2024 STATEWIDE AVOCADO
ACREAGE & CONDITION ANALYSIS

Prepared for
California Avocado Commission

Prepared by

LAND IQ

2020 L Street, Suite 210
Sacramento, CA 95811
Contact: Joel Kimmelshue
916.265.6330

September 2024

Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

EXECUTIVE SUMMARY

Spatial land use information is essential for the California Avocado Commission to make informed decisions for budgeting and marketing of crops. Accurate and timely land use information is the foundation of these analyses and is vital to the decision-making process.

Increased availability of digital satellite imagery, aerial photography and new analytical tools make remote sensing land use surveys possible at the grove scale. These technologies allow accurate, large-scale crop and land use identification to be performed at time increments as desired and make highly accurate and comprehensive statewide avocado mapping possible.

Growers, industry, regulators, government agencies, and commodity groups also benefit from spatial data related to crop type, location, condition, and density. These data are key components for management of environmental resources and proximity to sensitive areas including water quality, air quality, and disease or pest vectors.

For 2024, the total planted avocado acreage in California was 53,703 acres.

Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

INTRODUCTION

Accurate acreage information is critically important to the work of the California Avocado Commission (CAC). Acreage drives a multitude of activities that range from yield forecasting to member data tracking and budgeting. In response to this need for information, Land IQ was contracted by CAC to develop a comprehensive and accurate statewide spatial land use database of avocado groves and condition on a grove scale using remote sensing, statistical, and temporal analysis methods.

Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

FORECASTING METHODS

Land IQ integrated crop production knowledge with multiple satellite and aerial image resources to conduct remote sensing land use analysis at the grove scale. The mapping approach employs advanced spatial statistical analysis to determine prediction probabilities and inform QA/QC efforts. A rigorous QA/QC and photo interpretive analysis is employed to improve predictions on all lower confidence groves. In addition, these groves are also back-checked with the CAC industry representatives.

Individual avocado polygon boundaries (areas of homogeneous crop types representing true cropped area rather than legal parcel boundaries) are used so that each independent avocado polygon could be analyzed independently and assigned a condition class. The results represent the true cropped area and not legal or other less detailed boundaries that may be available elsewhere.

The condition legend was developed by CAC and is summarized in Table 1.

Table 1. Avocado Condition Description

Condition	Description
Producing	Groves that are greater than 4 years old.
Topped/Stumped	Groves that have been topped and/or stumped and not producing.
New/Young	Groves that are 4 years old or younger.
Abandoned	Groves previously identified as avocados that do not return to healthy growth statistics as represented by spectral data.

Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

Data Collection

Satellite data resources were used for the classification. Avocado boundaries from 2023 avocado mapping were used as a base layer for 2024. Multiple Landsat 8 images were used for the initial crop classification. Imagery from the Landsat 8 satellite is free of charge, available every 16 days, and used for temporal analysis throughout the growing season. Following analysis with Landsat 8 images, various sources of localized high resolution imagery were used to further evaluate groves for condition, age, and boundary updates. Data provided by Maxar is higher resolution but requires a paid subscription.

Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

Analysis

The Land IQ avocado mapping unit is a grove-scale layer focused on avocado polygons equal to or greater than 0.5 acres across the state. 18,794 delineated polygons were classified using multiple image sources and dates. The images are used as the base layer data, in which classification algorithms are applied for crop identification.

Classified groves with a lower confidence level are carefully reviewed by assessing image resources using photo interpretation methods. Results are also cross-validated with ancillary data sources such as the coinciding USDA Crop Data Layer, county agricultural surveys and county crop reports to assess and evaluate significant differences.

The geospatial database is attributed with avocado polygon size in acres, relevant county, and the appropriate condition category per the CAC legend (Table 1). Table 2 summarizes the database attributes associated with the final mapping product and their definitions.

