1 The Farmland Mapping and Monitoring Program

Twenty years of documenting changes in agricultural land use.

The goal of the Farmland Mapping and Monitoring Program (FMMP) is to provide consistent, timely and accurate data to decision makers for use in assessing present status, reviewing trends, and planning for the future of California's agricultural land resources.

Approximately 91% of the privately owned land in the state (45.9 million acres) was mapped this update cycle by FMMP. The survey area is shown on the following page (Figure 1). Each map is updated every two years, providing an archive for tracking land use change over time.

Using a geographic information system (GIS), air photos, local input, and other information, FMMP combines soil quality data and current land use information to produce Important Farmland Maps. The program is funded through the state's Soil Conservation Fund. This fund receives revenues from Williamson Act contract cancellation fees.

The number of products available has grown with the requirements of users - including printed maps, statistics, field reports, and GIS data. The maps and data are used in environmental studies to assess the impacts of proposed development on agricultural and open space land. In recent years, FMMP data has become widely used in urbanization and environmental modeling, and comparative land cover studies.

REFERENCES

FMMP is authorized under Government Code §65570.

The Williamson Act & FSZ Programs are part of the Division of Land Resource Protection, along with FMMP: conservation.ca.gov/dlrp

In addition, only land that is classified in one of the four main agricultural categories on FMMP maps is eligible for enrollment in Farmland Security Zone (FSZ) contracts. Under FSZ contracts, landowners receive substantial property tax benefits for committing to keep their land in agricultural use for 20-year periods.

This is the ninth Farmland Conversion Report produced by the FMMP, the current report covering the 2000 to 2002 period.

Farmland Mapping and Monitoring Program Survey Area 2002

Locations shown as 'Out of Survey Area' may be added in the future, while those indicated as 'Local, State, and Federal Owned Land' are not planned for incorporation. Examples of government owned land include National Parks, Forests, and Bureau of Land Management lands. Please note that small areas of public land are included in the FMMP survey area - generally appearing as 'Other Land' on the map below.

