In search of affordable sustainability

Analyzing the effects of climate planning investments on advertised rents using web-scraped Craigslist data

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Abstract

As the impacts of climate change intensify, state and local governments around the world are experimenting with new models of sustainable development that seek to simultaneously mitigate the worst case climate scenarios and adapt to impacts already being felt. Large scale capital investments can, however, have unintended negative consequences if they fail to acknowledge and address existing social, economic, and environmental disparities. Research has found that the announcement of large-scale sustainability initiatives can trigger land speculation that leads to increased property values and in some cases spurs gentrification and displacement. Research on the complex relationship between local climate change investments and housing affordability is scant, partially due to inherent limitations in traditional sources of housing data. This study seeks to deepen our understanding of the potential unintended consequences, or "maladaptation," arising from new models of climate-smart development by using a novel dataset to measure the impacts of the announcement and early implementation of the California Transformative Climate Communities Program (TCC) on local housing prices. Using data scraped from Craigslist we analyze changes in advertised rent at the neighborhood-scale for the three Round 1 TCC sites, which include Fresno, Ontario and the Watts neighborhood in Los Angeles. Changes are also measured at comparable sites in order to control for external forces that may have an exogenous effect on rents within the TCC sites. While the program's primary goal is to reduce greenhouse gas emissions, TCC takes a comprehensive planning approach, which also aims to support affordable housing development, improve public health, and spur job creation. Contrary to our hypothesis, we find that the program has had no significant impact on housing prices to date. These findings could be explained by methodological limitations including timing and spillover effect or by characteristics of the program that minimize its impact on property values and rents, such as the intervention's scale, cohesiveness, type and target. The paper also offers valuable methodological insights into a relatively new and understudied housing data source, online rental housing search engines. Further research into the interactions and trade-offs between simultaneous equity-oriented climate interventions would be useful for planners and policymakers that are seeking to materialize the 'climate-just city.'

Keywords: housing affordability; sustainable development; climate change planning; web-scraping; Craigslist

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Introduction

As concern about climate change mounts, state and local governments around the world are experimenting with new models of development that seek to balance climate goals with social wellbeing and equity. Mitigating and adapting to climate change requires financial and human capital in order to upgrade existing physical and social systems, as well as create new ones. When poorly planned, however, our responses to climate change can exacerbate existing social, political, and economic inequities leading to "maladaptation" (Magnan et al., 2016; Pelling, 2011; Smit, 1993). As Campbell (1996) argues, it is the job of planners to reconcile inherent tensions between three conflicting goals commonly known as "three Es": to spur economic growth, to distribute the gains and costs of growth equitably, and to do so in a way that does not degrade the environment.

Since the 1990s, a growing body of literature has examined tensions that often arise amidst efforts to simultaneously advance environmental sustainability and social equity. In particular, research on environmental gentrification has begun to tease out the ways in which sustainability investments can lead to gentrification and displacement. For the most part, research at the intersection of sustainable development and housing affordability has typically focused broadly on potential residential displacement due to the expansion or creation of green space. Some studies have measured changes in home prices due to large scale environmental change and sustainability initiatives, but little is known about the effects of local climate planning on rental housing affordability, partially due to inherent limitations in traditional sources of housing data.

This study contributes to the climate planning and housing literature in two ways. First, it offers methodological insights into the possible uses and challenges associated with a novel, high-resolution source of rental housing data. Second, it adds to the environmental gentrification literature by using this data to quantify the effects of a state-funded sustainability program in California on housing affordability at the neighborhood scale. Using pre- and post-intervention data scraped from Craigslist, we analyze the early effects of California's Transformative Climate Communities (TCC) Program on advertised rental housing prices at the Round 1 sites in Fresno, Ontario and Watts. While the Round 1 projects will not be fully implemented until after 2024, we use Craigslist data collected two years before the program was created (2014) and two years into the program (2020) to assess the effects of the announcement and early implementation of TCC on rental housing prices. Due to the size and public nature of the TCC investments, we expected to see a statistically significant increase in advertised rents at TCC sites compared to similar areas that did not receive these investments. A pre-post difference-in-differences analysis, however, found that the program has had no significant impact on rental housing prices.

The paper is divided into four sections. In the first section, we present an overview of the current state environmental gentrification literature and highlight key gaps. The second section provides a narrative account of the TCC program and the three sites being studied. In the third section, we lay out our methodology and data collection process, and in the final section, we present our findings and discuss the takeaways for both research and practice.

Background

Sustainable development, climate change and housing affordability

The work of mitigating and adapting to climate change is increasingly being tackled at the regional, state, city, and neighborhood scales. While nations struggle to agree on emissions targets, cities around the world are working to address climate change through targeted policies and local planning (Bulkeley, 2006; Wheeler, 2000). Climate change planning has become a common function of city, county, and state governments as they grapple with new hazards amidst growing social and economic crisis. In practice, climate change planning touches on a wide range of traditional subfields within planning such as land use, environmental management, housing, transportation, urban design, and community and economic development.

Beginning in the late twentieth century, environmentally-conscious cities began incorporating the language of sustainability into conventional city planning. Sometimes this reflected a genuine desire to reduce energy consumption and improve public health, but it was also often a way for cities to differentiate themselves in the age of entrepreneurial urbanism. By branding themselves as "green," they sought to encourage new residents and businesses to move in yielding increased local tax revenue and spurring growth at a time when urban cores and their residents were suffering acutely from decades of state disinvestment and neglect (Bryson, 2013). Historically, planners and planning institutions have prioritized economic growth over both ecological and social equity. As an overwhelmingly white profession, planning has perpetuated racial segregation through explicitly racist practices, such as racial covenants and redlining (Rothstein, 2017), as well as more subtly through processes of suburbanization that, albeit unintentionally, contribute to environmental racism (Pulido, 2000). In addition to creating new challenges for planning due to increased uncertainty, climate change arguably adds new urgency to the quest for justice in planning (Steele et al., 2012).

The proliferation of climate change planning has evolved in conjunction with greater attention, in both scholarship and practice, to the complex relationships between sustainable development and social equity (Agyeman, 2008; Campbell, 2013; Manderscheid, 2012). Much of this literature builds on decades of research on the processes and causes of gentrification leading to sub-branches of research on environmental gentrification (Checker, 2011; Eckerd, 2011; Immergluck & Balan, 2017; Pearsall, 2010; Pearsall & Anguelovski, 2016; Rigolon & Németh, 2018; Sandberg, 2014), ecological (or eco-) gentrification (Dooling, 2009; Quastel, 2009), green gentrification (Anguelovski et al., 2018; Bockarjova et al., 2020; Draus et al., 2020; Gould & Lewis, 2012; Lugo, 2015; Ngom et al., 2016), low-carbon gentrification (Bouzarovski et al., 2018), and, most recently, climate gentrification (Anguelovski et al., 2019; Keenan et al., 2018; Shokry et al., 2020).

For the most part, this literature focuses on initiatives that restore, enhance or create new urban green space. As is the case more broadly within the gentrification literature, environmental gentrification (EG) is conceptualized as increasing property values and subsequent displacement of residents resulting from the additional of desirable amenities in a neighborhood. Pearsall and Anguelovski define EG as "the exclusion, marginalization, and displacement of long-term residents associated with sustainability planning or green developments and amenities, such as smart growth, public park renovations, and healthy food stores" (2016, p. 1). **Table 1** summarizes a sampling of this growing body of literature and

highlights the types of inventions being studied, as well as the different methods and indicators used to measure EG.

Table 1. Literature connecting gentrification and sustainability efforts*

Author(s)	Intervention type(s)	Gentrification indicator(s)	Methods/Data
Dooling (2009)	Public green space	Displacement of homeless populations	Interviews
Immergluck (2009)	Multi-use trail	Home sale prices	Change in home sale prices in and around project; county tax and census data
Quastel (2009)	New urbanist redevelopment	Rental housing prices	Document and discourse analysis
Pearsall (2010)	Brownfield redevelopment	Property values and rental housing prices	Change in house values, income, gross rent; discriminant analysis; interviews
Eckerd (2011)	Hazardous site clean-ups	Demographic change	Change in percent of residents that are college educated and working managerial or professional jobs
Checker (2011)	Sustainability planning; green space	Imposed values in sustainability planning	Document analysis; observation; interviews
Gould & Lewis (2012)	Green space restoration	Residential displacement; demographic change; property values and rental housing prices	Change in racial demographic breakdown, income, percent in poverty, gross rent, home value, percent owner-occupied
Sandberg (2014)	Brownfield redevelopment; green space	Demographic change; rental housing	Interviews; document analysis; change in income, education level, rental properties, immigration status, car ownership
Immergluck & Balan (2017)	Multi-use trail	Home sale prices; demographic change	Change in home sale prices in and around project; county tax and census data
Bouzarovski et al. (2018)	Sustainable urban redevelopment plan	Residential displacement	Interviews
Anguelovski et al (2018)	Green infrastructure planning	Residential displacement and dispossession	Document analysis; participant observation; interviews
Keenan et al (2018)	-	Home sale prices	County tax data
Anguelovski et al (2019)	Green infrastructure; climate planning	Residential displacement	Document analysis; observation; interviews
Rigolon and Németh (2018)	Multi-use trail	Demographic change; rental housing prices	Interviews; document analysis; change in income, gross rent, racial breakdown, educational attainment
Shokry et al (2020)	Green resilience infrastructure	Demographic change; property values	Change in racial breakdown, gross rent,

	median income, education level

* This list is by no means a comprehensive review of all the literature on this subject, but rather serves as a sample of the variety of research that has emerged in the last ten years.

While much of the EG literature includes some measure of housing cost or property value as an indicator of possible or actual gentrification, in many cases this is discussed in terms of displacement. For the most part, gentrification scholars have been careful to disambiguate the concepts of gentrification and displacement, the former referring broadly to neighborhood change due to an inflow in amenities and non-native residents and the latter referring to the involuntary outflow of native residents due to rising costs, among other reasons. Some EG studies have looked at property or home sale prices or gross rent as a measure of the potential of an intervention to contribute to or cause gentrification. For example, Immergluck (2009) uses county tax assessor data to analyze the announcement effects of a large-scale green redevelopment project, the Atlanta Beltline, on home sale prices in and around the project area. He found that news and marketing of the project triggered land speculation and spurred gentrification several years before the project broke ground. Several years into the project's implementation, Immergluck and Balan (2016) analyzed tax assessor and census data in the surrounding neighborhoods and found that property values increased significantly around the project, particularly in lower-income neighborhoods with greater proportions of black and brown residents.

In a similar study, Keenan et al. (2018) use the term 'Climate Gentrification' (CG) to describe the ways in which climate change is impacting property values and markets in Miami-Dade County, Florida, due to varying degrees of changing environmental exposure. They find that the rate of price appreciation between 1971 and 2017 is positively correlated with elevation, what they call the 'Elevation Hypothesis.' As the authors write, "If CG proves to be an accurate description of economic processes and behaviors, high-elevation property, shaded or wind-cooled property, fresh water resources property, geologically stable property, ecologically diverse property, pollution-free property, and property with resiliently design[ed] buildings will all provide attributes of market valuation that complicate the existing capacities of cities to house and shelter [our] most vulnerable populations" (2018, p. 2).

Property and home sales, however, do not necessarily capture changes in rental housing prices. Given the fact that over 30 percent of the population in the United States are renters, there is a clear need to understand the impacts of sustainable development on rental housing and prices (Lloyd, 2019). While many quantitative EG studies include median gross rent in their explanatory models, few studies focus exclusively on changes in rental housing prices due to sustainability interventions and none of these studies quantify changes in rental housing prices that can be directly linked to specific sustainable interventions.

As the EG literature demonstrates, environmental change, sustainability policy and plans, and housing affordability are inextricably tied together in more ways than one, however climate planning as a practice rarely considers housing issues beyond questions of density and building energy efficiency. In a study of low-carbon policy and water scarcity in Sao Paulo, Brazil, Cohen (2018) argues that "the best way to prevent ecological breakdown is to democratically pursue climate policies that reduce social inequality. In other words, that effective urban climate politics converge with the already-thriving "right to the city" agenda (Harvey, 2008; Lefebvre, 1968). Understanding the actual, layered impacts of specific climate change policies and planning is critical for realizing the 'climate-just city' (Steele et al., 2012). This study seeks to expand our understanding of the unique impacts of comprehensive,

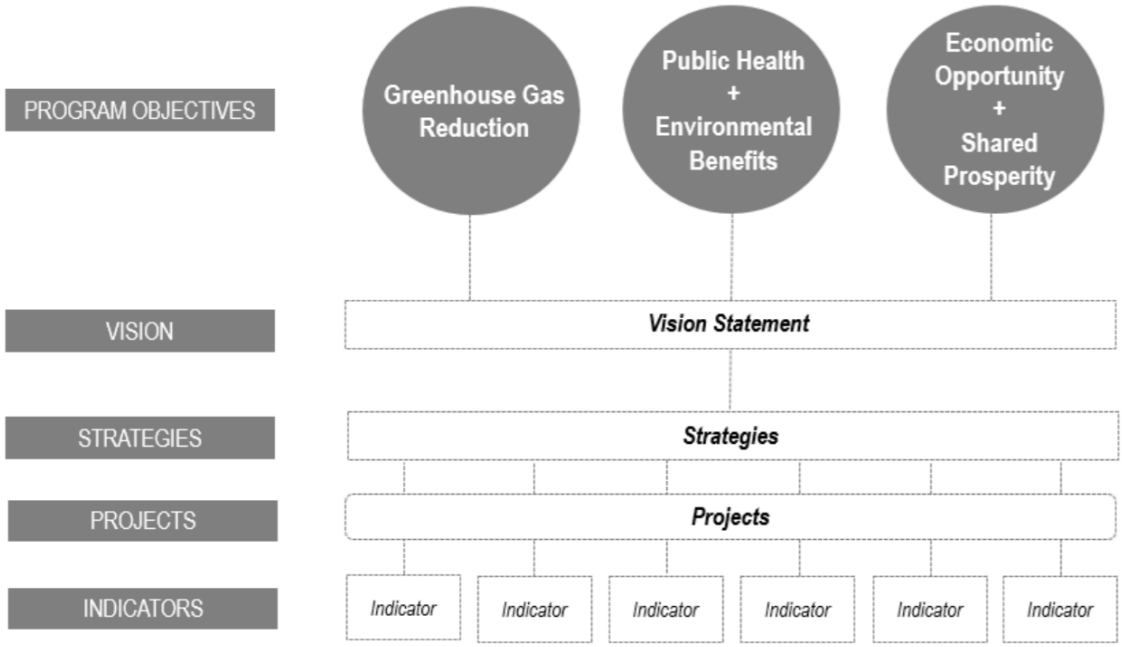
neighborhood-scale climate change planning on rental housing affordability and offer methodological insights into the potential for Craigslist data to be used as a source of high-resolution rental housing data to help researchers, planners and policymakers better understand local housing market trends.

The section below provides a description of TCC and the specific case study sites that are analyzed in this paper.

Case Study: California's Transformative Climate Communities

Established by the California state legislature in 2016 and administered by the Strategic Growth Council (SGC), the Transformative Climate Communities Program (TCC) funds neighborhood-scale plans and policies that reduce greenhouse gas (GHG) emissions and provide additional benefits, such as improved public health, job training, and affordable housing. TCC is funded through the Greenhouse Gas Reduction Fund (GGRF) by a portion of the proceeds from the California cap and trade program, which was created in 2006 through the Global Change Solutions Act (AB 32) and is the third largest GHG trading program in the world. TCC's primary purpose is to help the state achieve its goal of reducing state-wide GHG emissions to 1990 levels by 2020.[2] Examples of eligible projects include rooftop solar energy, tree planting, public transit service, bicycle and pedestrian infrastructure, and waste diversion, among other things. **Figure 1** illustrates the TCC program framework, highlighting the program's simultaneous emphasis on GHG emissions reductions and economic and human health co-benefits.

Diagram 1: Program Framework - Relationship of Projects



[2] At the time that AB 32 was signed into law it was estimated that this goal would require a 25 percent reduction in emissions from 2006 levels. In 2016, the state passed SB 32 extending the cap and trade program to 2030 and increasing the target to 40 percent below 1990 emissions. In July 2018 the California Air Resources Board (CARB) announced that state-wide emissions had fallen below 1990 for the first time (Clegern, 2018).

Figure 1. TCC Program Framework. Source: Strategic Growth Council, "Final Guidelines: 2018 Transformative Climate Communities Program" (Strategic Growth Council, 2018, p. 19)

TCC has been widely touted as a catalyst for local climate planning that successfully balances ecological, economic, and equity goals. As a state-funded climate mitigation program, TCC is unique in a number of ways. First, the program exclusively awards grants to "disadvantaged communities" (DACs), which the state identifies as communities with disproportionately high levels of multiple sources of pollution and a high percentage of low-income residents. In order to qualify for a TCC Implementation Grant[3] a majority of the census tracts in the application area must fall within the top 5 percent of disadvantaged tracts in the state. The 2018 program guidelines recognize that many of the challenges facing these communities are the "result of a history of inequitable land use and zoning policies, underinvestment and lack of meaningful engagement with community residents in planning and policy decisions" (Strategic Growth Council, 2018, p. 4).

Second, TCC employs a "place-based" transformation model that emphasizes community engagement and comprehensive planning. This holistic approach to climate action draws connections between often siloed areas of planning including housing, transportation, and public health. In addition to implementing emissions abatement projects, each TCC grantee is required to develop and implement three "transformative plans," including a Community Engagement Plan (CEP), a Workforce Development Plan (WDP), and a Displacement Avoidance Plan (DAP). Applicants are required to submit these plans with their applications.

Keeping sustainability affordable

TCC explicitly recognizes the need to create and maintain residential and commercial affordability as part of a holistic approach to climate mitigation and adaptation planning and it promotes these goals most directly by encouraging the development of affordable housing as an eligible project type and requiring each grantee to develop a DAP.

Affordable housing development

When developing their applications, communities can choose from eight potential strategies.[4] The first strategy, Equitable Housing and Neighborhood Development, seeks to "promote equity and access to opportunity through neighborhood-focused community development such as constructing, rehabilitating, or preserving affordable and mixed-income housing and mixed-use development; and infrastructure improvements and other activities that incentivize economic development, leverage private investment, and address the priorities and needs identified by residents" (Strategic Growth Council 2018, 10). Any affordable housing projects being proposed under this strategy for TCC funding must comply with the existing requirements of the Affordable Housing and Sustainable Communities Program (AHSC), as highlighted by the project requirements outlined in **Figure 2**.

[3] In addition to Implementation Grants, TCC also provides smaller Planning Grants to communities that are in the early stages of climate planning.

[4] The eight strategies include: 1) Equitable Housing and Neighborhood Development, 2) Transit Access and Mobility, 3) Decarbonizing Energy and Energy Efficiency, 4) Water Efficiency, 5) Materials Management, 6) Urban Greening and Green Infrastructure, 7) Land Conservation and Restoration, and 8) Health and Well-being.

Table D-1: Equitable Housing and Neighborhood Development

If selected, these affordable housing development projects must conform to the requirements of the Affordable Housing and Sustainable Communities Program as outlined in AHSC's Program Guidelines (http://sgc.ca.gov/programs/ahsc/docs/20171024-AHSC_16-17_Guidelines.pdf) (Figure 1) for the following eligible housing projects:

- Transit Oriented Development Project Area
- Integrated Connectivity Project Area
- Rural Innovation Project Areas

Proposed Affordable Housing projects should at minimum include one of the following projects:

- New or expanded transit service (bus, train, ferry, shuttle, or vanpool)
- Increased ridership
- New pedestrian facilities
- New bike paths or lanes (Class I, II, or IV)
- New or expanded bike share

Figure 2. Equitable Housing and Neighborhood Development Project Requirements. Source: Strategic Growth Council, "Final Guidelines: 2018 Transformative Climate Communities Program" (Strategic Growth Council, 2018, p. D-2).

Displacement avoidance

The 2018 program guidelines define displacement as:

> Residential displacement is considered to be occurring when households are forced to move from, or are prevented from moving into a Project Area, which was previously accessible to them due to conditions that:
>
> a. Are beyond the reasonable ability of households to control or prevent (e.g., rent increases);
> b. Occur despite households having met all previously imposed conditions of occupancy; and
> c. Make continued occupancy by households impossible, hazardous, or unaffordable.
>
> Displacement can result from gentrification when neighborhoods become financially out of reach for people or can occur at earlier stages through disinvestment, increasing vacancies and facilitating demographic turnover. (Adapted from Grier and Grier (1978) and Marcuse (1986) and included in the Urban Displacement Project found at urbandisplacement.org)
>
> Displacement manifests itself in many forms, from physical (i.e., evictions or service disruption) to economic (i.e., very high and/or frequent rent increases and sharp increases in housing costs relative to comparable neighborhoods). (Strategic Growth Council, 2018, p. A-2)

While all grantees are required to develop a DAP, they have a fair amount of flexibility in terms of the policies and approaches they adopt. **Figure 3** lists example policies that applicants can draw from when developing their DAP.

Table 2: Example Policies to Avoid the Displacement of Very Low and Low-Income Households

Category	Policy
Production of Affordable Housing	• Incentives for inclusionary zoning* • Density bonus ordinance* • Community land trusts • Fee on new commercial or residential development that is dedicated to affordable housing • Land banking programs • Development of new accessory dwelling units • Neighborhood preference legislation that gives existing residents within a certain circumference preference for newly built affordable units* • Dedication of a certain percentage of a housing bond to building housing in the TCC Project Area • Site acquisition and fee deferrals to develop 100% affordable housing* • Production of family-sized rental and ownership affordable units • Allow affordable housing on a limited number of underutilized Production, Distribution and Repair (PDR) parcels with a ground floor requirements for PDR* • Housing bond to fund affordable unit development
Preservation of Affordable Housing	• Rent control, stabilization ordinances, and rent review boards* • No-net loss of affordable housing units / net gain of affordable units* • Preservation of existing affordable housing in the Project Area through the one-for-one redevelopment of distressed public housing; right-to-return policies for existing residents in good standing in redeveloped public housing; and commitment not to raise rents above pre-redevelopment levels for existing residents in redeveloped buildings* • Policies to preserve single-room occupancy and/or mobile home parks and to allow current residents in good standing to remain or return in the case of redevelopment* • Condominium conversion restrictions* • Demonstration of application to local, state, and federal programs to fund preservation of affordable housing • Preservation of affordable housing via acquisition and rehabilitation programs* • Covenants to maintain affordability in perpetuity • Community land trusts • Restrictions on short-term rentals* • Restrictions on non-primary residences*
Tenant Protections and Support	• Tenant anti-harassment policies • Right-to-return policies for existing households • Source of income non-discrimination* • 'Just Cause' eviction policies • Limiting of low-fault evictions* • Culturally appropriate tenant rights education • Funding for tenant organizing • Tenant legal services and right to council in eviction proceedings
Note: *Indicates policies that require local municipal participation to be implemented.	

Figure 3. Example displacement avoidance policies. Source: Strategic Growth Council, "Final Guidelines: 2018 Transformative Climate Communities Program" (Strategic Growth Council, 2018, p. 11).

TCC Round 1: Fresno, Ontario and Watts

The first round of TCC Implementation Grants (hereafter referred to as Round 1) were announced in the Spring of 2018 and were awarded to the City of Fresno ($66.5 million), the City of Ontario ($33.25 million), and the neighborhood of Watts in the City of Los Angeles ($33.25 million), to be disseminated on a reimbursement basis over the 5-year grant period (**Figure 4**).

