Vulnerability-in-Production: A Spatial History of Nature, Affluence, and Fire in Oakland, California

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Vulnerability-in-production is offered as a theoretical construct to highlight two interrelated aspects of vulnerability: a process where landscapes are altered and developed in a manner that retains their productivity for property owners and other stakeholders and a recursive and relational process that is always in production and inscribed unevenly over time and space. The 1991 Oakland Hills (Tunnel) Firestorm remains the largest conflagration—in terms of numbers of dwellings destroyed—in California's history. Using the Tunnel Fire as a starting point for analysis, this article argues for the dedicated application of spatial history analysis to vulnerability. A first spatial history section highlights how land development strategies from the mid-1800s to the early 1900s contributed to the production of vulnerable conditions in Oakland. A second section describes how conservative homeowner politics and state tax restructuring spanning the 1950s to the 1980s further generated vulnerabilities throughout the city. A third spatial history section reveals processes that undergird and connect uneven patterns of affluence and vulnerability within Oakland. Collectively, these sections enhance our epistemic commitment to the study of vulnerability through spatial–historical analysis that uses diverse data, visualizations, and analytic techniques; our understanding of vulnerability as a recursive and relational process; and our appreciation for the political ecological nature of vulnerability—where affluence and levels of net vulnerability are highly uneven yet also deeply intertwined in their production. *Key Words: affluence, fire, political ecology, spatial history, vulnerability, wildland–urban interface.*

本文提出 "生产中的脆弱性" 之理论建构, 以强调脆弱性的两个相关面向: 地景用一种为产权所有者及其他利益关係人保持其生产力的方式, 进行改变或打造的过程; 以及随着时空推移, 永远在生产中、且被不均地铭刻的循环及关係性过程。 1991 年的奥克兰山丘大火 (隧道火灾), 就被摧毁的住宅而言, 仍然是加州历史上最大规模的火灾。本文运用隧道火灾作为分析的起点, 主张需将空间历史分析专门应用于脆弱性之上。第一个空间历史段落, 强调自 1800 年代中期至 1900 年代早期的土地发展策略, 如何生产了奥克兰的脆弱境况。第二个段落描述保守的房屋所有者的政治, 以及从 1950 年代延伸至 1980 年代的州税再结构, 如何进一步造成整个城市的脆弱性。第三个空间历史段落, 揭露了从底层支持并连结奥克兰的富裕和脆弱性的不均模式之过程。这些段落, 共同推进我们透过运用各种数据、视觉化及分析技术的空间历史分析来研究脆弱性的知识承诺、我们将脆弱性视为循环且关係性过程之理解, 以及我们对于脆弱性的政治生态本质之评价——富裕与基本脆弱性的程度是高度不均的, 但在生产过程中却深刻地相互交织。 *关键词: 富裕, 火灾, 政治生态学, 空间历史, 脆弱性, 荒地—城市界面。*

La vulnerabilidad en producción se ofrece como un constructo teórico con el que se destacan dos aspectos interrelacionados de la vulnerabilidad: un proceso donde los paisajes son alterados y desarrollados de modo que retenga su productividad para los dueños de la propiedad y otros interesados, y un proceso recursivo y relacional que está siempre en producción y desigualmente inscrito en el tiempo y en el espacio. La Tormenta de Fuego (Túnel) de Oakland Hill en 1991 sigue siendo la más grande conflagración—en términos de viviendas destruidas—en la historia de California. Utilizando el Fuego del Túnel como punto de partida en el análisis, en este artículo se aboga por la aplicación dedicada del análisis de historia espacial a la vulnerabilidad. Una primera sección de la historia espacial destaca cómo las estrategias para el desarrollo del territorio desde la mitad del siglo XIX hasta principios del XX contribuyeron a la generación de condiciones de vulnerabilidad en Oakland. Una segunda sección describe cómo las políticas conservadoras de propietarios de vivienda y la reestructuración de los impuestos en el lapso que va de los años 1950 hasta los 1980 generó adicionalmente vulnerabilidades a través de la ciudad. Una tercera sección de historia espacial revela procesos que aseguran y conectan patrones de afluencia y vulnerabilidad dentro de Oakland. Colectivamente, estas secciones fortalecen nuestro compromiso epistémico de estudiar la vulnerabilidad por medio de análisis espacio-histórico que utiliza diversos datos,

Annals of the Association of American Geographers, 104(6) 2014, pp. 1199–1221 © 2014 by Association of American Geographers
Initial submission, June 2013; revised submission, December 2013; final acceptance, January 2014
Published by Taylor & Francis, LLC.

visualizaciones y técnicas analíticas; nuestra la comprensión de la vulnerabilidad como un proceso recursivo y relacional; y nuestra apreciación de la naturaleza política y ecológica de la vulnerabilidad—donde la afluencia y los niveles de vulnerabilidad neta son altamente desiguales pero a la vez profundamente entrelazados en su producción. *Palabras clave: afluencia, fuego, ecología política, historia espacial, vulnerabilidad, interfaz terrenos baldíos–ciudad.*

Each year around the American West, news reports fill the airwaves with stories of devastating wildfires, shattered communities, lost lives, and costly reconstruction efforts. In 2012, the state of California alone witnessed more than 5,800 separate fire incidents (CalFire 2013). These fires—many of which occur at the wildland–urban interface (WUI)—fan debates among scholars, governments, and the public over why communities are constructed in such vulnerable landscapes. The 1991 Oakland Hills Firestorm (henceforth, Tunnel Fire) stands as an exemplary case example. Located in northeastern Oakland, California, the Tunnel Fire destroyed more than 3,000 homes and killed twenty-five people over a twenty-four-hour period (see Figure 1 and Figure 2). More than twenty years later, the Tunnel Fire has left a lasting legacy in the region as the largest wildfire—in terms of numbers of dwellings destroyed—in California's history. To be sure, this is a dubious distinction, given California's long record of frequent and intense WUI firestorms.

Dating back to 1900, fire regime analysis indicates a high frequency of wildfires in the Oakland Hills region. Between 1900 and 1991, for example, twelve fires were recorded in close proximity to the area consumed by the Tunnel Fire (Simon 2012). This article is motivated by this long history of persistent conflagrations and the serious questions it raises about urban development, land use planning, and resource management efforts that have placed tens of thousands of homes in harm's way (see Figure 3).

Using the Tunnel Fire as a starting point for analysis, this article employs spatial–historical analysis to illuminate how vulnerabilities, affluence, and space are coproduced (Simon and Dooling 2013). In so doing, this analysis articulates two interrelated dimensions of vulnerability-in-production. First, vulnerability is shown to be a recursive and relational process—embedded within regional environmental and development histories—that is always in production, at play, and inscribed unevenly over time and space. Vulnerability is thus much more than simply an effect of planning ending, produced outcome, or material inscription. Second, although vulnerability is conventionally viewed as a negative condition experienced by discontented communities, this article highlights it as both facilitating and resulting from market opportunism and private wealth accumulation (Collins 2010). Here, vulnerability is generated in a manner that retains and maximizes the economic productivity of certain landscapes for homeowners, developers, landholders, and city governments.

Three interrelated spatial history sections are presented to explain the contradictory proposition of placing homes in widely acknowledged fire-prone areas and to describe how the Tunnel Fire, like so many other WUI fires, is closely connected to policies, economies, affluence, and vulnerabilities across temporal and geographical scales (see, e.g., Davis [1998] on the fire-prone hillsides of Malibu, California). As fire historian Pyne (2009) reminds us, "[Fire] cannot be studied in itself; it is a profoundly interactive technology; it is what its context makes it" (446). Throughout this article, vulnerability is defined as the potential for reduced well-being and lost property or life, coupled with low and incommensurate levels of potential financial reparation or other direct compensation.[1]

A first spatial history section highlights how instrumentalist use of tree cover—early timber extraction activities during the middle 1800s, and subsequent afforestation strategies in the late 1800s and early 1900s—contributed to the production of vulnerable conditions in Oakland hillside areas. A second section describes how conservative homeowner politics and state tax restructuring spanning the 1950s through the 1980s further contributed to vulnerability in the city's hill and flatland regions. These two passages illustrate how vulnerability to the Tunnel Fire is inextricable from the post–gold rush economic ascendance of the San Francisco Bay Area and California's anti-tax movement, respectively. A third spatial history section casts new light on the first two and describes how factors generating vulnerability in the relatively wealthy Tunnel Fire area also contribute to the production of vulnerabilities within poorer flatland areas of Oakland. This section illustrates the uneven, yet highly intertwined, production of vulnerability and estate-based wealth for property owners and other stakeholders

Figure 1. Location of the Tunnel Fire. *Source:* Map Credit: Peter Anthamatten. (Color figure available online.)

across urban–suburban and nonwhite–white communities (Davis 1998). Dedicated spatial–historical analysis assists our efforts to connect these diverse causes and conditions of vulnerability.[2]

A Spatial–Historical Approach to Vulnerability

Spatial history holds as foundational that space is much more than an empty container simply filled by history. Rather "space is itself historical" (White 2010, 2) and continuously produced and reproduced over time through diverse and interrelated social, political, and biophysical changes. Indeed, to study history is to interrogate geography. And to interrogate geography is to engage history. Spatial–historical vulnerability research therefore begins with an understanding that social and biophysical changes are best explained through longitudinal analysis of shifting spatial relations that influence flows of resources, people, information, and power.

