



**RESEARCH FOUNDATION**

RESEARCH FOR THE NFPA MISSION

# Impact of Home Fire Sprinkler System Requirements in California

---

**FINAL REPORT BY:**

**Sam Bowles**

Newport Partners LLC  
Davidsonville, MD, USA

© 2018 Fire Protection Research Foundation

1 Batterymarch Park, Quincy, MA 02169-7417, USA  
Email: [foundation@nfpa.org](mailto:foundation@nfpa.org) | Web: [nfpa.org/foundation](http://nfpa.org/foundation)



## **FOREWORD**

As residential fire sprinkler adoption is debated in many states, there is a noteworthy amount of misrepresentation about the economic impact of home fire sprinklers. Among the claims by critics of home fire sprinklers is that requiring sprinklers may impact home affordability, housing starts, consumer choice, and owner rights. More facts are needed on the issue of economic impact of home fire sprinklers.

In 2011, California issued a statewide requirement for fire sprinkler installation in new 1- and 2-family homes. This project will explore the economic impact of home fire sprinklers as it relates to the housing market by using California as a case study. This research compares the economic impact as measured primarily from building permit activity from pre-2011 when sprinklers were not required to the current status.

The Fire Protection Research Foundation expresses gratitude to the report author Sam Bowles, who is with Newport Partners LLC located in Davidsonville, MD, USA. The Research Foundation appreciates the guidance provided by the Project Technical Panelists, the funding provided by NFPA and the Home Fire Sprinkler Coalition, and all others that contributed to this research effort.

The content, opinions and conclusions contained in this report are solely those of the authors and do not necessarily represent the views of the Fire Protection Research Foundation, NFPA, Technical Panel or Sponsors. The Foundation makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

### **About the Fire Protection Research Foundation**

The [Fire Protection Research Foundation](#) plans, manages, and communicates research on a broad range of fire safety issues in collaboration with scientists and laboratories around the world. The Foundation is an affiliate of NFPA.



### **About the National Fire Protection Association (NFPA)**

Founded in 1896, NFPA is a global, nonprofit organization devoted to eliminating death, injury, property and economic loss due to fire, electrical and related hazards. The association delivers information and knowledge through more than 300 consensus codes and standards, research, training, education, outreach and advocacy; and by partnering with others who share an interest in furthering the NFPA mission.



[All NFPA codes and standards can be viewed online for free.](#)

NFPA's [membership](#) totals more than 65,000 individuals around the world.

**Keywords:** home fire sprinklers, economic impact, building permits, California

**Report number:** FPRF-2018-06



## **PROJECT TECHNICAL PANEL**

Greg Andersen, CalFire

Bill Barnard, Maryland State Fire Marshal (Retired), National Fallen Firefighters Foundation (NFFF)

Chase Browning, Deputy Fire Marshal, Medford, OR, USA

Mike Chapman, Chapman Homes

Ronny Coleman, Fireforceone

Jim Siriano, American Water Works Association (AWWA)

Stephen "Steve" Hart , Consultant/Historian (Retired Fire Marshal)

Tonya Hoover, United State Fire Administration (USFA) National Fire Academy

David Rehnstrom, East Bay Municipal Utility District

Ben Evarts, NFPA Research

Bob Fash, NFPA

## **PROJECT SPONSORS**

NFPA

Home Fire Sprinkler Coalition (HFSC)



# Impact of Home Fire Sprinkler System Requirements in California

SAM BOWLES, NEWPORT PARTNERS



**Acknowledgement**

Newport Partners would like to thank Michael Carliner for his contributions to this report. Michael is an economic consultant specializing in housing, construction, demographics, and regional economics. With more than 30 years of experience performing and managing research, he has established expertise in analyzing markets, evaluating data, and communicating information. Michael was essential in the data collection and his expertise in analyzing housing data was critical to the success of this report.

## Table of Contents

Section 1- Introduction .....	3
Section 2- Findings .....	4
Section 3- Approach .....	4
Section 4- Early Adopters vs. County & State Building Activity .....	8
Single Family Building Permits .....	8
Permit Values .....	11
Percentage of Building Permits.....	13
Multifamily .....	16
Section 5- Jurisdiction Profiles and County Level Comparisons .....	17
Cities with > 8,000 Single Family Building Permits (1990-2016).....	17
Oxnard.....	17
Riverside.....	19
Roseville .....	21
Fremont.....	22
Jurisdictions with 2,000-8,000 Single Family Building Permits (1990-2016) .....	24
Arcadia .....	24
San Clemente .....	26
Union City.....	28
Woodland.....	30
Cities with 1,000-2,000 Single Family Building Permits .....	32
Santa Monica .....	32
Santa Cruz .....	35
Sonoma .....	36

## Section 1- Introduction

Mandatory requirements for home fire sprinkler systems have been a hot debate for over a decade. In 2006, the International Residential Code (IRC) first included home fire sprinkler systems as an optional appendix before making them a standard item in 2009. However, although the IRC is adopted in 49 U.S. states, all but two of them, California and Maryland, have chosen to lift the requirement for home fire sprinkler systems, moving it back to an optional appendix or removing it all together.

There are several assumed reasons for the slow adoption of statewide requirements for home fire sprinkler systems. At the local level, many home builders argue that consumers simply don't value the added life safety and security that comes with a fire sprinkler and that adoption will negatively impact housing supply and affordability. Other stakeholder groups have argued that it will negatively impact the water supply and water quality and potentially result in increased costs for meter and pipe upsizing, permit fees, and testing/inspection. However, at the forefront of the argument against home fire sprinkler systems is the home building industry and the increased construction costs associated with installing sprinklers which they don't believe they can fully recover.

Because the cost issue is so prevalent, there have been several economic studies conducted related to the added cost associated with home fire sprinkler systems. [A 2013 study](#) by NFPA determined that the national average to install a home fire sprinkler system was \$1.35/ft<sup>2</sup>. Looking solely at the two states (California and Maryland) that have statewide requirements for all new construction that number drops to \$1.16/ft<sup>2</sup>. It is important to note that the cost of sprinkler systems can vary widely depending on a number of variables (house size, house design, climate, type of pipe, water supply, etc.). However, what was clear from that study is that widespread adoption lowers the cost.<sup>1</sup>

In addition to the cost studies, NFPA conducted a 2016 market research study, "Home Fire Sprinklers-Stakeholder Perceptions in Mandatory Requirement States." Various stakeholder groups (water purveyors, local government officials, and homeowners) in both California and Maryland were surveyed and interviewed to gauge how the statewide requirements were affecting stakeholders. Summarizing the report, the various groups were overwhelming positive about the sprinkler requirements and how they have (or more importantly have not) affected them. Additionally, there were no identified impacts on water quality or supply. That report can be read in its entirety [here](#).<sup>2</sup>

This study looks at the economic impact of home fire sprinklers as measured primarily by building permit activity, both in terms of total units and valuation. As more states and jurisdictions consider implementing sprinkler requirements, the experience in both California and Maryland, and the lessons learned in both will go a long way to help make these decisions. Maryland was the subject of a 2009 study, [available here](#).<sup>3</sup> This study focuses on the housing impact in California.

---

<sup>1</sup> Home Fire Sprinkler Cost Assessment, Newport Partners, 2013

<sup>2</sup> Stakeholder Perceptions of Home Fire Sprinklers, Newport Partners, 2016

<sup>3</sup> Comparative Analysis of Housing Cost and Supply Impacts of Sprinkler Ordinances at the Community Level, Newport Partners, 2009

## Section 2- Findings

- The housing market forces during the period studied created large changes in building permit activity in both early adopters and late adopters of home fire sprinkler requirements. For example, in 2007 California housing prices faced the steepest decline in 26 years with wide variations in prices and housing activity across the state.<sup>4</sup>
- Of the jurisdictions studied there was a mix of growth and decline in building permit activity following adoption of a sprinkler ordinance relative to the remaining county share with an overall positive result (Tables 2 and 3), indicating that taken together, the Early Adopter jurisdictions increased their share of building permits slightly (2%) relative to their county. This does not indicate that adoption had a positive impact, just that there is no evidence of a negative impact.
- When compared to state and county data, construction costs (as measured by permit values<sup>5</sup>) in Early Adopter jurisdictions experienced similar increase and/or decreases from 1990-2016, indicating that sprinkler requirements had very little to no impact.
- The findings from this study mirror the findings in the 2009 Maryland study referenced which also found no evidence of impact on housing supply or cost.

## Section 3- Approach

This study focuses on how sprinkler requirements impact both building activity and value of homes. Prior to the 2010 California Residential Code, a number of jurisdictions in California had already adopted home fire sprinkler requirements. Drawing from the experience in these jurisdictions and comparing them to the county within which they reside, we hope to gain a better understand of what, if any, impact home fire sprinkler systems have on building activity and value.

To develop our study, we first identified all of the jurisdictions that instituted requirements for home fire sprinkler systems prior to 2011.<sup>6</sup> Of these, we focused this study on jurisdictions that did not place square footage minimums<sup>7</sup> on their sprinkler requirements to ensure that all of the building permits issued would have to comply. These jurisdictions are included in Table 1, and shown on the maps Figures 1, 2, and 3. We refer to these jurisdictions as “Early Adopters.” From there, we narrowed down our list of individual jurisdictions to get a range based on building activity (permits), population, geographic location, and income. Jurisdictions with requirements that pre-dated the 2011 statewide requirement were first categorized by building activity, and then individual cities were chosen so they would represent the variety of demographics and geographic locations in California. The jurisdictions highlighted in individual profiles are in italics on Table 1 on page 6.

---

<sup>4</sup> The California Economy, Crisis in the Housing Market, Public Policy Institute of California, 2008.

<sup>5</sup> The US Census defines permit value as, “the value of new private housing units is the sum of the estimated valuation of construction on each building permit authorized in that year by local permit-issuing jurisdictions.”

<sup>6</sup> Data are based on information from a National Fire Sprinkler Association sponsored survey of local fire jurisdictions in 2003, and information collected by the National Fire Protection Association through 2010

<sup>7</sup> In some cases, certain jurisdictions adopted sprinkler requirements that only went into effect if a building was over a specific square footage.

This study focuses primarily on changes in building permit activity as that is the clearest measure of impact. Additionally, it considers changes (or shifts) in construction costs (as represented by building permit value), and changes in construction of housing type (from single-family to multifamily building).

**Important references for this report:**

- Early Adopter jurisdictions are only those who required home fire sprinkler systems prior to 2011 and have no minimum square footage requirement.
- All charts that include data on Early Adopters include ALL jurisdictions that meet these requirements, not just those highlighted in Section 4 of the report.
- All building permits, unless otherwise specified, reference “Single Family” building permits.
- Unless otherwise noted, permit value figures in the individual profiles in Section 4 of the report are reported on a per unit basis. Total permit values charted in Figures 8, 9, and 10 are an average of the total permit values (not per unit).
- County data is relevant to only those counties that include a jurisdiction identified as an Early Adopter.
- The black lines on all charts in Section 4 indicate when the statewide requirement went into effect. In Section 5, these lines indicate when the requirement went into effect for that specific jurisdiction.
- All population, income, and permit data (units and valuation) taken from the US Census Bureau. All other sources are recognized in footnotes.

The Early Adopters identified for this study are included in Table 1 below and illustrated in maps shown in Figures 1-3.

Place	Year of Adoption	2008-2012 Population	2008-2012 Household Median Income
Fairfield	2008	105407	\$66,363
Livermore	2007	81086	\$97,379
Oxnard	2007	197456	\$60,736
Riverside	2007	306128	\$56,403
Fremont	1995	215188	\$99,169
Roseville	2007	119537	\$74,579
Arcadia	2007	56497	\$77,342
Petaluma	2008	57852	\$76,909
Placentia	2008	50616	\$75,693
San Clemente	1979	63187	\$87,184
Union City	1995	69820	\$83,066
Woodland	2007	55585	\$55,139
Cypress	2007	47986	\$80,440
Daly City	2007	101538	\$72,762
Santa Cruz	1996	60319	\$62,755
Santa Monica	1992	90008	\$72,271
Sonoma	2003	10602	\$63,147
Beverly Hills	2007	34215	\$85,918
Burbank	2004	103420	\$67,693
Claremont	2007	35043	\$80,754
Downey	2005	111807	\$60,132
Glendora	2007	50247	\$74,619
San Gabriel	2008	39809	\$56,260
San Mateo	2007	97322	\$87,662
Culver City	1990	38949	\$76,182
La Habra Heights	2006	5333	\$119,605
Larkspur	1996	11952	\$86,675
Monterey	2008	28168	\$63,072
San Carlos	2002	28455	\$120,112
Tiburon town	1982	8959	\$132,344
Ukiah	2007	15962	\$44,958

Table 1: Early Adoption Jurisdictions

	Over 8,000 Permits since 1990
	2,000-8,000 Permits
	1,000-2,000
	500-1,000
	Less than 500

Color Key

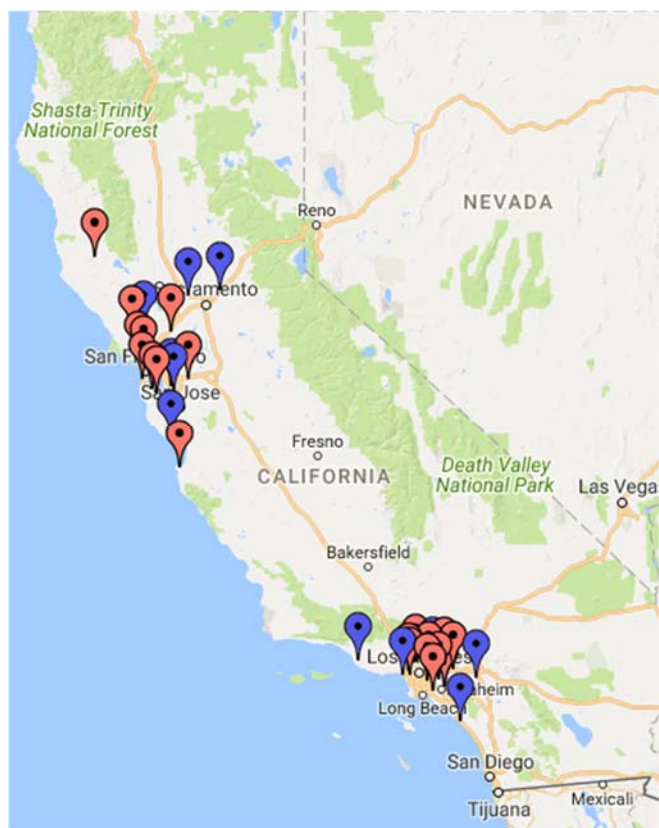


Figure 2: Map of Early Adopter Jurisdictions

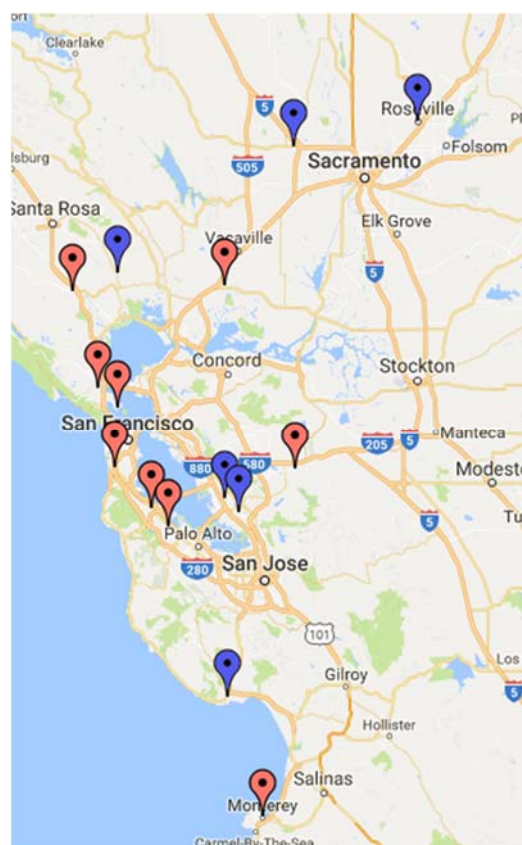


Figure 1: Map of Early Adopter Jurisdictions: San Francisco, San Jose, Sacramento Area