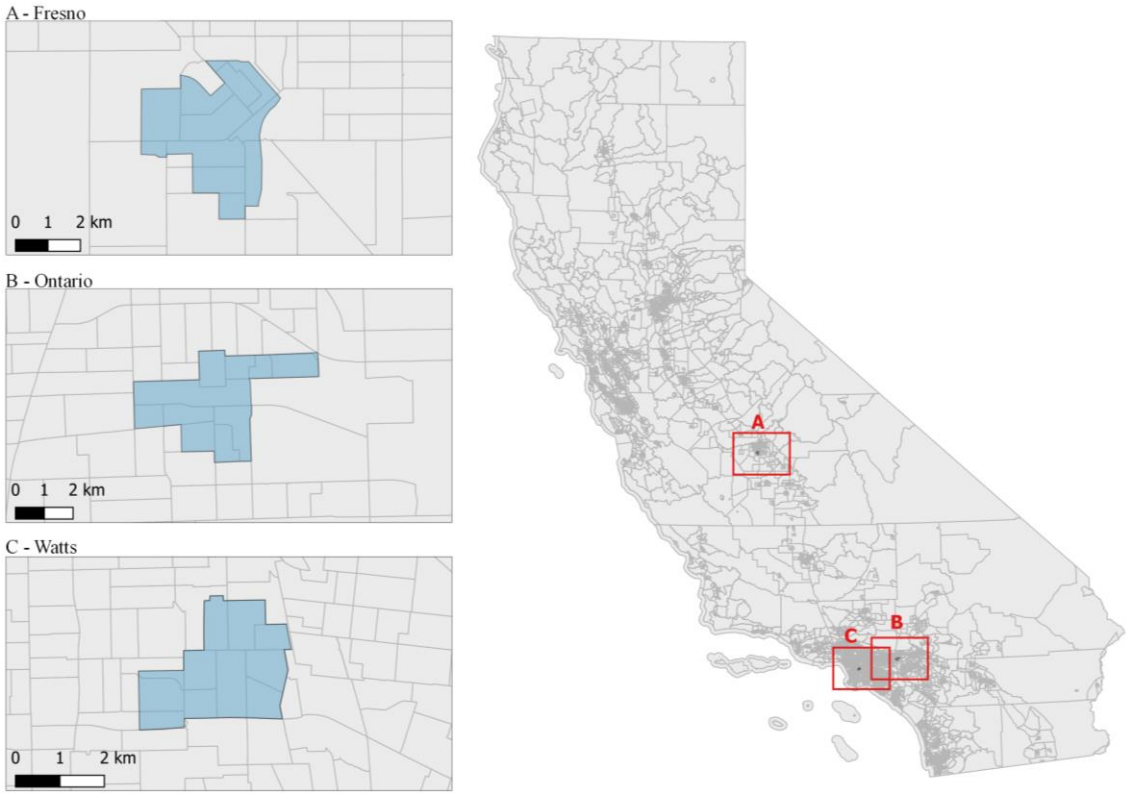


Figure 4. TCC Round 1 sites and project boundaries

Table 2 below provides a summary of key demographic and socioeconomic changes within the treatment sites between 2013 and 2018, leading up to the announcement of TCC. These estimates are based on the U.S. Census Bureau's American Community Survey and the stared numbers represent changes that are statistically significant. The Fresno site, for instance, saw a 10 percent increase in its Hispanic population. The Ontario site grew in population by almost 8 percent and saw an increase in the percent renters (6.2%), percent high income (75.8%), and percent with a bachelor's degree or higher. The Watts site also grew in population by over 7 percent and saw a 123 percent increase in its non-Hispanic Asian population and a 34 percent increase in the percent with a bachelor's degree or higher.

Table 2. Descriptive data for the Round 1 sites (change from 2013 to 2018)

	Fresno	**Ontario**	**Watts**
Total population	+1.8%	+7.9%*	+7.5%*
Percent Hispanic, all races	+10.1%*	-1.4%	+3.2%
Percent Non-Hispanic Asian	-22.4%	+61.7%	+123.7%*
Percent Non-Hispanic Black	-27.3%	+21.4%	-12.3%
Percent Non-Hispanic White	+13.3%	-20.1%	+25.3%
Percent Non-Hispanic, other groups	+41.1%	+59.2	-9.6%*
Percent foreign born	-9.3%	-7.3%	+3.6%
Median household income	+5.8%	+15.1%	+14.0%
Percent living below poverty	-0.8%	-27.1%	-10.6%
Percent high income ($125k+)	-20.2%	+75.8%*	+16.4%
Percent with bachelor's degree or higher	+17.8%	+26.1%*	+34.5%*
Percent renters	-2.4%	+6.2%*	-3.9%
Percent homeowners	+6.0%	-8.6%	+8.0%

Percent of renters paying ≥ 50% of income on rent	-3.5%	+0.8%	-1.1%

* Statistically significant at the 95% confidence level. Significance tests were conducted in accordance with methods described by the U.S. Census Bureau in Understanding and Using American Community Survey Data: What All Data Users Need to Know (2018). Source: Luskin Center Year 1 TCC Reports.

As part of the grant application, each site had to propose a suite of implementable projects that will lead to a measurable reduction in GHG emissions. The projects have to be completed within the five-year timeline of the grant. **Table 3** highlights the total number of projects being funded at each of the Round 1 sites, as well as their type and status as of June 2019. (See Appendix A for a full list of the projects being carried out at each site and the status of each.)

Table 3. Number projects by status and type

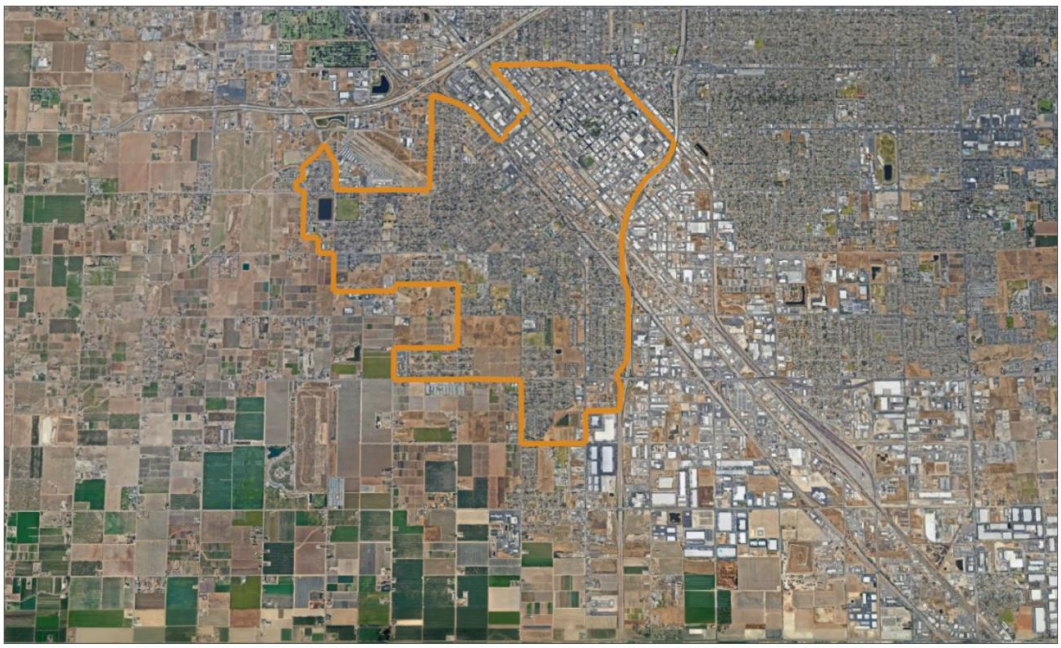
	Fresno	**Ontario**	**Watts**
Total	**24**	**13**	**26**
Project Status (as of June 2019)			
Pending	16	8	12
In Progress	8	5	13
Completed	0	0	1
Project Type			
Active Transportation	2	2	0
Affordable Housing	1	1	1
Food Waste Prevention	1	0	1
Leverage	4	2	7
Low Carbon Transportation/Transit	1	1	2
Low Income Weatherization	0	2	2
Organics	0	1	0
Rooftop Solar/Energy Efficiency	1	0	0
Urban Greening	7	0	6
Urban/Community Forestry	5	1	4

Transform Fresno

The City of Fresno is located in the center of the San Joaquin Valley, in the southern portion of California's Central Valley. It is the fifth most populous city in the state and the most populous inland city. Initially founded in 1878 as a railroad station on the Central Pacific Railroad, it was officially incorporated as a city in 1885. Due in part to the heavy amount of truck traffic that travels past Fresno on Interstate 5, the city has long suffered from poor air quality and correspondingly high rates of diabetes, asthma, and cardiovascular disease. Climate change threatens to worsen existing public health disparities, especially in places like the Central Valley that are already experiencing the effects of extreme heat.

The City of Fresno acted as the lead applicant for the Transform Fresno TCC grant along with 13 co-applicants including developers, non-profits, and community-based organizations. **Figure 5** demarcates the TCC site boundary within the city (DeShazo et al., 2020a). In addition to the three required transformative plans, Transform Fresno proposed 21 projects, including 7 urban greening projects, 5 urban and community forestry projects, 2 active transportation projects, 1 rooftop solar and energy efficiency project, 1 low carbon transportation project, 1 food waste prevention project, 1 affordable housing project, and 4

leverage projects (**Table 3**). **Figure 6** shows anticipated project outputs, outcomes and impacts based on the Fresno Year 1 Annual Report produced by the Luskin Center for Innovation.



Aerial view of the Fresno TCC site boundary; the site is 4.9 square miles and measures 2.6 miles from west to east and 3.0 miles from north to south at the farthest points. Photo Credit: Google Earth 2020

Figure 5. Aerial view of Fresno TCC site. Source: Transform Fresno Year 1 Report

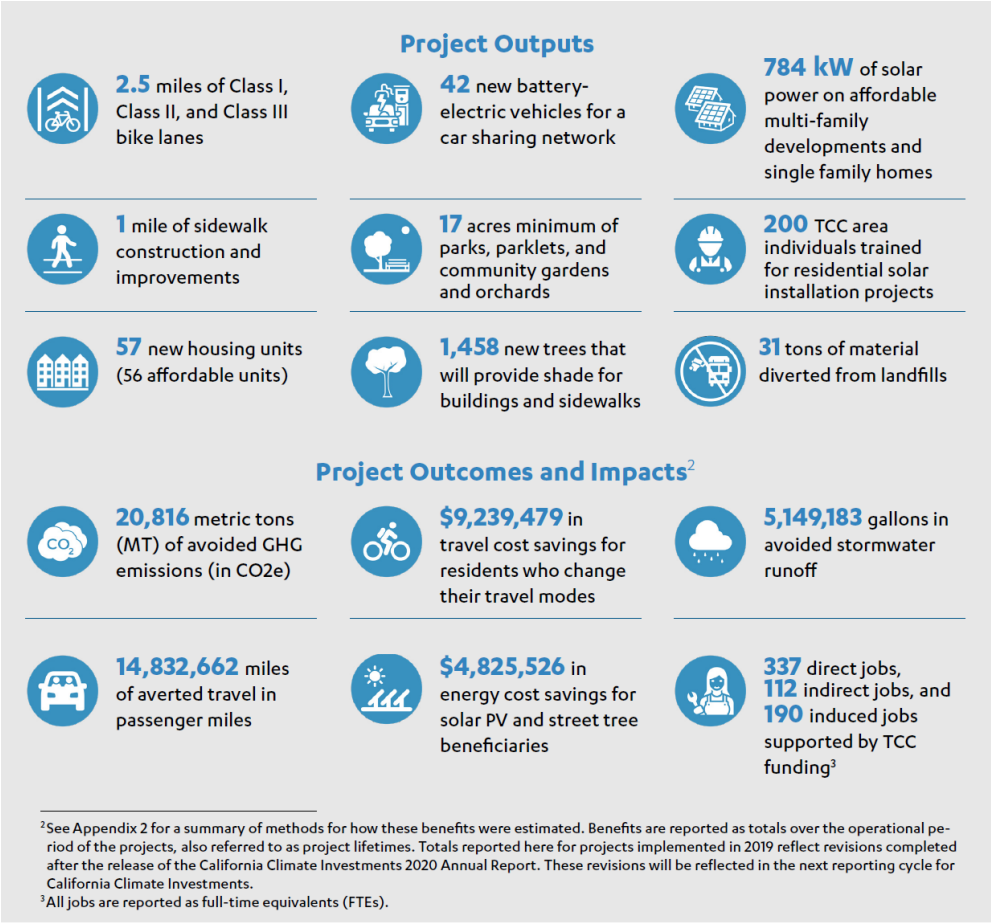


Figure 6. Transform Fresno anticipated benefits. Source: Transform Fresno Year 1 Report

According to UCLA's Center for Neighborhood Knowledge (CNK) much of the city is characterized by high renter vulnerability measured by a combination of census tract level indicators such as percent below the poverty line, percent renters, and percent identifying as immigrants (UCLA Center for Neighborhood Knowledge, 2020). Transform Fresno's DAP aims to preserve the supply of affordable housing, protect existing residents from displacement, and retain and grow local businesses. The Year 1 Report notes that none of the TCC projects will cause direct displacement due to the fact that they are being implemented on vacant or public land, however, it acknowledges the potential for the projects to cause indirect displacement due to rising property values.

To address concerns about indirect residential and commercial displacement, in November of 2018 the City established the Anti Displacement Task Force (ADTF) with 11 members from tenant organizations, development firms, and advocacy groups. The ADTF held three stakeholder meetings between April and June of 2019 in order to identify and prioritize DAP policies. The community was surveyed to collect input on a draft plan in May and June and a final plan was released in September of 2019. Among other things the DAP suggests that the city expand its rent control ordinance, adopt a "just cause" eviction policy, provide incentives and protections to first time home owners, and offer subsidies for local, minority-owned businesses. The DAP is intended to be a living document that will be amended and expanded as new data is gathered and analyzed.

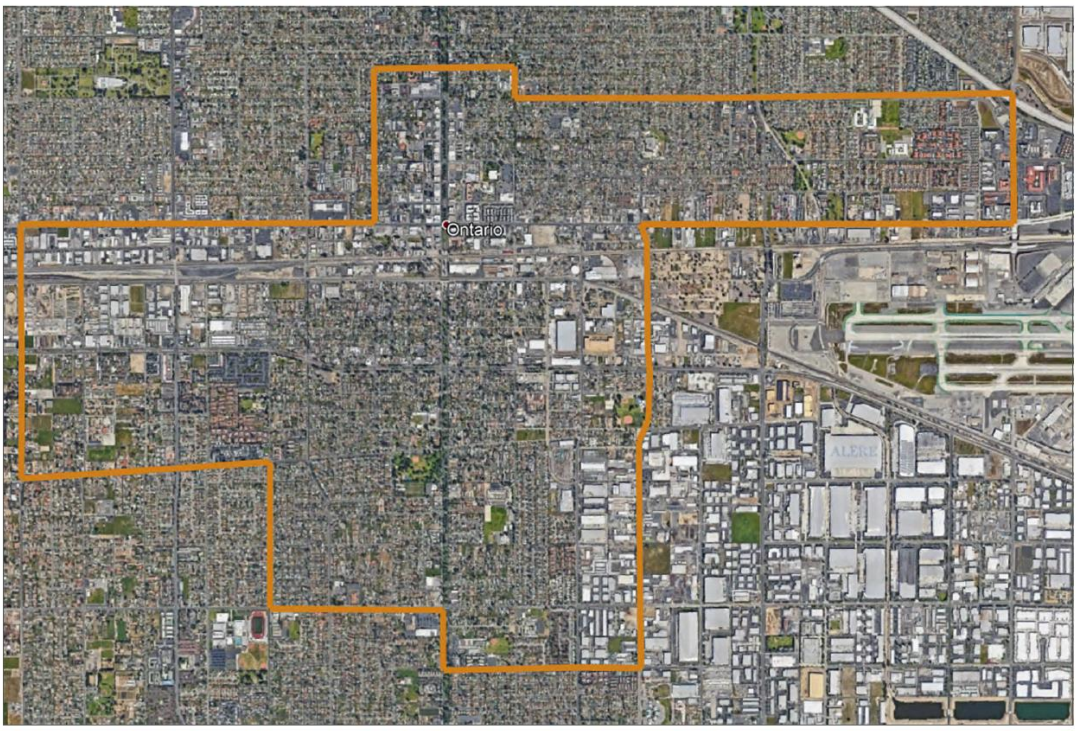
As part of the effort to prevent displacement, Transform Fresno proposed a new affordable housing development in the project area. The Chinatown Housing Project is a 57-unit mixed use affordable housing development in Fresno's Chinatown neighborhood. The project has varying levels of income restrictions: 15 of the units will be rented to households earning at or below 30 percent of the area median income (AMI), 14 units will be rented to households earning at or below 50 percent of the AMI, and 27 will be rented to households earning at or below 60 percent of the AMI. The project, which is being constructed by the Fresno Housing Authority, uses $11.7 million of TCC grant funds and $18.9 million of leveraged funds and is expected to be completed in December 2021. In addition to creating affordable housing, the project involves the implementation of several sustainable transformation improvements (STI) including installing LED streetlights, making sidewalk improvements, planting trees, and reconstructing a permeable green alley adjacent to the project. Over its 30-year lifetime, the Chinatown Housing Project is estimated to lead to a reduction of 5,345 mega tons of carbon dioxide emissions ($MTCO_2e$) and 14 million vehicle miles travelled (VMT).

Ontario Together

The City of Ontario is situated 35 miles east of Los Angeles in what is known as Southern California's Inland Empire. Incorporated in 1891, the city was named after the Ontario Model Colony development established nine years earlier by Canadian engineer, George Chaffey. Citrus farmers were drawn to the area by the arid climate, however, the expansion of the Los Angeles Port and the warehouse industry inland led to a shift in the economy away from agriculture and toward global logistics in the late nineteenth century (Lara, 2018). Pollution from truck traffic, as well as other environmental hazards, are responsible for high rates of respiratory disease and cancer. Like Fresno, Ontario's location exposes the community to increasingly severe heatwaves, which put already vulnerable communities at risk.

The City of Ontario was the lead applicant for the Ontario Together TCC grant along with 13 co-applicants including other local government agencies, non-profits, community-based

organizations, and joint powers authorities. **Figure 7** shows the TCC site boundary within the city (DeShazo et al., 2020b).



Aerial view of the Ontario TCC site boundary; the site is 4.9 square miles and measures 4 miles from west to east and 2.4 miles from north to south at the farthest points. Photo credit: Google Earth 2020

Figure 7. Aerial view of Ontario TCC site. Source: Ontario Together Year 1 Report

Ontario Together proposed 10 projects, including 2 active transportation projects, 2 low income weatherization projects, 1 urban and community forestry project, 1 low carbon transit operations project, 1 organics project, 1 affordable housing project, and 2 leverage projects (**Table 3**). **Figure 8** shows anticipated project outputs, outcomes and impacts based on the Ontario Year 1 Annual Report produced by the Luskin Center for Innovation.

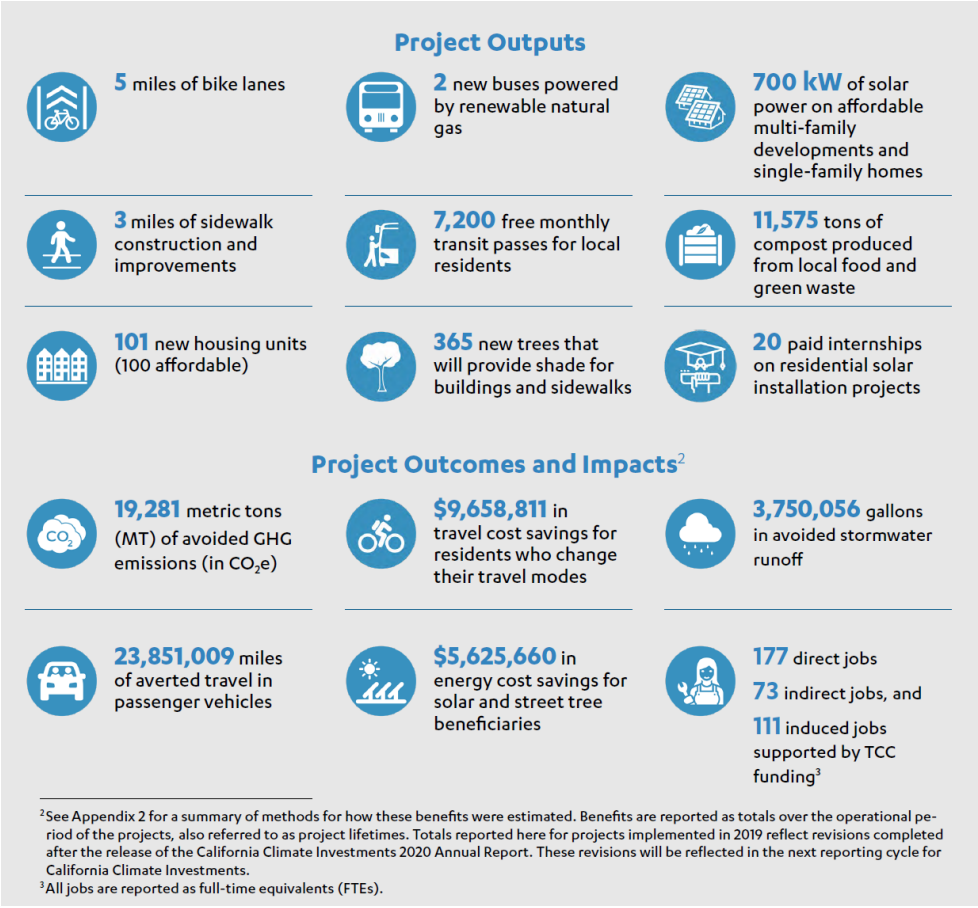


Figure 8. Ontario Together anticipated benefits. Source: Ontario Together Year 1 Report

According to CNK's Neighborhood Vulnerability Map, much of Ontario and the surrounding census tracts rank in the mid-range on the Renter Vulnerability Index (RVI) mostly as low, moderate or high, with several adjacent tracts ranking highest (UCLA Center for Neighborhood Knowledge, 2020). As with Fresno, none of Ontario Together's projects are expected to cause direct residential or commercial displacement since they are being constructed on vacant, underutilized lots. Nonetheless indirect displacement is a possible unintended consequence of rising property values around the site. Ontario Together's DAP emphasizes preservation of existing affordable units and production of new affordable housing.

The TCC grant enabled the City to move forward with the Vista Verde Apartments, a 101-unit affordable housing development, which began construction in June 2019. In addition to the $18.8 million made available by the TCC grant, the City issued $21 million in Multi-Family Mortgage Revenue Bonds and signed two loan agreements totaling $4.4 million in order to finance the project. The Ontario Housing Authority was also able to leverage the grant in order to secure funding from a developer and from state housing tax credits to begin construction of the Emporia Place Apartments, which will add 75 affordable housing units to the project area. Additionally, the City issued a bond to rehabilitate and extend the affordability covenants on 86 housing units at Ontario Townhouses.

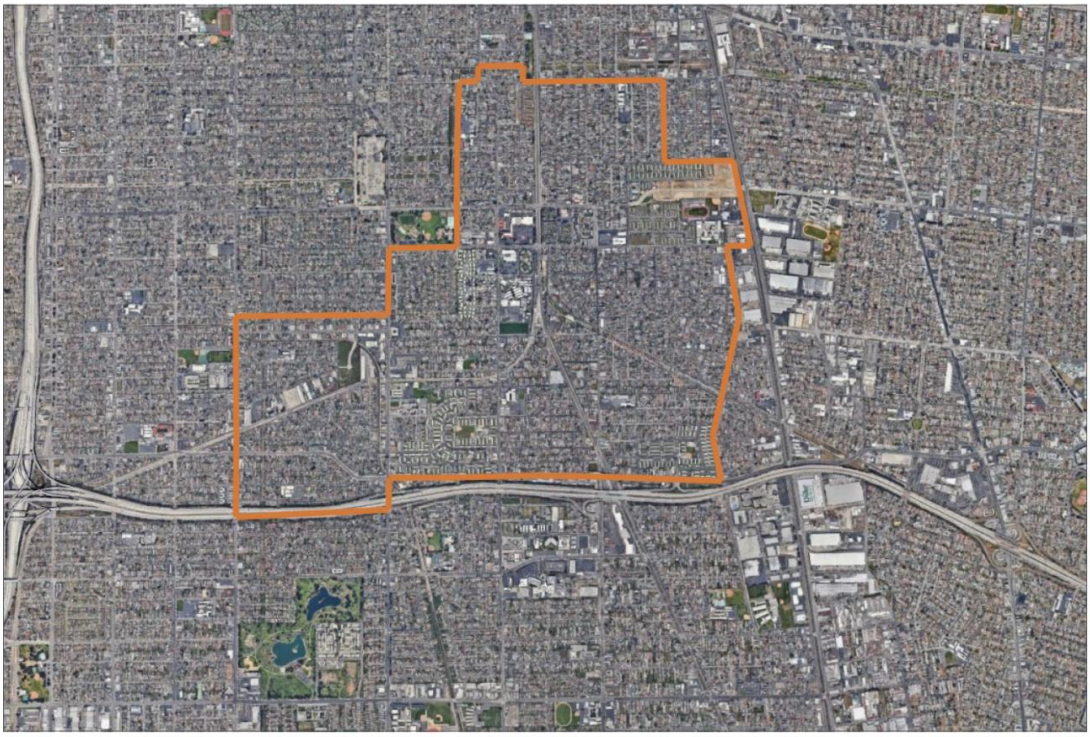
In addition to the above efforts, the City is actively marketing publicly owned land within the project area to affordable housing developers, offering financial incentives such as density bonus agreements and reduced development fees for affordable units. The City is also implementing a homeowner rehabilitation program and emergency grant program to support

residents at risk of foreclosure and the City plans to conduct annual vulnerability assessments to gather more information on local displacement pressures and trends.

Watts Rising

The neighborhood of Watts is located in the south eastern part of the City of Los Angeles. Initially founded as a ranching community along the railroad line, Watts was incorporated into the City of Los Angeles in 1926. By the 1940s Black families, who were prevented from living in many L.A. neighborhoods by racially restrictive covenants, made up a majority of the population. Growing discontent and resentment related to discriminatory police practices and lack of public services led to the 1965 "Watts Rebellion," which resulted in 34 deaths. In the 1980s, many Black families began moving out of Watts and into more suburban communities in the Inland Empire, San Gabriel Valley and San Joaquin Valley. Located just north of Interstate 105, Watts suffers from high levels of air pollution due to heavy car traffic. As a highly urbanized neighborhood Watts is particularly vulnerable to extreme heat, which is exacerbated in cities by the expanse of dark, impervious surfaces in cities through the urban heat island effect (UHI).