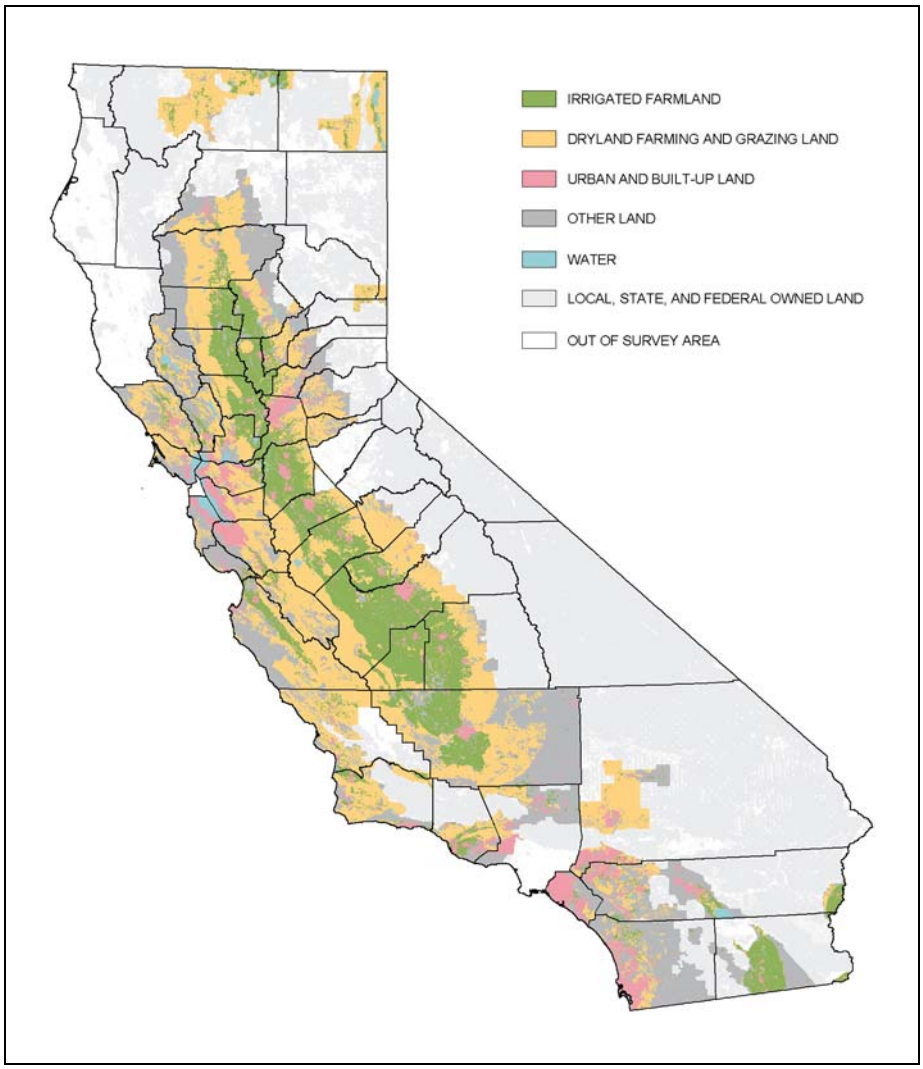


FIGURE 1
FMMP
SURVEY AREA

Important Farmland Map Categories

About 92% of FMMP's study area is covered by U.S. Department of Agriculture (USDA) modern soil surveys. Technical ratings of the soils and current land use information are combined to determine the appropriate map category.
The minimum mapping unit for all categories is 10 acres unless otherwise noted.

Prime Farmland has the best combination of physical and chemical features able to sustain long-term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

Farmland of Statewide Importance is similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

Unique Farmland consists of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include nonirrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.

Farmland of Local Importance is land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee. The definitions for this category are detailed in Appendix D of this report.

Grazing Land is land on which the existing vegetation is suited to the grazing of livestock. This category was developed in cooperation with the California Cattlemen's Association, University of California Cooperative Extension, and other groups interested in the extent of grazing activities. The minimum mapping unit is 40 acres.

Urban and Built-up Land is occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. Common examples include residential, industrial, commercial, institutional facilities, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, and water control structures.

Other Land is land not included in any other mapping category. Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry or aquaculture facilities; strip mines, borrow pits; and water bodies smaller than 40 acres. Vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 acres is mapped as Other Land.

Water - perennial water bodies with an extent of at least 40 acres.

INTERIM MAPPING

In areas where no USDA soil survey is available, Interim Farmland categories allow FMMP to monitor land use until soils data becomes available. These categories substitute for the categories of Prime, Statewide, Unique, and Local. All other map categories are as described above.

At present, Butte County and portions of Kern County are the locations where Interim mapping categories apply.

Irrigated Farmland is land with a developed irrigation water supply that is dependable and of adequate quality. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

Nonirrigated Farmland is land on which agricultural commodities are produced on a continuing or cyclic basis utilizing stored soil moisture. Wheat and other grains are the most common nonirrigated crops.

OPTIONAL DESIGNATION

Land Committed to Nonagricultural Use is defined as existing farmland, grazing land, and vacant areas that have a permanent commitment for development. This optional designation allows local governments to provide detail on the nature of changes expected to occur in the future. It is available both statistically and as an overlay to the Important Farmland Map.

STATISTICAL NOTES

Residual Polygons, those less than the 10- or 40-acre minimum mapping unit, are a natural result of the mapping process as changes are made to adjacent areas. In order to maintain map unit consistency, these small units are absorbed into the most appropriate adjacent land use type. This process results in shifts among categories that may appear anomalous in the conversion statistics - such as urban to agriculture or Prime Farmland to Farmland of Statewide Importance.

In some counties, major revisions to the maps are being made to accommodate new mapping technology. This process, and its effect on the data, is discussed in the following section of the report.