Table 2. Definition of Database Fields

Avocado Polygon Attribute	Description
Acres	Area of the avocado polygon
County	Indicates the county that the centroid of each avocado polygon resides in
Crop 2024	Crop classification type for the year 2024
Modified By	Name of person who last modified the record
Date Data Refers To	Date the data refers to
Last Modified Date	Date record was last modified
Condition	Describes condition of the avocado polygon
Year Planted	Year the grove was planted or stumped
Comments	Any user-provided comments
Source	Original source of the boundary and attribute information

Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

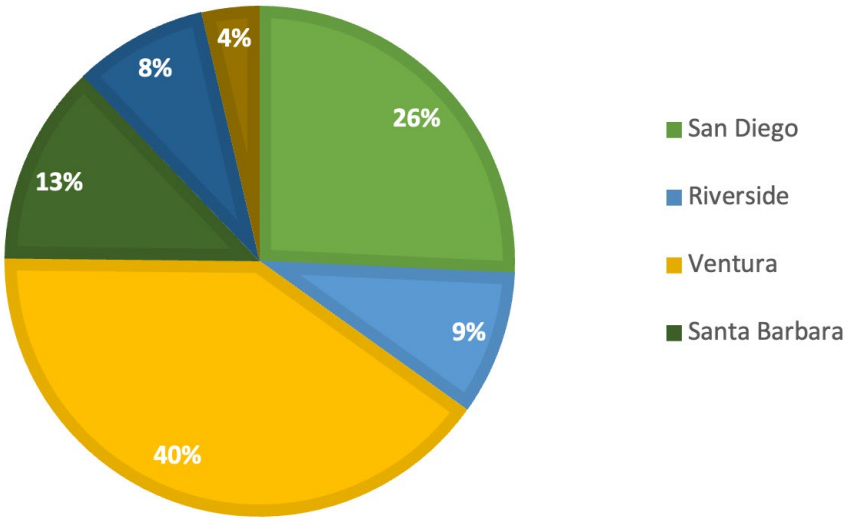
Numeric Results

The avocado acreage classification for the 2024 year totaled 18,794 avocado fields and 53,703 planted acres. The five main avocado growing counties are Ventura, San Diego, Santa Barbara, Riverside, and San Luis Obispo. Small acreages were also present in Orange, San Bernardino, Monterey, Tulare, Los Angeles, Fresno, Kern, and Sacramento Counties. Statewide avocado acreages by county are summarized in Table 3 and Figure 1.

Table 3. Summary of 2024 Statewide Avocado Acreage by County

Five County	Acres	Number of Fields	Minor County	Acres	Number of Fields
San Diego	13,829	5,848	Orange	913	392
Riverside	4,902	2,501	San Bernardino	538	157
Ventura	21,636	6,876	Monterey	370	68
Santa Barbara	6,823	1,964	Tulare	99	35
San Luis Obispo	4,548	928	Los Angeles	20	15
			Fresno	10	4
			Kern	3	1
			Sacramento	11	5
Five County Total	**51,738**	**18,117**	**Minor County Total**	**1,965**	**677**
Overall Total: 53,703 Classified Acres/18,794 Fields					

Figure 1. Summary of 2024 Statewide Avocado Acreage by County



Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

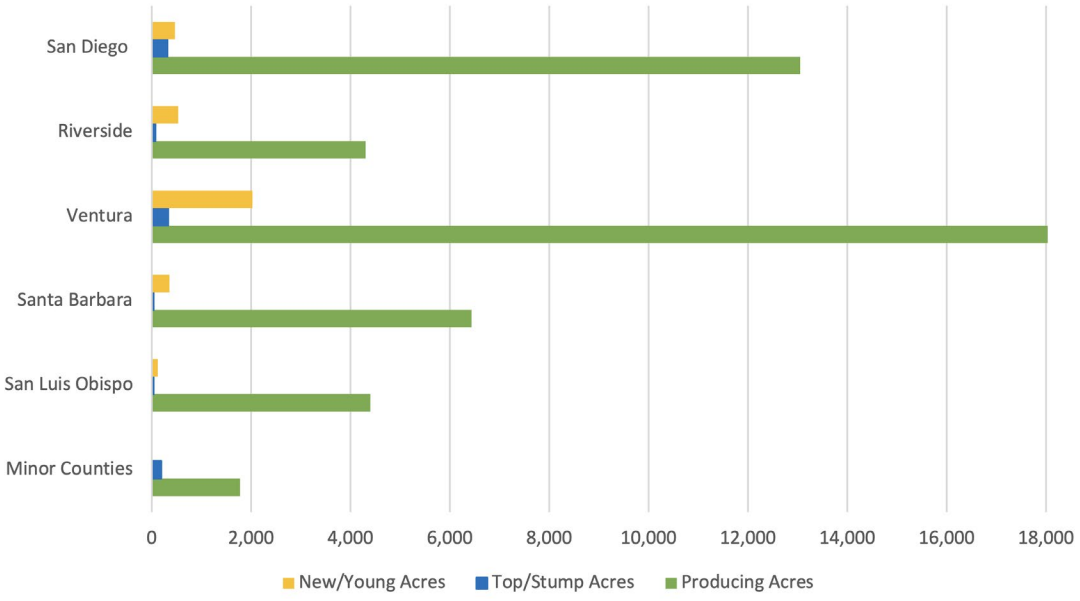
References
List of Figures
List of Tables