Figure 4 outlines the premise of spatial history as an analytic framework emphasizing relational inquiry and historical–geospatial data synthesis. Following the upper arrows in Figure 4, spatial history analysis entails integrating diverse data (ranging from large and opaque data sets to archival imagery and exemplary oral histories) and conducting geospatial analysis to render these data legible and meaningful through the construction of dynamic and interactive visualizations and accompanying text-based explanations (see Figure 5 for sample panels from a web-based vulnerability-in-production visualization). Animating spatial data temporally and historical data spatially provides an opportunity to not only represent complex relationships, feedbacks, and thresholds that are difficult to ascertain in static or tabular form; these visualizations also generate opportunities to expose unexpected connections, ask new research questions, and chart new research trajectories. Ultimately, the integration of these data allows geographers to animate space and time using data that are cartographic and historical, fixed and relational, represented and representational (O'Sullivan 2005; Gregory and Healey 2007).[3]

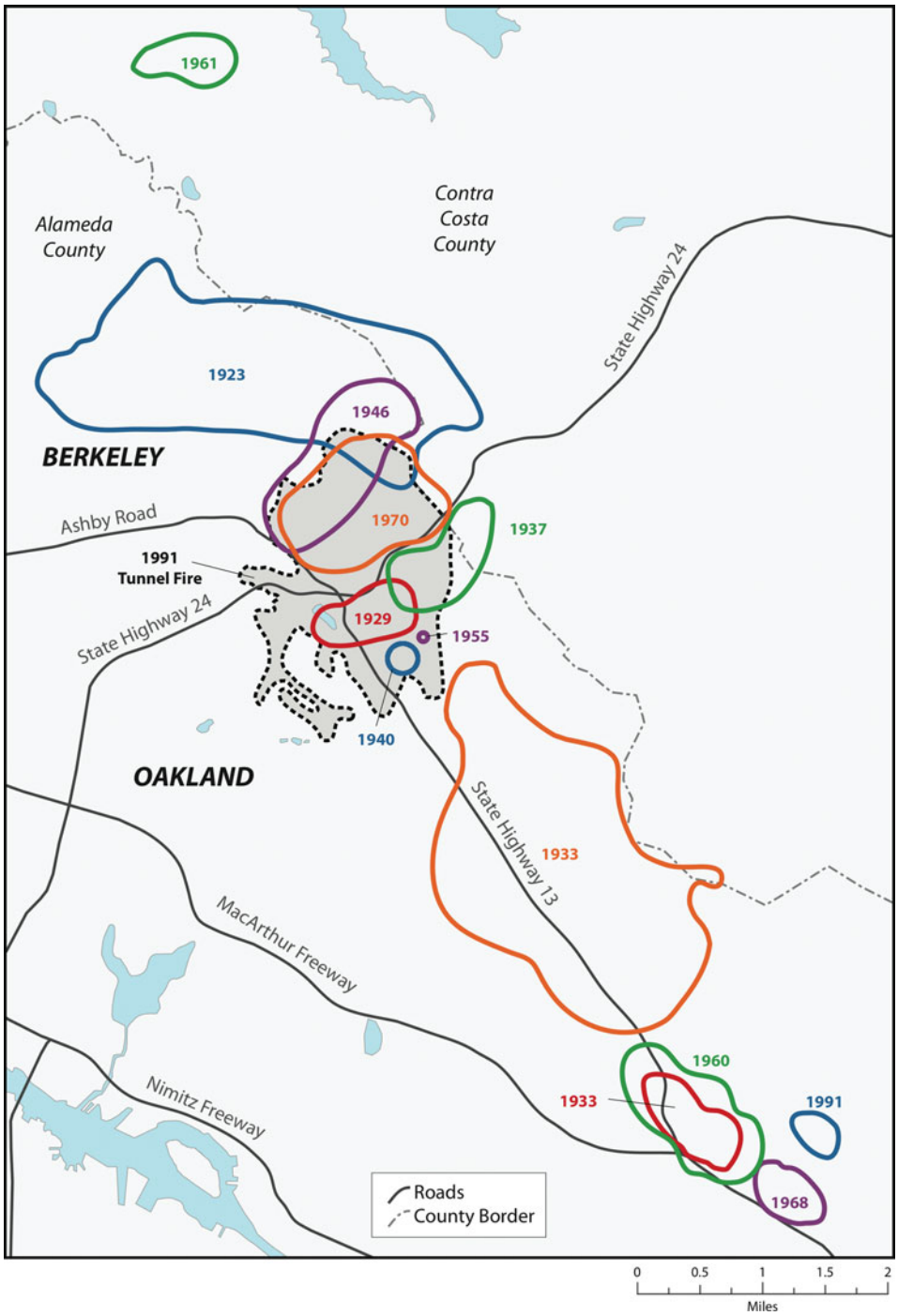

Figure 2. Periodic fires in the East Bay Hills over the past century reveal the persistent threat of conflagrations. *Source:* Map Credit: Peter Anthamatten. (Color figure available online.)

Complementing this analysis of diverse spatial and historical data is a commitment to relational inquiry (highlighted along the bottom arrows in Figure 4). Relational analysis involves examining how landscapes, policies, and people are connected in time and space through specific relationships that drive social and environmental change. Spatial histories of vulnerability, for example, demonstrate the recursive production of vulnerabilities and raise larger questions about how those conditions are generated and responded to over time. A key focus of this analytic approach, therefore, is to integrate and leverage diverse data that illuminate the production and reproduction of vulnerable spaces in relation to other spaces (Simon and Dooling 2013). In this study, spatial history analysis promotes relational enquiry that elucidates how factors generating

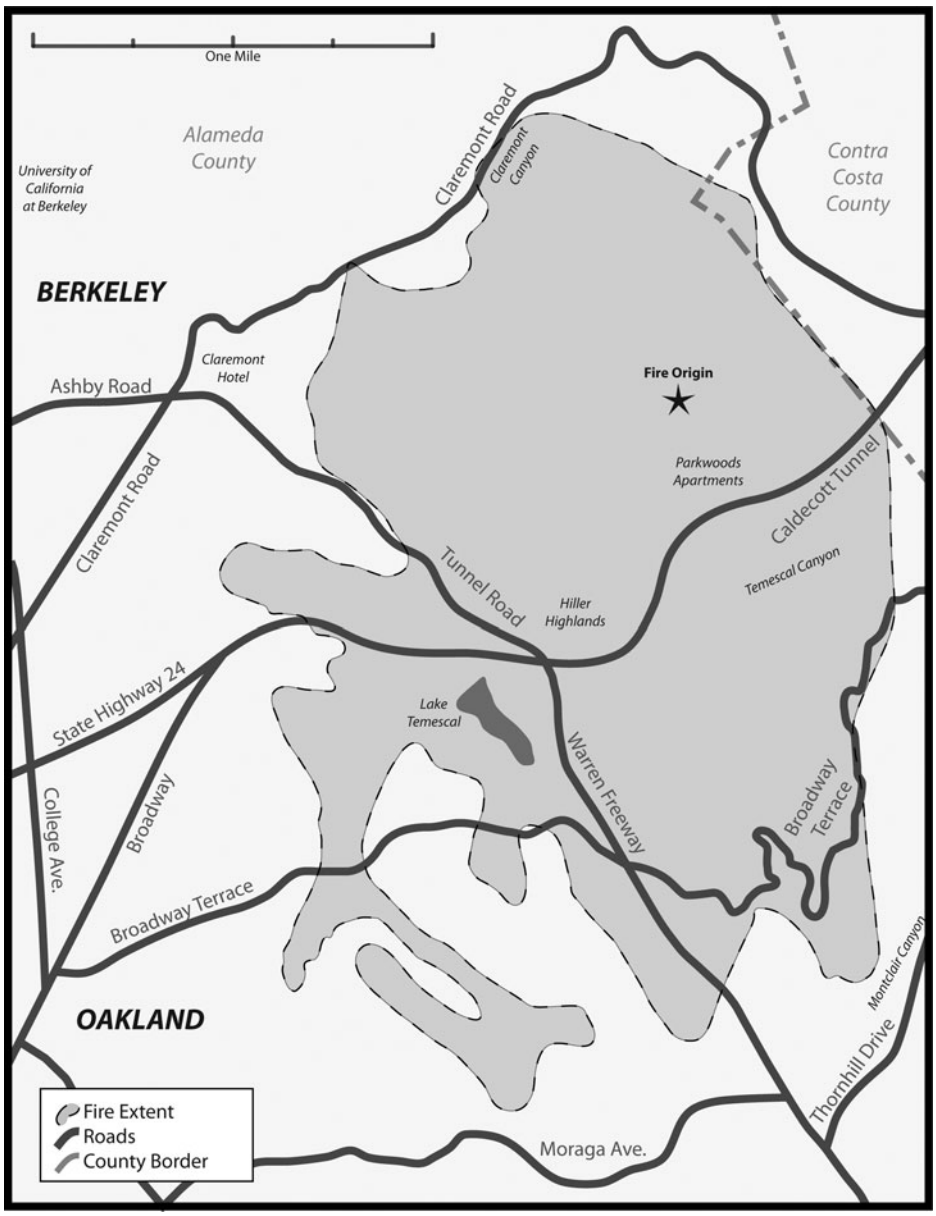

Figure 3. The Tunnel Fire area extent, major land features, and fire origin. *Source:* Map Credit: Peter Anthamatten.

vulnerability in high-risk fire areas build over time (temporal relationality) and also influence and reinforce vulnerabilities within other parts of Oakland (spatial relationality).

To be sure, integrating spatial and historical data and methods alone does not constitute spatial history analysis; nor does highlighting the recursive nature of socioenvironmental change. Rather, undergirding spatial history is an integration of analytic approaches from (1) digital history—that is, using visualizations, geospatial analysis, and historical geographic information systems (GIS) to animate historical conditions and processes spatially, while also revealing unexpected relationships, novel geographical explanations, and new research possibilities (Gregory and Healey 2007; Offen 2013); (2) historical geography—that is, examining the material and cultural significance of particular places with an emphasis on how these landscapes and communities interact with other sites across geographical and temporal scales (Naylor 2005, 2006; Offen 2012); and (3) critical human geography (including, in this case, urban political ecology)—that is, underscoring the interconnected, yet divergent and unevenly distributed outcomes of social and environmental change as well as their structural and ideological underpinnings (Boone et al. 2009; Heynen 2014).