Minimum units of analysis within the GIS database are 0.3 acres for land use changes. When digital soil information is incorporated from USDA, soil units of less than 1.0 acre have been merged with the next most appropriate category.

2 2000-2002 Improvements

Western Fresno County addition, mapping process improvements, and additional detail on rural development uses.

The increasing need for accurate information on agricultural land conversion, expressed by users in government and the private sector, drives FMMP to continually improve technology and procedures. Significant progress occurred toward meeting these needs during the 2000-2002 update cycle. Improvements included an increase in the survey area, more detailed land use delineation, and more accurate soil data. In addition, a pilot study to document rural residential and related categories impacting the planning process covered four counties. Many of these improvements were funded with a temporary augmentation FMMP received from the 2000 Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act (Proposition 13).

Survey area addition - Western Fresno County. The completion of a soil survey for western Fresno County allowed FMMP to add more than 1.3 million acres to the database. This had been the largest gap remaining in the productive San Joaquin Valley. Soil data was added to the 2000 version of the map, so that complete 2000-2002 conversion figures are available in this report.

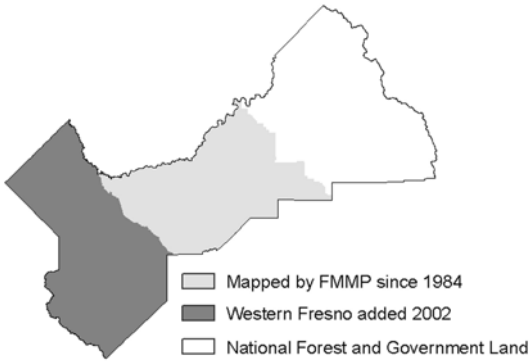


FIGURE 2
FRESNO COUNTY
MAPPING

Irrigated land in this section of Fresno County is almost exclusively Prime Farmland and Farmland of Statewide Importance.

Digital map updating workflow – now complete statewide.
Starting in 1998, FMMP began transitioning the mapping process to a system in which all data sources (digital photography, soil lines, field notations, reference maps) are co-registered and digitizing is done on screen. This system has improved both the spatial and classification accuracy of the Important Farmland Maps and allows for cross-referencing to other relevant GIS data. The volume of detailed work to conduct this transition required three update cycles to encompass the 45.9 million acre study area.

Due to the boundary corrections that are inevitable with this improvement, anomalous land use conversions - from urban to agriculture, for example - are evident in the

statistics for the year digital conversion takes place. In large counties, these anomalies may total in the thousands of acres. More detail on these impacts follows in this chapter.

As a result of this process, spatial accuracy of the Important Farmland data is much closer to 1:24,000 than the original compilation scale of 1:100,000. Due to variations in the quality of terrain correction for imagery or other reference data, however, FMMP does not claim a particular spatial accuracy standard.

Digital soil survey data incorporation – phase I.

The Natural Resources Conservation Service (NRCS) has begun releasing its soil survey data in GIS format. This information offers much greater accuracy and ease of analysis compared with prior hand-transfer methods. FMMP is incorporating this data as individual counties are released and as staff resources allow.

This improvement allows FMMP to accurately represent the original NRCS soil maps, and any modifications NRCS makes to the data in its digital form. The FMMP land use minimum mapping unit of ten acres remains the same, but digital soil units as small as one acre in size will now occur in the GIS data.

TABLE 1
DIGITAL SOIL SURVEY INCORPORATION

Farmland Mapping and Monitoring Program

Digital Soil Survey (SSURGO) Incorporation Progress

2002 Update (1)	2004 Update (1)	Not Yet Available (2)
Alameda	Amador	Butte
Colusa	Glenn	Kern (NE and SW)
Contra Costa	Imperial	Modoc
El Dorado	Kern (SE and NW)	
Fresno	Los Angeles	
Kings	Madera	
Lake	Merced	
Marin	Nevada	
Mariposa	Riverside	
Monterey	San Benito	
Napa	San Diego	
Orange	San Luis Obispo	
Placer	San Mateo	
Sacramento	Santa Barbara	
San Bernardino	Santa Clara	
San Joaquin	Santa Cruz	
Solano	Shasta	
Stanislaus	Sierra Valley	
Sutter	Siskiyou	
Tulare	Sonoma	
Ventura	Tehama	
Yolo	Yuba	

(1) Incorporations listed for a given update year are conducted prior to the update itself. Thus, 2002 incorporations were conducted on the 2000 data.

