

## **Chapter 7**

# Environmental Sustainability

Minimize negative transportation impacts on the environment for cleaner air and natural resource protection



## Introduction to Environmental Sustainability

Environmental sustainability is one of six MTP principles addressed in this MTP/SCS. The desire to minimize negative transportation impacts on the environment for cleaner air and natural resource protection has always been an important consideration in each MTP. However, since the adoption of the 2008 MTP, two important changes have happened that affect the environmental sustainability analysis in this MTP/SCS.

First, California adopted SB 375 (Chapter 728, Statutes of 2008). The law focuses on aligning transportation, housing, and other land uses to achieve greenhouse gas (GHG) emission reduction targets established under the California Global Warming Solutions Act (AB 32). SB 375 requires California MPOs to develop a Sustainable Communities Strategy (SCS) as part of the MTP, with the purposes of identifying policies and strategies to reduce per capita passenger vehicle-generated GHG emissions. The SCS must identify the general location of land uses, residential densities, and building intensities within the region; identify areas within the region sufficient to house all the population of the region; identify areas within the region sufficient to house an eight-year projection of the regional housing need; identify a transportation network to serve the regional transportation needs; gather and consider the best practically available scientific information regarding resource areas and farmland in the region; consider the state housing goals; set forth a forecasted development pattern for the region; and allow the regional transportation plan to comply with the federal Clean Air Act. For further discussion of SB 375, see Chapter 1.

Second, SACOG launched the Rural-Urban Connections Strategy (RUCS) at the conclusion of the 2008 MTP in an effort to provide policy and technical approaches to addressing or avoiding impacts to rural resources in the Sacramento region. The project was identified as a mitigation measure for impacts to agricultural lands from the 2008 MTP, as well as a Transportation Control Measure as part of the region's plan to meet federal air quality requirements. RUCS is also part of SACOG's effort to streamline the NEPA environmental review process for transportation projects. The region's approach to urban growth, as laid out in the MTP/SCS, minimizes the amount of open land that will be needed to accommodate growth through the planning horizon. This result is important for balancing the needs for future growth while also conserving open space resources that provide economic and environmental benefit for rural areas and for the entire region. Through the RUCS project, SACOG has developed a more holistic approach to this balanced solution by looking in detail at the rural challenges and opportunities to protecting and promoting economic and environmental sustainability. In the same way that

Blueprint is seen as an economic development and environmental sustainability strategy for urban areas, the RUCS project is an economic and environmental sustainability strategy for rural areas. The RUCS project is an integral piece of the MTP/SCS and a strategy for the region's success.

This chapter is divided into three sections. The first provides information and issues that relate to the RUCS project, including why and how agriculture and farmland, habitat and other natural resources, and water are integral to the plan. The second, air quality and health, looks at the different ways the impacts on the regional community are considered in the development of the MTP/SCS. The third and final section, climate change, addresses how the climate is affected by land use and transportation choices and what the MTP/SCS does to minimize these impacts. Each of these sections will discuss the research and analysis that was carried out in order to inform the development of the MTP/SCS, as well as the effect of the plan on these issues. SACOG considered these issues as key factors in creating not only a successful MTP/SCS, but a vibrant region.

## Rural-Urban Connections Strategy, Natural Resources and Farmland

The MTP/SCS land use forecast and transportation system attempt to minimize negative impacts on various natural and manmade resources, building on local policies and strategies related to conservation and protection of these resources. There is acknowledgement around the region of the need to maintain a balance between the need to urbanize and the need to conserve rural lands and their uses. The two competing pressures exist in the interest of economic sustainability. RUCS, an implementing activity of the MTP/SCS, provides additional information and a powerful set of analytical tools to the region's local governments and stakeholders engaged in this important discussion. This section will reference much of the RUCS project work to discuss environmental sustainability relating to agriculture and farmland, infrastructure, recreation and open space, habitat and natural resources, water resources, and flood control. For more information on the RUCS project, including work completed to date, see Appendix E-2—Rural-Urban Connections Strategy.

### An Overview of the Rural-Urban Connection

Although most of the Sacramento region's 2.3 million residents live and work in urban areas, the region spans an extraordinary range of landscapes. From the Sierra forests to fields that feed the world, our region enjoys remarkably diverse lands and natural resources. Across the six counties of El Dorado, Placer, Sacramento, Sutter, Yolo and Yuba, approximately 85 percent of the lands are agricultural, forest, or other open space. The contributions of farms and open spaces are vital to the success of the entire region. This section explores these various landscapes in terms of what they mean to the region, how they fit within the framework of the MTP/SCS, and what impact the plan has on these resources.

Although RUCS began at SACOG, farmers, ranchers, agricultural researchers, farm bureaus, local, state, and federal officials, distributors, chefs and many other stakeholders have made the project possible. RUCS outreach and research is organized by five broad topic areas, including: land use and conservation, infrastructure, economic opportunities, forest management, and regulations. SACOG gathered data and conducted research for each topic area collaboratively and with input from local agriculture, planning, economic development, and environmental representatives to help the region better understand the unique issues in rural areas. SACOG conducted stakeholder workshops to vet research and findings on each of the topics and to develop innovations that help address challenges and promote opportunities for rural economic viability and environmental sustainability. At the same time, the SACOG

board participated in a series of agriculture field trips to learn about the opportunities and challenges facing the agricultural economy in different parts of the region.

The RUCS effort has drawn from land use, agriculture and open space elements of county general plans, and from existing open space and habitat planning initiatives, to address land use issues that are critical to conserving and enhancing rural resource lands. SACOG reviewed these plans to understand the existing policies that conserve land and promote agricultural viability and habitat quality. This work helped SACOG forecast development in the MTP/SCS. Coupled with technical work, SACOG and its partners have a richer understanding of current challenges and opportunities for enhancing rural economic viability and environmental sustainability.

### Agriculture/Farmland

Agriculture has deep roots in our region's history and future. The Sacramento region has some of the most productive farmland in the world. While agriculture is a \$1.66 billion industry in the Sacramento region, there is more that we get from agriculture than revenue. These areas provide benefits such as habitat, flood control, groundwater recharge, carbon sequestration, and energy production. Loss of these lands for agricultural purposes not only has an economic impact, but also environmental and social impacts.

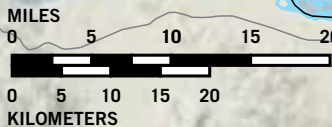
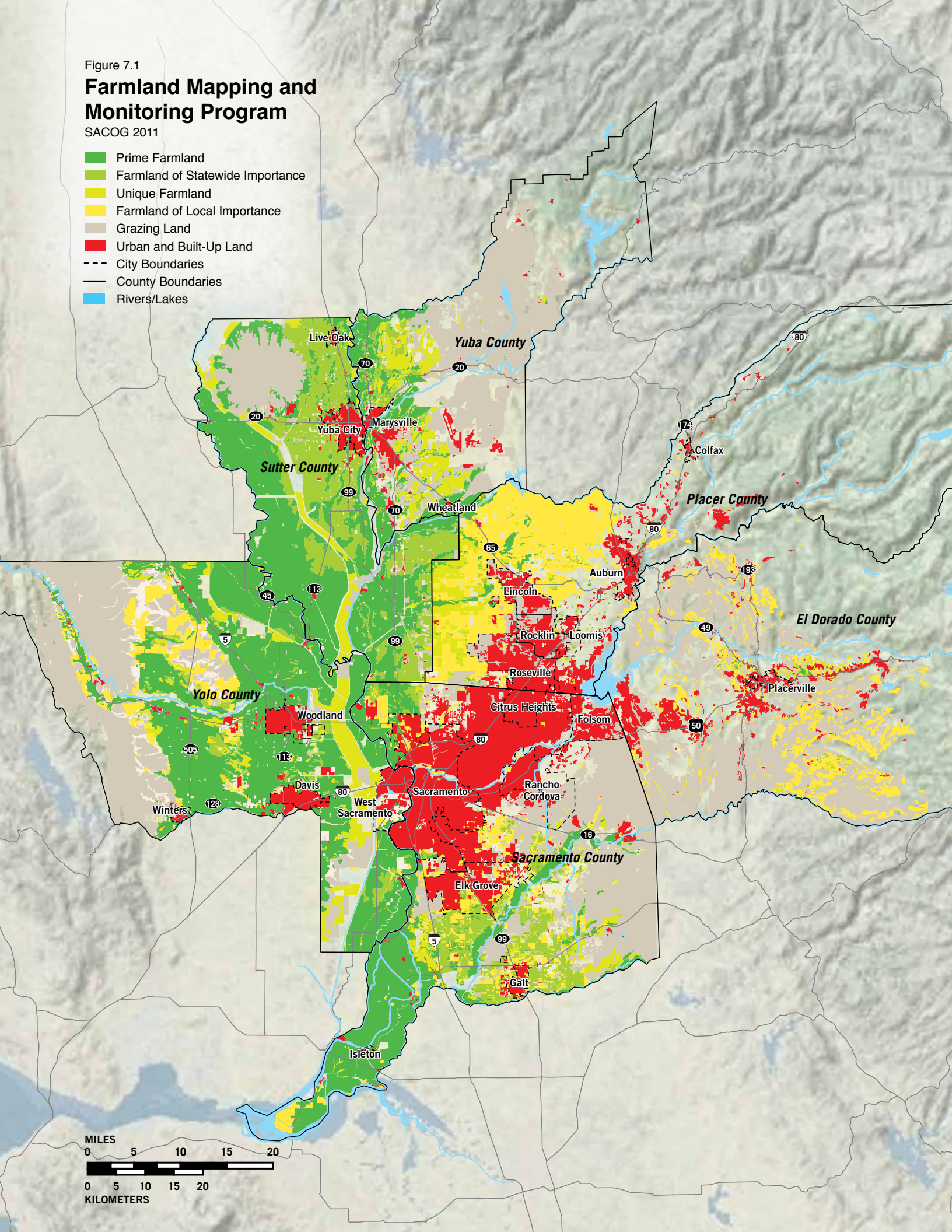
In developing the MTP/SCS land use forecast and transportation system, SACOG relied on its RUCS research and the policies of local governments to develop urbanization assumptions based on the most recent information available. Local land use policies related to agricultural protection and preservation were of particular importance in this effort.

Figure 7.1

# Farmland Mapping and Monitoring Program

SACOG 2011

- Prime Farmland
- Farmland of Statewide Importance
- Unique Farmland
- Farmland of Local Importance
- Grazing Land
- Urban and Built-Up Land
- City Boundaries
- County Boundaries
- Rivers/Lakes



The California Department of Conservation maps farmland throughout California under the Farmland Mapping and Monitoring Program (FMMP). Figure 7.1 shows a 2008 FMMP map of these farmlands in the MTP/SCS plan area. An acreage summary of the FMMP mapping categories

is presented in Table 7.1. Most of the land located west of the Sierra Nevada foothills and east of the Capay Hills is classified, under the FMMP, as Important Farmland (i.e., Prime Farmland, Farmland of Statewide Importance, Unique Farmland, or Farmland of Local Importance).

**Table 7.1**  
**Acreage Summary of Farmland Mapping and Monitoring Program Mapping Categories in the SACOG Region**

	El Dorado	Placer	Sacramento	Sutter	Yolo	Yuba	Region
Prime Farmland	770	7,921	104,282	165,319	255,074	41,325	574,690
Farmland of Statewide Importance	922	4,868	49,436	106,565	16,789	10,973	189,552
Unique Farmland	3,765	20,188	15,432	19,079	45,727	32,586	136,778
Farmland of Local Importance	59,669	100,832	43,819	3	60,323	4	264,651
Grazing Land	194,324	24,398	156,559	52,532	157,880	141,597	727,290
All Farmland	259,450	158,207	369,529	343,498	535,793	226,485	1,892,961
Urban and Built-Up Land	32,165	58,623	177,915	13,226	30,194	13,667	325,789
Other Land	237,414	188,997	70,763	30,608	79,127	164,821	771,730
Water	6,881	4,559	17,558	2,037	7,581	6,653	45,268
Non-Farmland	276,460	252,178	266,236	45,870	116,902	185,141	1,142,788
Total Area Surveyed <sup>1</sup>	535,910	410,386	635,765	389,368	652,695	411,626	3,035,749

<sup>1</sup> Approximately one million acres of land within the Proposed MTP/SCS plan area in eastern Placer and El Dorado counties were not surveyed. The survey area excludes most of the Sierra Nevada, as well as desert and forested parts of California that are less likely to have productive farmland. Some of these locations may be added in the future, while most areas identified as Local, State, and Federal Owned Land will not be added. Some small areas of public land are included in the survey area, generally as 'Other Land'. See California Farmland Conversion Report 2006–2008, pg. 5 (California Department of Conservation, 2011).

Source: California Department of Conservation, 2011. California Farmland Conversion Report 2006–2008.

As the table shows, Important Farmland is particularly prevalent in the counties of Sacramento, Sutter and Yolo, due to the fertile soils and flat topography of these valley counties. Western Yolo County, the eastern third of Sacramento County, the Sutter Buttes region in Sutter County, and the foothill regions of El Dorado, Placer and Yuba counties are predominantly classified as grazing land. Although El Dorado, Placer and Yuba counties contain less Important Farmland, these counties contain significant Grazing Land and Other Land. According to FMMP data, only 10 percent of the region is currently urbanized. The abundance of agriculture and farmland in the plan area is important to the region for economic, social and environmental reasons, but also to the rest of world. These lands are some of the most productive farmlands in the nation and provide food for the world.

From 1988 to 2005, a period of 17 years, the region grew by approximately 657,000 people. In that same time, approximately 200,000 acres of farmland were converted to urban and rural development (over 5 percent of the total farmland, much of which was higher-quality farmland). This is the impact the update of the MTP strives to minimize. For a longer planning period of 27 years (2008–2035), and an additional 871,000 people, this MTP/SCS forecasts the conversion of 36,396 acres of farmland by 2035. And, as Table 7.2 shows, less than half of that impact comes from Protected Farmland. This significantly lower rate of conversion is due largely to local and regional efforts to balance urban expansion with the protection of economically viable farmland.

