** (share/percent of the total census tract population that was calculated as Mexican). The next class of variables were chosen to reflect the neighborhood and included noted markers of gentrification. **Proportionoftotalpersonsbelow** was selected to evaluate the presence of poverty. **Percblucol** was selected to evaluate the percent of blue-collar workers (as discussed above Glass (1964) defined gentrification as the invasion of the gentry class and displacement of blue-collar workers). **Percolged** was selected to measure the percent of college educated residents (a proxy for change in income, again going back to Glass (1964) definition of those with higher incomes moving into an area). Considering the physical structure of the home, and the history of converting single-family homes into smaller multi-family units, **Percentof3BedroomsACS20062** was used to provide a measure of house characteristics. The variable **postKaty** was chosen to represent the timeframe of the entry either before or after the trail was constructed and served as an environmental characteristic. **DirectlyAdjacenttotheTrail** (determining adjacency to the trail) and **parkcity** (identifies census tracts in Highland Park) were the two variables where one of the variables was dropped to avoid collinearity (because if the census tract is adjacent to the trail it cannot at the same time be one census tract removed from the trail, and can therefore represent the full dummy data set with one variable).

## B. Model

Once the panel data set was compiled, the next step was to create a model for estimation. Each variable was included in the model and distinguished by both time and census tract. Also, the natural log transformation of the **AggVal** and **Pop** were taken for ease of coefficient interpretation.

This transformation allowed for comparison of percent changes between variables. The resulting model was:

$$P_i = P(S_i, Q_i, G_i, ON_i)$$

↓

$$\begin{aligned} \ln \text{AggVal}_{it} = & \beta_0 + \beta_1 \text{postKaty}_{it} + \beta_2 \text{DirectlyAdjacenttotheTrail}_{it} + \beta_3 \ln \text{Pop}_{it} \\ & + \beta_4 \text{Proportionoftotalpersonsbelow}_{it} + \beta_5 \text{percblucol}_{it} + \beta_6 \text{percolged}_{it} \\ & + \beta_7 \text{parkcity}_{it} + \beta_8 \text{PercentBlack2010}_{it} + \beta_9 \text{PercentMexican2010}_{it} \\ & + \beta_{10} \text{Percentof3BedroomsACS20062}_{it} + u_{it} \end{aligned}$$

*Equation 4. Linear Hedonic Regression Model for Katy Trail*

where **DirectlyAdjacenttotheTrail** represents a set of dummy (binary) variables for adjacency to the Katy Trail for each census tract and **postKaty** represents the pre- and post-construction timeframes for each census tract. Both variables are multiplied by their individual regression coefficients (with one in each set excluded to avoid perfect collinearity of the variable).

### C. Results

The analysis was run using the statistical software package STATA. The model in the previous section is shown at the top of the results output using a fixed effects estimation. Below are the results of the analysis.



```
. xtreg lnAggVal postKaty DirectlyAdjacenttotheTrail lnPop Proportionoftotalpersonsbelow percbluocol perccolged parkcity PercentBlack2010 PercentMexican2010 Percentof3BedroomsACS20062, fe robust
note: DirectlyAdjacenttotheTrail omitted because of collinearity
note: parkcity omitted because of collinearity
```

Fixed-effects (within) regression	Number of obs	=	73
Group variable: <b>CensusTract</b>	Number of groups	=	15
R-sq: within = <b>0.7861</b>	Obs per group: min	=	4
between = <b>0.7084</b>	avg	=	4.9
overall = <b>0.7391</b>	max	=	5
	F(8,14)	=	121.41
corr(u_i, Xb) = <b>-0.2026</b>	Prob > F	=	0.0000