The Housing Authority of the City of Los Angeles (HACLA) served as the lead applicant for the Watts Rising TCC grant along with 15 co-applicants including other local government agencies, developers, non-profits, and community development organizations. **Figure 9** demarcates the TCC site boundary (DeShazo et al., 2020c).



Aerial view of the Watts TCC site boundary; the site is 2.6 square miles and measures 2.15 miles from west to east and 1.85 miles from north to south at the farthest points. Photo Credit: Google Earth 2020

Figure 9. Aerial view of Watts TCC site. Source: Watts Rising Year 1 Report

The Watts Rising collaborative proposed 23 projects in their TCC grant, including 6 urban greening projects, 4 urban and community forestry projects, 2 low income weatherization projects, 2 low carbon transportation projects, 1 organics project, 1 affordable housing project, 1 food waste prevention project, and 7 leverage projects (**Table 3**). One of the leverage projects,

the Century Boulevard Complete Streets project was completed in September of 2018, adding and improving street lights, signals, sideways and green space along a half mile stretch in the project area. **Figure 10** shows anticipated project outputs, outcomes and impacts based on the Watts Year 1 Annual Report produced by the Luskin Center for Innovation.

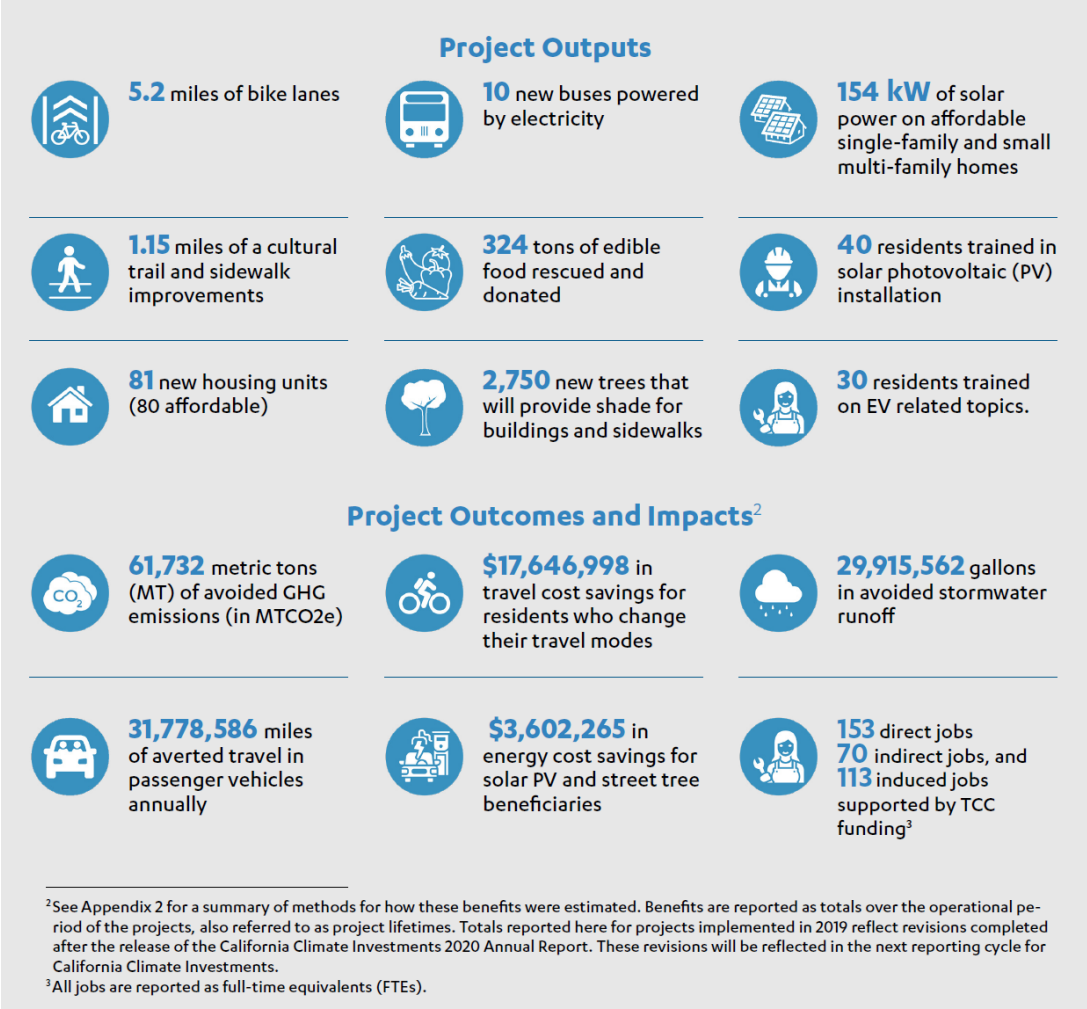


Figure 10. Watts Rising anticipated benefits. Source: Watts Rising Year 1 Report

According to CNK's Neighborhood Vulnerability Map, Watts falls within a large grouping of census tracts in South L.A. that rank highest on the RVI (UCLA Center for Neighborhood Knowledge, 2020). Watts Rising's DAP centers around the production of new affordable units, as well as tenant and homeowner education to prevent displacement. TCC funds are directly supporting construction (currently ongoing) of the Jordan Downs development in Watts, which will provide 81 one to four bedroom units of LEED certified affordable housing reserved for families making between 30 and 50 percent of the AMI. Leverage funding is supporting development of another phase of Jordan Downs, which will create an additional 156 affordable multifamily units.

Evaluating TCC

In order to track the TCC program's impacts, a team of researchers from the University of California Los Angeles and University of California Berkeley were contracted by the California Strategic Growth Council (SGC) to conduct a comprehensive, five-year long

evaluation of Round 1. The Final Evaluation Plan is divided into four phases: 1) baseline data collection, 2) process evaluation, 3) outcome evaluation, and 4) impact evaluation. The evaluation team worked with the grantees to develop a list of performance indicators in track the progress and impacts of each project being undertaken. Baseline data will be collected for all possible indicators for the year prior to implementation (2018).

The process evaluation involves collecting information about project outputs as implementation is underway. This includes quantitative measurements, such as the number of trees planted in year one, as well as qualitative information about how implementation is going. The outcomes evaluation, by contrast, uses indicators to track changes in stakeholders' knowledge, attitudes, skills, behaviors, practices, and decisions. Finally, the impact evaluation seeks to determine the causal effects of TCC on concrete changes in the environment or human wellbeing that align with the objectives of the program (DeShazo et al., 2018). Due to the programs' broad scope its impacts will not be fully realized until several years after implementation and in some cases the effects could take decades to materialize visibly.

The evaluation relies on a variety of data sources including primary data (e.g., interviews with program participants), secondary data (e.g., US Census Bureau data), and estimated data (e.g., calculated emissions reductions using California Air Resources Board tools). In order to control for exogenous factors that could affect changes in the indicators being tracked, the evaluation team is using control sites—census tracts that do not touch the treatment sites, but are in the same county and are similar to their respective TCC sites in terms of various socioeconomic, demographic, and environmental characteristics.

Table 4 outlines the indicators being used in the evaluation that relate to rental housing, affordability and residential displacement avoidance for renters. The majority of these indicators are not controllable, meaning the changes at the sites cannot be directly compared to changes at the control sites, making it hard to single out the program's effects.

Table 4. Relevant TCC evaluation indicators pertaining to rental housing affordability and displacement avoidance

Indicator	Units	Control Feasible?	Data Source	Collection Frequency
Outputs				
Housing units	Number of new housing units	Yes	County tax assess parcel data	Annually
	Number of new housing units (by number of bedrooms)	No	Project documentation (e.g., occupancy permits)	Continuously, as relevant
	Number of market rate units built under density bonus agreements (by number of bedrooms)	No	Project documentation (e.g., agreement paperwork)	Continuously, as relevant
	Number of market rate units built under reduced development impact fees (by number of bedrooms)	No	Project documentation (e.g., fee waivers)	Continuously, as relevant
Affordable housing units	Number of new affordable housing units	Yes	California Housing Partnership Corporation (CHPC) Preservation Database; Local housing authority data	Annually
	Number of new affordable housing units (by number of bedrooms)	No	Project documentation (e.g., occupancy permits)	Continuously, as relevant

	Number of affordable units built under density bonus agreements (by number of bedrooms)	No	Project documentation (e.g., agreement paperwork)	Continuously, as relevant
	Number of affordable units built under reduced development impact fees (by number of bedrooms)	No	Project documentation (e.g., fee waivers)	Continuously, as relevant
Educational workshops	Number of residents invited to workshops about affordable housing opportunities	No	Project documentation (e.g., sign-in sheets)	Continuously, as relevant
	Number of tenants' rights education classes held	No	Project documentation (e.g., agendas)	Continuously, as relevant
	Number of residents invited to tenants' rights education classes	No	Project documentation (e.g., mailing lists)	Continuously, as relevant
	Number of residents participating in tenants' rights education classes	No	Project documentation (e.g., sign-in sheets)	Continuously, as relevant
Intermediate Outcomes				
Housing unit occupancy rate	% of housing units occupied	No	Project documentation (e.g., rental agreements)	Continuously, as relevant
Income-restricted housing unit occupancy rate	% of income-restricted housing units occupied	No	Project documentation (e.g., rental agreements)	Continuously, as relevant
Impacts				
Reduced housing crowding	% of households w/ more than one occupant per room	Yes	American Community Survey	Annually
Reduced housing costs for renters	% of households spending more than 20, 30, 40, & 50% of their income on rent	Yes	American Community Survey	Annually
	Actual household expenditures on housing per month (dollars)	No	Affordable Housing and Sustainable Communities (AHSC) user survey	3-months following move-in
Increased housing stability	% of households who moved within the past year (by income group)	Yes	American Community Survey	Annually
Increase in available housing units for rent	Vacancy rate for rental unit (%)`	Yes	American Community Survey	Annually

This study was conceived of in part as a way to explore Craigslist data as a potential supplementary secondary data source to add to the TCC program evaluation and future evaluations. The section below outlines the methods we used to scrape and analyze the data.

Methods & Data Collection

Understanding the actual, layered impacts of local climate policies and programs is critical to achieving equitable sustainability and actualizing the 'climate-just city' (Steele et al., 2012). Impact evaluation, however, is often limited by the availability of data and measuring neighborhood scale changes in housing affordability has long presented a challenge to planners and researchers. Existing sources of housing data, such as the U.S. Census Bureau's American Community Survey (ACS) and private apartment associations, such as CoStar and Reis, offer useful data such as gross rent and rent as a percentage of household income, however, they do

not offer a complete picture of the nuanced rental housing market, leaving out less conventional rental options such as accessory dwelling units (ADUs), condominiums and houses for rent, and self-managed apartments (Wegmann & Chapple, 2012). Additionally, at smaller scales these data sources tend to have high error margins, raising concerns about accuracy when looking at the neighborhood scale. Scholars have argued that big data, and especially volunteered geographic information (VGI) such as online housing listings, represent a valuable supplementary source of housing data for planners and researchers interested in understanding rental housing market trends (Boeing & Waddell, 2016).

Using data from a novel, high-resolution source, Craigslist, we developed a difference-in-differences model to analyze the effects of TCC on advertised local rents. While there are a number of online housing markets, we chose to scrape data from Craigslist due to the fact that we already had access to Craigslist rental housing data from 2014, obtained from Boeing and Waddell (2016), which enabled us to conduct a difference-in-differences analysis with pre-and post-intervention data.

A Python program was adapted from Boeing and Waddell (2016) to scrape Craigslist listings for our specific regions, subdomains, and time periods. To narrow down the scraping criteria, each TCC site was matched with a corresponding Craigslist region. Craigslist regions roughly correspond to U.S. Census Bureau Metropolitan Statistical Areas (MSA) (see **Table 5** below). Each type of listing is separated based on Craigslist's categorization of housing listings and each listing type corresponds to a different subdomain within a Craigslist Domain. For each subdomain, there are at most 3,000 listings available to be collected because Craigslist caps the number of listings that can be retrieved per search to 3,000. While we collected data for a range of types of rentals including (e.g. apartments, houses, sublets, room share, etc.), for this study we focus exclusively on apartments for rent in order to match our pre-intervention data.

Table 5. Craigslist regions used to collect data for each TCC site

Site	Craigslist Region	Region - Census MSA	Craigslist Domain
Fresno	Fresno-Madera	Fresno, CA MSA; Madera, CA MSA	https://fresno.craigslist.org/
Ontario	Inland Empire	Riverside-San Bernardino-Ontario, CA MSA	https://inlandempire.craigslist.org/
Watts	Los Angeles	Los Angeles–Long Beach–Anaheim MSA	https://losangeles.craigslist.org/

Data was collected daily between December 2019 and July 2020 (**Figure 11**). For each listing the scraper collected the post ID, post title, rent, number of beds, neighborhood, square footage, post description, latitude and longitude. See **Appendix B** for the detailed scraping methodology.

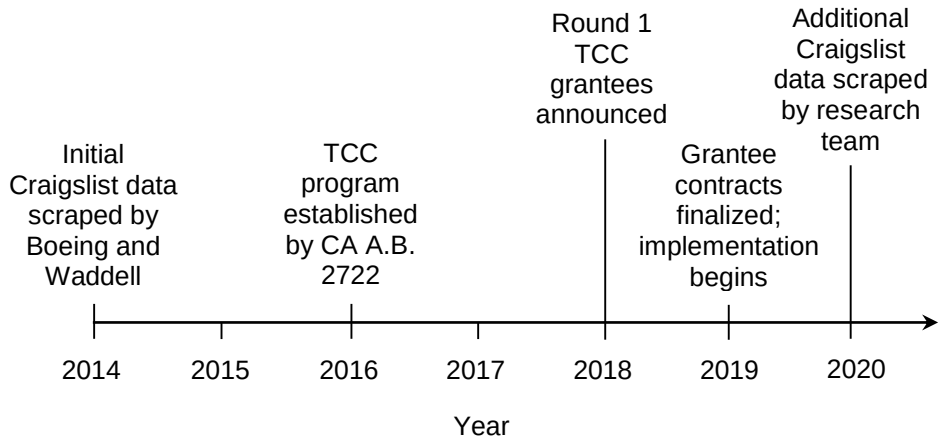


Figure 11. Study timeline

Both the pre- (2014) and post-intervention (2020) data were cleaned to exclude listings that did not rent, square footage, or latitude and longitude data. The 2014 Craigslist data shared with us by Boeing and Waddell had already been filtered to omit duplicates based on the unique post IDs. Both sets of data were further cleaned to remove any listings that had the same rent, square footage, and posting date, in order to reduce the changes of including duplicate listings of the same apartment in our analysis.[5] The data were then joined with the TCC treatment and control census tract boundaries[6] and cropped to include only the listings that fell within our treatment or control tracts (these filtered datasets were used for the difference-in-differences analysis). Each individual listing was labelled with a binary '1' or '0' to indicate whether it fell within a treatment or control tract. Lastly, outliers were excluded by removing listings that fell below the bottom 0.2 percentile and above the top 99.8 percentile of each dataset. See **Appendix C** for a breakdown of the data filtering values used to remove outliers.

Difference-in-differences analysis

While a majority of empirical studies on environmental gentrification use hedonic models, we chose to use a difference-in-differences modeling approach to assess the effects of TCC on advertised rent. Unlike hedonic modeling, which provides an indirect measure of the value of an amenity, a difference-in-differences model examines whether an intervention influences an outcome over time (Heckert & Mennis, 2012). Since this study is evaluating the impacts of an intervention (TCC funding) on a specific outcome (housing affordability), the difference-in-differences modelling approach was selected as the most appropriate.

In order to control for external factors, such as regional changes in housing policy or natural disasters, we incorporated control tracts into our model. The control tracts[7] used for our analysis were developed by the Round 1 TCC evaluation team. An extensive analysis was conducted to identify ideal control tracts based on their physical proximity to and comparability

[5] The issue of duplicate listings is a tricky one to address without manually going through each listing in the datasets. Craigslist listings are often reposted multiple times by a landlord, however, there are also cases where multiple, identical apartments are available in the same building, in which case the listings look identical, but in fact are unique units.

[6] The actual TCC site boundaries do not align exactly with census tract boundaries, therefore we include census tracts for which at least 10 percent fell within the project boundaries.

[7] Due to the fact that the control sites are not contiguous clusters of census tracts, we refer to them as "control tracts" rather than control sites.

with the TCC Round 1 sites based on a number of variables, including climate zone, CalEnviroScreen Score, racial composition, ethnic composition, income to poverty ratio, median household income, percent unemployed, percent renter occupied housing, housing cost burden, and percent of households speaking Spanish, Asian or Pacific Island languages at home. The control tract selection process is described in detail in Appendix 3 of the TCC Round 1 Evaluation Plan (DeShazo et al., 2018, p. 80).

For the difference-in-differences model a 'tcc' variable was created and assigned the value of '1' for TCC census tracts and '0' for control tracts. Our model uses the census tract as the unit of analysis and compares the average change in median rent per square foot in the TCC treatment census tracts with the change in average rent per square foot in the control census tracts. We hypothesized that the announcement and early implementation of TCC will lead to an increase in rental housing prices in and around the sites, due to speculation caused by the anticipation or provision of new amenities and services in the area. A significant and positive interaction coefficient between the change in average advertised rent per square foot in the treatment and control tracts would suggest that the announcement and early implementation had had a positive effect on rental housing prices.

Results & Discussion

By comparing our web-scraped Craigslist data with Boeing and Waddell's 2014 data, we are able to analyse changes in Craigslist listings, median rents, and affordability (measured as rent per square foot) between 2014 and 2020. **Table 6** shows the total apartment listings on Craigslist within our case study and control sites, as well as in each corresponding region. According to our data, Craigslist became increasingly popular as a housing market platform between 2014 and 2020, with some exceptions at smaller geographic scales. The number of Craigslist apartment listings grew most in the L.A. region, from 95,616 listings in 2014 to 796,724 listings in 2020. Median advertised rents increased between 20 and 50 percent everywhere except in the Watts TCC site where the median rent decreased from $1,350 to $800 between 2014 and 2020. Median rent per square foot increased from between 37 and 107 percent, again with the exception of the Watts TCC site where median rent per square foot decreased from $1.50 to $0.57 in the same timeframe.

Table 6. Change in total number of Craigslist apartment listings, median rent, and median rent/ft^2 between 2014 and 2020

	Fresno			**Ontario**			**Watts**		
	Region	**TCC**	**Control**	**Region**	**TCC**	**Control**	**Region**	**TCC**	**Control**
Total listings 2014	13,563	242	645	35,586	319	719	95,616	36	130
Total listings 2020	25,265	395	335	79,717	152	2,825	796,724	80	354
% change 2014 to 2020	86%	63%	-48%	124%	-52%	293%	733%	122%	172%
Median rent 2014	$875	$750	$700	$1,300	$960	$1,340	$1,835	$1,350	$1,400
Median rent 2020	$1,224	$1,125	$875	$1,661	$1,420	$2,040	$2,195	$800	$2,000
% change 2014 to 2020	40%	50%	25%	28%	48%	52%	20%	-41%	43%
Median rent/sqft 2014	$0.87	$0.75	$0.80	$1.25	$1.28	$1.27	$2.00	$1.50	$1.40
Median rent/sqft 2020	$1.27	$1.55	$1.27	$1.96	$2.08	$2.13	$2.73	$0.57	$2.33
% change 2014 to 2020	46%	107%	59%	57%	63%	68%	37%	-62%	66%

The relatively low number of listings in the Watts TCC site raises an important limitation of the Craigslist data related to its actual representativeness of the rental housing

market. While the Los Angeles region had the most overall Craigslist listings in both 2014 (n=95,616) and 2020 (n=796,724), the Watts TCC site had the fewest number of listings both years (n=36 in 2014 and n=80 in 2020). This seems to support Boeing's (2019) findings that Craigslist listings are not representative, but instead are spatially concentrated in wealthier, white neighborhoods. The small number of listings in Watts means that our model some of the census tract comparisons in our model may be based on a single listing.

Spatial Trends in Advertised Rental Housing

The cleaned Craigslist data were mapped at the regional and neighborhood scales in order to look for visual trends in housing affordability that may have been obscured in the difference-in-differences analysis, which aggregates the variables at the census tract level. **Figures 12** and **13** show the Fresno Craigslist listing in 2014 and 2020, respectively. While there were more listings at both the regional and site scales in 2020 compared to 2014 **(Table 6)**, when mapped, the listings appear more numerous in 2014 than in 2020. This is likely due to the 2020 listings being more tightly clustered and might suggest that there were more multi-family apartment listings rather than houses or duplexes for rent, which would show up as unique addresses. A close scan of the 2020 data confirms that there are many postings with the same location, similar or the same posting title, and other similar characteristics that were posted on different days so they would not have been removed in our cleaning process. For example, between May 1 and July 6, 2020 there were 23 posts advertising $1,025/month, single bedroom units at the Vagabond Lofts multi-use development in Fresno. Given that the Vagabond Lofts was built in 2008 and only has 38 units, it seems unlikely that there were 23 vacancies within the span of two months, however, it is not impossible, especially given the fact that many apartment leases begin in August and so these may be higher turnover months.

The geographic spread of Craigslist apartment listings in Fresno did not appear to change drastically between 2014 and 2020 at either the regional or neighborhood scales. In both years, listings are concentrated in Downtown and North Fresno, with fewer listings in the southern portions of the city, including much of the TCC treatment site. The Craigslist listings within the TCC treatment site boundaries are almost entirely in the northern and eastern quadrants, with this geographic leaning becoming more stark in 2020. Regionally there does not appear to be any clear patterns in terms of affordability. In the TCC site, listings range from both extremes of rent per square foot, suggesting that there are a mix of more and less affordable rental options in the area.

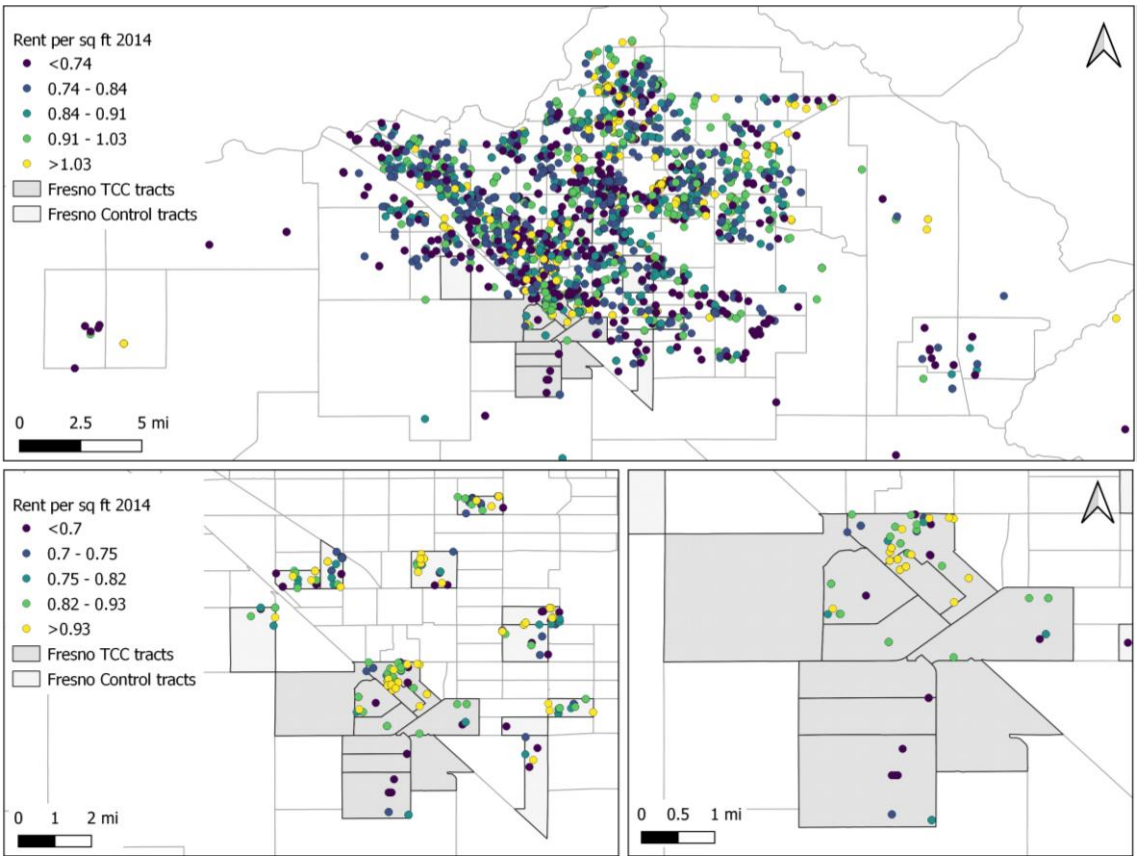


Figure 12. Regional and site specific Fresno 2014 Craigslist listings by rent/ft^2 (USD)

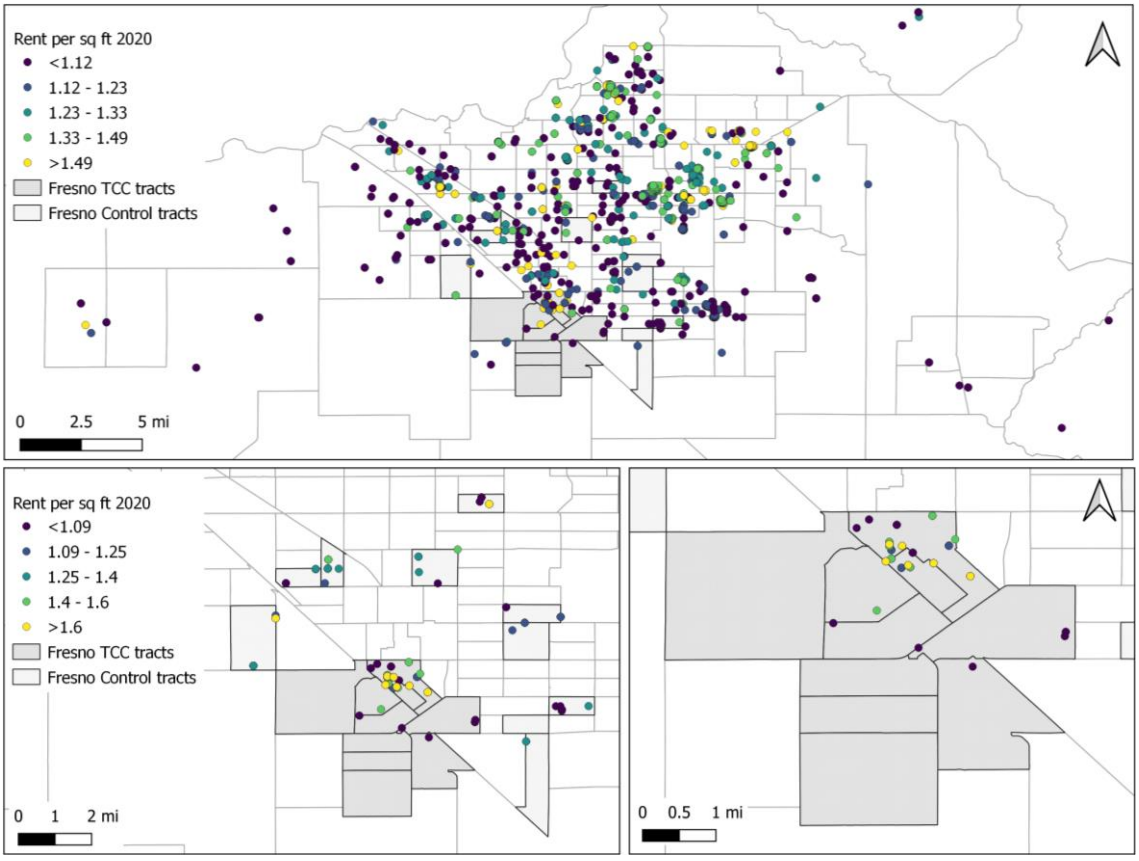


Figure 13. Regional and site specific Fresno 2020 Craigslist listings by rent/ft^2 (USD)

Similarly to Fresno, the total number of Craigslist listings increased in the Inland Empire in 2014 and 2020, but again the 2020 listings look sparser on the map (**Figures 14** and **15**). Unlike the Fresno Craigslist Region, however, the Inland Empire Region encompasses a number of cities, many of which are larger than Ontario where the TCC site is located. There is a clear pattern, most apparent in 2014, with more affordable listings to the east and southeast, likely corresponding to the cities of San Bernardino and Riverside and less affordable listings to the west and northwest around the cities of Upland, Rancho Cucamonga and Pomona. Ontario is located in between the two extremes with a mix of rental options. The portions of the city that fall within the TCC site boundaries, however, seem to become notably more affordable in 2020.