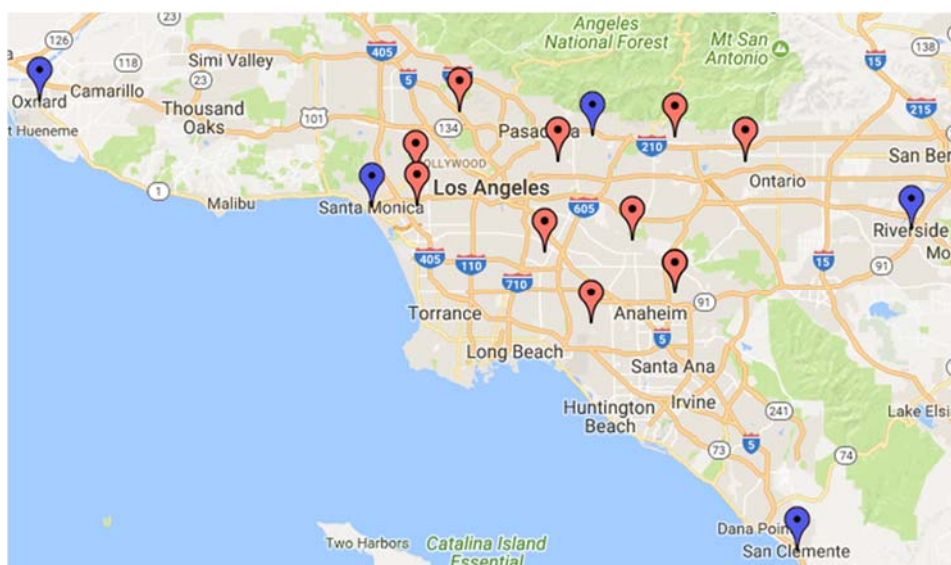


Figure 3: Map of Early Adopter Jurisdictions: Los Angeles Area

## Section 4- Early Adopters vs. County & State Building Activity

### Single Family Building Permits

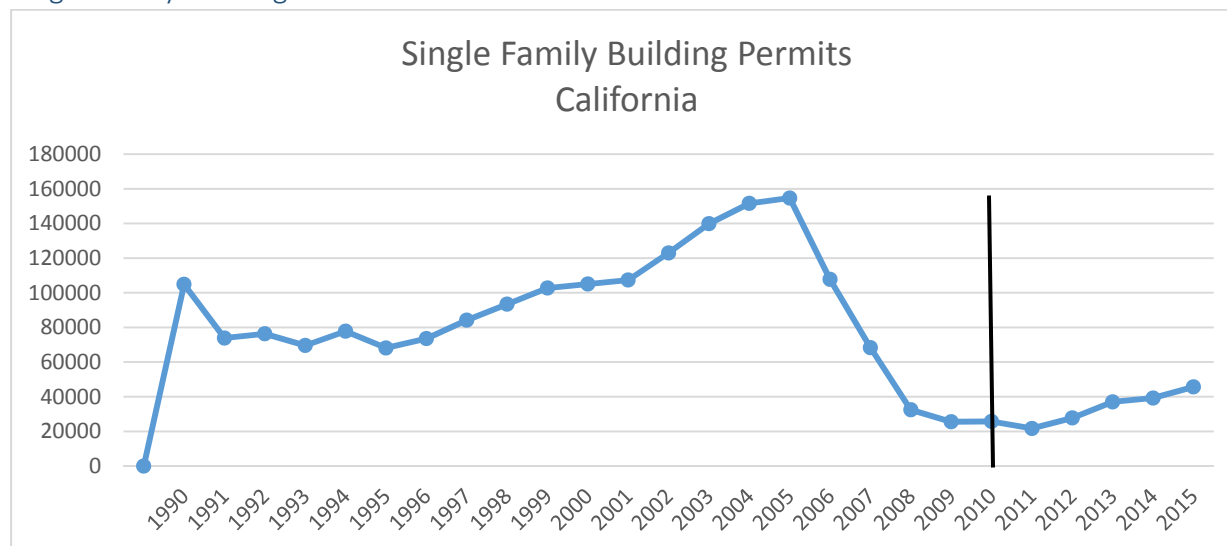


Figure 4. Single Family Building Permits 1990-2016

Figure 4 shows the number of single family building permits for the entire state of California from 1990-2016. From 1995-2005, the state experienced a steady growth, followed by a substantial decline in single family building permits as a result of the housing bubble crash. However, since 2011 the number of building permits has slowly increased each year.

During the growth period from 1995-2005, 9 jurisdictions adopted home fire sprinkler requirements (with no minimum square footage requirements). From 2006-2010, when single family permits substantially declined, 26 jurisdictions adopted home fire sprinkler requirements. From 2011, after the statewide requirement for home fire sprinkler systems, permit numbers have been on the rise.



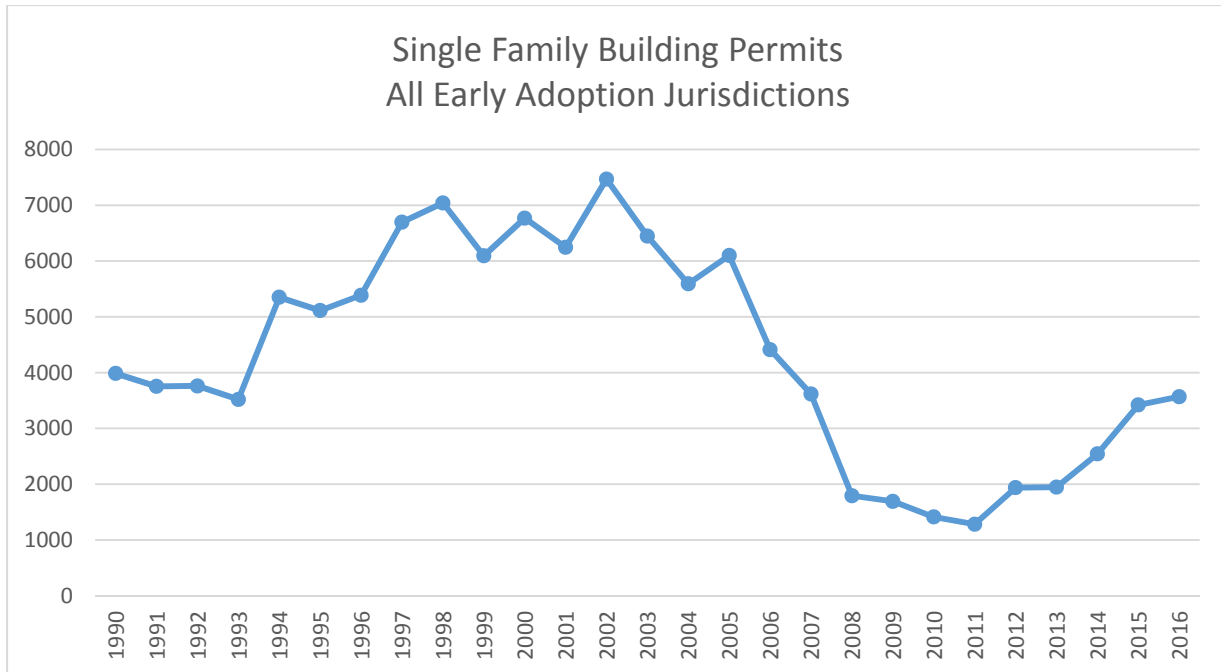


Figure 5. Single Family Building Permits- All Early Adoption Jurisdictions

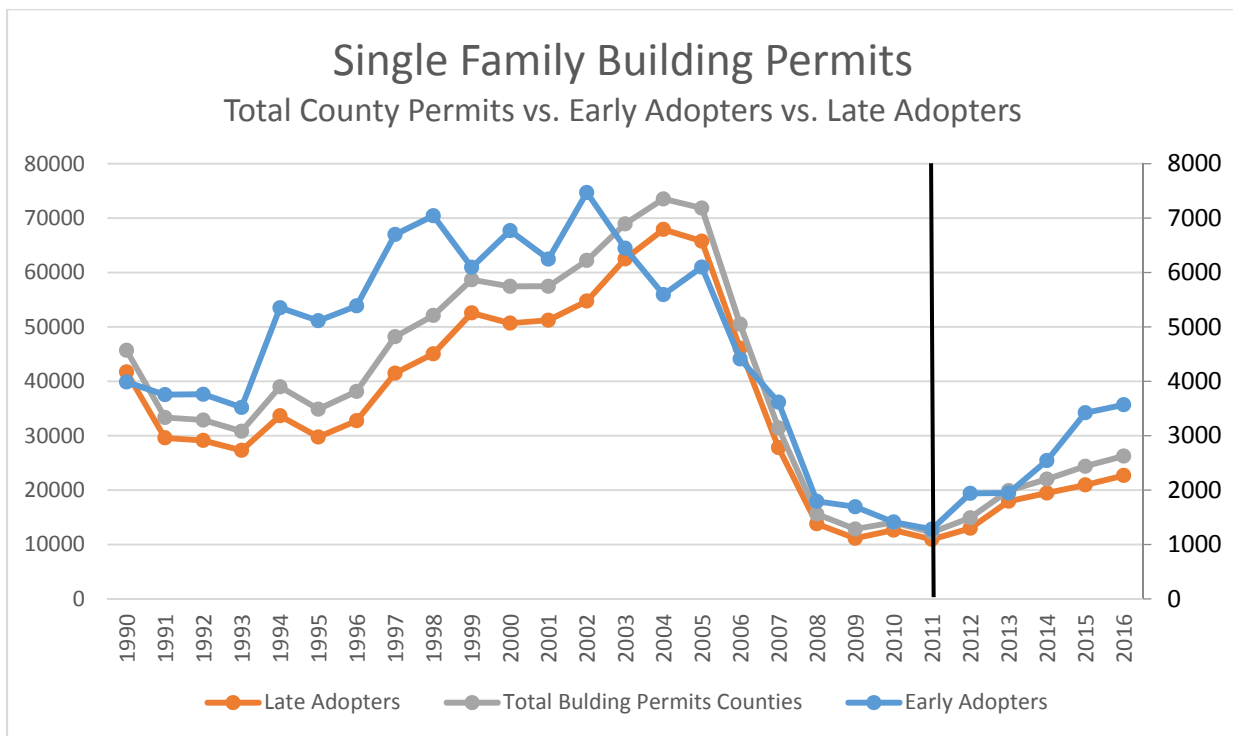


Figure 6: Single Family Building Permits- Early Adopters, Late Adopters, Total County<sup>8</sup>

<sup>8</sup> The data for Early Adopters, represented by the blue line in Figure 6, is plotted on the chart using the right y-axis.

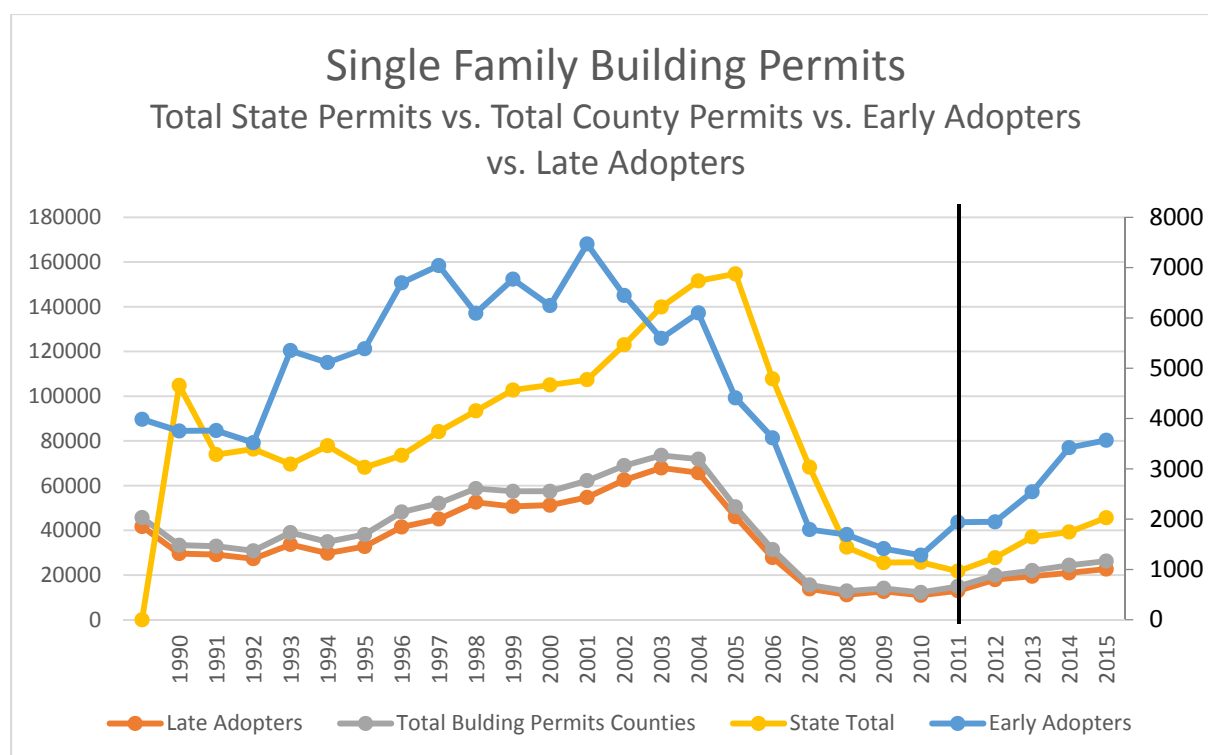


Figure 7: Single Family Building Permits- Early Adopters, Late Adopters, Total County, Total State<sup>9</sup>

The Figure 7 shows the number of single family building permits issued for all jurisdictions with home fire sprinkler requirements prior to 2011 (with no minimum square footage) as well as the permits for all other jurisdictions within the counties associated with the early adopters and the total for the state.

A review of the data as depicted in Figures 6 and 7 indicate, there is no clear finding that can be associated with the requirements for home fire sprinkler systems. Building activity across the state follows the same pattern, whether sprinklers are required or not, and is impacted by larger market forces in the California economy.

While at first glance the “Early Adopters” line in the chart above seems to be more stable than the “Late Adopters,” it is a result of a smaller volume plotted on the same Y-axis. The relative increase and decrease in number of permits is relatively even between early adopters and late adopters. This would seem to indicate there is no impact on building activity due to requirements for home fire sprinkler systems. In fact, since the statewide requirement went into effect in 2011, the number of building permits has gone up across the state.

<sup>9</sup> The data for Early Adopters, represented by the blue line in Figure 7, is plotted on the chart using the right y-axis.