**Table 7.2**  
**MTP/SCS Land Use and Transportation Impacts to Farmland Mapping and Monitoring Program Protected Farmland**

	Acres of Impact			
	Prime Farmland	Unique Farmland	Farmland of Statewide Importance	Total Protected Farmland
Land Use Growth Footprint	3,315	903	3,940	8,158
Transportation Projects <sup>1</sup>	733	139	631	1,503

<sup>1</sup> Transportation projects considered for this analysis include new roadways, new light rail routes and roadway widenings. Other transportation projects occur within existing rights-of-ways. Acres of impact were calculated by measuring a 100-foot buffer from road/rail centerline. Impacts in this table are therefore, high estimates of impact.

Source: California Department of Conservation, 2011; SACOG, 2011.

This decrease in the impact to farmland from the MTP/SCS is important as the viability of the agriculture industry is correlated with the amount of land in production and the type of production. Limited farmland conversion can help to maintain the approximately \$3.3 billion economic output related to agriculture in the Sacramento region, and protect employment of over 21,000 people in the agricultural industry, ranging from laborers that help farmers plant and harvest their crops to financial, legal and other professional services that support the industry. This information from the RUCS project and how it is integrated into the plan does two things for the region. First, it shows that these resources provide a substantial and stable source of economic activity. Second, it provides invaluable information about rural lands to inform the long range planning efforts taking place throughout the region at the local level.

The Williamson Act is another mechanism that affects the viability of farmland. Enacted in 1965, the Williamson Act allows farmland owners to enter into contract with a county to keep land in agricultural use over a ten-year period in return for a lower property tax rate based on agricultural production value rather than potential urban development value. This prevents or postpones conversion of farmlands to urban uses when landowners want to keep farming. Table 7.3 shows the amount of agricultural lands under Williamson Act contract in each of the Sacramento region's six counties.

**Table 7.3**  
**Williamson Act Lands within the SACOG Region as of 2009**

	Prime	Nonprime	Total	Percent
El Dorado	2,315	31,800	34,115	5%
Placer	15,470	26,169	41,639	6%
Sacramento	87,617	93,554	181,171	24%
Sutter	51,408	13,165	64,573	9%
Yolo	244,050	174,477	418,527	57%
Yuba <sup>1</sup>	0	0	0	0%
<b>SACOG Region</b>	<b>400,860</b>	<b>339,165</b>	<b>740,025</b>	<b>100%</b>

<sup>1</sup> Yuba County does not participate in the Williamson Act program.

Source: California Department of Conservation, 2010. The California Land Conservation (Williamson) Act Status Report 2010.

As of 2009, the Sacramento region contained a total of 740,025 acres of land contracted under the Williamson Act. Of those acres, over 400,000 acres were prime farmland and about 339,000 acres were nonprime. More than 50 percent of both prime and nonprime lands under contract are located in Yolo County. Just under one quarter of all contract acres are located in Sacramento County. Though state subventions to backfill lost property tax revenue have been eliminated, the program is still embraced by participating counties in the region and remains an important part of their farmland conservation strategies. That said, a landowner may cancel or non-renew a Williamson Act contract at any point. As of 2009, 36,024 acres were in non-renewal. Nevertheless, of the 740,025 acres under Williamson Act contract in 2009, only 965 acres, (0.1 percent of contract acres) are impacted by the MTP/SCS.

One of the key land use issues studied in the RUCS project is addressing the conflict between urban and rural uses at the interface of these two land uses. Analysis of historical cropping patterns shows that rates of fallowing triple at hard edges (i.e., where there is a clear line between urban and rural) and quadruple at soft edges (i.e., where there is a gradual transition from urban to rural) at the urban edge due to conflicts and speculation about urbanization. These empirical data highlight how important it is to manage both sides of this edge as urban and rural uses transition to the other. Conflicts from rural uses for people in adjacent urban areas can include spraying, noise, odor and dust. Conflict from urban areas for people in adjacent rural areas can include traffic, theft, vandalism, and loose pets. These conflicts complicate production practices and often limit what a farmer can grow. Policy responses such as agriculture and open space designations, growth boundaries, buffers, right-to-farm ordinances, rural housing restrictions, and land conservation can be effective, particularly when bundled to address specific issues in a particular area. The RUCS

project has helped the region understand that there are no one-size-fits-all solutions, as demonstrated by the unique land management and conservation approach in each county (Appendix E-2—Rural-Urban Connections Strategy).

While there are dozens of general plan designations for urban uses, the diverse types of agriculture—from rice fields to peach orchards to diversified farms—are all labeled agriculture. This simplified view makes it hard for policy makers and economic development agencies to help growers, processors or distributors. In an effort to have a more detailed understanding of our agriculture and forest lands, crop data were collected at the field level across more than 2 million acres of farmland as part of the RUCS project. The culmination of this work characterizes crops not as one single use, but as 33 distinct landscape types. Each landscape type is backed by input cost, yield, price, and other factors such as habitat. The data are used in models developed for the RUCS project that can show how changing crop patterns, market conditions and policy and business decisions may affect the viability of agriculture. The specific outputs include: yield and value of production, demand for inputs (e.g., labor, water, fuel, seed, trucking), and net returns.

This analysis capability gives the region a robust set of data, including what crops are on the ground today and which of those are most impacted by the MTP/SCS development. These data have been used to inform issues related to water, safety on rural roads, and the interface of rural and urban traffic with additional development. This can all help decision makers craft better policies and plans, help agricultural businesses make operational decisions, and help the public understand the trade-offs that affect rural economies.

Complementary to conserving open land is supporting the economic activities on that land. In some cases, open lands become urbanized when property owners cannot



earn a living on their land. Once lost to development or other uses, that land cannot provide food or environmental services (e.g., habitat, flood control, groundwater recharge, carbon sequestration and energy production). There are increasing opportunities in agriculture: increasing demand for food internationally, increasing regional demand for locally produced food, state mandates for alternative energy production, and the potential for GHG emissions offsets. These opportunities offer the potential for regional economic growth, and to support an industry that manages our rural lands to provide not only food and energy, but also all the other environmental services noted above that contribute to the region's sustainability.

The cornerstone of the RUCS project is to understand what factors affect profitability and to find ways to enhance the economic viability of rural lands. SACOG uses this information to create scenarios to evaluate how production practices, market fluctuations and global events will affect growers' economic viability. SACOG adapted its land use planning tools developed in the Blueprint process—initially designed to analyze urban development scenarios—to analyze agriculture scenarios. This, along with an econometric model and other tools, help analyze various possible future scenarios for agriculture. For instance, the models can simulate how worldwide events such as droughts and resulting higher grain prices can have direct impacts on farmers in the Sacramento region. Another example is testing how rising oil prices will impact fuel and fertilizer costs, thereby affecting viability and decisions to plant or leave a field fallow. Other factors can be tested including changes in labor costs or water supplies and cost. The models can also test market conditions, by exploring how changes to business practices or commodity prices will affect agricultural viability and following. Farmers in our region are major players in the national and world economies. Their economic livelihood depends on being able to quickly and successfully adapt to events and trends they cannot control. The RUCS analytical tools will help them do that, and help the public agencies in the region understand what they can do to help. Appendix E-2 provides a more detailed discussion of the tools used in the RUCS project.

SACOG's tools are designed to work at all scales of analysis. At a macro scale, these tools can help the region understand what factors affect agricultural viability and possible policies or economic development strategies that could support the industry. For example, results that show where and how much labor is needed for crops in the region can help decision makers identify where housing and transportation services for agricultural workers would be best located. Trucking demand results will help the region identify key farm-to-market routes and where road improvements could help support the industry. At a micro scale, using SACOG's tools, a farmer could estimate return on investment by adjusting production variables and identifying those that most impact farming operations.

### **The Infrastructure of Agriculture**

In many rural parts of the region, agriculture and other open space uses share roadways with rural housing development. SACOG's transportation modeling shows that on average, rural residential residents (living on one to ten acres) travel an average of 80 miles per household per day, compared to an average of 30 vehicle miles traveled per household in urban areas. This creates traffic and safety issues in our rural areas. Rural economic development and agritourism objectives can sometimes exacerbate this conflict by bringing more trips onto rural roads. Rural commuting is discussed in more detail in Chapter 9—Economic Vitality.

The issues caused by the average daily miles driven in rural areas are compounded by the incoming farmworker traffic to these areas. A lack of farmworker housing not only challenges labor supply, but also may contribute to traffic impacts as workers drive or are transported sometimes long distances. And in some areas, available farmworker housing is generally far from retail, medical and other services, creating another source of traffic on rural roadways. The MTP/SCS land use pattern forecasts no new development within agricultural areas and only a small amount in rural areas—approximately 5,000 housing units between 2008 and 2035. This level of growth helps to address the concern of longer daily driving by offering some additional housing potential near agriculture related jobs, yet does not add much additional burden to rural roads. Chapter 3 provides more discussion on the land uses associated with the MTP/SCS.

In addition to addressing these issues through changes in land use, transportation investments made in the MTP/SCS help to improve travel in rural areas as well. The MTP/SCS invests \$6.8 billion on local roadway improvements. One targeted area is for operational improvements in rural and small communities. This includes safety improvements along farm-to-market routes and corridors along the rural-urban edge. Chapter 4 details the various transportation investments made in the MTP/SCS.

Beyond road investments, SACOG is beginning to look at other infrastructure needed to support agriculture. Aggregation, distribution, processing, and storage facilities are an important part of the agriculture infrastructure. However, the region has experienced a number of facility closures. Many economic factors—some of them international—contribute to these closures. Trucking products to facilities outside of the region increases vehicle miles of travel, emissions, transport costs, and potentially reduces product quality and therefore price. In some cases, the loss of a facility causes farmers to cease growing a particular crop altogether. Such closures also eliminate direct and indirect processing jobs, as well as the economic multiplier associated with those jobs and the facility. As local markets take hold in the region, advocates have identified local food system infrastructure as a necessity to scale up the system for

larger customers of local food, particularly institutions which often need pre-cut and processed food for their services. It takes a complex distribution system to move food from fields to consumers. Food distribution centers can provide a valuable connection between local producers and local wholesale, retail, food service, institutional and other food outlets—while relieving producers of the responsibility of aggregating, marketing, and distributing product. Distribution centers could also decrease vehicle miles traveled by growers who currently deliver to multiple sites, leaving more time for farming. State grant funding is enabling SACOG to analyze how to establish food system infrastructure in the region to support both production and local agriculture for markets outside and within the region.

### **Recreation and Open Space**

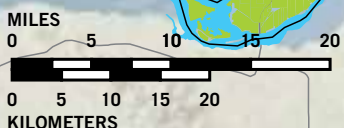
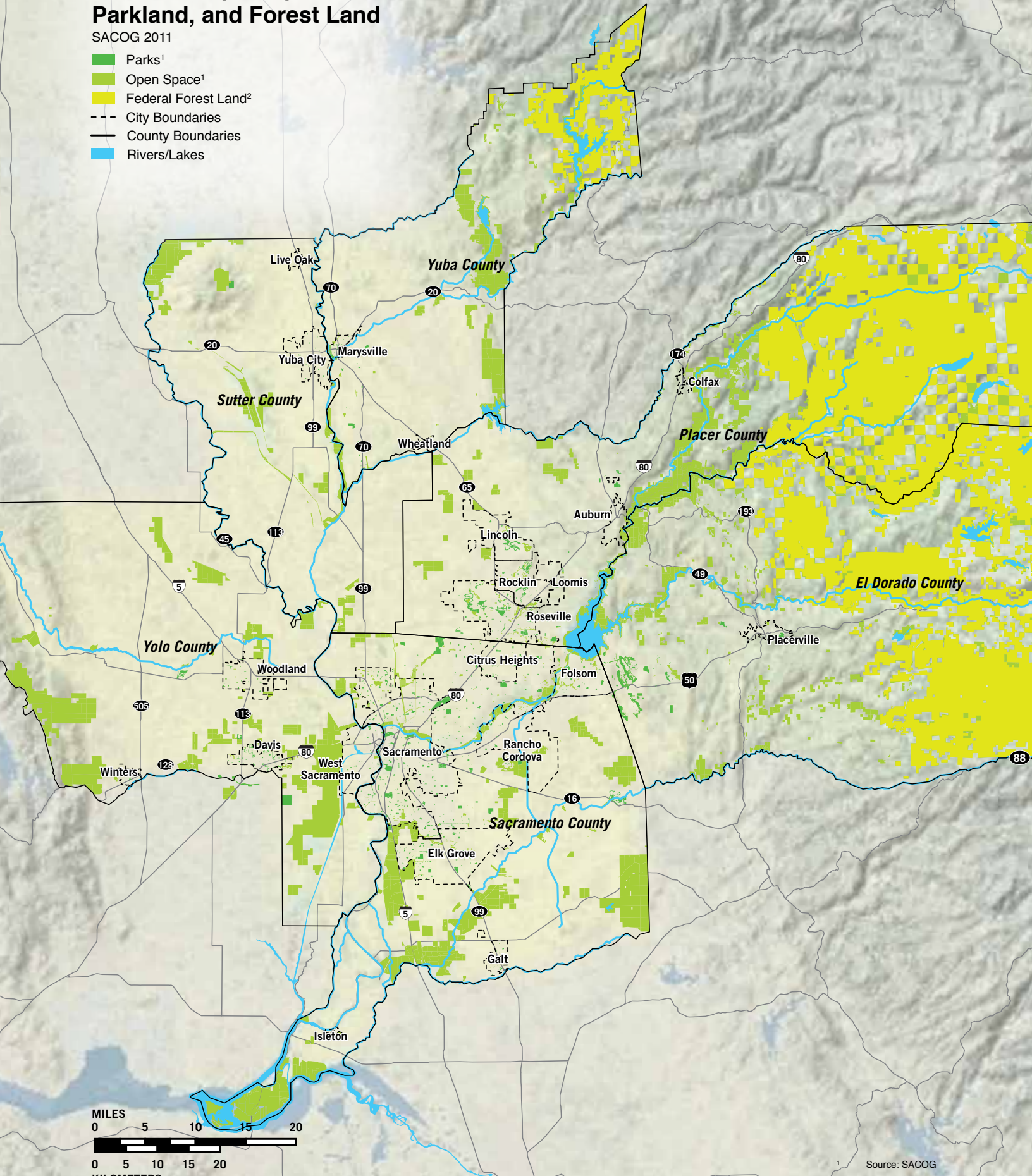
Beyond agriculture, open space includes forestry, parks, trails and wildlife areas that not only provide habitat, but also support recreational activities, educational opportunities and the connection between built and natural environments. Public parks, trails and wildlife preserves are the dominant means by which people connect with nature. This green infrastructure is part of the natural heritage and presents opportunities to understand how it relates to the built environment. Private assets, such as the Nature Conservancy's Cosumnes River Preserve, add to the inventory of public recreational and wildlife areas that are part of the region's rural fabric. As conservation plans throughout the region are completed, this inventory will include lands that are set aside as part of those efforts. SACOG's inventory of these lands is continually updated and currently accounts for roughly 252,000 acres of parks and conservation lands, including 42,000 acres in urban areas (Table 7.4). The data are derived from the California Protected Areas Database and discussions with our member agencies, and are taken into consideration when identifying areas where future growth may occur. For example, when the SCS was developed as part of the MTP, a geographic boundary of various open space lands was used to limit the growth that could occur in an area.

