PATHS TO PROSPERITY FOR THE SOUTHERN SIERRA AND SOUTHERN SAN JOAQUIN VALLEY

CAPITALIZING ON THE ECONOMIC BENEFITS OF LAND CONSERVATION AND COMPACT GROWTH

PREPARED FOR THE **SOUTHERN SIERRA PARTNERSHIP**

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TABLE OF CONTENTS

Title page photos: Sequoia Riverlands Trust, 2009 (top) and John Greening, 2010 (bottom).

EXECUTIVE SUMMARY

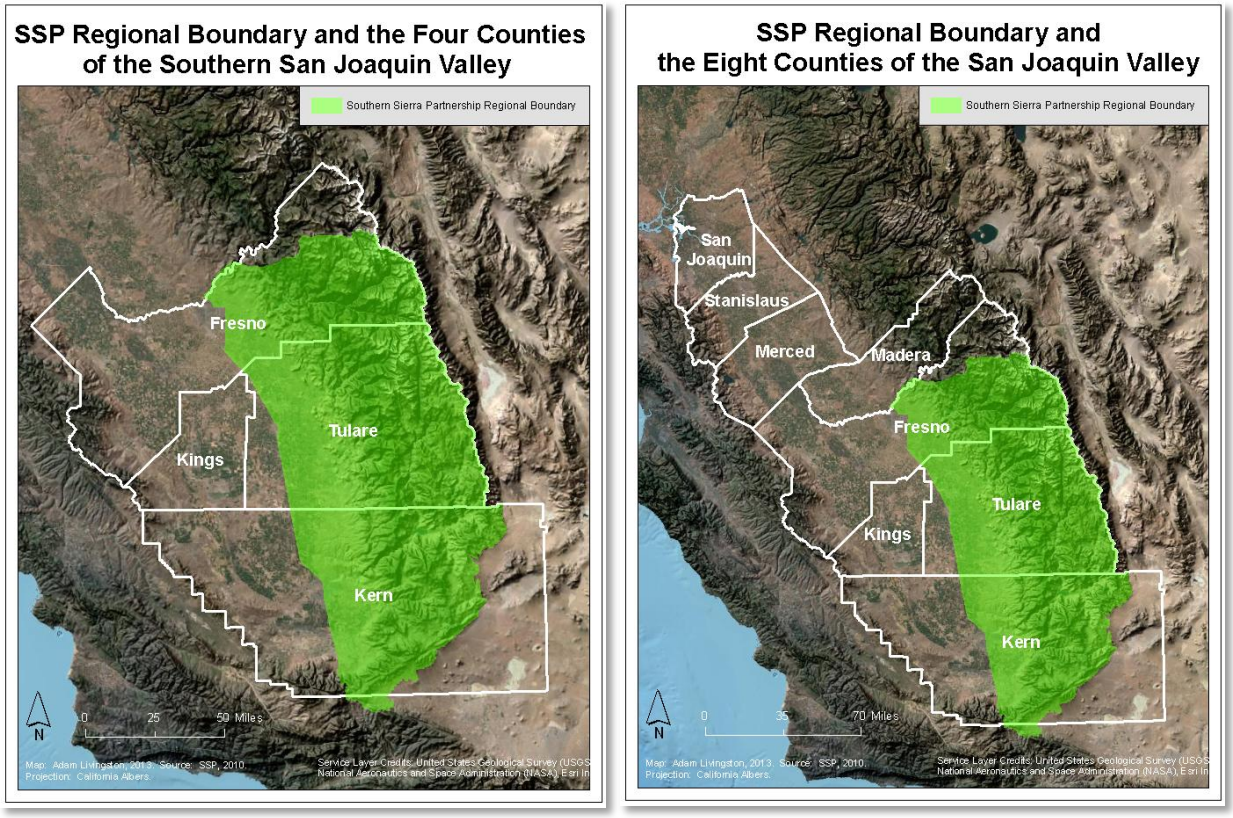
The purpose of this Report is to contribute to land use decisions in the Southern Sierra and Southern San Joaquin Valley by making the economic case for land conservation and compact growth. After providing an overview of current development patterns, the Report uses academic literature, case studies and local data to examine the economic benefits that could be produced by a more sustainable pattern. These include 1) protecting the land base that forms the foundation of the region's economy, 2) helping the region to maximize water availability, minimize the costs of water treatment, and limit flood risk, 3) saving taxpayer dollars on infrastructure, public health and firefighting costs, 4) creating a more resilient housing market through reduced transportation costs and higher home values, 5) helping the region meet state-mandated greenhouse gas emission reduction targets without compromising economic growth, and 6) allowing local governments to obtain more tax revenue per developed acre without raising rates. Because a common argument against compact growth is that it would benefit cities at the expense of counties, the Report also considers California's complex system of local government finance, and discusses how tax revenue can be shared between cities and counties. Finally, it examines the benefits that land conservation and compact growth are producing in other regions, including the Sacramento Valley.

NOTE ON GEOGRAPHY

The Southern Sierra Partnership (SSP), a group of nonprofits dedicated to conservation, compact growth and sustainable development, has historically served a 7 million-acre area stretching from Route 99 to the peaks of the Sierras (Figures 1 and 2). This area was the focus of SSP's Framework for Cooperative Conservation and Climate Adaptation for the Southern Sierra Nevada and Tehachapi Mountains, and remains central to the efforts of SSP member organizations.[1] But it is also the geographic core of a larger region—the Southern Sierra and Southern San Joaquin Valley—roughly defined by the boundaries of Fresno, Tulare, Kings and Kern Counties[2] (Figure 1). These four counties, in turn, are part of a broader region—the San Joaquin Valley—that also encompasses Madera, Merced, Stanislaus and San Joaquin Counties (Figure 2). Several of the sources cited below are applicable to the San Joaquin Valley as a whole, and are noted as such in the text. The primary geographic focus of this Report, however, will be the four counties of the Southern Sierra and Southern San Joaquin Valley. It is in these counties that many of the decisions affecting land use in SSP's service area will be made, and the effects of those decisions felt.

[1] SSP, 2010.

[2] With the exception of northern Fresno County and southeastern Kern County, this four-county area is also coextensive with the Tulare Lake Hydrologic Region. DWR, 2009.



Figures 1 and 2: SSP regional boundary in the context of the Southern San Joaquin Valley (Figure 1) and the San Joaquin Valley as a whole (Figure 2) (SSP, 2010).

INTRODUCTION

The region formed by the Southern Sierra and Southern San Joaquin Valley is one of the state's most geologically, ecologically and demographically diverse. It reaches from sea level to over 14,000 feet, contains landscapes ranging from fruit orchards to giant sequoia groves, and is home to a majority-minority human population. But, from farmland that brings in tens of billions of dollars a year to a National Park where annual visitor spending exceeds $100 million, the entire region is defined by a close connection between land and livelihood.

It is also shaped by rapid population growth: by 2050, the region is expected to have nearly 1.7 million new residents. If current land use patterns continue, many will be housed in low density developments at the edges of existing cities. Instead of creating thriving urban centers, like those that drive economic growth in other parts of the state, these developments will consume productive land and divert resources from downtowns. They will increase the cost of basic public goods ranging from clean water and flood control to infrastructure, health care and fire protection. They will also increase mortgage default rates by forcing households to spend more on transportation costs. Moreover, they will make it more expensive for the region to meet

emissions requirements mandated under SB 375, and will weaken local governments' long term fiscal position by producing less revenue per acre than denser developments. In short, the region's current path leads to a conflict between population growth and economic growth.

But this conflict is not inevitable. There is an extensive body of literature on the economic effects of land use patterns, including studies that focus on areas in or near the Southern San Joaquin Valley. A synthesis of this literature, combined with data and case studies on specific communities, will show that a development pattern based on compact growth could protect working lands, meet projected housing demand, and turn the region's city centers into engines of economic growth. While sustainable development would have a number of benefits, this Report will focus on six in particular:

- Protecting economically productive land that brings in tens of billions of dollars a year;
- Helping the region to maximize water availability, minimize the costs of water treatment, and limit flood risk;
- Saving taxpayer dollars on infrastructure, public health and firefighting costs;
- Lowering mortgage default rates by allowing individual households to save money on transportation costs and creating conditions that lead to higher home values;
- Helping the region to meet its responsibilities under SB 375 while maximizing economic growth; and
- Allowing governments to raise more tax revenue per developed acre without raising rates.

These benefits need not be limited to cities. Although Proposition 13 and other statewide requirements restrict both the amount and allocation of property tax revenue, local governments can adopt agreements to share other types of revenue. Such agreements can limit perverse incentives for "fiscal zoning," allowing cities and counties alike to benefit from sustainable development.

Moreover, residents of the Southern Sierra and Southern San Joaquin Valley need not look far to see the economic gains that can be produced by land conservation and compact growth. The Sacramento region has been directing much of its new development into infill for over a decade, and is already realizing significant benefits. As this and other examples will show, land conservation and compact growth can work here, too.

I. BACKGROUND

The Southern San Joaquin Valley contains some of the most productive farmland on the planet,[3] including the top three farming counties in both California and the nation.[4] In 2011, it was responsible for agricultural production valued at over $20 billion.[5] This tremendous productivity would not be possible without rivers that bring water from the Sierra Nevada, the source of approximately 65% of the state's fresh water.[6] Riparian corridors also host critical wildlife habitat,[7] water the grasslands that provide forage for working ranches and, in areas protected by Sequoia and Kings Canyon National Park, contribute to tourism revenue that can exceed $100 million annually.[8]

Photo: John Greening, 2011.

As these facts suggest, much of the region's land is directly or indirectly involved in economic production. The vast majority of undeveloped land on the Valley floor is devoted to crop cultivation, while the foothills are dominated by grasslands suitable for grazing (Figure 3). In the three counties that reach from the Valley floor to the peaks of the Sierras, the portion of land devoted to agricultural production—a category that encompasses both cropland and rangeland (Figure 4)—is between 37.9% (Tulare) and 45.4% (Kern).[9] In neighboring Kings County, 76.5% of the land area is used for agriculture, the vast majority of which is devoted to cropland.[10] The Southern Sierra, meanwhile, is dominated by the forests of Sequoia and Kings Canyon National Park and surrounding federal lands (Figure 3).

[3] American Farmland Trust, 2013.
[4] National Agricultural Statistics Service, 2012.
[5] National Agricultural Statistics Service, 2012.
[6] SSP, 2010; Natural Capital Project, 2008.
[7] SSP, 2010.
[8] Headwaters Economics, 2012b.
[9] Headwaters Economics, 2012a.
[10] Headwaters Economics, 2012a.

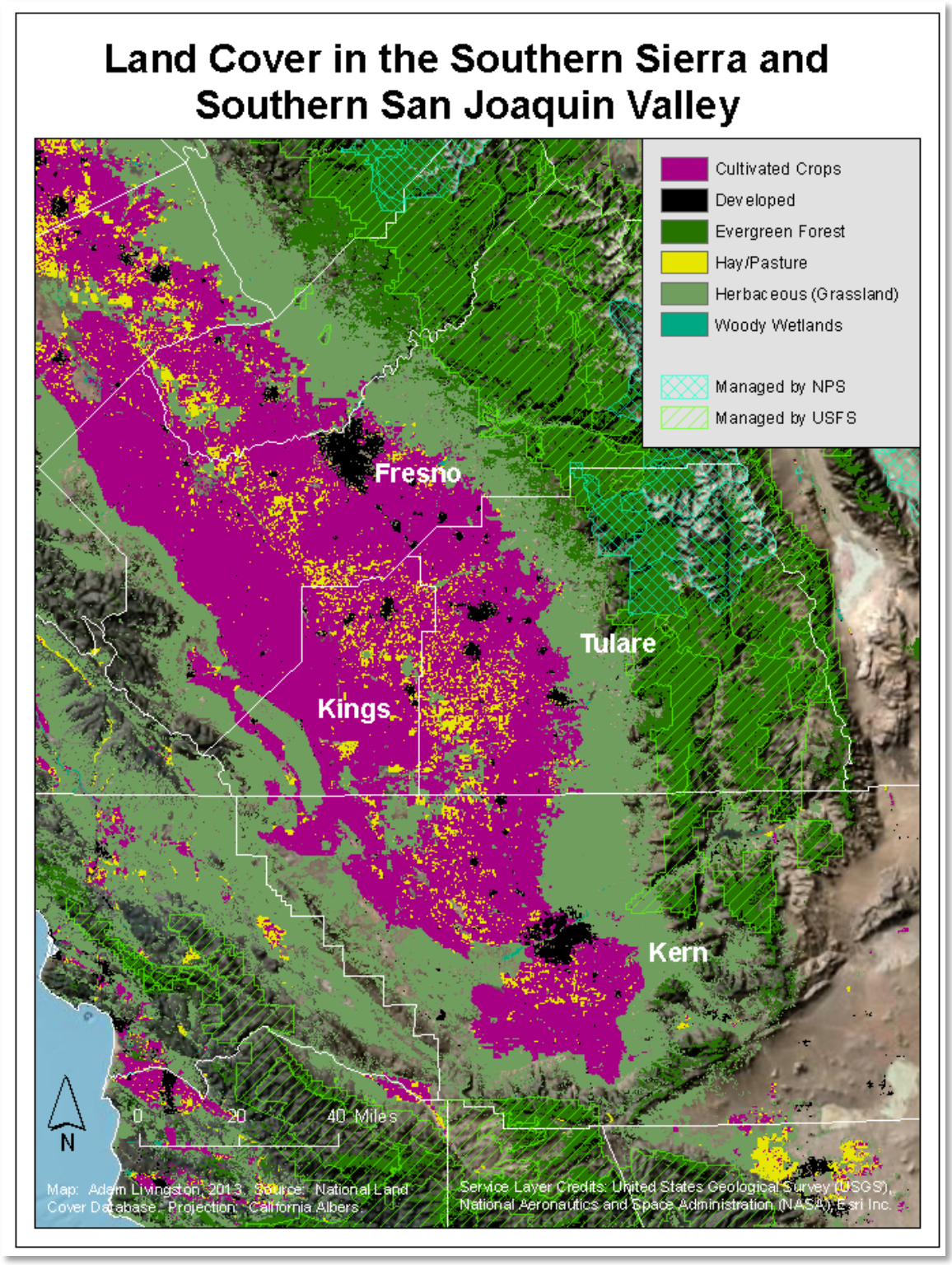


Figure 3: Major land cover types in the Southern Sierra and Southern San Joaquin Valley (National Land Cover Database, 2011). Areas managed by the National Park Service (NPS) or U.S. Forest Service (USFS) are marked with blue crosshatch or green diagonal overlays, respectively (National Atlas of the United States, 2013).

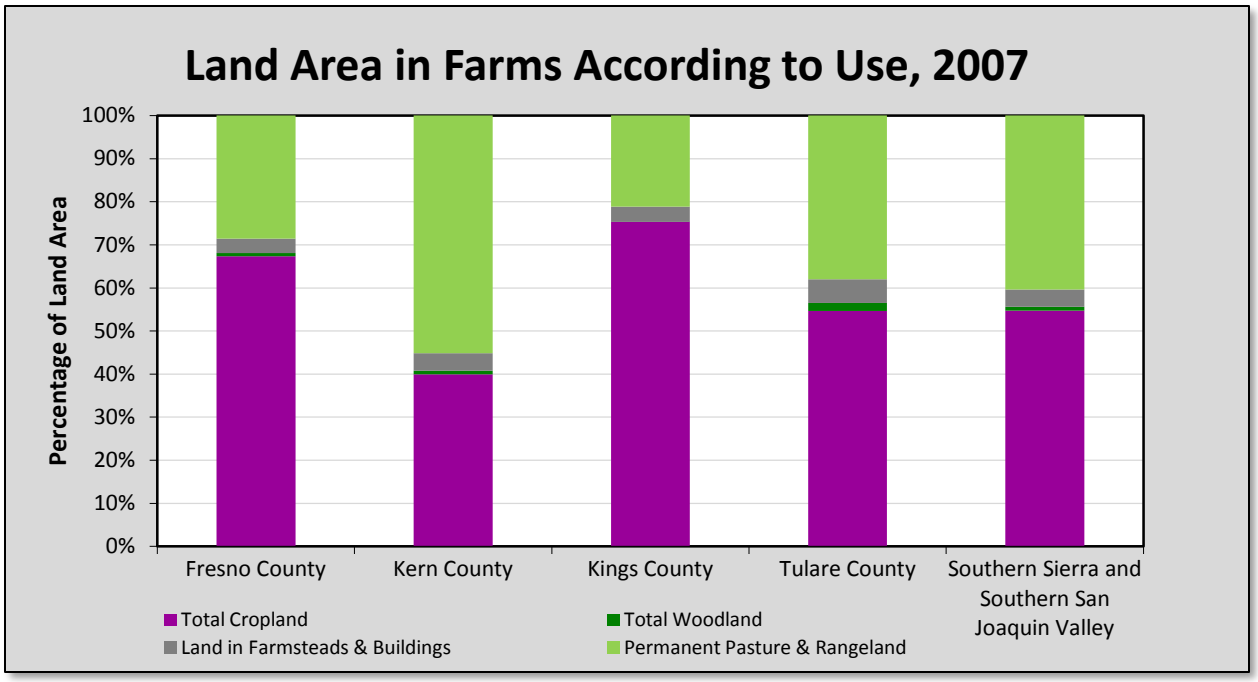


Figure 4: Land area in farms according to use, as of 2007 (Headwaters Economics, 2012a).

