

An analysis prepared as part of

THE **Vivid Picture** PROJECT

Estimating Spatially Explicit Population Distribution and Urban Area Expansion in California for the Year 2030

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Key findings

We evaluate multiple scenarios of potential population growth, distribution and urban area expansion. These include: a scenario given current trends in densities and urban area expansion, a smart growth scenario that encourages higher densities (lower per capita land consumption rates) and preservation of specific land features such as riparian areas and wetlands and, a smart growth scenario that focuses on higher densities coupled with an emphasis on protection of important farm land types.

We find that under the scenario that evaluates potential effects of urban growth following current trends, the total projected urban area in 2030 is 5.7 million acres approximately a 1.8 million acre increase from the 2000 urban area footprint (46% increase). On the other hand, under both smart growth scenarios we find the projected urban area in 2030 to be 4.4 million acres, approximately a 0.5 million-acre increase from the 2000 urban area footprint (an 11% increase). This is a 1.3 million-acre difference between the two scenarios.

The amount of urban area growth under each scenario depends to a large degree on the number of new people in 2030 that will require new urban area. This number varies depending on expected densities of both existing urban areas (infill rates) and expected future densities of new urban areas. Under the “current trend” scenario, densities are projected to be 6% higher than current densities within existing urban areas and 11% higher in new urban areas. Under both smart growth scenarios, densities are projected to be at least as high as the second densest urban area in each size class. These projected densities represent a total increase in population within existing urban areas (infill) of 2.3 million people for the current trend scenario and 5.5 million people for both smart growth scenarios. This represents an “absorption” into existing urban areas of 17.0% and 40.7% of the new expected population increase respectively.

Overall densities vary between scenarios both within existing urban areas as well as in expansion areas and rural areas. As is expected, the smart growth statewide densities are higher than that of the current trend scenario (10.21 people/acre compared to 8.16 people per acre). Densities increase in both existing urban areas as well as future expansion areas. Both scenarios exhibit higher statewide densities than current (2000) population densities. Table 1 represents current and expected densities for each scenario.

Land class	existing (2000)	expected 2030 (current trend)	smart growth (both scenarios)
Urban	7.43	8.19	10.26
expected urban (expansion area)	na	7.17	8.72
Statewide mean (urban areas)	7.43	8.16	10.21

Resulting urban area spatial distributions and effected land use types vary according to factors influencing/limiting growth under each scenario. Under the current trend scenario, 355,070 acres of prime farmland are loss to development. Under the smart growth scenario, 77,435 acres of prime farmland are lost and under the smart growth

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scenario that emphasizes farmland protection only 22,847 acres of prime farmland are affected. Table 2 represents different farmland categories affected under each scenario.

Table 2: Farmland categories affected under different growth scenarios in 2030			
farm land type	Current trend	smart growth	smart growth with emphasis on farmland preservation
Prime Farmland	355,070	77,435	22,847
Farmland of Statewide Importance	70,451	28,615	5,968
Unique Farmland	96,118	13,816	22,714
Farmland of Local Importance	3,395	25,296	445
Grazing Land	303,208	55,648	36,752
Other	189,657	12,017	10,774
Total	1,017,900	212,827	99,499

(More detailed information on how farmland classifications are assigned can be downloaded in PDF format through the CA Division of Land Resource Protection website: www.consrv.ca.gov/DLRP/fmmp/index.htm.)

Introduction

The Vivid Picture project describes a vision of a sustainable food system in the state of California in the year 2030 and proposes a change agenda for reaching that future. A wide variety of variables underlie the development of the Vivid Picture. One such variable is the manner in which projected population growth is accommodated across the state.

California's population is estimated to grow by 13 million people over the next 25 years. Taking that projection as a given, a range of potential growth patterns exist. The extent to which population growth is accommodated by expanded urban footprints or by greater urban densities will influence both the production and consumption components of a future food system.

On the food production side, projected urban area expansion is an important factor in determining the amount of agricultural land that will be available for production in 2030. On the consumption side, a detailed spatial understanding of projected population growth patterns determines the siting of food outlets under differing circumstances, and is thus an important factor in ascertaining projected levels of food access and local purchasing, two indicators of sustainability adopted by the Vivid Picture project.