(2) SSURGO incorporation is conducted when all surveys for a county are available in digital format. Status subject to change during biennial update.

Mapping Improvements – Impact on Statistics

The improvements described above make the paper and digital (GIS) versions of the Important Farmland Maps significantly more accurate and useful. They represent evolutions in technology that have occurred in recent years, and are necessary to create products meeting modern standards for use in the planning process.

The changes have an unavoidable affect on the statistics in the years they are implemented, making comparisons more complicated. County conversion tables have footnotes to describe particular impacts, which can be categorized in two ways:

The digital imaging workflow adoption affects land use conversion data, particularly as urban boundaries are adjusted to more detailed, terrain corrected imagery. Image data at 2-foot ground sampling resolution was used in much of southern California during the 2002 map update (Figure 3, below).

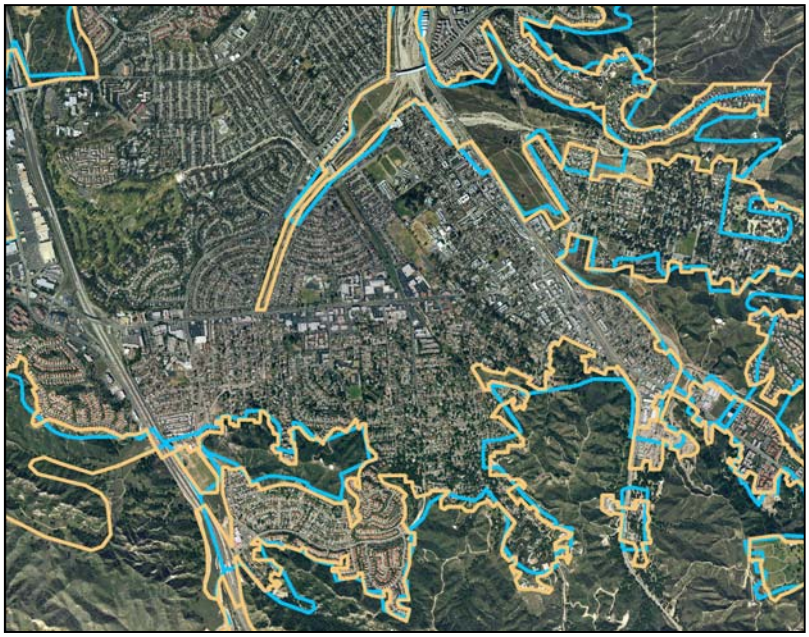


FIGURE 3
DATA
IMPROVEMENT
EXAMPLE

This example from Los Angeles County depicts improved lines (gold) and the more generalized old data (blue).

In this instance, comparisons between old and new data result in conversions between Urban and Other Land. Raw conversion data (Part III of the Appendix A tables) is therefore inflated relative to actual land use change. Chapter 4 summary data for urban conversion has been adjusted to reflect net change.

SSURGO incorporation impacts acreage totals for agricultural categories and Other Land. The impact is noticeable when comparing the 2000 acreages in this report to those published in the 1998-2000 report. While typically small, these variations may be a few thousand acres in specific instances - especially if Farmland of Local Importance definitions involve a soil component.

Please contact FMMP with questions about these statistical anomalies and how to best use the published data from this or prior reports.