But the region also hosts a growing human population: from under 2.4 million in 2010, the combined population of Fresno, Tulare, Kings and Kern Counties is expected to exceed 4 million by 2050.[11] The fate of the region's land and the future of its economy will depend in part on how and where these new residents are housed.

A. Current and Expected Development Patterns in the Region[12]

1. Unbalanced Patterns of Residential Development

The dominant growth pattern in the Southern San Joaquin Valley has historically been low density development outside existing urban centers.[13] In the residential context, growth has consisted almost entirely of single family homes on large lots: on average, 90% of the residential permits issued in the San Joaquin Valley from 1990 through 2011 were for this type of home, and enough have been built to satisfy expected demand until 2050.[14] Moreover, 20% of the region's developed land is devoted to "ranchettes," a form of rural housing that accommodates extremely low population densities, is often built on high quality farmland and,

[11] The Planning Center | DC&E, 2012.
[12] Portions of this section are adapted from Livingston (2011).
[13] American Farmland Trust, 2013.
[14] Nelson, 2013.

due to small parcel sizes, rules out most economically productive forms of agriculture.[15] In the Southern Sierra and Southern San Joaquin Valley, the nearly exclusive focus on low density housing caused the land area devoted to residential development to increase by more than a quarter from 1980 to 2000 (Figure 5).

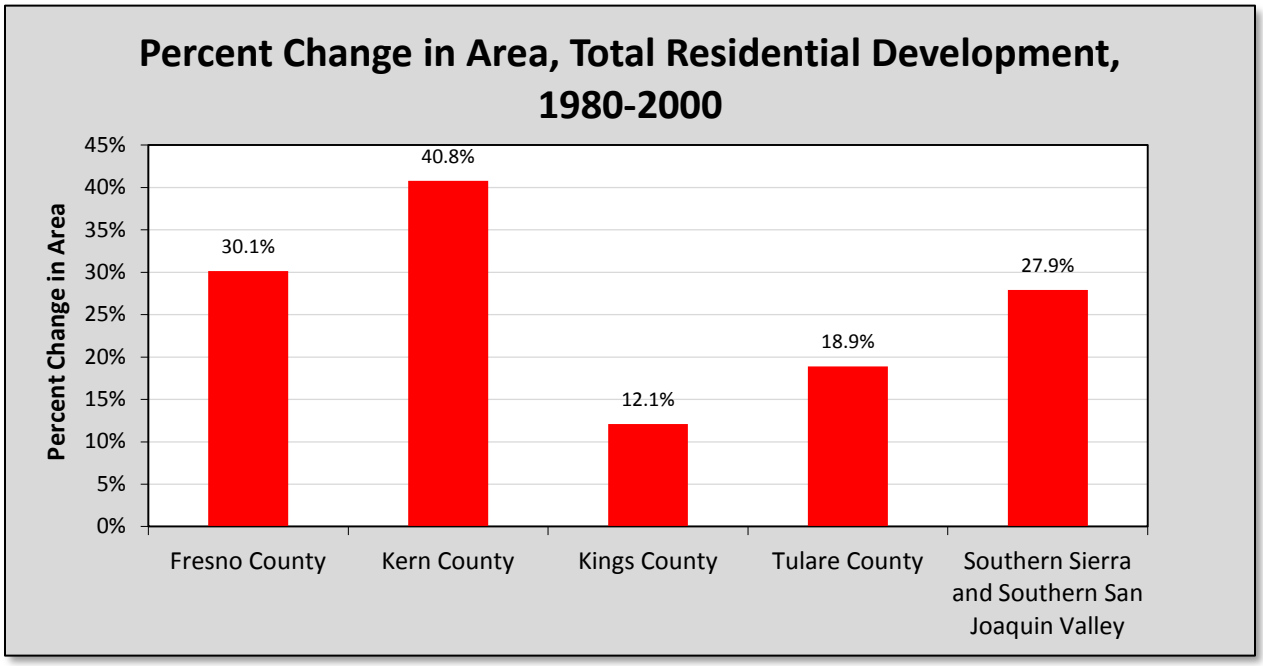


Figure 5: Percent change in area, total residential development, 1980-2000 (Headwaters Economics, 2012a).

This pattern continues in spite of a shift in market demand to multifamily homes and small-lot single family homes.[16] Indeed, as a study focusing on nearby Sacramento points out, a shift in available housing types from luxury single-family homes to multifamily housing could create economic surplus for the vast majority of households.[17]

Moreover, a combination of economic and regulatory factors, such as higher structural unemployment and post-2008 minimum downpayment requirements, are beginning to reduce homeownership rates generally.[18] One study predicts that 47% of the San Joaquin Valley's households will be renting in 2050 (as opposed to 43% in 2010), and that there will be significant unmet demand for multifamily housing.[19] These trends, combined with stagnant

[15] American Farmland Trust, 2009; American Farmland Trust, 2006.
[16] Nelson, 2013; The Concord Group, 2012.
[17] Rodier et al., 2012.
[18] The Planning Center | DC&E, 2012.
[19] The Planning Center | DC&E, 2012.

wages—between now and 2050, real household income in the region is expected to increase by 0.4% or less per year—may represent a "new normal" that will continue to depress homeownership rates.[20]

2. Stagnant Population Density

While the region's population is growing substantially, its population density is not: a recent study by the American Farmland Trust found that the average number of people per acre in the San Joaquin Valley as a whole has gone from 5.8 in 1990 to 6.0 now.[21] A 2005 report by the Public Policy Institute of California (PPIC) predicted that population density would actually *decrease* in coming decades, because modeling based on recent development patterns indicated that "urban areas [would] grow much faster than population."[22] This decrease would be from densities that are already significantly lower than those of other major cities in California. In 2010, the city of Fresno had 4,418.4 people per square mile, and Bakersfield had only 2,444.2.[23] By comparison, San Francisco had 17,179.2 per square mile, Los Angeles had 8,092.3, and even Anaheim—the epitome of Orange County urban sprawl—packed in 6,747.5[24]

3. Loss of Productive Land along the Fresno-Bakersfield Corridor

The combination of a rapidly rising population and stagnant population density has led to the loss of hundreds of thousands of acres of productive land.[25] If these patterns continue, the American Farmland Trust estimates that the San Joaquin Valley as a whole will lose over 300,000 acres of high quality farmland—soil so productive it has been designated by the state

[20] The Planning Center | DC&E, 2012.
[21] American Farmland Trust, 2013.
[22] Teitz et al., 2005. The PPIC report assumes that the San Joaquin Valley will have 7 million residents by 2040, and uses a "cellular automata" urban growth model to explore four scenarios: 1) "Accommodating Urban Development," in which present development trends continue; 2) "Prime Farmland Conservation," in which 3.2 million acres of prime farmland are protected, but a significant portion of non-prime farmland is lost; 3) "High-Speed Rail," in which developments cluster around a proposed rail network; and 4) "Automobile-Oriented Managed Growth," in which development is weighted toward current and projected highway corridors. Teitz et al., 2005. Three of the four scenarios predict that over a million acres of presently-undeveloped land will be lost to urbanization. The fourth, Prime Farmland Conservation, predicts that nearly 800,000 acres will be lost. Teitz et al., 2005.
[23] U.S. Census Bureau, 2010.
[24] U.S. Census Bureau, 2010.
[25] American Farmland Trust, 2013; American Farmland Trust, 2005.

as "prime," "of statewide importance" or "unique"—by 2050.[26] Total farmland losses are expected to be significantly higher, and could be up to 500,000 acres by 2050.[27]

These losses are occurring disproportionately on high quality farmland.[28] In Kings County, for example, 78% of land that was urbanized between 1990 and 2004 had been designated by the state as prime, of statewide importance, or unique.[29] In Tulare, it was 71%, and in Fresno, 58%.[30] Moreover, as of 2005, the proportion of undeveloped land that was also high quality farmland was higher within urban spheres of influence (SOIs)—the areas designated for cities' future growth—than outside them in Fresno, Tulare and Kern.[31]

The disappearance of the region's best farmland coincides with another pattern: the creation of a corridor of low density development stretching from Fresno to Bakersfield. Today, a majority of Southern San Joaquin Valley residents live along this corridor in cities of 50,000 or more (Table 1).

Major Population Centers (> 50,000 Residents) on the Fresno-Bakersfield Corridor	**2010 Population**
Fresno	494,665
Clovis	95,631
Hanford	53,967
Visalia	124,442
Tulare	59,278
Porterville	56,165
Delano	53,041
Bakersfield	347,483
Total	**1,284,672**

Table 1: Major population centers on the Fresno-Bakersfield corridor, with populations from the 2010 Census (U.S. Census Bureau, 2010). Communities with less than 100,000 residents are highlighted in yellow, those with 100,000-250,000 in orange, and those with more than 250,000 in red.

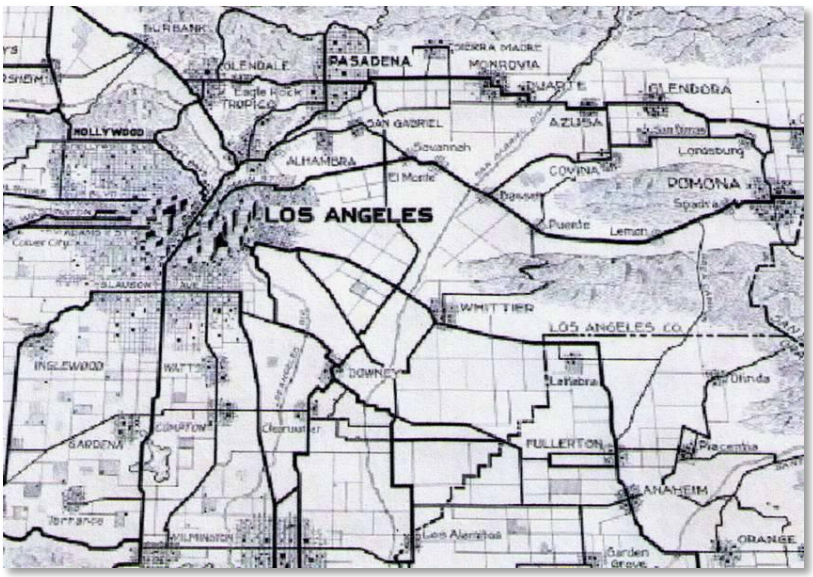
[26] American Farmland Trust, 2013.
[27] American Farmland Trust, 2013. These losses are an extreme example of a statewide trend: between 1982 and 2007, 1,767,200 acres of agricultural land in California, including 301,500 of prime farmland, were lost to development. American Farmland Trust and NCRS, 2012.
[28] American Farmland Trust, 2009; American Farmland Trust, 2007.
[29] American Farmland Trust, 2007.
[30] American Farmland Trust, 2007.
[31] American Farmland Trust, 2005.

A substantial minority live in smaller communities along the same corridor. For example, a cluster of small towns at the border of Fresno and Tulare Counties, dominated by Sanger, Dinuba, Reedley and Selma, is converging to fill the space between Fresno and Visalia. These communities have fewer than 25,000 residents each, but their combined population would make them the third-largest node on the corridor (Table 2).

Minor Population Centers (<50,000 Residents) at the Border of Fresno and Tulare Counties	2010 Population
Sanger	24,270
Orange Cove	9,078
Orosi	8,770
Dinuba	21,453
Reedley	24,194
Parlier	14,494
Fowler	5,570
Selma	23,219
Kingsburg	11,382
Total	**142,430**

Table 2: Population centers at the border of Fresno and Tulare counties (U.S. Census Bureau, 2010). Communities with less than 10,000 residents are highlighted in yellow, those with 10,000 to 20,000 in orange, and those with more than 20,000 in red.

Small nodes are also agglomerating on the southern end of the corridor, as Shafter, McFarland and Wasco, with a combined population of over 50,000, begin to link Delano and Bakersfield.[32] At the same time, communities like Porterville and Three Rivers in the east, and Lemoore and Corcoran in the west, are widening the corridor.



Like an early-twentieth-century map of Los Angeles County (Figure 6), the eventual result is already visible in outline (Figure 7).

Figure 6: Stylized representation of development in Los Angeles County, as of 1915 (American Farmland Trust, 2011).

[32] U.S. Census Bureau, 2010.

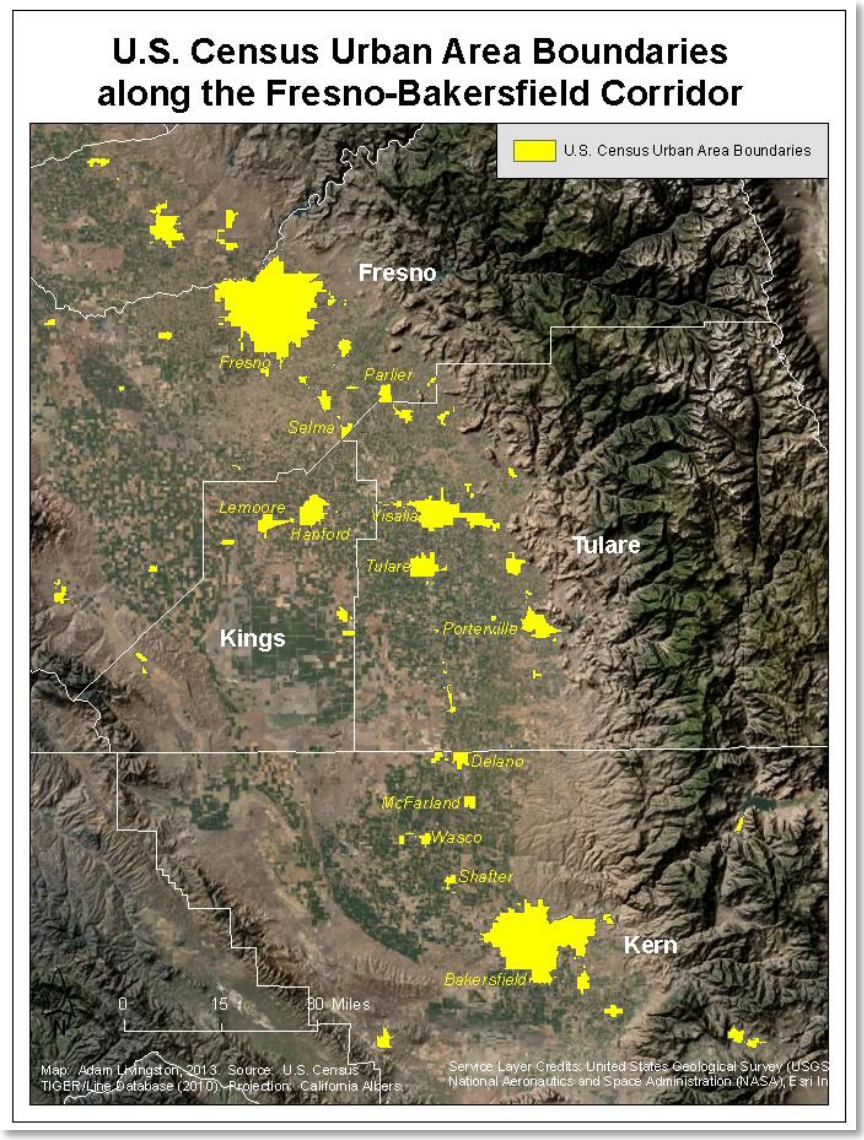


Figure 7: Urban area boundaries along the Fresno-Bakersfield corridor (U.S. Census, 2010).

4. Economic and Environmental Outcomes of the Region's Development Patterns

The results are also visible on the ground. In terms that could describe the Southern San Joaquin Valley in 2013, the 2005 Executive Order establishing the California Partnership for the San Joaquin Valley explains that "[b]y nearly every indicator, the economic well-being of the residents of the Valley lags behind state and national averages."[33] The average family in the San Joaquin Valley makes 35% less than the average family in California[34] and, in the Southern San Joaquin Valley, more than a fifth of the population lives in poverty.[35] For both individuals and families, the region's poverty rates are far above the national average (Figure 8).

[33] California Office of the Governor, 2005.
[34] Mintier Harnish et al., 2011.
[35] Headwaters Economics, 2012a.