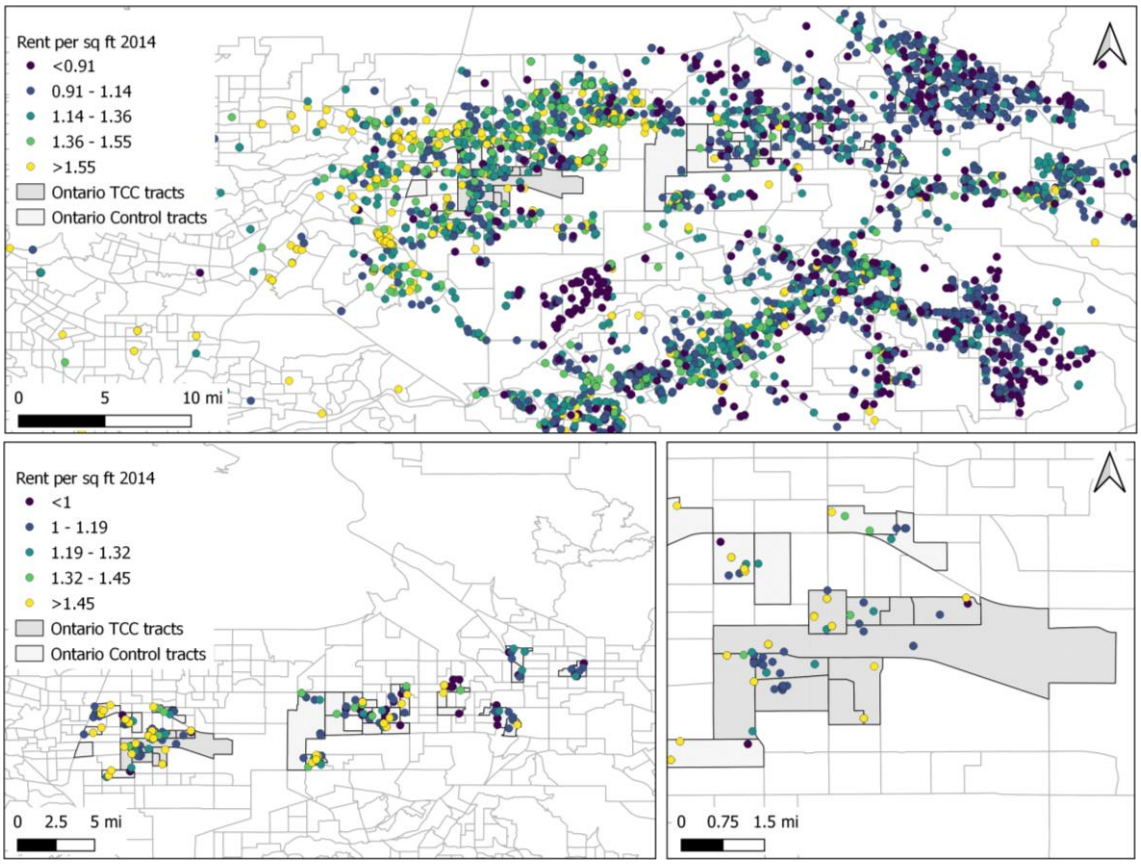


Figure 14. Regional and site specific Ontario 2014 Craigslist listings by rent/ft^2 (USD)

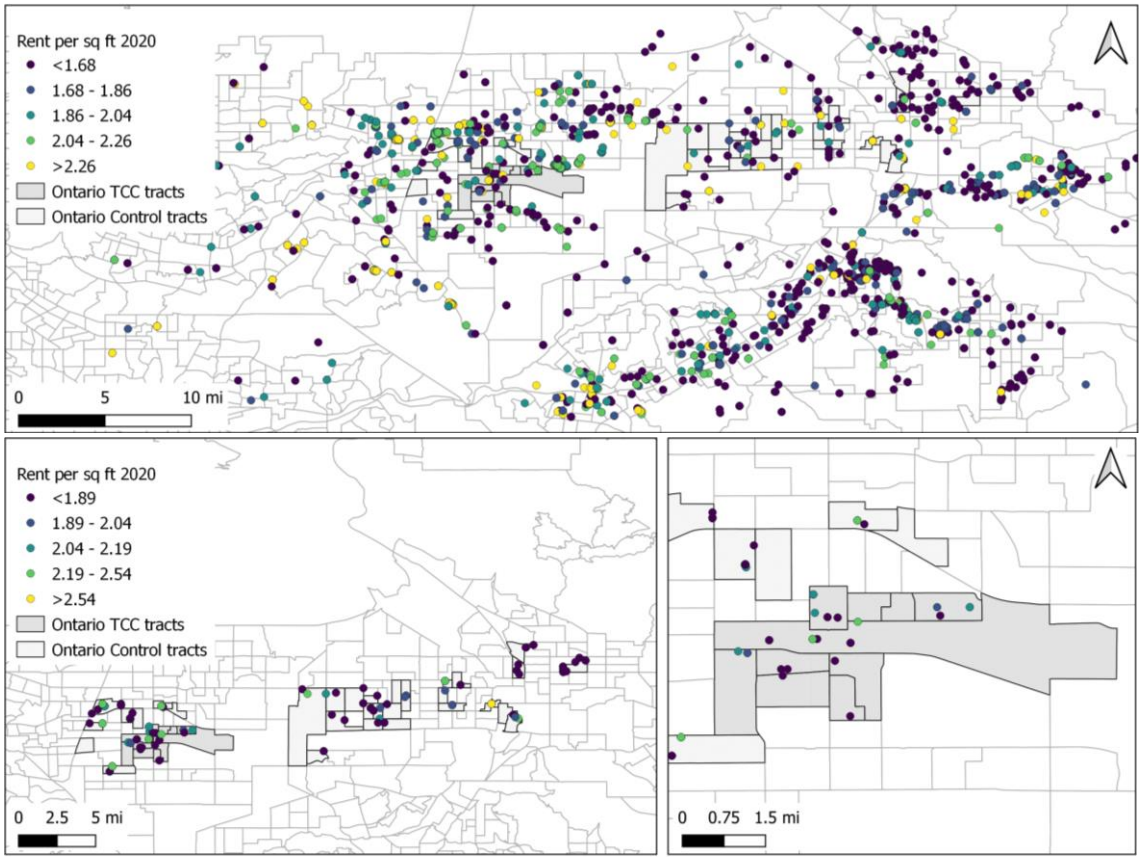


Figure 15. Regional and site specific Ontario 2020 Craigslist listings by rent/ft^2 (USD)

The Los Angeles Region, like the Inland Empire, encompasses a microcosm of cities. Los Angeles County alone includes 88 cities stretching from the coast to the eastern edge, stopping just short of the City of Ontario. The regional map of Craigslist listings shows clusterings of the least affordable rental housing along the coast and in Central and Downtown Los Angeles (**Figure 16**). The geographic extent of the least affordable housing seems to grow in 2020, expanding slightly south and east (**Figure 17**).

In the case of the Watts TCC site, the maps reveal little on the surface. It is impossible to tell by looking at the maps that there are more than a handful of listings within the site boundaries in either year, however, as **Table 6** shows there were 36 listings posted in 2014 and 80 in 2020. In both years the Craigslist apartment listings posted in this area ranged from moderately to most affordable based on the cost per square feet. As noted previously, this case highlights one of major limitations of Craigslist rental housing data, which is its uneven geographic distribution and tendency to concentrate in wealthier, whiter neighborhoods (Boeing, 2019).

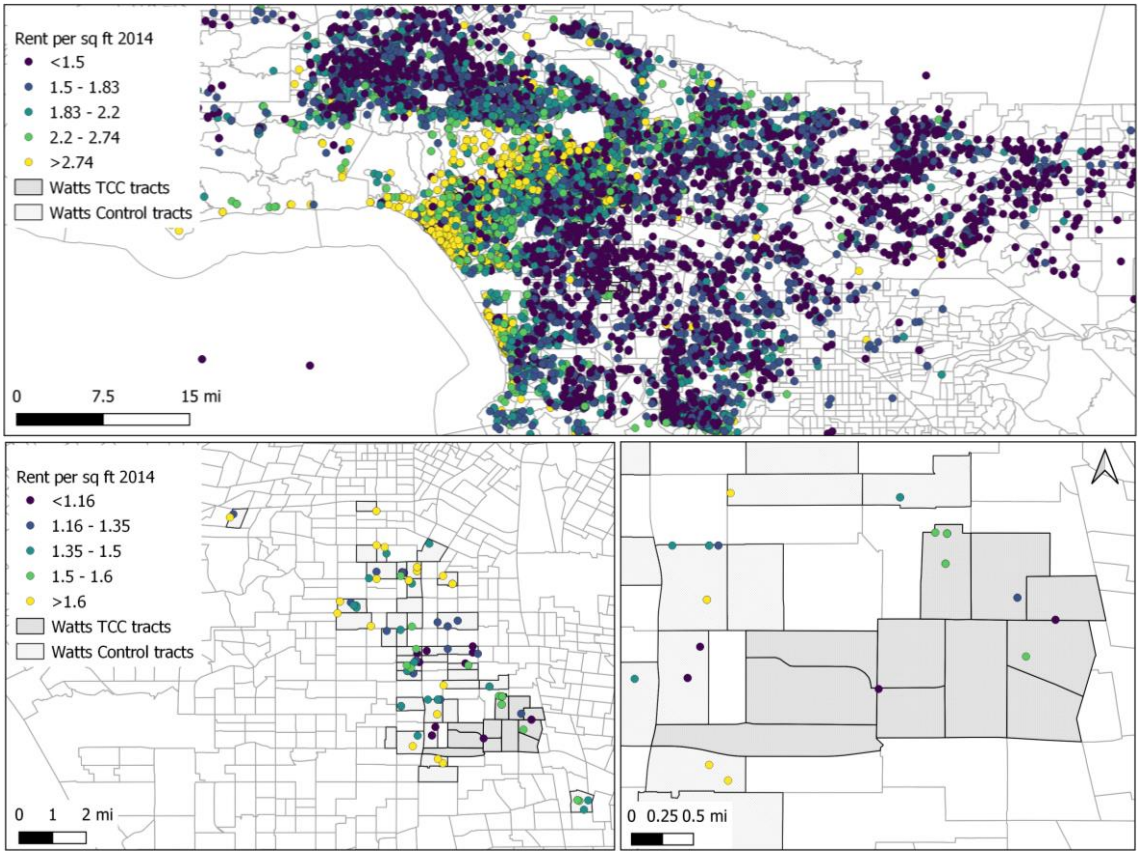


Figure 16. Regional and site specific Watts 2014 Craigslist listings by rent/ft^2 (USD)

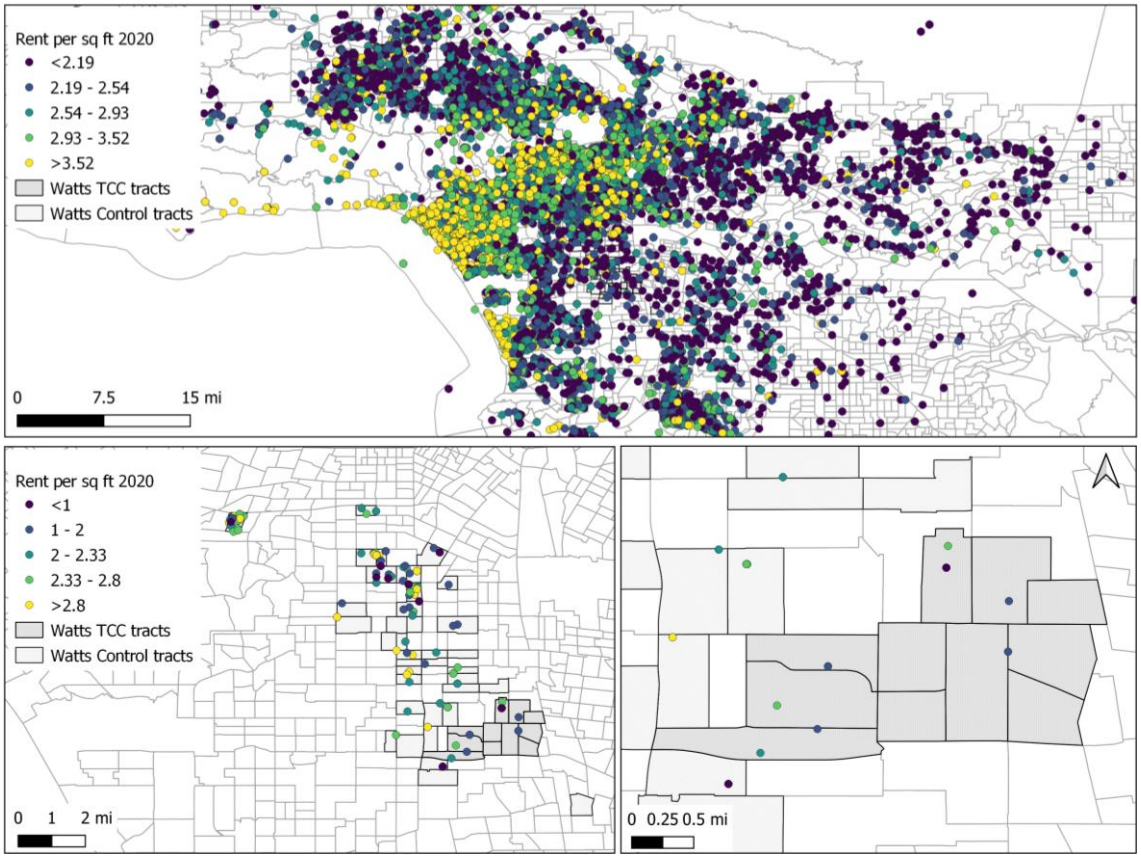


Figure 17. Regional and site specific Watts 2020 Craigslist listings by rent/ft^2 (USD)

Difference-in-Differences

In order to test the effects of the announcement and early implementation of TCC on housing affordability at the three Round 1 sites, we ran four difference-in-differences models, one for each study site and one pooled model that included all three. All four models indicate that the announcement and early implementation of the TCC program has had no significant impact on advertised local rental prices (see **Tables 7-10**). Since our analysis compares the average change at the level of the census tract, the 'n' for each model reflects the number of census tracts that were included in each analysis (e.g. there are 33 tracts included in the Fresno model encompassing both the treatment and control tracts).

Table 7. Coefficients of Fresno difference-in-differences model (n=33)

Variable	**Coefficient**	**P > | t |**	R^2
constant	0.7606	0.000	0.699
Time	0.4688	0.000	
Group	0.0528	0.499	
TCC	-0.0059	0.959	

Table 8. Coefficients of Ontario difference-in-differences model (n=66)

Variable	**Coefficient**	**P > | t |**	R^2
constant	1.1679	0.000	0.446
Time	0.5452	0.000	
Group	0.0497	0.694	
TCC	-0.0303	0.865	

Table 9. Coefficients of LA difference-in-differences model (n=70)

Variable	**Coefficient**	**P > | t |**	R^2
constant	1.4840	0.000	0.304
Time	0.9054	0.000	
Group	-0.3556	0.313	
TCC	0.0451	0.925	

Table 10. Coefficients of pooled difference-in-differences model (n=169)

Variable	**Coefficient**	**P > | t |**	R^2
constant	0.8410	0.000	0.460
Time	0.6988	0.000	
Group	-0.0186	0.889	
TCC	-0.1015	0.587	
Fresno	-0.1373	0.070	
Ontario	0.2753	0.000	
LA	0.7030	0.000	

Contrary to our hypothesis, the results of our model do not show that the announcement and early implementation of the Round 1 TCC Implementation Grants have led to a significant increase in advertised rent. There are at least three possible interpretations of this finding. The first two suggest that this could be a false negative due to inherent limitations in the design of the study. The first of these has to do with timing. Given the fact that most of the Round 1 projects had not yet broken ground when we collected the 'post-intervention' data, it may

simply be too early to detect the effects of the program on housing affordability. This interpretation leaves open the possibility that TCC *could* impact rental prices in the future. Alternatively, it is possible that TCC *has* in fact impacted rents at the treatment sites, but that there is substantial spillover of those effects into the control tracts such that the difference between them appears insignificant. Based on this interpretation TCC could have already impacted rents or could impact them in the future, however, our current methodology would not capture the effect.

A third possible explanation is that the TCC Implementation Grants are designed, intentionally or not, in such a way that minimizes their impact on property values and rents. Below we outline several characteristics that might influence whether or not, and the degree to which, an intervention might affect the local housing market. The first is the *scale*, or size, of the intervention. For example, an urban greening project that spans an entire neighborhood seems more likely to affect property values than one that concentrates on a single black. The second is *cohesiveness*, in other words the degree to which the intervention is understood to be a uniform coordinated effort, rather than disparate parts of an ambiguous whole. This piece has to do with both the design of the intervention and the way in which it is marketed and shared with the public. For example, an initiative focused on increasing a neighborhood's tree canopy by planting trees is likely to appear more cohesive than a program aimed at addressing the impacts of the urban heat island effect through a range of approaches, such as tree planting, construction of shade structures, distribution of AC units, and public education.

The third characteristic is the *type* of intervention, in particular whether it is a hard (e.g. physical infrastructure) or soft (e.g. programmatic) intervention. It would seem likely that a physical intervention, such as the development of a new park, would be more likely to have a measurable effect on property values than a programmatic intervention, such as a transit ridership incentive program, which can be ephemeral. Lastly, the *target* of the intervention (e.g. energy efficiency, heat mitigation, transit usage, etc.) may influence whether or not it has an effect on property values. We might expect, for instance, that interventions which explicitly relate to housing supply or neighborhood amenities (e.g. housing development or urban greening) would be more likely to affect housing prices than interventions that do not (e.g. electrification of buses or diversion of organic waste).

Unlike previous studies that have focused on large, physical sustainability interventions (Immergluck, 2009), our study seeks to parse out the effects of a bundle of decentralized hard and soft interventions. While these projects together likely have the ability to alter the urban space in which they are being deployed as much as a single larger intervention, the lack of a clear vision of how the community will change as a result of the intervention probably reduces, or perhaps even completely negates, the possible effects of the grant's announcement on land and housing speculation.

It is also worth noting that the post-intervention data used in this study was collected during the largest economic recession since the Great Depression. Studies have already documented the uneven effects of the COVID-19 crisis on housing (Ong et al., 2020) and it is certainly plausible that the pandemic has also affected Craigslist apartment listings.

Further research could help determine the validity of the first two interpretations. Propensity Score Matching could be used as a way of validating control site selection. This measure, in addition to conducting the analysis once all the projects have been fully implemented may well lead to different results. Testing the validity of the third interpretation would require elucidating these four variables (scale, cohesiveness, type and target) and coming up with a way of testing the effects of each of these on the likelihood of an intervention to affect housing affordability. While it is possible that TCC's proactive approach to supporting housing

affordability and minimizing displacement is succeeding, it is likely too early to observe the full impacts of the DAPs and affordable housing development projects at each site.

Conclusion

Research has found that the announcement of large-scale sustainability interventions can trigger land speculation that leads to increased property values and in some cases spurs gentrification and displacement. For the most part, research at the intersection of sustainable development and housing affordability has typically focused on potential residential displacement due to the expansion or creation of green space. Some studies have measured changes in home prices due to large scale environmental change and sustainability initiatives, but little is known about the effects of local climate planning on rental housing affordability, partially due to inherent limitations in traditional sources of housing data.

This study contributes to the climate planning and housing literature in two ways. First, it offers methodological insights into the possible uses and challenges associated with a novel, high-resolution source of housing data. Web-scraped Craigslist data provides timely, high-resolution information, capturing segments of the rental housing market that are often obscured or left out of governmental and private data. Access to individual apartment data including rent and square foot allow for more nuanced assessments of actual affordability. In this case, the data enabled us to conduct analyses in real time rather than waiting for Census estimates to be released. The limitations of this data must be recognized, however, as well as its inherent bias toward whiter, wealthier, more educated census tracts (Boeing, 2019). While it is not representative of the entire market, Craigslist and similar online housing data can be a useful supplemental data source for researchers and practitioners trying to trace trends in local housing markets.

Second, this study adds to the environmental gentrification literature by using this data to quantify the effects of a state-funded sustainability program in California on local rental housing prices. Using pre- and post-intervention data scraped from Craigslist, we analyze the early effects of California's Transformative Climate Communities (TCC) Program on advertised rental housing prices at the Round 1 sites in Fresno, Ontario and Watts. Due to the size and public nature of the TCC investments, we hypothesize that TCC will have led to statistically significant increases in advertised rents compared to similar areas that did not receive these investments, however, a difference-in-differences analysis found that the program has had no significant impact on rental housing prices. These findings could be explained by methodological limitations including timing and spillover effect or by characteristics of the program that minimize its impact on property values and rents, such as the intervention's scale, cohesiveness, type and target.

Scholars and practitioners may need to broaden our existing conceptualizations of environmental gentrification in order to unravel the myriad impacts of emerging models of local comprehensive climate planning. At the local and regional scales climate mitigation and adaptation necessarily involves changes to nearly all sectors, many of which fall outside of the environmental gentrification literature such as energy production, transportation infrastructure, and housing development. Further research into the interactions and trade-offs between simultaneous equity-oriented climate interventions would be useful for planners and policymakers that are seeking to materialize the 'climate-just city.'