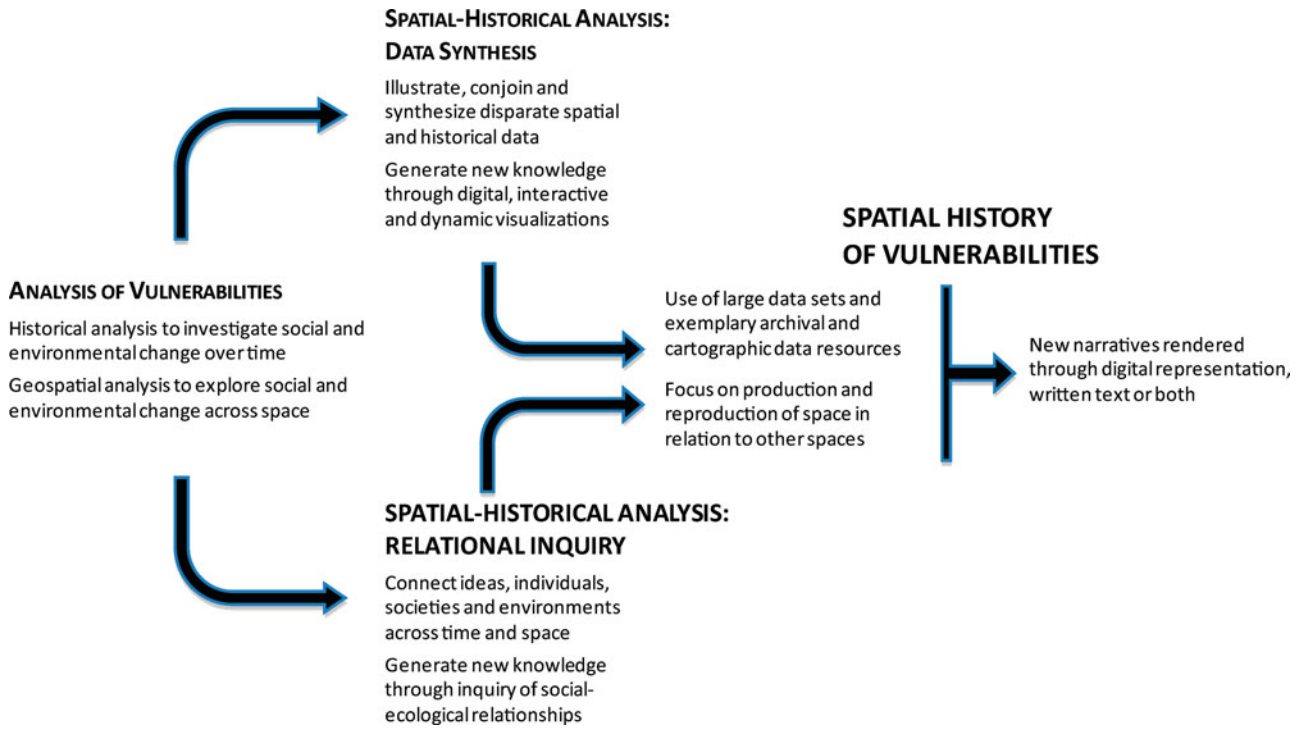

Figure 4. Spatial history: Synthesis of spatial and historical data and use of dedicated relational inquiry to generate narratives in both digital and textual form. (Color figure available online.)

Spatial–historical analysis of vulnerability leverages the important work of geographers (and others in cognate fields) who have examined vulnerability through the prism of historical and multiscale social and environmental change. Beginning with the work of Hewitt (1983), Liverman (1990), and Wisner (1993), among others, many have sought to illuminate structural processes undergirding vulnerability. This scholarship closely examines how interactions between political economies of resource use and normative planning activities influence which places and populations become vulnerable (e.g., Mustafa 1998, 2005; Cutter, Mitchell, and Scott 2000; Oliver-Smith 2002; Pelling 2003; Orsi 2004; Wisner et al. 2004; Hogan and Marandola 2005; Collins 2008, 2010; Simon 2012); how material conditions of vulnerability are produced through complex and shifting governance arrangements comprised of diverse business, civil society, and government entities (Pelling et al. 2008; Lynch 2012); and how disconnections between lived experiences and political discourse reveal political struggles over resources and livelihoods (Dooling and Simon 2012; Rebotier 2012; Simon and Dooling 2013). Findlay's (2005) concept of vulnerable spatialities, for example, connotes the social, political, and economic processes through which people and places become exposed to shifting states of vulnerability over time (see also Adger 2006; Dooling and Simon 2012). Collectively, these studies have shown that effective vulnerability mitigation will entail studying what Mustafa (2005) labeled dynamic "hazardscapes," through robust assessment of "the cumulative progression of vulnerability, from root causes through to local geography and social differentiation" (Adger 2006, 272).

Spatial–historical analysis must also be situated within a substantial body of urban political–ecological work that eschews binaries of human–nature and urban–rural in favor of dedicated relational analysis. This requires embracing (1) the mutually constitutive relationship between cities and diverse economies, policies, and ecological systems across spatial scales (e.g., Williams 1973; Cronon 1991; Gandy 2002; Swyngedouw 2004); (2) the expansive ontological boundaries of urban nature, which, as Braun (2005, 642) noted, exist as "material *and* narrated, ecological *and* political"; and (3) cities as complex ecological systems governed, to a large extent, by an unremitting commitment to regional economic growth (Wolch, Pincetl, and Pulido 2001; Keil and Desfor 2004; Dooling, Simon, and Yocom 2006; Heynen, Kaika, and Swyngedouw

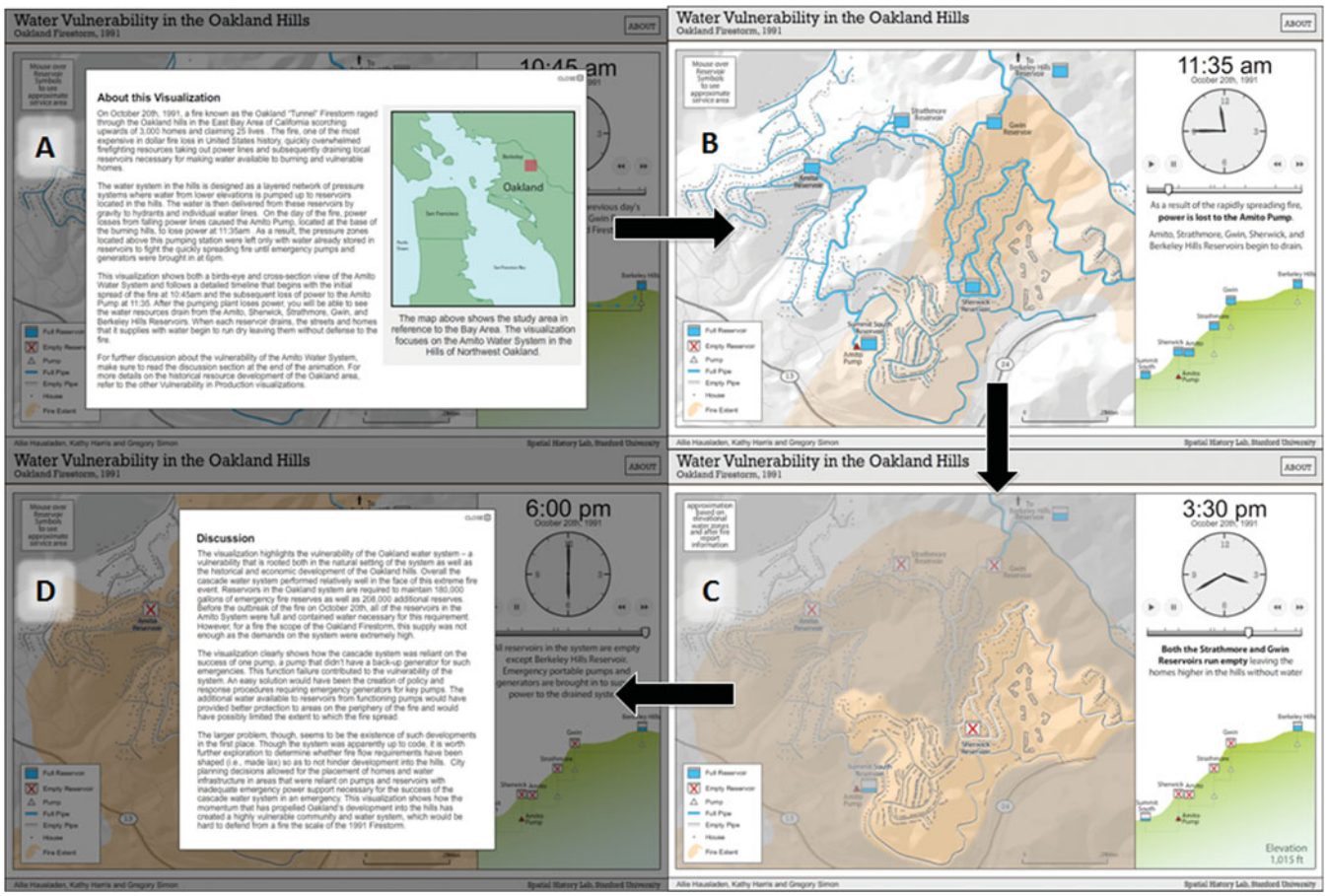

Figure 5. Panels from example dynamic spatial history visualization that is both an analytic tool and research outcome. Based on historical municipal water infrastructure maps and postdisaster reports, (A) reviews water delivery challenges during the Tunnel Fire, and (B) and (C) provide interactive opportunities for viewers to explore topographical, fire-spread, pump technology, and water storage and delivery system features. (D) Links impaired response effort to physical environment and historical city developments. (The online visualization is part of the Vulnerability-in-Production project in Stanford University's Spatial History Project.) (Color figure available online.)

2006; Robbins 2007; Boone et al. 2009; Perkins 2009, 2011).

Regional Economic Growth, Property Development, and Timber Use

Logging Activities and Road Infrastructure

This article's description of vulnerability-in-production begins with large-scale clear-cutting of redwood trees (*Sequoia sempervirens*) in the area as early as 1840. During this period, "redwoods as tall as 300 feet and as wide as 32 feet" were felled and hauled to shipping points and sent for home and commercial construction purposes in San Francisco and Oakland during and immediately following the Gold Rush boom cycle of the mid-1800s (Bagwell 1982, 15). Much of this lumber was used to replace structures and resurrect portions of the burgeoning city of San Francisco that had burned during major fires in 1850 and 1851. Increased commercial redwood lumber prices reflect this spike in demand, as costs skyrocketed from $30 per 1,000 board feet in 1847 to upward of $600 in 1849 (Bagwell 1982). By 1852, there were four steam sawmills operating in the Oakland Hills. The operation was so extensive that, by 1860, hardly a tree remained (City of Oakland 1996).

Logging and other land conversion activities during the mid-1800s did more than alter the physical landscape of the Oakland Hills; they also introduced crude infrastructure and laid the foundations and momentum for housing development trajectories in subsequent decades. (Other factors such as topography and landownership also influenced the form and

distribution of home construction.) Many current roads that abut or cross through the Oakland Hills fire area originally terminated at logging sites and were used to haul timber down slope to the Oakland Estuary and across the waterway to San Francisco. Figure 6 illustrates how "several other East Bay roads (including present day Claremont Road and Thornhill Drive) also began as logging roads" (Bagwell 1982, 18).[4] Although many of these pathways have been significantly widened and modified, most remain in the same graded location as they existed during the mid to late 1800s.