Because the accommodation of projected population growth has an effect on Vivid Picture outcomes, the Roots of Change Council has requested that the Vivid Picture include assumptions of smart growth policies, which promote greater urban densities, in place throughout the State. In this paper we review several research projects that have been conducted specific to growth trends in California and discuss our approach, which utilizes a selection of components from these studies. Then we present findings that compare the effects of accommodating projected population growth with (1) a baseline scenario that assumes the continuation of settlement patterns that follow recent trend data, and (2) a smart growth scenario that assumes the adoption of policies to encourage greater levels of urban density.

Background

The California Department of Finance is required by state law to develop forty-year population growth projections for the State. These projections are extrapolated at the county level for specific demographics. According to Department of Finance projections (2005), the statewide population will grow from roughly 35 million in 2005 to 48 million by the end of the 2030 study period, an increase of 37%.

How this projected population growth is accommodated will affect both food production and consumption patterns across the State, and is thus a factor in the development of scenarios for the Vivid Picture project. Several papers have examined data and drawn conclusions that are relevant to the question of projecting the accommodation of expected population growth.

In a 2000 paper, *Sprawl in California*, researchers Leon Kolankiewicz and Roy Beck find a high correlation between California's population growth and its expanding urban

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footprint. Yet they also find that urban densities throughout the state, as measured by per capita land consumption, are increasing. From 1970 to 1990 the weighted average of per capita land consumption in California's 16 urbanized areas decreased by six percent. Among the 12 urbanized areas added to the list in the 1980 census, the decrease in per capita land consumption over the decade was 11 percent. Kolankiewicz and Beck define an urbanized area as one of more than 50,000 residents.

A 2004 working paper by John Landis and Michael Reilly at the Institute of Urban and Regional Development, UC Berkeley, entitled *How We Will Grow: Baseline Projections of the Growth of California's Urban Footprint through the Year 2100* projects baseline growth scenarios for 38 predominantly urban counties. Employing trend data compiled from 1972 to 1998, the authors find that marginal densities rise with the share of the land area in urban use—as counties grow more urban, their urban densities increase. They also find that the percentage of population growth occurring as infill—within existing urban areas—rises with the share of the land area in urban use—as counties grow more urban, the tendency of population growth to settle in existing urban areas increases. Our approach for projecting a baseline scenario of urban area expansion follows methods developed by Landis and Reilly.

Landis and Reilly evaluate growth of urban areas based on increases to existing municipalities with an assumed population density. Growth is limited by factors such as land use regulations. They apply probabilities to all locations within the study area based on the likelihood that any given location will be developed. The likelihood of development is based on factors affecting or limiting growth, particularly economic factors such as job growth.

Bob Johnston and Shengyi Gao (2000) at UC Davis have also performed analyses of urban area expansion under different land use scenarios. Their model projects land uses in size increments roughly matching development parcel sizes. Land use densities must be represented, to get runoff, habitat, and other impacts right.

Projections of population growth utilized by Landis and Reilly and developed by the California Department of Finance are at the county level. We project this growth at a finer spatial resolution—the census block-level. This finer spatial understanding of projected population growth allows for a better projection of food consumption. Furthermore, as consumption patterns defined by ethnicity may become important at a future stage of the Vivid Picture project, we also consider this demographic characteristic in projecting census block-level population growth.

In addition, the Landis and Reilly model covers areas where major population centers exists, but it does not consider growth of non-urban centers (rural “town centers”). Our analysis is statewide.

The findings of a 2001 national study, performed for the Brookings Institution, are also of note for this analysis—particularly the fact that California is home to eight of the 20 densest metropolitan areas in the country and that, with 8.31 persons per acre in 1997, Los Angeles-Anaheim-Riverside ranks as the metropolitan area with the second highest density in the nation.

No studies that we have been able to locate have projected the accommodation of population growth for all of California under smart growth scenarios for our target year

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of 2030. As such, we take components of each of the analyses noted and developed a model flexible enough to run multiple scenarios using varying sets of parameters. For example, we modify the methods developed by Landis and Reilly to account for potential land use drivers such as higher housing densities resulting from a smart growth scenario. Additionally, we use findings from Kolankiewicz and Beck to calibrate densities associated with our current trend scenario.