Permit Values

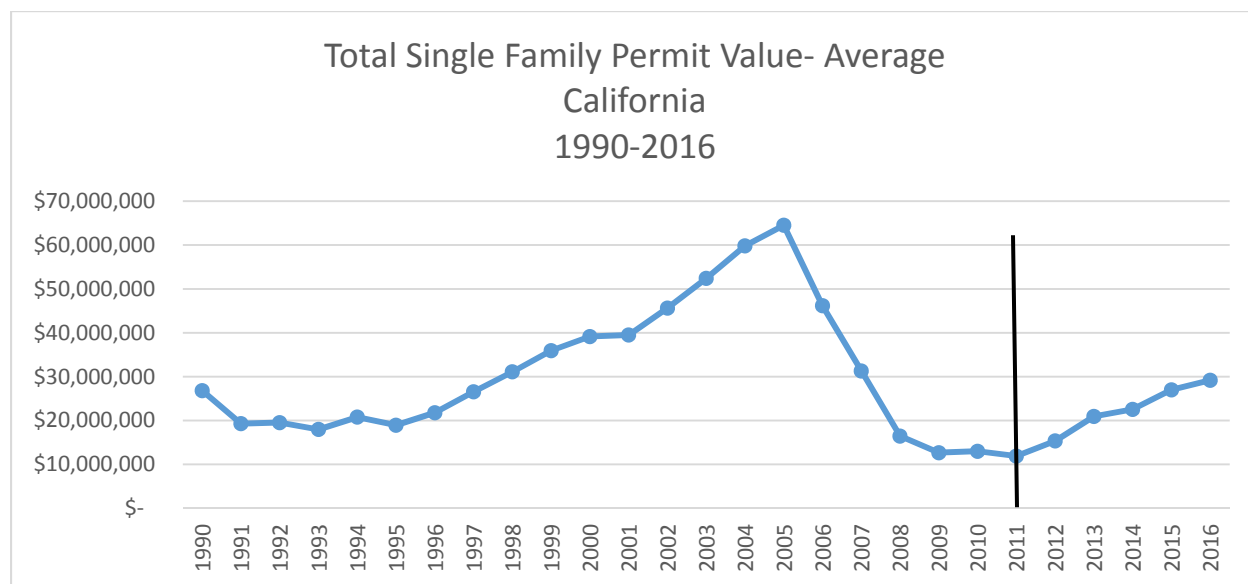


Figure 8: Average Permit Value- California

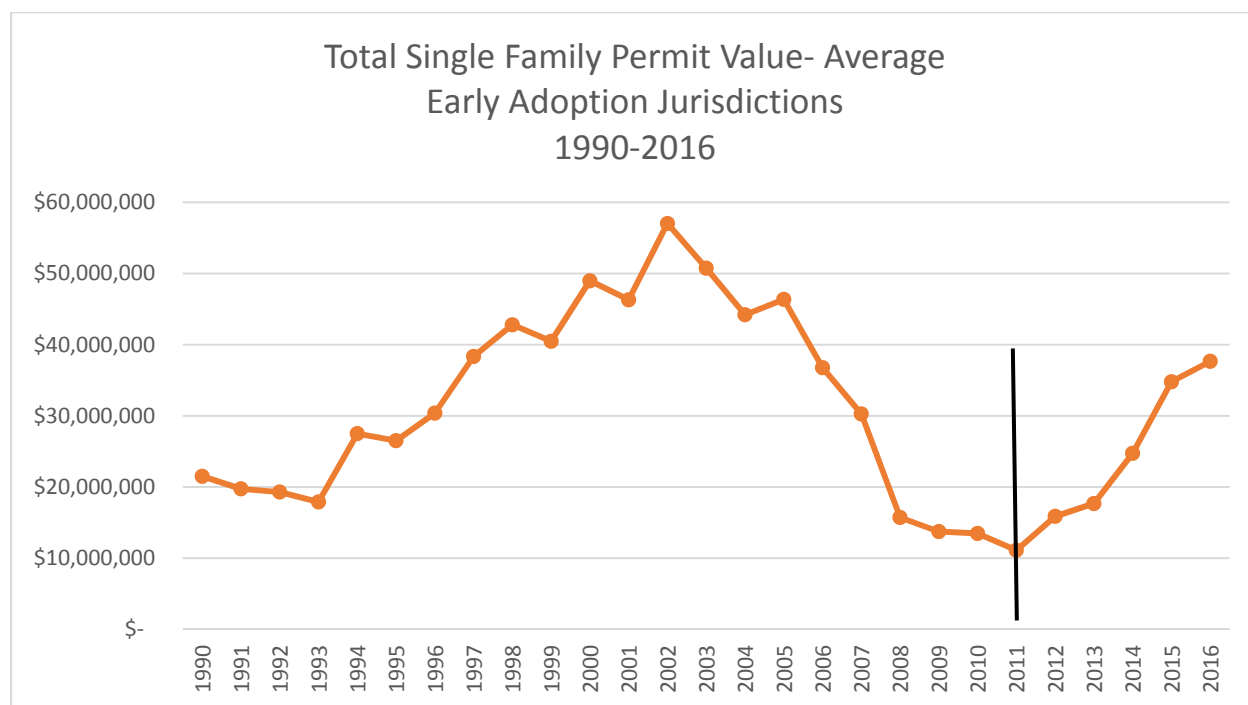


Figure 9: Average Permit Value- Early Adopters

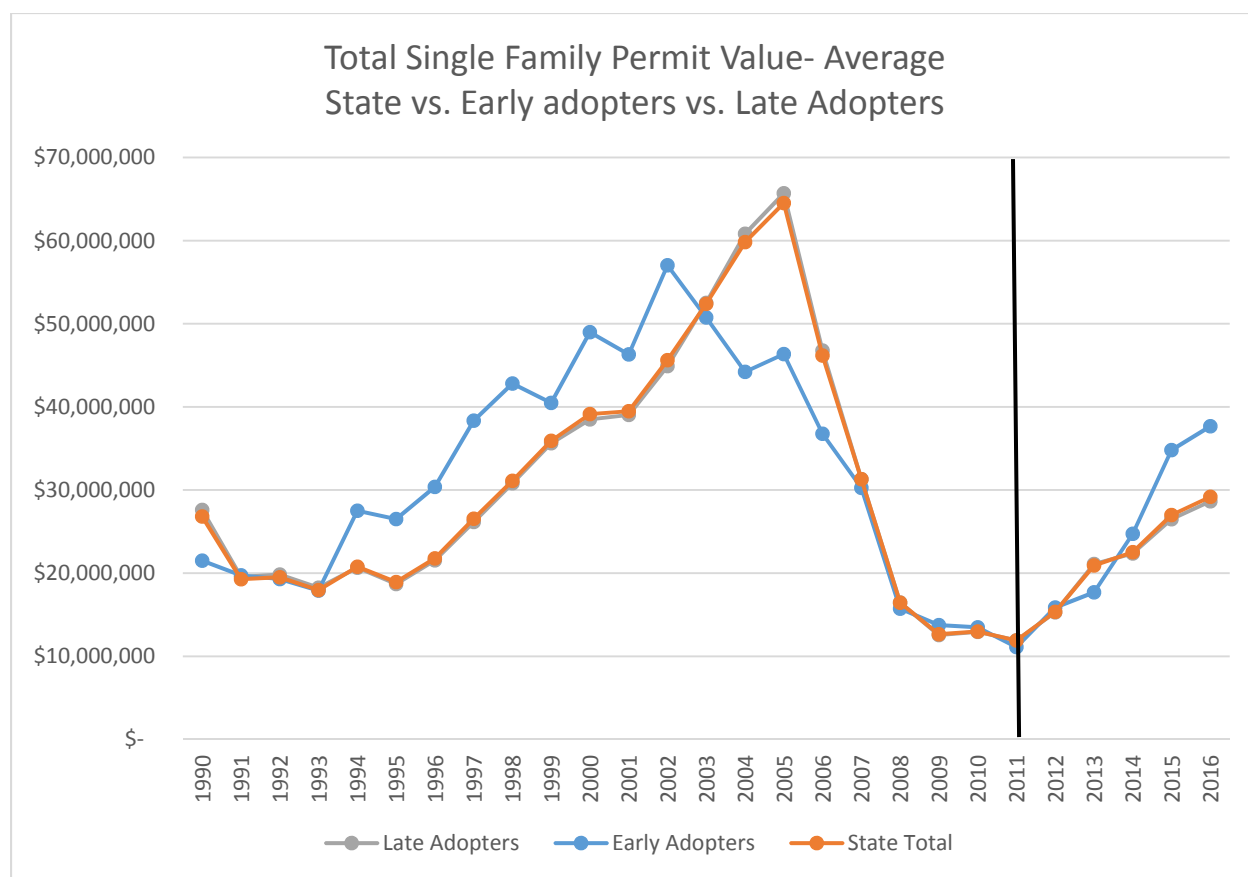


Figure 10: Average Permit Value- Early Adopters, Late Adopters, State Total

The Figures 8-10 show the average permit values<sup>10</sup> for “Early Adopters”, “Late adopters,” and the state of California as a whole. The chart shows that permit values the “Early -Adopters” follows the same general path as both the “Late adopters” and total state numbers. At first glance, there seems to be a little more volatility amongst the “Early adopters” however, that is most likely just the result of the volume being much smaller. Should one of the jurisdictions included in this group experience a dramatic increase or decrease, the effect on the overall number for “Early Adopters” is much greater than it would be for the larger pool of data within “Late Adopters” and the state as a whole.

<sup>10</sup> The average permit value figure used in Figures 8,9, and 10 represents the total permit values for all jurisdictions. It is not a per unit measurement.

## Percentage of Building Permits

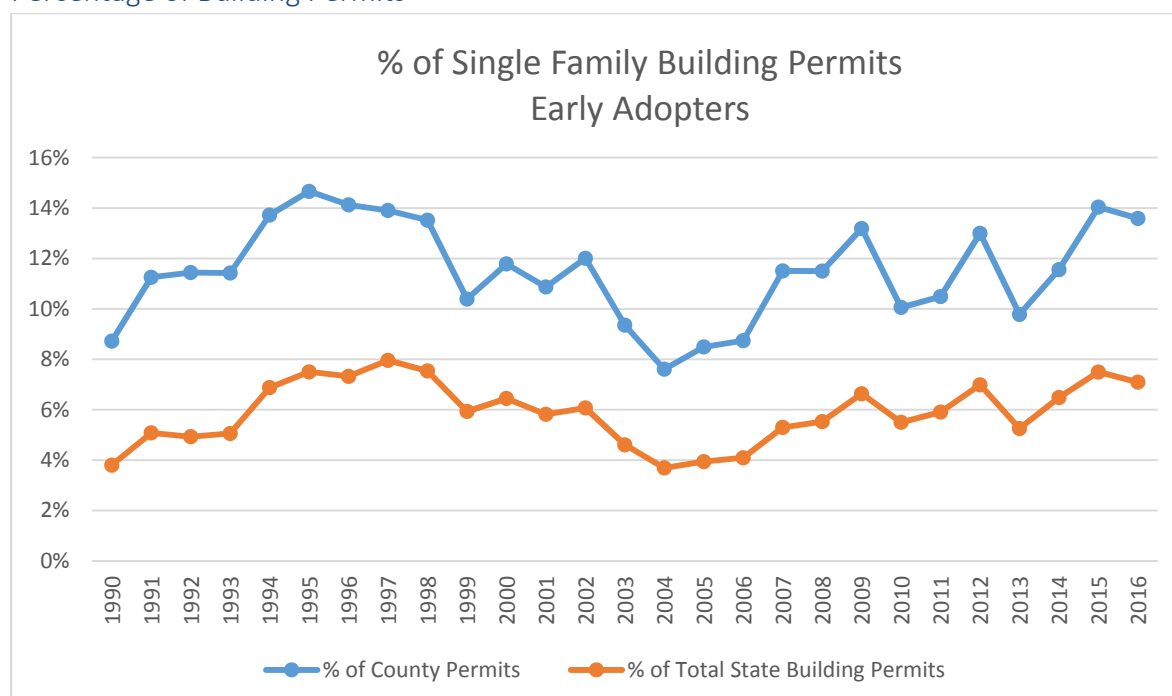


Figure 11: Percentage of Building Permits- Early Adopters vs. County, State

The Figure 11 shows the percentage of building permits associated with the “Early Adopters” for both the whole state of California as well as the county associated with that jurisdiction.

Place	County	Year of Adoption	Share Year Prior	Share Year of Adoption	Share Year 1	Share Year 2
<b>Arcadia</b>	Los Angeles	2007	1%	1%	1%	1%
<b>Riverside</b>	Riverside	2007	4%	4%	2%	2%
<b>Roseville</b>	Placer	2007	30%	48%	49%	54%
<b>Fremont</b>	Alameda	1995	10%	7%	10%	13%
<b>Oxnard</b>	Ventura	2007	23%	24%	20%	29%
<b>Union City</b>	Alameda	1995	7%	6%	11%	12%
<b>Woodland</b>	Yolo	2007	44%	48%	54%	50%
<b>Santa Monica</b>	Los Angeles	1992	3%	1%	0%	0%
<b>Santa Cruz</b>	Santa Cruz	1996	24%	15%	34%	17%
<b>Sonoma</b>	Sonoma	2003	5%	8%	3%	4%
<b>San Clemente<sup>11</sup></b>	Orange	1979	N/A	N/A	N/A	N/A

Table 2: Share of County Single Family Building Permits- Early Adoption Jurisdictions

Table 2 compares the percent share of building permits for Early Adopter jurisdictions studied within the county for the year prior to adoption of a sprinkler requirement to two years after. Some jurisdictions

<sup>11</sup> San Clemente has required Home Fire Sprinkler since 1979 so they are not included in this data set, although they are included in others.

likely delayed or had a grace period for enforcement so we took the analysis out another year. The results are shown here:

Jurisdiction	County	Year of Adoption	Change in Share from year prior to adoption to Share Year 2	Change in Share from year of adoption to Share Year 2	Change in Share from year prior to adoption to Share Year 1	Change in Share from year of adoption to Share Year 2
<b>Arcadia</b>	Los Angeles	2007	0	0	0	0
<b>Riverside</b>	Riverside	2007	-2%	-2%	-2%	-2%
<b>Roseville</b>	Placer	2007	+24%	+6%	+19%	+6%
<b>Fremont</b>	Alameda	1995	+3%	+6%	0	+6%
<b>Oxnard</b>	Ventura	2007	+6%	+5%	-3%	+5%
<b>Union City</b>	Alameda	1995	+5%	+6%	+4%	+6%
<b>Woodland</b>	Yolo	2007	+6%	+2%	+10%	+2%
<b>Santa Monica</b>	Los Angeles	1992	-3%	-1%	-3%	-1%
<b>Santa Cruz</b>	Santa Cruz	1996	-6%	+2%	+10%	+2%
<b>Sonoma</b>	Sonoma	2003	-1%	-4%	-2%	-4%
<b>Average Change</b>	Orange	1979	+3.2%	+2%	+3.3%	+2%

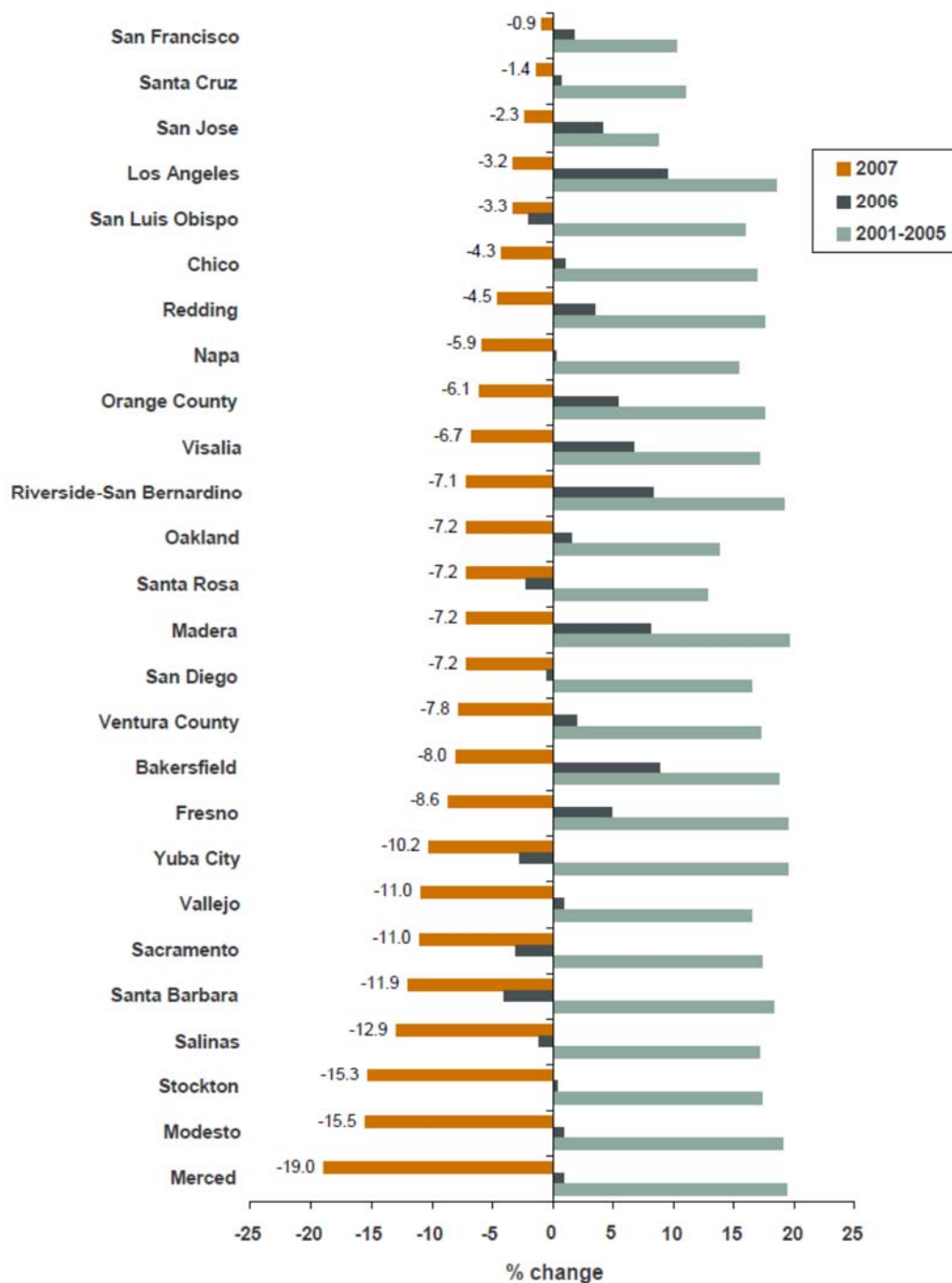
*Table 3: Share of County Single Family Building Permits- Early Adopters- % Increase/Decrease*

Table 3 shows a mix of growth and decline in percent shares with an overall positive, indicating that taken together, these jurisdictions increased their share of building permits relative to their county.

Based on the fact that the data show changes in both directions, a reasonable conclusion is that home fire sprinkler requirements do not negatively impact permit activity. Further, although the totality of the changes is positive, we do not conclude that sprinkler requirements add positively to permit activities. It is more likely that the relatively small changes in cost and value resulting from sprinkler requirements are overshadowed by many other factors impacting building permits and values in these and other jurisdictions.

The following figure examining the changes in housing values from 2001 to 2007 in California illustrates that the market fluctuates.

### Housing Price Changes in Selected Metropolitan Areas, Annualized



Sources: (1) Office of Federal Housing Enterprise Oversight. (2) Census Bureau.

12

<sup>12</sup> [http://www.ppic.org/content/pubs/jtf/JTF\\_HousingMarketJTF.pdf](http://www.ppic.org/content/pubs/jtf/JTF_HousingMarketJTF.pdf)

## Multifamily

One theory explored in this report is that increases in the cost of single family construction would drive greater activity in multifamily building.

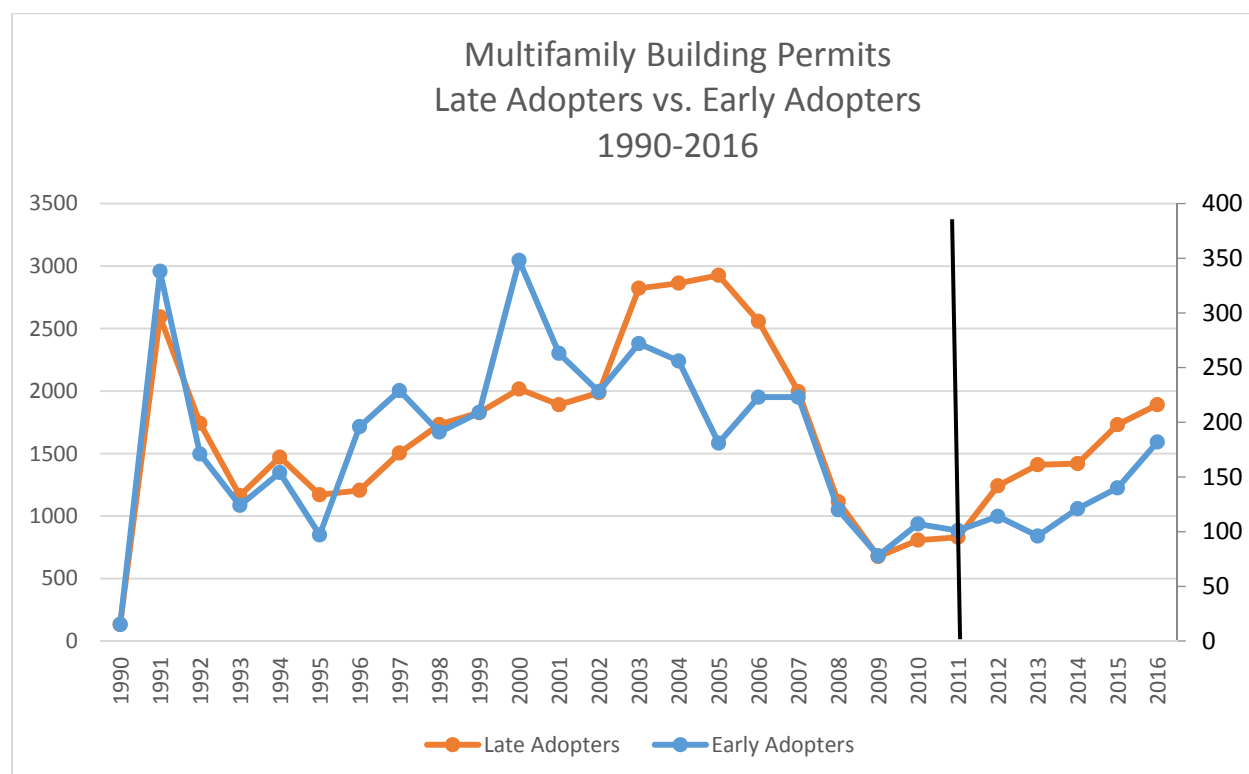


Figure 12: Multifamily Building Permits- Late Adopters, Early Adopters<sup>13</sup>

Figure 12 shows the number of multifamily building permits issued for all jurisdictions with home fire sprinkler requirements prior to 2011 (with no minimum square footage) as well as the permits for all other jurisdictions within the counties associated with the early adopters. This was reviewed to see if there was any shift in permits from single family to multifamily, potentially as a result of a sprinkler requirement.<sup>14</sup>

<sup>13</sup> The data for Early Adopters, represented by the blue line in Figure 12, is plotted on the chart using the right y-axis.