Figure 7.2

# Plan Area Open Space, Parkland, and Forest Land

SACOG 2011

- Parks<sup>1</sup>
- Open Space<sup>1</sup>
- Federal Forest Land<sup>2</sup>
- City Boundaries
- County Boundaries
- Rivers/Lakes



<sup>1</sup> Source: SACOG  
<sup>2</sup> Source: <http://www.fs.fed.us/r5>

**Table 7.4**  
**Acres In Open Space Land by County**

County	Acres	Urban Open Space <sup>2</sup>	Outside Urban Areas
El Dorado <sup>1</sup>	34,639	137	
Placer <sup>1</sup>	78,787	10,696	
Sacramento	44,085	27,625	
Sutter	12,571	174	
Yolo	77,027	3,375	
Yuba	4,930	372	
<b>Total</b>	<b>252,039</b>	<b>42,378</b>	<b>209,661</b>

<sup>1</sup> Does not include Tahoe Basin.

<sup>2</sup> Open space includes parks, open space, habitat, easements, any open land that is not agricultural and not forest.

Source: SACOG, September 2011.

### Habitat and Natural Resources

According to federal and state requirements, every land development and transportation project must mitigate, or compensate for, the effects on sensitive habitat and open space. In response to the mandate to conserve natural resources in a more systematic manner, several jurisdictions in the region have been developing Habitat Conservation Plans (HCPs) and Natural Communities Conservation Plans (NCCPs). This section provides a summary of the status of habitat conservation plans (HCPs) and natural community conservation plans (NCCPs) in the region, although not all of these plans have been adopted or fully implemented. These plans include: the South Sacramento HCP, Natomas Basin HCP, Yuba/Sutter NCCP/HCP, Yolo County NCCP/HCP, Placer County Conservation Plan, and the El Dorado County Integrated Natural Resource Management Plan. The boundaries of each of these plans are depicted in Figure 7.3.

During implementation of specific projects, an activity subject to Section 10 of the Endangered Species Act (ESA) and considered a covered project under the implementing rules of an adopted HCP or NCCP may be able to participate in the plan. To the extent possible, SACOG works with federal agencies, regional partners, and local jurisdictions regarding proposed development in areas containing federally or state protected natural resources. SACOG gathers and considers information on the timing of any applicable permits and their relationship to HCP and NCCP planning efforts to feed into phasing assumptions for the MTP/SCS land use forecast. Given available data, mapping and HCP and/or NCCP status, SACOG considers impacts on or conservation of areas that have biological resources and/or provide habitat for species covered by the federal and state ESA and the Native Plant Protection Act.

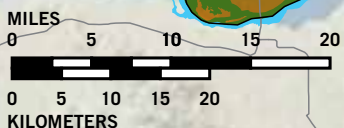
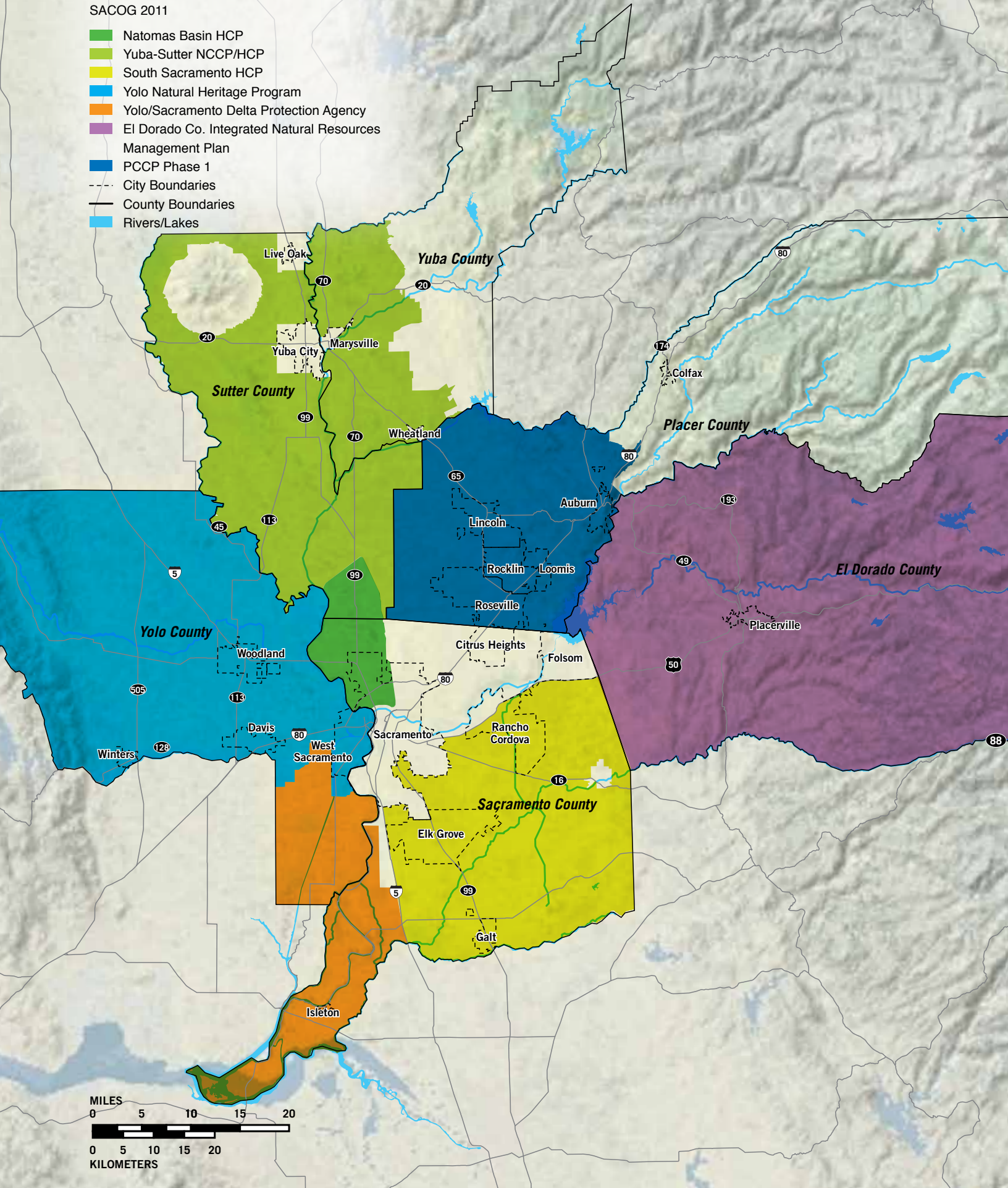
The ultimate resolution of the many on-going natural resources planning efforts will have a major influence on future growth patterns in the region. The land use forecast in this MTP/SCS considered the uncertainties associated with these on-going efforts throughout the region. The progress of these planning initiatives will be carefully monitored and it is expected that once the HCPs/NCCPs are adopted and being implemented that their provisions will have a significant influence on the land use forecasts in future MTPs/SCSs.

Figure 7.3

# HCP/NCCP Boundaries

SACOG 2011

- Natomas Basin HCP
- Yuba-Sutter NCCP/HCP
- South Sacramento HCP
- Yolo Natural Heritage Program
- Yolo/Sacramento Delta Protection Agency
- El Dorado Co. Integrated Natural Resources Management Plan
- PCCP Phase 1
- - - City Boundaries
- County Boundaries
- Rivers/Lakes



### South Sacramento Habitat Conservation Plan

The South Sacramento Habitat Conservation Plan (SSHCP) is currently in preparation. The SSHCP area encompasses 345,000 acres in southern Sacramento County. The SSHCP will consolidate environmental efforts to protect and enhance wetlands (primarily vernal pools) and upland habitats to provide ecologically viable conservation areas. It will also minimize regulatory hurdles and streamline the permitting process for development projects. The SSHCP is planned to cover 40 different species of plants and wildlife including ten that are state or federally listed as threatened or endangered. The SSHCP will be an agreement between state/federal wildlife and wetland regulators and local jurisdictions, which will allow land owners to engage in the incidental take of listed species (i.e., to destroy or degrade habitat) in return for conservation commitments from local jurisdictions. The options for securing these commitments are currently being developed and will be identified prior to the adoption of the SSHCP. The geographic scope of the SSHCP includes U.S. 50 to the north, Interstate 5 to the west, the Sacramento County line with El Dorado and Amador counties to the east, and San Joaquin County to the south. The Study Area excludes the City of Sacramento, the City of Folsom and Folsom's Sphere of Influence, the Sacramento-San Joaquin Delta, and the Sacramento County community of Rancho Murieta. Sacramento County is partnering with the incorporated cities of Rancho Cordova, Galt, and Elk Grove as well as the Sacramento Regional County Sanitation District and Sacramento County Water Agency to further advance the regional planning goals of the SSHCP.

### Natomas Basin Habitat Conservation Plan

The Natomas Basin HCP (NBHCP) was approved in 2003 and has two permit holders: the City of Sacramento and Sutter County. The Natomas Basin is a low-lying, 53,537-acre area of the Sacramento Valley located in the northern portion of Sacramento County and the southern portion of Sutter County. The Natomas Basin Conservancy (TNBC) is the nonprofit entity responsible for administering and implementing the NBHCP. TNBC reports directly to the permit holders. The HCP covers 22 sensitive species.

### Yuba-Sutter Natural Community Conservation Plan/Habitat Conservation Plan

The Yuba-Sutter NCCP/HCP is intended to provide an effective framework to protect and enhance agricultural and natural resources in Yuba and Sutter counties, while improving and streamlining the environmental permitting process for impacts on threatened and endangered species. The Yuba-Sutter NCCP/HCP will allow Yuba and Sutter counties, the cities of Wheatland, Yuba City, and Live Oak, and the Plan Implementing Entity to control threatened and endangered species permitting for activities and projects in specifically defined areas of the counties, encompassing approximately 440,000 acres. This NCCP/HCP will also

serve to provide comprehensive species and ecosystem conservation and contribute to the recovery of threatened and endangered species in northern California. The Yuba-Sutter NCCP/HCP is planned to provide coverage for 17 species including 14 wildlife species and 3 plant species. The plan is currently under development with public drafts anticipated in mid-2012 and completion in 2013.

### Yolo County Natural Community Conservation Plan/Habitat Conservation Plan

The Yolo County NCCP/HCP is currently in preparation. In February 2005, the Joint Powers Authority (five local public agencies formed to prepare a regional conservation plan for Yolo County) and the state Department of Fish and Game (DFG) entered into an NCCP/HCP Planning Agreement, now known as the Yolo Natural Heritage Program. The independent science advisor's report was finalized in March 2006. The NCCP/HCP planning area encompasses almost 400,000 acres and is planned to provide habitat for 28 sensitive species, including 13 state- and federally listed species (no fish species are covered).

### Placer County Conservation Plan

Placer County, DFG, and U.S. Fish and Wildlife Service finalized an NCCP planning agreement in December 2001. The Placer County Conservation Plan (PCCP) is being prepared in three phases. Phase 1 is currently underway and covers 273,983 acres of the valley floor and low foothill portions of Placer County. Five plant and 28 wildlife species are proposed for coverage. The county is working to establish a process to review and evaluate interim projects in order to avoid foreclosing conservation options and receipt of desired permits.

### El Dorado County Integrated Natural Resources Management Plan

El Dorado County General Plan Policy 7.4.2.8 and Implementation Measure CO-M direct the County to prepare and adopt an Integrated Natural Resources Management Plan (INRMP) to offset the impacts of loss and fragmentation of wildlife habitat from development authorized under the 2004 General Plan. In May, 2009, the county split the process of developing the INRMP into two phases. The first, an information gathering, mapping, and development of options process, was completed in April, 2011 with the submittal of the Options Report. Phase 1 also included a Habitat Inventory, developed a list of indicator species for monitoring purposes, evaluated wildlife movement corridors and constraints, and developed a discussion of alternatives approaches for development of the habitat protection strategy. Phase 2 is the development of the plan itself. This includes identification of the mitigation program, development of a funding mechanism, management strategies, and monitoring. The county is preparing a request for proposal to solicit bids from qualified firms to complete Phase 2 during 2012–13. Phase 2 will include CEQA analysis of the proposed plan.

### Habitat and Agriculture

The relationship between habitat conservation and agricultural land can cut two ways. Parts of the region are experiencing a conversion of agricultural land to habitat preservation for development mitigation purposes, which can have the effect of removing land from agricultural use (and into habitat conservation) and sometimes creates difficulties for adjacent agricultural lands with the invasion of weeds, rodents, birds, and waterfowl. However, there can also be working relationships between the two land uses in which both needs can be met. Some examples include, but are not limited to: alfalfa is good foraging habitat for the Swainson's Hawk, while grazing helps keep non-native grasses in check and helps vernal pools function.

Yolo, Sacramento, and Placer counties are addressing this and planning for these working relationships in their habitat conservation plans (HCPs). Sutter and Yuba counties have begun developing a joint HCP that will also address these issues. Yolo and Sacramento county staffs indicate that some components of their HCPs will be dependent on agricultural land preservation for implementation; in Sacramento County as much as 90 percent is dependent on agriculture. Yolo County's General Plan includes Policy CO-1.17, which would allow out-of-county mitigation easements in Yolo County provided several criteria are met, including requirements that existing agricultural operations continue to be farmed for commercial gain and mandatory wildlife-friendly strategies and practices are followed. These issues highlight the struggles realized in agricultural and conservation lands. The pressures from development in many ways are mirrored by pressures from other non-urbanized lands.