Methods

Building upon the existing data of how population will increase on a county-by-county basis, our model projects population increases by demographic characteristics at the census block level specific to urban areas defined by the Bureau of Census. We account for potential infill to these urban areas, and subsequently project the expansion of urban areas that would be required to accommodate additional population growth after infill. Our model is constructed so that different land use constraints and density levels can be tested.

Our methodology follows a five-step conceptual process:

1. Estimate population increases for each urban area for specific demographics.
2. Determine potential infill to existing urban areas based on varying per capita land consumption rates
3. Stratify potential population infill by demographic at the census block level.
4. Estimate urban area expansion, constrained by land use variables, until projected urban area population growth that is unaccounted for after infill is accommodated.
5. Project probable habitation areas within expanded urban areas.

Estimate population increases for each urban area

Two underlying assumptions of our projected population methodology are that specific demographics will increase proportionally in areas where they already exist and population growth will originate from existing urban areas. Following these assumptions, we evaluate county specific increases by demographic category, using the six ethnicity categories identified in 2000 census data and DOF county projections. Ethnicity categories found in the 2000 census data and in the DOF county projections include:

1. Asian
2. Black
3. Hispanic
4. Native American
5. White
6. Pacific Island origin (other)

We then distribute cumulative growth to existing urban areas. Proportional increases are then applied to each census block. As mentioned above, we assume that population increases will follow existing demographic patterns. We adjust current demographic distribution in individual blocks to “zero out” areas that would otherwise experience negative growth. That is, we account for negative growth of specific demographics

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through the immigration of positive-growth demographics. This results in new distributions by demographic and adjusted percent change inputs by ethnicity, which are then used in the expansion area analysis.

For example, if a given county has a projected decrease of 12% in the white population and an expected 150% increase in the Hispanic population and block A within that county currently has 100 white and 50 Hispanic and block B has 10 white and 28 Hispanic we would want to replace the loss of 12 white people in block A and 1.2 white people in block B with the same number of Hispanic people.

The resulting white population would then be 86.8 people and the resulting Hispanic population would be:

$$(28 + 50 + 13.2 = 91.2) \text{ (62 in block A and 29.2 in block B)}$$

Finally we would adjust the Hispanic percent change accordingly:

$$(150\% \text{ increase} - (78 / 91.2 = 14\% \text{ increase}) = 136\% \text{ increase.}$$

The white percent change would be set to 0.

Determine potential infill to existing urban areas based on varying density rates

The primary variable that drives infill potential is probable per capita land consumption—how much urban area land is required to support how many people. Per capita land consumption is calculated by dividing the total urban land area by the total number of residents. Kolankiewicz and Beck (2000) found California statewide per capita land consumption decreased from 1980 to 1990. Our analysis shows this trend continues through 2000. Such decreases can largely be attributed to larger metro areas such as Los Angeles. However, all urban size classes include some urban areas that have experienced decreases.

We evaluate various per capita land consumption rates and analyze what impacts these rates would have on future sprawl. For example, our analysis shows that an additional 11% decrease in per capita land consumption can account for over 8% of the expected population increase. Targeting realistic per capita consumption is pivotal to depicting a credible vision for growth and its effects on the food system. Although each urban area is home to unique factors, such as land use regulations, demographic distributions, and economic drivers, for the purposes of this analysis, it is necessary to apply general rules to urban areas in specific classes. That is, we assume that if a single urban area within a given size class has achieved a certain level of density; other urban areas within the same size class can achieve similar densities.

We classify all 185 California urban areas by population and evaluate densities and per capita land consumption for the each class (Appendix A has a list of urban areas and associated population and acreages). Table 4 displays general statistics for each class.

class	population range	Cumulative area (acres)	total population	number of urban areas	per capita land consumption	minimum mean density	maximum mean density	2nd max mean density	mean - mean density	2030 expected mean density
1	< 5,000	54,457	156,946	51	0.347	1.04	12.29	10.21	2.88	3.06
2	5,001 10,000	75,135	298,909	40	0.251	1.46	12.00	11.36	3.98	4.22

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3	10,001 50,000	373,132	1,523,291	64	0.245	1.47	18.56	17.01	4.09	4.33
4	50,001 250,000	699,093	3,922,042	35	0.178	2.44	10.26	9.66	5.61	5.95
5	250,001 1,000,000	572,205	3,854,650	10	0.148	4.89	11.13	8.91	6.74	7.14
6	> 1,000,000	2,206,698	23,864,380	6	0.092	6.56	13.12	12.42	10.82	11.47

Note: Densities are calculated as people per acre, per capita land consumption as acres per person.