(Std. Err. adjusted for 15 clusters in CensusTract)

lnAggVal	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
postKaty	.7584532	.217111	3.49	0.004	.2927964	1.22411
DirectlyAdjacenttotheTrail	0	(omitted)				
lnPop	1.405141	.5003402	2.81	0.014	.3320177	2.478264
Proportionoftotalpersonsbelow	.024389	.0209445	1.16	0.264	-.0205325	.0693105
percbluocol	.000315	.0165511	0.02	0.985	-.0351835	.0358136
perccolged	.0768054	.0111751	6.87	0.000	.0528371	.1007736
parkcity	0	(omitted)				
PercentBlack2010	.020561	.0115309	1.78	0.096	-.0041702	.0452923
PercentMexican2010	.0378061	.0171098	2.21	0.044	.0011092	.074503
Percentof3BedroomsACS20062	.0489995	.0166386	2.94	0.011	.0133133	.0846856
_cons	-.7380655	3.753564	-0.20	0.847	-8.788659	7.312528
sigma_u	.93850924					
sigma_e	.88141029					
rho	.53134359	(fraction of variance due to u_i)				

Figure 15. Linear Hedonic Regression Model of Katy Trail – RESULTS

### 1. Adjustments for Collinearity

The STATA output show the variables *DirectlyAdjacenttotheTrail* and *parkcity* coefficients as 0. This is a result of using a fixed effects model. This model estimates coefficients for variables that change over time. The variables *DirectlyAdjacenttotheTrail* and *parkcity*, as included in the model, are constant over time. Therefore, these variables were not evaluated within the fixed effect model.<sup>1</sup> Also, important to note, robust represents that the model controlled for heteroskedasticity by accounting for robust standard errors (Torres-Reyna, 2007, pp. 5-6).

<sup>1</sup> A random effects model was run to estimate the *DirectlyAdjacenttotheTrail* and *parkcity* variables omitted in the fixed effect model. They were found not to be significant in this model with p-values of 0.930 and 0.566 and t-values

## 2. Explanation of the Variation in the Independent Variable

Linear regression seeks to determine the linear relationship between the mean of one variable and the mean of other variables. The **R-squared** value (“R-value”) of a model represents the proportion to which the model (the effect of all independent variables taken together) explains the variation in the dependent variable, in this instance aggregate housing value at the census tract level. In other words, the R-value determines how well the model explains the variation in the dependent variable, where an R-value of 0 indicates a poor fit (explanation) and an R-value of 1 indicates a perfect fit (explanation) (Wooldridge, 2013, p. 38). The overall **R-value** for this model is **0.7391**. This means that the model explains approximately **74%** of the variation (change) in aggregate housing value.

## 3. Variable Importance

The t-value is a test of the hypothesis that each variable coefficient will equal 0 (Torres-Reyna, 2007, pp. 5-6). In order to reject this hypothesis, the t-value (calculated as the coefficient divided by its standard error) must be greater than 1.96 (the minimum for a model requiring 95% confidence, or a p-value of 0.050 or less) (Torres-Reyna, 2007, pp. 5-6). T-values are also used to show the individual importance of a specific variable within the model (Torres-Reyna, 2007, pp. 5-6). The results show the following *variables with a t-value greater than 1.96*:

✚ **postKaty (t = 3.49)**

✚ **lnPop (t = 2.81)**

✚ **percolged (t = 6.87)**

✚ **PercentMexican2010 (t = 2.21)**

✚ **Percentof3BedroomsACS20062 (t = 2.94)**

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less than 1.96. An additional analysis is needed to better test the effect of these variables on aggregate housing value at the census tract level.

According to these t-values the percent of college educated residents and the presence of the Katy Trail are the two most important factors in the variation of the aggregate housing price.

#### 4. Significance of the Results

The  $P > |t|$  (**p-value**) is used to summarize the strength or weakness of the model's ability to disprove the null hypothesis and asks, "... what is the smallest significance level at which the null hypothesis would be rejected?" (Wooldridge, 2013, pp. 133-134). Smaller p-values are evidence rejecting the null hypothesis and higher p-values indicate not rejecting the null hypothesis, both measured on a scale of 0 to 1 (Wooldridge, 2013, pp. 133-134). Evaluating the p-value shows which variables are significant in the change in housing price. The p-value (**Prob > F**) of the model is calculated to determine the reliability of the independent variable to predict the dependent variable (Torres-Reyna, 2007, pp. 5-6). The **p-value of the model is 0.000**, which means the model shows evidence of a statistically significant relationship between the dependent and independent variables.