In addition to their mitigation requirements for habitat lands, Yolo and El Dorado counties have mitigation policies specifically addressing the loss of agricultural land. Yolo County, for example, adopted an agricultural mitigation ordinance which requires all projects that result in a permanent loss of either farmland and/or habitat to mitigate an equal amount of land. Agricultural and habitat easements may not be stacked within the same property, and must be mitigated separately. The ordinance requires that agricultural conservation easements be located within two miles of the development that is being mitigated. The purpose of this is to give first protection priority to lands close to urban areas, which in Yolo County are viewed as higher risk for conversion to urban uses. Within Yolo County, the cities of Woodland and Davis also have agricultural mitigation requirements. The Yolo County Local Agency Formation Commission also requires agricultural mitigation (in lieu of an existing city requirement) when agricultural land is lost as a result of annexation.

Additional information about the biological and hydrological conditions in the plan area is included in Appendix E-4—Natural Resources Data.

Conservation and preservation efforts around the region and the processes described in this section have been considered in the development of this MTP/SCS. SACOG has coordinated closely with local cities and counties to ensure that the MTP/SCS land use pattern does not contradict or undermine efforts related to conservation at the local level. SACOG has made efforts to support this work at the local level, providing assistance at many levels when appropriate or needed. When these plans are finally adopted, they will be fully referenced in future MTP/SCS growth strategies.

The MTP/SCS includes a land use pattern and supporting transportation system that, while it impacts natural resources, is consistent with the locations identified for development in draft HCPs/NCCPs. Furthermore, new development areas were assessed for their federal and state permit status. Table 7.5 illustrates the impact of the MTP/SCS on natural resources by habitat/land cover type. The 37,681 acres of land use and transportation impact represent 1 percent of the 2,543,519 acres of habitat and land cover in the region today.

**Table 7.5**  
**MTP/SCS Land Use and Transportation**  
**Impacts to Wildland Habitat**

Wildland Habitat/ Land Cover	Land Use Impacts	Transportation Impacts
Barren	215	17
Chaparral	1,208	19
Foothill Woodland	5,243	255
Grassland	20,133	3,148
Montane Forest	4,016	85
Open Water	345	13
Riparian	1,026	212
Riverine	46	28
Sagebrush Scrub	24	0
Valley Oak Savanna	866	32
Valley Oak Woodland	217	22
Wetland	421	90
Wildlands Total	33,760	3,921

Source: Yuba-Sutter HCP/NCCP, South Sacramento HCP/NCCP, Placer County Conservation Plan, Yolo HCP/HCCP, California Vegetation Maps for Northern Sierra and Central Valley ecological zone.

### Six-County Aquatic Resources Inventory

In 2009, the U.S. Army Corps of Engineers (USACE), made an investment of just over \$1,000,000 to inventory all waters within the six-county SACOG region. The request for this funding came not only from within USACE, but with the strong support of SACOG. The intended outcome of this investment from SACOG's perspective is to utilize the inventory (under review for a mid-2012 release) to prioritize areas of natural significance and streamline 404 permitting particularly in accordance with Blueprint and smart growth development. Additionally, SACOG has been and will remain engaged in ensuring that the inventory continues in its development of utility via coordination amongst its members in addition to facilitating coordination for the Corps of Engineers and their regulatory partners at both the federal and state levels. The inventory data are not yet available for use and are not expected to be available until mid- to late 2012. The data will be useful to member jurisdictions, and will be available for use in the next MTP/SCS update.

### Water Resources

The balance between urban and rural land use and the management of those lands has a direct impact on the use and management of our water resources. Management of these resources are not only mandated by state and federal law, but critical to the sustainability of the region. In terms of water, the Sacramento region is positioned between a Sierra snowpack, the source of most of our surface water supply and which climate models predict will diminish in the future, and the Sacramento-San Joaquin Delta, which is in need of more fresh water from this region and beyond to help stabilize the decline of the estuary's ecosystem. Groundwater is plentiful in some areas, but challenged in others. From conservation to stormwater management to water quality, jurisdictions and water purveyors continue to use water management plans to ensure they balance demand and supply. This water balance effort extends to the entire region through Integrated Regional Water Management plans that also address issues such as adequate stream flow for habitat, groundwater recharge and flood control. Whether we are growing buildings or growing crops, water is a key factor that will shape the region's future. This section discusses water-related issues around the region, how they interact with the MTP/SCS, and what impacts development in the plan has on water resources.

Every county has a different profile of water use, but overall approximately 80 percent of developed water supply—water that is diverted from waterways or pumped from aquifers—is used for agriculture and 20 percent is for urban uses. Unlike agriculture's seasonal demand, urban areas need water throughout the year. This increases pressure on groundwater supplies to manage shortages. Despite the ability to pay for water delivery infrastructure in most urban areas, water supply limitations can still hinder urban development plans. Planning and management efforts are critical

to achieving a sustainable water balance throughout the region. When development occurs, a source of water, and the infrastructure to deliver it, must be identified. SACOG coordinates with local jurisdictions to understand the water supply and infrastructure requirements of proposed development in creating the MTP/SCS land use forecast.

With more demand on water supplies, great efforts are being made to use water more efficiently. Water supply uncertainty is the byproduct of drought, court decisions, legislation, development, and possible climate change impacts. Preparing for the region's future requires strategies that not only secure water supplies, but also use the water that is available in a more efficient manner. This saves water and money, which helps urban and rural users meet their needs and still meet the needs for the environment. Urban Water Management Plans, Agriculture Water Management Plans, and Integrated Regional Water Management Plans—comprehensive, inter-jurisdictional studies of how to manage the supply and use of water for urban and non-urban uses—can improve the efficiency of water use and result in solutions that help all stakeholders. These plans, and efforts such as the Water Forum Agreement, employ best management practices to reduce water use for urban purposes. State-mandated conservation will also drive continued efforts to reduce urban water demand. In agriculture, drip irrigation has been used by farmers for a number of years and saves substantial amounts of water, energy and cost. Irrigation Management Services (IMS) use data collected from soil moisture sensors to customize irrigation schedules based on the crop and soil moisture conditions. These and other conservation efforts help reduce demand and costs and keep as many acres as possible supplied with water.

Often secondary in the thinking of many water planners, water quality regulations actually are a primary factor in how water is managed today and into the future. For urban water purveyors, threats to water quality are of paramount importance with regulatory requirements driving frequent monitoring and testing. Locally, the groundwater contamination from past practices on industrial properties, military bases and even corner gas stations has forced water managers to change sources of water, shut off wells and make significant investments in new infrastructure and treatment. As groundwater is pumped, managers must understand whether their actions exacerbate contamination or help contain it. Once water is used for many of our indoor needs, wastewater treatment plant operators have the task of cleaning the water of human and non-human wastes to meet standards for discharge. Fortunately, SACOG analysis shows that compact growth reduces water demand significantly. During the Blueprint process, SACOG estimated that new growth in the Blueprint would consume 30 percent less water than the Base Case scenario. These results suggest that compact growth will reduce demand for water and impacts on water treatment systems.



### Flood Control

Four counties, Sutter, Yuba, Yolo, and Sacramento, have large floodplains along the Sacramento, Yuba, Feather, and American rivers and their tributaries. Flood control projects—dams and levees—have made it possible in these floodplains to develop not only urban areas, but also agricultural production. Some flood control plans include setting aside farmland to reduce the amount of land needing an urban level of protection in the future and thereby minimizing overall flood risk. Maintenance of many of the levees is the responsibility of reclamation districts, which in rural areas are funded by farm operations and related agricultural businesses. These and other flood management activities protect not only agricultural operations, but also wildlife areas and mitigation lands. Croplands also provide a buffer that helps protect urban areas by slowing flood flows and storing water. This water can recharge groundwater supplies and help minimize land subsidence. While agriculture and open space provide numerous flood benefits, in some cases, levee improvements may impact these lands within the basin being protected when levees are built over farmland. Additionally, farmland may be converted to habitat for required levee mitigation. At the same time, rural communities within the floodplain are prohibited from new construction and infrastructure improvements until they achieve an urban level of flood protection.

The majority of urban development in the SACOG region already exists within a floodplain; to achieve GHG emissions reductions, improve regional air quality, and maintain an efficient transportation system, some of the region's future urbanization will also occur within floodplains. Of the 303,000 new housing units forecasted by the MTP/SCS, 75,655 are expected to be constructed in a 200-year floodplain. The challenge for the region will be to continue balancing the need for flood protection with agricultural and environmental sustainability, and growing needs for providing urban development for a growing population. The timing of this forecasted development has been carefully evaluated to ensure that the additional growth occurs only after levees are projected to be certified by FEMA and consistent with state requirements.

In fact, due to both potential opportunity and conflict, SACOG has been and will remain substantively engaged with the White House Council on Environmental Quality (CEQ) as it updates the Principles and Guidelines for water and land related resources. In 2010, the Obama Administration expanded the scope of the 1983 Principles and Guidelines for Water and Land Related Resources. The first step in this significant process was the release of a draft report that emphasized that water resources projects should maximize sustainable economic development, avoid unwise use of floodplains, and protect and restore natural ecosystems, among other important points. In addition to the Principles and Guidelines, CEQ is also updating the Principles and Standards, the vehicle through which new policy will be implemented via an expanded collective of federal agencies.

SACOG recently updated its levee status report as part of the process of developing the land use plan for the MTP. The purpose of the report was to determine if any potential growth areas in floodplains might be delayed due to levee conditions and the jurisdiction's ability to improve their levees to meet federal and state requirements for flood protection. The report concludes that most growth areas are scheduled for levee upgrades to conclude before 2020. In particular, portions of Yolo County, West Sacramento and Sutter County have levee improvements that may result in delays of growth. This was reflected in the growth assigned to these areas in the MTP/SCS by 2020, and phasing of growth is in line with levee improvement schedules and levees being certified as being able to provide urban level of flood protection by FEMA. Both the levee status report and descriptions of the MTP/SCS 2020 and 2035 land use forecast are in Appendix E-3—Land Use Forecast Background Documentation. SACOG continuously monitors the status of this issue and if the situation changes in any of the areas from what is assumed in this plan, growth assumptions in future updates will be amended accordingly.

SACOG is also participating in the California Emergency Management Agency (Cal EMA) Working Group on Hazard Mitigation Planning to offer regional coordination for the next update of the Cal EMA State Hazard Mitigation Plan. This work is discussed in Chapter 10—Financial Stewardship.

## Air Quality and Health

Air quality is an important part of the MTP/SCS due to the widespread consequences it has for both public health and the environment. With a projected population increase of 871,000 people by 2035, the region must rise to the challenge of meeting and maintaining state and federal health-based air quality standards. Transportation conformity provides the link between air quality and transportation planning; linking State Implementation Plans (SIPs) for air quality and the MTP/SCS. More prescriptively the SIPs in our region provide the strategies that will be used to attain and maintain National Ambient Air Quality Standards (NAAQS); the MTP/SCS through the conformity process determines that our land use and transportation implement this strategy.

### Climate and Topology

The majority of the MTP/SCS plan area is located in the Sacramento Valley Air Basin (SVAB), a basin bounded by the Sierra Nevada Mountain Range to the east and the Coastal Mountain Ranges to the west. Topography in the SVAB is generally flat, with relief anywhere from slightly below sea level near the Sacramento-San Joaquin Delta to over 2,150 feet above sea level at the Sutter Buttes.

Hot dry summers and mild rainy winters characterize the Mediterranean climate of the SVAB. During the year the temperature may range from 20 to 115 degrees Fahrenheit with summer highs usually in the 90s and winter lows occasionally below freezing. Average annual rainfall is about 20 inches, with about 75 percent occurring during the rainy season, generally from November through March. The prevailing winds are moderate in strength and vary from moist clean breezes from the south to dry land flows from the north.

The mountains surrounding the SVAB create a barrier to airflow, which can trap air pollutants when certain meteorological conditions exist. The highest frequency of air stagnation occurs in the autumn and early winter when large high-pressure cells lie over the SVAB. The lack of surface wind during these periods and the reduced vertical flow caused by less surface heating reduces the influx of outside air and allows air pollutants to become concentrated in a stable volume of air. The surface concentrations of pollutants are highest when these conditions are combined with smoke or when temperature inversions trap cool air, fog and pollutants near the ground. The ozone season (May through October) in the SVAB is characterized by stagnant morning air or light winds, with the Delta breeze arriving in the afternoon out of the southwest. In addition, longer daylight hours provide a plentiful amount of sunlight to fuel photochemical reactions between reactive organic gases (ROG) and oxides of nitrogen ( $\text{NO}_x$ ), which result in ozone formation.

As an air basin, air quality in the Sacramento region is impacted not only by pollutants generated within the region, but also by pollutants generated in the San Francisco Bay Area, which are carried into the Sacramento region by Delta breezes. The effect of pollutants transported from the San Francisco Bay Area or from the San Joaquin Valley on air quality in the Sacramento region can vary from substantial to inconsequential on any given day, largely determined by accompanying meteorological conditions. Thus, the success of the Sacramento region in attaining better air quality is partially contingent on the achievement of better air quality in nearby areas that affect Sacramento's air quality.

### Attainment Status in The Region

The Sacramento Air Quality Maintenance Area (AQMA) is comprised of five air districts in the southern portion of the SVAB. Various portions within this area have been classified as either attainment or nonattainment for NAAQS and CAAQS. There are four pollutants monitored in the AQMA, which are ozone, particulate matter with a diameter of less than 10 micrometers ( $\text{PM}_{10}$ ), particulate matter with a diameter of less than 2.5 micrometers ( $\text{PM}_{2.5}$ ), and carbon monoxide (CO); see below for additional detail. The AQMA is in nonattainment status for ozone,  $\text{PM}_{10}$ , and  $\text{PM}_{2.5}$ , and is classified as a maintenance area for CO.