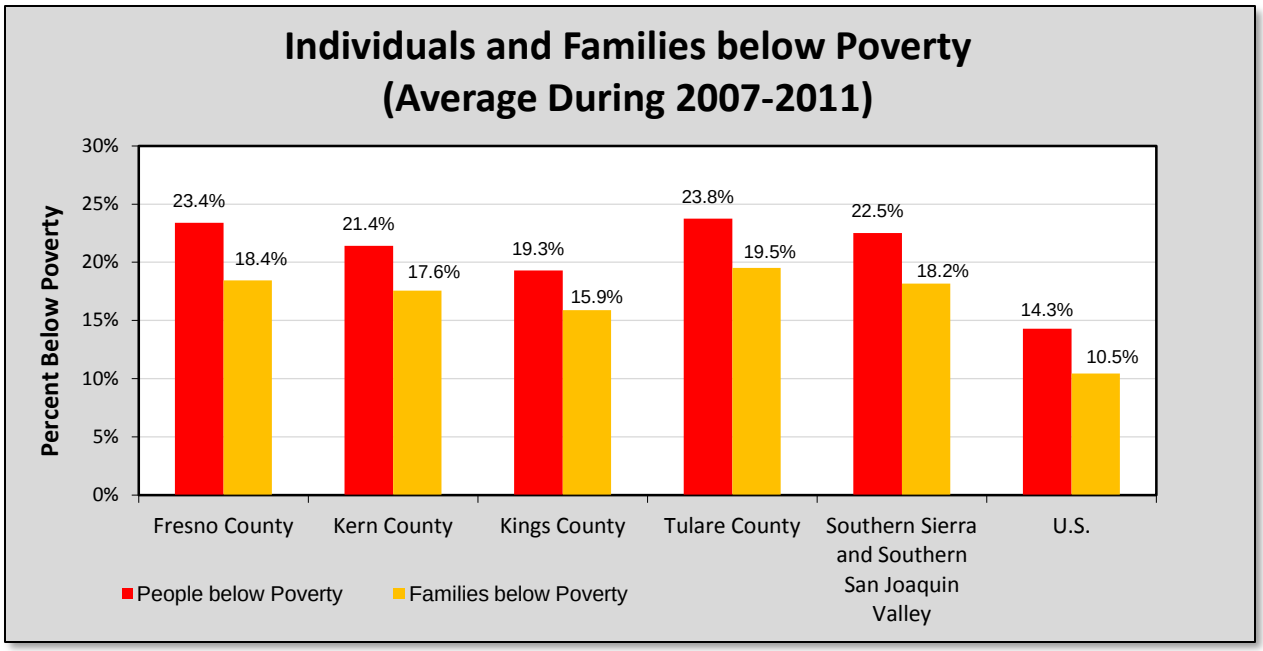


Figure 8: Individuals and families below poverty, based on averages from annual surveys conducted between 2007 and 2011 (Headwaters Economics, 2012a).

The Southern San Joaquin Valley also suffers from double-digit unemployment and unusually low land values. December 2012 county unemployment rates ranged from 13.5% in Kern to 15.7% in Fresno—significantly higher than the statewide rate of 9.8% and the national rate of 7.8%.[36] In the same month, median home sale prices in Fresno ($145,900), Visalia ($162,500), and Bakersfield ($160,000) were, at best, just over half the statewide median of $317,800.[37]

Environmental indicators are equally troubling. The San Joaquin Valley has been identified by the EPA as an "extreme non-attainment" zone for ozone pollution.[38] Its metropolitan areas, including not only major population centers like Bakersfield-Delano, but also smaller groupings such as Hanford-Corcoran, suffer from some of the worst ozone and particulate matter pollution in the country.[39] In addition to its air quality issues, the region gets much of its drinking water from underground aquifers that are being drained at unsustainable rates,[40] and are increasingly contaminated by nitrates, pesticides and salt accumulation.[41]

[36] U.S. Bureau of Labor Statistics, 2013.
[37] Zillow.com, 2013.
[38] San Joaquin Valley Air Pollution Control District, 2012.
[39] American Lung Association, 2013.
[40] Reilly et al., 2008.
[41] Schoups et al., 2005; Mintier Harnish et al., 2011.

Moreover, the region's economic and environmental burdens fall disproportionately on specific, disadvantaged populations, including the agricultural workers who plant, tend to and harvest the region's crops.[42] A recent study found that nearly a third of San Joaquin Valley residents suffer from a combination of "high degrees of social vulnerability" caused by "poverty, low levels of formal education, and low English literacy," and "high . . . environmental risk," including exposure to toxic levels of pesticides and other pollutants.[43] These types of risk are correlated in certain geographic areas, which the authors mapped across the San Joaquin Valley.[44] The combined burden is greatest in portions of Fresno and Bakersfield, as well as rural communities affected by pesticide application, power plants and waste disposal facilities.[45]

B. Alternative Development Patterns

As the sources cited above suggest, there is widespread concern about the economic and environmental costs of the region's current development patterns. In recent years, local governments, consultants, and others have begun mapping and modeling alternatives.

1. Vision California and Other RapidFire Modeling

Among the most well-known are the Vision California scenarios developed by Calthorpe Associates and incorporated into the San Joaquin Valley Blueprint process.[46] These scenarios are built around specific assumptions about land use, transportation and public policy. At a statewide level, for example, the main difference between "Business as Usual" and "Smart Growth" is that the former assumes that current development patterns will continue, while the latter assumes that more growth will be channeled into existing cities.[47] Using a spreadsheet-based model called RapidFire, these assumptions are combined with existing data and projected into the future to yield predictions about land consumption, infrastructure costs, public health needs, water and energy use, vehicle miles traveled[48] and greenhouse gas emissions.[49]

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[42] London et al., 2009.
[43] London et al., 2009.
[44] London et al., 2009.
[45] London et al., 2009.
[46] The Blueprint process is discussed in more detail below.
[47] Calthorpe Associates, 2011.
[48] As discussed below, reductions in per capita vehicle miles traveled can play a significant role in meeting emission reduction targets under SB 375.
[49] Calthorpe Associates, 2011.

Vision California scenarios have been run for both the state and the region. The statewide "Growing Smart" and "Green Future" scenarios, both of which emphasize urban infill and compact growth, result in less land consumption, reduced infrastructure costs, and significantly lower per-capita vehicle miles traveled by 2050.[50] They also produce lower annual public health costs by 2035.[51]

For the San Joaquin Valley, two scenarios—"Business as Usual" and "Valleywide Hybrid"—were modeled through 2035.[52] Business as Usual assumes that current, low density growth patterns will continue, while Valleywide Hybrid is based on a compact growth scenario ("Scenario C") developed during the San Joaquin Valley Blueprint process.[53] By 2035, the Valleywide Hybrid scenario produces a number of economic and environmental benefits, including the following:

- Cumulative regional savings of over $20 billion in infrastructure costs;
- Cumulative regional savings in energy use of 17 trillion BTUs;
- Annual savings of $3,600 in per-household driving and utility costs;
- A cumulative reduction in gasoline consumption of more than 8 billion gallons;
- A cumulative reduction of 158 billion vehicle miles traveled; and
- Greenhouse gas emissions 16% lower than under the Business as Usual scenario.[54]

Thus, RapidFire modeling indicates that land conservation and compact growth can have significant benefits for the region.

2. Spatially Explicit Growth Scenarios (UPlan)

A different group of scenarios has been developed using a Geographic Information Systems (GIS) tool called UPlan. These scenarios capture not only the overall effects of growth patterns, but also the impacts of specific land use choices. To do this, UPlan starts with a map of the region, including currently developed areas, and a set of assumptions about population growth and development patterns.[55] It then converts new population into demand for land and, based on assumptions about suitability, zoning and other land use factors, assigns new development to specific places.[56]

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[50] Calthorpe Associates, 2011; Calthorpe, 2011.
[51] Calthorpe Associates, 2011.
[52] Calthorpe Associates, 2010.
[53] Calthorpe Associates, 2010; Mintier Harnish et al., 2010.
[54] Calthorpe Associates, 2010.
[55] Beardsley et al., 2009.
[56] Beardsley et al., 2009.

In recent years, a series of peer-reviewed studies have used UPlan to predict the effects of different growth scenarios on a variety of land use outcomes in the San Joaquin Valley.[57] The contexts of these papers ranged from habitat and farmland conservation[58] to agricultural revenue[59] and vehicle miles traveled.[60] In every case, a scenario based on compact growth outperformed scenarios based on current trends:

- A compact growth scenario is the most effective in minimizing losses from 14 geographic sets of conservation priorities, including the riparian corridors that bring water from the Sierras.[61]
- A compact growth scenario minimizes impacts on the ecological network in general, as defined by specific Conservation Opportunity Areas (COAs) and corridors linking them.[62]
- Compared to a scenario based on current development patterns, a compact growth scenario would protect nearly $1.5 billion more of the San Joaquin Valley's annual crop value.[63] Indeed, compact growth would save even more crop value than two scenarios specifically designed to protect farmland, outperforming one by over $366 million and the other by more than $1.4 billion.[64]
- By 2030, a compact growth scenario would produce lower vehicle miles traveled in seven of the San Joaquin Valley's eight counties than a business-as-usual ("As Planned") scenario.[65] Results from this study are discussed in more detail below.

Thus, UPlan modeling in a variety of contexts suggests that development patterns based on compact growth would have significant economic and environmental benefits for the region.

3. Natural Resource Mapping

From the SSP Framework[66] to the ongoing San Joaquin Valley Greenprint,[67] the region has been the subject of detailed natural resource mapping and conservation planning efforts. The SSP

[57] Beardsley et al., 2009; Huber et al., 2011; Roth et al., 2012; Niemeier et al., 2011.
[58] Beardsley et al., 2009; Huber et al., 2011.
[59] Roth et al., 2012.
[60] Niemeier et al., 2011.
[61] Beardsley et al., 2009.
[62] Huber et al., 2011.
[63] Roth et al., 2012.
[64] Roth et al., 2012. One reason for this may be that the compact growth scenario minimizes the area where farmland abuts developed land, thereby "creat[ing] a smaller potential zone of conflict over land uses and limit[ing] the negative effects of the urban area on agricultural productivity." Roth et al., 2012.
[65] Niemeier et al., 2011.

Framework, which documents a number of ecosystem services that underpin the region's economy and quality of life, will be discussed in several sections below. The Greenprint will not be complete until 2014, but is likely to provide additional data on the natural resources that underpin the region's economy.

C. Regional Planning Efforts

The effort to imagine alternatives for the region has not been limited to consultants, academics and activists. In 2005, then-Governor Schwarzenegger signed an Executive Order establishing the California Partnership for the San Joaquin Valley.[68] Composed of representatives from state and county governments, as well as the private sector, the Partnership was directed to focus on "improv[ing] the economic well-being of the Valley and the quality of life of its residents."[69] Its Strategic Action Plan identified a number of policy goals, including attaining clean air standards by 2013 and avoiding any net loss of agricultural land.[70] In addition, the Partnership laid out the framework for a "Regional Blueprint Planning process."[71] While this process would not produce a legally binding result, it would allow policymakers and the public to consider different growth scenarios and work out a shared vision for the Valley's future development.

The resulting San Joaquin Valley Blueprint Roadmap is built around Scenario B+, which emphasizes public transit and sets a Valley-wide target of 6.8 units per acre in new residential development.[72] Based on this target, as well as twelve Smart Growth Principles (including "[p]reserve open space, farmland, natural beauty and critical environmental areas," and "[s]trengthen and direct development towards existing communities"), the Roadmap sets county-specific density targets for new residential development through 2050.[73] Targets for the four counties of the Southern San Joaquin Valley range from 5.3 units per acre for Tulare to 8.0 for Fresno.[74]

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[66] SSP, 2010.
[67] Fresno COG, 2012.
[68] California Office of the Governor, 2005.
[69] California Office of the Governor, 2005.
[70] California Partnership for the San Joaquin Valley, 2006.
[71] California Partnership for the San Joaquin Valley, 2006.
[72] Mintier Harnish et al., 2010. B+ was not the most compact option considered: Scenario C ("Valleywide Hybrid"), which was selected by 53% of participants in the 2009 Blueprint Regional Summit and recommended by the Blueprint Regional Advisory Committee, called for 10 units per acre. Mintier Harnish et al., 2010. But B+ was slightly more compact than Scenario A, which represented the status quo of 4.3 units per acre. Mintier Harnish et al., 2010.
[73] Mintier Harnish et al., 2011.
[74] Mintier Harnish et al., 2011.

In addition to the Roadmap, the Blueprint process has produced a whitepaper on possible institutional arrangements for a regional planning agency,[75] and a detailed study on the region's demographics and expected housing demand through 2050.[76] It has also informed the work of the Smart Valley Places Consortium, a group of fourteen San Joaquin Valley City Managers, plus other representatives from government and academia.[77] The cities represented in Smart Valley Places have each committed to specific planning and outreach projects.[78] In many cases, these consist of revising existing planning documents to make them more consistent with the Roadmap.[79] Today, the Blueprint process is contributing to the ongoing development of Sustainable Communities Strategies under SB 375, a process discussed in more detail below.

But the region is a long way from meeting the goals of the Roadmap. At the time the Blueprint process was happening, the U.C. Davis Sustainable Transportation Center conducted a study of specific sustainability policies adopted by cities in the Central Valley. The authors compared each city's planning documents to a list of 50 separate policies, many of which emphasized resource conservation and compact growth,[80] and assigned each city a score from 1-50.[81] While Fresno (33.0) was ranked most sustainable, Visalia (29.0) was fourth and Bakersfield (26.5) was ninth, the average score was only 17 out of 50.[82]

II. THE LAND BASE IS THE FOUNDATION OF THE REGION'S ECONOMY

From farms on the Valley floor whose production has been valued at $20 billion a year to a National Park responsible for more than 1,700 local jobs and $100 million in annual visitor

[75] Mintier Harnish and Carol Whiteside, 2011.
[76] The Planning Center | DC&E, 2012
[77] Smart Valley Places, 2012.
[78] Smart Valley Places, 2012.
[79] Smart Valley Places, 2012.
[80] Although the study was not conducted as part of the Blueprint process, many of the policies are consistent with the Blueprint's Smart Growth Principles, and some are identical with specific Principles. For example, one Principle is to "[m]ix land uses," and one of the zoning policies by which Lubell et al. rank cities is "mixed use zoning" (Mintier Harnish et al., 2011; Lubell et al., 2009). Similarly, the Blueprint calls for the preservation of "open space, farmland, natural beauty, and critical environmental areas," and several of the land use policies identified by Lubell et al. focus on the protection of habitat and farmland (Mintier Harnish et al., 2011; Lubell et al., 2009). There is also considerable overlap on transportation, infill, compact building design and other issues (Mintier Harnish et al., 2011; Lubell et al., 2009).
[81] Lubell et al., 2009.
[82] Lubell et al., 2009.

spending, the land base is the foundation of the region's economy.[83] The region's future depends on conserving this land base, and on creating dense, thriving city centers that can act as economic drivers in their own right.

A. JOBS AND REVENUE FROM AGRICULTURE

According to the U.S. Geological Survey, the Central Valley contains approximately 1% of the nation's farmland, but produces a quarter of its food supply.[84] The San Joaquin Valley, which encompasses the southern half of the Central Valley, has been described as "the single richest agricultural region in the world," and "the nation's salad bowl."[85] Its hundreds of commodities range from stonefruit, citrus and grapes, to vegetables, cotton and dairy products.[86] For many of these crops, the San Joaquin Valley is responsible for a significant percentage of U.S. or world production:

- Up to 73% of world almond production occurs in the San Joaquin Valley.[87]
- Approximately 45% of walnuts grown in the U.S. come from the San Joaquin Valley.[88]
- California produces more milk than any other state in the nation, and 86% of California milk production occurs in the San Joaquin Valley.[89]
- Nearly 100% of raisins produced in the U.S. are made from grapes grown within 60 miles of Fresno.[90]
- California leads the nation in carrot production, and California's carrot crop is dominated by Kern County.[91]

Photo: John Greening, 2009.

Much of this productivity is concentrated in the Valley's four southernmost counties. As Figure 9 shows, the majority of farmland in the Southern San Joaquin Valley has been designated as "prime," "of statewide importance" or "unique," and other areas have been identified as

[83] National Agricultural Statistics Service, 2012; Headwaters Economics, 2012b.
[84] USGS, 2006.
[85] U.S. E.P.A., 2011; CERES, 2011.
[86] U.C. Davis Vegetable Research and Information Center, 2011; Umbach, 1997.
[87] San Joaquin Valley Regional Planning Agencies, 2012a.
[88] San Joaquin Valley Regional Planning Agencies, 2012a.
[89] San Joaquin Valley Regional Planning Agencies, 2012b.
[90] California Raisin Marketing Board, 2013.
[91] U.C. Davis Vegetable Research and Information Center, 2011; Umbach, 1997.

"farmland of local importance." Grazing land in the foothills adds to the region's productivity by supporting working ranches.