Applying a 90% confidence threshold ( $0.000 \leq p \leq 0.100$ ) the following variables are significant in predicting the variation in the dependent variable for **lnAggVal**:

- ✚ **postKaty (p = 0.004)**
- ✚ **lnPop (p = 0.014)**
- ✚ **percolged (p = 0.000)**
- ✚ **PercentBlack2010 (p = 0.096)**
- ✚ **PercentMexican2010 (p = 0.004)**
- ✚ **Percentof3BedroomsACS20062 (p = 0.011)**

Applying a 95% confidence threshold ( $0.000 \leq P \leq 0.050$ ) the following variables are significant in predicting the variation in the dependent variable for **lnAggVal**:

✚ **postKaty (p = 0.004)**

✚ **lnPop (p = 0.014)**

✚ **percolged (p = 0.000)**

✚ **PercentMexican2010 (p = 0.004)**

✚ **Percentof3BedroomsACS20062 (p = 0.011)**

### 5. Variable Coefficients

Examining the estimated coefficients provides further explanation of the linear relationship between each independent variable and the dependent variable of aggregate housing value. The results confirmed the highly correlated relationship between population and housing value with the highest positive coefficient, showing that a 1% increase in population will result in a 1.40% in aggregate housing value. The presence of the Katy Trail results in a 0.7584% increase in aggregate housing value. The model also shows that a 1% increase in the percent of the population with a college degree, percent Black, and percent Mexican are all positively related and result in a 0.0768%, 0.0206%, and 0.0378% increases in the aggregate housing value, respectively. The presence of 3bedroom homes also positively affected aggregate housing value, where a 1% increase in the number of 3bedroom homes resulted in a 0.0490% increase in aggregate housing value.

### 6. Supplemental Analysis

The t-test will allow examination of the means of two variables. This test is used to determine if the Pre-Katy and Post-Katy groups have a significantly different relationship with the sociodemographic factor listed.

## T-Test Examination of Sociodemographic Factors

Variable	Percentage		Difference	Significance
<b>Percent Black Residents</b>	<i>Pre-Katy</i>	15.33	↓ <b>8.37</b>	<b>P = 0.043</b> <b>t = 1.740</b>
	<i>Post-Katy</i>	6.96		
<b>Percent Mexican Residents</b>	<i>Pre-Katy</i>	16.12	↓2.21	P = 0.294 t = 0.5446
	<i>Post-Katy</i>	13.91		
<b>Percent White Residents</b>	<i>Pre-Katy</i>	74.13	↑5.95	P = 0.831 t = -0.965
	<i>Post-Katy</i>	80.08		
<b>Percent of 3Bedroom Homes</b>	<i>Pre-Katy</i>	23.24	↓1.40	P = 0.406 t = 0.238
	<i>Post-Katy</i>	21.84		
<b>Percent Blue Collar Workers</b>	<i>Pre-Katy</i>	46.18	↓ <b>11.72</b>	<b>P = 0.005</b> <b>t = 2.627</b>
	<i>Post-Katy</i>	34.46		
<b>Percent College Educated</b>	<i>Pre-Katy</i>	42.51	↑ <b>23.37</b>	<b>P = 1.000</b> <b>t = -5.236</b>
	<i>Post-Katy</i>	65.88		

*Figure 16. Results of T-tests of Sociodemographic Variables*

The results show there is a statistically significant difference between the mean of Pre-Katy and Post-Katy data sets regarding the variables representing the percent of black residents, blue-collar workers, and college educated residents.<sup>2</sup>

### 7. Research Question

In looking to the question of whether the trail impacts the value of nearby housing, this model answers in the **affirmative**, and shows that the presence of the trail causes a 0.7584% increase in aggregate owner-occupied property values (the second highest coefficient behind population). The presence of the trail is also the second most important variable in the analysis according to the

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<sup>2</sup> This is using a confidence of 95% ( $p \leq 0.050$ ) and a t-value of at least 1.96 as discussed in detail above.

calculated t-values for each variable ( $t = 3.49$ ). These values were also found to be significant with a p-value of 0.004, showing greater than a 95% significance.