<sup>14</sup> Multifamily buildings have their own code requirements when related to fire protection. Multifamily was not a part of the state requirement in 2011.



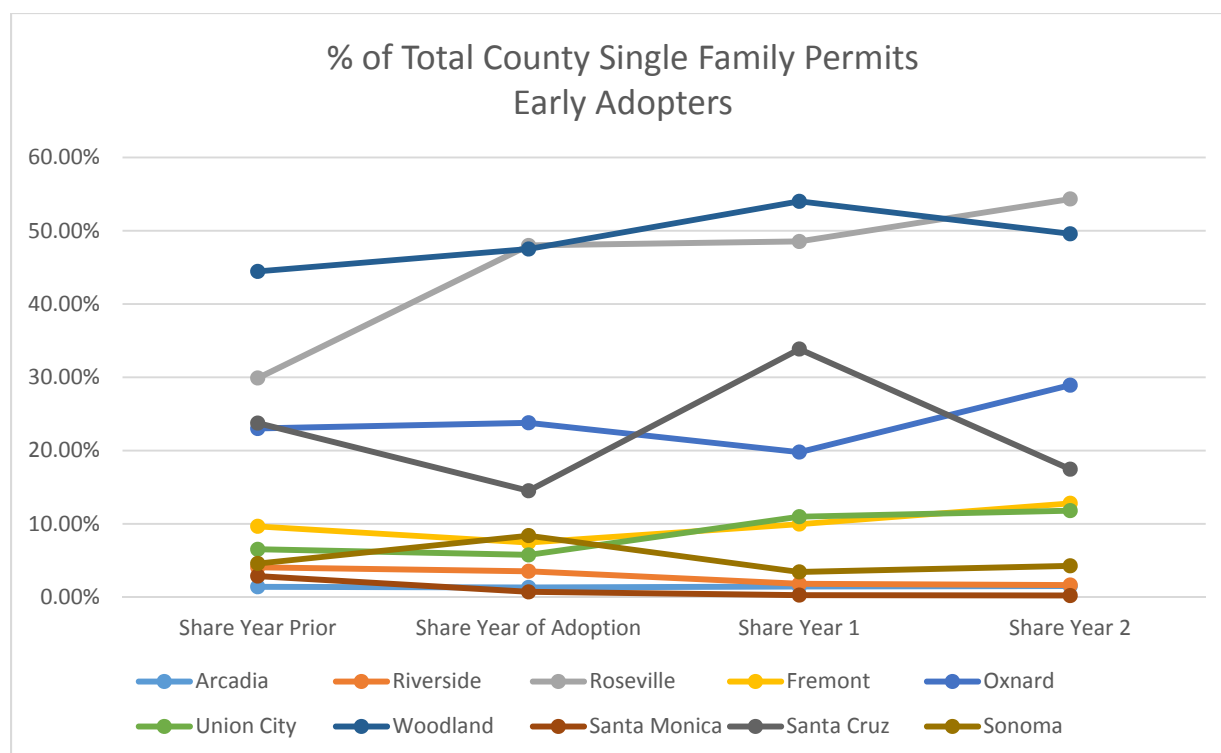


Figure 13: Percentage of Total County Single Family Building Permits- Early Adopters

The Figure 13 shows the percentage of total county permits associated with the jurisdictions highlighted in this report. The share of county permits for each of the jurisdictions shows the year prior to the requirement taking place, the year of adoption, and the two years post adoption. As shown in the figure, there is no negative impact on share of county permits associated with sprinkler requirements going into effect. Most percent changes were minimal and the largest changes actually show an increase in county share post adoption.

## Section 5- Jurisdiction Profiles and County Level Comparisons

This section includes individual case studies of various jurisdictions that adopted requirements for home fire sprinkler systems prior to the 2011 statewide requirement. As stated previously, these jurisdictions were selected to best represent the variety of demographics, economics, and geographic location in the state.

For all jurisdiction profile tables below:

- All data is from the US Census
- 2010 Income is the 2008-2012 range
- Permit Value is average \$/permit

### Cities with > 8,000 Single Family Building Permits (1990-2016)

#### Oxnard

Oxnard, CA is located along the Southern California coast in Ventura County. Oxnard is the 19<sup>th</sup> most populous city in California and the most populous city in Oxnard- Thousand Oaks – Ventura Metro area

which is regularly listed as one of the wealthiest areas in the country, let alone California. According to the 2010 US Census, the median household income in Oxnard was \$60,736, well above the national average of \$49,445 and slightly higher than the California average of \$59,540.

Oxnard issued a requirement for home fire sprinkler systems when they adopted Ordinance 25 in 2007 amending Appendix VII of the Uniform Fire Code Volume 1 (2000 Edition). Section 903.2.2 of the ordinance states “Automatic fire sprinkler systems shall be installed, maintained, and accessible for service in all new buildings, regardless of location, floor area, construction type, or occupancy.”

County: Ventura		Sprinkler Ordinance: 2007				
	1990	1995	2000	2005	2010	2016
<b>Permit Activity</b>	255	248	608	482	61	96
<b>Permit Value</b>	\$134,306	\$183,609	\$202,503	\$223,394	\$244,631	\$249,816
<b>Population</b>	142,216		170,358		197,899	
<b>Income</b>	\$37,174		\$48,603		\$60,736*	

Table 4: Oxnard Profile

Place	Share Year Prior (2006)	Share Year of Adoption (2007)	Share Year 1 (2008)	Share Year 2 (2009)
<b>Oxnard</b>	23%	24%	20%	29%

Table 5: Share of County Single Family Building Permits- Ventura County

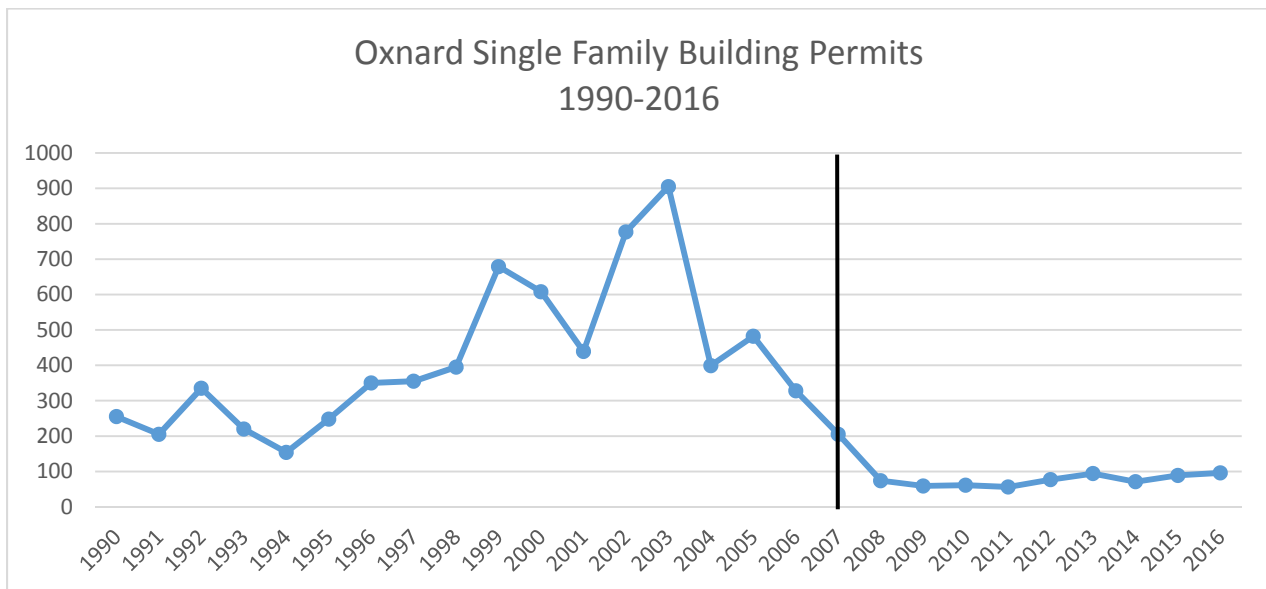


Figure 14: Oxnard Single Family Building Permits

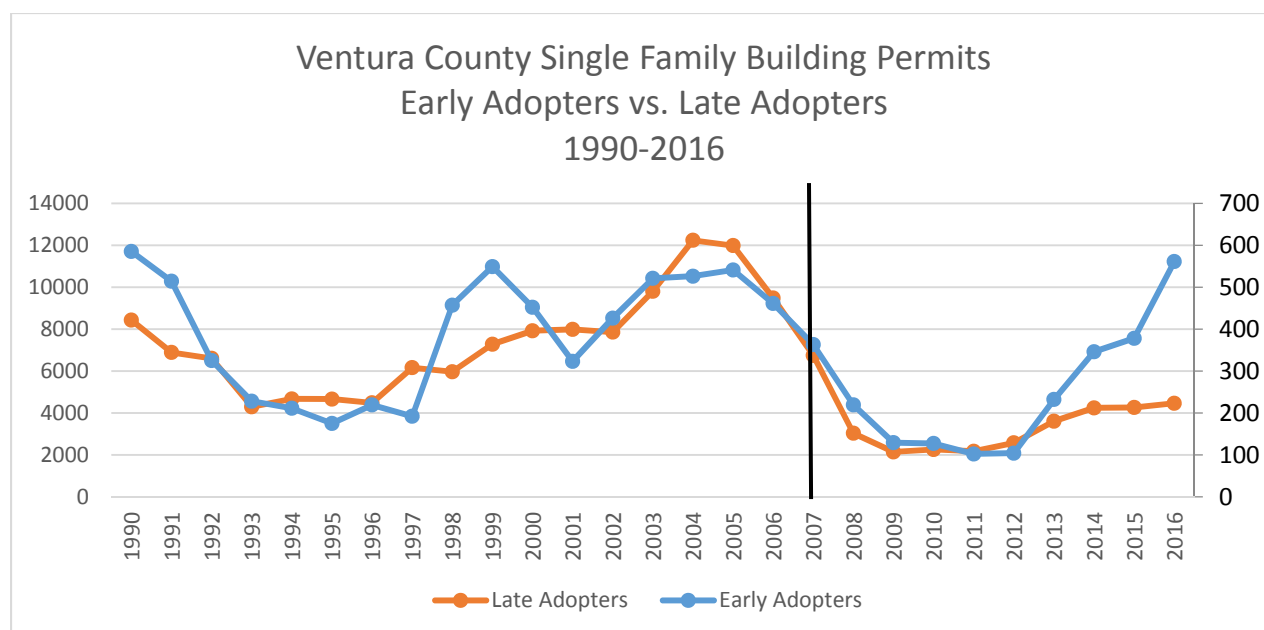


Figure 15: Ventura County Single Family Building Permits- Early Adopters vs. Late Adopters<sup>15</sup>

## Riverside

Riverside, California is located in Riverside County and part of the Inland Empire metropolitan area. It's the most populous city both in the county and the metropolitan area, the 12<sup>th</sup> most populous city in California and the 59<sup>th</sup> most populous city in the United States. In 2010 the census estimated population of Riverside to be 303,871. The median household income for Riverside in 2010 was \$56,403, significant higher than the national average (\$49,445) but below the 2010 average in California (\$59,540).

Riverside adopted a fire sprinkler ordinance in 2007 with Title 16 of the Riverside buildings and construction code. It amended section 903 of the California building code by requiring all new buildings to have operable fire sprinklers.

County: Riverside		Sprinkler Ordinance: 2007				
	1990	1995	2000	2005	2010	2016
<b>Permit Activity</b>						
<b>Permit</b>	646	166	1017	1441	107	219
<b>Permit Value</b>	\$132,775	\$154,522	\$185,989	\$231,182	\$260,583	\$221,273
<b>Population</b>	226,505		255,166		303,871	
<b>Income</b>	\$34,801		\$41,646		\$56,403	

Table 6: Riverside Profile

Place	Share Year Prior (2006)	Share Year of Adoption (2007)	Share Year 1 (2008)	Share Year 2 (2009)
Riverside	4%		4%	2%

<sup>15</sup> The data for Early Adopters, represented by the blue line in Figure 15, is plotted on the chart using the right y-axis.

Table 7: Share of County Single Family Building Permits- Riverside County

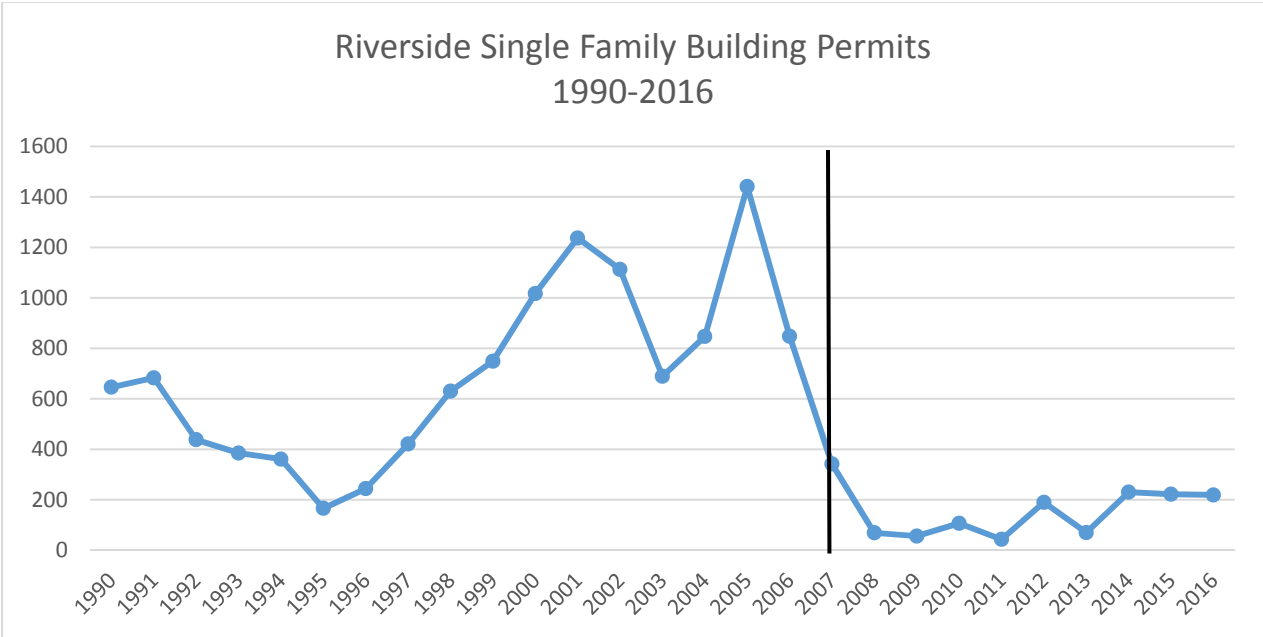


Figure 16: Riverside Single Family Building Permits

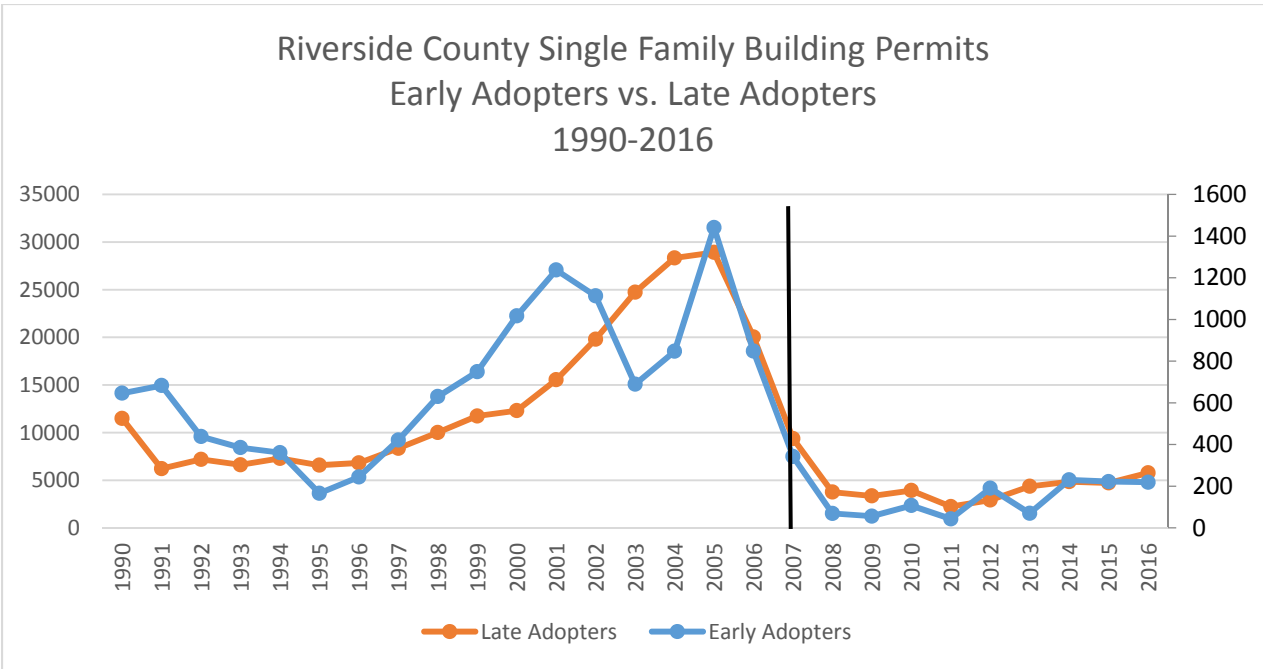


Figure 17: Riverside County Single Family Building Permits- Early Adopters vs. Late Adopters<sup>16</sup>

<sup>16</sup> The data for Early Adopters, represented by the blue line in Figure 17, is plotted on the chart using the right y-axis.