#### Ozone

The Sacramento Metropolitan Area is designated a severe nonattainment area for the eight-hour NAAQS for ozone. The area was previously a serious nonattainment area for ozone until the five local air districts requested to be reclassified as severe-15 in February 2008. The request for a voluntary bump-up in classification was in recognition of the fact that the Sacramento Metropolitan Area must rely on longer-term reduction strategies to meet the ozone attainment goal. The use of longer-term reduction strategies should have lasting effects, though it called for the extension of the original attainment deadline from 2013 to 2018. The nonattainment area for ozone is comprised of Sacramento County, Yolo County, the southern portion of Sutter County, the eastern portion of Solano County, and the portions of El Dorado and Placer counties west of the Tahoe Basin.

Included in the *2009 Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan* were 43 transportation control measures (TCMs) for the Sacramento Region. TCMs are strategies for reducing vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions. SACOG worked with local governments and local air districts to develop the proposed TCMs. TCMs include public transit, carpooling and vanpooling, bicycling and pedestrian enhancement, and land use programs. One of the successful TCMs is The "Spare the Air" program.

A full list of TCMs and the implementation status of these TCMs is available in Appendix F-1—Conformity Determination for the MTP/SCS.

### Carbon Monoxide

The area monitored for carbon monoxide (CO) levels was re-designated as a maintenance area in the California Air Resources Board (ARB) document *1996 Carbon Monoxide Maintenance Plan for 10 Federal Planning Areas*. The area has reduced emissions to acceptable amounts in accordance with the proposed budget of CO emissions as included in the *2004 Amendment to the California State Implementation Plan for Carbon Monoxide*. The maintenance area for CO includes the urbanized portions of Placer, Yolo, and Sacramento counties.

### Particulate Matter 10 (PM<sub>10</sub>)

The United States Environmental Protection Agency (U.S. EPA) designated Sacramento County as a moderate nonattainment area for PM<sub>10</sub> in 1994, though a redesignation request to classify Sacramento County as a maintenance area for PM<sub>10</sub> is pending U.S. EPA approval. The area monitored for PM<sub>10</sub> consists solely of Sacramento County, although the four remaining air districts in the Sacramento region are designated nonattainment for the state AAQS and unclassified/attainment areas for the federal AAQS. Sacramento County attained the PM<sub>10</sub> NAAQS by the attainment deadline of 2000 and has been demonstrating maintenance since then. In recent years there have been no exceedances. On November 18, 2010, the ARB approved the PM<sub>10</sub> Implementation/Maintenance Plan and Redesignation Request for Sacramento County. The plan shows that the 1987 standard for PM<sub>10</sub> was attained and establishes the strategy for maintaining the standard through 2022. U.S. EPA has yet to act on the redesignation request to classify Sacramento County as a maintenance area for PM<sub>10</sub>.

### Particulate Matter 2.5 (PM<sub>2.5</sub>)

The third nonattainment designation within the AQMA is for PM<sub>2.5</sub>. U.S. EPA changed the 24-hour standard for PM<sub>2.5</sub> from 65µg/m<sup>3</sup> to 35µg/m<sup>3</sup> in 2006. The area failed to meet the new standards and was consequently designated a PM<sub>2.5</sub> nonattainment area in 2009. The area currently monitored for PM<sub>2.5</sub> includes all of Sacramento and Sutter counties, the western portions of Placer and El Dorado counties, the southern majority of Yuba County, the eastern half of Yolo County, and portions of Solano County. Beginning in 2012, efforts to produce a State Implementation Plan for PM<sub>2.5</sub> will initiate. Planning assumptions to develop the emission budgets for this SIP will be derived from the VMT and population data used to develop the MTP/SCS. This will be a future collaborative effort between SACOG and the various AQMDs/AQMAs in the region.

## Details of Pollutants in the Region and Their Health Impacts

### Ozone (O<sub>3</sub>)

Ozone (O<sub>3</sub>) is a nearly colorless, odorless gas which irritates the lungs and damages materials and vegetation. Ozone pollution is created by chemicals that come from many sources, including mobile sources such as automobiles, buses, heavy duty trucks, light trucks, trains, construction vehicles, farm vehicles, airplanes, motorcycles, boats, and dirt bikes. Ozone is a major component of smog in the Sacramento region, and results from the photochemical reaction of ozone precursors, reactive organic gases (ROG) and nitrogen oxide (NOx) in the presence of sunlight and heat. Although ozone is the air contaminant for which standards are set, ROG and NOx are the pollutants that must be controlled.

Ozone interferes with the photosynthesis process necessary for plant growth, reducing forest and crop growth. Thus, ozone pollution poses a danger to agricultural economies that depend on stable conditions. In addition to the effect on economies reliant on natural resources and crops, ozone deteriorates the appearance of local, state, and national parks in the Sacramento region by damaging the vegetation. The effects of ozone on health have also been studied by health researchers, who have found that exposure to ozone can cause decreases in lung function, and repeated exposure can result in permanent lung damage. Symptoms of lung disease may also be related to repeated exposure to ozone concentrations above current standards. Ozone reduces resistance to colds and pneumonia, and aggravates heart disease, asthma, bronchitis, and emphysema. Irritation from ozone pollution also manifests as wheezing, coughing, and irritation of the airways.

### Nitrogen Dioxide (NO<sub>2</sub>)

NO<sub>2</sub> is a highly reactive, reddish-brown gas that, at high levels, can cause breathing difficulties. It is formed when nitric oxide (pollutant produced from burning processes) combines with oxygen. It contributes to smog formation and causes the brown haze seen on cold mornings. NO<sub>2</sub> pollution is most severe close to roadways and in vehicles; consequently, area-wide pollution monitors often show a considerably lower reading of NO<sub>2</sub> pollution than readings collected beside active roadways. NO<sub>2</sub>, when combined with nitric oxide (NO), forms nitrous oxide (NOx), a precursor to ozone. Therefore, reducing the amount of NO<sub>2</sub> created will also decrease the amount of ozone created.

NO<sub>2</sub> has an adverse effect on the respiratory system of humans, with exposure causing inflammation of the airways in people without a respiratory condition, and aggravated symptoms in people with asthma or other respiratory conditions. Children, the elderly population, people suffering from respiratory conditions, and people who exert energy through working or exercising outside are most sensitive to the effects of NO<sub>2</sub> pollution.

### Particulate matter (PM)

PM refers to finely divided solids or liquids such as soot, dust, aerosols, and mists. PM is largely the result of human activities, such as residential fuel combustion smoke and soot, grading and excavation activities, agriculture (as created by soil preparation activities, fertilizer and pesticide spraying, weed burning, and animal husbandry), and from motor vehicles, particularly diesel-powered vehicles. Suspended particulates aggravate chronic heart and lung disease problems, produce respiratory problems, and often transport toxic elements such as lead, cadmium, antimony, arsenic, nickel, vinyl chloride, asbestos, and benzene compounds. Suspended particulates also absorb sunlight, producing haze and reducing visibility.

### Particulate matter 10 (PM<sub>10</sub>)

Respirable particulate matter (PM<sub>10</sub>) consists of small particles, less than 10 microns in diameter, of dust, smoke, or droplets of liquid which penetrate the human respiratory system and cause irritation by themselves or in combination with other gases. PM<sub>10</sub> pollution can result in damage to vegetation, but the focus is generally placed on the adverse health effects of particulate matter. PM<sub>10</sub> causes a greater health risk than larger particles, since these fine particles are too small for the natural filtering process of the human body and can more easily penetrate the defenses of the human respiratory system.

Controlled human exposure studies have shown that exposure to elevated levels of particulate matter causes adverse health effects, especially regarding the inhibition of lung functions and an increase in respiratory and cardiovascular afflictions, as well as cancer risks. Individuals with pre-existing respiratory or cardiovascular disease are especially susceptible to the adverse effects of PM<sub>10</sub> exposure, as are asthmatic children and the elderly population.

### Particulate matter 2.5 (PM<sub>2.5</sub>)

Fine particulate matter (PM<sub>2.5</sub>) consists of small particles, which are less than 2.5 microns in size. Similar to PM<sub>10</sub>, these particles are primarily the result of combustion in motor vehicles, particularly diesel engines, as well as from industrial sources and residential/agricultural activities such as burning. PM<sub>2.5</sub> is also formed through the reaction of other pollutants. As PM<sub>2.5</sub> is smaller than PM<sub>10</sub>, it can more deeply penetrate the human body through inhalation, allowing many chemicals harmful to human health to be carried to internal organs. These particulates can increase the chance of respiratory disease, cause lung damage, cancer, and even premature death in people with heart or lung disease.

### Carbon Monoxide (CO)

CO is a highly toxic, odorless, colorless gas which is primarily produced by the incomplete combustion of carbon-containing fuels (vehicular exhaust from tailpipes). CO is a local pollutant that creates individual hot spots,

or small areas where CO concentrations are high. CO is mostly a wintertime problem in the Sacramento urbanized area which is currently in attainment of the CO standard. CO affects human health by binding to hemoglobin in the bloodstream in the place of oxygen molecules. By reducing the oxygen-carrying potential of blood, CO causes heart difficulties in people with chronic diseases, reduces lung capacity, impairs mental functioning by interfering with the transfer of oxygen to the brain, and may aggravate arteriosclerosis. CO air contamination can result in death if quantities are extremely high.

### Sources of Air Pollution

Release of air pollutants, like those described above, comes from almost all human activities, including industrial facilities, dry cleaners, automobiles, auto body shops, trucks, trains, lawn movers, bakeries, farm equipment, paints, paving, printing, airplanes, construction equipment, refining, and agricultural activities. Some sources emit large amounts of the pollutants that cause ozone but only small amounts of CO or particulate matter, while others emit large amounts of all three.

Emissions are normally grouped into four main categories; stationary, area-wide, mobile, and natural sources. Generally, stationary and area-wide sources are those attached to the ground, while mobile sources are those involved in the movement of people and goods. Natural emission sources refer to emissions that are non-anthropogenic (non-human-caused) sources. Each of these categories is usually further divided into major source categories and then summary categories. A brief description of these four main categories is listed below.

#### Stationary Emission Sources

Stationary source emissions, also referred to as point source emissions, are emissions from major industrial, manufacturing and processing plants. This category also includes emissions from electric utilities; waste burning; solvent use; petroleum processing, storage and transfer; and industrial processes.

#### Area-wide Emission Sources

Area sources are those that individually emit only small quantities, but collectively result in substantial emissions when aggregated over a larger area. Emissions result from landscaping; natural gas consumption; small industrial engines; solvent use in dry cleaning, auto repair, auto body shops and paints; wood burning; industrial coatings; consumer products; printing; bakeries and restaurants; asphalt paving; and fugitive dust (i.e., small airborne particles that do not originate from a specific point).

### Mobile Emission Sources

There are two major categories under mobile emissions:

**On-road Motor Vehicles:** This major source category accounts for the emissions from all vehicles licensed to travel on public roads and highways. This includes passenger cars, light- and medium-duty trucks, heavy-duty gas and diesel trucks, heavy-duty urban diesel buses, and motorcycles.

**Other Mobile Sources:** This major category accounts for vehicular emissions from: construction equipment, farm tractors, off-road recreational vehicles, trains, ships, aircraft, mobile equipment, utility equipment, and lawn mowers.

### Natural (Non-anthropogenic) Sources

This category accounts for emissions from non-anthropogenic sources such as: wildfires, agricultural vegetation, and petroleum seeps.

### Attainment Status and the MTP/SCS

The link between the MTP/SCS and existing SIPs, as mentioned above, is transportation conformity. Consistency is the core of a conformity determination. Transportation activities must be consistent with the emission reduction requirements in the SIP that, when implemented, will contribute to the efforts in the SACOG region to attain NAAQS. Specifically, the MTP/SCS cannot result in new violations of the NAAQS, increase frequency/severity of NAAQS violations, or delay timely attainment of the NAAQS.

The MTP/SCS was developed with consideration of balancing the objectives of meeting the air quality standards for the region, future transportation and land use needs, and the projected population increase of approximately 871,000 people by 2035. This was done through close analysis of the interface of future transportation and land use in the region. The location and pattern of growth is important because it determines travel behavior and provides a means for determining the impact of future vehicle emissions in the MTP/SCS planning area. A compact growth pattern served by an efficient transportation system provides the foundation to reduce automotive travel and increase walking, bicycling and transit use, which reduce individual vehicle trips and associated VMT. Reduced VMT and vehicle trips are linked to reduced regional criteria pollutant emissions. By focusing on providing more small lot and attached housing, maximizing infill and redevelopment opportunities, and planning for communities with a mix of uses, the MTP/SCS creates a more compact land use pattern. This emphasis toward more compact development and reduced VMT and trips is a necessary part in growing our region while at the same time improving our air quality and the health of those in our region.

### Toxic Air Contaminants

As described above, the location and pattern of growth is important because it determines travel behavior and provides a means for determining the impact of future vehicle emissions in the MTP/SCS planning area. However, in order to achieve the greatest VMT reductions from a compact growth pattern, development needs to be situated near public transit corridors, which, in the SACOG region are typically near major roadway corridors. As a result, transit-efficient compact development can inherently result in closer proximity of receptors to localized sources of TACs.

Although ambient air quality standards exist for criteria pollutants, no ambient standards exist for air toxics. Many pollutants are identified as air toxics because of their potential to increase the risk of developing cancer or because of the acute or chronic health risks that may result from exposure to these substances. For air toxics that are known or suspected carcinogens, ARB has consistently found that there are no levels or thresholds below which exposure is risk free. Individual air toxics vary greatly in the risk they present—at a given level of exposure, one air toxic may pose a hazard that is many times greater than another. For certain air toxics, a unit risk factor can be developed to evaluate cancer risk. For acute and chronic health risks, a similar factor called a Hazard Index is used to evaluate risk.

Air toxics are a form of particulate matter pollutant that are increasingly being studied and added to the list of impacts of the transportation system to health. Air toxics are released from sources throughout the country, including motor vehicles, stationary sources such as industrial/manufacturing plants, and area sources such as dry cleaners and auto paint shops. Several air toxics are emitted during combustion of gasoline and diesel fuel by motor vehicles, including benzene, formaldehyde, 1,3-butadiene, and particulate matter from diesel exhaust. Of these emitted toxics, particulate matter from diesel exhaust—such as emissions from freeways, distribution centers, railyards, and ports—represents the greatest health risk. Air toxics other than those primarily associated with diesel exhaust are still considered significant, even if they do not appear to greatly contribute to the overall risk level of the region. Those air toxics can present a high risk to members of the population in close proximity to a source of the pollutant.