## 8. Summary of Findings

A summary the quantitative findings is presented below.

- The presence of the Katy Trail resulted in increases in aggregate housing value in nearby census tracts.
- The model shows that the presence of Blacks and Hispanics are positively correlated to the increase in housing value. This relationship was unexpected after reviewing the data set and may be skewed by the extremely low numbers of these racial and ethnic groups in the three Highland Park census tracts (some census tracts in Highland Park show a 0% minority population).
- The increase in housing value was positively correlated to the number of college-educated residents, a proxy for *the gentry class* Glass (1964) referenced in the coining of the term gentrification. Higher education is often associated with higher incomes and would likely mean the existing residents are no longer in place.
- When comparing the means of pre- and post-Katy data sets, there is a statistically significant difference with regard to the variables representing the percent of Black residents, blue-collar workers, and college educated residents, again leaning to an inference of displacement of the previously existing minority and lower income populations.
- The change in the number of 3bedroom homes may also be explained by the large number of luxury apartments that have been added to the census tracts near the trail. Although they are not 3bedrooms, they require a higher monthly payment than previously existing multi-

family units (reference overall property value increase in Uptown from \$525million to \$5.5 billion discussed in detail above).

## Chapter 6 – Policy Suggestions

After thoroughly evaluating the Katy Trail using the IAD Framework and confirming there is a correlation between rising housing price and the presence of the Katy Trail, I would like to offer a few policy suggestions that might help to mitigate these same outcomes in future trail development. Traditional ideas such as rent controls (limiting the annual increase of rental amounts) as well as home owner tax abatements or controls (to limit the annual increase of property taxes asses) would be applicable in these cases to help keep existing residents in place (Diamond, McQuade, & Qian, 2019, p.1). Next, the City of Dallas could explore executing a memorandum of understanding between adjacent municipalities when a city trail amenity borders another jurisdiction. This could allow for shared costs, participation of residents from both areas on equal footing, and facilitate access/the creation of trail heads from beginning to the end of the trail.

On the planning outreach and practice inclusive/equitable development could be incorporated from trail idea to trail construction. The Government Alliance of Race and Equity (GARE) has created a definition of equitable development that has been adopted by the City of Dallas, which states:

Quality of life outcomes, such as affordable housing, quality education, living wage employment, healthy environments, and transportation are equitably experienced by the people currently living and working in a neighborhood, as well as for new people moving in. Public and private investments, programs, and policies in neighborhoods that meet the needs of residents, including communities of color, and reduce racial disparities, taking into account past history and current conditions.

(Curren, Liu, Marsh, & Rose, 2015, p. 5). The intent of this process is to create meaningful engagement of existing residents to address the park and/or recreational need for the area as well as the type of programming and design that would best suit the neighborhood. This should be an iterative process that allows for community feedback on design, addressing any barriers to access, and inclusion of desired features. Inclusionary park development could also include the creation of diverse cultural programming specific to the surrounding neighborhoods. Polls, listening



sessions, charettes, and other hands-on activities could be employed to garner feedback from residents. Historical tours or markers that represent a true and accurate history and present of the area would help to provide a sense of place and honor the history of the place. When considering inclusionary practices around infrastructure, welcome signs at trail entrances/trailheads could be a placemaking activity for the community to welcome park users to the pace. Additionally, spaces or pavilions along the trail could be created for group interaction and play, which research shows is how park space is most often used by racial minority groups (discussed in detail above). Another inclusionary practice could be training or hiring members of the nearby communities on green jobs increasing community investment and skills (i.e. landscaping, environmental education, park tours, etc.).