## Roseville

The City of Roseville is located in California on the southwest edge of Placer County, bordering Sacramento County. The City of Roseville (the City) began as a railroad junction in 1864 and was called, Roseville Junction. Renamed Roseville City, the City was incorporated in 1909 and officially became a chartered city in California in 1955. In 1907, a fire protection committee was established and thus was born the Roseville Fire Department. The City was an early adopter of Home Fire Sprinkler Systems, and later replaced the City ordinance with adoption by reference of the statewide requirements.

County: Placer		Sprinkler Ordinance: 2007				
	1990	1995	2000	2005	2010	2016
<b>Permit Activity</b>	492	1416	1393	826	635	862
<b>Permit Value</b>	\$160,729	\$144,937	\$225,247	\$203,944	\$235,581	\$282,897
<b>Population</b>	44685		79921		118788	
<b>Income</b>	\$39,975		\$57,367		\$74,579	

Table 8: Roseville Profile

Place	Share Year Prior (2006)	Share Year of Adoption (2007)	Share Year 1 (2008)	Share Year 2 (2009)
Roseville	30%	48%	49%	54%

Table 9: Share of County Single Family Building Permits- Placer County

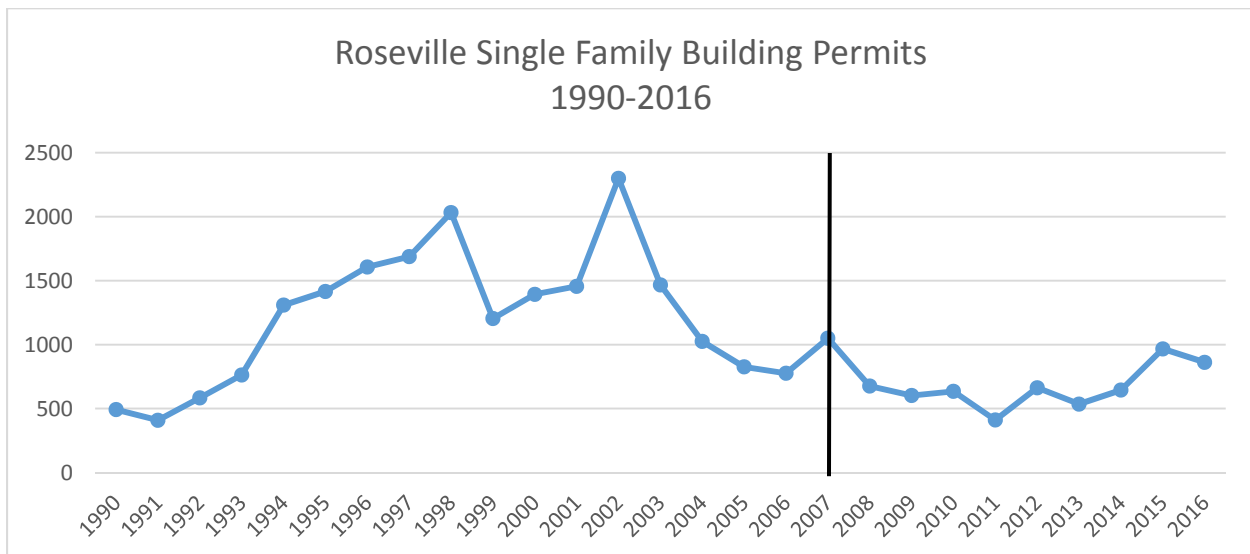


Figure 18: Roseville Single Family Building Permits

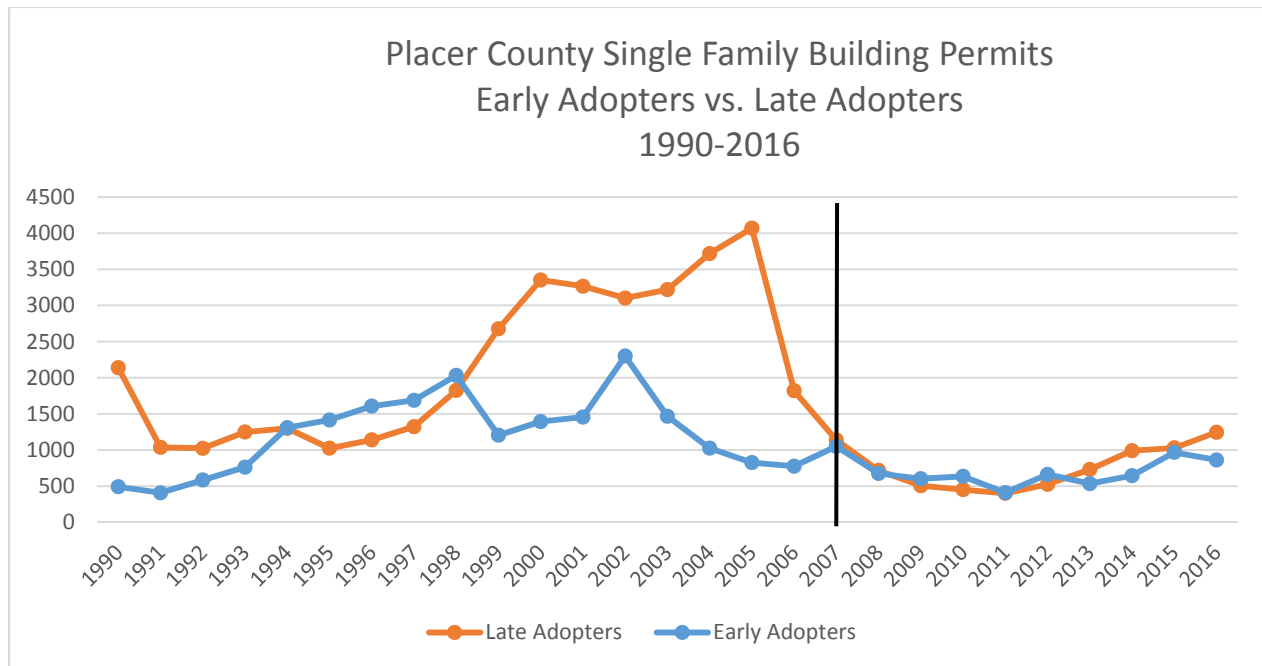


Figure 19: Place County Single Family Building Permits- Early Adopters vs. Late Adopters

## Fremont

Fremont, CA is a town in Alameda County, CA. It is the 16<sup>th</sup> most populous city in CA, and 4<sup>th</sup> most populous city in the San Francisco Bay Area. The 2010 median household income is \$99,169 much greater than the national (\$49,445) or California (\$59,540) averages.

County: Alameda			Sprinkler Ordinance: 1995			
	1990	1995	2000	2005	2010	2016
<b>Permit Activity</b>	281	360	236	157	100	414
<b>Permit Value</b>	\$205,001	\$199,614	\$297,138	\$248,554	\$307,334	\$375,702
<b>Population</b>	173339		203413		214089	
<b>Income</b>	\$51,231		\$76,579		\$99,169	

Table 10: Fremont Profile

Place	Share Year Prior (1994)	Share Year of Adoption (1995)	Share Year 1 (1996)	Share Year 2 (1997)
Fremont	10%	7%	10%	13%

Table 11: Share of County Single Family Building Permits- Alameda County

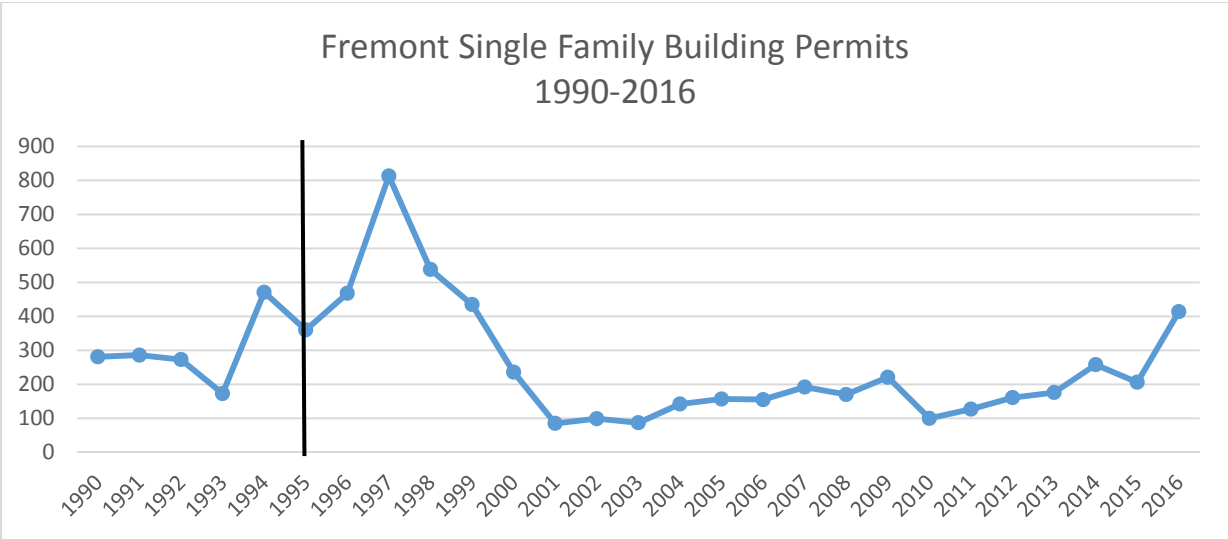
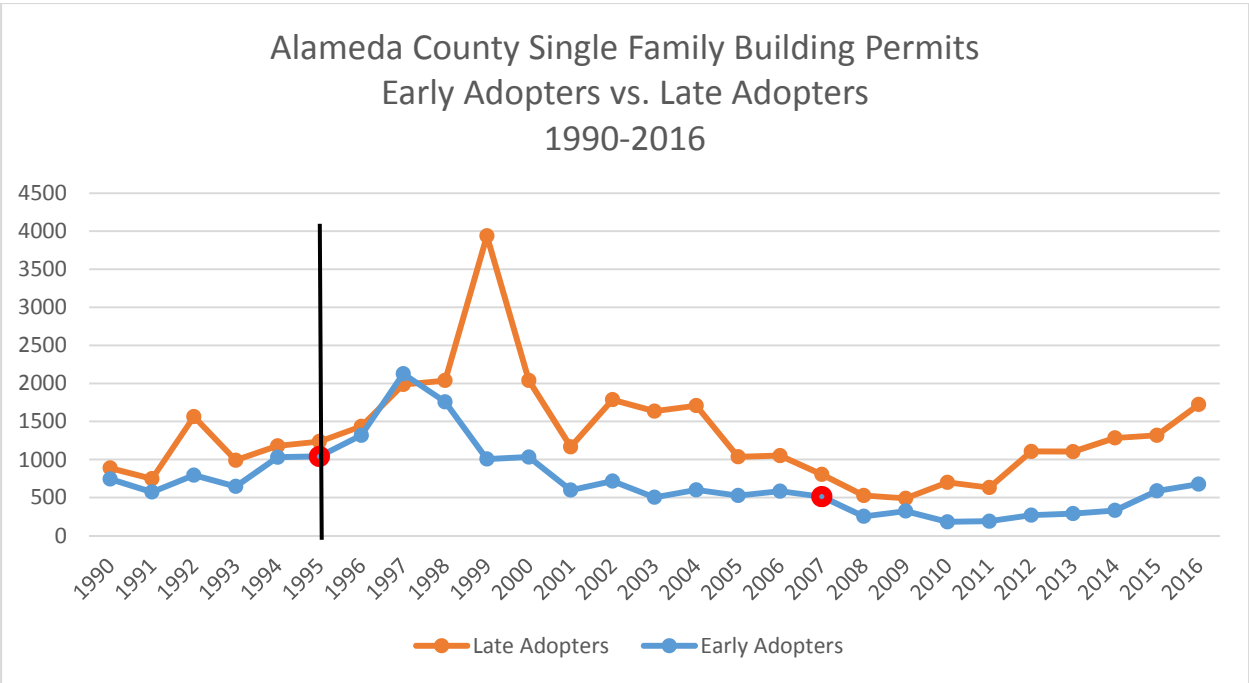


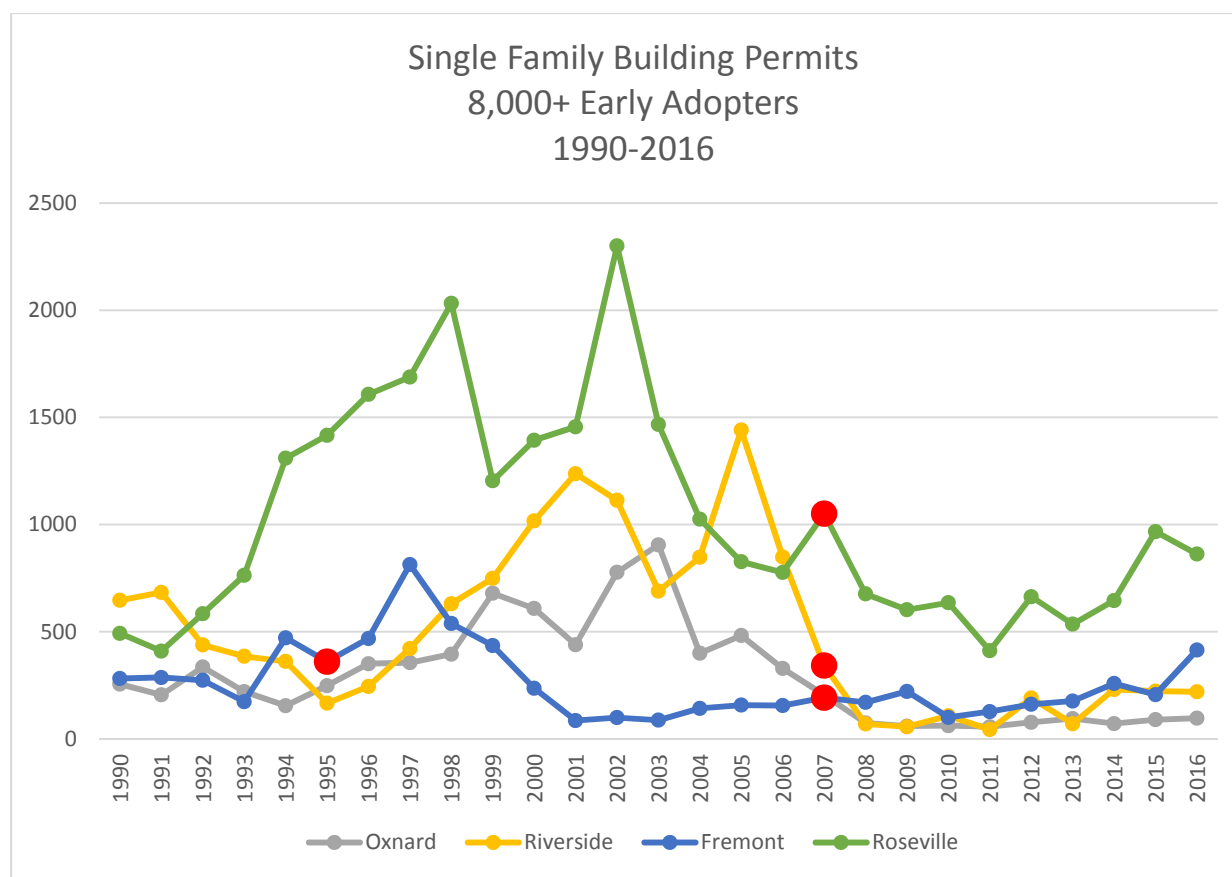
Figure 20: Fremont Single Family Building Permits



17

Figure 21: Alameda County Single Family Building Permits- Early Adopters vs. Late Adopters

<sup>17</sup> Figure 19 for Alameda County also includes building permit data from the following jurisdictions: Livermore (2007), Union City (1995). The red dots indicate when each jurisdictions adopted home fire sprinkler system requirements.



18

Figure 22: Single Family Building Permits- Early Adoption Jurisdictions with 8,000+ Single Family Building Permits (1990-2016)

The chart above highlights the number of building permits in each of the four jurisdictions chosen for this report that had higher building activity (8000+) based on permits issued from 1990-2016. Each of the larger dots on the chart indicates when the sprinkler requirements went into effect for each of the jurisdictions. From this chart there is not a clear connection between the requirement for home fire sprinklers and either an increase or decrease in building activity.