Acreage by county and condition for the five main growing areas are summarized in Table 4 and Figures 2 and 3.

Table 4. Summary of 2024 Statewide Avocado Acreage by Condition

County	Producing Acres	Top/Stump Acres	New/Young Acres	Planted Acres
San Diego	13,053	316	461	13,829
Riverside	4,303	69	530	4,902
Ventura	19,282	325	2,028	21,636
Santa Barbara	6,436	34	352	6,823
San Luis Obispo	4,395	35	118	4,548
Five County Total	**47,470**	**779**	**3,489**	**51,738**
Minor Counties	1,775	190	0	1,965
Total	**49,245**	**969**	**3,489**	**53,703**

Figure 2. 2024 Avocado Acreage by Condition and County



Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

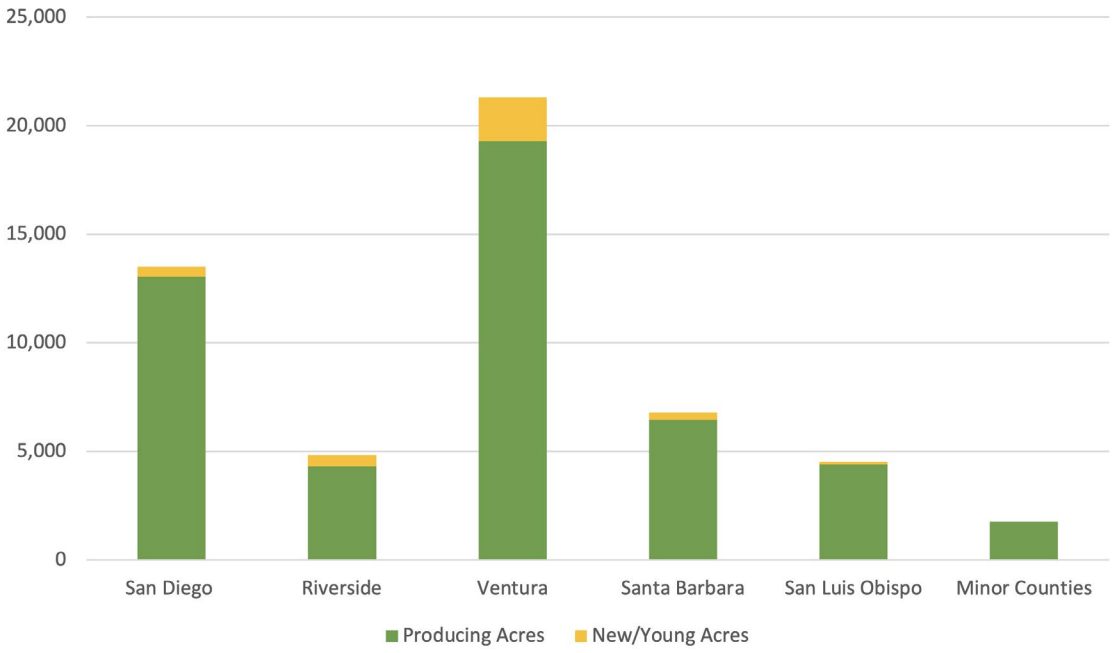
Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

Figure 3. 2024 Avocado Acreage of Producing and New/Young Acreage by County



Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

In addition to acreage and condition summaries, a spatial analysis was completed to determine acreage by other jurisdictional boundaries including zip code. Acreage by zip code is summarized in Table 5.