Kolankiewicz and Beck found per capita land consumption to be decreasing in California, both in existing urban areas as well as in newly developed areas. Within existing urban areas they found per capita land consumption to decrease 6% from 1970 to 1990. For newly developed areas they found this decrease to be higher—eleven percent over 10 years. Landis and Reilly (2001) followed a similar approach in calibrating urbanization and infill shares using trend data from 1972 – 96. Over this period, they found an increase in infill rates in urbanized areas and a corresponding decrease in land consumption rates. Landis and Reilly also found a relationship between the urban share and density rates for any give county. That is, the more urban a county becomes, the more dense the urban areas within that county experience.

The higher the allowable housing densities, the more additional people can be accommodated through infill into existing urban areas. We test results of several per capita land consumption levels as applied to urban areas of different size classes. For example, if densities reflect the mean density of the second densest urban area in each class for the 6 different sized urban areas, infill could account for almost 22% of the projected increase in population for the year 2030. On the other hand, if projected per capita land consumption is set equal to the mean value of all urban areas within any given size class, infill will account for only 6.7% of the projected population.

Once density levels by urban area size classes are set, we then determined infill potential for each urban area. We compare the infill potential against the expected urban area population increase to determine what proportion of the expected population growth can be accounted for via infill. If infill potential is greater than the expected increase, we reduce the infill potential to equal that of the expected population, prior to applying infill to the block level.

Project population infill by demographic at the census block level

With a calculation of infill potential for each urban-area census block, we then assign that infill to smaller geographic units—census blocks. We infill census blocks without consideration of zoning data, as no reliable statewide zoning or land use data exists and zoning changes are frequent and difficult to predict. Indeed, the very notion of infill often necessitates zoning changes.

We assume that infill will not be uniform throughout urban areas, but that census blocks will add population inversely proportional to their current population densities, i.e. those census blocks with lower densities will experience proportionally greater infill. Successful models of infill exhibit development in vacant and underdeveloped areas. However, without reliable data for such areas, it is difficult to predict where infill may occur. As such, we use density as a proxy for potential infill sites. Where there are lower densities we assume a higher infill potential. Obviously, this is not always the case, as

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many areas are zoned specifically for low or no density and although these areas may exhibit lower densities they may very well have no potential for infill.

We test the sensitivity of this assumption by evaluating an area with detailed zoning information and adjusting our infill potential proportional to specific zoning types (i.e. we allowed for higher densities in areas zoned for such). We then sum the resulting infill totals for the entire urban area and compare against the resulting totals from the analysis where zoning is omitted. Differences at the block specific level are expectedly significant, as the analysis without the zoning data exhibits a much more evenly distributed ending population. However, aggregated totals show no significant difference between the two analyses.

The above sensitivity analysis informs us of two important aspects of our model specific to the model's purpose. Evaluating zoning information in determination of infill is less important when determining urban expansion. It is more important, however, for use in the outlet placement model.

Project urban area expansion, constrained by land use variables, until projected county-level population growth that is unaccounted for after infill is accommodated

We assume growth of any given urban area will follow a similar pattern that it has historically. That is, if a given urban area has a significant amount of industrial and commercial land and low housing densities, we assume future expansion will express similar qualities. Thus, the amount of land required to fulfill future growth needs will vary among urban areas, depending on their current patterns of density.

With future densities set as a percentage of current densities, infill rates and rural gains are considered at the state level and applied as a percentage. The resulting information gives us a specific required expansion area for every urban area within the state.

Landis uses trend data to identify variables that explain where growth has and has not occurred. He found the variables that best explain growth differ among geographic regions. For example, the main factors affecting growth in the Bay Area are proximity to freeways and location within the incorporated area of a city. In the Central Valley, job growth is one of the most significant factors influencing growth. We choose the set of factors Landis found to be most influential for any area, and rather than calibrate the model with historic trends, we allow for adjustment of the influence of individual factors. This allows for more flexibility in designing "desired" future conditions.