Rural Land Mapping Project

The question of 'What is happening to California's farmland?' that FMMP was set up to answer has only partially been addressed by the existing mapping process. Important Farmland Maps contain detailed information on Prime Farmland and the extent of cultivated uses, as well as up-to-date Urban Land information. However, the broad miscellaneous category called Other Land (Other) covers 30% of the FMMP survey area, and contains land uses that range from highly valuable agriculture (e.g. dairies, poultry houses) to low-density residential "ranchettes" to wildlife areas.

The Other category does not provide sufficient detail to track changes such as the subdivision of farmland into large lot residences or the movement of farmland into ecological restoration areas. These conversions cause fragmentation in the farming landscape and could lead to restrictions on agricultural practices on the remaining land - further eroding agricultural viability.

The Rural Land Mapping Project represents an enhancement to the standard Important Farmland Map products, in which Other Land is subdivided in to four subcategories, as described below.

Rural Residential and Rural Commercial: residential areas of one to five structures per ten acres, farmsteads, small packing sheds, unpaved parking areas, composting facilities, firewood lots, and recreational water ski lakes.

Vacant or Disturbed Land: open field areas that do not qualify for an agricultural category, mineral and oil extraction areas, and rural freeway interchanges.

Confined Animal Agriculture: aquaculture, dairies, feedlots, and poultry facilities.

WHY SUBDIVIDE OTHER LAND?

Other Land acreage increased an average of more than 5,600 acres per year since FMMP mapping began in 1984.

Milk and cream are the top agricultural commodities in California, yet dairies are not shown as an agricultural use unless part of a county Farmland of Local Importance definition.

Nonagricultural and Natural Vegetation[1]: heavily wooded, rocky or barren areas, riparian and wetland areas, grassland areas which do not qualify for Grazing Land due to their size or land management restrictions, and small water bodies. Constructed wetlands are also included in this category.

Rural Land Mapping categories are the primary land use distinctions within the miscellaneous Other Land class which can be readily distinguished with the imagery

[1] The Rural Land classes are not designed for interpretation as 'habitat.' Differences between the Nonagricultural/Natural Vegetation class and the Vacant/Disturbed Land class are a function of level of disturbance, relative location, and time period since disturbance occurred. Geographic data on the extent of habitat for various species may be available from other state and federal entities.

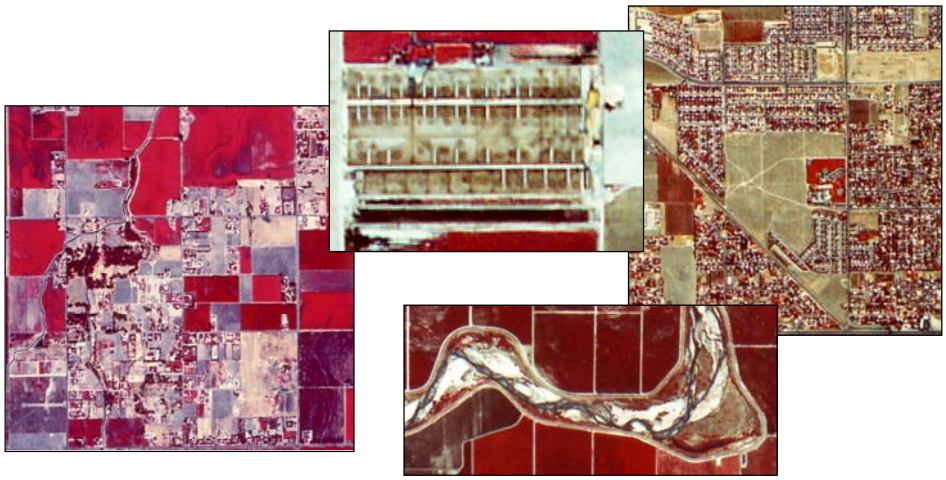
used to conduct FMMP mapping. The increased number of categories results in greater complexity in the database and in the map updating process, but is still reasonable to achieve relative to FMMP's two-year mapping interval.