Table 5. Summary of 2024 Statewide Avocado Acreage by Zip Code

San Diego	
Zip Code	Producing Acres
91935	-
92003	666
92019	4
92021	268
92025	307
92026	871
92027	1,345
92028	3,510
92029	12
92040	5
92057	269
92059	121
92061	1,277
92064	199
92065	168
92069	233
92078	52
92082	3,188
92084	558

Riverside	
Zip Code	Producing Acres
92028	22
92220	2
92503	96
92504	107
92506	4
92507	17
92508	21
92521	10
92530	6
92544	28
92557	12
92562	155
92570	7
92583	9
92590	3,723
92592	17
92595	19
92881	16
92882	14
92883	17

Ventura	
Zip Code	Producing Acres
90265	3
91320	1
91360	23
91361	6
93001	1,432
93003	215
93004	128
93010	261
93012	1,266
93013	37
93015	3,163
93021	2,292
93022	2
93023	815
93030	-
93033	236
93036	103
93040	502
93060	4,694
93065	123
93066	3,979

Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

Santa Barbara

Zip Code	Producing Acres
93013	2,006
93103	42
93105	277
93108	133
93109	12
93110	15
93111	547
93117	3,016
93436	46
93454	44
93455	298

Los Angeles

Zip Code	Producing Acres
90265	7
90631	5
91301	1
91711	1
91768	5

San Luis Obispo

Zip Code	Producing Acres
93401	257
93402	15
93405	172
93420	569
93422	2
93428	213
93430	362
93442	620
93444	550
93452	21
93454	1,567
93465	46

Monterey

Zip Code	Producing Acres
93907	3
93908	5
93960	275
95012	1
95076	8

Kern

Zip Code	Producing Acres
93215	3
93308	0

Orange

Zip Code	Producing Acres
92602	583
92610	48
92618	63
92620	17
92624	0
92675	104
92705	5
92782	7
92887	1

Fresno

Zip Code	Producing Acres
93654	2
93662	1
93725	7

Sacramento

Zip Code	Producing Acres
95615	9
95690	3

San Bernardino

Zip Code	Producing Acres
91709	17
91784	7
92313	12
92346	6
92359	114
92373	65
92374	284
92407	4

Tulare

Zip Code	Producing Acres
93221	2
93235	1
93244	3
93247	6
93257	14
93286	17
93292	31
93631	4
93647	21

Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

In 2024, a separate analysis was performed to determine the year the grove was either planted or stumped. Table 6 shows the acreage that was either planted or stumped within that year. Table 7 and Figure 4 show the age as a percentage of planted acreage.

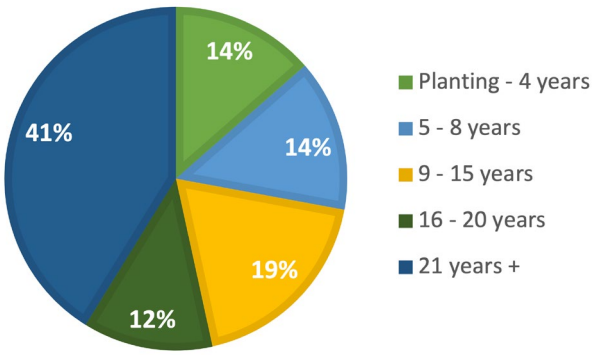
Table 6. 2024 Planted Avocado Acreage by Year Planted or Stumped