Landis then transforms each variable to represent a scale with a range determined by the weight given to that variable. The data of any given variable represents the assumed "cost" to develop in a specific location. All variables are then added together to get a total cost of development for any given location.

Variables we use in our analysis include wetlands, riparian areas, wildlife habitat, and floodplains—each expressed as a Boolean. Other variables include slope, proximity to freeways, farmland type, and distance from existing urban areas—each expressed as a range. We do not use job growth projections as a variable.

Each variable is transformed following Landis's approach where the data represents a range determined by the weight given to any given variable. Weights are adjusted for

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different scenarios. For example, under a smart growth situation, in addition to higher densities we may see stronger regulations around farmland preservation. As such, we increase the weight given to farmlands of different types relative to other variables.

The resulting data layer represents a cost of development for any given location. We then use cellular automata (CA) to then expand urban areas, where a given location will be incorporated into an expansion area based on its cost to develop as determined by the variables. Public lands and waterways are masked, as are existing urban areas.

The model iteratively adds locations to the urban expansion area until the desired area (determined in earlier steps) is met for all urban areas. Results are evaluated, parameters adjusted and the model is re-run if necessary.

Urban area expansion model sensitivity

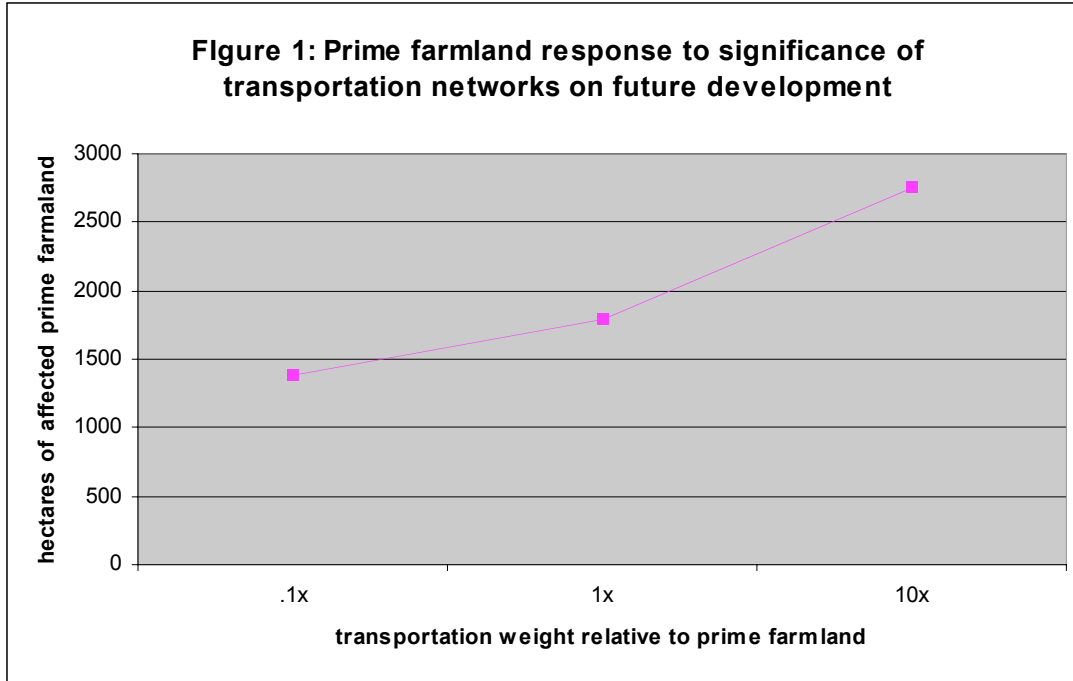
We test the sensitivity of variables mentioned above to constrain growth based on agricultural land response. We hold all variables constant and adjust one at a time relative to the significance given to farmlands. Our analysis focuses on the Sacramento region, where there is abundant prime farmland in close proximity to urban areas. Testing the sensitivity of constraint variables would surely yield different results in different areas as the frequency of any one variable varies from one area to the next.

Nevertheless, the benefit of such an analysis is that we can use the model to inform us of the most important factors that may affect development of prime farmland in the future and as such are able to make realistic suggestions around land use planning and environmental protections.