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Appendices

Appendix A: TCC Project Statuses

Table A1. Transform Fresno TCC individual project progress (as of June 2019)

	Project type	**Details**	**Status / Key Accomplishments**
1	Community Engagement Plan (CEP)	NA	Ongoing; Community members approved the final Transform Fresno project package; 7 Outreach & Oversight Committee quarterly meetings held, with 30-60 stakeholders engaged at each; 120 community members engaged at five popup workshops conducted by the consultant Raimi & Associates Inc. in May 2019; Draft CEP Framework released in May 2019; 30 community members filled out surveys evaluating the Draft CEP Framework between in May & June 2019
2	Displacement Avoidance Plan (DAP)	NA	Ongoing; Anti Displacement Task Force (ADTF) established in November 2018 with 11 members appointed by the Mayor; 3 ADTF meetings held between in April & June 2019; Stakeholders identified and prioritized DAP policies at a May 15, 2019 workshop » Downtown Displacement Report informing the DAP was released in May 2019 by the City of Fresno Development and Resource Management Long Range Planning Division; Draft DAP Framework released in May 2019; 23 community members filled out surveys evaluating the Draft DAP Framework in May & June 2019
3	Workforce Development Plan (WDP)	NA	Pending
4	Active Transportation	Annadale mode shift: 14,000 ft^2 of new sidewalk and over 2,000 linear ft of new bike lanes	Pending
5	Affordable Housing	Chinatown Housing Project: 57-unit mixed-used affordable development in Chinatown	Pending
6	Active Transportation	LED streetlights	Pending
7	Urban Greening	Tree planting and park expansion	Pending
8	Urban Greening	China Alley: green alley	Pending
9	Food Waste Prevention	Southwest Fresno Community Food Hub	Pending

10	Low Carbon Transportation	Clean Shared Mobility Network: EV charging stations, ridesharing, and bicycle sharing programs	Pending
11	Rooftop Solar and Energy Efficiency	Solar and energy efficiency projects	In progress; Workforce development and community engagement workshops held
12	Urban and Community Forestry	Southwest Urban Forest Expansion	Pending
13	Urban and Community Forestry	Yosemite Village Permaculture Community Garden & Urban Farm Incubator	In progress; Sub-grant agreement with City of Fresno executed in April 2019
14	Urban and Community Forestry	Inside Out Community Garden	Pending
15	Urban and Community Forestry / Urban Greening	Southwest Fresno Community Food Hub: Community Orchard & Urban Heat Island Mitigation	Pending
16	Urban Greening	Southwest Fresno Trail	Pending
17	Urban Greening	Chinatown Urban Greening	Pending
18	Urban Greening	Mariposa Plaza	Pending
19	Urban Greening	Park at MLK Magnet Core	Pending
20	Urban Greening	Fresno City College: West Fresno Satellite Campus	Pending
21	Leveraged Project	Property Based Improvement District	In progress; Sub-grant agreement with City of Fresno executed in January 2018
22	Leveraged Project	Enhanced Fleet Modernization Program (EFMP) Plus-Up Vehicle Replacement and Incentives project	In progress; Sub-grant agreement with City of Fresno executed in May 2019
23	Leveraged Project	West Fresno Satellite Campus offsite improvements	In progress; Sub-grant agreement with City of Fresno executed in January 2018
24	Leveraged Project	Fresno Area Express (FAX) increased transit frequencies	In progress; Procurement underway for purchase of two 40-ft electric buses

Table A2. Ontario Together TCC individual project progress (as of June 2019)

	Project type	**Details**	**Status / Key Accomplishments**
1	Community Engagement Plan (CEP)	NA	Ongoing; Formation of the Ontario Together governance body and appointment of trustees; 5 resident leaders onboarded and trained to assist with engagement efforts; public meetings held by the Community Health Improvement Association (CHIA)
2	Displacement Avoidance Plan (DAP)	NA	Ongoing; The Ontario Housing Authority has secured funding from a developer ($15.7 million) and state and housing tax credits ($5.8 million) for the construction of Emporia Place Apartments, which will bring 75 units of affordable housing to the project area; The City

			of Ontario issued a $24.6 million bond to rehabilitate and extend the affordability covenants of 86 housing units at Ontario Townhouses, also located within the project area.
3	Workforce Development Plan (WDP)	NA	Pending
4	Active Transportation	Pedestrian Pathway Improvements and Network	Pending
5	Active Transportation	Mission Boulevard Bike and Pedestrian Improvements	Pending
6	Affordable Housing	Vista Verde Apartments: 101-unit affordable housing development	In progress; City of Ontario issued $21 million in Multi-family Mortgage Revenue Bonds and executed two loan agreements totaling $4,420,000 to help finance the cost of the development; Ontario Housing Authority closed escrow and began construction in June 2019.
7	Low Carbon Transit Operations	Transit Pass Program/ Travel Training/ Route 83 Expansion	Pending
8	Low Income Weatherization	Ontario Shines: Multi-family Solar PV	Pending
8	Low Income Weatherization	Ontario Shines: Single-family Solar PV	Pending
10	Organics	Ontario Carbon Farm	Pending
11	Urban and Community Forestry	Urban canopy: planting 365 trees in Downtown Ontario	Pending
12	Leveraged Project	Healthy Ontario Initiative	Ongoing; 11 public meetings held with residents about available resources in the community, TCC project updates, and additional funding opportunities (19-54 stakeholders engaged at each HOI meeting)
13	Leveraged Project	Small Business Support Program	Ongoing; Launched the Lightspeed Makerspace at the central library in downtown Ontario; 250 businesses contacted about small business technical assistance opportunities; 43 businesses directly engaged about small business technical assistance opportunities

Table A3. Watts Rising TCC individual project progress (as of June 2019)

	Project type	**Details**	**Status / Key Accomplishments**
1	Community Engagement Plan (CEP)	NA	Ongoing; The Leadership Council had its kickoff meeting in May and met again in June 2019.
2	Displacement Avoidance Plan	NA	Ongoing; Two funding opportunities were applied for: the California Department of

	(DAP)		Housing and Community Development Affordable Housing Sustainable Communities Grants
3	Workforce Development Plan (WDP)	NA	Pending
4	Affordable Housing and Sustainable Communities	Jordan Downs Phase 2A	In progress; Bicycle Education and Safety Training classes kicked off with about 40 attendees at the first event.
5	Low Carbon Transit Operations Program	DASH Bus Electrification	In progress; LADOT provided a service plan for new battery- electric buses; LADOT issued an RFP to procure 10 battery- electric DASH buses
6	Low Carbon Transportation	Mega Watts Electric Vehicle Car Share	In progress; EV site assessments and host agreement execution began
7	Low Income Weatherization Program	Program Solar Watts	Pending
8	Low Income Weatherization Program	Energy Efficiency	Pending
9	Urban Greening	WalkBike Watts	Pending
10	Urban Greening	Wilmington Avenue Great Streets	Pending
11	Urban Greening	Weigand Elementary Urban Trees / Rain Garden	Pending
12	Urban Greening	Watts Cool Schools - Green Schools	Pending
13	Urban Greening	Greening the Blue Line	Pending
14	Urban Greening	Freedom Tree Park	In progress; Freedom Tree Park held three community events for Jordan Downs residents, park users, and Watts families, with over 100 attendees across three events in English and Spanish
15	Urban and Community Forestry	Community Healing Tech Garden	In progress; The Watts Community Healing Tech Garden planted 10,890 square feet of garden, distributed 250 pounds of food, held their first Community Gardening Day with 25 attendees, and gave their first community tour for city and Watts Rising staff with 20 attendees
16	Urban and Community Forestry	Watts Yardeners	In progress; The Watts Yardners Program distributed over 200 flyers in English and Spanish to outreach to Watts residents.
17	Urban and Community Forestry	Greening Public Housing	In progress; The Greening Public Housing project contacted 30 local youth through outreach (English) and contacted 80 residents through outreach (English and Spanish).
18	Urban and Community Forestry	Greening Watts	In progress; The Greening Watts project contacted 80 residents through outreach (English and Spanish).

19	Food Waste Prevention and Rescue Program	MudTown Farms food rescue project	Pending
20	Leveraged Projects	Jordan Downs Phase 1B	In progress; Housing units currently under construction
21	Leveraged Projects	103rd Street Trees	Pending
22	Leveraged Projects	Central Avenue Streetscape	Pending
23	Leveraged Projects	103rd Street Streetscape	In progress; This project broke ground in May 2019 and is currently underway; 3,500 square feet of pedestrian pathways was completed from Grape Street to Weigand; 6 ADA standard ramps were installed at Grape and 103rd Streets
24	Leveraged Projects	Century Boulevard Complete Streets	Completed in August 2018
25	Leveraged Projects	Jordan Downs Retail Center	In progress; Nike, Inc., Smart & Final Extra!, Ross Stores, Inc., and Blink Fitness have all signed leases at Primestor Development Inc.'s Jordan Downs Plaza.
26	Leveraged Projects	Success Avenue Green Streets	Pending

Appendix B: Craigslist Scraping Documentation

Purpose

The purpose of this appendix is to detail how we are using Craigslist rental and housing data to better understand local housing markets in Transformative Climate Community (TCC) investment regions. The goal of the TCC program is to "empower the communities most impacted by pollution to choose their own goals, strategies, and projects to reduce greenhouse gas emissions and local air pollution." This study is part of a multi-year evaluation of the TCC project by UCLA's Luskin Center for Innovation. In particular, with this study, we would like to see how climate investments impact housing affordability in 4 TCC sites: Fresno, Ontario, Watts, and Pacoima. Craigslist.org was chosen to measure rental and housing affordability because it contains very rich micro-neighborhood level rental and housing data.

Data collection will be from November 2019 to July 2020.

Sites

The TCC program investment regions include 3 sites from Round 1 of the program (Fresno, Ontario, Watts) and 1 site for Round 2 of the program (Pacoima).

Site Definition:

1. *TCC Sites*:

   Each TCC Site can be specified using either 1 of 2 methods, a) using the actual TCC project boundaries with a shapefile, or b) using U.S. Census Tracts that overlap with TCC project boundaries.

   a. Actual TCC project boundary shapefiles: 'TCC Box Folder/Climate Action/Transformative Climate Communities - Round I/Shapefiles/TCC Project Area Boundaries and Control Tracts/TCC Census Tract Clusters and Control Tracts'

   b. Census Tract TCC project boundary shapefiles: 'TCC Box Folder/Climate Action/Transformative Climate Communities - Round I/Shapefiles/TCC Project Area Boundaries and Control Tracts/TCC Formal Site Boundaries'

2. *TCC Control Sites*:

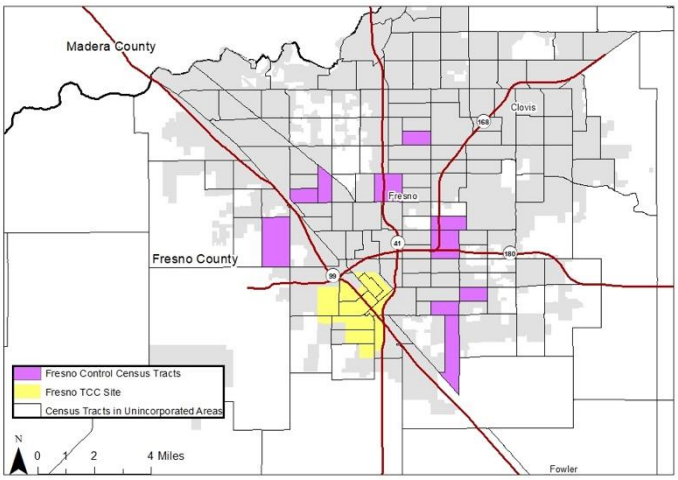
   TCC Control Sites were selected because they fell outside of TCC project boundaries and would serve as a set of control sites that did not receive the TCC project treatment, which includes housing affordability investments.

   Census Tract TCC Control Site boundary shapefiles: 'TCC Box Folder/Climate Action/Transformative Climate Communities - Round I/Shapefiles/TCC Project Area Boundaries and Control Tracts/TCC Formal Site Boundaries'

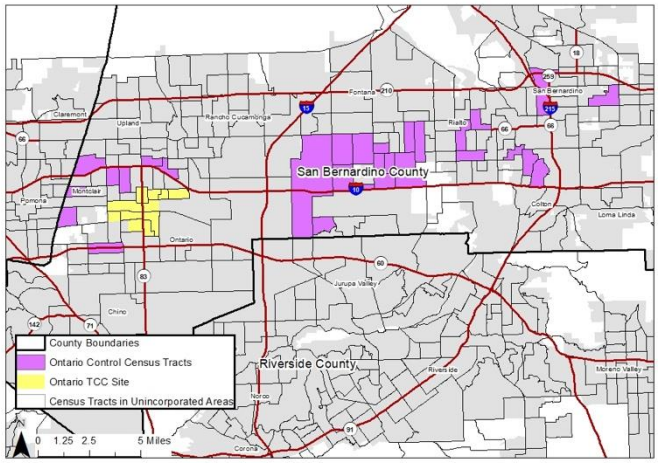
Site Boundaries:

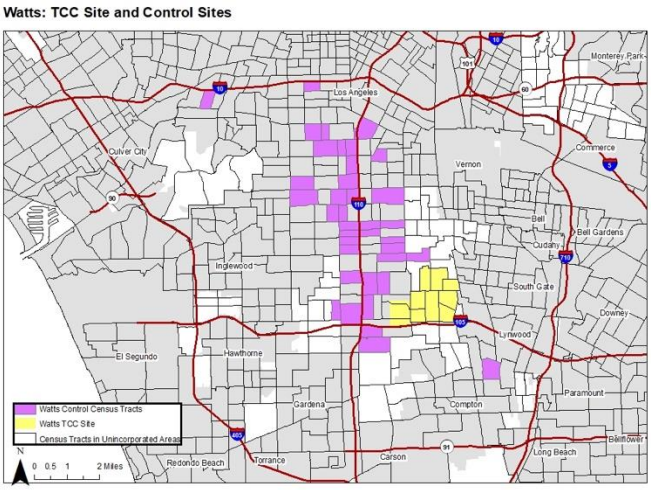
See below for maps of TCC Site and Census Tract boundaries. Note that the TCC site boundaries do not always correspond with Census Tract boundaries.

Fresno: TCC Site and Control Sites



Ontario: TCC Site and Control Sites





Domains

With each TCC Site, we matched them with a corresponding Craigslist region. Craigslist regions roughly correspond to U.S. Census Bureau Metropolitan Statistical Areas (MSA).

TCC Site	**Craigslist Region**	**Region - Census MSA**	**Craigslist Domain**
Fresno, CA	Fresno-Madera	Fresno, CA MSA; Madera, CA MSA	https://fresno.craigslist.org/
Ontario, CA	Inland Empire	Riverside-San Bernardino-Ontario, CA MSA	https://inlandempire.craigslist.org/
Watts, CA	Los Angeles	Los Angeles–Long Beach–Anaheim MSA	https://losangeles.craigslist.org/
Pacoima, CA	Los Angeles	Los Angeles–Long Beach–Anaheim MSA	https://losangeles.craigslist.org/

Listings

For each Craigslist Domain, we collect 6 general types of listings:

1. Apartments and Housing for Rent
2. Real Estate Listings Posted by Brokers
3. Real Estate Listings Posted by Owners
4. Rooms and Room Sharing
5. Sublets and Temporary Rentals
6. Vacation Rentals

Each type of listing is separated based on Craigslist's categorization of housing listings. And each listing type corresponds to a different subdomain within a Craigslist Domain. See below for a table of each listing type we use, their corresponding categories, and their subdomains ('region' can be replaced with 'fresno', 'inlandempire', 'losangeles', etc.). For each subdomain, there are at most 3,000 listings available to be collected because Craigslist caps the number of listings that can be seen at a time at 3,000.

Listing Type	Craigslist Category	Craigslist Subdomain
1) Apartments and Housing for Rent	apts / housing for rent	region.craigslist.org/search/apa
	housing swap	
	housing wanted	
	office / commercial	
	parking / storage	
2) Real Estate Listings Posted by Brokers	real estate - by broker	region.craigslist.org/search/reb
3) Real Estate Listings Posted by Owners	real estate - by owner	region.craigslist.org/search/reo
4) Rooms and Room Sharing	rooms / shared	region.craigslist.org/search/roo
	rooms wanted	
5) Sublets and Temporary Rentals	sublets / temporary	region.craigslist.org/search/sub
6) Vacation Rentals	vacation rentals	region.craigslist.org/search/vac

We chose to collect data on various types of rentals that were more formal (apartments, houses, sublets, temporary rentals, vacation) and informal (room listings and room sharing). To capture formal housing listings, we wanted to collect all real estate listings, regardless of who posted it (broker and owner). Craigslist Categories we chose not to collect include housing swap, housing wanted, office / commercial, parking / storage, and rooms wanted. See Section 4a for examples of each listing type we collect data on.

Scraping Craigslist Listings

To scrape Craigslist listings, we use a Python Program to pull listing data for specific regions, subdomains, and time periods. There are 4 main scraping groups of listing scrapes, all of which are specific to a region, they are called Fresno, Watts1, Watts2, and Ontario.

Scraping Group 1 is called the Fresno group, which includes all 6 of the listing types for the Fresno/Madera region from the following websites:

- https://fresno.craigslist.org/search/apa,
- https://fresno.craigslist.org/search/reb,
- https://fresno.craigslist.org/search/reo,
- https://fresno.craigslist.org/search/roo,
- https://fresno.craigslist.org/search/sub,
- https://fresno.craigslist.org/search/vac

Scraping Group 2 is called the Watts1 group, which includes all apartment and housing rentals for the Los Angeles region from the following website:

- https://losangeles.craigslist.org/search/apa

Scraping Group 3 is called the Watts2 group, which includes all the 5 other listing types besides apartment and housing rentals for the Los Angeles region from the following websites:

- https://losangeles.craigslist.org/search/reb,

- https://losangeles.craigslist.org/search/reo,
- https://losangeles.craigslist.org/search/roo,
- https://losangeles.craigslist.org/search/sub,
- https://losangeles.craigslist.org/search/vac

Scraping Group 4 is called the Ontario group, which includes all 6 of the listing types for the Inland Empire region from the following websites:

- https://inlandempire.craigslist.org/search/apa,
- https://inlandempire.craigslist.org/search/reb,
- https://inlandempire.craigslist.org/search/reo,
- https://inlandempire.craigslist.org/search/roo,
- https://inlandempire.craigslist.org/search/sub,
- https://inlandempire.craigslist.org/search/vac

Schedule and Timing

For each Scraping Group, there are specific time periods in which a Python program is run to collect Craigslist listings from their respective websites for the previous 24 hours.

For the Fresno, Watts2 and Ontario groups, listings are collected daily at 12am midnight. These scraping groups collect listings from their respective websites for the previous 24 hours. So, if the program were run Dec 18, 2019 at 12am, the listings posted from Dec 17, 2019 at 12am to Dec 18, 2019 at 12am would be collected in our Python program.

With the Watts1 group, listings are collected at 4 time points for listings posted in the last 24 hours: 12am midnight, 6am, 12pm noon, and 6pm. The reason for collecting data at 4 time points for Watts1 is because of the large volume of listings posted in the Los Angeles region. If we were to only collect listings at midnight for Los Angeles, the listings would only cover listings posted between 6pm the day before and 12am today, so a 6-hour time period. Therefore, to order to capture listings from the previous 24 hours, we would need at least four 6-hour time periods.

Python Program Logic

The Python program goes in 2 steps to collect listing information for listings in each website in a Scraping Group. The Scraping Group is an input to the Python program and is inputted from AWS Lambda. To collect the listings, the program first collects all the metadata for listings for each website in a Scraping Group. This is because the set of listings could change if the program collects listing information by each page in a website's search results. This could be an issue in regions where the volume of listings is high and the set of listings in the search results of a website is different from one hour to the next. Collecting the metadata first resolves this issue because we have our set of listings defined first, and then we collect listing information for each listing in the set.

Step 1: Collect All Listing Metadata

First, the Python program is given as an input the Scraping Group that we are looking to collect listings for (Fresno, Watts1, Watts2, or Ontario). Then the program loops through each website

in a Scraping Group, starting on the first page of a website's search results. The program goes through the following logic:

- For each website in a Scraping Group
    - For each page in website's search results (24 pages max, 120 listings per page)
        - Get Page Request
            - If Error
                - Log Error
            - Else
                - Use XPath to pull listing metadata for each listing (120 per page max)
                - Add listing metadata to a Python list for each website

Each website will be a value in a Python dictionary, and each website will have a Python list of listings metadata, which will look something like this:

{'https://fresno.craigslist.org/search/apa':
[listing 1apa metadata, listing 2apa metadata, …, listing napa metadata],
'https://fresno.craigslist.org/search/reb':
[listing 1reb metadata, listing 2reb metadata, …, listing nreb metadata],

…,

'https://fresno.craigslist.org/search/vac':
[listing 1vac metadata, listing 2vac metadata, …, listing nvac metadata]}

Step 2: Collect Listing Information for each Listing in the All Listing Metadata

The loop starts with the first website in the Python dictionary from Step 1, and then starts on the first listing in a website's set of listings. What limits the Python program from collecting listing information for all of the listings in a listing set is the earliest timestamp (24 hours from the scrape time point, e.g. midnight the day before) and the latest timestamp (the scrape time point, e.g. midnight today). With those parameters, the program goes through the following logic:

- For each website in a Scraping Group
    - For each listing in the set of listings
        - Use XPath to pull basic listing information from a listing
        - For each variable in a listing (total 9 variables)
            - If missing variable
                - Return empty string, ''
            - Else
                - Store variable value in a Python dictionary
        - If listing posting datetime IS AFTER the latest timestamp
            - Log listing information
        - If listing posting datetime IS BEFORE the earliest timestamp
            - End the collection of listing information for a website
        - Else
            - Use XPath to pull detailed listing information from a listing's url

- Get Page Request for Listing URL
    - If Error
        - Log Error
    - Else
        - For each variable in a listing page (total 5 variables)
            - If missing variable
                - Return empty string, ‘’
            - Else
                - Store variable value in a Python dictionary

The result will be a Python list of Python dictionaries with the basic and detailed listing information for all the websites in a Scraping Group. The Python list will look something like this:

[{'pid': '7013124775', 'repostid': '6806430675', 'dt': '2019-11-03 21:36', 'url': 'https://fresno.craigslist.org/apa/d/fresno-2-bed-villa-borgata/7013124775.html', 'title': '2 Bed Villa Borgata', 'price': '900', 'neighb': 'Downtown Fresno', 'beds': '2', 'sqft': '', 'lat': '36.738717', 'lng': '-119.779334', 'accuracy': '15', 'address': '', 'posttext': 'Clean 2 bed, 1.25 bath second story condo near CRMC hospital and courthouse. Walking distance to grocery and Amtrak in a secured complex with pool and laundry. Looking for a reliable tenant. $900/month. Call or text me at', 'domain': 'https://fresno.craigslist.org/search/apa'},

{'pid': '7013117288', 'repostid': '', 'dt': '2019-11-03 21:02', 'url': 'https://fresno.craigslist.org/apa/d/coarsegold-rural-home/7013117288.html', 'title': 'Rural Home', 'price': '1700', 'neighb': 'Coarsegold', 'beds': '3', 'sqft': '2140', 'lat': '37.221400', 'lng': '-119.745500', 'accuracy': '22', 'address': '', 'posttext': 'Lovely 3-Bedroom Home on 2 acres - 3-bedroom - 2.5-baths. Non smoking. Must have good credit history. Pet negotiable. Include name, email & phone number with your inquiry.', 'domain': 'https://fresno.craigslist.org/search/apa'},

…

{'pid': '7004592372', 'repostid': '6952206395', 'dt': '2019-11-03 03:38', 'url': 'https://fresno.craigslist.org/vac/d/flagstaff-rent-cozy-cabin-this-fall-or/7004592372.html', 'title': 'Rent a Cozy Cabin this Fall or Winter', 'price': '0', 'neighb': 'Flagstaff, Az.', 'beds': '3', 'sqft': '', 'lat': '35.387623', 'lng': '-111.384791', 'accuracy': '22', 'address': '', 'posttext': 'Please visit vrbo.com/1336516 for information. Thank you.', 'domain': 'https://fresno.craigslist.org/search/vac'}]

Amazon Web Services Integration

The entire scraping procedure is performed in the Amazon Web Services (AWS) ecosystem. It utilizes AWS Elastic Computing Cloud (EC2) to store the Python program, Python libraries, scraping logs, and scraping test data (logs and test data are used for debugging). It also uses the

AWS Relational Database Service (RDS) to store the scraped listings we get from our Python program in a MySQL Database. To perform these scrapes automatically in AWS, we take advantage of AWS Lambda, which allows us to start an EC2 Instance to run the Python program on a predetermined schedule (see Section 1ei. for the scraping schedule and Section 2d on how to change the scraping schedules in AWS Lambda). The Lambda programs loop through EC2 Instance IDs, which correspond to different scraping groups (Fresno, Watts1, Watts2, Ontario) and are used as an input to the Python scraping program. This tells the Python program which scraping group to pull listing information for.

MySQL Database

After the detailed Craigslist listing information is compiled from the Python scraping program, a list of Python dictionaries with 15 variables for each Craigslist listing for a scrape period, all the of listings are uploaded to an AWS MySQL Database. The table for Craigslist listings in the database is called the 'craigslist_table' (See Section 2c. for more on how to access the craigslist listing data in the database).