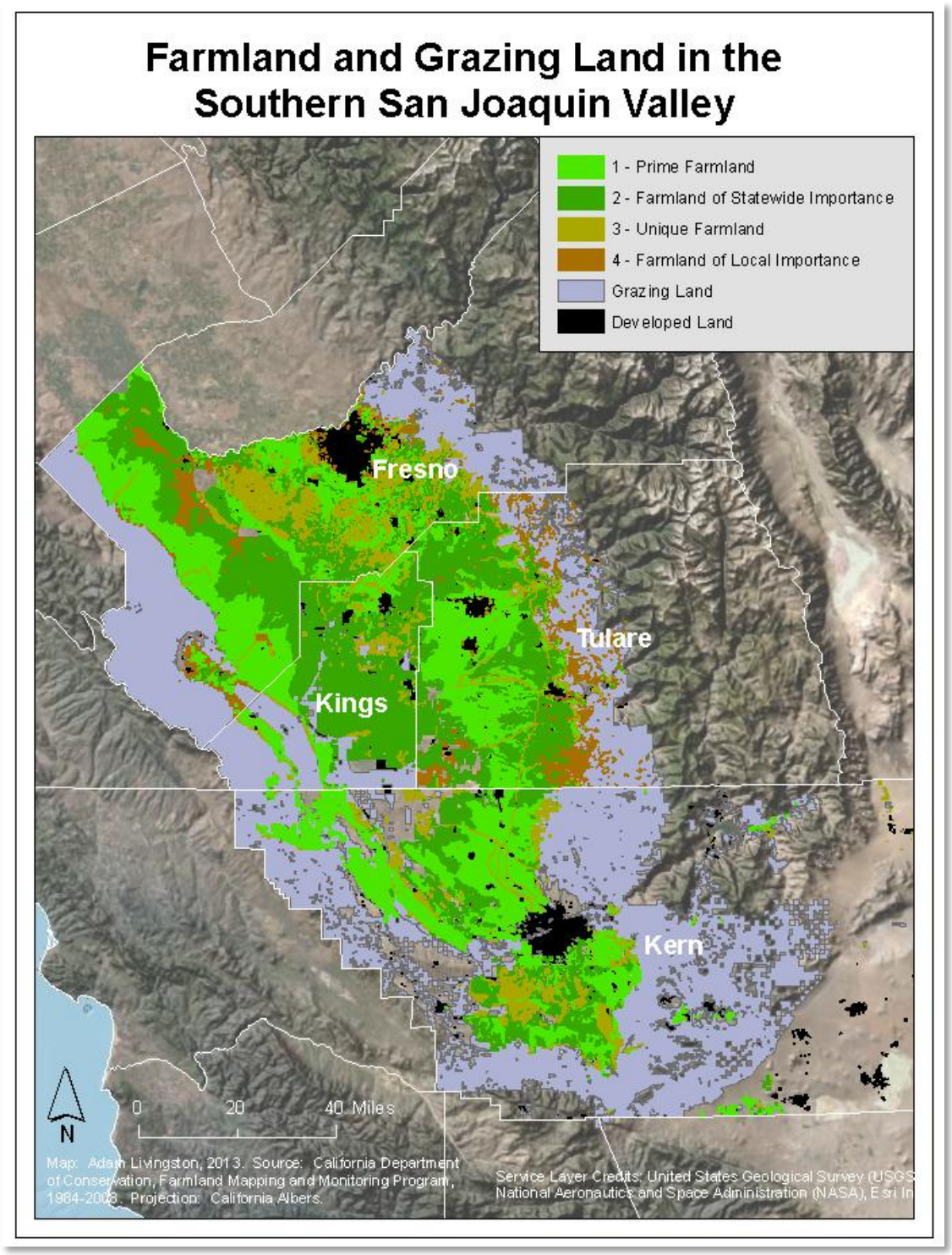

Figure 9: Farmland and grazing land in the Southern San Joaquin Valley (California Department of Conservation, 1984-2008).

1. Annual Agricultural Production and the Total Agricultural Value Chain

Fresno, Tulare and Kern are the top three farming counties in both California and the United States, together accounting for more than $17.8 billion in annual agricultural production.[92] Historically, these three counties have been responsible for nearly a third of the state's agricultural sales.[93] Kings County, which is smaller than Fresno, Tulare or Kern, but still ranks as the eighth most productive in the state, produces more than $2.2 billion.[94]

The economic benefits of agriculture, however, extend far beyond crop sales.[95] A 2011 study examining the agricultural value chain in California found that it supports nearly 2.5 million jobs at an average salary of $50,000, and contributes more than $300 billion to the state's economy.[96] These jobs include not only production and processing, but also packaging, support and distribution.[97] Far from being the concern only of farmers and ranchers, the region's agricultural land supports truckers, veterinarians, accountants and many others.[98] Indeed, a recent study found that every job in agricultural processing is associated with an additional 2.46 jobs in related fields.[99] In nearby San Joaquin County, this value chain supports 17% of total employment, and is responsible for an annual economic impact of more than $6.6 billion—approximately three times the value of the County's agricultural production alone.[100]

Taking the agricultural value chain into account, the University of California Agricultural Issues Center (AIC) found that every dollar of farm production in the San Joaquin Valley adds a total of $1.89 to the local economy.[101] This means that the true value of Fresno's annual agricultural production is not $6.9 billion, but more than $13.0 billion. Instead of amounting to $5.6 billion in Tulare and $5.4 billion in Kern, agricultural production in each of these counties puts more than $10 billion into the economy. The value added in Kings County is not $2.2 billion, but

[92] National Agricultural Statistics Service, 2012; Economic Research Service, 2012. These figures include products of both farmland and rangeland. They do not include timber value, which amounted to $1.4 million in Fresno, $132,000 in Tulare, $176,000 in Kern, and nothing in Kings. National Agricultural Statistics Service, 2012.
[93] Centers of Excellence, 2011.
[94] National Agricultural Statistics Service, 2012.
[95] Centers of Excellence, 2011; University of California Agricultural Issues Center, 2009; Business Forecasting Center, 2008; Growth Alternatives Alliance 1998.
[96] Centers of Excellence, 2011.
[97] Centers of Excellence, 2011.
[98] Business Forecasting Center, 2008.
[99] University of California Agricultural Issues Center, 2009.
[100] Business Forecasting Center, 2008; National Agricultural Statistics Service, 2012.
[101] University of California Agricultural Issues Center, 2009.

nearly $4.2 billion. And in the region as a whole, the value added by agricultural production is *nearly $38 billion*.

2. Farmland Conservation as an Economic Imperative

A single acre of highly productive farmland can produce an annual crop worth thousands of dollars. In 2011, for example, the average acre of almonds in Fresno County produced a harvest worth approximately $5,151.[102] Multiplied by 1.89 to account for additional value added,[103] that acre put nearly $9,735 into the local economy.

The San Joaquin Valley's current development pattern is expected to consume more than 300,000 acres of highly productive farmland by 2050.[104] If these losses can be averted in the Southern San Joaquin Valley, and if an acre of almonds in Fresno is representative of the economic potential of highly productive farmland,[105] the region's economy stands to gain hundreds of millions of dollars.

- If 100,000 acres of highly productive farmland that would otherwise be developed can be conserved, and each acre makes an annual contribution of $9,735 to the local economy, the region will have saved a revenue stream worth nearly $1 billion a year.
- If 150,000 acres can be saved, and each contributes $9,735 a year, the region will keep a revenue stream worth nearly $1.5 billion a year.
- If 200,000 acres can be protected, and each contributes $9,735 a year, the region will keep a revenue stream worth more than $1.9 billion a year.

These figures understate the gains that can come from conservation, because they focus on highly productive farmland. According to the American Farmland Trust, the *total* amount of farmland lost to development in the San Joaquin Valley by 2050 may approach 500,000 acres.[106] If a significant portion of this land is in the Southern San Joaquin Valley, and if it can be conserved, the annual benefit to the region's economy is likely to be in the billions of dollars.

Farmland conservation can boost the region's economy in other ways as well. In addition to continuing annual returns from agricultural production, land protection measures such as

[102] National Agricultural Statistics Service, 2012.
[103] University of California Agricultural Issues Center, 2009.
[104] American Farmland Trust, 2013.
[105] In 1998, the annual economic contribution of each acre of irrigated farmland in Fresno County was estimated to be between $6,000 and $15,000. Growth Alternatives Alliance, 1998.
[106] American Farmland Trust, 2013.

conservation easements and farmland mitigation programs can bring in new sources of revenue. For example, mitigation programs often require developments that consume highly productive farmland to fund the protection of similarly productive farmland elsewhere.[107] The developer of a recent project that consumed 50 acres of prime farmland in Stanislaus County put $450,000 into the economy to fund farmland mitigation.[108] This amount was leveraged to attract state and federal funding of nearly $2 million, which the Central Valley Land Trust used to protect 300 nearby acres of prime farmland.[109]

3. Economic Benefits of Rangeland

The Southern San Joaquin Valley's $20 billion in agricultural production includes over $4 billion in milk and dairy products,[110] and hundreds of millions attributed to the value of cattle themselves. A portion of this value comes from the Sierra foothills, where grassland provides forage for grazing (Figure 10).[111] Indeed, nearly 30% of the area devoted to agriculture in Fresno County is pasture and rangeland, as is nearly 40% in Tulare and over 50% in Kern.[112]

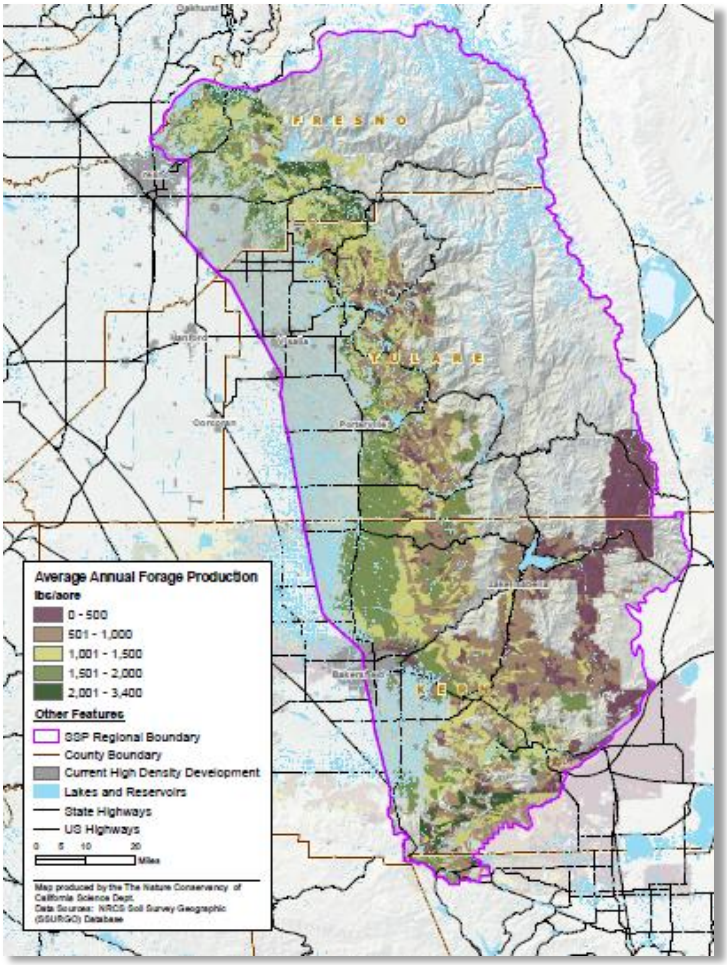

Figure 10: Forage production in Southern Sierra rangelands, as mapped in the SSP Framework (SSP, 2010).

Rangeland also plays an essential role in securing the region's water supply. As melted snowpack and other runoff moves toward the Valley floor, rangeland in the foothills helps to

[107] Jackman, 2012.
[108] Jackman, 2012.
[109] Jackman, 2012.
[110] National Agricultural Statistics Service, 2012. In 2011, the value of fluid milk produced by Tulare County alone was more than $2 billion. National Agricultural Statistics Service, 2012.
[111] SSP, 2010.
[112] Headwaters Economics, 2012a.

channel it into waterways such as the Kings, Kaweah and Kern Rivers, and ultimately to the Valley floor.[113] Thus, by protecting rangeland, the region can maximize the amount of water available for agriculture and other economically productive uses.[114]

Photo: Sequoia Riverlands Trust, 2010.

But the contribution of rangelands to agriculture is not limited to dairy production and water supply. Intact habitat in the foothills supports crops on the Valley floor by hosting wild bees, which provide pollination services worth hundreds of millions of dollars.[115] The statewide annual value of these services, which would have to be provided artificially if wild bee habitat disappeared, is estimated to be between $889 million and $2.2 billion.[116] Of this, Fresno County alone receives between $146 million and $313 million.[117] Kern ($61 million - $150 million), Tulare ($52 million - $125 million) and Kings ($17 million - $48 million) also benefit significantly.[118] Thus, through pollination by wild bees, habitat in and around the region's rangelands puts between $276 million and $636 million into the economy every year.[119]

B. Jobs and Revenue from National Parks and Other Protected Lands

The economic benefits of land conservation are not limited to farms and ranches. With thousands of square miles of protected land, including a National Park, a National Monument, and portions of three National Forests, the region brings in millions of dollars from tourism and recreation, and collects millions more from direct federal transfers to county governments. These areas also have the potential to attract talented workers from around the country.

1. Tourism Revenue and Direct Federal Transfers

Tourism and recreation contribute significantly to the region's economy. In 2010, for example, Sequoia and Kings Canyon National Park supported over 1,700 jobs and was responsible for

[113] DWR, 2009.
[114] SSP, 2010.
[115] Chaplin-Kramer et al., 2011a.
[116] Chaplin-Kramer et al., 2011a.
[117] Chaplin-Kramer et al., 2011b.
[118] Chaplin-Kramer et al., 2011b.
[119] Chaplin-Kramer et al., 2011b; R. Chaplin-Kramer, personal communication, October 29, 2012.

more than $100 million in visitor spending.[120] Tourism and recreation also account for three fourths of the goods and services created by National Forests,[121] and policies favoring these uses may confer an additional benefit by reducing the costs associated with less productive uses.[122] Moreover, while most ecotourism revenue goes to communities in the Sierras, parks on the Valley floor, such as the nearby San Joaquin River Parkway, are also generating income through recreation.[123] And at least one study has found that additional revenue could be generated through wildlife-based recreation in wetlands.[124]

The region also benefits from Payments in Lieu of Taxes (PILT), a program under which the BLM provides direct transfers to counties to offset property tax revenue lost from federal land ownership.[125] In FY 2012, these payments amounted to approximately $2.3 million for Fresno, $2.9 million for Tulare, $21,000 for Kings and $2.5 million for Kern, a regional total of $7.7 million.[126] Fresno, Tulare and Kern also received payments from the Secure Rural Schools (SRS) program, under which the Forest Service uses a portion of its revenue to support schools and roads in counties that host National Forests.[127] Taken together, SRS payments for Fresno, Tulare and Kern exceeded $2.1 million in 2012.[128] Thus, in the most recent fiscal year, the

[120] Headwaters Economics, 2012b.
[121] The Southern Sierra contains portions of three National Forests—Sierra, Sequoia and Inyo—as well as the U.S. Forest Service-managed Sequoia National Monument.
[122] Pacific Rivers Council and ECONorthwest, 2002; Loomis and Richardson, 2001. Shifting to tourism and recreation (as opposed to extractive uses, which support relatively few jobs) could reduce costs by forestalling money-losing timber sales, lowering water treatment costs for downstream municipalities, and attracting new residents interested in natural amenities. Pacific Rivers Council and ECONorthwest, 2002.
[123] Houser and North, 1999.
[124] Creel and Loomis (1992) modeled the economic value of allocating water to 14 protected wetlands in the San Joaquin Valley, assuming that the wetlands would be used for bird watching, fishing and other wildlife-based recreation. They found that the value per acre-foot of water allocated to these wetlands was approximately $303 ($497 in 2013 dollars)—more than twice 1991 estimates of the value per acre-foot of water devoted to agricultural uses. Creel and Loomis, 1992; U.S. Bureau of Labor Statistics, 2013. For Kern and Pixley, two reserves that had unreliable water supplies at the time, increasing the water supply to optimum levels for outdoor recreation would yield a benefit of $348 ($571 in 2013 dollars) per acre-foot. Creel and Loomis, 1992. While this is an older study, it suggests that the potential for tourism and recreation revenue is not limited to the mountains.
[125] U.S. Department of the Interior, 2013.
[126] U.S. Department of the Interior, 2013.
[127] U.S. Forest Service, 2013.
[128] U.S. Forest Service, 2013. Because it does not contain a National Forest, Kings County does not receive SRS payments. U.S. Forest Service, 2013.

region's counties received approximately $9.8 million in direct transfers from federal agencies.[129]

2. Natural Amenities as Magnets for Human Capital

In addition to tourism, recreation and direct payments from the federal government, protected areas such as National Parks help to attract talented workers to the region—a significant advantage in a mobile, service-oriented economy.[130] Indeed, the presence of National Parks, National Forests and other federally-protected land is correlated with population growth and economic growth in much of the Western U.S.[131] It has also been linked with higher per capita income in certain counties: non-metropolitan counties with more than 100,000 acres of protected public land have an average per capita income $4,360 higher than counties without protected lands.[132] This effect is not as easy to measure in metropolitan counties, such as those of the Southern San Joaquin Valley, but its existence elsewhere suggests that wilderness areas can be long-term assets to the region's economy.[133]

C. Compact City Centers as Drivers of Economic Growth

Unlike ranchettes and strip malls, the dense, thriving city centers created by compact growth can act as engines of economic growth. By bringing people and jobs together in large numbers, they allow for the creation of a complex and diversified economy.[134] Economic diversification, in turn, contributes to employment growth, and makes the region more resilient to increases in unemployment.[135] City centers also provide local markets for agricultural goods, allowing for direct economic links between city and countryside. Moreover, density decreases the cost—in both money and time—of transportation, thereby removing another obstacle to economic growth.[136] Possibly for this reason, there is a positive correlation between annual per capita GDP and reductions in vehicle miles traveled in U.S. states.[137] There is also a positive

[129] As of early 2013, the long-term fate of these programs is unclear, though PILT has been renewed through FY 2013. U.S. Department of the Interior, 2013.
[130] Headwaters Economics, 2012c.
[131] Headwaters Economics, 2011.
[132] Headwaters Economics, 2012c; Rasker, 2006.
[133] Headwaters Economics, 2012c; Rasker, 2006.
[134] Frenken et al., 2007; Izraeli and Murphy, 2003.
[135] Frenken et al., 2007. Specifically, diversification within the same economic sector has been found to contribute to employment growth, while diversification between sectors has been shown to slow the growth of unemployment. Frenken et al., 2007.
[136] Center for Neighborhood Technology, 2010; Cortright, 2010.
[137] Litman, 2012.

correlation between annual per capita GDP and urban density in U.S. suburban regions.[138] As these results suggest, the region's economy could benefit significantly from policies designed to direct new development into existing city centers.