A four-county pilot area, located in the San Joaquin Valley, includes Fresno, Madera, Merced, and Stanislaus counties, and covers 12% of the FMMP study area. These counties were selected due to their strategic central valley location, agricultural importance (ranks 2, 5, 7, and 15 statewide) and divergent patterns of gross agricultural value despite their adjacency. Among the four counties, change in gross agricultural values between 2000 and 2001 varied from –13% (Madera) to +13% (Stanislaus).

During the pilot phase, database structure and criteria were established, while the process was monitored to document resource needs for potential statewide application. Additional counties may be enhanced with Rural Land data as funding becomes available.

Mapping enhancements were made starting with the 2002 edition of the four counties. Rural Land Mapping statistics will be reported separately from the standard conversion tables published by FMMP.

FIGURE 4
RURAL LAND
MAPPING
EXAMPLES



Rural land uses in the San Joaquin Valley, clockwise from left: rural residential/commercial; confined animal agriculture, vacant land, and nonagricultural/natural vegetation.

DATA SUMMARY

The distribution of rural land uses in the adjacent pilot counties illustrates the lack of homogeneity in the Other Land class (Figure 5, page 12). Landscape characteristics, administrative boundaries, and infrastructure affect where the rural land use categories occur.

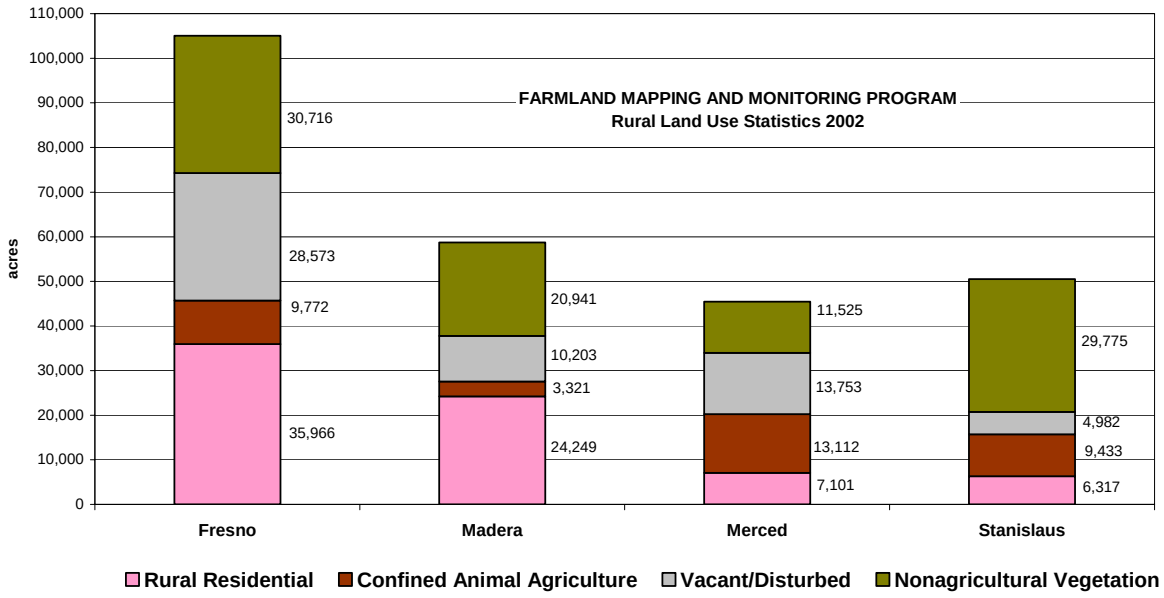
Geography combines with administrative factors in the distribution of Nonagricultural Vegetation, primarily in the form of riparian channels along the San Joaquin River, its tributaries, and designated refuge areas. Although some refuges allow seasonal grazing, the specific units in this category prohibit grazing uses. FMMP updates refuge grazing status information on a cyclic basis. In addition, higher elevation zones, such as in Fresno County, exhibit slope and forest conditions not suited to grazing uses. The study area does not include National Forest land in eastern Fresno and Madera counties.