Another option for area residents is to use tactical urbanism to show the City how they would like to use available space in their neighborhood (Silva, 2016, pp. 1041, 1044-1045). Tactical urbanism allows the community to drive the process in a proactive, not a reactionary, way. It challenges them to consider the realm of possibility and to narrow down the available options to ones that are a best fit for their community needs, resources, and scale (Silva, 2016, pp. 1044-1045). This could be hosting fun mile run or park day to get the community used to the idea of seeing an unused space in a new way and be a tool to organize the community around a shared use/purpose for the space. For parks that are already in existence, adding residents to the Board of Directors, working groups, or task forces could allow for residents to be involved in the management and upkeep of the park. Again, working to foster a sense of belonging and ownership of the park as part of their neighborhood, not a new addition that is not for them and/or does not welcome them.

## Chapter 7 – Conclusion

### A. Research Conclusions

My initial research questions were:

- ✚ How do we explain the process of Green Gentrification?
- ✚ Is there a correlation between green improvements and noted markers of gentrification?
- ✚ If so, are there strategies and tactics that the community and practitioners can employ to prevent the displacement effects of these actions and still reap their improvement benefits?

The IAD Framework was used to frame, explain, and understand how gentrification occurred around the new green amenity of the Katy Trail. This framework looked at sociodemographic statistics of the area first to provide a baseline context for the analysis. The differences between the City of Dallas and Highland Park were stark, which can most clearly be seen in the average home value for the municipalities (projected as \$154,000 and \$1,200,000, respectively), racial composition (24% and 90% white, respectively), and college education attainment (35% and 89%, respectively). The impact of these differences was seen in the ability of a small, wealthy community to heavily influence the use of a public resource owned, and primarily located within, another municipality. It also discussed the interplay of power and friction between two bordering cities, as well as influencing factors to access and use a public park managed by a private entity.

Revisiting the second research question, the analysis sought to determine if a correlation existed between green improvements facilitated by the construction of the Katy Trail and markers of gentrification (i.e. higher educational attainment, low poverty, etc.). The LHR model, created and analyzed in STATA, determined that there is a significant correlation between aggregate housing

value and the construction of the trail, population, educational attainment, race & ethnicity, and percent of 3bedroom homes. This question was answered in the affirmative.

The final research question asked if a correlation was found between the Katy Trail and noted markers of gentrification, what strategies and tactics could be used in the future to prevent similar displacement effects and still reap their improvement benefits. Several options were discussed including inclusive & equitable development, tactical urbanism, local representation in park decisions, placemaking, and fiscal protection of existing residents. The aim of these initiatives is to give existing residents an active voice in the creation, construction, and maintenance of parks in their neighborhoods.

## B. Future Research

I would like to extend this research into two comparative studies. The first would be an analysis of similar cities and evaluate the effect of linear parks on cities in different parts of the county. Possible additional trail case studies could include the MKT/SP Rails to Trails (Heights Trail) in Houston, TX (comparable trail to the Katy inside Texas), Eastside Trail (Atlanta Beltline) in Atlanta, GA (comparable trail to the Katy outside of Texas) and the 606 Trail in Chicago (comparable to the Katy outside of the southern United States). The second would compare this outcome to that of parks within the Highline Network that are working to repurpose urban spaces and to remedy past park inequities to see if the measures are indeed remedying past harm. I would also like to use this research as the base to build a green gentrification index that could help future city administration, parks staff, park friends groups, and other interested parties on how they might mitigate displacement and evaluate the equitable design of future green infrastructure. Additional research initiatives include an in-depth cultural study surrounding the racial makeup of the areas surrounding the Katy Trail. This could also be paired with an in-depth study on use and perception

of the park by park users according to race and exploring ways to make the environment more equitable if barriers are indeed shown to exist.

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