### Jurisdictions with 2,000-8,000 Single Family Building Permits (1990-2016)

#### Arcadia

Arcadia is a city in Los Angeles County, California, United States located about 13 miles (21 km) northeast of downtown Los Angeles in the San Gabriel Valley and at the base of the San Gabriel Mountains. It is the site of the Santa Anita Park racetrack and home to the Los Angeles County Arboretum and Botanic Garden. Arcadia prides itself on its residential character, however, it is a largely developed city without significant opportunity for growth and high property values.

In 2016, Arcadia was ranked the 5th most expensive housing market in the United States by Business Insider, with an average list of \$1,748,680 for a four-bedroom home.<sup>19</sup>

<sup>18</sup> The red dots in Figure 20 indicate when each jurisdiction adopted home fire sprinkler system requirements.

<sup>19</sup> <http://www.businessinsider.com/most-expensive-housing-markets-in-the-us-2016-9/#5-arcadia-california-21>



County: Los Angeles		Sprinkler Ordinance: 2007				
	1990	1995	2000	2005	2010	2016
<b>Permit Activity</b>	214	59	135	196	33	75
<b>Permit Value</b>	\$243,065	\$380,962	\$363,130	\$305,498	\$306,039	\$431,320
<b>Population</b>	48290		53054		56364	
<b>Income</b>	\$47,347		\$56,100		\$77,341	

Table 12: Arcadia Profile

Place	Share Year Prior (2006)	Share Year of Adoption (2007)	Share Year 1 (2008)	Share Year 2 (2009)
Arcadia	1%	1%	1%	1%

Table 13: Share of County Single Family Building Permits- Los Angeles County

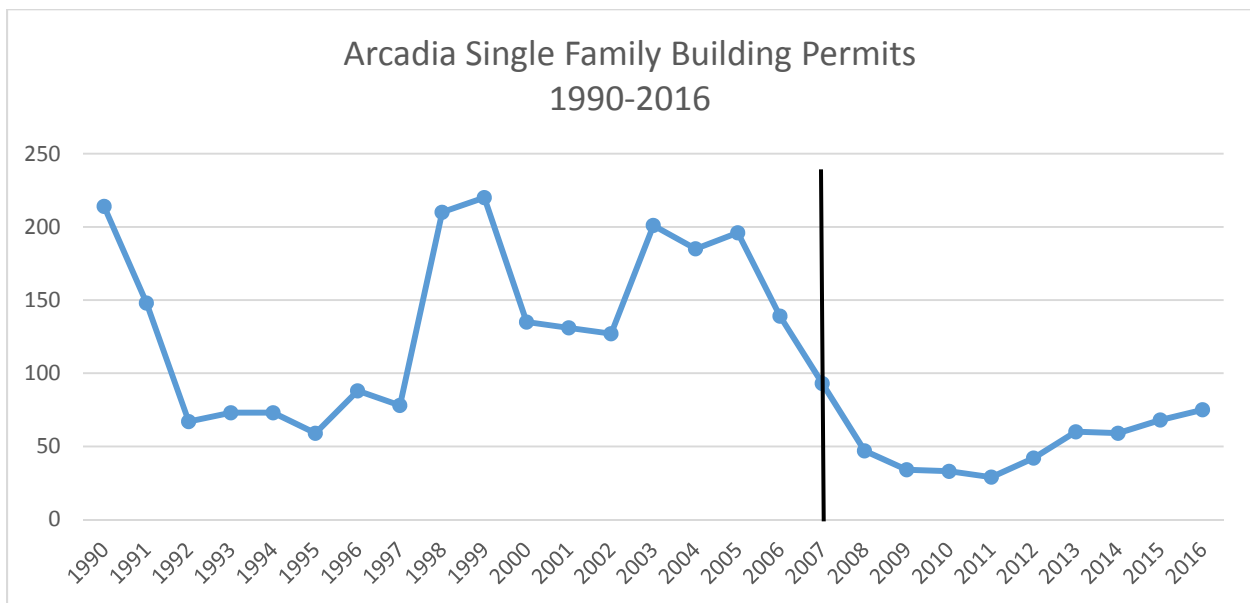
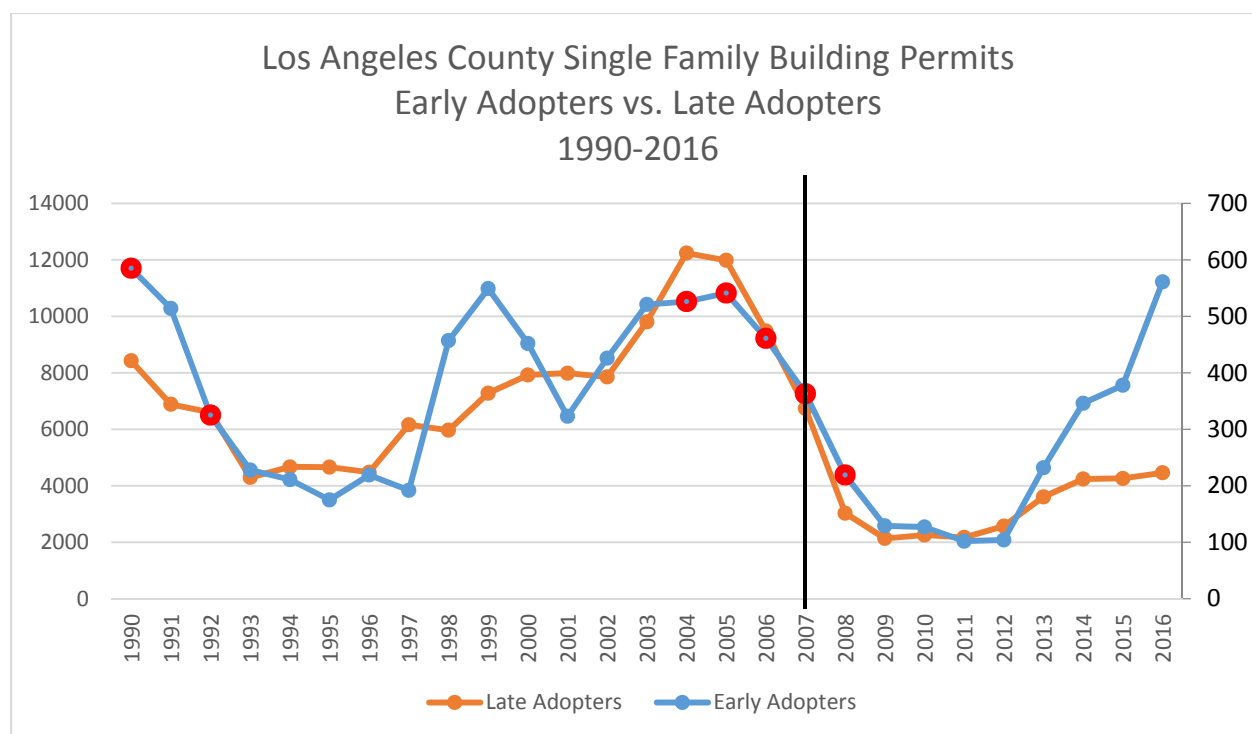


Figure 23: Arcadia Single Family Building Permits



20

Figure 24: Los Angeles County Single Family Building Permits- Early Adopters vs. Late Adopters<sup>21</sup>

## San Clemente

San Clemente, California is in Orange County approximately midway between Los Angeles and San Diego. 2010 Census population was 63,522 and median household income was \$87,184 well above both the national and state averages of \$49,445 and \$59,540 respectively.

San Clemente was the first community in the nation to mandate the installation of fire sprinklers in new housing, implemented as a fire sprinkler ordinance by the city council in April 1978.

County: Orange			Sprinkler Ordinance: 1979			
	1990	1995	2000	2005	2010	2016
<b>Permit Activity</b>	94	266	970	386	45	101

<sup>20</sup> Figure 24 for Los Angeles County also includes building permit data from the following jurisdictions: Beverly Hills (2007), Burbank (2004), Claremont (2007), Culver City (1990), Downey (2005), Glendora (2007), La Habra Heights (2006), San Gabriel (2008), Santa Monica (1992). The red dots in Figure 24 indicated when each jurisdiction adopted home fire sprinkler system requirements.

<sup>21</sup> The data for Early Adopters, represented by the blue line in Figure 24, is plotted on the chart using the right y-axis.

<b>Permit Value</b>	\$256,690	\$241,174	\$275,856	\$332,351	\$475,225	\$522,629
<b>Population</b>	41100		49936		63522	
<b>Income</b>	\$46,988		\$63,507		\$87,184	

Table 14: San Clemente Profile

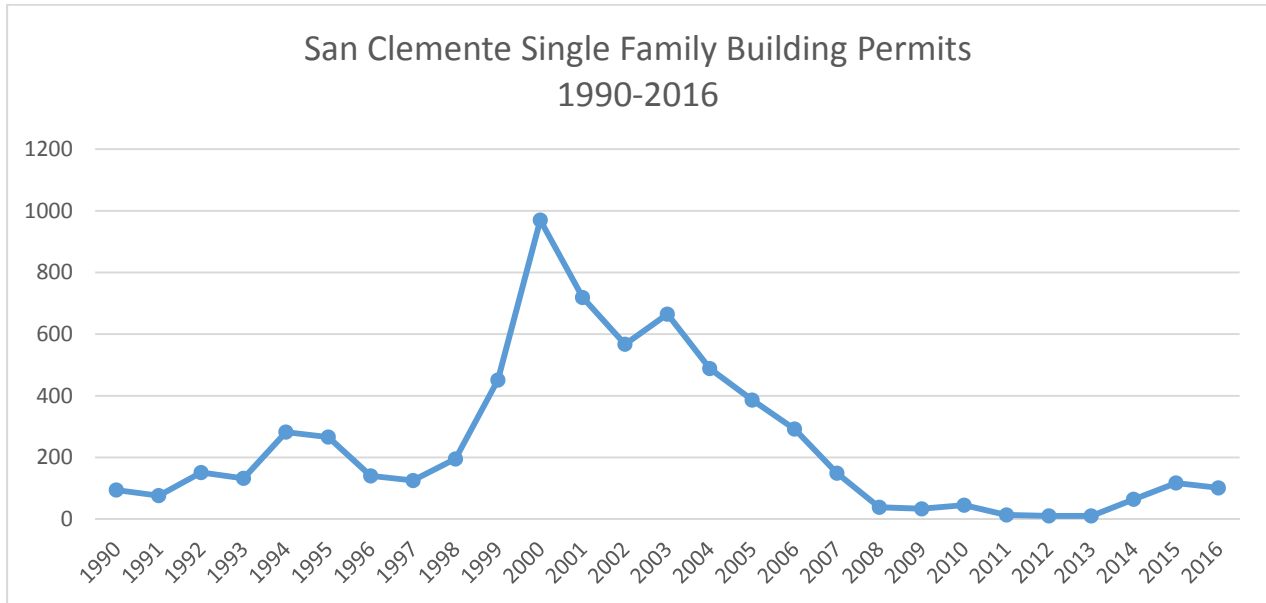


Figure 25: San Clemente Single Family Building Permits

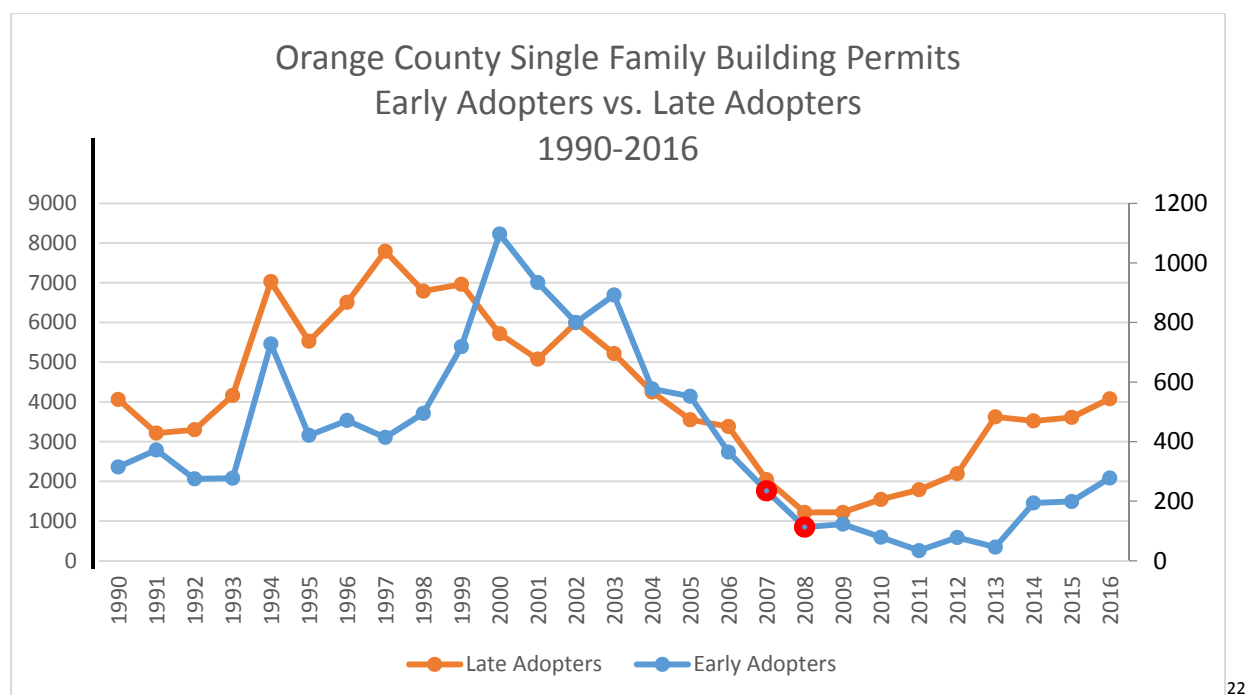


Figure 26: Orange County Single Family Building Permits- Early Adopters vs. Late Adopters<sup>23</sup>

## Union City

Union City is a city of 69,516 people located in Alameda County 20 miles south of Oakland and 30 miles southeast of San Francisco. Median household income is \$83,066 well above the national and state averages. Fire service for Union City is provided by Alameda County.

County: Alameda County			Sprinkler Ordinance: 1995			
	1990	1995	2000	2005	2010	2016
<b>Permit Activity</b>	209	131	340	132	2	47
<b>Permit Value</b>	\$99,884	\$232,373	\$223,838	\$302,775	\$146,258	\$627,950
<b>Population</b>	53762		66869		69516	
<b>Income</b>	\$46,988		\$71,926		\$83,066	

Table 15: Union City Profile

Place	Share Year Prior (1994)	Share Year of Adoption (1995)	Share Year 1 (1996)	Share Year 2 (1997)
-------	-------------------------	-------------------------------	---------------------	---------------------

<sup>22</sup> San Clemente adopted a sprinkler requirement in 1979, the reason for the black line being off the x-axis below. Figure 26 also includes building permit data from the following jurisdictions: Cypress (2007), Placentia (2008), and Stanton (2007). The red dots in Figure 26 indicate when each jurisdiction adopted home fire sprinkler system requirements.

<sup>23</sup> The data for Early Adopters, represented by the blue line in Figure 26, is plotted on the chart using the right y-axis.