Momentum toward increased home development—influenced, in part, by the introduction of hillside logging roads—proceeded in two ways. On the one hand, graded and reinforced thoroughfares were viewed simply as a cost-efficient means of bringing roads to large real estate owners waiting to initiate home construction. The City of Oakland and local banks providing loans to public service corporations held a favorable view of road and public infrastructure financing decisions that reduced outlay costs. On the other hand, these hillslope property owners were not content to sit idly by waiting for infrastructure to come to them. Indeed, powerful landowners such as The Realty Syndicate indicated they were "not compelled to wait, as is the individual, upon the completion of corporation or municipal facilities," as they proceeded to "develop neighborhoods of a high class nature in absolutely new districts" (The Real Estate Syndicate 1911, 269). Efforts by large real estate holders to improve their property through leveling and tree planting activities prior to the completion of residential road improvements helped to attract public investments and "pull" housing developments (and graded roads) onto their property.

Real Estate Syndicates, Afforestation, and Home Construction

The Claremont Hotel and Resort, which today stands as a landmark at the foot of the Oakland/Berkeley Hills, was first constructed alongside major resource extraction access roads in 1915. Built by a suite of local real estate developers, the hotel was erected, in large part, to attract home construction investments and potential homebuyers to hillside areas along former timber extraction routes just upslope from the hotel. The Claremont Hotel thus signifies a transition in the Oakland Hills from productive logging area to a valued landscape falling under the speculative eye of real estate developers.

As the introduction of crude road infrastructure helped generate access possibilities for developers, dedicated tree importation and reforestation efforts facilitated housing tract speculation, construction, and marketing efforts. As early as the 1880s, massive tree planting ensued, including cypresses, acacia, eucalyptus, and various pine species. Figures 7 and 8 depict the denuded landscape confronting initial settlements and subsequent reforestation efforts. From 1885 through 1893, the California State Forestry Board, which favored quick-growing eucalyptus trees, guided regional reforestation efforts. Later, between 1910 and 1913, and nearly fifty years after the removal of virtually all tree cover in the hills region, Frank Havens, a prominent land owner in the region, planted approximately 3 million nonnative eucalyptus (*Eucalyptus globulous*) and Monterey pine (*Pinus radiata*) seedlings along the region's hill slopes (Figure 9). Eucalyptus trees were initially planted for commercial lumber speculation due to their purported wood quality. During the next few decades, the fast-growing eucalyptus indeed proved to be a hearty species tolerant of high winds, shallow soils, and seasonal drought conditions (Tyrell 1999). Unfortunately for the timber industry, they were a poor source of construction-worthy lumber due to their interlaced wood fibers and irregular grain.

Despite having low construction utility, the eucalyptus still served a crucial development purpose by increasing land values along unsightly barren slopes and generating a bucolic residential environment suited for affluent members of the San Francisco and East Bay business class (Nowak 1993). Following these successful eucalyptus and pine plantings, directors of the powerful Realty Syndicate noted, "the increased value their holdings would have if plentifully timbered" (*Oakland Tribune* 1923, 9). The Mahogany Eucalyptus and Land Company, which dominated local property holdings at the turn of the nineteenth century, noted, "This tree at this particular moment is in many instances the most valuable one on the face of the globe. . . . The Company now sees plainly that it possesses a source of emolument higher than that of the average gold mine" (O'Brien 2006, 2).

By the early 1900s, this newly forested landscape began to fulfill its intended development potential as a number of housing subdivisions quickly populated the hillside area. The financial benefits for property owners were substantial. In 1906 the assessed value of

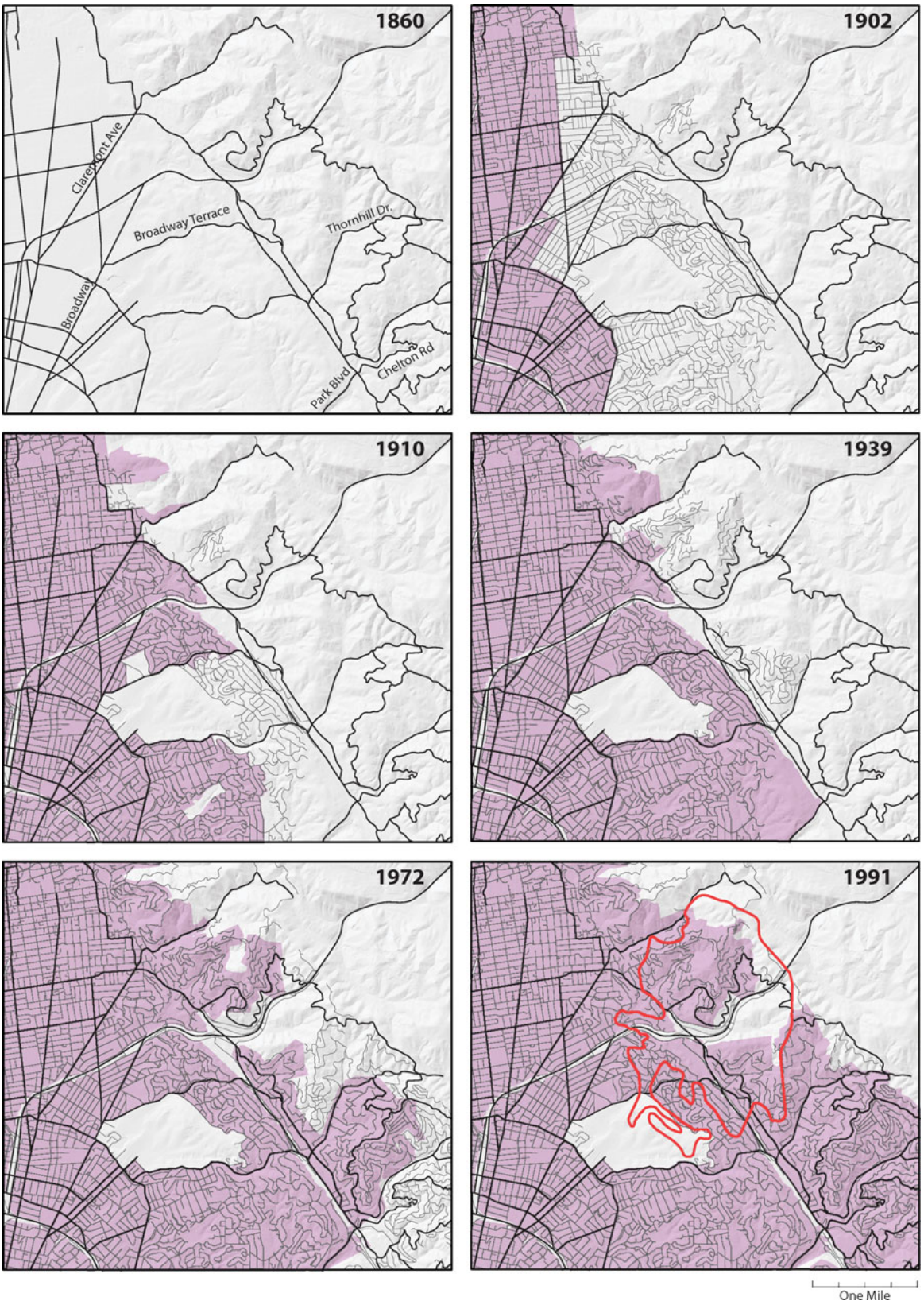

Figure 6. Map sequence illustrating development of road and home construction in the City of Oakland. Real estate developers utilized early logging roads in subsequent decades as preestablished and cost-efficient points of entry into the hillside. Magenta shading indicates extent of home development, which generally follows road construction. *Source:* Map Credit: Peter Anthamatten & Eric Ross. (Color figure available online.)

Figure 7. Intensive logging during the mid-1800s left much of the Oakland Hills area void of tree cover. The homestead of essayist Joaquin Miller (1886) sits in the foreground. *Source:* University of California Berkeley, Bancroft Library.

undeveloped real estate in the fire area was $250 per acre. By 1911, and after only two years of market exposure, these same properties had experienced a twelve-fold increase in adjusted value (Laymance Real Estate Co. 1911b).

Within its recent history, the north hills region of Oakland "originated as a lumbering center" before transitioning into "a residential area best known for its spectacular views, forested character, winding streets, and hillside architecture," a transformation marked by its eventual evolution into a "vacation retreat for San Franciscans" (City of Oakland 1998, 205). In 1923, the Oakland Hills witnessed a 900 percent increase in home construction over the previous five years (Bagwell 1982). If redwoods helped to construct a burgeoning San Francisco during the 1850s, eucalyptus and Monterey pine plantings during the 1920s assisted the construction of a suburban respite from the hustle and bustle of San Francisco's now frenzied business environment. As one real estate booster put it, "These [San Francisco] new-comers . . . found themselves as far removed from the dirt and turmoil of the work-a-day world as if they had traveled fifty miles into the mountains" (The Real Estate Syndicate 1911, 261).

Figure 8. By 1913 the environment around the Miller homestead and much of the Oakland Hills changed considerably. Nonnative and ornamental species can be seen around the property. *Source:* University of California Berkeley, Bancroft Library. (Color figure available online.)

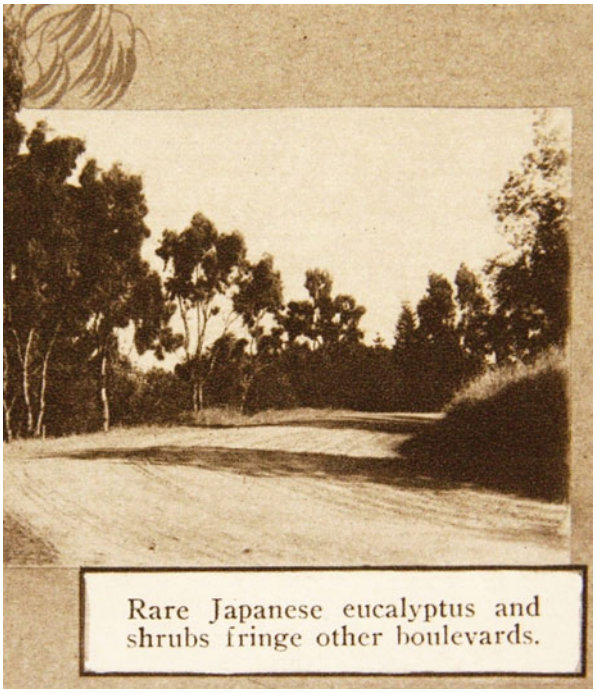

Figure 9. Post logging replacement land cover arrived in the form of eucalyptus trees and other nonnative and ornamental species. Many eucalyptus saplings were sold and replanted in other nearby locations. Others, as shown in this real estate brochure, remained in place and contributed to the roadside aesthetics of new real estate tracts. *Source:* Oakland Public Library History Room. (Color figure available online.)