Though U.S. EPA issued a Mobile Sources Air Toxics (MSAT) Rule in 2001, and issued a second MSAT Rule in 2007, no set standards for air toxics were identified. Because there is no regulatory setting for air toxics at this time that the MTP/SCS must comply with, the evaluation of their impact is more qualitative. Standards and regulations are in place to reduce air toxics emissions using the base level emissions level as a starting line, instead of aspiring to a scientifically prescribed level of acceptable emissions. ARB uses a similar approach, with the long-term goal of their statewide control program being to reduce diesel PM by 80% by 2020; requiring cleaner diesel fuel and cleaner

diesel engines are two standards being employed to reduce the public's exposure to diesel PM. There is no consensus on thresholds for exposures for sensitive people or proximity of their sensitive land uses from pollutant sources. Guidelines and recommended practices are being applied while more information and appropriate policies are being developed.

ARB's *Air Quality and Land Use Handbook: A Community Perspective* (April 2005) identifies sensitive land uses—new residences, schools, day care centers, playgrounds, and medical facilities—that should receive additional consideration during land use discussions. It also identifies the segments of the population most susceptible to the non-cancer health risks from air toxics exposure: children, pregnant women, the elderly, and those with existing health problems are most vulnerable to the effects of air toxics, with evidence pointing to increased sensitivity among children to cancer-causing chemicals. Within the guidance are recommended buffers to be considered when siting new sensitive land uses. The identified sources include: high-traffic freeways and roads, distribution centers, railyards, ports, refineries, chrome plating facilities, dry cleaners using perchloroethylene, and large gasoline dispensing facilities. Each of these individual sources has recommended buffers related to their siting near sensitive land uses.

Specifically, the ARB handbook states that sensitive land uses (e.g., homes, schools, day care centers, parks, hospitals) be located outside a 500-foot buffer of major roadways, defined as freeways or urban roads with traffic volumes of 100,000 or more vehicles per day or rural roads with 50,000 or more vehicles per day. As of 2008, the population within the buffer zone represents only 2.02 percent of the entire region's population. By 2035, the population within the buffer zone will represent only 2.4 percent of the entire region's population (see Table 7.6). This means that less than half a percent (.38 percent) increase in the expected population will be within these buffer zones. Figure 7.4 shows the location of high-volume roadways in 2035.

**Table 7.6**  
**Population within 500-Foot Buffer of High-Volume Roadways, 2008 and 2035**

County	2008 % of total population	2035 % of total population
El Dorado	0.26%	0.26%
Placer	1.30%	1.02%
Sacramento	2.73%	3.34%
Sutter	0.00%	0.00%
Yolo	1.23%	1.89%
Yuba	0.00%	0.00%
Region Total	2.02%	2.40%

Source: SACOG, 2011.

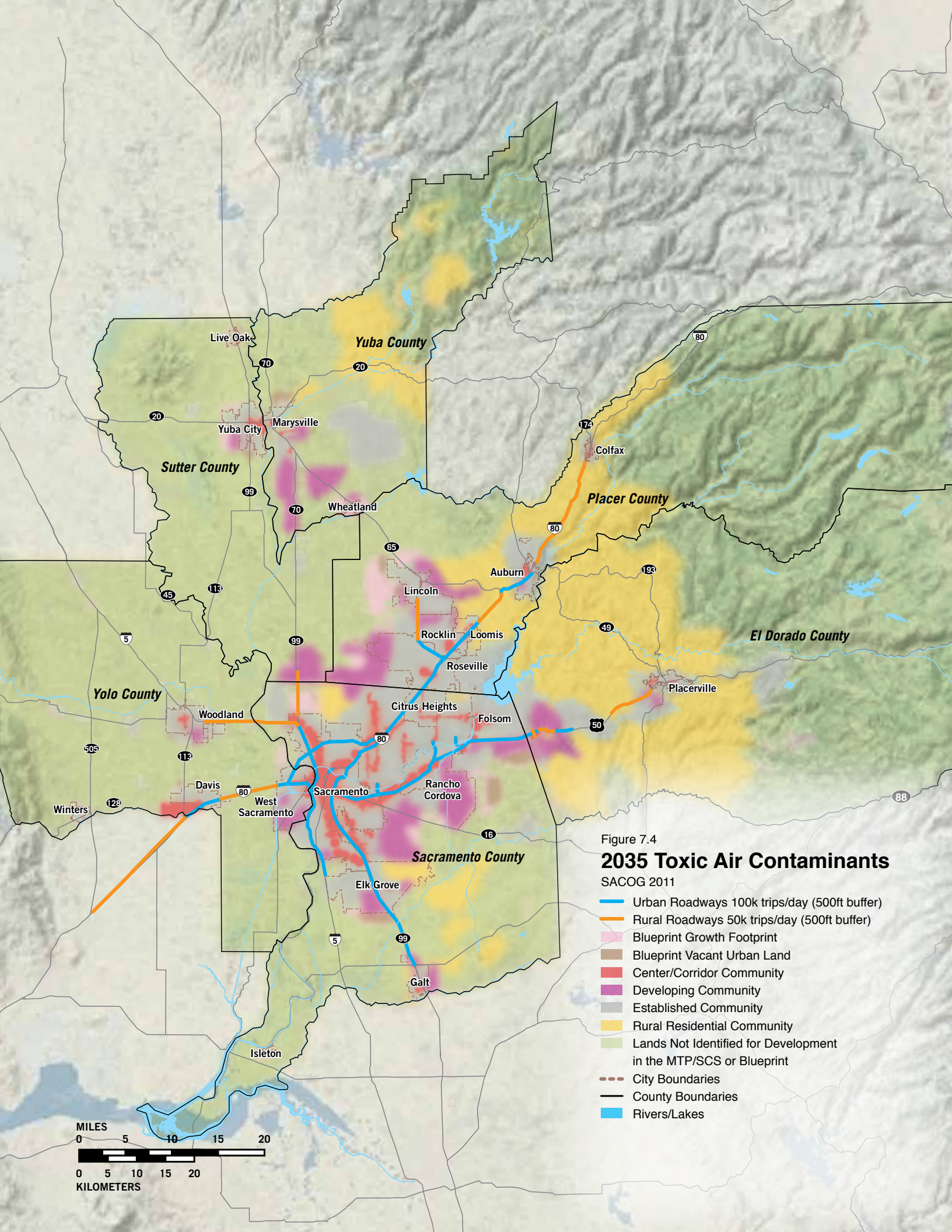


Figure 7.4  
**2035 Toxic Air Contaminants**  
 SACOG 2011

- Urban Roadways 100k trips/day (500ft buffer)
- Rural Roadways 50k trips/day (500ft buffer)
- Blueprint Growth Footprint
- Blueprint Vacant Urban Land
- Center/Corridor Community
- Developing Community
- Established Community
- Rural Residential Community
- Lands Not Identified for Development in the MTP/SCS or Blueprint
- - - City Boundaries
- County Boundaries
- Rivers/Lakes

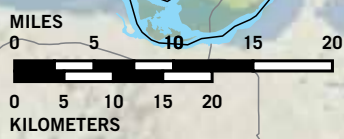


Figure 7.5 shows the location of the existing facilities that emit TACs for which locational data were available via permit or available data.

In addition to the 2005 ARB handbook, a statewide discussion has been taking place among affordable homebuilders, equity advocates, and public health experts seeking to better understand the relationship between infill development and public health.

At the local level, the Sacramento Metropolitan Air Quality Management District (SMAQMD) has developed its own protocol, *Recommended Protocol for Evaluating the Location of Sensitive Land Uses Adjacent to Major Roadways* (March 2011), for project developers to use in assessing potential risks to residents from siting in particular locations, and mitigation strategies to address any identified risks. As illustrated by the ARB handbook and SMAQMD protocol, the risk is highly site-specific. The height of nearby freeways, prevailing winds, and other factors can make a significant difference in whether potential development sites pose elevated risks. Risks are different for children, seniors and those with certain health conditions than for healthy adults, and are based on a standard 70-year exposure, although many people do not necessarily live in the same location for 70 years. SACOG, through discussion and research, has identified a number of considerations for assessing exposure to high-volume roadway toxic air contaminants:

- SACOG does not have the capacity to assess every individual site within the buffer zone for potential variations in risk, but the local project proponents are expected to conduct assessments on a project-by-project basis to assess risk for planned residents or users.
- There are tradeoffs between the health benefits and risks of siting new residential development in infill areas near transit, which often runs on major roadway corridors. Risks of exposure to toxic air contaminants from proximity to high-volume roadways may need to be weighed along with such benefits as better transit access to health care, lower transportation costs that leave more money for medical care, and new higher quality housing and increased physical activity for residents that can help improve health.
- State and federal agencies provide points in competitive housing funding programs for affordable home developments near frequent transit, recognizing that lower income residents tend to be more transit-dependent.
- Both environmental justice and non-environmental justice areas have small populations within the buffer zone. It is likely that what proximity there is includes more than low-income and minority residents, be-

cause populations in the buffer zone are likely to be diverse in ethnicity and income level, especially by 2035. For a full discussion on this population please see Chapter 8—Equity and Choice.

- Perchloroethylene is due to be phased out of dry cleaning operations by 2023.
- Increasingly cleaner vehicles are reducing some of the health risks from air contaminants. Strategies exist to mitigate risks include: siting residences and sensitive receptors away from the roadway, reducing windows facing the freeway or roadway, installing central heating and air conditioning systems, and planting trees that filter out air contaminants. Given the site-specific nature of exposure risk and available mitigation strategies, it is likely that the population that may experience exposure risk is even less than the 2 percent of the population in SACOG's analysis.



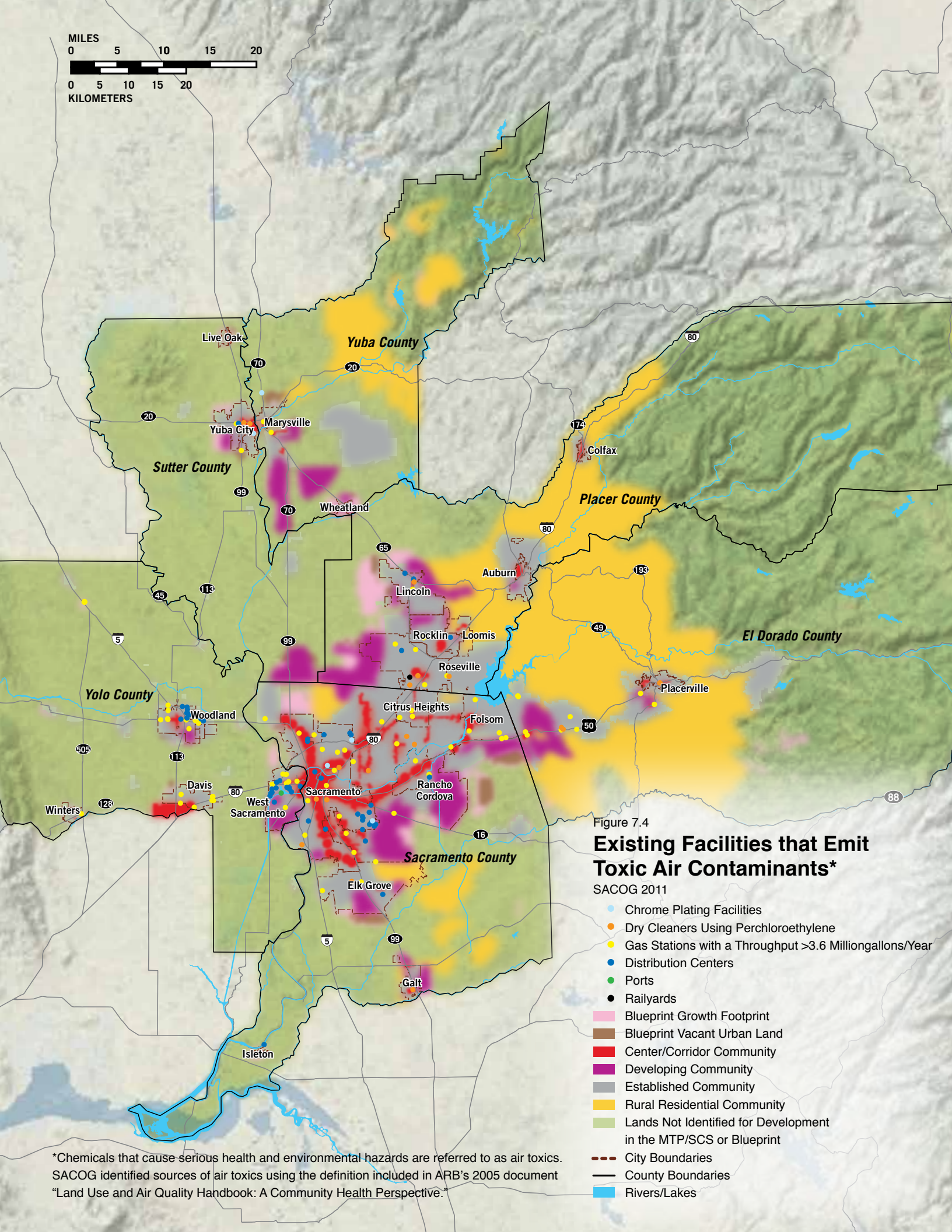
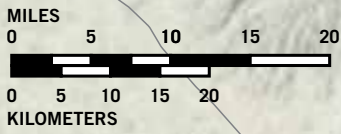


Figure 7.4

### Existing Facilities that Emit Toxic Air Contaminants\*

SACOG 2011

- Chrome Plating Facilities
- Dry Cleaners Using Perchloroethylene
- Gas Stations with a Throughput >3.6 Milliongallons/Year
- Distribution Centers
- Ports
- Railyards
- Blueprint Growth Footprint
- Blueprint Vacant Urban Land
- Center/Corridor Community
- Developing Community
- Established Community
- Rural Residential Community
- Lands Not Identified for Development in the MTP/SCS or Blueprint
- City Boundaries
- County Boundaries
- Rivers/Lakes

\*Chemicals that cause serious health and environmental hazards are referred to as air toxics. SACOG identified sources of air toxics using the definition included in ARB's 2005 document "Land Use and Air Quality Handbook: A Community Health Perspective."