Proximity to processing facilities such as Hershey Chocolate (Oakdale), Hilmar Cheese (Hilmar), and Foster Farms (Turlock and Livingston) likely contributes to the greater concentration of Confined Animal Agriculture in Merced and Stanislaus counties. These counties rank in second and third place for dairy income in California, which in turn is the top dairy state in the country.

Vacant or Disturbed areas exhibit the impacts of all three factors - examples include riverside gravel operations, historic mine tailings, valley aquaducts, and undeveloped land adjacent to cities such as Madera. Specific vacant land units may represent opportunities for accommodating projected population increases.

Rural subdivisions are most common to the north and east of existing cities, coming in two forms. At the base of the foothills, where irrigated and grazing uses meet, blocks of these subdivisions exist in one to five square mile units. This is particularly true of Madera and Fresno counties. More irregular configurations of low-density residential occur at higher elevations as Highways 41 and 168 lead in to the Sierra.

FIGURE 5
DISTRIBUTION OF
RURAL LAND
CATEGORIES



3 Understanding the Data

Locating and interpreting the California Farmland Conversion Report's tabular data and graphics.

Important Farmland information is developed on an individual county basis, taking two years to map the 45.9 million acre survey area. This report begins with each county's information, compiling it in various ways to produce the assessment in Chapter 4.

Detailed county tables - Appendix A. Includes acreage tallies and conversion data for individual counties. The figure below describes how conversion tables are constructed.

2000 and 2002 county acreage tallies – Appendix B. Values for the individual years (Tables B-1 and B-2) are extracted from Part I of the tables in Appendix A. These tables also indicate the proportion of each county within the FMMP survey area—approximately half of the counties are not completely mapped due to lack of a soil survey. Table B-3 shows this same information for 2002, grouped by region.

Statewide conversion summary – Chapter 4, Table 3. This table summarizes material from all three sections of the Appendix A information. This table now includes data on the Interim mapped areas in Butte and portions of Kern County.

FIGURE 6
CONVERSION
TABLE
STRUCTURE

TABLE 4
LAND USE CONVERSION SUMMARY (1)
1998-2000 Land Use Conversion

DEPARTMENT OF CONSERVATION
Division of Land Resource Protection

Farmland Mapping and Monitoring Program

PART I
Land Use Totals and Net Changes

LAND USE CATEGORY	TOTAL ACREAGE INVENTORIED 1998	TOTAL ACREAGE INVENTORIED 2000	1998-00 ACREAGE CHANGES ACRES LOST (-)	ACRES GAINED (+)	TOTAL ACREAGE CHANGED	NET ACREAGE CHANGED
Prime Farmland (2)						-39,588
Farmland of Statewi						-12,213
Unique Farmland (2)						24,676
Farmland of Local In						-6,030
IMPORTANT FARM						-33,155
Grazing Land						-52,193
AGRICULTURAL LA						-85,348
Urban and Built-Up Land	2,535,516	2,608,038	13,755	86,277	100,032	72,522
Other Land	9,011,609	9,018,671	54,898	61,960	116,858	7,062
Water Area	637,377	643,141	491	6,255	6,746	5,764
TOTAL AREA INVENTORIED	33,340,497	33,340,497	402,472	402,472	804,944	0

PART I:
Indicates county area mapped & overall change in each category.

PART II
Land Committed to Nonagricultural Use

Grazing Land	63,496
AGRICULTURAL LAND SUBT	124,134
Urban and Built-Up Land	18
Other Land	42,968
Water Area	22
TOTAL ACREAGE REPORTE	167,142

PART II:
Land expected to be developed (voluntary submission by local governments).