From our analysis we find that the influence of freeways and other major transportation networks and the influence of development within city limits have the greatest effect on prime farmland. When de-emphasizing the influence that transportation networks have on future development we find a significant decrease in prime farmland being developed (figure 1).

This finding is significant in that if farmland preservation is a goal of any given community in the Sacramento region, an understanding of how transportation affects prime farmland is crucial. Furthermore, because transportation is one of the more consistent variables across the state (minimal variability between regions) long term transportation planning, at the local, regional and state level becomes an essential step in preserving farmland.

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All other variables measured only had minimal effects on prime-farmland development. However, we find that when preservation of prime farmland is given high priority, other variables such as wetlands, riparian areas and wildlife habitat experience increased development.

Project demographic habitation of expanded urban areas

Lastly, we apply demographic characteristics to the population of the expanded urban areas. The demographic composition is determined by existing county-level projections of population growth by demographic. We assume habitation of new urban areas will be culturally diverse and development patterns will be similar to the existing urban area development. We therefore randomly assign varying levels of densities following existing levels within associated urban areas.

Results

Densities and potential infill

We run our analysis using two different density adjustments to determine effects of both growth and distribution resulting from development patterns following current trends and higher densities following a probable smart growth scenario. For the current trend analysis we use Kolankiewicz’s findings (2000) and assume present rates of decrease in per capita land consumption rates (increased density) following the current trend over the past two decades. That is a statewide average decrease of 11% per decade over 30 years (our starting point is 2000) for new developments and a 6% decrease over 2 decades in urbanized areas. This results in an overall absorption rate into existing urban areas of 14.7% of the projected 2030 additional population. Given the same per capita land consumption rates for urban area size classes, this means an additional 1,769,268

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acres of land will be required statewide to accommodate the projected 2030 population at projected densities.

As per recommendations by Cowan (2005) we evaluate maximum mean densities in each urban area size class with the intention of using these as our target densities for our smart growth scenario. Because of the unrealistic density projections due to the effects outliers in our data, we choose to use densities represented by the second highest mean density in each urban area size class as our target density. These densities result in an overall absorption rate into existing urban areas of 21.8% of the projected 2030 additional population. Table 5 represents different infill absorption rates by urban area size class for different target densities.

Table 5: Urban area absorption rates by size class for different infill densities

class	population range	Total population increase	mean infill	% of total	2030 expected infill	% of total	2nd max mean density	% of total
1	< 5,000	504,567	3,448	0.68%	6,448	1.28%	163,542	32.41%
2	5,001 10,000	713,904	7,654	1.07%	52,356	7.33%	145,257	20.35%
3	10,001 50,000	1,016,261	43,426	4.27%	139,386	13.72%	178,916	17.61%
4	50,001 250,000	2,381,104	102,906	4.32%	186,611	7.84%	296,431	12.45%
5	250,001 1,000,000	2,397,275	82,114	3.43%	283,908	11.84%	183,155	7.64%
6	> 1,000,000	8,488,324	788,197	9.29%	1,621,910	19.11%	2,408,859	28.38%
Total		15,524,049	1,027,745	6.62%	2,290,619	14.76%	3,376,160	21.75%

Proportional increases in urban area size classes

Under both scenarios, the larger urban areas experience the greatest amount of growth; however suburban areas in the smart growth scenario tend to absorb the majority of new population within existing urban areas. This is due to the relatively low density levels in many suburban areas and the high potential for infill, and conversely, the low potential for suburban area infill under a 6% current-trends increase in urban densities.

The most striking difference however is in the smaller urban area size classes. Such areas exhibit relatively small urban area expansion footprints with relatively high densities resulting from the smart growth scenario but an equal amount of expansion for the current trend scenario (with much lower densities, however). This can be attributed to the greater increase in population in rural areas.

As a whole, the rural areas experience a much greater proportion of growth in the current trend scenario, experiencing 29% increase in the rural population statewide. On the contrary, smart growth scenario actually exhibits a decrease (-0.5%) in the rural areas. However, much of this can be attributed to proportions of the current rural population being absorbed into future urban expansion areas. That is, populations living within the projected expansion areas in 2000 were considered “rural residents” and in 2030 are considered part of the expansion area (i.e. part of the urban population).