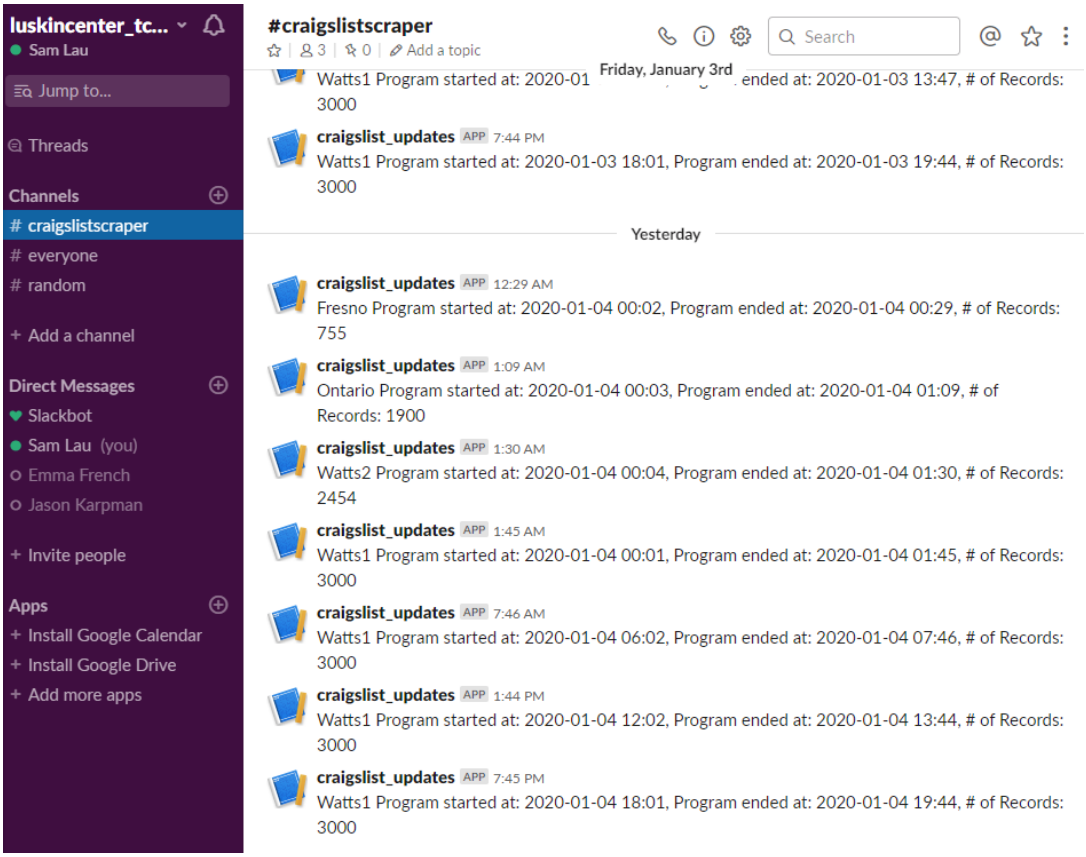
The 'craigslist_table' has the following fields:

- pid: Posting ID
- dt: Posting Datetime (Year-Month-Day Hour-Minute, e.g. '2019-11-03 03:38')
- url: Listing URL
- repostid: Reposting ID (used to link postings that are repostings by ID)
- title: Listing Title
- price: Listing Price
- neighb: Neighborhood
- beds: Bedrooms
- sqft: Square Footage
- lat: Latitude (WGS84 datum)
- lng: Longitude (WGS84 datum)
- accuracy: Geolocation accuracy
- address: Postal Address
- posttext: Listing Post Text
- region: scraping group (Fresno, Watts1, Watts2, Ontario)
- begts: scraping program beginning timestamp for scraping group (Year-Month-Day Hour-Minute, e.g. '2019-11-03 03:38')
- endts: scraping program ending timestamp for scraping group (Year-Month-Day Hour-Minute, e.g. '2019-11-03 03:38')

Note that listings in the 'craigslist_table' are valid from November 4, 2019 and onwards. Adjustments were made to adjust for daylight savings time changes and to add additional scrape periods for Watts1. A detailed list of documented changes to the MySQL database and tables can be found here:
https://drive.google.com/open?id=1RzZNZ4RFH1U6oZvBZFEfeW_d04CSkHIg

Scraping Monitoring (Slack Notifications)

To monitor the progress of the scraping programs, we have integrated the Slack API to post updates on a Slack workspace, luskincentert-reb7272.slack.com. On the #craigslistscraper channel, the start time, end time, and listing scrapes for each scraping group and period are posted as messages. See below for an example of posted messages for January 4, 2020.



Slack API settings are under Sam Lau's account information.

Amazon Web Services (AWS)

The AWS EC2, RDS, S3 and Lambda products are utilized to run the Craigslist scraping program. To set up and adjust AWS settings, we use the online product management tools at https://aws.amazon.com/. See Jason Karpman for AWS login and password information for the Luskin Center for Innovation AWS account. In this section we will explain how we set up and use EC2 Instances, the MySQL database, and AWS Lambda.

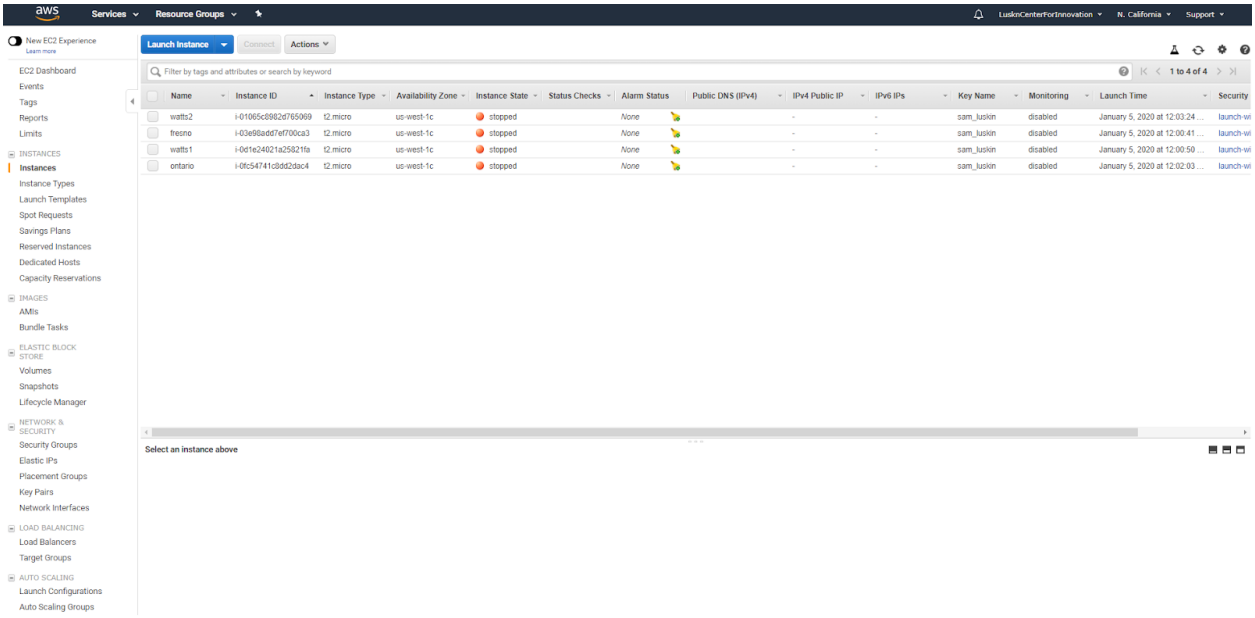
The AWS account is currently under the AWS Free Tier, which is a 12 month offer on popular AWS products (link). The initial sign-up date for the Luskin Center AWS account is May 2019. After May 2020, the AWS account will no longer be using the free tier.

AWS Elastic Compute Cloud (EC2) Instances

EC2 is a web service that provides resizable compute capacity in the cloud (link). An EC2 Instance is computing capacity that we rent to perform computer tasks, such as Craigslist

scraping. An alternative to using an EC2 Instance is using a personal/work computer or laptop or dedicated server to run the Craigslist scraping program, but some limitations of this approach are lack of scalability, maintenance costs, and a potential lack of consistent computing capacity.

To access our EC2 Instances, you must be signed into the Luskin Center for Innovation AWS account. Then, once you are there, you have to click the 'Services' tab and the 'EC2' link within the 'Compute' service grouping. Clicking the 'Instances' link on the dashboard on the left-hand side will take you the page below, the Instance Landing Page.



Clicking through each instance (4 total), you will see which instances correspond to which scraping groups. Instance IDs i-03e98add7ef700ca3, i-0d1e24021a25821fa, i-01065c8982d765069, and i-0fc54741c8dd2dac4, correspond to Fresno, Watts1, Watts2, and Ontario, respectively.

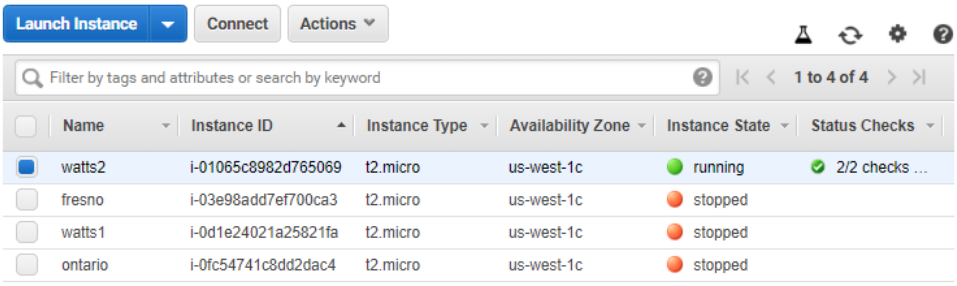
Each of these instances have the following specifications:

- Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type (8 GB)
    - Each SSD Volume uses Elastic Block Storage (EBS). An EBS volume is a portable way to store data on EC2 instances and keep your programming environment, program files, and data logs in one place even if you are renting a computing capacity from a different EC2 computer, which we constantly are doing.
- Instance type: t2.micro (specs)

Accessing an AWS EC2 Instance

On the Instance Landing Page (see 2a above for directions to get there), there are 2 key pieces of information we need from an instance, the instance ID and the Public DNS (IPv4). If you click an instance, the instance ID will show up in the Description window at the bottom of the page. To get the Public DNS, you have to Start an Instance. To do that you have 1) right click an instance, 2) go to 'Instance State' and 3) click the 'Start' button. Once the 'Instance State'

has changed from ‘stopped’ to ‘running’, you should copy the Public DNS (see blue highlighted section below).



The sub-sections below will show you how to access an Instance using a PC and a Mac.

Important: After you have finished using an Instance, make sure to stop the Instance. To do that you have 1) right click an instance, 2) go to ‘Instance State’ and 3) click the ‘Stop’ button.

The programming environment in each instance is set up using the following commands in the terminal. Step 1 updates and installs Python 3, Step 2 updates and installs pip3, Step 3 install the python packages we need, and Step 4 makes the file directories.

Step 1:
sudo yum install python36
python3 –version

Step 2:
cd /tmp
curl -O https://bootstrap.pypa.io/get-pip.py
python3 get-pip.py –user

Step 3:

```
pip3 install sqlalchemy --user
pip3 install pandas --user
pip3 install mysql.connector --user
pip3 install lxml --user
pip3 install requests --user
pip3 install PyMySQL --user
pip3 install boto3 --user
pip3 install slackclient --user
pip3 install watchtower –user
```

Step 4:

```
cd /home/ec2-user/
mkdir housing
mkdir housing/programs
mkdir housing/data
mkdir housing/data/raw
```

After setting up the programming environment, the last step is placing a copy of the Python scraping program, <craigslist_scraper_aws.py>, in the 'home/ec2-user/housing/programs' directory.

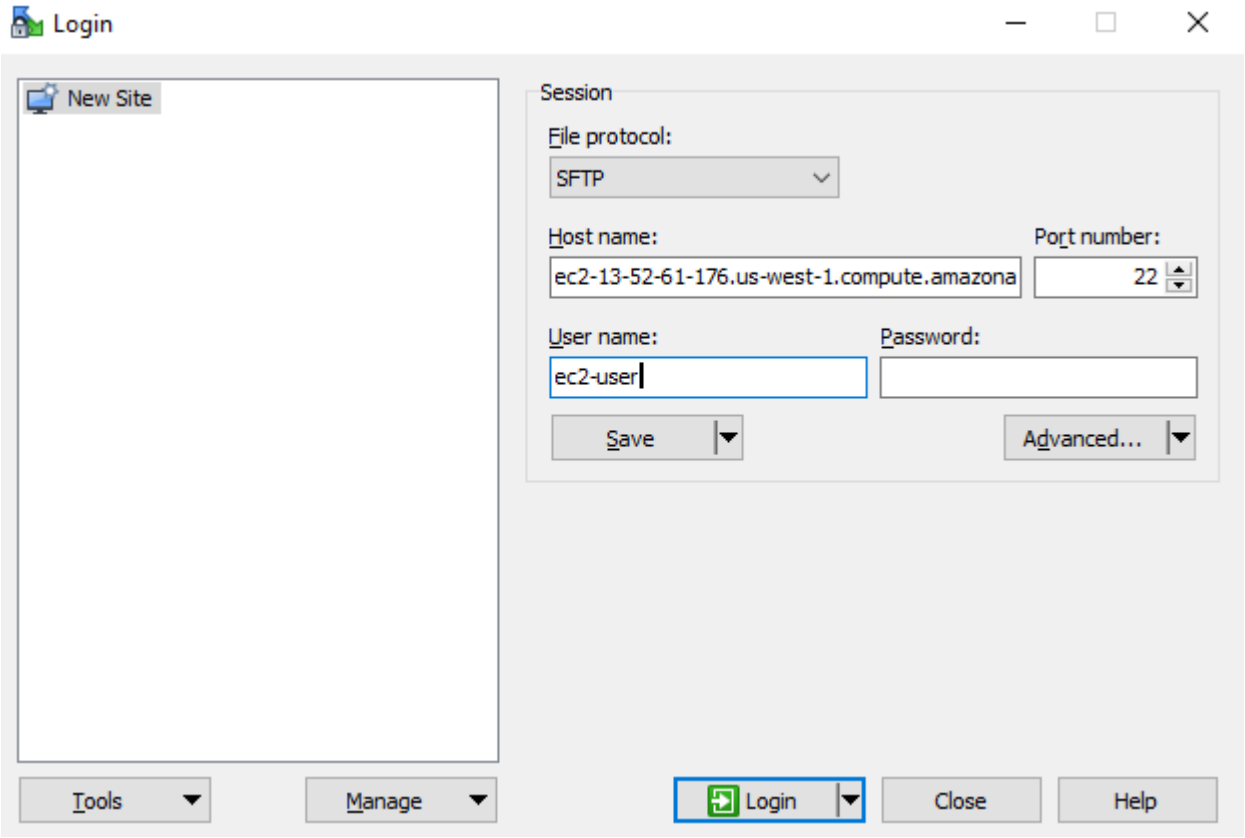
Accessing an EC2 Instance on PC

Step 1:
Navigate to the AWS S3 page using the 'Services' tab and by clicking on the 'S3' link in the 'Storage' Services Group.

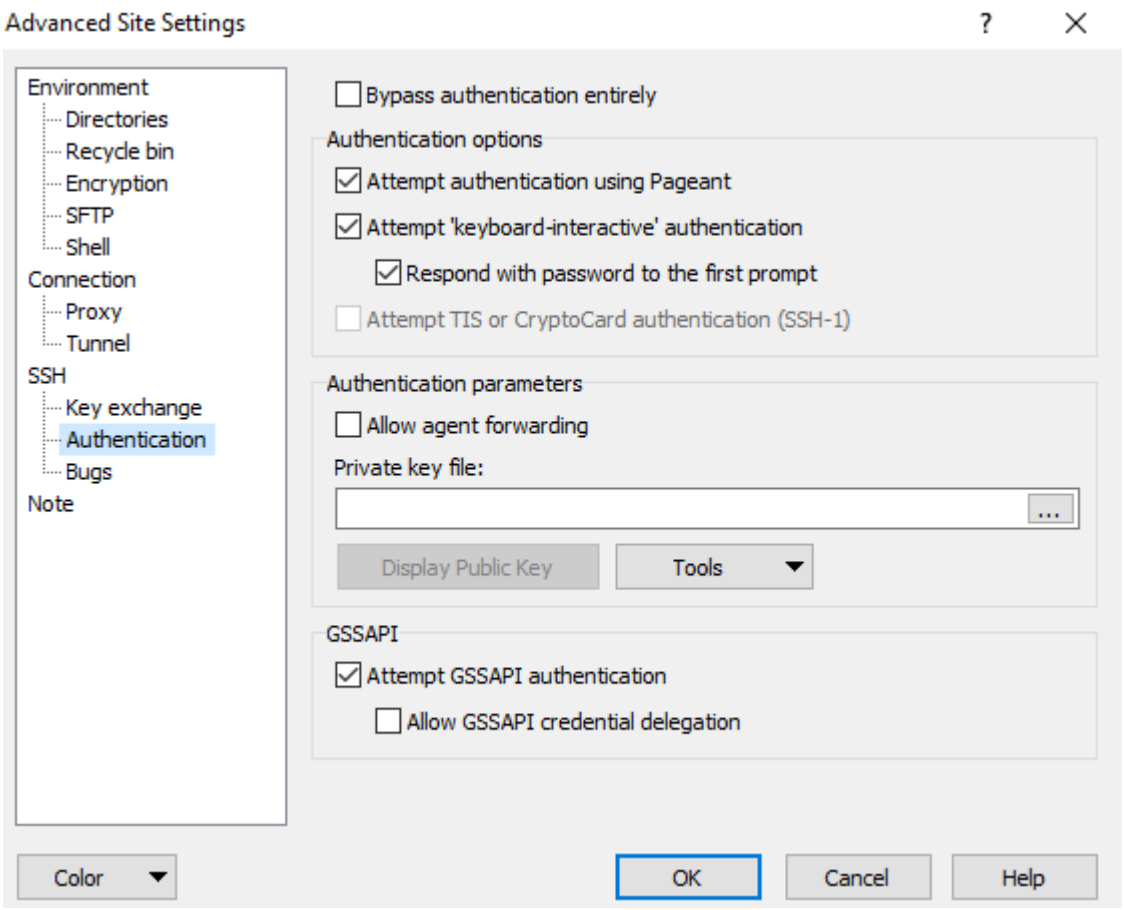
Step 2:
Go into the 'housing-afford-project' bucket and download the PuTTY Private Key <sam_luskin.ppk> and store it in a secure folder on your computer.

Step 3:
Download the most recent version of WinSCP for your Windows computer (link).

Step 4:
Load WinSCP and enter in the Public DNS you collected from the EC2 Landing Page for the Instance you want to access (e.g. 'ec2-13-52-61-176.us-west-1.compute.amazonaws.com'). The inputs for the logging into the EC2 Instance will look like this:



Step 5:
Click on the ‘Advanced’ drop down menu and click the ‘Advanced’ button, navigate to the Authentication tab under the SSH section.



Step 6:
Once you are on the correct tab, load the <sam_luskin.ppk> 'Private key file' that we downloaded earlier and stored in a secure folder.

Step 7:
Login to the EC2 Instance and now you can add, remove, or copy files from the Instance. Make sure to sign out and stop the instance when you are done using the Instance. For more on how to use WinSCP see here: https://winscp.net/eng/docs/guides. Additionally, the access instructions for an EC2 server can also be found here: https://winscp.net/eng/docs/guide_amazon_ec2.

Accessing an EC2 Instance on Mac

Step 1:
Navigate to the AWS S3 page using the 'Services' tab and by clicking on the 'S3' link in the 'Storage' Services Group.

Step 2:
Go into the 'housing-afford-project' bucket and download the PEM file <sam_luskin.pem> and store it in a secure folder on your computer.

Step 3:
Load up the 'Terminal' application and SSH into the EC2 server by entering in the following commands into the terminal.

chmod 400 ‘[directory to the <sam_luskin.pem> file]’
ssh -i [directory to the <sam_luskin.pem> file] [Public DNS you collected from the EC2 Landing Page for the Instance you want to access]

Step 4:
Once you have SSH’d into the EC2 Instance, you can alter the programming environment, copy files to EC2, and copy/delete/move/edit files on the Instance. Make sure to close out the SSH and stop the Instance when you are done using it.

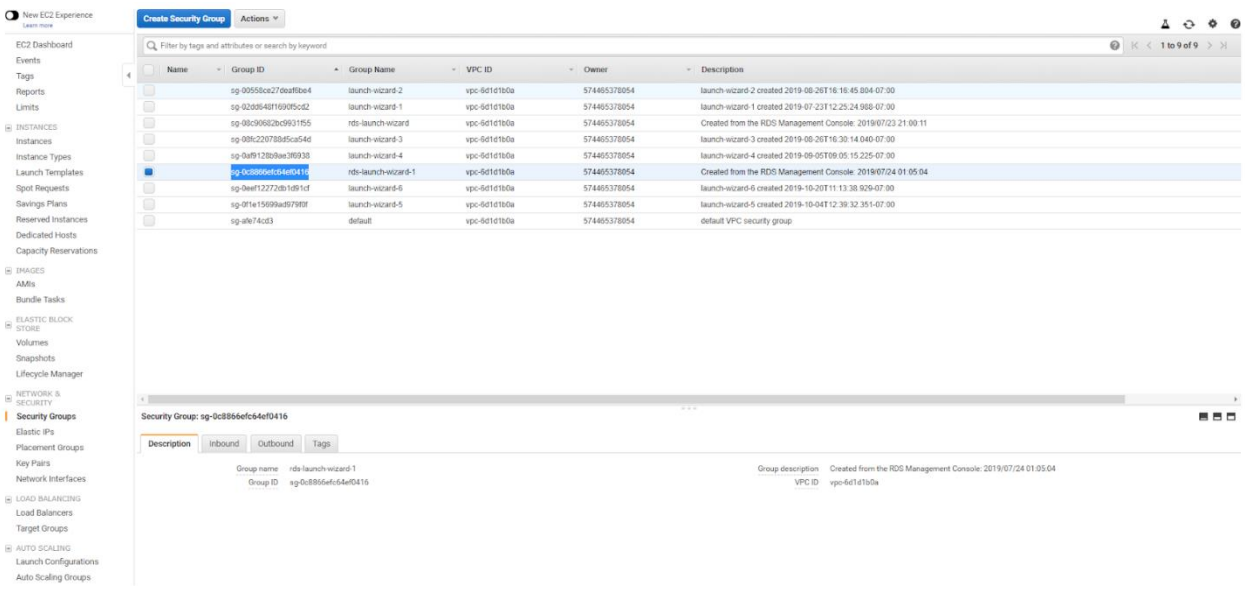
Accessing the MySQL Database

Step 1:
Install MySQL Workbench with the version appropriate for your operating system (https://dev.mysql.com/downloads/workbench/).

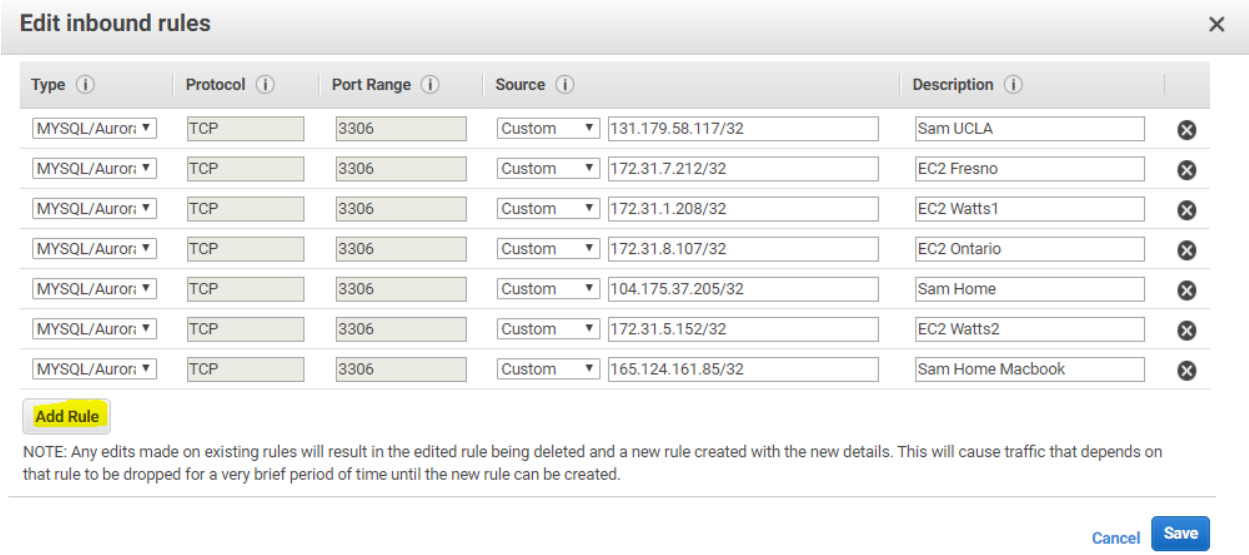
Step 2
Launch MySQL Workbench and Select the ‘Database’ menu, click the ‘Manage Connections’ tab and input the following parameters after making a ‘New’ MySQL Connection:

- Connection Name: housing-afford-db-rds
- Connection Method: Standard (TCP/IP)
- Hostname: housing-site-db.cxxl1so9sozw.us-west-1.rds.amazonaws.com
- Port: 3306 (default)
- Username: luskincenter
- Password: tccproject

Step 3:
Add your IP address to Security group rules on the AWS EC2 Landing page by going to the ‘Security Groups’ section on the left-hand side menu. There you will be selecting the ‘sg-0c8866efc64ef0416’ Security Group ID or the ‘rds-launch-wizard-1’ Security Group Name. The page will look like what is below.