Union City	7%	6%	11%	12%
------------	----	----	-----	-----

Table 16: Share of County Single Family Building Permits- Alameda County

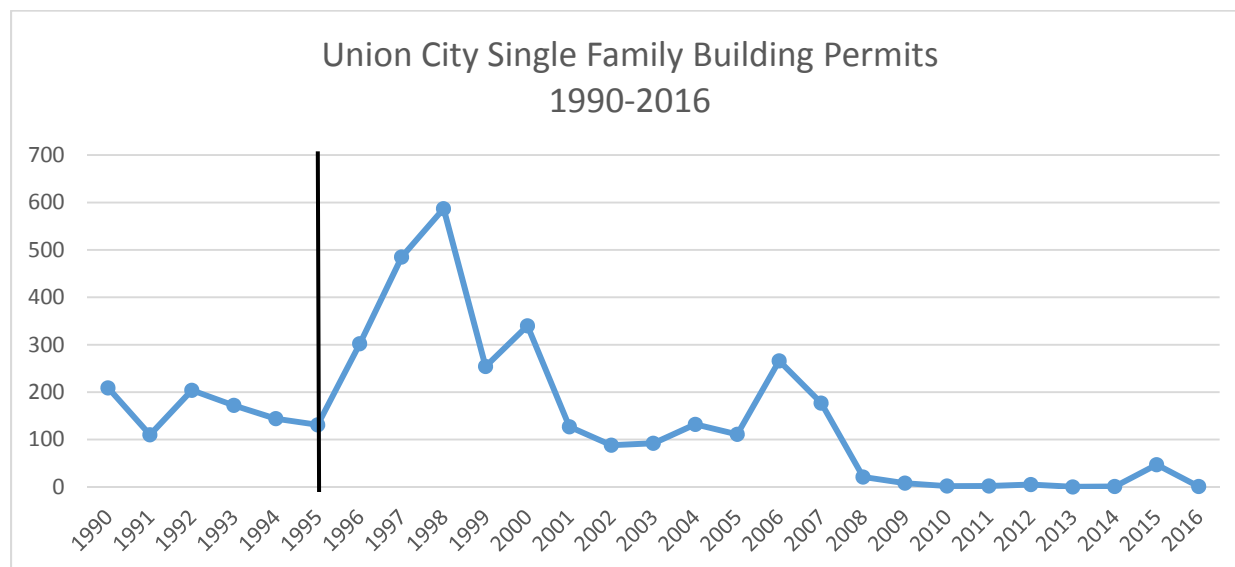
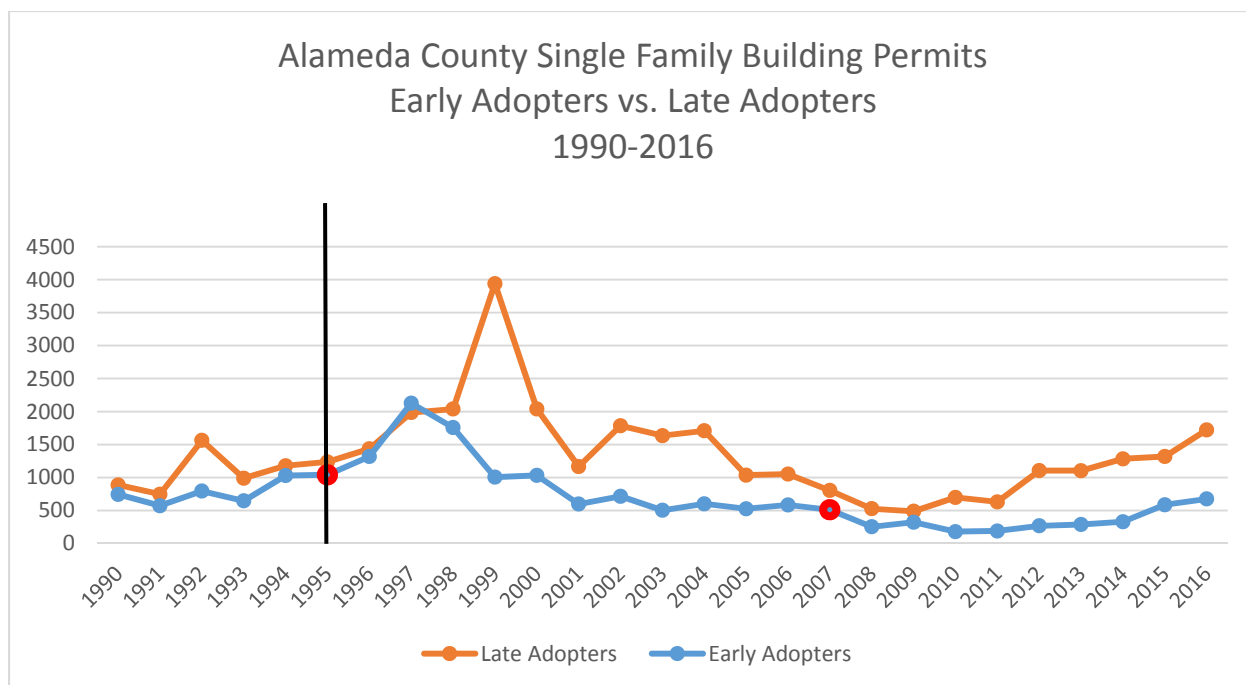


Figure 27: Union City Single Family Building Permits



24

Figure 28: Alameda County Single Family Building Permits- Early Adopters vs. Late Adopters

### Woodland

Woodland, CA is a town of 55,468 in the 2010 census. 15 miles northwest of Sacramento it's the seat of Yolo County. Median household income was \$55,139 in between the national (\$49,445) and state (\$59,540) averages.

County: Yolo	Sprinkler Ordinance: 2007 <sup>25</sup>					
	1990	1995	2000	2005	2010	2016
<b>Permit Activity</b>	153	319	23	131	9	263
<b>Permit Value</b>	\$90,051	\$95,244	\$116,354	\$193,323	\$218,902	\$302,248
<b>Population</b>	39802		49151		55468	
<b>Income</b>	\$31,671		\$44,449		\$55,139	

Table 17: Woodland Profile

Place	Share Year Prior (2006)	Share Year of Adoption (2007)	Share Year 1 (2008)	Share Year 2 (2009)
Woodland	44%	48%	54%	50%

<sup>24</sup> Figure 26 for Alameda County also includes building permit data from the following jurisdictions: Livermore (2007), Fremont (1995). The red dots in Figure 26 indicate when each jurisdiction adopted home fire sprinkler requirements.

<sup>25</sup> All dates for adoption of the sprinkler ordinances came from NFPA. However, we also found that Woodland may have adopted earlier. On November 28, 1995 the City Council unanimously adopted Ordinance 1276 "Providing for Automatic Fire Extinguishing Systems." It amended section 9A-15 of the Woodland Municipal Code.

Table 18: Share of County Single Family Building Permits- Yolo County

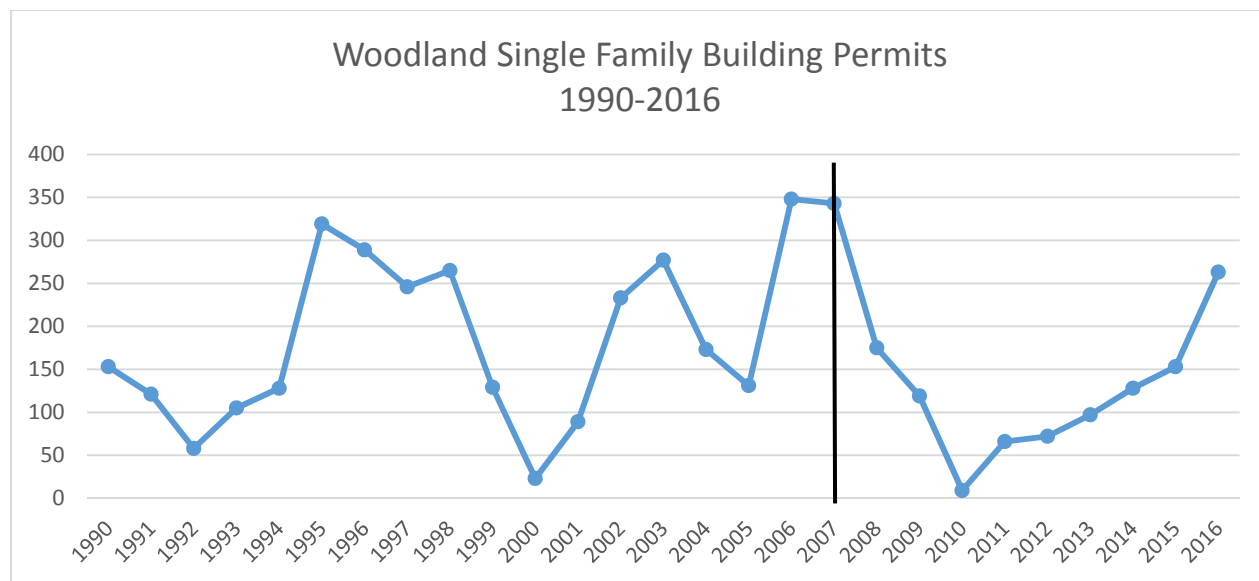


Figure 29: Woodland Single Family Building Permits

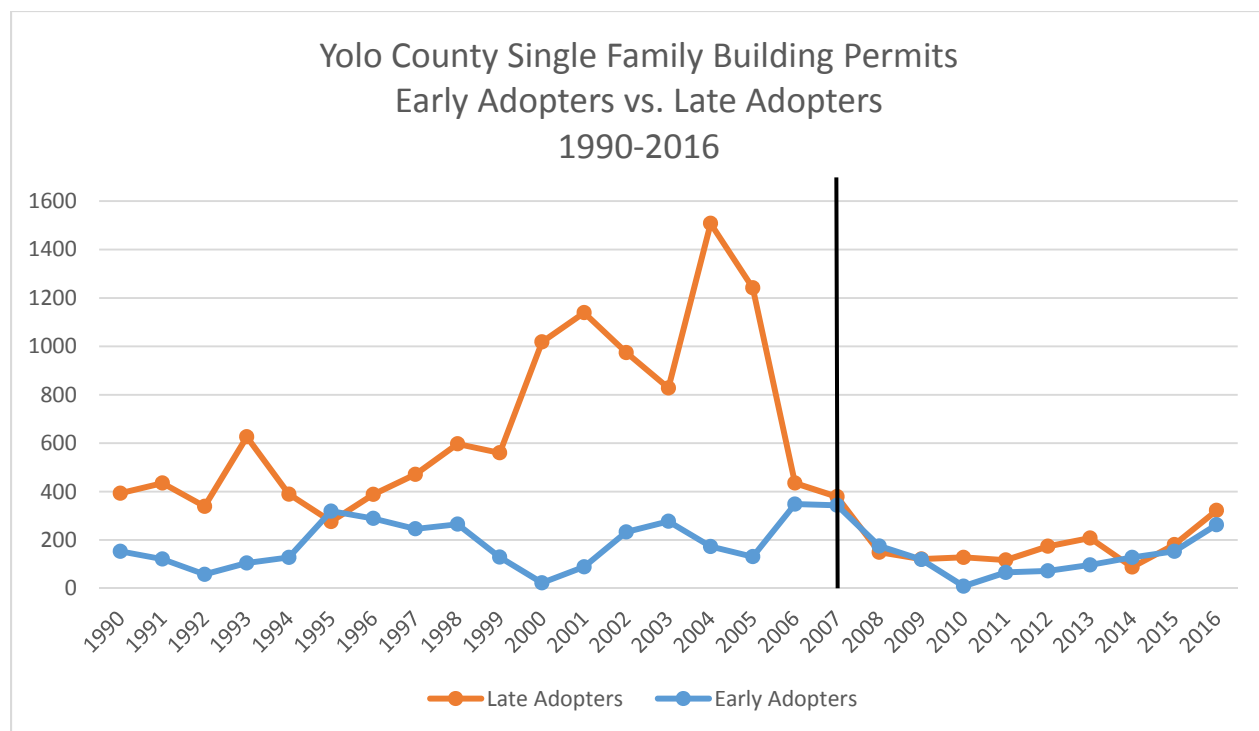
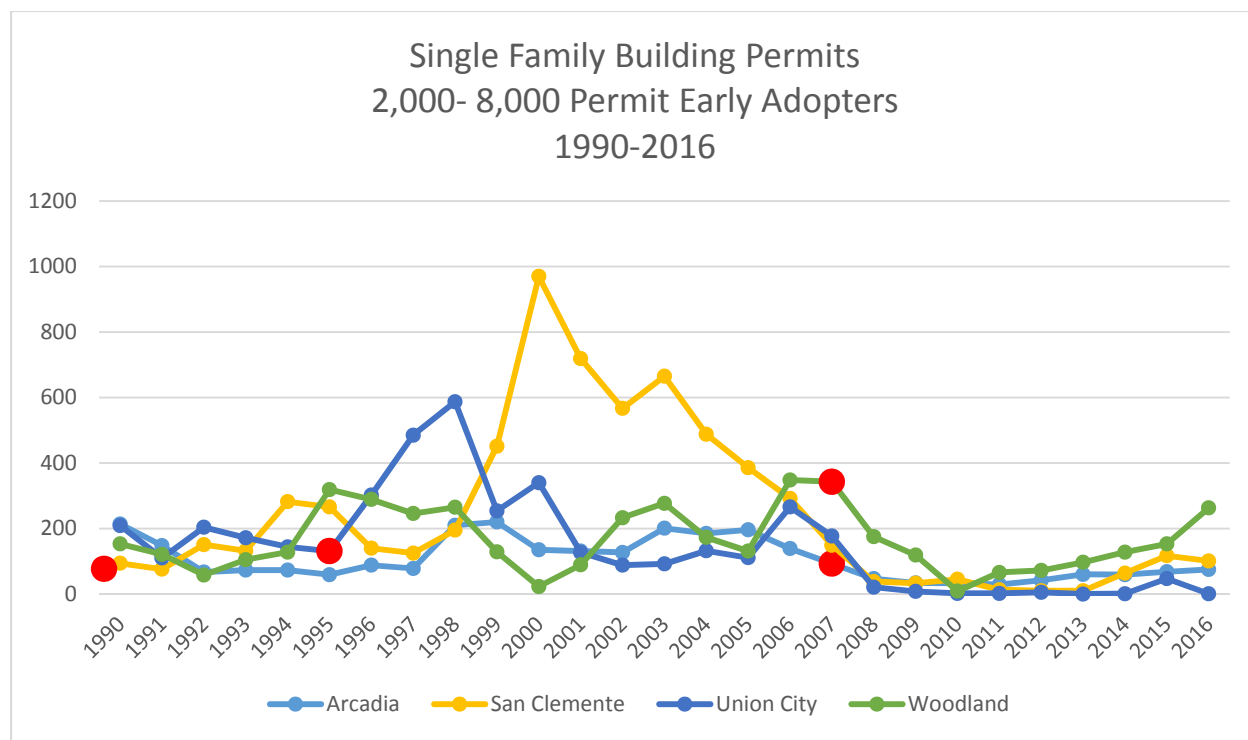


Figure 30: Yolo County Single Family Building Permits- Early Adopters vs. Late Adopters



26

Figure 31: Single Family Building Permits- Early Adoption Jurisdictions with 2,000-8,000 Single Family Building Permits (1990-2016)

### Cities with 1,000-2,000 Single Family Building Permits

#### Santa Monica

Santa Monica is in western Los Angeles County on the beach of Santa Monica Bay. Bordered by the city of Los Angeles on 3 sides it is a popular resort destination with a population of 89,736. Median household income of \$72,271 is well above state and national averages of \$49,445 and \$59,540.

Fire sprinkler requirements date back to 1992 and now are adopted by reference to the California code.

County: Los Angeles			Sprinkler Ordinance: 1992			
	1990	1995	2000	2005	2010	2016
<b>Permit Activity</b>	71	7	52	70	22	48
<b>Permit Value</b>	\$251,615	\$202,142	\$384,531	\$381,571	\$633,249	\$667,130
<b>Population</b>	86905		84084		89736	
<b>Income</b>	\$35,997		\$50,714		\$72,271	

Table 19: Santa Monica Profile

<sup>26</sup> The red dots in Figure 29 indicate when each jurisdiction adopted home fire sprinkler requirements.



Place	Share Year Prior (1991)	Share Year of Adoption (1992)	Share Year 1 (1993)	Share Year 2 (1994)
Santa Monica	3%	1%	0%	0%

Table 20: Share of County Single Family Building Permits- Los Angeles County

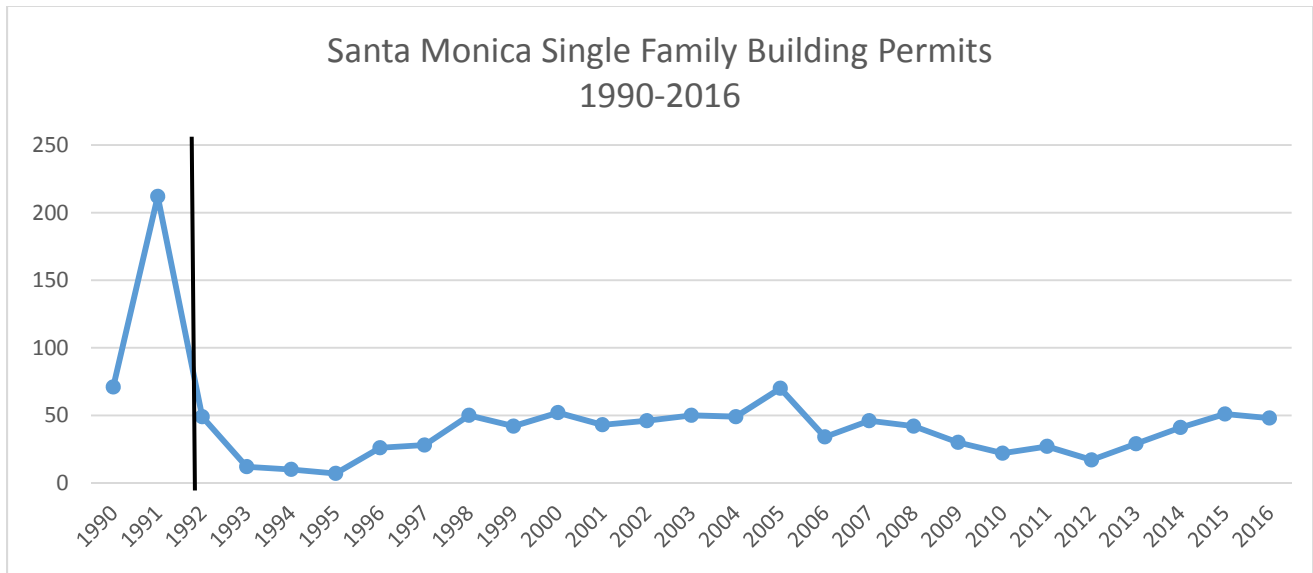
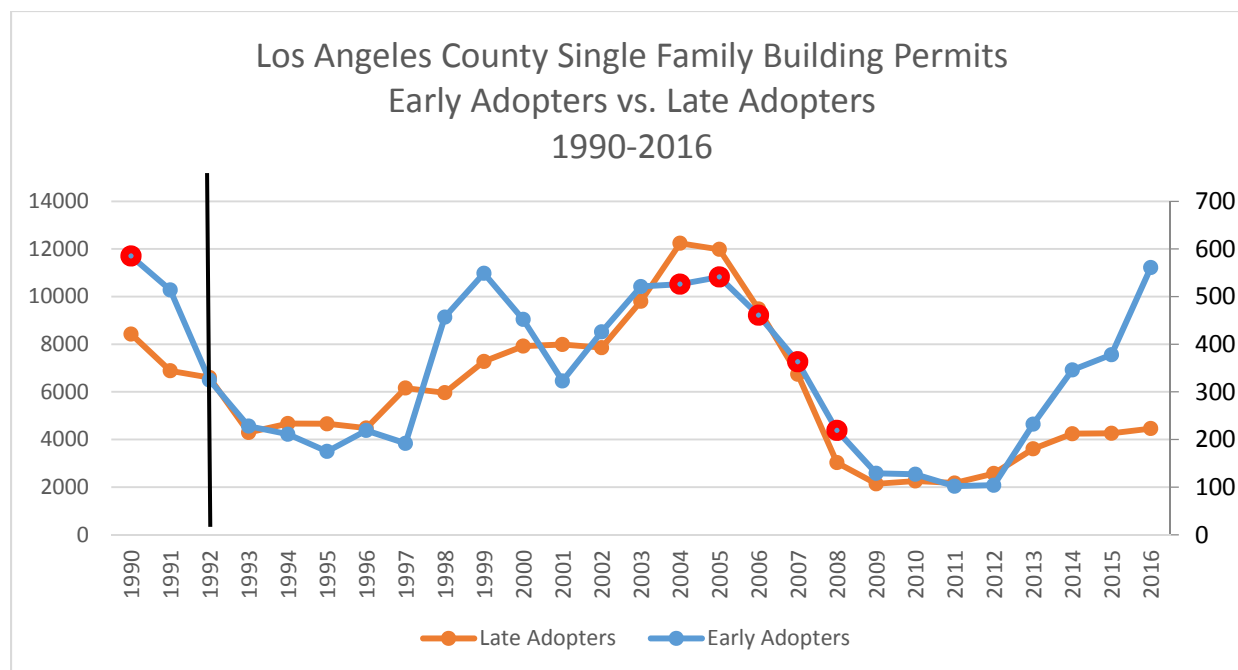


Figure 32: Santa Monica Single Family Building Permits



27

Figure 33: Santa Monica Single Family Building Permits- Early Adopters vs. Late Adopters<sup>28</sup>

<sup>27</sup> Figure 33 Los Angeles County also includes building permit data from the following jurisdictions: Arcadia (2007), Beverly Hills (2007), Burbank (2004), Claremont (2007), Culver City (1990), Downey (2005), Glendora (2007), La Habra Heights (2006), San Gabriel (2008). The red dots in Figure 33 indicate when each jurisdiction adopted home fire sprinkler requirements.