### Climate Change: Mitigation and Adaptation

The integrated approach to reducing the effects GHG emissions have on climate change is one that SACOG takes seriously. SACOG has been involved in many aspects related to climate change throughout the region, including involvement in many climate action plans adopted or underway in the region. SACOG has conducted its own operational emissions inventory since 2006; was the first American organization to apply the Greenhouse Gas Regional Inventory Protocol (GRIP) model that culminated in a regional inventory and future year GHG inventory scenarios (see Appendix E-7); has received grants to work on planning for plug-in electric vehicle infrastructure; and has worked at reducing VMT, minimizing the impacts of GHG emissions on our climate, and realizing many of the benefits an MTP/SCS has to offer. For this MTP/SCS, SACOG has conducted extensive research on what factors lead to climate change, how it impacts human health, the environment, and economy, and what components of the MTP/SCS can help to minimize the effects climate change will have on the region.

### Causes and Effects of Climate Change

Climate change is a measurable change in the state of the average weather conditions over a period of time, usually decades or longer<sup>1</sup>. A growing body of scientific research has linked climate change to an increase in the concentration of GHGs in the Earth's atmosphere. Concentrations of atmospheric GHGs has remained relatively constant up until the last two hundred years at between 260 and 285 parts per million<sup>2</sup>. Current levels of atmospheric GHGs exceed 390 parts per million<sup>3</sup>.

Part of this fluctuation is caused by the natural carbon cycle. Absorption and release of GHGs by the oceans, plants, and the atmosphere is a natural occurrence. However, the Energy Information Administration (EIA) estimates that there are 6 billion metric tons of GHG emissions annually from human activity, and while some of this is absorbed by the carbon cycle, roughly 3 billion metric tons are released into the atmosphere each year<sup>4</sup>. While there is uncertainty on how the variation in climate is impacted by this increase in human-produced GHG emissions, it is believed that any increase in GHG concentrations in the atmosphere can increase global temperatures, which can have an impact on weather conditions around the globe.

In the United States, roughly 82 percent of all GHG emis-

sions come from the use of petroleum and natural gas. This equals about 25 percent of global emissions. According to an EIA report, world energy consumption will increase by 47 percent from 2007 to 2035. This increase will be led by the use of liquid fuels, including petroleum and natural gas. Worldwide demand for oil is growing steadily. Current world oil usage is about 90 million barrels per day, with demand rising to around 111 million barrels per day by 2035<sup>5</sup>.

The U.S. consumed approximately 19.1 million barrels of petroleum-based products per day in 2010. This is expected to increase to 21.9 million barrels per day in 2035<sup>6</sup>. Most of the increase in oil demand comes from the transportation sector, where there are the fewest available alternatives to petroleum. Roughly 70 percent of the U.S. oil consumption is in the transportation sector (14 million barrels per day)<sup>7</sup>. In California, petroleum-based fuels account for 43 percent of all energy consumption, and 39 percent of that is for transportation<sup>8</sup>. Over the last 20 years, California's consumption of gasoline and diesel fuel increased 50 percent. However, with recent state and federal regulations on fuel efficiency and alternative fuel sources, transportation-related fuel consumption is projected to decrease 3.7 percent by 2030.<sup>9</sup>

Carbon dioxide (along with water) is the natural end product of the clean burning of petroleum fuels, so the only way to reduce the influence on global climate is to reduce the amount of fuel burned, or to find a new fuel for vehicles that does not come from oil. Even carbon emissions from cleaner sources such as natural gas, ethanol, or electricity (unless derived from a renewable source) play a role in global warming. It is widely accepted that carbon dioxide forms approximately 84 percent of all GHG emissions; this is true in California as in the rest of the world.

The impacts from a change in global climate can be felt throughout the region. California has adopted the public policy position that global climate change is "a serious threat to the economic well-being, public health, natural resources, and the environment of California." Health and Safety Code § 38501 states that:

*the potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious disease, asthma, and other hu-*

<sup>1</sup> Intergovernmental Panel on Climate Change, Annex I—Glossary, <http://www.ipcc.ch/pdf/glossary/ar4-wg1.pdf>

<sup>2</sup> California Climate Change Portal, <http://www.climatechange.ca.gov/background/index.html>

<sup>3</sup> Thomas Conway and Pieter Tans, NOAA/ESRL, [www.esrl.noaa.gov/gmd/ccgg/trends/](http://www.esrl.noaa.gov/gmd/ccgg/trends/)

<sup>4</sup> Energy Information Administration, <http://www.eia.gov/oiaf/1605/gccebpro/chapter1.html>

<sup>5</sup> Ibid

<sup>6</sup> Energy Information Administration, Annual Energy Outlook 2011

<sup>7</sup> Ibid

<sup>8</sup> Energy Information Administration, California State Energy Profile 2009

<sup>9</sup> Ibid

*man health-related problems ... [and that] ... global warming will have detrimental effects on some of California's largest industries, including agriculture, wine, tourism, skiing, recreational and commercial fishing, and forestry (and)...will also increase the strain on electricity supplies necessary to meet the demand for summer air-conditioning in the hottest parts of the State.*

The United Nations Intergovernmental Panel on Climate Change (IPCC) constructed several GHG emission scenarios of varying demographic, social, economic, technological, environmental, and policy futures. They concluded that GHG emissions at or above current levels would cause “many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century” (IPCC 2007).

The California Environmental Protection Agency (CalEPA) took the IPCC work and built scenarios specific to California. As directed by Executive Order #S-3-05, CalEPA prepared a series of reports, including the *Scenarios of Climate Change in California: An Overview* (Climate Scenarios report), in February 2006. This report analyzed the impacts the following temperature ranges could have on California during the 21<sup>st</sup> century: lower warming range (3.0–5.5°F); medium warming range (5.5–8.0°F); and higher warming range (8.0–10.5°F). It considered impacts on public health, water resources, agriculture, forests and landscapes, and rising sea levels. These impacts are discussed in detail below.

#### Public Health

Higher temperatures would create additional, longer, and more intense climate conditions leading to increased air pollution. An increase in global background ozone levels, as predicted in some scenarios, would make it impossible to meet local air quality standards. Large wildfires could become up to 55 percent more frequent, further increasing air pollution.

Under the higher warming scenario, in Sacramento there could be up to 100 more days per year with temperatures above 95°F by 2100. Rising temperatures will increase the risk of death from dehydration, heat stroke/exhaustion, heart attack, stroke, and respiratory distress caused by extreme heat. It will also result in more GHG emissions from increased energy consumed from the use of air conditioners.

#### Water Resources

Rising temperatures, especially if combined with decreases in precipitation, would severely reduce spring snow pack, increasing the risk of summer water shortages. Also, an influx of saltwater would degrade California's estuaries, wetlands, and groundwater aquifers. Saltwater intrusion caused by rising sea levels is a major threat to the quality and reliability of water within the southern edge of the Sacramento-San Joaquin River Delta, a major state fresh water supply.

#### Agriculture

As temperatures rise, there will be more demand for water for crops and a less reliable water supply. Increases in pests and disease in crops will compound the problem as rising temperatures will likely aggravate ozone pollution, which makes plants more susceptible.

Plant growth tends to increase with rising temperatures. However, faster growth can result in less-than optimal development for many crops, so rising temperatures are likely to worsen the quantity and quality of yield for a number of California's agricultural products. Products likely to be most affected include wine grapes, fruits, nuts, and milk.

#### Forests and Landscapes

Global climate change is expected to intensify this threat by increasing the risk of wildfire and altering the distribution and character of natural vegetation. If temperatures rise into the medium warming range, the risk of large wildfires in California could increase by as much as 55 percent, which is almost twice the increase expected if temperatures stay in the lower warming range. In the Sacramento region, the areas most at risk are the foothills in El Dorado, Placer and Yuba counties, and the foothills of western Yolo County.

Moreover, continued global climate change will alter natural ecosystems and biological diversity within the state. The productivity of the state's forests is also expected to decrease as a result of global climate change.

#### Rising Sea Levels

Rising sea levels, more intense coastal storms, and warmer water temperatures will increasingly threaten the state's coastal regions. Under the higher warming scenario, sea level is anticipated to rise 22 to 35 inches by 2100. Elevations of this magnitude would inundate coastal areas with saltwater, accelerate coastal erosion, threaten vital levees and inland water systems, and disrupt wetlands and natural habitats.

#### Addressing the Effects of Climate Change

To reduce the negative effects that fossil fuel consumption has on climate change, two themes emerge. First, advances in technology such as cleaner engines, better gas mileage, and the use of alternative fuels have the potential to slow the effects of climate change. However, there is a worry that the shift to more energy-efficient vehicles will occur too slowly to avoid potentially significant crises that will challenge the transportation system. This leads to the second theme: changing travel behavior. If people shift to greater use of alternative modes (transit, bicycling and walking), the reliance on oil and the negative effect on the climate is reduced. With these questions in the forefront of the planning process, the MTP/SCS was developed using a multi-faceted approach to reduce the consumption of energy sources that lead to increased GHG emissions and climate change.

*Moving Cooler* was a landmark study looking at the impacts certain transportation-related strategies could have on curbing GHG emissions. It looks at different approaches individually to determine what works and why, and combines them to get an overall sense of the relationship between travel and climate change. The study finds that the best approach to addressing the effects of travel on climate change is an integrated, multi-strategy approach that considers policies at different levels, travel behavior, and overall efficiency of travel<sup>10</sup>. This section will explore various efforts underway at the state and regional level that take this same approach, and in particular, what the MTP/SCS does in regard to travel activity and efficiency.

### Policy Approach

California has already passed landmark laws, AB 32 and SB 375, intended to curb GHG emissions. When creating the MTP/SCS, SACOG made every effort to meet and surpass the goals outlined by both these laws. SB 375 is an implementation measure of AB 32, and creates specific targets that each region throughout California must try to meet. AB 32, on the other hand, does not direct SACOG to achieve any GHG emission reduction but instead sets statewide goals. However, the MTP/SCS were developed to not only achieve the goals of SB 375, but create an efficient land use plan and robust transportation network that would meet AB 32 goals and further reduce our impact on climate change.

### AB 32

AB 32 calls for the state of California to reach 1990 levels of GHG emissions from all sources by the year 2020. It places California as the leader in the abatement of climate change and offers a model for other states and countries to reduce GHG emissions. As part of AB 32, in 2008, ARB created the Scoping Plan<sup>11</sup>, which contains strategies to reduce GHG emissions. The Scoping Plan uses various actions including regulations, incentives, and market mechanisms to achieve reduction targets. In 2011, ARB approved an update of the expected GHG reductions from each of the measures outlined in the Scoping Plan document. Table 7.7 outlines GHG emissions, expressed in million metric tons of CO<sub>2</sub> equivalents (MMtCO<sub>2</sub>e) and the expected reductions from each. The table includes reduction measures from transportation, and electricity and natural gas sources that will be covered

under new cap-and-trade regulations adopted by ARB in October 2011.<sup>12</sup> It does not include non-capped measures, which will have little influence on this MTP.

**Table 7.7**  
**Expected California GHG Reductions from Scoping Plan (MMtCO<sub>2</sub>e)**

Measures in Capped Sectors	
<b>Transportation</b>	
T-1 Advanced Clean Cars	3.8
T-2 Low Carbon Fuel Standards	15.0
T-3 Regional Targets (SB 375)	3.0
T-4 Tire Pressure Program	0.2
T-5 Ship Electrification	0.6
T-7 Heavy Duty Aerodynamics	0.9
T-8 Medium/Heavy Hybridization	0.0
T-9 High Speed Rail	1.0
<b>Total Transportation</b>	<b>49.0</b>
<b>Electricity and Natural Gas</b>	
E-1 Energy Efficiency and Conservation	7.8
CR-1 Energy Efficiency and Conservation	4.1
CR-2 Solar Hot Water	0.1
E-3 Renewable Energy Standards	11.4
E-4 Million Solar Roofs	1.1
<b>Total Electricity and Natural Gas</b>	<b>24.6</b>

Source: ARB AB 32 Scoping Plan

<sup>10</sup> Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions, Cambridge Systematics, Inc 2009.

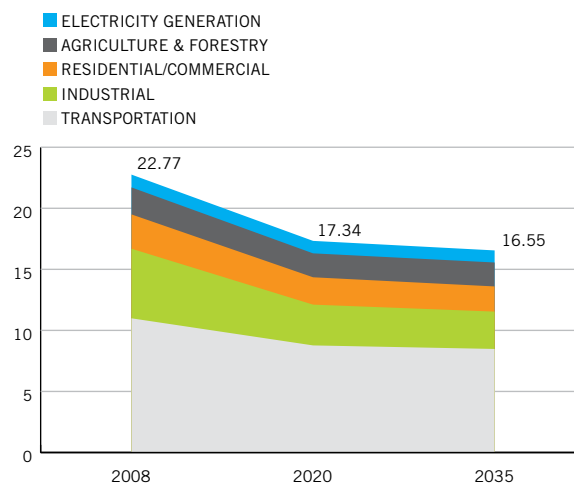
<sup>11</sup> AB 32 Scoping Plan. California Air Resources Board.  
<http://arb.ca.gov/cc/scopingplan/scopingplan.htm>

<sup>12</sup> Cap and trade is a strategy used to reduce GHG emissions. The policy sets an annual limit on the amount of GHG emissions that can be released from each source statewide. It then sets a price point at which the various GHG emitters can purchase a permit that allows them to emit a set amount; these permits are often called allowances. A market is then created for these entities to buy and sell allowances, based on their ability and desire to meet the amount set for each allowance. Periodically the cap, allowance amount, and price point are adjusted to facilitate increased GHG reductions. Compliance with ARB regulations begins in 2013.