III. LAND CONSERVATION AND COMPACT GROWTH CAN HELP THE REGION TO MAXIMIZE WATER AVAILABILITY, MINIMIZE THE COSTS OF WATER TREATMENT, AND LIMIT FLOOD RISK

A. WATER AVAILABILITY

While the land base is the foundation of the region's economy, its productivity depends on water. Nearly three fourths of the water that enters the Tulare Lake Hydrologic Region—a closed basin that encompasses all but the northern edge of Fresno County and the southeastern portion of Kern (Figure 11)—comes from precipitation, with the remainder being imported through the California Aqueduct, the Friant-Kern Canal and other water delivery infrastructure.[139]

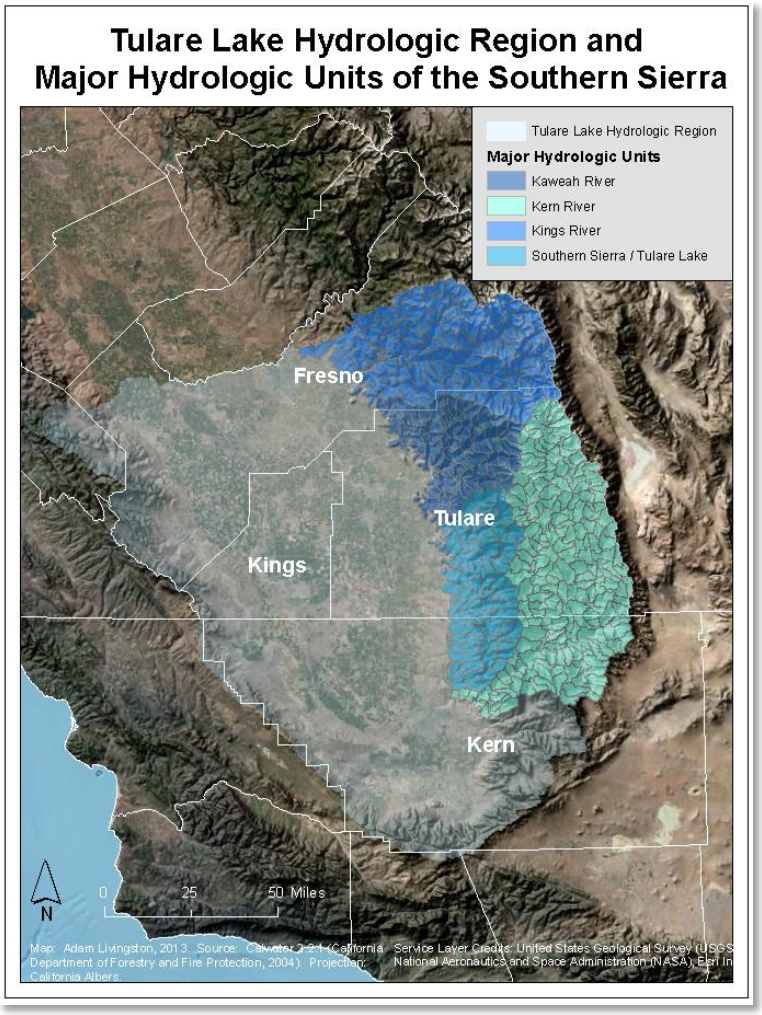

Figure 11: Tulare Lake Hydrologic Region and major hydrologic units in the Southern Sierra (California Department of Forestry and Fire Protection, 2004).

But, due in part to evaporation, runoff and other outflows, the 10 to 15 million acre-feet of water that the region's farms and cities consume each year are largely derived from imported water and groundwater.[140] In the Eastern San Joaquin Valley, local surface water,

[138] Litman, 2012.
[139] DWR, 2009.
[140] DWR, 2009; Michael et al., 2010.

including water flowing from the Sierras, provides 52.6% of the water supply, groundwater provides 32.6%, and 14.8% is imported.[141] But in the Western San Joaquin Valley, more than 85% of the water supply is imported by the State Water Project and the Central Valley Project, and two thirds of the remainder comes from groundwater.[142]

1. The Danger of Relying on Imported Water and Groundwater

Because of its reliance on imported water and groundwater pumping, the region is vulnerable to fluctuations in the water supply. This was dramatically illustrated in 2009, when a combination of drought and pumping restrictions reduced the amount of water available in the western portions of Fresno, Kings and Kern Counties.[143] From 2008 to 2009, the combined number of harvested acres in these counties fell by nearly 231,000.[144] An estimated $343 million - $368 million in agricultural revenue was lost,[145] as were more than 5,500 jobs.[146] This may not be a unique event, as erratic weather patterns and ongoing climate change suggest that water supplies could become less reliable over time.[147]

Moreover, the region is rapidly depleting its once-abundant groundwater supplies. A 2008 U.S. Geological Survey report found that withdrawal of groundwater for agricultural use has "greatly exceeded natural recharge and resulted in large water-level declines," a problem exacerbated

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[141] Michael et al., 2010.

[142] Michael et al., 2010. Imported water creates additional costs for the region. According to a 2005 report by the California Department of Water Resources, for example, the total cost of moving an acre-foot of water from the Sacramento-San Joaquin Delta to the metropolitan Los Angeles area—a region only slightly further away than the Southern San Joaquin Valley—is over $170 per acre-foot. DWR, 2005.

[143] Michael et al., 2010.

[144] Michael et al., 2010.

[145] The authors used two methods to calculate lost revenues: 1) correlating decreases in harvested acres of particular crops with crop values listed in County Agricultural Reports, which indicates a loss of $342.6 million; and 2) an optimization tool called the Statewide Agricultural Production Model (SWAP), which indicates a loss of $368.0 million. Michael et al., 2010.

[146] Michael et al., 2010. Estimated job losses range from 5,567 (based on crop reports) to 7,434 (based on SWAP model results). Michael et al., 2010.

[147] From 2006-2011, for example, the region experienced extreme variation in precipitation, reservoir storage, snowpack and runoff. In the Tulare Lake Hydrologic Region, precipitation ranged from 60% of average (2007) to 150% of average (2011), reservoir storage ranged from 145% of average (2006) to 80% of average (2008), runoff ranged from 50% of average (2007) to 185% of average (2011), and snowpack ranged from 20% of average (2007) to 180% of average (2011). Great Valley Center and Sierra Nevada Research Institute, 2012.

by the use of groundwater to meet urban water demand.[148] From 1962 to 2003, groundwater in the Central Valley was lost at an average rate of approximately 1,900 cubic feet per second.[149] Overpumping continued in the past decade: from October 2003 to March 2010, groundwater levels in the Central Valley declined by approximately 20.4 mm (0.8 inches) per year.[150] The total volume of groundwater lost was 20.3 cubic kilometers.[151] This translates to 16.5 million acre-feet or 20.3 trillion gallons—over three times the total water volume of the San Francisco Bay at mean tide.[152]

Remaining groundwater supplies are increasingly contaminated. A 2005 study found that fresh water in deep aquifers is giving way to water with high salt concentrations, making these supplies "less suitable for drinking or irrigation water purposes."[153] Closer to the surface, nitrates and two commonly-used pesticides are becoming increasingly common in the groundwater of the Eastern San Joaquin Valley.[154] Based on these findings, and the region's history of agricultural chemical use, it is expected that nitrate and pesticide concentrations in deeper areas—and therefore in public supply wells—will increase over time.[155]

2. Securing Water from the Sierras through Land Conservation

If the region cannot rely on imported water, and will eventually run out of usable groundwater, its farms, cities and reservoirs will depend on water from precipitation and runoff. Much of this water falls as snow in the Sierras: as the SSP Framework notes, the average annual water yield can be between 7 and 13 acre-feet in the mountains, but rarely exceeds 3 acre-feet on the Valley floor.[156] Melted snowpack and other runoff from the mountains is collected by watersheds, including those that feed the Kings, Kaweah and Kern Rivers (Figure 11), and brought to the Valley floor.[157] By protecting the lands that make up these watersheds—including rangeland in the Sierra foothills and important groundwater recharge areas in lower-elevation river deltas—the region can maximize the amount of water it receives from the

[148] Reilly et al., 2008.
[149] Reilly et al., 2008.
[150] Famiglietti et al., 2011.
[151] Famiglietti et al., 2011.
[152] Famiglietti et al., 2011. The total volume of the San Francisco Bay at mean tide has been estimated to be more than 5 million acre feet. San Francisco Estuary Project, 1999.
[153] Schoups et al., 2005.
[154] Burow et al., 2008.
[155] Burow et al., 2008.
[156] SSP, 2010.
[157] DWR, 2009.

Sierras.[158] If managed to avoid overuse, this water could also help the region to replenish its rapidly-declining groundwater supplies (Figure 12).[159]

3. Limiting Water Consumption through Compact Growth

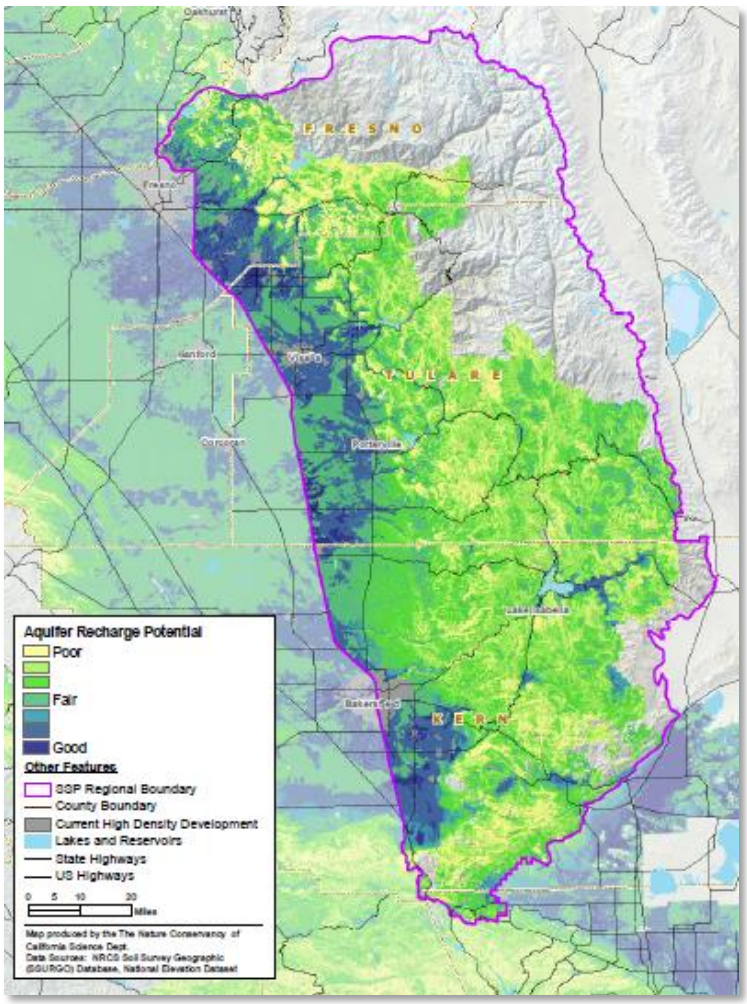

Figure 12: Aquifer recharge potential in the Southern Sierra, as mapped in the SSP Framework (SSP, 2010).

Similarly, by meeting the demand for multifamily housing[160] and channeling development into existing urban centers, the region can save water that might otherwise be used for lawns and golf courses. A statewide development pattern based on conservation and compact growth (the "Green Future" scenario modeled in the Vision California process) would allow the average household to use 55,000 fewer gallons of water per year by 2050, saving a cumulative total of nearly 78 million acre-feet of water.[161] In the San Joaquin Valley, a development pattern based on the Valleywide Hybrid scenario would allow the average household to save more than 18,000 gallons per year, which would translate to annual Valley-wide savings of 680,000 acre-feet of water per year.[162] This is more than half of the amount

[158] A 1998 study estimated the productive use value of water flowing from forests in the Sierra Nevada to be $1.32 billion per year ($1.86 billion in 2013 dollars). Krieger, 2001; U.S. Bureau of Labor Statistics, 2013. But given the region's unsustainable reliance on groundwater, and the absolute necessity of water for both agriculture and urban areas, this is almost certainly an underestimate.

[159] SSP, 2010.

[160] Nelson, 2013.

[161] Calthorpe Associates, 2011.

[162] Calthorpe Associates, 2010.

devoted to urban water systems annually in the Tule Lake Hydrologic Region from 1998 through 2005.[163]

B. Water Treatment

Land conservation and compact growth can also help the region to save on water treatment costs. Natural systems such as wetlands can play a significant role in removing pollutants from the region's water supply, performing tasks that would otherwise require additional water treatment infrastructure.[164] For example, Central Valley wetlands in the USDA Wetland Reserve Program may be able to remove most nitrate-nitrogen (NO_3-N) from otherwise unpolluted water within 18 days.[165] Indeed, the role that wetlands can play in bioremediation has been known for decades. In 1974, the community of Arcata saved $25 million ($118 million in 2013 dollars) by using the Arcata Marsh and Wildlife Sanctuary—a coastal marsh that was previously a brownfield—to treat wastewater naturally instead of building a new sewage plant.[166]

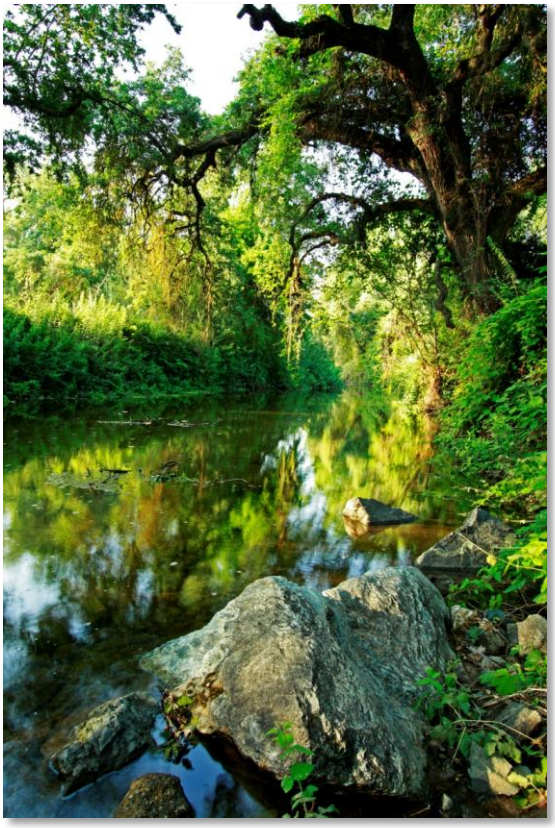

Photo: Sequoia Riverlands Trust, 2009.

Forests in Southern Sierra watersheds can also contribute to water quality. Trees regulate runoff and supply, control erosion (thereby reducing sediment loads), and filter pathogens, pesticides, metals and other contaminants.[167] Because this work would otherwise need to be done by human-built filtration systems, water treatment services provided by trees are a significant asset to the region's economy. According to a 1998 study, for example, estimated annual values of water-related services provided by forests globally include $35.20 per acre of forest for waste treatment, and $38.80 per acre for erosion control and sediment retention ($49.73 and $54.82, respectively, in 2013 dollars).[168]

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[163] DWR, 2009.
[164] Newbold, 2005; Newbold, 2002.
[165] Duffy and Kahara, 2011.
[166] Gies, 2009; U.S. Bureau of Labor Statistics, 2013.
[167] Nowak, 2007; Krieger, 2001.
[168] Krieger, 2001; U.S. Bureau of Labor Statistics, 2013.