Regional Development, Resource Management, and the Production of Vulnerability

Increased fire exposure in the Tunnel Fire area was produced over many decades as a result of regional development activities directly benefiting land developers and real estate owners around the Bay Area. After the first commercial round of timber, conditions of vulnerability gained traction, becoming slowly instantiated on the landscape through road grading and rudimentary infrastructure construction. Fifty years later, home developments were constructed along these and other access corridors in areas containing historically high levels of susceptibility to wildfires. Of course, this housing stock itself added substantially to the region's fuel load, thereby increasing the size and intensity of fires in the area. According to an East Bay Regional Park District report, "many structures that exist within the interface are wood-framed or have wood shingles further increasing the complexity of wildfire risks. . . . Homes generally present fires with densities of flammable materials that are much higher than the surrounding wildlands" (LSA Associates 2009, 13).

Vulnerability within these amenity-oriented communities was further augmented through the introduction and maturation of property value–enhancing tree cover including, to a large extent, flammable eucalyptus and Monterey pine species. According to a Federal Emergency Management Agency (FEMA) report issued after the Tunnel Fire, eucalyptus and Monterey pine are "highly vulnerable to rapid fire spread" because they "release massive amounts of thermal energy when they burn. They also create flying brands, which are easily carried by the wind to start new spot fires ahead of the fire front" (FEMA 1992, 7). Five years prior to the Tunnel Fire, *The North Oakland Hill Area Specific Plan* mentioned that, "In addition to naturally-occurring fires, the potential for accidental fires has increased as a result of . . . plant species such as eucalyptus and highly flammable ornamental vegetation" (City of Oakland 1986, 112; see also Farmer 2013).

After nearly fifty years, two instrumentalist uses of tree cover—early timber extraction activities during the middle 1800s, and subsequent afforestation strategies in the late 1800s and early 1900s—contributed to the production of sylvan, yet highly vulnerable neighborhoods in the Tunnel Fire area. In each case, these strategic ecological transformations delivered considerable economic benefits for a small group of powerful landowners and other profit-seeking stakeholders. This history of land ownership, fire and landscape change illustrates the explanatory power that comes from integrating physical and critical human geography analysis—that is, critical physical geography (Lave et al. 2013).

California Tax Revolt, City Disinvestment, and Revenue Equalization

Suburban Homeowner Political Movement and Curtailed City Revenues

Several decades after housing development and afforestation activities first began, conditions of vulnerability in the Oakland Hills were deepened by a second powerful force: increased suburbanization and extensive changes to preexisting tax revenue structures in the State of California. Building momentum during the 1950 and 1960s, the California suburban homeowner political movement reached a groundswell in the late

1970s, resulting in dramatic changes to the state's taxation and revenue collection system. These changes were, in part, a by-product of skyrocketing real estate values and fast-rising inflation rates that resulted in elevated private property taxes. Members of an emerging conservative antitax (or "tax revolt") movement launched a massive publicity campaign attacking rising property tax payments. To rally support, the movement focused its criticism on public expenditures in older city segments with high African American, Hispanic, and Asian American populations far removed from the largely white suburban homeowner tax base.

Public sentiment across California was put to the vote in 1978 in the form of Proposition 13. The tax revolt initiative won overwhelmingly 64.8 percent to 35.2 percent, leading to the passage of the nation's first comprehensive tax limitation measure. Voting was not equal across all cities, however. In Alameda County, suburban cities approved the measure with more than 70 percent of the vote, whereas 52 percent of the residents in Oakland rejected the measure (see Figure 10). This voting pattern underscores an emergent postwar metropolitan development sentiment around the state and nation: a desire by fast-growing white suburban populations to substantially detach their city investments, tax revenues, and wealth from core urban areas.

The effects of Proposition 13 were nothing short of profound for California's city economies. The Proposition set maximum tax rates at 1 percent of total property value and restricted maximum increases in assessed value to 2 percent from one year to the next. Of even greater consequence, its passage mandated that property could only be revalued under a transfer of ownership. The impact on city revenues was particularly dramatic for cities like Oakland with aging infrastructure, a large working-class population, and sizable public works programs.

To fully appreciate the depth of expenditure curtailments in cities like Oakland, it is important to contextualize Proposition 13 and the tax revolt within broader patterns of post–World War II suburbanization in California.[5] During this period, numerous suburban communities received substantial levels of public and private investments to attract homeowners, industry, and financial capital—marking a redistribution of wealth, property values, and tax revenues that directly undercut the economic best interests of core cities like Oakland. This process was spurred by large government subsidies in the suburban housing market and a growing coalition of construction entrepreneurs and suburban city boosters. Through federal urban policy retrenchment and market forces, the suburban landscape was converted into various forms of capital: increased property values for homeowners, direct profits for developers, and taxes for public agencies (Self 2003). The results of regional suburbanization became apparent in the rapid development of suburbia and the underdevelopment of Oakland during the postwar period.

Reduced Fire Department Budgets and Vulnerability Intensified

Urban residents in cities like Oakland are now paying for many services through price systems composed of fees and charges rather than general citywide revenue streams such as the property tax.[6] And yet, despite these new revenue sources, the funding consequences for the Oakland Fire Department are unmistakable. Prior to Proposition 13, revenues from city property taxes were almost entirely earmarked for city expenditure items.[7] For example, at the time of Proposition 13's passage, 90 percent of fire department budgets in California were funded through local property tax revenues (Brownlee 2003, cited in Self 2003). After the measure's passage, local property tax revenues witnessed a 53 percent overall reduction (Ross 2009). By the 1990s, the proportion of city revenues drawn from property taxes had decreased to 8 percent within the state. This decline is evident at the county level as well. Prior to Proposition 13, counties in California drew 33 percent of their revenue from property taxes. By the 1990s, property taxes shrank to a mere 10 percent of county revenues (Chapman 1998).

Sharply reduced city tax revenues have resulted in underfunded fire response, mitigation, and retrofitting programs throughout Oakland (Self 2003). According to FEMA (1992), the Oakland Hills were "particularly vulnerable in the fall of 1991, after 5 years of drought, several months with no recorded precipitation, and reduced efforts to control wildland interface fires due to State and local budget limitations" (2). The report goes on, "Before budget reductions in the 1970s and 80s, [the Oakland Fire Department] was recognized as one of the strongest fire suppression departments in the western United States. The budget limitations reduced the number of companies in service and the staffing on each company. Several stations were closed during this period" (50).

Moreover, it is well documented that damaged and dead trees pose a significant fire risk. A deep freeze in 1972 and 1990 harmed numerous eucalyptus groves and contributed to the formation of highly flammable

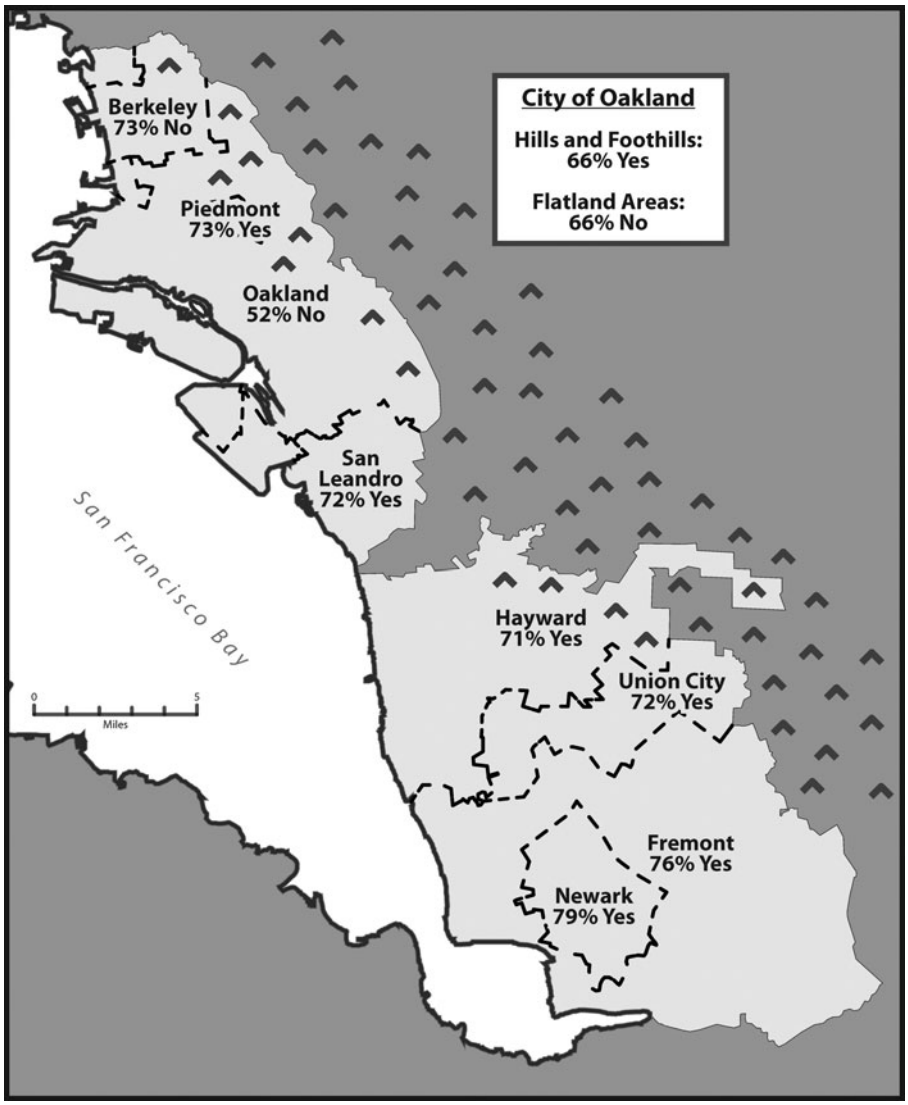

Figure 10. California Proposition 13 voting outcomes in Oakland and its suburban neighbors in 1978. *Source:* Adapted from Self (2003) by Peter Anthamatten.

vegetation cover. Yet, according to the Oakland General Plan, budget reductions led to conditions where "the City lacks the funds to completely restore its damaged or dead vegetation" (City of Oakland 1996, 38). Still further, according to the fire chief, Oakland's Fire Department operational units were overextended during the 1991 Tunnel Fire, leading to diminished emergency response and mitigation capabilities (City of Oakland 1992a).