Table 6 displays proportional increases into existing urban areas, expansion areas and rural areas for the two scenarios:

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Table 6: Population increases by urbanization class

year	total	urban smart growth	urban current trend	urban expansion smart growth	urban expansion current trend	rural smart growth	rural current trend
2000	33,809,224	30,386,566	30,386,566	102,380	405,620	3,297,778	3,039,538
2030	47,905,735	40,500,524	32,600,695	4,999,928	12,680,518	2,405,283	3,924,522
% change	41.69%	33.22%	7.24%	4792.46%	1941.91%	-27.26%	29.12%

Effects of footprint on existing land uses

The total urban area footprint in the smart growth scenario is 4.4 million acres. This is a 0.5 million acre increase from 2000 urban areas. As expected this increase is highly associated with current urban areas, and tends to expand into currently relatively under-utilized land such as grazing lands. The current trend scenario, on the other hand, tends to exhibit growth onto existing prime farmland as well as into more sensitive habitats such as wetlands, riparian corridors and wildlife habitat. The total urban area footprint associated with the current trend scenario is 5.7 million acres, a 1.8 million acre increase from 2000 urban areas.

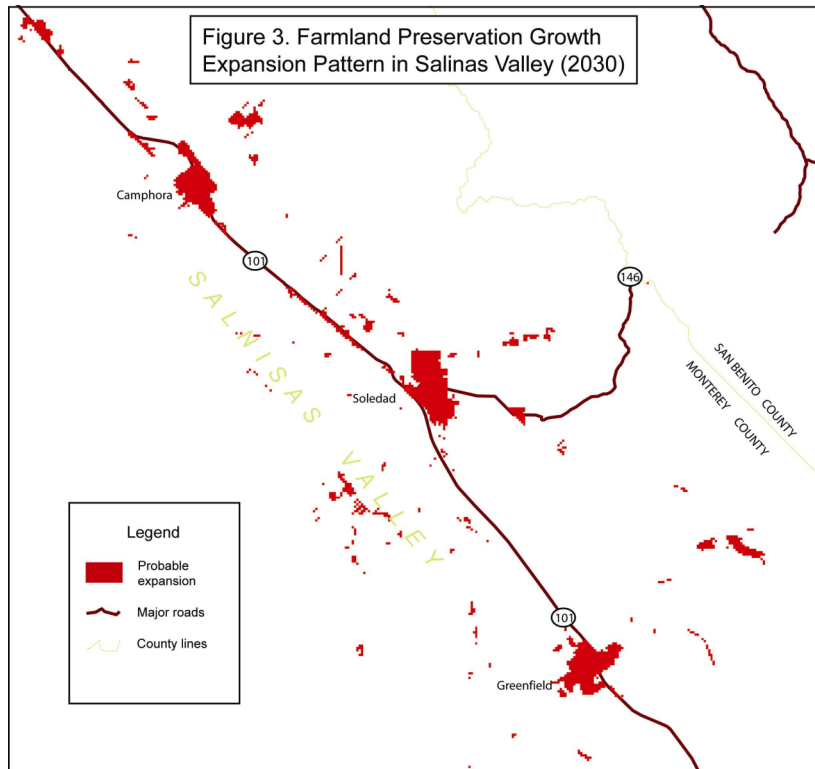
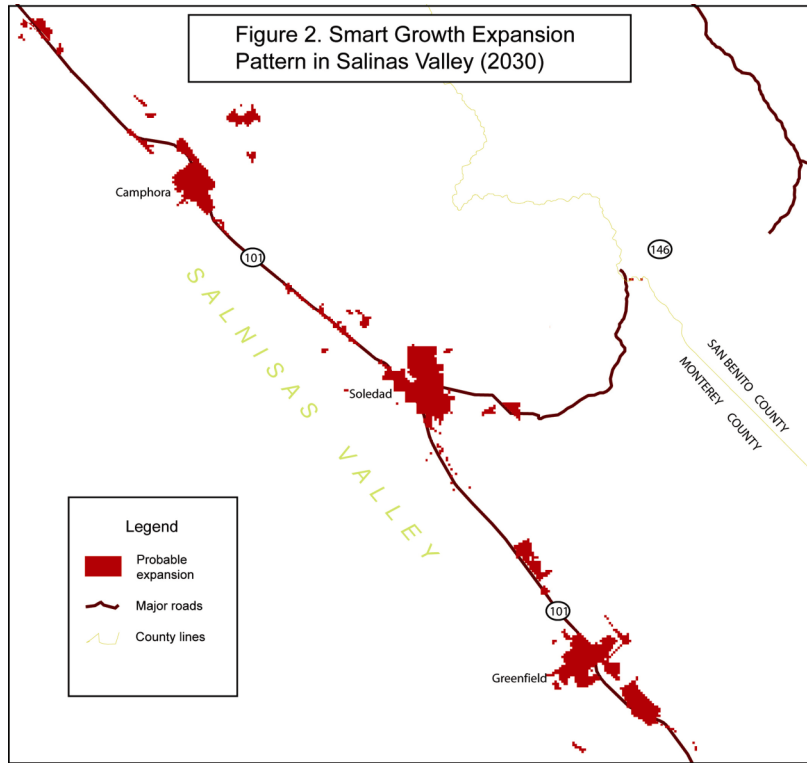
In addition to the above scenarios, we also evaluate the urban expansion that accounts for prime farmland preservation, using smart growth target densities. We do this by placing an extremely high weight on farmland types relative to other variables. (Table 7 represents different weights given to individual parameters under each scenario.) We test this scenario to analyze the effects that farmland preservation may have on other variables. We find that under this scenario, although prime farmland was effectively protected, other resources were compromised such as riparian corridors and wildlife habitat.