Moreover, compact development patterns can provide additional savings by reducing per capita amounts of major pollutants in stormwater. A 2009 study found that denser development patterns are correlated with decreased per capita nitrogen, phosphorous and suspended solid loads.[169] Indeed, the authors concluded that "a simple doubling of standard suburban densities . . . in most cases could do more to reduce contaminant loadings . . . than many traditional stormwater [management practices]."[170]

C. FLOOD CONTROL

The San Joaquin Valley has long been prone to flooding: the Tulare Lake Basin alone is estimated to have had over 180 floods in the past two millennia, including one in 2010 that caused up to $66.5 million in damage to crops and infrastructure.[171] Much of the region is within the 100 year flood zone (Figure 13), and the 200 year and 500 year flood zones extend even further.[172] Parts of the San Joaquin Valley are protected by levees (and therefore deemed to be outside the 100-year flood zone), but even these areas are at risk, because they are vulnerable to floods that exceed the levees' design specifications.[173]

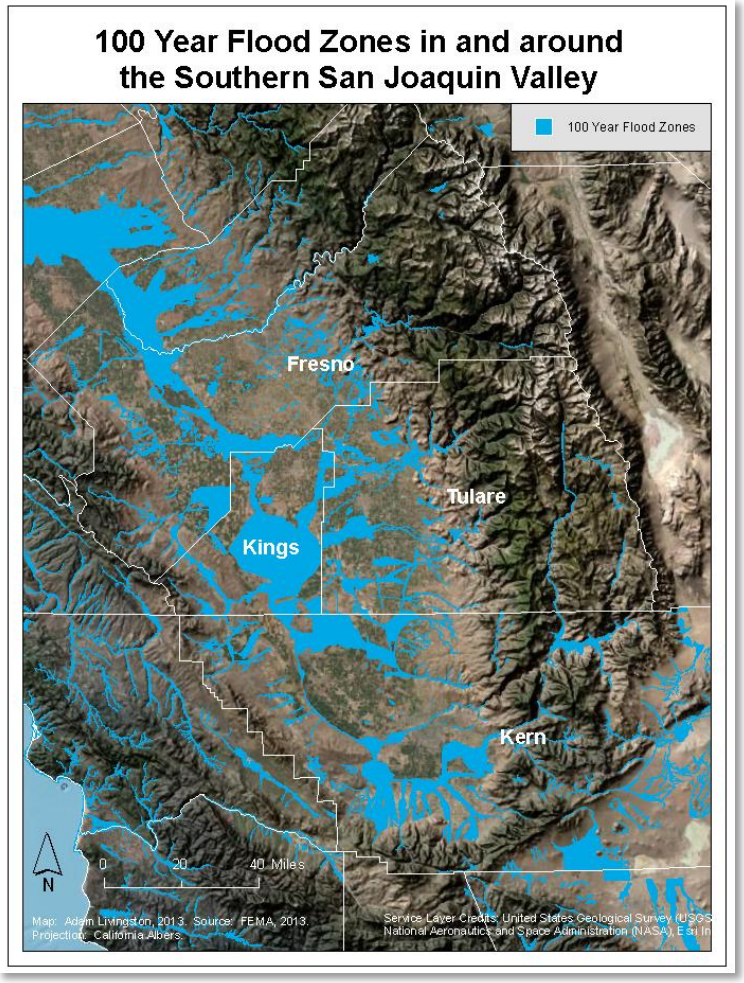

Figure 13: 100 year flood zones in and around the Southern San Joaquin Valley (FEMA, 2013).

By conserving wetlands and avoiding development in the areas most prone to flooding, however, the region can limit both infrastructure costs and

[169] Jacob and Lopez, 2009.
[170] Jacob and Lopez, 2009.
[171] Austin, 2012; Ritchie, 2010.
[172] DWR, 2013.
[173] Ludy and Kondolf, 2012. Homebuyers outside the 100-year floodplain are often not informed of this risk, suggesting that the damage caused by a significant flood could be compounded by a lack of public preparedness. Ludy and Kondolf, 2012.

flood damage. Wetlands can store significant quantities of water: in the Central Valley as a whole, areas in the USDA Wetland Reserve Program may be able to hold up to *3.9 billion cubic meters* of floodwater.[174] This is equivalent to nearly eight times the volume of floodwater in New Orleans during the worst day of the Katrina disaster.[175]

The region can further limit flood risk by directing development away from 100 year and 200 year flood zones. Since many of these areas consist of farmland in Kings County, as well as neighboring areas of Fresno and Kern,[176] reducing flood risk will also benefit the economy by conserving productive agricultural land.

IV. LAND CONSERVATION AND COMPACT GROWTH CAN SAVE TAXPAYER DOLLARS THROUGH REDUCED INFRASTRUCTURE, PUBLIC HEALTH AND FIREFIGHTING COSTS

A. REDUCED INFRASTRUCTURE COSTS

A major difference between the region's current pattern of development and a more compact alternative is the cost of infrastructure. Since the 1970s, studies have shown that it is less expensive per capita to provide roads, sewer service and other basic infrastructure for infill than for low density greenfield developments.[177] For example, studies in the early 2000s found significant nationwide differences in the cost of water and sewer infrastructure, service delivery, road construction and per-unit development costs depending on how new homes fit into growth patterns:

- The average nationwide per-unit cost of water and sewer infrastructure was estimated to be $3,860 for multifamily buildings using urban public systems, $6,540 for single family detached homes using urban public systems, and $9,600 for rural, single family detached homes using septic systems[178] ($5,162, $8,746, and $12,838, respectively, in 2013 dollars).[179] If the U.S. built approximately 5 million homes in more compact developments than under a business-as-usual "sprawl scenario," there could be

[174] Duffy and Kahara, 2011.
[175] According to Smith and Rowland (2006), the volume of floodwater in New Orleans reached approximately 131 billion gallons (486 million cubic meters) on September 2, 2005.
[176] DWR, 2013.
[177] Real Estate Research Corporation, 1974; Ewing, 1994; EPA, 2012.
[178] Burchell et al., 2005; Ewing et al., 2002.
[179] U.S. Bureau of Labor Statistics, 2013. Values from Burchell et al. (2005) and Ewing et al., (2002) are in 2000 dollars. To avoid significantly understating the savings that could be achieved through compact growth, 2013 values are provided.

nationwide savings of $12.6 billion (over $16.8 billion in 2013 dollars)[180] in water and sewer costs by 2025.[181] Annual operations and service delivery costs could be reduced by $4 billion (over $5.3 billion in 2013 dollars).[182]

- Although a lane-mile of urban road is more expensive than a lane-mile of rural road, low density development creates a need for more roads to serve fewer people.[183] For this reason, a 2005 study estimated that a compact growth scenario could save taxpayers nearly $110 billion in roadbuilding costs (approximately $147 billion in 2013 dollars) by 2025.[184]
- Due in part to differences in land consumption, estimated national per-unit development costs are $154,035 under a compact growth scenario, compared to $167,038 under a sprawl scenario ($205,988 and $223,377, respectively, in 2013 dollars).[185]

More recent studies have shown similar differences on statewide, regional and local scales. For example, RapidFire modeling conducted as part of the Vision California process found that compact growth scenarios ("Growing Smart" and "Green Future") could save the state's taxpayers $18 billion in infrastructure costs by 2035, and $32 billion by 2050, compared to a "Business as Usual" scenario.[186] Operations and maintenance costs—the continuing investments required to deliver service and keep infrastructure working—would be $6 billion less by 2035, and $15 billion less by 2050.[187] For these reasons, compact growth would result in higher cumulative local revenues, with cities and counties obtaining $53 billion more by 2035 and $120 billion more by 2050.[188]

Applied to the San Joaquin Valley, RapidFire predicts infrastructure savings of $24,300 per new housing unit under the compact growth-oriented Valleywide Hybrid Scenario.[189] This amounts to over $20 billion by 2035.[190]

[180] U.S. Bureau of Labor Statistics, 2013.
[181] Burchell et al., 2005; Ewing et al., 2002.
[182] Muro and Puentes, 2004.
[183] Burchell et al., 2005.
[184] Burchell et al., 2005; U.S. Bureau of Labor Statistics, 2013.
[185] Burchell et al., 2005; U.S. Bureau of Labor Statistics, 2013.
[186] Calthorpe Associates, 2011.
[187] Calthorpe Associates, 2011.
[188] Calthorpe Associates, 2011.
[189] Calthorpe Associates, 2010.
[190] Calthorpe Associates, 2010.

On a local scale, studies have shown that compact growth can minimize the cost of constructing and maintaining infrastructure in specific communities. For example, a 2001 study compared the cost of development in a community near Bakersfield's "center of gravity," or central service district, with the costs of development in two "far-distant suburban" communities.[191] Costs were consistently lower in the more centrally-located development:

- The cost of building an identical home was nearly $38,000 lower in the centrally-located development than in one of the suburbs, and more than $6,000 lower than in the other suburb ($49,000 and $8,000 lower, respectively, in 2013 dollars);
- One-time capital costs were up to $152 million lower in the centrally-located development (nearly $198 million lower in 2013 dollars); and
- Annual operating costs were up to $3.7 million lower in the centrally-located development (over $4.8 million lower in 2013 dollars).[192]

Moreover, building near existing infrastructure not only saves money, but also increases the value of that infrastructure and of nearby land.[193] For example, a 1993 study found that approximately 33% of Bay Area residents living near BART stations commuted via rail, whereas only 5% of other Bay Area residents did.[194] And property values rise more rapidly near mass transit stations. In transit-oriented Portland, Oregon, for example, values rose 112% to 491% from 1980 to 1991, compared to a national average of 67.5% over the same period.[195]

Thus, by directing new development into infill, instead of spending taxpayer dollars to build and service new infrastructure for greenfield construction, the region can save billions of dollars, and increase the value of existing infrastructure and homes.

B. Reduced Public Health Costs (Improved Air Quality and Lower Rates of Chronic Disease)

There are significant opportunities for land conservation and compact growth to save taxpayer dollars on public health costs. Today, for example, the region's economy is hobbled by some of the worst air quality in the country:

[191] Khé and Grammy, 2001.
[192] Khé and Grammy, 2001; U.S. Bureau of Labor Statistics, 2013.
[193] EPA, 2012; Zykofsky, 1998.
[194] Zykofsky, 1998.
[195] Zykofsky, 1998.

- Asthma afflicts over 16% of children in Fresno County and nearly 12% in the San Joaquin Valley.[196] In the Central Valley as a whole, up to 800,000 schooldays are lost annually as a result of childhood asthma, costing school districts at least $26 million.[197]
- Since 2005, toxic air contaminants such as diesel particulate matter (PM), formaldehyde, and acetaldehyde have increased in the San Joaquin Valley Air Basin.[198] PM from diesel engines alone is responsible for approximately 260 deaths per year in the San Joaquin Valley.[199]
- According to the American Lung Association, the Bakersfield-Delano metropolitan area has the nation's third worst ozone pollution,[200] and absolute worst particulate pollution (both short-term and year-round).[201] Fresno-Madera is not far behind and, in spite of their much smaller populations, Visalia-Porterville and Hanford-Corcoran are among the five worst metropolitan areas for both ozone and year-round particulate pollution.[202]

These are not the only public health costs imposed by the region's current pattern of development. A 2003 study linked sprawl to weight gain, obesity and hypertension: on a county-compactness index going from 63 to 352, the authors found, each 50-point decrease is associated with a weight gain of one pound, a 10% higher chance of obesity, and a 6% higher chance of hypertension for the average person.[203] Low density development patterns are also associated with greater numbers of fatal car accidents—up to 18 deaths per 100,000 residents per year in the most sprawling regions, as opposed to 8 per 100,000 in the least sprawling.[204] In addition, children in car-dependent communities watch more TV, and play outside less, than those in walkable communities.[205]

A different pattern of development can help the region to lower these costs. Conservation of forested areas can help the region to avoid land use patterns that produce obesity, hypertension and other illnesses by promoting compact growth, while directly reducing air pollution. By one estimate, each square meter of canopy cover can remove approximately 11

[196] Bedsworth, 2004.
[197] Gies, 2009.
[198] Great Valley Center and Sierra Nevada Research Institute, 2012.
[199] Bedsworth, 2004.
[200] Ozone pollution harms not only human health, but also plant health. Across the Central Valley, it is estimated to cause $270 million a year in crop damage. Gies, 2009.
[201] American Lung Association, 2013.
[202] American Lung Association, 2013.
[203] McCann and Ewing, 2003.
[204] Ewing et al., 2002.
[205] Zykofsky, 1998.

grams of ozone, PM-10, SO_x, NO_x and CO annually.[206] Trees can also reduce temperatures by providing shade and transpiring (i.e., releasing moisture into the air), thereby saving energy that would otherwise be used to cool buildings and reducing formation of certain pollutants.[207]

Health costs associated with air pollution can be further reduced through development patterns that allow people to drive less. A study conducted in Southern California, parts of which suffer from air pollution almost as severe as the Southern San Joaquin Valley, found that reducing vehicle miles traveled by 20% could save over $1.6 billion in health and other costs, due in part to reductions in respiratory symptoms and asthma attacks.[208] In these and other ways, land conservation and compact growth can help the region realize significant savings in public health costs.

C. Reduced Firefighting Costs

More than 1% of the region's homes are located in wildland-urban interface (WUI) areas, where development abuts fire-prone habitat such as forests.[209] Because these are often second homes in the Sierra foothills,[210] they may be left unattended for part of the year. In Fresno, Tulare and Kern Counties, WUI homes are often built on larger lots than non-WUI homes, which not only consumes more land, but also means that firefighters must protect (or insurers compensate for) a greater area. [211] Moreover, many areas threatened by wildfire lack adequate defensive zones to prevent fires from consuming structures (Figure 14).

This has significant implications for wildfire suppression costs borne by taxpayers. A study that examined 27 recent wildfires in the Sierra Nevada, ranging from the China-Back Fire near Yreka to the Piute Fire near Bakersfield, found that the presence of homes in the WUI is correlated with increased firefighting costs: for each 1% increase in the number of WUI homes within six miles, these costs go up by 0.07%.[212]

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[206] Nowak, 2007. Results are similar in other parts of the country. A comparison between the PM reduction potential of mesquite trees and the cost of a street paving program designed to reduce dust in Tucson, Arizona, found that the value of each tree's dust control services was $4.16 annually ($5.41 in 2013 dollars). Krieger, 2001; U.S. Bureau of Labor Statistics, 2013.
[207] Nowak, 2007.
[208] American Lung Association, 2010.
[209] Headwaters Economics, 2012a.
[210] Headwaters Economics, 2012a.
[211] Headwaters Economics, 2012a.
[212] Gude et al., 2011.

Climate change is likely to raise the costs of WUI development further by increasing the risk of fire. A 2009 study based on data from Western Montana found that a one degree Fahrenheit (0.55° C) increase in average spring and summer temperatures would increase home protection costs by 107% and area burned by 305%.[213] Current climate projections indicate that average temperatures will rise 3.1 to 7.2 degrees Fahrenheit (1.8° to 4.0° C) by the end of the century.[214] These projections also suggest that the region will have a slightly drier climate than it does now,[215] which may exacerbate the recent tendency toward larger and more severe wildfires.[216] If WUI developments in the Sierra Nevada experience even a fraction of the increased fire risk predicted for similar developments in Montana, firefighting costs borne by taxpayers will rise significantly.

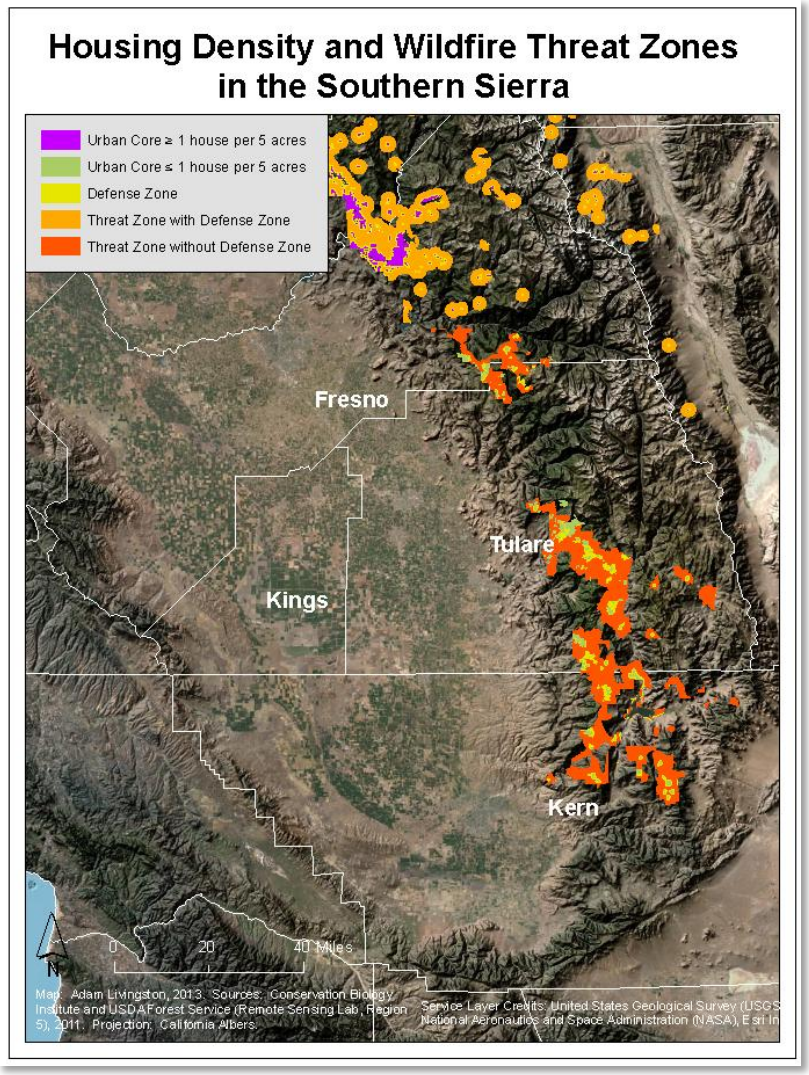

Figure 14: Housing density and wildfire threat zones in the Southern Sierra (Conservation Biology Institute and U.S. Forest Service, 2011).