In light of budgetary constraints, many fire departments now rely on a regional network of response agencies. This model of flexible and shared emergency response governance is exceedingly more cost efficient for participating municipalities than fully staffed, autonomous units. And yet, this interagency structure has its own shortcomings. According to a State of California (2001) report, during the Tunnel Fire, "nozzle hook-ups for Oakland . . . actually had a smaller size than the other districts. So, when firefighters came from areas, they could not plug into the Oakland hydrants" (12). The report goes on, "Communications broke down. They could not communicate with one another adequately because the radios were on different wave lengths. . . . It was pretty much chaos" (12). Along with technical and communication incompatibilities, many of these agencies were themselves undergoing similar operational constraints from budget cuts (Pincetl et al. 2008). The Tunnel Fire illustrates how residents in the City of Oakland—who had become increasingly dependent on flexible and efficient cross-jurisdictional support—were underserved by this interagency response structure.

A complex process of suburbanization—characterized by the reorientation of public and

private finance toward metropolitan peripheries and the emergent influence of a homeowner antitax movement—contributed to budget cuts, decreased city revenues, and, ultimately, the reduction of fire prevention and mitigation capabilities. Moreover, the regional fire response model emerging after budget reductions was itself rendered vulnerable to technical and communication limitations.

City Revenue Equalization and New Housing Subdivisions

The effects of city revenue curtailment on vulnerability extend beyond reduced fire prevention and mitigation capabilities. Beginning in the late 1950s, city builders in Oakland erected hundreds of high-density housing units in areas directly adjacent to the origin of the Tunnel Fire (see Figure 3). The Hiller Highlands Complex, Parkwoods Apartments, and other new developments in Oakland's hillside areas were constructed, in part, as a response to lost revenues from state and federal retrenchment and state property tax restructuring. Home developments and subdivisions can generate substantial city income, particularly in hilly terrain containing high property values and tax revenue potential (Chapman 1998). Figure 11, based on comprehensive city tax roll analysis, details the considerable property tax revenue generated from homes in state-designated high fire risk areas of Oakland during 2012. As part of this strategy to offset decreased property tax revenues, the City of Oakland extended housing developments higher into the hillside.[8] Unfortunately, but not surprisingly, many of these expansive home and condominium developments, located at the Tunnel Fire epicenter, were the first units to be destroyed by the 1991 conflagration.

The North Oakland Hill Area Specific Plan describes this revenue replacement strategy: "Given the assumed value of new homes in the North Oakland Hills Area, and the significant level of property taxes generated, the net fiscal impact of development on public services is positive." The plan goes on to note that this net fiscal benefit to the City of Oakland holds true "unless an attempt is made to operate a new fire station" (City of Oakland 1986, 122). Here, city officials seem to indicate that tax revenues from new housing developments in the Oakland Hills can have a positive fiscal impact on the city but that net revenues will only increase without the construction and maintenance of a new fire station to serve the area.

In a stark paradox, this means that populating the hill slope to compensate for lost revenues requires not only intentionally placing homes within a landscape historically vulnerable to frequent wildfires, but it requires doing so without additional fire protection. As city planners in the same report soberly noted, "New residential development will significantly increase the potential for loss of life and damage to property from fire hazards in the North Oakland Hills, especially given the poor accessibility" (City of Oakland 1986, 122). The ripple effect of lost tax revenues in Oakland is clear: the construction of more housing units with less fire protection in high fire risk areas (City of Oakland 1992a).

Risk Offsetting and the Uneven Distribution of Affluence and Net Vulnerability

Uneven Levels of Indemnification and Exposure to Revenue Curtailments

Thus far, this article has viewed vulnerability as a series of hillside manifestations, characterized by enhanced fire risk due to a rapid increase in total fuel load, residential communities, and impaired fire-fighting capabilities. Although these landscape changes are extremely important, particularly for those residing in high-risk fire areas, there exist other important and interrelated vulnerabilities throughout the rest of Oakland. A third spatial history section illustrates how

	Property Tax Revenue (2013)	Area	Number of Units	Tax Revenue / Unit
City of Oakland	$334,655,556	56.07 sq mi	69,749	$4,798
Very High Fire (VHF) Risk Area	$109,667,332	17.32 sq mi	16,491	$6,650
Non-VHF Area	$224,988,224	38.75 sq mi	53,258	$4,224

Figure 11. Based on comprehensive city tax roll analysis from fiscal year 2012. Very high fire risk areas in Oakland account for a significant portion (nearly one third) of the city's overall property tax revenue. Property taxes from these high-risk areas generate more revenue per unit (57 percent higher) compared to the rest of Oakland.

factors generating vulnerability and affluence in the Tunnel Fire area also contribute to the production of vulnerabilities throughout the rest of Oakland. Here, the allocation of estate-based wealth for property holders and levels of net vulnerability are highly uneven across space and demographic groups—yet also deeply intertwined in their production.

At first glance, Proposition 13 voting patterns might appear to signal a tax revolt movement largely driven by suburban city residents and rural homeowners. As one digs deeper into the spatial distribution of Proposition 13 voting in Oakland, however (Figure 10), another trend emerges: Voters in the Oakland Hills followed suburban patterns in support of the proposition by a nearly two-to-one margin, whereas downtown Oakland and flatland areas, populated much more heavily by working-class minorities, voted two-to-one against the measure (Kemp 1980). This intracity division in voting illustrates how residents in Oakland hillside and flatland areas clearly held different views of what constitute acceptable property tax rates and levels of revenue sharing.

The spatial distribution of votes in favor of Proposition 13 underscores a powerful antitax sentiment supporting the protection of personal estate-based wealth over redistributive structures of taxation. As illustrated earlier, though, the cumulative impacts of city revenue curtailments on hillside residents had unintended consequences: the rapid depletion of fire department budgets and subsequent housing construction in fire-prone areas. In an effort to reduce individual property taxes, fire response agencies were left with insufficient resources to protect those very same vocal property owners from devastating conflagrations.

The case of the Tunnel Fire suggests that the acceptance of high fire danger and curtailed fire mitigation capabilities by these hillside residents is buoyed by a multilevel system of fire risk subsidization (see, e.g., Davis 1998; Wolch, Pincetl, and Pulido 2001). This structure of vulnerability offsetting is supported, to a large extent, by an expansive insurance industry supporting loss indemnification. If residents can afford the cost of comprehensive fire insurance—such as guaranteed replacement cost plans—they can effectively pay for the right to live in areas with historically high fire activity.

Along with insurance coverage, there exists a tiered structure of postdisaster redevelopment policies that also facilitates risk reduction. Immediately after the Tunnel Fire, for example, the State of California paid an estimated $15 million to local governments in the form of public disaster assistance. This included payments directly to city governments, loans to owner-occupied and rental properties, individual and family grants, and homeowner property tax deferrals. Meanwhile, federal grants were issued for an estimated $42 million to state and local governments to recover these and other incurred costs (State of California 1991). The influence of these pre- and postdisaster policies on levels of vulnerability are significant because they help Oakland Hills residents rationalize and accept (as expressed through Proposition 13 voting patterns) chronic citywide disinvestments in fire response and prevention programs.[9]

To be sure, residing in these hillside areas presents very real risks for community members—including loss of life and damage to or loss of irreplaceable items, heirlooms, and keepsakes. Thus, despite these risk-offsetting policies, many hillside residents living in fire-prone areas hold a lower level of net vulnerability when compared with less privileged residents in flatland areas (Rodrigue 1993). Poorer city residents who cannot afford comprehensive insurance premiums, and are thus rendered insufficiently indemnified, might therefore feel the acute and uneven social consequences of elevated fire vulnerability. This condition results in a landscape comprised of individuals with highly differentiated abilities to "anticipate, cope with, resist, and recover from the impact of a natural hazard" (Blaikie et al. 1994, 9; see also Mustafa 2005). Post–World War II antitax homeowner politics coupled with insurance and government risk reduction measures illustrates "why hazards affect people in varying ways and why people experience disasters differently" (Ray-Bennett 2007, 420).

Of course, decreased fire department capacities represent but one form of social vulnerability resulting from city revenue curtailment. Reduced welfare and financial hardships are also generated from declining support for other public programs related to education, environmental health, psychological services, child care, and so on. Moreover, the impacts of disinvestment run across generational lines (i.e., those purchasing homes before and after passage of Proposition 13) and thus disproportionately affect new and immigrant households who must buy into newly reassessed properties with adjusted (and higher) property tax rates (Ross 2009).

Still further, tax restructuring has led city officials to pursue alternate income streams such as from elevated sales tax rates. Sales taxes, however, disproportionately impact lower income families, who spend a larger portion of their salary on household staples (e.g., Gale, Houser, and Scholz 1996; Greenwood and Brown 2003). Similarly, state and local budgets have become

more reliant on income taxes for revenue. Yet income tax revenues are among the most volatile forms of state funding, as government entitlement programs experience greater susceptibility to budget crises during economic downturns (Gamage 2009).

In short, flatland residents experience elevated vulnerability to fires as a result of (1) decreased fire prevention and response services and (2) reduced capacity, for many households, to recover losses due to unaffordable comprehensive insurance plans. Adding to the burden are (3) other potential acute impacts of city revenue curtailment where the responsibility of balancing city budgets is shifted onto household income and expenditure activities.

"A Part of the City Below"

This third spatial history section illustrates how after nearly 150 years of vulnerability-in-production, perhaps the most acute burden of risk to urban fires and reduced city spending besets flatland community members receiving only attenuated benefits from the region's history of instrumentalist land use policy, lucrative real estate developments, and skyrocketing property values. Figure 12 illustrates this point and shows how the financial dividends of homeownership in Oakland are disproportionately higher in hill areas and, in particular, in the area impacted by the 1991 Tunnel Fire. Here, analysis of seventy years of census data reveals that median property values have increased from under $100,000 in 1940 to about $900,000 (900 percent rise in value) in 2010, whereas increases in flatland areas grew more modestly from nearly $70,000 to roughly $400,000 (570 percent rise in value) over the same period. Moreover, the most dramatic increases in home value occur in areas populated predominantly by white residents, whereas segments of the city with higher nonwhite populations have experienced considerably lower increases in home value. This bifurcated development reflects historically differentiated capital investment and land use planning in Oakland's flatlands through a process McClintock (2011, 93) referred to as "demarcated devaluation."

The hillside subdivision and home development process must also be understood as establishing a foundation for future capital accumulation and elevated postdisaster property values. After the Tunnel Fire, displaced residents were presented with an opportunity to negotiate the reconstruction of their homes. Based on spatial analysis of home footprints for 422 houses before and after the fire, the average home size grew by 247 square feet (11.1 percent larger than the previous structure). The distance between units was reduced from 14.2 feet to 12.4 feet (or 14.4 percent closer). Figures 13 and 14 present a sample depiction of changes in home size and proximity after the Tunnel Fire.