As part of this MTP/SCS, SACOG conducted an analysis of regional climate change impacts and estimated what emissions were in 1990 and 2008, and to see how well the plan addressed the AB 32 GHG emission reduction goal of returning to 1990 levels by 2020. The MTP/SCS only impacts GHG emissions from sources where SACOG has some influence, mainly from the on-road portion of the regional transportation network and land use decisions, for example where people live and work. However, in order to better illustrate the full picture of GHG emissions in the region, the analysis SACOG conducted considered emissions from different sources, including: the generation of electricity, farming and forestry practices, residential and commercial uses, industrial processing, and all sources of transportation. As expressed in the Scoping Plan, 1990 levels can be approximated as 15 percent below 2008 levels. This is the assumption SACOG made for the MTP analysis, which used local land use data along with data from various state agencies and utility providers to generate an emissions inventory for the region. The analysis concluded that the region emitted 22.7 MMtCO<sub>2</sub>e in 2008. Therefore, 19.36 MMtCO<sub>2</sub>e is the level that must be attained by 2020 for the region to meet the reduction target set by AB 32. By implementing the transportation and land use components of the MTP/SCS, and including measures from the Scoping Plan, 2020 emissions are forecasted to be 17.34 MMtCO<sub>2</sub>e for the region in 2020. This is 12 percent below the target set by AB 32.

AB 32 only set targets for 2020, but the MTP/SCS looks at forecasted growth to the year 2035. Therefore, SACOG decided to take this analysis a little further and estimate GHG emissions for the year 2035. The benefits of the type of growth assumed in the SCS coupled with the efficient transportation system created in the MTP/SCS, further reduce GHG emissions beyond the year 2020. The forecasted emissions for the region are 16.55 MMtCO<sub>2</sub>e in the year 2035, an additional 5 percent reduction from 2020 levels. As previously mentioned, despite the fact that SACOG only has influence on land use and transportation sources of GHG emissions, all sectors were evaluated. As illustrated in Figure 7.6, which shows GHG emissions from all sectors for the years 2008, 2020, and 2035, the region's emissions of harmful GHGs are on a downward trajectory. The slope of this trajectory, however, is not as aggressive as it is from 2008 to 2020 as it does not include additional GHG reduction measures similar to those found in the Scoping Plan. Aside from SB 375 GHG reductions, the Scoping Plan has no reductions beyond 2020. All reductions shown beyond 2020 are from the beneficial land use and transportation projects in the MTP/SCS.

**Figure 7.6**  
**Plan Area MMtCO<sub>2</sub>e Emission by Sector in 2008, 2020, and 2035**



Source: SACOG, 2011.

The development and related transportation projects in this MTP/SCS provide for a mix of housing options located closer to jobs and transit. The proposed growth is more compact in form and more effectively utilizes energy and existing infrastructure. This efficient land use and transportation relationship is characterized in Figure 7.6 above, shown by reductions in GHGs from all sectors, but most specifically from Electricity Generation, Residential/Commercial, and Transportation.

### SB 375

One of the measures for reducing GHG emissions in the Scoping Plan is SB 375, which required ARB to set regional GHG reduction targets for light-duty trucks and automobiles. The law then requires each of California's MPOs create an integrated land use, housing, and transportation plan that demonstrates how the targets can be met. This plan, the Sustainable Communities Strategy, or SCS, is required to be incorporated into the MTP/SCS. ARB reviews the SCS to determine if it meets the targets, or if an Alternative Planning Strategy (APS) needs to be prepared in order to meet the targets. SB 375 provides incentives to residential mixed-use or residential development, if it is consistent with the SCS, in the form of relief from certain environmental review, described in Chapter 3—Land Use Forecast.

### SB 375 Results in the MTP/SCS

ARB set SB 375 GHG emission reduction targets for each of the state's 18 MPOs. For the region, the targets set are 7 percent below 2005 per capita emissions levels by 2020 and 16 percent below 2005 per capita emissions levels by 2035. The benefits of a cohesive land use-transportation relationship, as discussed above, are highlighted in the reduction in GHG emissions from light-duty trucks and

automobiles achieved in the MTP. The smart growth land use pattern and supporting transportation projects in the MTP/SCS are conducive to reducing GHG emissions as required by SB 375 and lead to GHG reductions beyond those targets set by the ARB.

The results in Table 7.8 reflect the more efficient travel from the type of growth forecasted in the MTP/SCS. The table shows the 2005, 2020, and 2035 GHG emissions from light-duty trucks and automobiles.

The per capita GHG pounds per day emissions for the region were 23.0 in 2005, which sets the benchmark for SB 375 reduction. Based on the development in the MTP/SCS, GHG per capita emissions reduce to 20.8 pounds per day in 2020. This is a 9.6 percent reduction from 2005 to 2020, well below the 7 percent reduction set by ARB. The results for 2035 are just as impressive, with per capita GHG pounds per day dropping by 16 percent to 19.7 in 2035. This reduction is for light-duty trucks and automobiles only. GHG emissions from medium and heavy-duty trucks, rail, ship, airplanes, and other transportation sources are not included in this reduction, but are included in the overall GHG emissions previously discussed.

How well the MTP/SCS performs at reducing GHG emissions from transportation becomes more apparent when visualized throughout the region. The map in Figure 7.7 shows GHG emissions per capita from on-road sources in 2035. The average emissions for the region are 19.7 pounds per day for each person. Emission values above that norm are colored in darkening shades of red, and values below are shaded green.

**Table 7.8**  
**MTP/SCS Plan Area CO<sub>2</sub> Equivalent Emission Estimates for 2005, 2020 and 2035**

	CO <sub>2</sub> e per Capita (lbs. per day)	Modeled CO <sub>2</sub> Reductions	Off-Model Reductions <sup>1</sup>	Total Reductions from 2005
2005	23.0	n/a	n/a	n/a
2020	20.8	-9%	-1%	-10%
2035	19.7	-14%	-2%	-16%

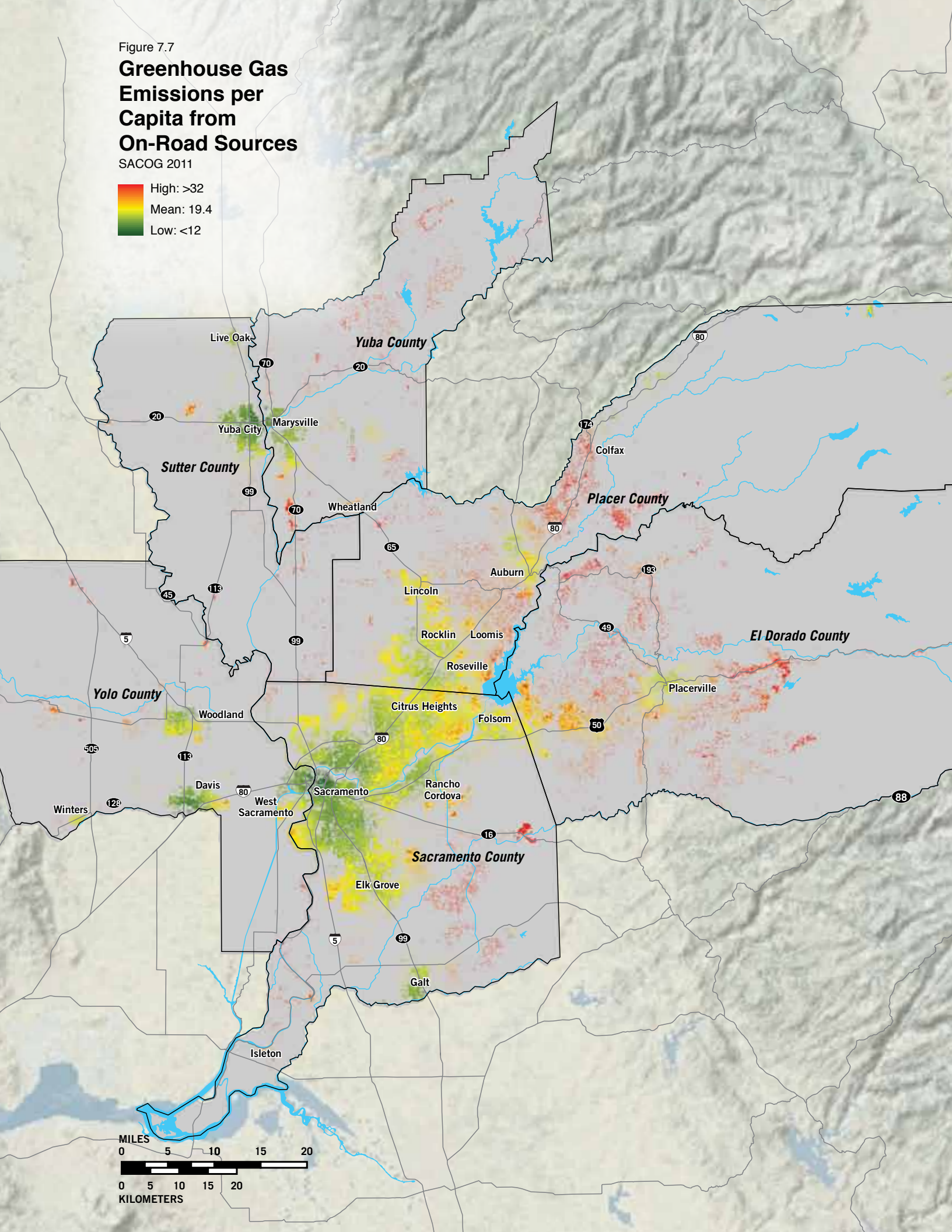
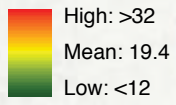
<sup>1</sup> Off model reductions account for effects of TSM, ITS, and TDM projects not accounted for in SACSIM

Source: SACOG, 2011

Figure 7.7

# Greenhouse Gas Emissions per Capita from On-Road Sources

SACOG 2011



### Travel Behavior Approach

Shifting more trips away from automobiles to transit, walking, and biking will reduce energy consumption from transportation. Viable, cost-effective alternatives to driving alone must be provided, and show they are safe, easy and efficient, and reduce the distances people must travel. For this MTP/SCS, SACOG considered several causes and effects of shifts in travel behavior.

There are several factors that influence travel behavior, a key one being cost. Beginning in 2005 and continuing through today, the nation is experiencing unprecedented volatility in fuel prices. Recent projections of fuel prices by the federal Department of Energy<sup>13</sup> and the California Energy Commission<sup>14</sup> have shown a much higher high-end price as compared to past projections. SACOG has worked with other MPO's around the state to develop consistent future projections of fuel prices for use in the integrated plans implementing SB 375 and achieving GHG reduction targets. Fuel prices were assumed to increase to \$4.74 by 2020, and to \$5.74 by 2035 (both stated in 2009 dollars).

Another key factor that influences transportation activity and the choices people make related to travel is land use. The relationship between land use and travel behavior is often referred to as the "D's", for variables including: Destination, Design, Diversity, Distance, and Density. Destination is a measure of how accessible by transit and driving an area is to the rest of the region. The less time spent getting from an area to a concentration of jobs, the more accessible the area. The Design variable describes the street pattern of an area, which makes travel by any mode more or less efficient. The mix of land uses within an area, or Diversity, will provide for fewer and shorter trips. Distance to nearest transit measures how likely trips coming to and leaving an area will be made by transit. Lastly Density, and specifically residential density, has been shown to be a key indicator of the likelihood of non-auto forms of travel. SACOG considered all of these factors when developing the land use pattern and transportation projects in the MTP/SCS. See Chapter 5A for a more detailed discussion on the relationship between land use and transportation, and the performance of the MTP/SCS as it relates to these variables.

The short-term effects from changing the cost of travel involves shifting from automobile use, while long-run effects are greater and include relocating homes or work locations in order to shorten travel distances. Travel options range from taking fewer auto trips, carpooling, and buying more fuel-efficient vehicles, to using transit, walking, biking, or some other mode of transportation. In this MTP/SCS, total person trips by walk, bike and transit increase by

755,500 for weekday travel, which is an 85 percent increase from the 2008 base year. The MTP/SCS was forecasted to increase per capita trips by bike, walk or transit from 0.40 in 2008 to 0.53, a 33 percent increase by 2035. People can also change the locations of their homes, jobs, or both to reduce their travel miles. People who live in areas with a mix of land uses in close proximity, and with nearby transit, walking and biking facilities will probably experience less inconvenience and disruption to their daily lives than others. While investments in public transportation infrastructure are expensive, a review of cost-benefit studies by Cambridge Systematics found that the benefits out-weigh the costs as much as 3 to 1. Additional benefits outside of reducing GHG emissions can include: "expanded travel options, reduced congestion, greater accessibility, improvements in the livability of urban areas, improved equity, improved environmental quality, enhanced public health, and improved safety"<sup>15</sup>.

### Travel Efficiency Approach

Another approach to addressing the impact GHG emissions have on climate change is advancing technologies that create more efficient forms of travel and reduce GHG emissions by automobiles. These include increased fuel efficiency, decreased carbon in fuel, and more efficient engine design. Although these are not specifically considered as part of the MTP, mainly because SB 375 does not allow for advances in technology to achieve GHG reduction goals, it is an integral part of the multi-strategy approach to addressing climate change from travel. AB 32 has very specific measures aimed at reducing GHG emissions from travel by making travel more efficient. SACOG has taken every possible step to make sure that the MTP/SCS does not interfere with the implementation and achievement of AB 32 goals.

The technological improvements most effective at dealing with global climate change increase fuel efficiency significantly, reduce carbon in fuels, or capture carbon emissions. Major advances in cleaner and more efficient technology are being made. Increased use of cleaner-burning fuels and engines will help reduce GHG emissions, while improvements to fuel efficiency will result in less consumption of fossil fuels. The uncertainty is when these technologies will penetrate the market, and how widely available and purchased they will be.

As discussed in more detail in Chapter 5A, technical coordination among MPOs statewide resulted in a consensus on the most likely passenger vehicle fleet fuel efficiency (25.5 miles per gallon in 2020, increasing to 29.3 by 2035), fuel prices for 2020 and 2035, and vehicle operating costs to use for the MTP/SCS.

<sup>13</sup> Department of Energy, "Energy Outlook" series provides forecasts and projections of prices for gasoline and diesel.

<sup>14</sup> California Energy Commission "Integrated Energy Policy Reports" series provides forecasts and projections of prices for gasoline and diesel.

<sup>15</sup> Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions, Cambridge Systematics, Inc 2009.