PART III Land Use Conversion from 1998 to 2000

LAND USE CATEGORY		Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal Important Farmland	Grazing Land	Total Agricultural Land	Urban and Built-Up Land	Other Land	Water Area	Total Converted To Another Use
Prime Farmland (2)												84,183
Farmland of Statewide Im												45,548
Unique Farmland (2)												29,644
Farmland of Local Import												80,914
IMPORTANT FARMLAND												40,289
Grazing Land												93,039
AGRICULTURAL LAND S												33,328
Urban and Built-Up Land												13,755
Other Land												54,898
Water Area	to:	0	8	0	22	30	119	149	81	261	--	491
TOTAL ACREAGE CONVERTED	to:	44,595	33,335	54,320	74,884	207,134	40,846	247,980	86,277	61,960	6,255	402,472

PART III:
Raw data from GIS provides detail on every acre of change that occurred. All changes result from revising the two-year-old linework based on new air photos.

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FOOTNOTES:
Information on large or unusual conversions and other descriptive material.

County and regional conversion summaries – Appendix C. The counties are grouped into geographic regions as seen in Figure 7.

Table C-1 Classifies sources of new urban land for the period, by county and region.

Table C-2 Identifies conversions in or out of agriculture aside from urbanization, capturing the ebb and flow of agricultural land use change over time.

Table C-3 Documents net agricultural change from all factors, grouped by region and ranked by acreage.

Appendix C information includes the Interim farmland portions of Butte and Kern counties. Much of the analysis in Chapter 4 is based on the data in Appendix C.

Simplifying assumptions for analyses – In order to conduct comparative analysis, certain simplifying assumptions have been made. For example, Unique Farmland is considered to be an irrigated farmland category, even though a small percentage of land within the Unique Farmland category supports high value nonirrigated crops, such as some coastal vineyards. Conversely, Farmland of Local Importance is considered to be a nonirrigated category although it also supports some irrigated pasture on lower-quality soils.

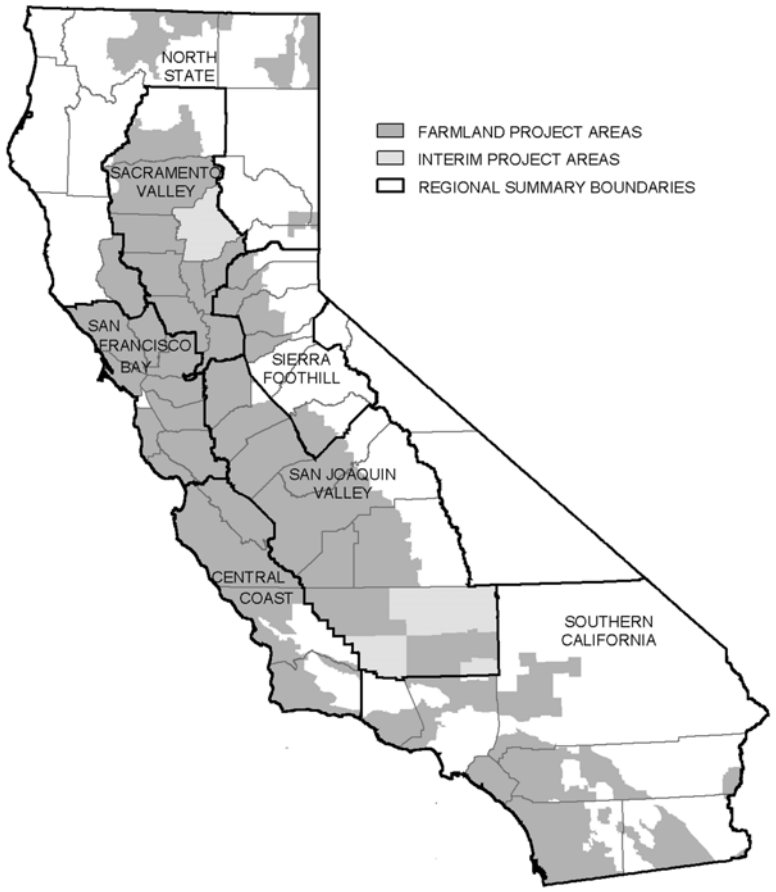

FIGURE 7
FMMP REGIONS