These costs can be reduced through land conservation and compact development. While land conservation will not prevent wildfires, it can reduce the amount of development in fire-prone habitats and minimize the number of homes that taxpayers must pay to defend. Policies promoting compact growth, in turn, can direct new residential development into existing city

[213] Gude et al., 2009.
[214] Union of Concerned Scientists, 2007.
[215] SSP, 2010.
[216] This tendency is in part a product of management decisions favoring dense stands of shade-tolerant trees, which are prone to catastrophic fires. SSP, 2010.

centers, ensuring that those who wish to live in our region can do so without risking the loss of their homes to wildfire.

V. LAND CONSERVATION AND COMPACT GROWTH CAN HELP HOUSEHOLDS AND COMMUNITIES RECOVER FROM THE HOUSING CRASH

A. LOCATION EFFICIENCY AND LOWER TRANSPORTATION COSTS

Transportation costs have a significant impact on housing affordability, which affects both individual households and the broader housing market.[217] The Center for Neighborhood Technology's Housing + Transportation Affordability Index, a tool that compares housing costs with *housing plus transportation* costs as a percentage of household income, shows just how great this impact can be. In Fresno County, for example, housing costs typically amount to 29.54% of income, but housing and transportation together consume 60.37%.[218] The contrast is even greater in Tulare, where the typical household spends 28.06% of income on housing, but 62.77% on housing and transportation combined.[219] As Figure 15 illustrates, the same pattern holds true for Kings and Kern: less than 30% of income is devoted to housing, while housing and transportation together consume more than 60%.[220] In all four counties, then, the typical household devotes more than 30% of its income to transportation.

Photo: Ben Lunsford, 2008.


Photo: Sanjib Lamar, 2006.

[217] Center for Neighborhood Technology, 2010.
[218] Center for Neighborhood Technology, 2013.
[219] Center for Neighborhood Technology, 2013.
[220] Center for Neighborhood Technology, 2013.

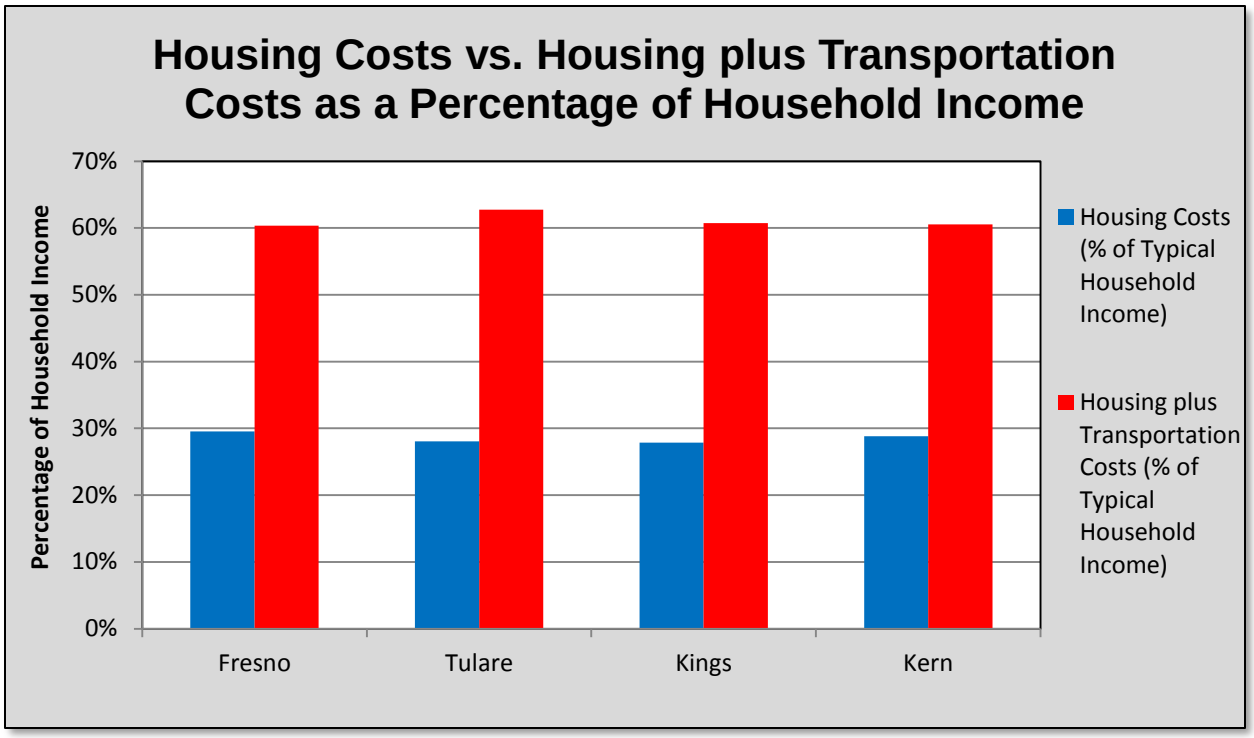

Figure 15: Housing costs versus housing plus transportation costs as a percentage of the typical household income, based on values from the Center for Neighborhood Technology's Housing + Transportation Affordability Index (Center for Neighborhood Technology, 2013).[221]

Dollars spent on transportation cannot be used to pay off mortgages. A recent study found that "location efficiency"—a combination of vehicles per household (controlling for income) and neighborhood walkability as measured by WalkScore® (www.walkscore.com)—has a statistically significant effect on mortgage default rates.[222] Households that own higher numbers of vehicles are more likely to default on their mortgages,[223] possibly because they are more vulnerable to increases in gas prices.[224] In wealthier areas, the probability of mortgage default declines as a neighborhood's WalkScore® increases.[225] These effects are so strong that the authors argue for incorporating location efficiency into mortgage underwriting decisions.[226]

Development patterns that make housing and transportation unaffordable not only weaken the housing market, but also affect the finances of local governments. A dramatic illustration of

[221] A "typical household" is at the regional median for income and the regional average for number of members and number of commuters. Center for Neighborhood Technology, 2013.
[222] Rauterkus et al., 2010.
[223] Rauterkus et al., 2010.
[224] Center for Neighborhood Technology, 2010.
[225] Rauterkus et al., 2010
[226] Rauterkus et al., 2010

this occurred in 2012, when the City of San Bernardino declared bankruptcy. A budgetary analysis found that City revenues had decreased by approximately $11.7 million in only four years, rendering the City insolvent.[227] $5.3 million of the decline was due to lower property tax revenues.[228] In short, a city where the typical household spends more than 59% of its income on housing and transportation[229] was pushed into bankruptcy by a weak housing market.

But the Southern Sierra and Southern San Joaquin Valley need not follow San Bernardino's example. More compact patterns of development can make the housing market—and the finances of governments that rely on property tax revenue—more resilient by reducing the amount that households spend on transportation.[230] This, in turn, can make the region less vulnerable to increases in gas prices, and enable its residents to put money that would otherwise be spent on transportation into other sectors of the economy. Thus, from individual households and businesses to city and county governments, location efficient growth is good for the bottom line.

B. Increased Property Values from Proximity to Open Space

Land conservation and compact growth can also increase property values by protecting open space that would otherwise be lost to low density development. Though the connection between open space and higher property values has been known since the nineteenth century,[231] it has been reestablished in a number of recent studies.[232] The home value premium added by open space is highly case-specific,[233] though it is likely to be affected by distance and how the open space is used. For example, a 2007 study found that parks of over 30 acres affect property values more than 1,500 feet from park borders, with even more noticeable effects within 600 feet.[234] Increases are likely to be higher near natural passive-use parks, which can add up to 20% to the value of nearby homes, than near active-use parks, such as outdoor sports facilities.[235]

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[227] City of San Bernardino, 2012.
[228] City of San Bernardino, 2012.
[229] Center for Neighborhood Technology, 2013.
[230] Center for Neighborhood Technology, 2010; Rauterkus, 2010. Since residents of the most sprawling areas can lose 240 hours per year to peak period travel, policies that favor location efficient housing can also improve commuters' quality of life. Cortright, 2010.
[231] Crompton, 2005.
[232] Kroeger, 2008; Crompton, 2007; McConnell and Walls, 2005; Curran, 2001.
[233] Shoup and Ewing, 2010.
[234] Crompton, 2007.
[235] Crompton, 2005; Curran, 2001.

Through its effects on tax rolls, open space can also benefit city and county governments. In areas immediately adjacent to open space, property tax revenues are higher, and can often pay for the long-term protection of parks that keep them that way—a principle that funded New York City's Central Park, London's Regent Park, and many others.[236] Closer to home, a 1999 study estimated that open space associated with the San Joaquin River Parkway had the potential to raise nearby property values by a total of more than $34 million ($47 million in 2013 dollars).[237] Moreover, a 2001 study found that "agricultural and open space land pay[s] significantly more in taxes than it requires in servicing from local governments."[238]

Open space protection can thus make the region's economy more resilient in three ways: 1) by increasing home values, it can improve the finances of individual households; 2) by increasing property tax revenues, it can contribute to the financial stability of local governments; and 3) by avoiding the need for new infrastructure, it can save money for taxpayers.

VI. Land Conservation and Compact Growth Can Help the Region Meet State-Mandated Greenhouse Gas Reduction Targets, and May Allow It to Sell Carbon Credits

SB 375 is designed to reduce greenhouse gas emissions through "changed land use patterns."[239] To that end, it requires each Metropolitan Planning Organization to add a Sustainable Communities Strategy (SCS) to its Regional Transportation Plan.[240] An SCS must show how the region will reduce greenhouse gas emissions from automobiles and light trucks to meet targets set by the California Air Resources Board.[241] If it complies with SB 375 requirements, an SCS can be used to streamline environmental review for certain residential projects and for high density developments near transit.[242]

Under the final targets adopted by the California Air Resources Board, the San Joaquin Valley must reduce per capita greenhouse gas emissions 5% (from a 2005 baseline) by 2020 and 10% by 2035.[243] These targets can be met through changed land use and transportation patterns, including reductions in vehicle miles traveled.

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[236] Crompton, 2005.
[237] Houser and North, 1999; U.S. Bureau of Labor Statistics, 2013.
[238] Curran, 2001.
[239] California Statutes, 2008.
[240] California Statutes, 2008.
[241] California Statutes, 2008.
[242] California Statutes, 2008.
[243] CARB, 2010.

A number of studies have found that land conservation and compact growth can significantly reduce vehicle miles traveled. For example, a 2011 article specifically focusing on the San Joaquin Valley compared 2030 vehicle miles traveled under a business-as-usual ("As Planned") scenario as well as a "Compact Growth" scenario.[244] Both scenarios were modeled using UPlan, a program that correlates expected population increases with land use and transportation outcomes.[245] By 2030, the Compact Growth scenario would produce lower vehicle miles traveled in seven of the San Joaquin Valley's eight counties (including all four counties of the Southern San Joaquin Valley) than the As Planned scenario.[246] Urbanized counties would experience greater reductions, with decreases of more than 10% in Fresno, San Joaquin, Stanislaus and Tulare.[247] Results for the Southern San Joaquin Valley are shown in Figure 16.

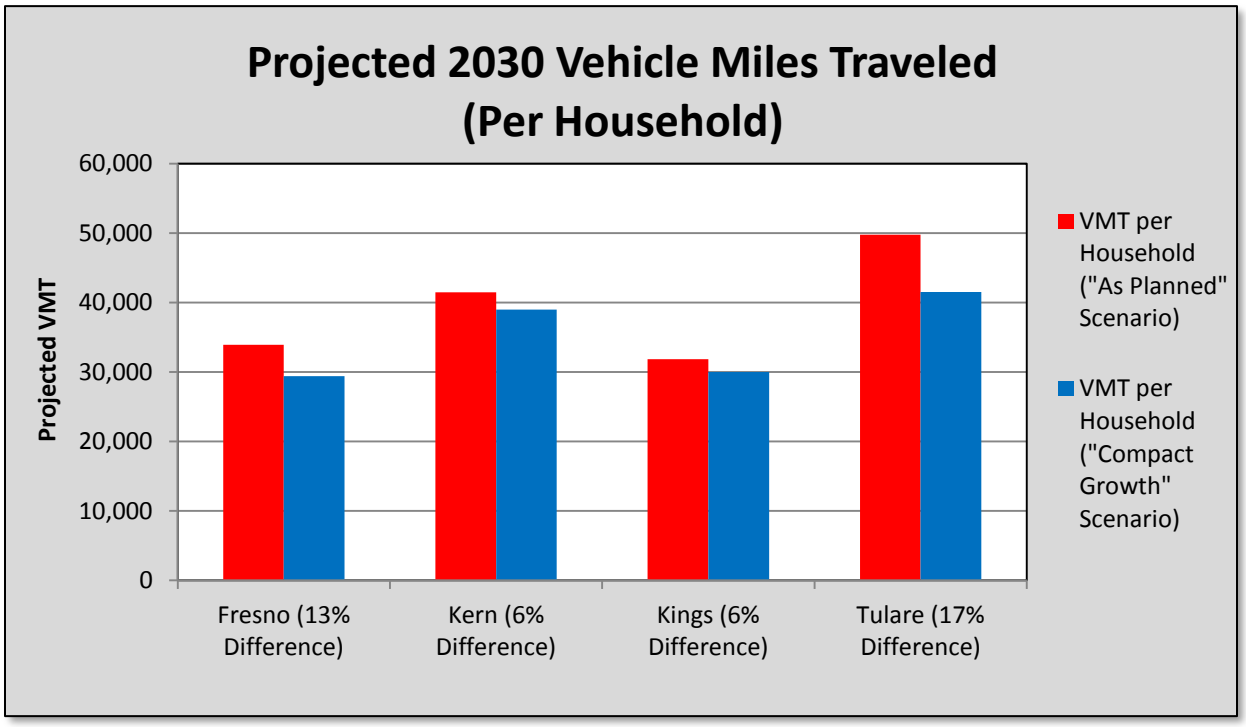

Figure 16: Projected 2030 per-household vehicle miles traveled for the four counties of the Southern San Joaquin Valley under "Compact Growth" vs. "As Planned" scenarios. Adapted from Table 8 in Niemeier et al., 2011.

Studies focusing on nearby regions, including Yolo County and the Sacramento area, support this result. A 2012 report for the California Energy Commission used UPlan to model different development patterns in Yolo County, and found that preserving agricultural land by directing

[244] Niemeier et al., 2011.
[245] Niemeier et al., 2011.
[246] Niemeier et al., 2011.
[247] Niemeier et al., 2011.

development into existing population centers would reduce greenhouse gas emissions from 2010 to 2050.[248] The authors noted that annual emissions from developed areas can be up to 70 times greater than those of an equivalent area of irrigated cropland, and 217 times greater than from an equivalent area of rangeland.[249] For this reason, they concluded that "[s]uburban or exurban development increases [greenhouse gas] emissions per land area substantially when compared with agricultural land uses."[250] Similarly, modeling of the Sacramento Area Council of Governments' "Preferred Blueprint" scenario, which favors compact growth, predicted reductions in greenhouse gas emissions associated with home construction.[251] The Sacramento study also found that lower housing and transportation costs associated with compact growth could indirectly increase emissions by freeing up more resources for production and consumption, but noted that this increase would be outweighed by the drop in home construction emissions.[252] In short, land conservation and compact growth can play a significant role in meeting the region's SB 375 targets.

They may also create new revenue streams for local landowners through California's carbon market. The cap-and-trade system is still in its infancy, but an initial auction held in November 2012 revealed nearly $290 million worth of demand for carbon credits.[253] Offsets—programs that reduce emissions or actively remove carbon from the atmosphere—can be used to satisfy a portion of this demand, and certain types of forestry projects qualify as offsets.[254] Oak woodlands and forests in the Sierra foothills already sequester millions of tons of carbon: in Fresno County, 3.60 million metric tons of carbon are sequestered in oak woodlands and 2.92 million in oak forests; in Kern, 3.35 million in woodlands and 2.31 million in forests; in Kings, 54,775 in woodlands and 836 in forests; and in Tulare, 3.98 million in woodlands and 2.03 million in forests.[255] While not directly applicable to SB 375 targets, management programs that sequester additional carbon, such as reforestation not already required by law, could qualify for offset credits by sequestering additional carbon.[256] Thus, reducing greenhouse gas emissions may benefit the region not only by helping it to meet SB 375 requirements, but also by providing additional revenue for local landowners.

[248] Jackson et al., 2012.
[249] Jackson et al., 2012.
[250] Jackson et al., 2012.
[251] Rodier et al., 2012.
[252] Rodier et al., 2012.
[253] Lopez, 2012.
[254] CARB, 2013.
[255] Gaman, 2008; Gaman and Firman, 2006.
[256] CARB, 2013.