Right click the ‘sg-0c8866efc64ef0416’ security group and choose to ‘Edit inbound rules’. A page will pop-up and will look like what is below.



From there, you need to click the ‘Add Rule’ button to add your IP address to one of the IP addresses that can access the MySQL database. The Type, Protocol, and Port Range fields will be the same. The Source field needs to be filled out with ‘[your IP address]/32’ and provide a Description of the device you are using to access the database.

Step 4:
Once you have added your IP address to the Security Group on AWS, go back to MySQL Workbench and test the connection for to the MySQL Database in the ‘Manage Connections’ tab by clicking the ‘Test Connection’ button. If the connection is successful, a pop-up window will tell you that MySQL Workbench ‘Successfully made the MySQL Connection’.

Step 5:
After doing this, you will be able to open the connection and view the housing website data from the [craigslist_table] that was specified in Section 1f. Once you are done pulling the data that you need, make sure to close the connection and MySQL Workbench.

See below for a couple of commands to pull data from the [craigslist_table] in the MySQL Database using the Query Script Window (make sure the ‘Don’t Limit’ option in the dropdown menu is selected):

1) Select all listings from the [craigslist_table] where the end timestamp is ‘2020-01-05 07:45’

```
SELECT * FROM housing_site_db.craigslist_table
WHERE endts = '2020-01-05 07:45';
```

2) Select all listings from the [craigslist_table] where the posting date is between Jan 1, 2020 and Jan 3, 2020.

```
SELECT * FROM housing_site_db.craigslist_table
```

```
WHERE STR_TO_DATE(dt, '%Y-%m-%d %H:%i')
BETWEEN '2020-01-01' AND '2020-01-03';
```

3) Select all listings from the [craigslist_table] where the scraping group is Fresno and where the posting date is Jan 1, 2020.

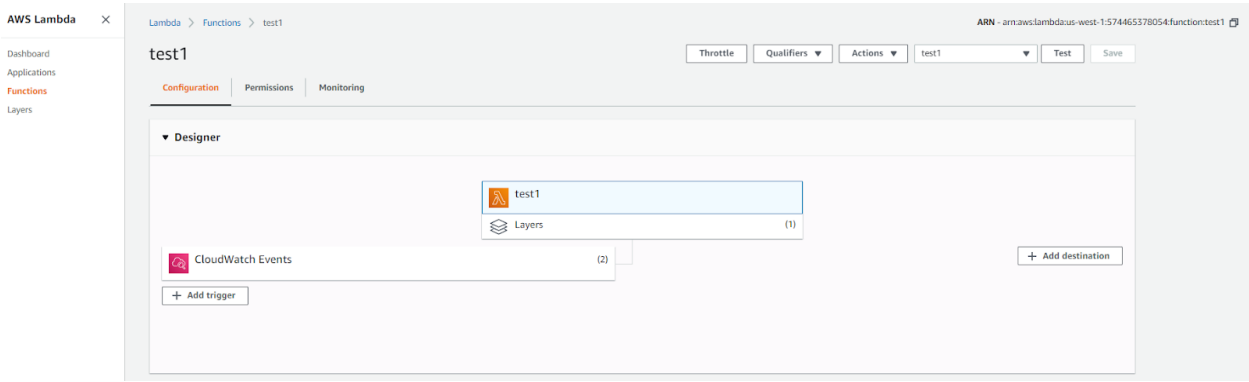
```
SELECT * FROM housing_site_db.craigslist_table
WHERE region = 'Fresno'
AND DATE(STR_TO_DATE(dt, '%Y-%m-%d %H:%i')) = '2020-01-01';
```

AWS Lambda

AWS Lambda is a tool that allows you to run code when something else triggers the code to run. So, for example, with our Craigslist scraper, we use CloudWatch to routinize scrapes for the different Scraping Groups at 12am, 6am, 12pm, and 6pm. The routine for Fresno, Watts2, and Ontario is ‘test1’, which is a Lambda function with Python code and a Python programming environment with preloaded Python packages, also called a Lambda Layer (for more on this, see Section 2di. below). The routine for Fresno, Watts2, and Ontario is ‘test1’ has scrapes scheduled at 12am. The ‘test2’ function is another Lambda function with the same set up as ‘test1’, except that it has scrapes scheduled for 12am, 6am, 12pm, and 6pm. Both the ‘test1’ and ‘test2’ Lambda functions do the following:

1. For each of the scraping groups in the Lambda function:
    a. Start the EC2 Instance for a scraping group
    b. Load the SSH PEM key from AWS S3
    c. SSH into the EC2 Instance (like what we did in Section 2b)
    d. Execute a command that runs the Python scraping program (detailed in Section 1e)
        1. When the program is finished it closes the EC2 Instance
    e. Close the SSH connection

Below is the landing page for the ‘test1’ function. For more on more on how to change scrape times, see Section 2dii. below.



Setting up a Lambda Layer

In AWS, you can set up a Lambda Layer, which is like setting up a portable programming environment with Python libraries already installed. This allows the Lambda function to execute the scraping program with the Python libraries it needs to access AWS EC2 and S3. For a more detailed explanation for each of these Lambda Layer creation steps, see here: https://medium.com/@qtangs/creating-new-aws-lambda-layer-for-python-pandas-library-348b126e9f3e.

Step 1:
Get the version of each python library we need in the Lambda function, which are boto3 and paramiko. We can do this in the terminal by using the 'pip3 freeze' command.

Step 2:
SSH into an EC2 Instance and create a <requirements.txt> file in the folder you want to create your Lambda Layer. The <requirements.txt> file for our Lambda Layer looks like this:

```
boto3==1.9.198
paramiko==2.6.0
```

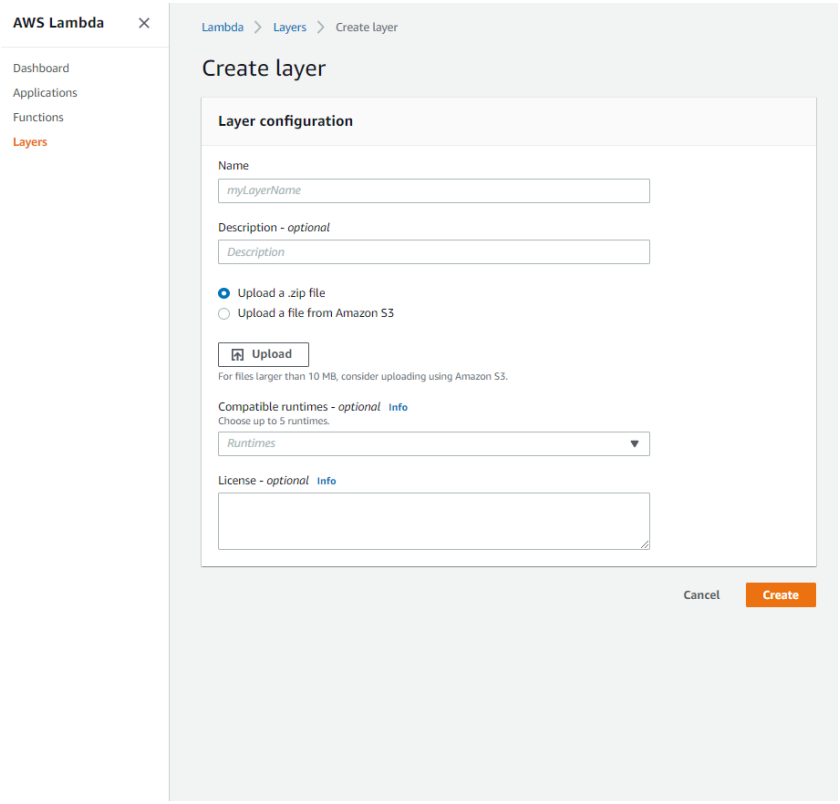
Step 3:
Install Docker Desktop to get Lambda compatible version of Python libraries and create a script called <get_layer_packages.sh> with the code below. This will install the compatible libraries in a 'python' folder in the same directory you placed the <requirements.txt> and <get_layer_packages.sh> files.

```
#!/bin/bash

export PKG_DIR="python"

rm -rf ${PKG_DIR} && mkdir -p ${PKG_DIR}

docker run --rm -v "$(pwd):/foo" -w /foo lambci/lambda:build-python3.6 \
            pip3 install -r requirements.txt -t ${PKG_DIR}
```

Step 4:
The next steps are to run the following commands in the terminal in the same directory where you placed the <requirements.txt> and <get_layer_packages.sh> files.

```
chmod +x get_layer_packages.sh
./get_layer_packages.sh
zip -r my-Python36-Pandas23.zip .
```

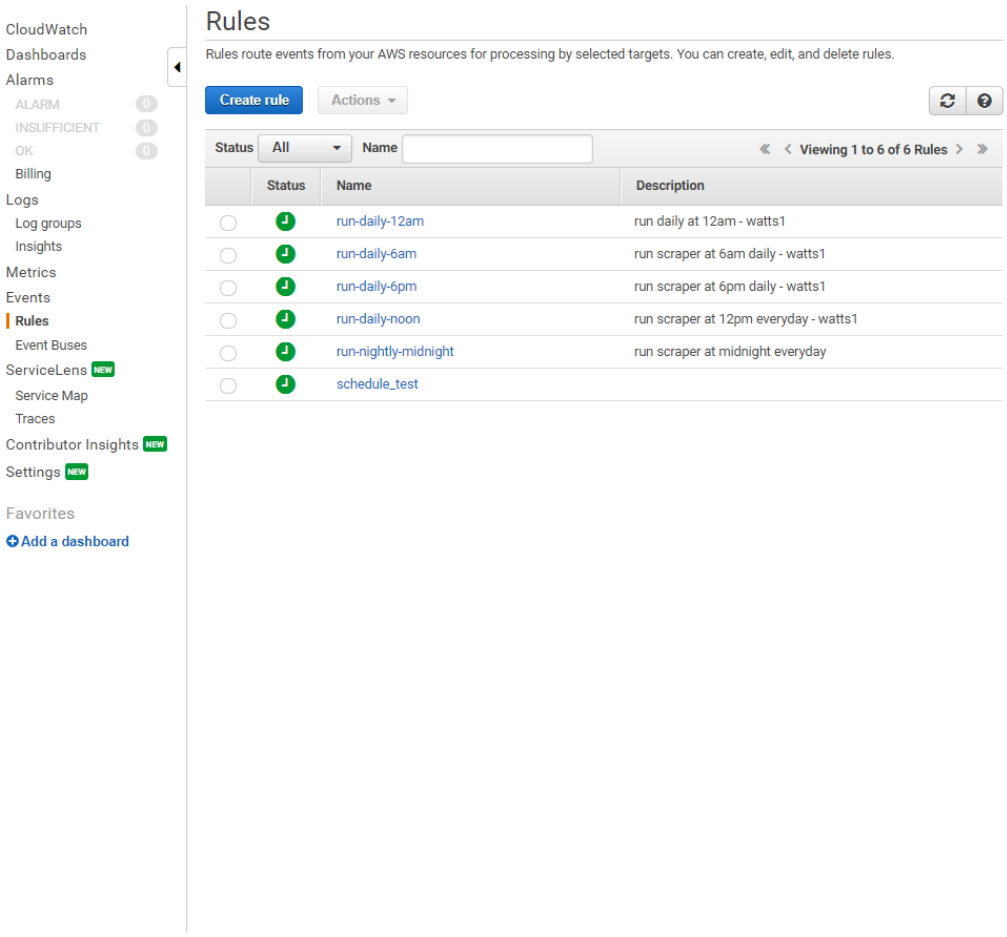
Step 5:
Upload the <my-Python36-Pandas23.zip> file to page below on AWS, give it a name, and create the Lambda Layer.



Step 6:
Note the ARN of the Layer you just created and go back to your Lambda function and add the layer to your function.

Altering Scrape Schedules

To make changes to existing scrape times, you need to go to the AWS CloudWatch service page and go to the 'Rules' section (see below). To change the time of an existing scrape schedule, you need to click one of the rules and edit the 'Cron expression' field for the rule. The Cron expression is the date and time pattern for a Lambda function to be triggered. The expression '00 08 * * ? *' triggers the 'test2' Lambda function to run daily at 12am (the Cron time is in GMT, 7 hours ahead of PST and 1 extra hour ahead after daylight savings time, Nov 3, 2019, to March 8, 2020). To create a new CloudWatch rule, you just need to have a 'Cron expression' and a target Lambda function that will run when the time rule is triggered.



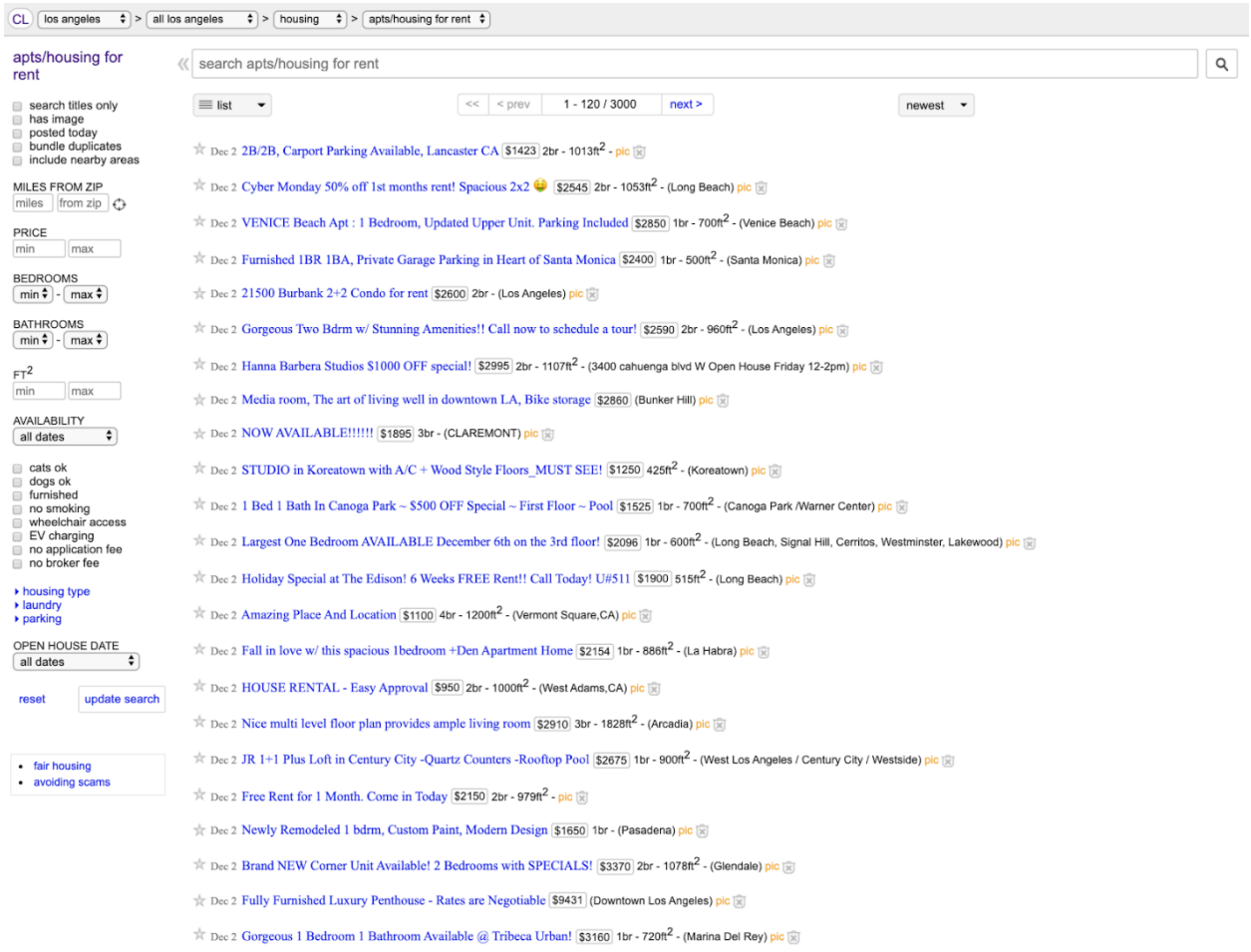
Craigslist Listing Examples

Listings examples for the Los Angeles region were pulled on Dec 2, 2019 and include the following listing types:

1. Apartments and Housing for Rent
2. Real Estate Listings Posted by Brokers
3. Real Estate Listings Posted by Owners
4. Rooms and Room Sharing
5. Sublets and Temporary Rentals
6. Vacation Rentals

1) Apartments and Housing for Rent

Subdomain List of Listings (https://losangeles.craigslist.org/search/apa?)



1) Apartments and Housing for Rent

Sample Listing (https://losangeles.craigslist.org/ant/apa/d/lancaster-2b-2b-carport-parking/7025953613.html)

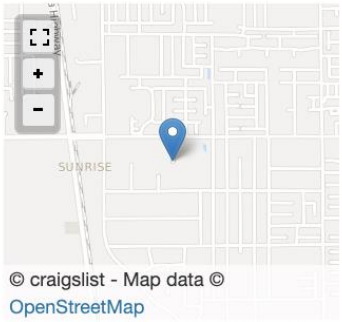
◀ prev ▲ next ▶

reply ☆ favorite ⊗ hide ⚐ flag

Posted 9 days ago print

$1423 / 2br - 1013ft^2 - 2B/2B, Carport Parking Available, Lancaster CA

image 1 of 11



43519 Kirkland Ave
(google map)

2BR / 2Ba **1013ft^2**
available now

cats are OK - purrr
dogs are OK - wooof
apartment

2BD | 2BA | 1013SQFT

At Sienna Heights Apartment Homes in Lancaster, CA, you are made the priority. Our pet-friendly one, two, and three bedroom apartments and townhomes are crafted to provide you with the ultimate comfort and convenience.

Amenities Include:

- Two Spas
- Carport Parking Available
- Modern Fitness Center
- Close to American Heroes Park
- Onsite Laundry Facility
- Move in with NO SECURITY DEPOSIT; only a small one-time fee!!
- Garages Available
- Onsite Dog Park
- Three Sparkling Swimming Pools
- Online Rental Payments
- Onsite Management

Call: show contact info

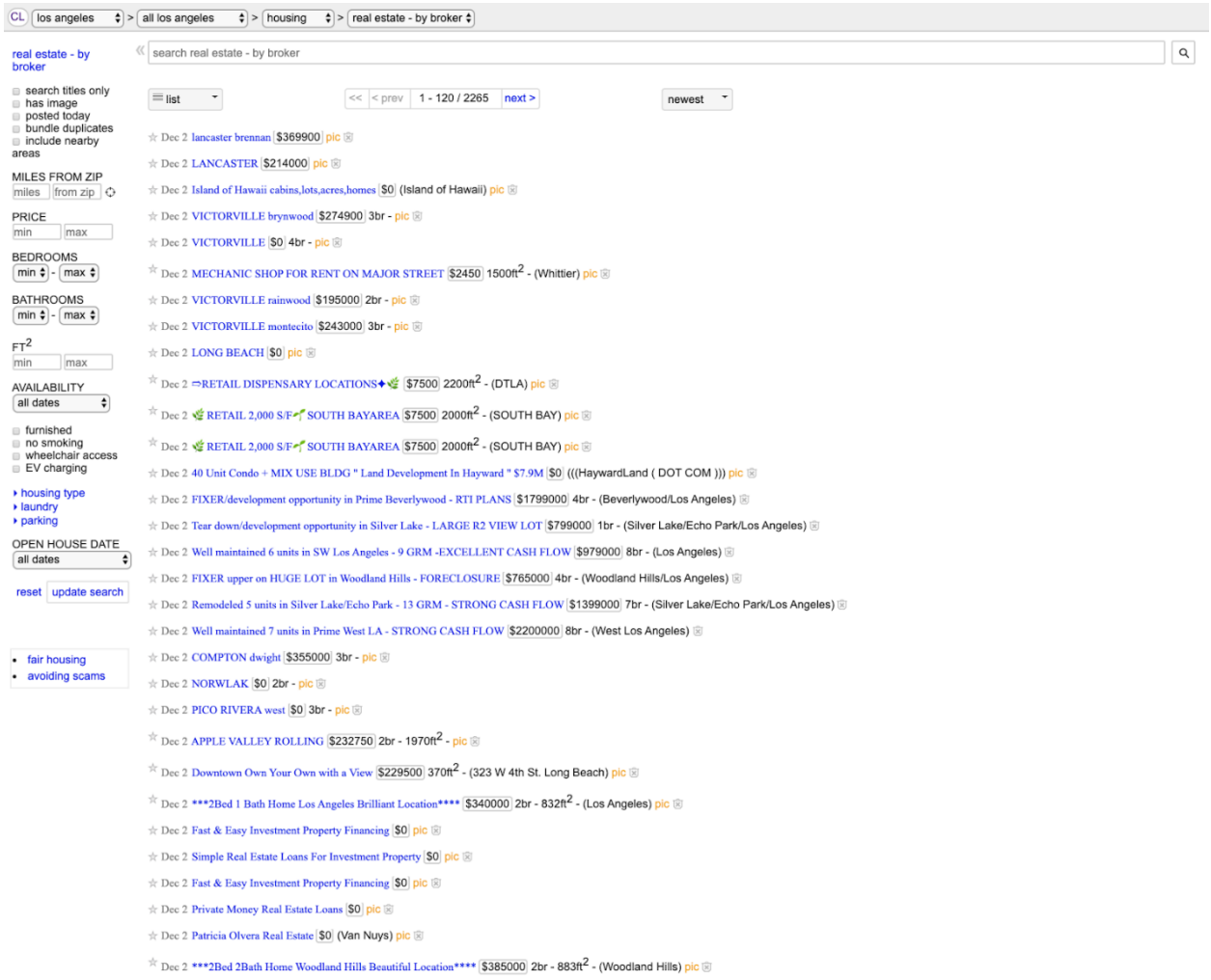
Equal Housing Opportunity
Prices Change Daily
Flexible Lease Terms **Pricing is subject to change daily** **WE DO NOT ACCEPT SECTION 8**

- do NOT contact me with unsolicited services or offers

post id: 7025953613 posted: 9 days ago updated: 27 minutes ago email to friend ♥ best of [?]

2) Real Estate Listings Posted by Brokers

Subdomain List of Listings



2) Real Estate Listings Posted by Brokers

Sample Listing (https://losangeles.craigslist.org/ant/reb/d/artesia-lancaster-brennan/7020715027.html)

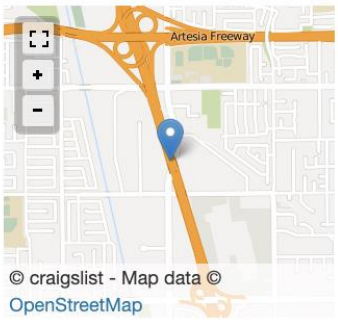
◀ prev ▲ next ▶

reply ☆ favorite ⊠ hide ⚐ flag

Posted 17 days ago print

$369900 lancaster brennan

image 1 of 3



18000 STUDEBAKER RD SUITE 795
(google map)

available now

house

license info: **01114731**

https://youtu.be/X0THTT0l0Ms

JOSE VEGA show contact info . HUD or FANNIE MAE propertys for sale. Perfect for first time buyers. Great opportunity to get a home at a lower price. Available throughout the Southern California area. Web sites are posted here so you can take a look. I post these adds in order for you to get information and for you to give me a call if you have questions. They are available for a limited time only, there is a bid deadline, so act fast. Most of these homes are marketed for owner occupants, 1st time buyers, and regular buyers, so there is special financing for them . You can buy with the FANNIE MAE program or FHA FINANCING even if these homes need repair. Other financing help is available. FANNIE MAE and HUD have closing cost incentives. You can qualify under the FHA quidlines, I can help you with that if your a 1st time buyer. Investors can make a bid after owner occupant deadline has expired. Call for availability and guidlines or visit HUDHOMESTORE.COM or HOMEPATH.COM. So you can see they are true.. JOSE VEGA show contact info BRE 01114731

Disclaimer .....
Some of these postings are old, not up to date, or the homes fell out of escrow and are available again.Most likely if this add is up,its because there is one in this city,or coming soon. Please call or text me for questions. These homes are not my listings and if available you can make bids on them through a registered agent like me.

Source MLS: CRMLS-California Regional MLS and or "HUDHOMESTORE.COM" , "HOMEPATH.COM" or "EXCELLENCE REAL ESTATE"
Fallowing their quidlines and policies in advertizing, nevertheless.....
Listing provided by :

1814 Brennan Ct Lancaster, California 93534
4 Beds | 3 Baths | 1,848 sq. ft.
REO ID: L1900DX
$369,900
Victoria Erfle
J & V Erfle Associates, Inc.