Table 7: Weighting of variables that effect urban area expansion

	Current trend	Smart growth	Smart growth with emphasis on farmland preservation
wetlands	10	1000	1000
slope	2000	1000	1000
riparian areas	10	1000	1000
in or outside of city limits and urban reserves	1000	1000	1000
proximity to freeways / arterials	2000	1000	1000
wildlife habitat	10	1000	1000
floodplains	1000	1000	1000
farmland type	100	1000	8000
prime farmland in urban areas	100	1000	8000
proximity to existing urban areas	1000	1000	1000

Furthermore, we find the spatial effects from such a scenario tend to be counter-intuitive to smart growth principles such as compact cities, particularly in areas where there is abundant prime farmland. In other words, results tend to exhibit conditions one would expect from the “current trend” scenario in that development tends to “leap frog” from location to location and the spatial distribution of the resulting urban areas (although identical in respective footprint areas) tend to be more spread out. A good example of this is in the Salinas valley along highway 101 concentrated around the towns of Soledad, Greenfield and King City. Figures 2 and 3 represent the spatial distribution of the Salinas valley urban areas in 2030 under both smart growth scenarios.

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All scenario growth patterns tend to avoid steeper slopes and follow major transit corridors. Given the negative effects to riparian corridors, wetlands and wildlife corridors, coupled with the sprawling effect resulting from the smart growth scenario with an emphasis on prime farmland preservation, the Vivid Picture team recommends a smart growth scenario giving each environmental variable equal weight relative to prime farmland. We feel the negative impacts on prime farmland under this scenario to be relatively small and do not outweigh the positive gains in riparian, wetland and wildlife habitat protection. Maps 1 and 2 illustrate the urban area footprint associated both the current trend scenario as well as the smart growth scenario without emphasis on preserving farmland respectively. Each map shows growth under the two scenarios both state wide as well as for the Sacramento area.

Urban farmland

Overlaying census defined urban areas with important farmland data. The California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program (FMMP) created the farmland data layer. Since the 1980s the FMMP has been measuring urban conversions and other land use changes at two-year intervals. The FMMP measures these land use changes on a statewide level using aerial photography and modern soil surveys. Since FMMP is highly dependent on the NRCS data, the extent of the farmland coverage corresponds to the availability of what the National Resources Conservation Service (NRCS) considers "modern soil surveys", or SSURGO data data we found there are as many as 250,000 hectares of farmland within urban areas. Nearly 30,000 hectares of these are classified as prime farmland. The Vivid Picture team recommends giving these areas high degree of protection. As such, we ran our model with the additional parameter of urban farmland protection. Preserving these farmlands however results in greater sprawl as growth after infill is displaced outside of urban areas. In other words, protection of these urban farmlands is contrary to smart growth principles around infill. Nevertheless we feel the benefits gained from urban farmland preservation offset the relatively small increase in sprawl due to the importance of rural-urban partnerships and the value of urban farmland.

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