Following Klein's (2007) theory of disaster capitalism, the postfire environment provided a brief window for strategic capital investment and financial opportunism. Through an expedited design review process, home construction was fast-tracked for approval to quickly return households to their hillside properties. With minimal oversight, these structures were rebuilt bigger and closer together. The logic for homeowners was simple: Capitalize on the disaster and generate as much square footage (and property value) out of insurance claims as possible. Meanwhile, these larger and more valuable homes injected more money into local real estate market sector transactions and increased Oakland's property tax revenue base. The firestorm could therefore be seen as presenting an opening for increased wealth accumulation for various parties involved in the postdisaster rebuilding process. Meanwhile, increased overall fuel load and more proximate structures have arguably generated higher susceptibility to future fires. Through the rebuilding process we see the simultaneous deepening of both fire exposure and affluence in the Tunnel Fire area.

To some, it might appear the sentiments offered in an early promotional real estate brochure still hold true: Oakland Hills residents are a part of the city below, yet apart from it (Laymance Real Estate Co. 1911b). Quite the contrary, dedicated spatial–historical analysis reveals that these bifurcated development trajectories and levels of vulnerability are in fact deeply intertwined. Wealthy, white hillside communities and relatively poorer minority flatland residents are indeed a part of the same urban story. Turn-of-the-century sylvan neighborhoods were generated through the introduction of property-enhancing replacement tree cover and other amenities leading to the development of a "Mecca toward which the successful Californian turns" (Laymance Real Estate Co. 1911b, 261). These land use developments, as Harvey (1996) suggests, represent "manifestations and instanciations . . . of . . . particular social relations" (183).

It is through this process that we are able to identify the formation and ossification of social stratification—local differences that reflect "unevenness within larger geographies of capitalist development, industrialization and urbanization" (Walker

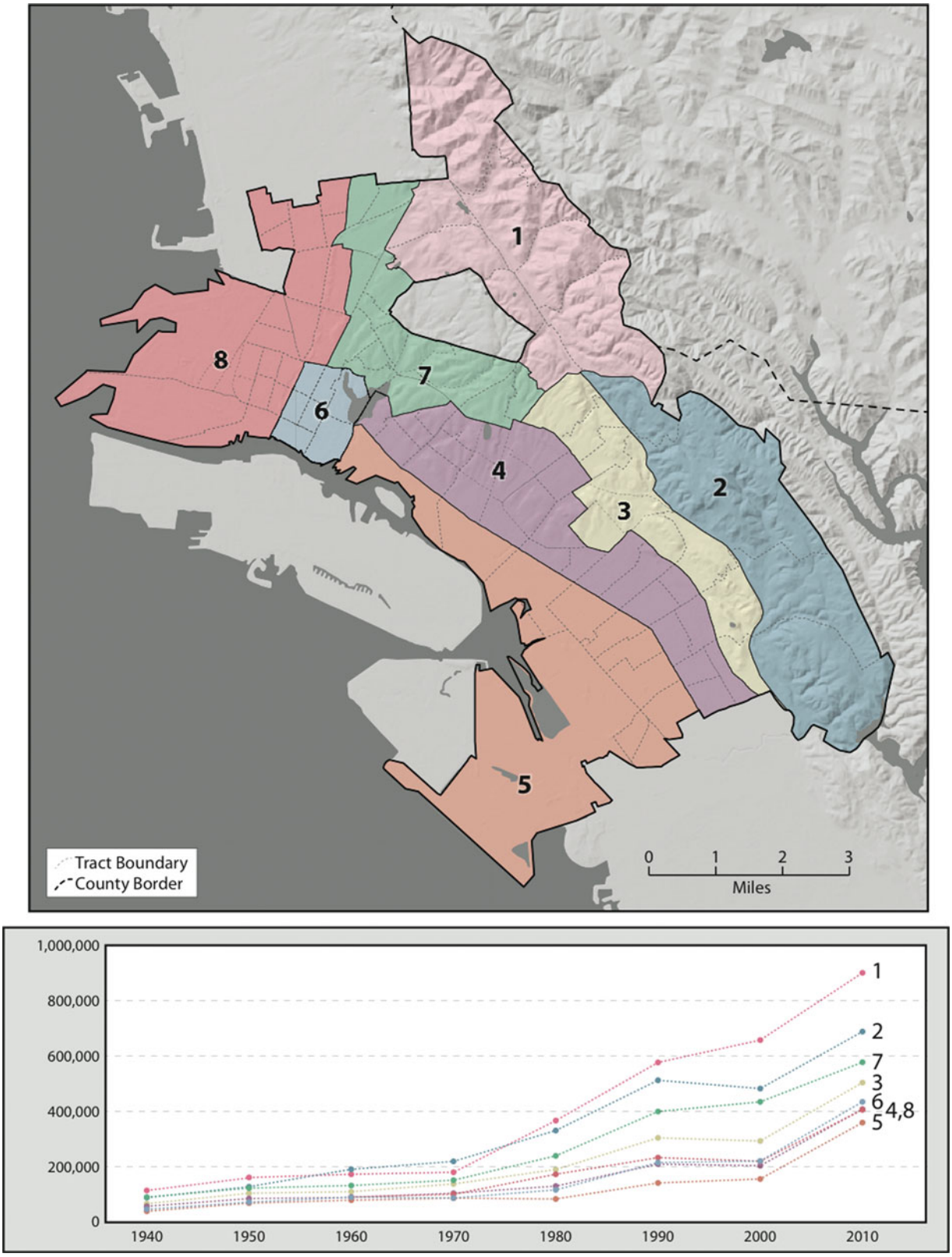

Figure 12. Change in home values from 1940 to 2010 illustrates the differentiated allocation of estate-based financial benefits across space and demographic groups in Oakland. *Source:* Map Credit: Peter Anthamatten and Alejandra Uribe. (Color figure available online.)

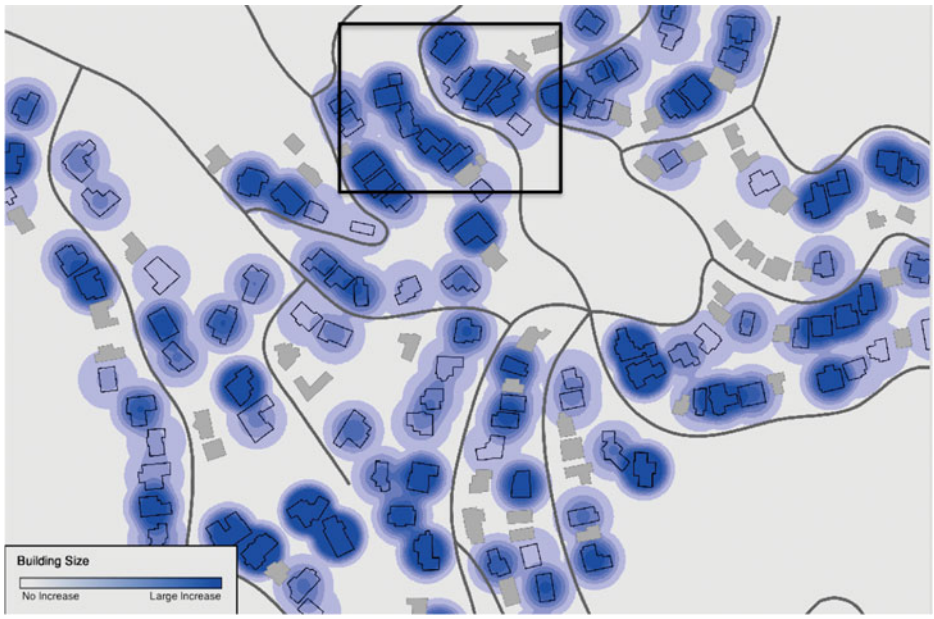

Figure 13. Kernel density analysis depicting homes in the Tunnel Fire area (from a larger sample of 422 houses). Image shows growth in home footprint after the rebuild. Darker blue indicates greater increase. The footprints of rebuilt homes were on average 247 square feet (or 11.1 percent) larger than prefire structures. (Color figure available online.)

1995, 1; see also McClintock 2011). Following Smith (1984), the City of Oakland matured in a manner perhaps most notable for its spatially uneven development where both space and nature were continually produced by and for estate-based capital accumulation. Indeed, the settlement of hillside landscapes by wealthy, white communities was no accident. As a Laymance Real Estate Company (1911a) brochure stated about one neighborhood in the Oakland Hills, "It is probably unnecessary to even mention that no one of African or Mongolian descent will ever be allowed to own a lot in Rockridge or even rent any house that may be built there" (6).

Some have suggested that Proposition 13 voting patterns, such as those found in Oakland, reflect dramatic differences in real estate values, where support for Proposition 13 simply increased in tandem with anticipated tax savings (Citrin and Martin 2009). This article does not refute this argument. Instead, it has proposed expanding on its rather aspatial, ahistorical, and apolitical explanatory purview by connecting early land transformations to these voting patterns a century later. Beginning in the mid-1800s, resource extraction and subsequent real estate speculation activities contributed to the production of white, affluent communities and heightened levels of vulnerability. Over a century later,

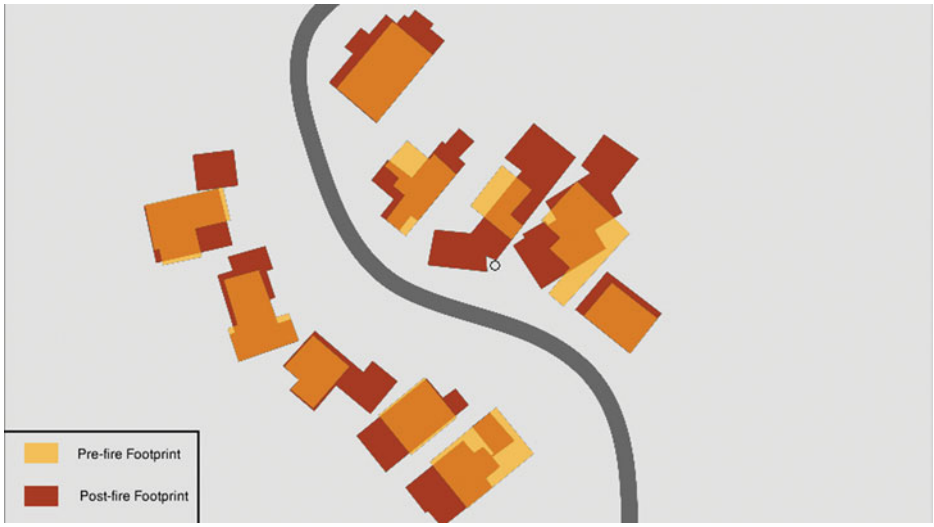

Figure 14. A subset of houses (box inset in Figure 13) depicting an overlay of pre- and postfire home footprints. Nearest neighbor distance analysis was applied to detect a change in the proximity of homes. Postfire structures were on average 1.8 feet (or 14.4 percent) closer than original homes. (Color figure available online.)