VII. COMPACT GROWTH CAN MAXIMIZE TAX REVENUE PER DEVELOPED ACRE WITHOUT RAISING RATES

A. MEASURING DEVELOPMENTS BY REVENUE PER ACRE

The fiscal effects of different types of growth can be seen by comparing the tax revenue per acre that they generate.[257] From Asheville, North Carolina to Fort Collins, Colorado, this method has shown that high density developments in thriving city centers are better for local government finances than low density developments on the edge of currently developed areas.[258] The difference is due in part to better utilization of space: multi-story buildings can pack in more homes, shops and other revenue sources than single story structures or parking lots.[259] For example, a typical acre of dense, mixed use development in downtown Asheville produces $360,000 more in tax revenue than an acre of low density development.[260] The contrast is even greater if the low density development consists of "big box" stores surrounded by parking lots: a Wal-Mart in Asheville that consumes 34 acres of land yields only $6,500 per acre in property taxes, whereas a restored six-story building on a single downtown block yields *$634,000* per acre.[261]

Closer to home, a recent report by the Infill Builders Association, Local Government Commission and Urban Three, LLC, examined the tax revenue per acre created by different types of developments in Modesto, Turlock and Merced.[262] Major low density developments yield up to 48.6% less property tax per acre than the average downtown property in each city.[263] The results provide a dramatic illustration of the effects of growth patterns on local government finances (Figure 17).

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[257] Badger, 2012; Minicozzi, 2012a.
[258] EPA, 2012; Minicozzi, 2012b; Minicozzi, 2010.
[259] EPA, 2012; Badger, 2012; Minicozzi, 2012a.
[260] Minicozzi, 2012a.
[261] Badger, 2012.
[262] Infill Builders Association et al., 2012.
[263] Infill Builders Association et al., 2012. As illustrated by research done in Minneapolis-St. Paul and repeated in metropolitan regions around the country, low density development at the periphery of existing cities can also harm property values in city centers. Orfield, 1997. Low density suburbs and exurbs often draw jobs, infrastructure investment and education funding away from established communities, which are left with more concentrated poverty and fewer resources to address it. Orfield, 1997. At first, new communities benefit from a combination of high tax bases and minimal need for services. Orfield, 1997. But as the wave of development moves further out, property values in these communities stagnate or decline, and they begin to suffer from the same pathologies that they were built to escape. Orfield, 1997.

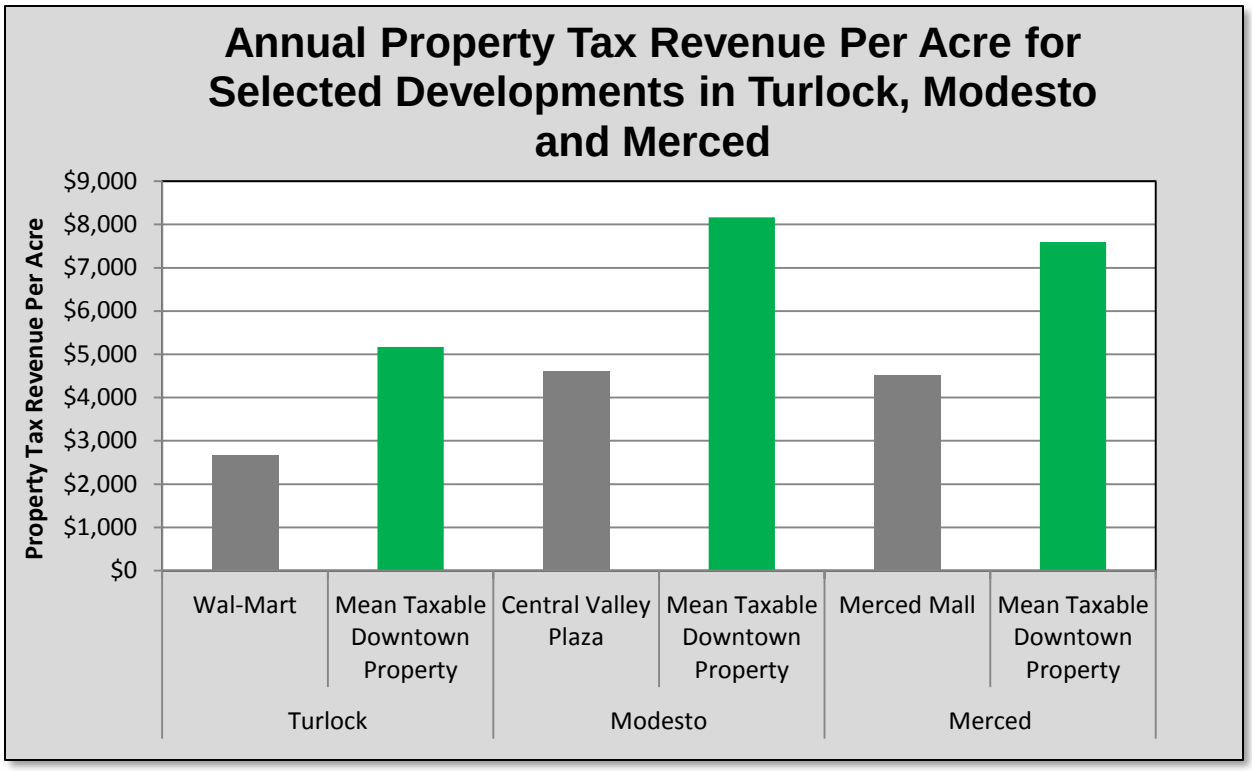

Figure 17: Annual property tax revenue per acre for selected developments in Turlock, Modesto and Merced (Infill Builders Association et al., 2012).

Moreover, the benefits of high density development patterns can be seen even when sales taxes are taken into account. For example, with sales taxes, the Wal-Mart in Asheville still produces only a sixth of the tax revenue per acre yielded by the six-story downtown structure.[264] Sales tax revenue also depends on the continued existence of the businesses that produce it. Near Modesto, shopping malls are "struggl[ing] to retain and bring in new tenants," and a number of structures built to house large stores are empty.[265] As a result, many low density developments are underperforming not only in property tax revenue per acre, but also in sales tax revenues.[266] This suggests that, even with sales taxes, compact growth is a better choice for local government finances.

[264] Badger, 2012.
[265] Infill Builders Association et al., 2012.
[266] Infill Builders Association et al., 2012.

B. Does Higher Revenue per Acre Benefit Counties? Possibilities for Revenue Sharing among Local Governments

At first glance, the connection between higher revenue per acre for developments in city centers and higher revenues for county governments may be difficult to see. Under Proposition 13, property tax revenues are not only restricted to a set percentage of assessed value,[267] but also placed under control of the State Legislature.[268] Portions of this revenue are allocated to local governments, including counties, and portions are used for other purposes, such as meeting statewide school funding requirements.[269] Within each county, the share allocated to each local government is based in part on the share it received more than 30 years ago, when Proposition 13 passed.[270] Proposition 1A, passed with the support of local governments in 2004, requires a two-thirds majority of the Legislature for reallocation between local governments.[271] Thus, barring future amendments to the California Constitution, the state is locked into a complicated and inflexible system of local government finance in which the connection between higher property tax revenues in urban centers and the fiscal health of county governments is far from obvious.

Making matters worse, restrictions on property tax revenue have created a "zero-sum fiscal system" in which city and county governments compete not only with the state, but also with each other, for revenue from other sources.[272] For example, local governments can directly claim sales and use tax revenues of up to 1.25% and may impose additional sales taxes with

[267] Institute for Local Government, 2008. Property taxes are limited to one percent of the assessed value. Institute for Local Government, 2008. For homes that have been in the same hands since the passage of Proposition 13 in 1978, this value is taken from 1975. Institute for Local Government, 2008; McCarty et al., 2001. Properties that have been sold since then are assessed at their most recent purchase price. Institute for Local Government, 2008. Barring a change in ownership, the assessed value can increase by a maximum of two percent per year, even if the market value goes up by more. Institute for Local Government, 2008.

[268] Prior to 1978, local governments could set property tax rates to match their constituents' demand for public services, and could generally decide for themselves how the revenues would be spent. Barbour, 2007. Thus, Proposition 13 effectively changed property tax from a local tax to a state tax administered by local governments. Barbour, 2007; Institute for Local Government, 2008.

[269] Institute for Local Government, 2008.

[270] Institute for Local Government, 2008.

[271] Barbour, 2007. Local governments do have limited control over property tax allocation in the event of a change in jurisdictional boundaries. When a city annexes new territory, for example, the city and county can negotiate the division of property tax revenue in the affected area. California Revenue and Taxation Code §§ 99(b)(8), 99(e).

[272] Barbour, 2007.

voter authorization.[273] If a purchase occurs in a city, local sales tax revenues go to the city government; if it occurs in an unincorporated area, they go to the county government.[274] This creates a perverse incentive to favor retail over other types of development, and for counties to support large retail developments outside city boundaries. The result is a land use pattern biased toward box stores and strip malls, instead of compact, multiuse development in existing city centers.[275]

But counties can indirectly realize the benefits of higher per-acre property taxes in cities through agreements to share revenue. Moreover, this revenue can come from a source that is more subject to local control than property taxes. The California Constitution specifically authorizes agreements to share sales and use taxes, provided they are 1) approved by the Legislature and by popular vote in each participating jurisdiction, or 2) approved by two thirds of the governing body of each jurisdiction.[276] Such agreements can allow counties to share in the revenue created by urban development, reduce incentives for "fiscal zoning" and give both cities and counties a stake in compact growth.[277]

Revenue sharing agreements are already in place in a number of counties, including Fresno, Alameda, Contra Costa and Stanislaus.[278] Under these agreements, Fresno County obtains up to 5.28% of sales tax revenue generated by particular cities, Alameda County receives 5% from most of its cities, and Contra Costa County gets 2.5%.[279] Even agreements to share smaller percentages can affect land use decisions. In 1998, for example, Stanislaus County and the City of Modesto agreed to share 1% of local sales taxes in a particular geographic area, with the goal of avoiding city-county competition for sprawling retail developments.[280] After the agreement was made, the region chose "a business park development over a big box retail project, reflecting the new planning philosophy that such decisions should be based on what is best for

[273] Institute for Local Government, 2008; California Board of Equalization, 2011.
[274] Institute for Local Government, 2008.
[275] Institute for Local Government, 2008. Counties' perverse incentives are made worse by their lack of success in competing for revenue: while local taxes and user-paid service fees have allowed city governments to become more fiscally independent in recent years, California's counties have become more dependent on other governments. Barbour, 2007. As of 2005, federal and state funding provided more than half of county government revenue in California. Institute for Local Government, 2008.
[276] California Constitution, Art. XIII, §§ 29(a)-(b); California Board of Equalization, 2011.
[277] Wheeler, 2008.
[278] Kogan, 2011; Association of Bay Area Governments, n.d.
[279] Kogan, 2011.
[280] Association of Bay Area Governments, n.d.

both city and county, rather than on the sales tax value of the proposed project."[281] Thus, even under California's current system of local government finance, counties and cities can work together to ensure that both benefit from tax revenue generated by compact growth.

VIII. LAND CONSERVATION AND COMPACT GROWTH ARE SUPPORTING COMMUNITY SUSTAINABILITY ELSEWHERE, AND CAN WORK HERE

From Portland and Spokane to Salt Lake City and Miami, land conservation and compact growth are producing economic benefits for communities around the country.[282] But some of the best examples of compact growth are in the Sacramento region and nearby Livermore.

For more than a decade, the Sacramento area has been pursuing compact growth. The City of Sacramento's 2002 Infill Strategy contains a number of measures to direct new development into existing urban areas.[283] For example, it calls for streamlined project review for certain types of infill development, such as multifamily projects and single family homes based on pre-approved designs, greater flexibility on zoning, parking and other regulations for infill neighborhoods, and reduced permit fees for developments in infill neighborhoods.[284] It also proposes forgiving or reducing tax and fine liens on infill lots when those lots are donated to a nonprofit infill developer.[285]

Thanks in part to policies like these, Sacramento has been able to direct a portion of its recent development into infill.[286] This is producing a number of economic and environmental benefits:

- Sacramento residents living in compact, single-family housing are saving money by consuming 20-30% less water than their counterparts in conventional subdivisions.[287]

[281] Association of Bay Area Governments, n.d.
[282] Municipal Research and Services Center of Washington, 2012.
[283] City of Sacramento, 2002.
[284] City of Sacramento, 2002.
[285] City of Sacramento, 2002.
[286] But the region could benefit from closer coordination and revenue-sharing between the City of Sacramento and Sacramento County. In a departure from the City's emphasis on infill, the County Board of Supervisors recently approved a 2,700-acre development on land at the edge of the County that is currently open space. Branan, 2013. Just as the City of Sacramento has benefited from infill, the County is expected to incur costs by pursuing the opposite pattern of development. Among other drawbacks, a representative of the Sacramento Area Council of Governments pointed out at the hearing that the development could jeopardize federal transportation funding and make it more difficult for the Sacramento region to meet SB 375 targets. Branan, 2013.

- Under the Preferred Blueprint Scenario adopted by the Sacramento Area Council of Governments in 2004, the region is expected to save $9.4 billion in transportation, water and other infrastructure costs by 2050, a savings of approximately $18,000 for each housing unit or 2,500 square feet of commercial space.[288]
- If the Sacramento region continues to follow the Preferred Blueprint Scenario, per capita vehicle miles traveled are expected to decline by 6-10% by 2035.[289]

Moreover, through high density, multiuse developments such as the Elliot Building—a restored, four-story structure near the State Capitol featuring restaurants, office space and loft-style apartments, one of which was chosen by Governor Brown as his official residence—Sacramento is gaining tax revenue and revitalizing its city center.[290]

Mixed use infill developments have been similarly successful in nearby Davis. One of the first projects replaced a dilapidated apartment building with a structure housing both commercial space and apartments.[291] This not only eliminated an eyesore in downtown Davis, but also allowed the city to profit from additional property taxes, sales taxes and new business license fees.[292] Since then, Davis has multiplied these benefits by pursuing several similar projects.[293]

Further west, the City of Livermore has been pursuing compact growth policies for over a decade. These include not only urban growth boundaries and efforts to link the community to the broader Bay Area through public transportation, but also a specific focus on directing "new retail, office, mixed-use and entertainment [developments] . . . primarily in[to] the Downtown Core," in order to "re-establish Downtown as the center of the City."[294] The result has been a revitalized downtown: an area that was once known for empty streets and abandoned, utilitarian buildings is now a thriving center of commerce.[295] Moreover, its theaters, restaurants and wine bars are bringing additional money to local businesses by attracting tourists from around the Bay Area.[296]

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[287] Kooshian and Winkelman, 2011.
[288] Kooshian and Winkelman, 2011.
[289] Kooshian and Winkelman, 2011.
[290] Infill Builders Association, 2011.
[291] Sierra Business Council, 2003.
[292] Sierra Business Council, 2003.
[293] Sierra Business Council, 2003.
[294] City of Livermore, 2004.
[295] Boer, 2013.
[296] Boer, 2013.

Compact growth is contributing to the prosperity of a number of additional communities in the Bay Area, though the resulting rise in property prices has limited the availability of affordable housing.[297] But compact growth need not price middle class homebuyers out of the region. In Portland, Oregon, where urban growth boundaries have been drawn to direct development into existing city centers, property values have skyrocketed, but smaller lot sizes and short project approval times have ensured a steady supply of affordable housing.[298]

Land conservation and compact growth can work here, too. A 2005 study found that the San Joaquin Valley as a whole could host anywhere from 26,800 to 246,200 units of infill.[299] While this is only 8% of total statewide infill potential, parcel sizes tend to be larger in the Valley than in other regions, which could make dense, multiuse developments more feasible here.[300]

Moreover, much of the planning that would underpin a concerted effort at compact growth has already been done. The Blueprint Roadmap, for example, provides specific scenarios and density goals for development between now and 2050. By implementing Scenario B+, the region could begin realizing the economic benefits of higher housing densities.[301] By pursing the higher density targets of Scenario C, which calls for an average of 10 units per acre in new residential development, the region could achieve even better results by 2050, including cumulative savings of over $20 billion in infrastructure costs, annual savings of $3,600 in per-household driving and utility costs, and cumulative savings of 158 billion vehicle miles traveled.[302]

The SB 375 planning process provides an additional tool—and an additional reason—for the region to promote compact growth. As the reduction in expected vehicle miles traveled under Scenario C illustrates,[303] and as other modeling confirms,[304] compact growth is the key to meeting the region's emission reduction targets.

Finally, some of the region's governments are already working to promote compact growth. Members of the Smart Valley Places Consortium are engaged in planning and outreach projects, including the revision of existing planning documents to make them more consistent with the

[297] Wheeler, 2008; Kantor, 2010.
[298] Sierra Business Council, 1997.
[299] Landis, 2005.
[300] Landis, 2005.
[301] Mintier Harnish et al., 2010.
[302] Calthorpe Associates, 2010.
[303] Calthorpe Associates, 2010.
[304] Niemeier et al., 2011.

goals of the Roadmap.[305] The Fresno Council of Governments is using spatially explicit modeling to assess land consumption, water and energy use, vehicle miles traveled, greenhouse gas emissions and other outcomes for different development scenarios. And county governments are working to determine how their development patterns can fit into a regionwide Sustainable Communities Strategy. By building on these efforts—a task that will entail not only planning, but also real-world decisions about the nature, location and density of new development—the region can begin to realize its full economic potential.

CONCLUSION

If the region adopted a development pattern focused on land conservation and compact growth, the impact would be felt throughout its economy. This Report provides an overview of several specific benefits, but can necessarily only scratch the surface. As a look through the References below will indicate, thousands of pages have been written on the subject, and new sources continue to appear. But even a cursory examination makes one thing clear: the economic future of the Southern Sierra and Southern San Joaquin Valley depends on land conservation and compact growth.

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