EXCELLENCE HOMES AND ESTATES REAL ESTATE 02041276
18000 STUDEBAKER RD SUITE 795
CERRITOS CA 90703

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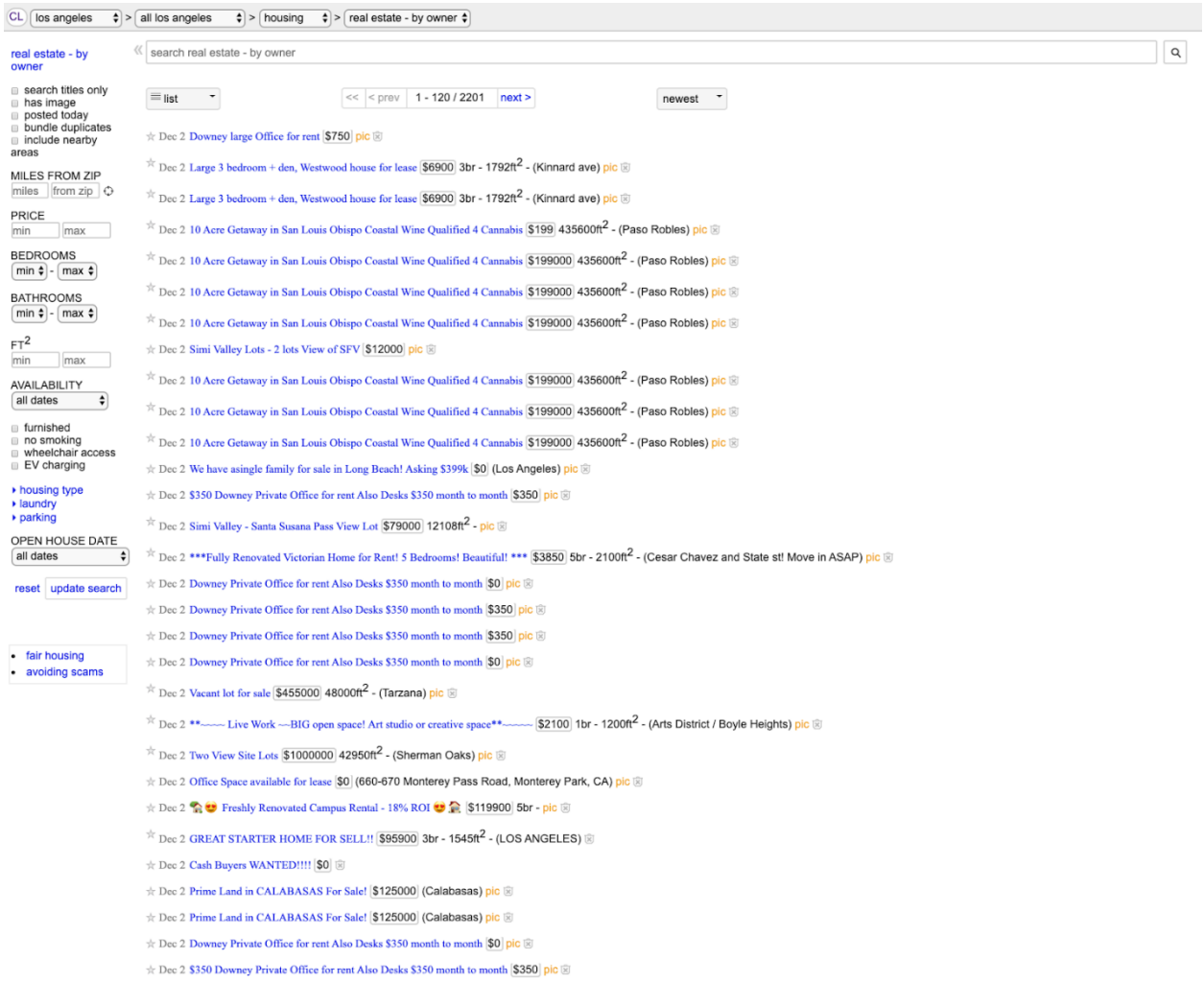
post id: 7020715027 posted: 17 days ago updated: 13 minutes ago email to friend ♥ best of [?]

3) Real Estate Listings Posted by Owners

Subdomain List of Listings (https://losangeles.craigslist.org/search/reo?)



3) Real Estate Listings Posted by Owners

Sample Listing (https://losangeles.craigslist.org/sfv/reo/d/paso-robles-10-acre-getaway-in-san/7027361880.html)

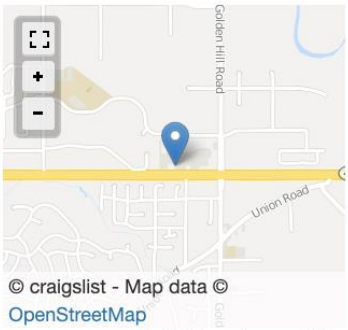
◄ prev ▲ next ►

reply ☆ favorite hide ⚐ flag

Posted 6 days ago print

$199 / 435600ft^2 - 10 Acre Getaway in San Louis Obispo Coastal Wine Qualified 4 Cannabis (Paso Robles)

image 1 of 21



3725 Gruenhagen Flat
(google map)

435600ft^2

land

10 Acre Getaway in Coastal Wine Country. Build your home and you will have a MILLION dollar Mansion and a FARM 40 minutes from the beach. This is a wonderful find! Right next to the site of the former Continental Vineyards, now part of the Broken Earth Winery, is this large acreage lot. With proper permits, you can use this to start your own small vineyard, or build a bed and breakfast, small horse ranch or nursery. The possibilities are endless .**** Or LEASE IT FOR COMMERCIAL CANNABIS OR GET YOUR OWN COUNTY PERMIT TO GROW CANNABIS LEGALLY. The county allows 22000 square feet of Indoor operation with proper permit. This beautiful area is isolated from big-city problems, but is still just a quick drive down the road to the old resort town of Paso Robles, and less than an hour from San Luis Obispo. Land Specifics: Road Access: Dirt Road: Slope Description: flat to Rolling.:

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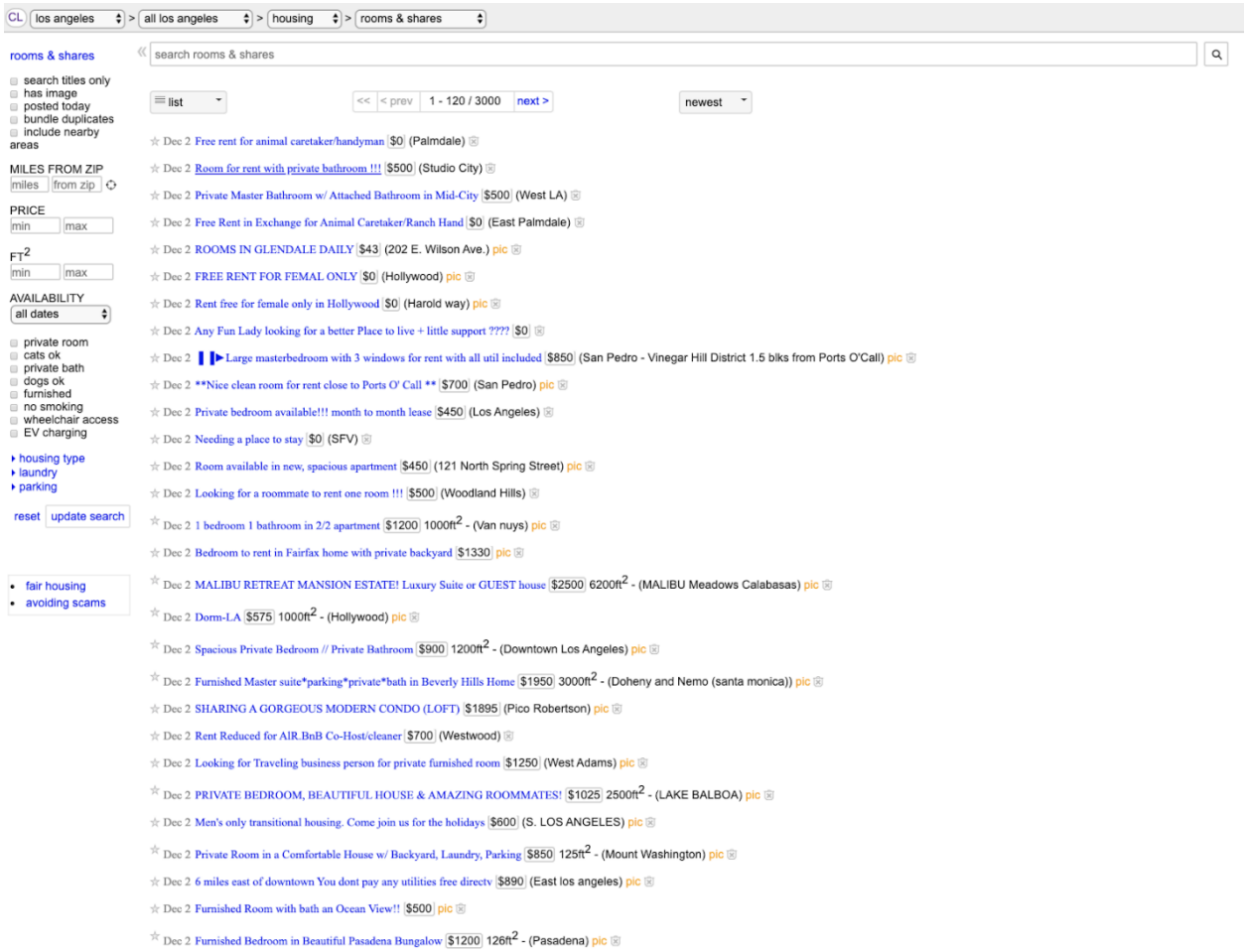
post id: 7027361880 posted: 6 days ago updated: 41 minutes ago email to friend ♥ best of [?]

4) Rooms and Room Sharing

Subdomain List of Listings (https://losangeles.craigslist.org/search/roo?)



4) Rooms and Room Sharing

Sample Listing (https://losangeles.craigslist.org/lac/roo/d/studio-city-room-for-rent-with-private/7030884073.html)

◀ prev ▲ next ▶

reply ☆ favorite hide ⚐ flag

Posted about 2 hours ago print

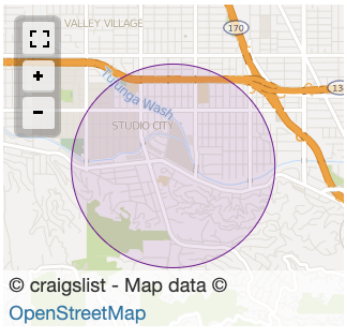
$500 Room for rent with private bathroom !!! (Studio City)

Room with private bathroom available. Home is open plan fully furnished , dining room, living room and 2nd lounge room with outdoor covered patio and large back garden available now for move in. 6 months initial. Possibly open to month by month. Private driveway that fits up to 3/4 cars. Very Residential area. No need to even bring your cups and plates. basically unpack and stay! Security deposit required.

Must like dogs. you'd share the place with 2 small shih-tzu's! Looking for someone relaxed and chill. Monthly rent is $500.

If you are interested in learning more, please email my personal email address **doreenjcurtis(at)g-m-a-i-l** . Thanks for your inquiry!

- do NOT contact me with unsolicited services or offers



(google map)

available now

furnished

house

w/d in unit

carport

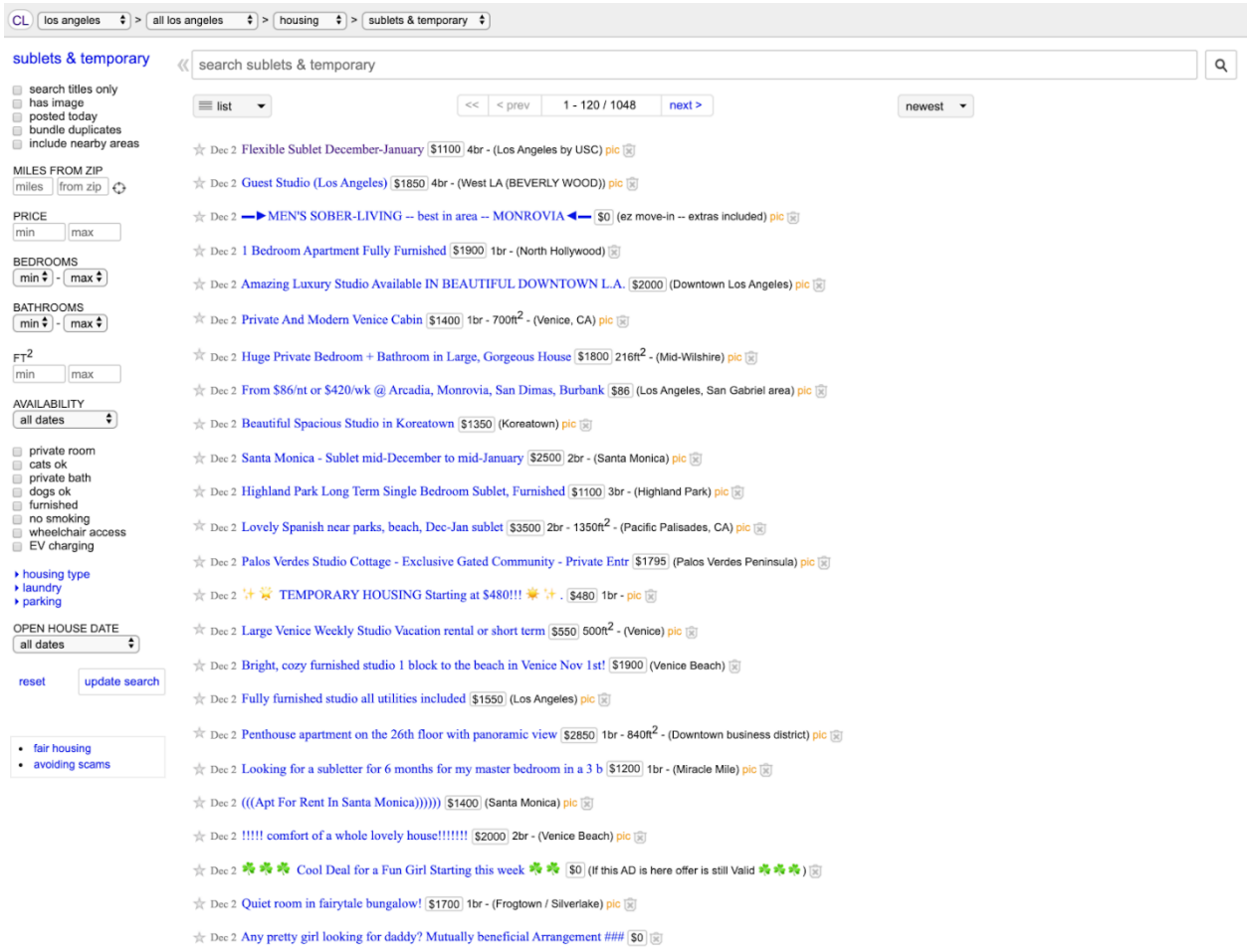
private bath

private room

post id: 7030884073 posted: about 2 hours ago email to friend ♥ best of [?]

5) Sublets and Temporary Rentals

Subdomain List of Listings (https://losangeles.craigslist.org/search/sub?)



5) Sublets and Temporary Rentals

Sample Listing (https://losangeles.craigslist.org/lac/sub/d/los-angeles-flexible-sublet-december/7022743439.html)

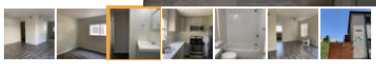
◀ prev ▲ next ▶

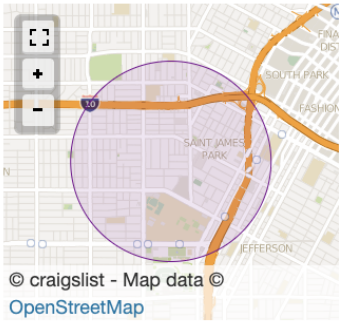
reply ☆ favorite ⊗ hide ⚐ flag

Posted 14 days ago print

$1100 / 4br - Flexible Sublet December-January (Los Angeles by USC)

image 3 of 7





(google map)

4BR / 2Ba

apartment
laundry on site
no smoking
no parking
private bath
private room
wheelchair accessible

Right by USC. Private room with Private Bathroom. Shared common areas.

4 bedroom house. 3 other roommates. Subletting between December 15th-January 15th. Flexible Move in-Move out.

Apartment is furnished. Room can be furnished.

No smoking or drugs of any kind.

Quiet Hours on Weekdays 11pm - 7am

Cleanning after yourself.

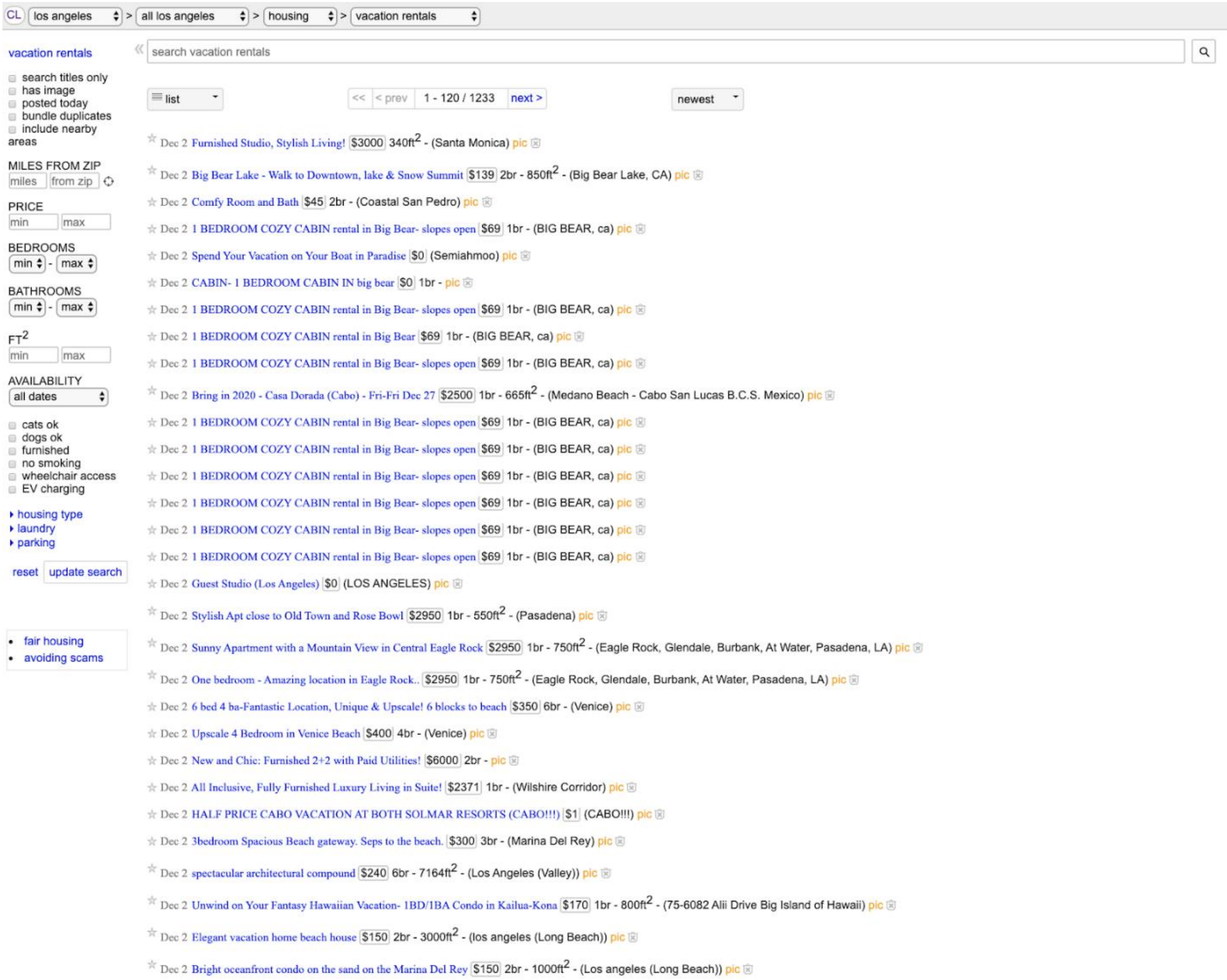
Text only: show contact info

- do NOT contact me with unsolicited services or offers

post id: 7022743439 posted: 14 days ago updated: about an hour ago email to friend ♥ best of [?]

6) Vacation Rentals

Subdomain List of Listings (https://losangeles.craigslist.org/search/vac?)



6) Vacation Rentals

Sample Listing (https://losangeles.craigslist.org/lac/vac/d/big-bear-lake-big-bear-lake-walk-to/7030941844.html)

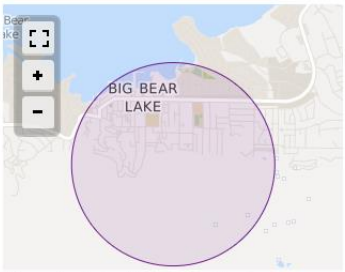
reply ☆ favorite hide flag

Posted 20 minutes ago

print

$139 / 2br - 850ft^2 - Big Bear Lake - Walk to Downtown, lake & Snow Summit (Big Bear Lake, CA)

image 1 of 12



© craigslist - Map data © OpenStreetMap

(google map)

2BR / 1Ba 850ft^2
available dec 4

furnished
cottage/cabin
w/d in unit
no smoking

At our Cottage, The Grizzly Pine you will be in the heart of Big Bear Lake!
Avoid all the crazy winter traffic and book your vacation with us, as it is difficult to find a place so close to everything Big Bear has to offer.
A 50 year record of snow has just dumped in Big Bear and the slopes are now open!
Downtown Big Bear (The Village) is less than a mile away from our cottage. The ski resort, Snow Summit is just a little over one mile away. The lake is only a couple blocks down the road. Walk next door to the Grizzly Manor Cafe for a huge breakfast or lunch that is a local's favorite and one of Big Bear's most popular places to eat on the mountain. There are several more restaurants and a coffee roasting shop within a block or two!
Enjoy the entire house to yourselves with nobody else on the property! Our cozy cottage is a single level and has two bedrooms and one full bathroom. It is almost 100 years old, and has been updated throughout but still has its original charm with a ton of Big Bear history! The laundry room/mud room has a washer and dryer with detergent. We have a Smart TV and Wifi and a large fenced yard with a large propane barbecue grill on the back porch!
There is plenty of room for parking in the yard and additional free parking on the street in front of our house.
Cozy up to our wood burning fireplace and enjoy a hot beverage!
The kitchen has everything we need such as a toaster, microwave, coffee & tea station (complementary coffee & tea provided) with a Keurig, ceramic tea pot, and coffee pot, pots, pans, crock pot, mixer, utensils, etc. salt & pepper and a few spices. We even have baking supplies with cookie cutters that we have used when our children were young.
We have a large video library of DVDs and VHS movies for your pleasure or log in to your Netflix, Prime Video, Hulu, etc. on our Smart TV. There are also books and family board games to enjoy.
Prices start at only $139 per night during the weekdays.
Christmas week is still available at only $369 per night.
Absolutely NO ANIMALS and NO SMOKING
Go to the link on the photo for the link to the booking. Our website is still under construction so please click on the AirBnB link on the bottom of the page.
Hope you all have a wonderful Christmas season!

Vacation Rental, California, Ski Skiing, Snowboarding, Boarding, Mountain, Snow, Resort, sledding, tubing

- do NOT contact me with unsolicited services or offers

post id: 7030941844 posted: 20 minutes ago updated: 3 minutes ago email to friend ♥ best of [?]

Appendix C: Data Filtering Values

Fresno 2014 (Fresno Region)		
	Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)
Rent	$335	$2,800
Ft²	400	4,075
Rent/ft²	$0.26	$2.27

Fresno 2020 (Fresno Region)		
	Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)
Rent	$430	$2,032
Ft²	174	2,835
Rent/ft²	$0.34	$2.84

Fresno 2014 (Treatment and Control Only)		
	Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)
Rent	$319	$1,525
Ft²	400	2,038
Rent/ft²	$0.11	$1.52

Fresno 2020 (Treatment and Control Only)		
	Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)
Rent	$375	$1,595
Ft²	85	1,423
Rent/ft²	$0.50	$2.84

Ontario 2014 (Inland Empire Region)		
	Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)
Rent	$399	$3,995
Ft²	300	5,100
Rent/ft²	$0.13	$11.61

Ontario 2020 (Inland Empire Region)		
	Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)
Rent	$505	$3,450
Ft²	280	3,600
Rent/ft²	$0.29	$3.57

Ontario 2014 (Treatment and Control Only)		
	Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)
Rent	$440	$2,435
Ft²	350	3,000
Rent/ft²	$0.17	$2.26

Ontario 2020 (Treatment and Control Only)		
	Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)
Rent	$650	$3,015
Ft²	350	1,980
Rent/ft²	$0.46	$2.99

Los Angeles 2014 (Los Angeles Region)		
	Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)
Rent	$480	$14,000
Ft²	130	5,400
Rent/ft²	$0.30	$16.52

Los Angeles 2020 (Los Angeles Region)		
	Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)
Rent	$500	$14,000
Ft²	150	4,200
Rent/ft²	$0.33	$8.29

Los Angeles 2014 (Treatment and Control Only)			Los Angeles 2020 (Treatment and Control Only)		
	Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)		Min. Reasonable Value (0.2 percentile)	Max. Reasonable Value (99.8 percentile)
Rent	$650	$2,300	**Rent**	$400	$5,999
Ft^2	325	1,980	**Ft^2**	197	3,696
Rent/ft^2	$0.58	$2.34	**Rent/ft^2**	$0.26	$6.35