Proposition 13 dismantled structures of revenue redistribution in a manner that conformed to social stratification and real estate value disparities across space. Voting patterns reinforced the divergent development trajectories first established under early land speculation activities. This spatial history thus animates vulnerability-in-production by illustrating why disparate land values exist and how they contribute to and reinforce (in part through subsequent voting patterns) levels of vulnerability in flatland areas resulting from chronic city disinvestments.

Conclusion: Toward a Spatial History of Vulnerability and Affluence

Spatial history analysis is a useful framework for interrogating social–environmental change and the concomitant production of vulnerability and affluence over time and space. To employ this research framework, this article has combined and leveraged analytic commitments from the fields of digital history, historical geography, and political ecology. On the one hand, spatial history analysis involves the collection, integration, and synthesis of diverse historical and spatial data and analytic methods. These resources—from expansive data sets to pointed quotes and imagery—are rendered legible and meaningful through the construction of combined text, cartographic, and dynamic visualization outputs. Animating spatial data temporally and historical data spatially provides an opportunity to not only represent complex relationships, feedbacks, or thresholds that are difficult to ascertain in static or tabular form; spatial history outputs also generate opportunities to expose unexpected connections, ask new research questions, chart novel research trajectories, and generate innovative spatial–historical narratives of vulnerability.

On the other hand, spatial histories of vulnerability demonstrate the recursive production of vulnerabilities across space and raise larger questions about how those conditions are generated and responded to (Simon and Dooling 2013). A key focus of spatial history, therefore, is to leverage diverse data to illuminate the production and reproduction of vulnerable spaces in relation to other spaces—thereby highlighting the production of vulnerability as a deeply relational process (see also Sayre 2005; Rocheleau 2008; Neumann 2010). To highlight the dynamic manner in which vulnerability and real estate–based wealth are coproduced, previous sections have illustrated the Tunnel Fire area, and the City of Oakland more generally, as by-products of deeply intertwined socio-environmental histories and spatialities (see, e.g., Boone et al. 2009).

The first spatial history section illustrates how vulnerability "does not exist in isolation from the wider political economy of resource use" (Adger 2006, 270). As Brechin (2006, xxix) opined, when the San Francisco Bay Area grows, much like all great metropolises, "so does both its reach and its power to transform the nonhuman world on which its people depend." He continued, "there exists a critical *ecological* relationship between the city and the countryside, a relationship as applicable to modern San Francisco as to ancient Rome" (xxix, emphasis in original). For its ability to generate valuable timber resources, the once-countryside setting of the Oakland Hills stands as a site of instrumentalist resource use supporting frenzied construction activities in the San Francisco Bay Area during its post–gold rush economic ascendance. These resource provisioning activities generated roadways that, several decades later, fell under the speculative eye of housing developers in search of suburban homes and vacation retreats for the region's new elite. This transition from resource extraction to real estate speculation was instantiated in the landscape, as several logging paths in Oakland became arterial roads populated by municipal infrastructure, flammable tree cover, and eventually a vast collection of new home developments in high-risk fire areas. This sequence of events illuminates how the production of vulnerability proceeds through—and is supported by—interconnected economic development and resource use activities across city and regional scales.

A second spatial history section also depicts the scalar dimensions of vulnerability-in-production. As Self (2003) postulated in his groundbreaking essay *American Babylon: Race and the Struggle for Postwar Oakland*, the story of Proposition 13 is as much about life and livelihoods within core cities as it is about the suburbs. According to Self, Proposition 13 marked a seminal moment within California's broad ideological shift toward the pursuit and maintenance of white, neopopulist homeowner policies predicated on individual rights, estate-based wealth protection, and a near-sighted commitment to social responsibility. In the face of a postwar suburban growth politics—culminating in the overthrow of conventional structures of taxation under Proposition 13—metropolitan core areas like Oakland experienced tax revenue losses and depleted operating budgets within tax-dependent city fire services (Pincetl et al. 2008). To generate new sources of

tax revenue, city officials pursued large housing developments within high fire risk areas. The slow increase in vulnerability to wildfires in the Tunnel Fire area is thus deeply intertwined with California's broader tax-revolt political movement.

A third spatial history section considers vulnerability in the context of diverse risk-offsetting resources and broader city revenue curtailments for Oakland's flatland residents. After nearly 150 years of vulnerability-in-production, perhaps the greatest risk burden from city disinvestment besets flatland residents—a suite of communities receiving only attenuated benefits from the region's long history of lucrative land use and real estate developments. Beginning with early land transformations, this section illuminates why the production and reproduction of difference matters and hence why it is important to study the production of vulnerability over time and space. Here, voting patterns are shown to reinforce divergent city development trajectories first established through land speculation and affluent home construction a century earlier—a level of private wealth that has been reinforced and augmented by opportunistic postdisaster home reconstruction efforts. In this way, lucrative hillside real estate developments and postwar tax-revolt movements are inseparable from, indeed constitutive of, the lives and livelihoods of inner-city residents. This article thus illustrates the political ecological nature of vulnerability—where the allocation of estate-based financial benefits and levels of net vulnerability are deeply intertwined, yet also unevenly distributed.

Using the Tunnel Fire as a starting point for analysis, this article has animated vulnerability and affluence, activated space, and demonstrated how each is coproduced over time. Three spatial history sections articulate the double meaning of vulnerability-in-production. First, conditions of vulnerability are always in production and actively influencing new vulnerabilities. As opposed to being a dormant outcome, vulnerability can be understood as an active and recursive process that gains momentum over time and accumulates unevenly across space. Second, vulnerability is generated within landscapes that are intentionally altered, developed, and maintained in a manner that retains their productivity for property owners and other stakeholders. These include real estate developers in search of cheap lumber supplies; early landowners looking to subdivide and beautify large real estate tracts; suburban homeowners seeking to protect their own financial assets at the ballot box; hillside residents capitalizing on the fire by rebuilding larger homes; and the City of Oakland looking to generate more tax revenues from lucrative hill areas.

Acknowledgments

Thanks to Richard White, Zephyr Frank, Erik Steiner, and other members of the Spatial History Project at Stanford University for their valuable insights and support. Thanks also to the many research assistants who helped with data collection and analysis. Also Peter Anthamatten for his timely and masterful cartographic assistance. I am also very grateful to staff in the Oakland Public Library History Room and Bancroft Library at the University of California, Berkeley. Finally, I would like to thank Bruce Braun and three anonymous reviewers for their incisive comments.

Funding

Thanks to the Colorado University Denver Center for Faculty Development and the College of Liberal Arts and Sciences Dean's Office for their generous financial support. Generous support was also provided by the Spatial History Lab at Stanford University.

Notes

1. These storylines by no means represent the totality of factors influencing levels of fire risk for area residents. Other notable factors include (1) patterns of housing sprawl and land fragmentation (Massada et al. 2009), home architecture and materials (Cohen 2000), road width and accessibility (Cova and Johnson 2002); (2) the role of climate conditions (Westerling et al. 2003), topographic features (Rehm and Mell 2009), and combustible vegetation cover (Gill and Stephens 2009); and (3) fire management practices including dedicated fire suppression (Pyne 1997, 2008) and coordination deficiencies between diverse fire mitigation agencies (Stephens et al. 2009).
2. Like other major conflagrations, the Tunnel Fire has been scrutinized within conventional analytic categories to assess underlying factors causing increased fire vulnerability (Office of Emergency Services 1992). Retrospective analysis has led fire experts and city agencies to closely examine the built environment of the East Bay Hills (City of Oakland 1992a; FEMA 1992), the region's biophysical attributes (City of Oakland 1992b; FEMA 1992), and vegetation and fire management activities (City of Oakland 1992a).
3. This spatial history, for example, utilizes considerable archival data (including images, brochures, city budget reports, and policy documents to reveal planning agendas and evidence of land use/cover change), historical maps and satellite imagery (which were georectified to illustrate urban road network morphology), aerial photography (that was analyzed alongside nearest neighbor

distance and kernel density techniques to determine changes in home structure size or proximity), oral histories and interviews (to construct historical city planning narratives), census data on both city demography and home values (to explore their relationship over time), city tax roll data (to determine property tax revenue from various parts of the city), and historical fire regime analysis (to reconstruct historical fire activity in the region).

4. Figure 6 utilizes road extents that are approximated to match chosen housing extent dates. For example, 1902 and 1910 frames both use 1912 roads; 1939 frame uses 1939 roads; and 1972 and 1991 use 2000 roads. Although road and home extents do not correspond exactly, Figure 6 is able to show the progression of roads along original logging access routes and how home developments generally followed this road infrastructure.
5. For a discussion of earlier, post–gold rush suburbanization in the San Francisco Bay Area (including the role of Alameda County and the City of Oakland), see Walker (2004).
6. A recent example is the California State Responsibility Area (SRA) Fire Prevention Benefit fee program initiated in 2011 to solicit payments of up to $150 for each habitable structure on the property of landowners in areas susceptible to wildfires to fund various fire prevention activities. For program opponents, such as the Howard Jarvis Tax Association (HJTA), "The [SRA] fire tax is a direct violation of Prop. 13," that is "taking more money from hardworking people for a program they were already paying for" (HJTA 2012, 1).
7. This is a legacy of California's "Home Rule Power" and "Separation of Sources Act" established in the early 1900s. Together these stipulations granted cities power to draft their own charters, govern municipal affairs, and retain locally generated taxes (Silva and Barbour 1999).
8. It is important to keep in mind that, in the State of California, local governments receive nearly all their funding through property taxes. Hence the dramatic impacts of Proposition 13 on local fire departments.
9. Household perceptions of actual fire risk might also have been reduced as a result of a persuasive scale construction deployed by the antitax movement. Through effective campaign strategies, tax opponents targeted suburban residents by suggesting that local property taxes are collected and redistributed from suburban areas into the metropolitan core. The ideologically driven nature of the movement masked the actual—and much more localized (i.e., intracity)—spatial extent of the property tax collection and redistribution catchment.

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