<sup>28</sup> The data for Early Adopters, represented by the blue line in Figure 33, is plotted on the chart using the right y-axis.

## Santa Cruz

Santa Cruz is the county seat and largest city in Santa Cruz County. It is known for its moderate climate, natural environment, coastline, redwood forests, alternative community lifestyles, and socially liberal leanings. It is also home to the University of California, Santa Cruz, a premier research institution and, the city's largest employer.

County: Santa Cruz			Sprinkler Ordinance: 1996			
	1990	1995	2000	2005	2010	2016
<b>Permit Activity</b>	45	85	44	119	18	56
<b>Permit Value</b>	\$135,998	\$142,271	\$210,881	\$135,696	\$595,473	\$203,101
<b>Population</b>	49040		54593		59946	
<b>Income</b>	\$31,857		\$50,714		\$62,755	

Table 21: Santa Cruz Profile

Place	Share Year Prior (1995)	Share Year of Adoption (1996)	Share Year 1 (1997)	Share Year 2 (1998)
Santa Cruz	24%		15%	34%
				17%

Table 22: Share of County Single Family Building Permits- Santa Cruz County

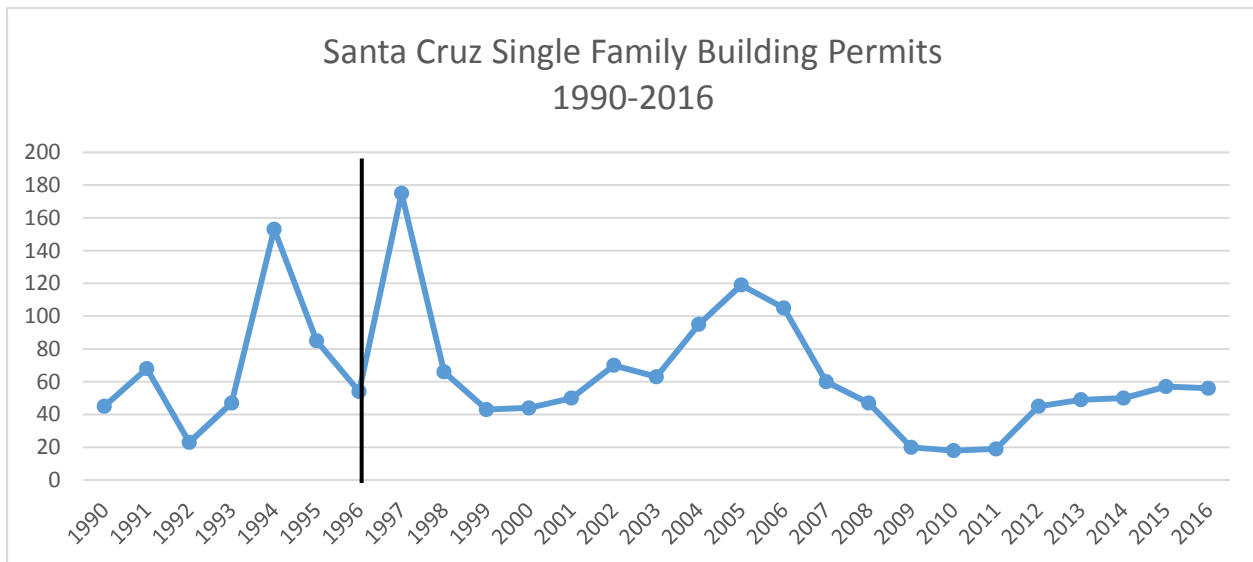


Figure 34: Santa Cruz Single Family Building Permits

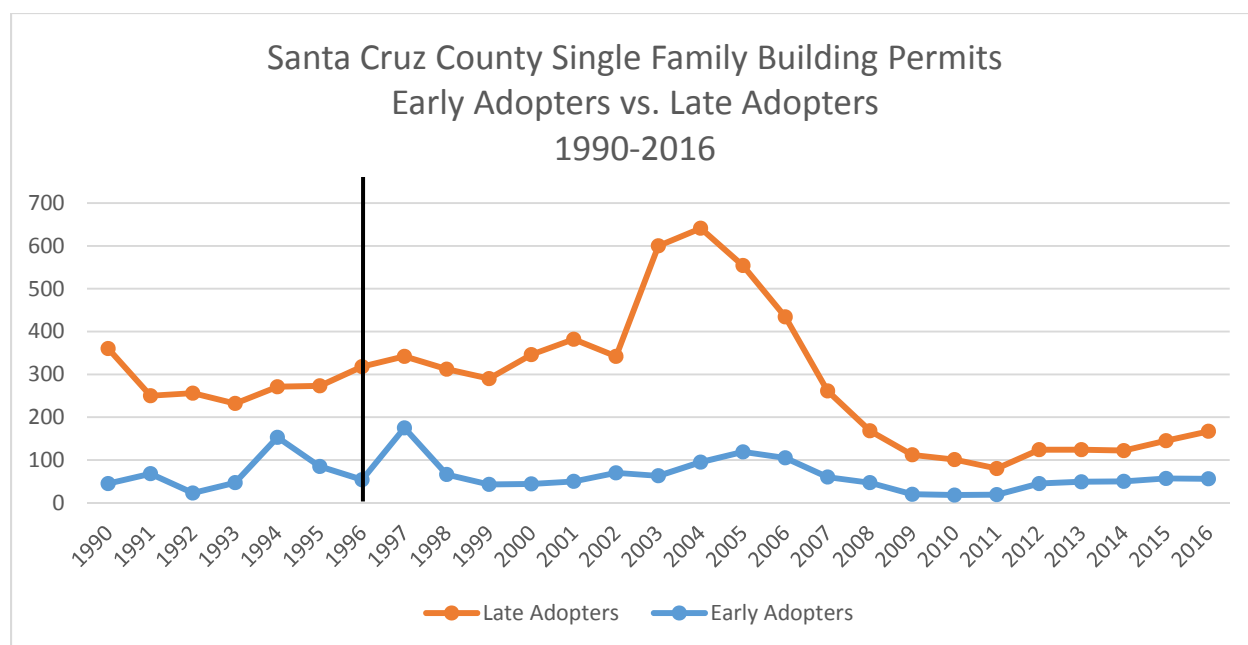


Figure 35: Santa Cruz County Single Family Building Permits- Early Adopters vs. Late Adopters

### Sonoma

Sonoma County in northern California is slightly Northwest of San Francisco and famous for being the home of the Bear Flag revolt of 1846 and Sonoma International Film Festival. Its population is 10,648 according to the 2010 census and median household income of \$63,147 was above both the state and national averages.

In 2003, the Sonoma County Board of Supervisors approved Ordinance # 5402 requiring fire sprinklers in residential and commercial occupancies.

County: Sonoma County			Sprinkler Ordinance: 2003			
	1990	1995	2000	2005	2010	2016
<b>Permit Activity</b>	60	148	47	68	8	32
<b>Permit Value</b>	\$145,027	\$141,995	\$219,595	\$240,991	\$441,134	\$203,630
<b>Population</b>	8121		9128		10648	
<b>Income</b>	\$32,520		\$50,505		\$63,147	

Table 23: Sonoma Profile:

Place	Share Year Prior (2002)	Share Year of Adoption (2003)	Share Year 1 (2004)	Share Year 2 (2005)
Sonoma	5%	8%	3%	4%

Table 24: Share of County Single Family Building Permits- Sonoma County

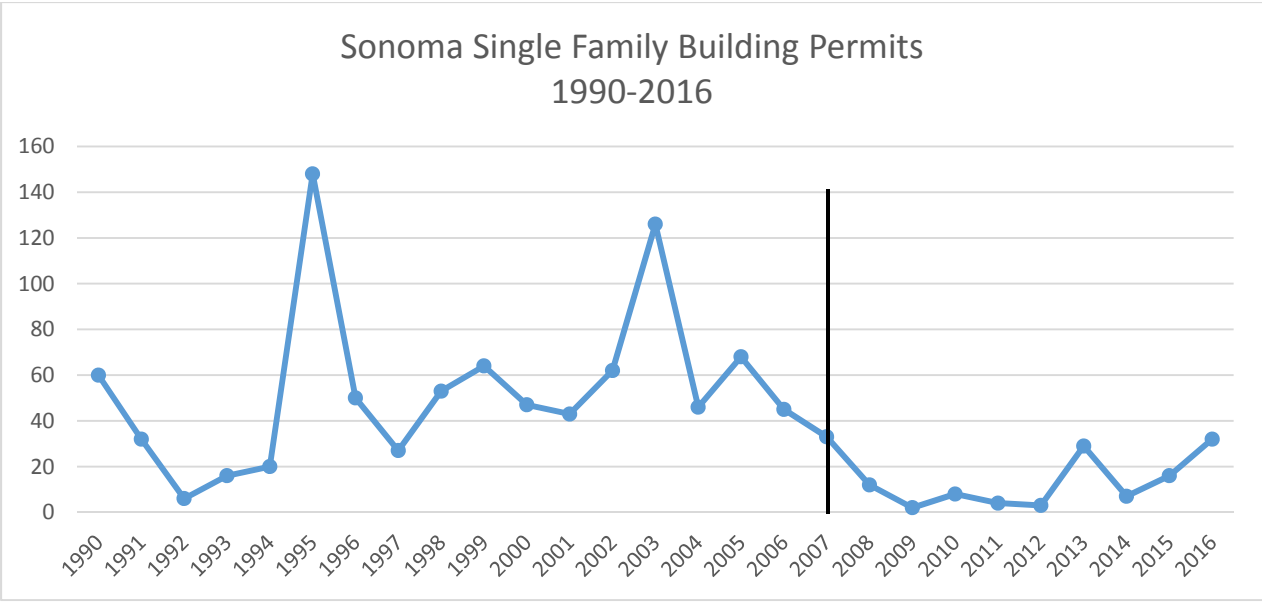
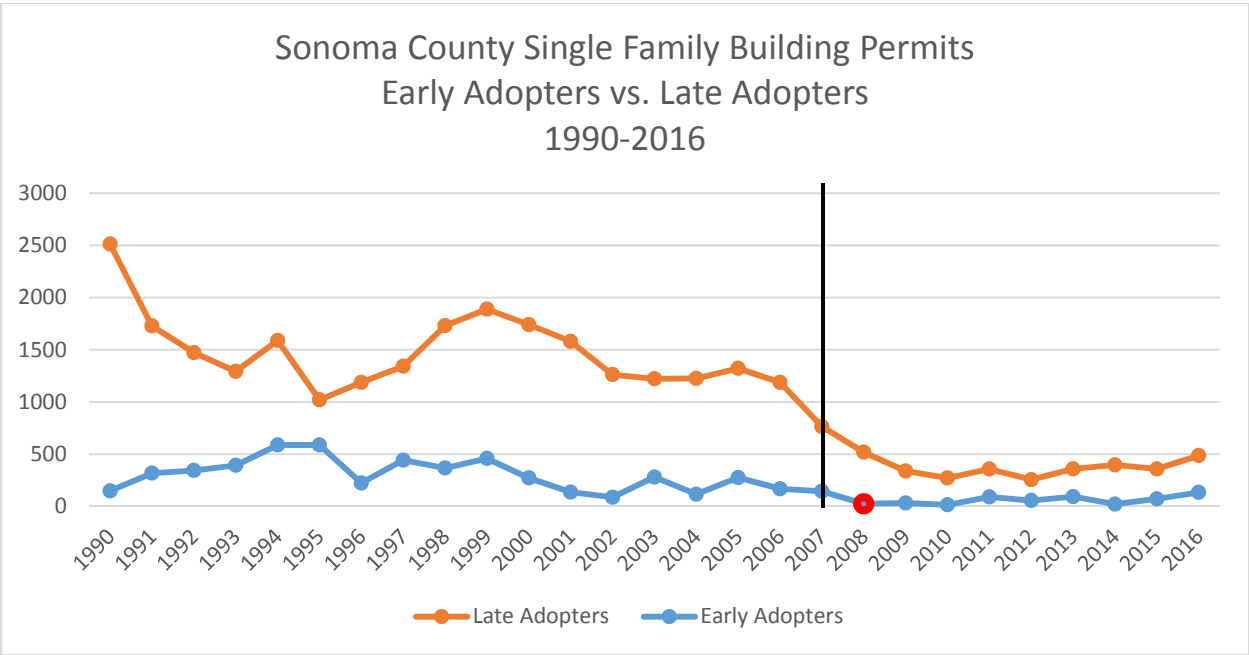


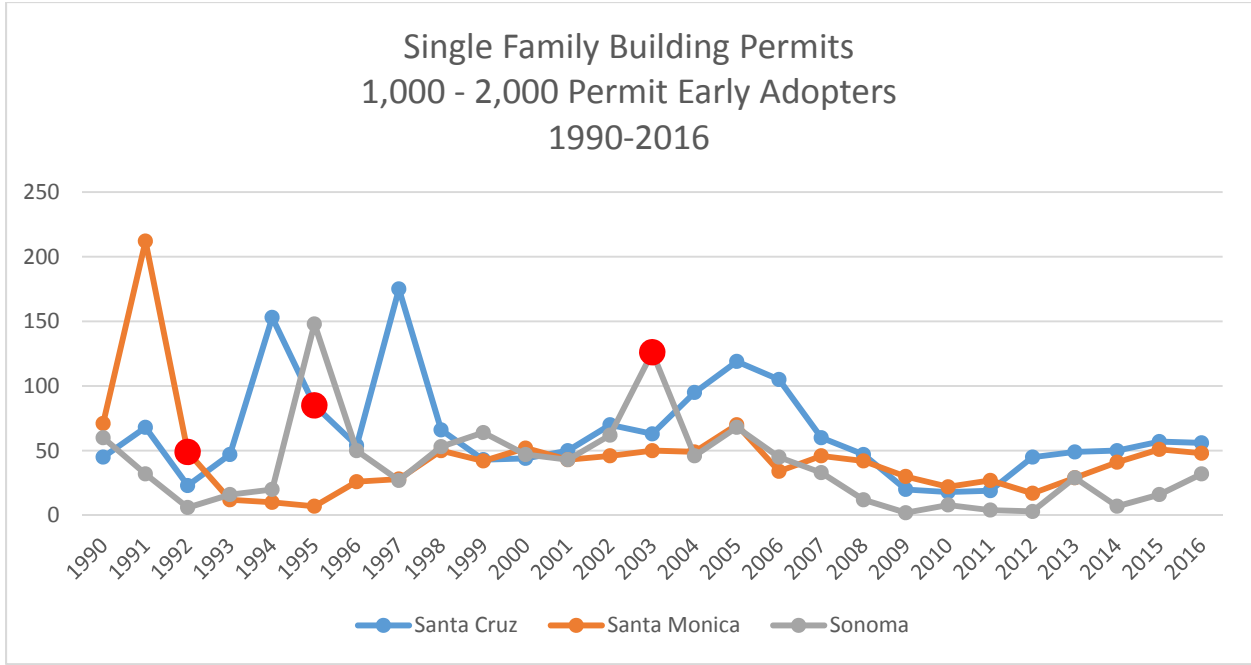
Figure 36: Sonoma Single Family Building Permits



29

Figure 37: Sonoma County Single Family Building Permits- Early Adopters vs. Late Adopters

<sup>29</sup> Figure 37 for Sonoma County also includes building permit data from the following jurisdictions: Petaluma (2008)



30

Figure 38: Single Family Building Permits- Early Adoption Jurisdictions with 1,000-2,000 Single Family Building Permits (1990-2016)

<sup>30</sup> The red dots in Figure 38 indicate when each jurisdiction adopted home fire sprinkler system requirements.