Year Planted	Planted Acres	Year Planted	Planted Acres	Year Planted	Planted Acres	Year Planted	Planted Acres
1984	13,673	1994	486	2004	2,089	2014	1,803
1985	5	1995	104	2005	1,201	2015	1,584
1986	45	1996	150	2006	976	2016	3,157
1987	127	1997	160	2007	1,426	2017	1,166
1988	17	1998	238	2008	890	2018	1,697
1989	34	1999	800	2009	1,116	2019	1,678
1990	497	2000	346	2010	919	2020	1,583
1991	184	2001	945	2011	1,117	2021	2,267
1992	165	2002	2,463	2012	1,097	2022	1,707
1993	135	2003	1,533	2013	2,391	2023	1,220
						2024	512

Table 7. 2024 Age as a Percentage of Planted Acreage

Age	Acreage	Percentage of Planted Acres
Planting - 4 years	7,290	14%
5 - 8 years	7,699	14%
9 - 15 years	10,027	19%
16 - 20 years	6,581	12%
21 years +	22,108	41%

Figure 4. Age as a Percentage of Planted Acres



Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

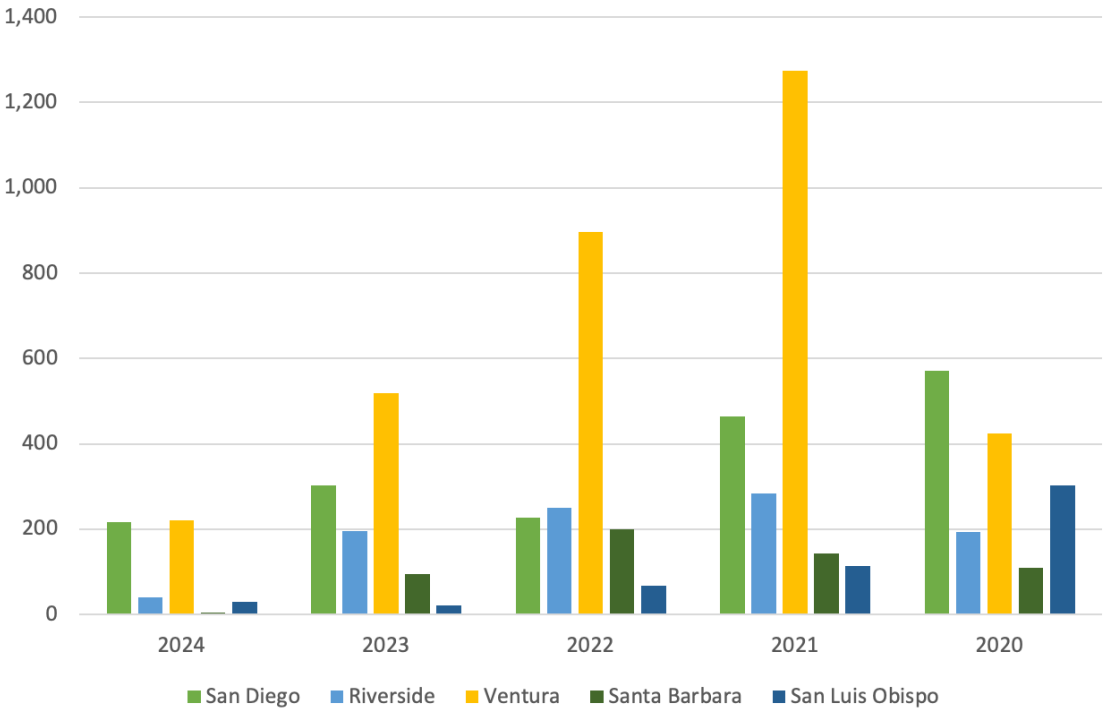
References
List of Figures
List of Tables

Table 8 and Figure 5 show the amount of new plantings that have occurred over the last five years. The spatial analysis can only be performed once new groves have reached a certain canopy size. Thus, the acres reported for 2023 and 2024 are only those that have been visually confirmed through ground truthing efforts.

Table 8. New Acres by County and Planting Year

County	2024	2023	2022	2021	2020
San Diego	217	303	226	464	572
Riverside	41	196	250	284	194
Ventura	220	519	896	1,275	425
Santa Barbara	6	94	200	143	109
San Luis Obispo	29	21	67	113	302

Figure 5. Young Avocado Acreage by Planting Year



Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

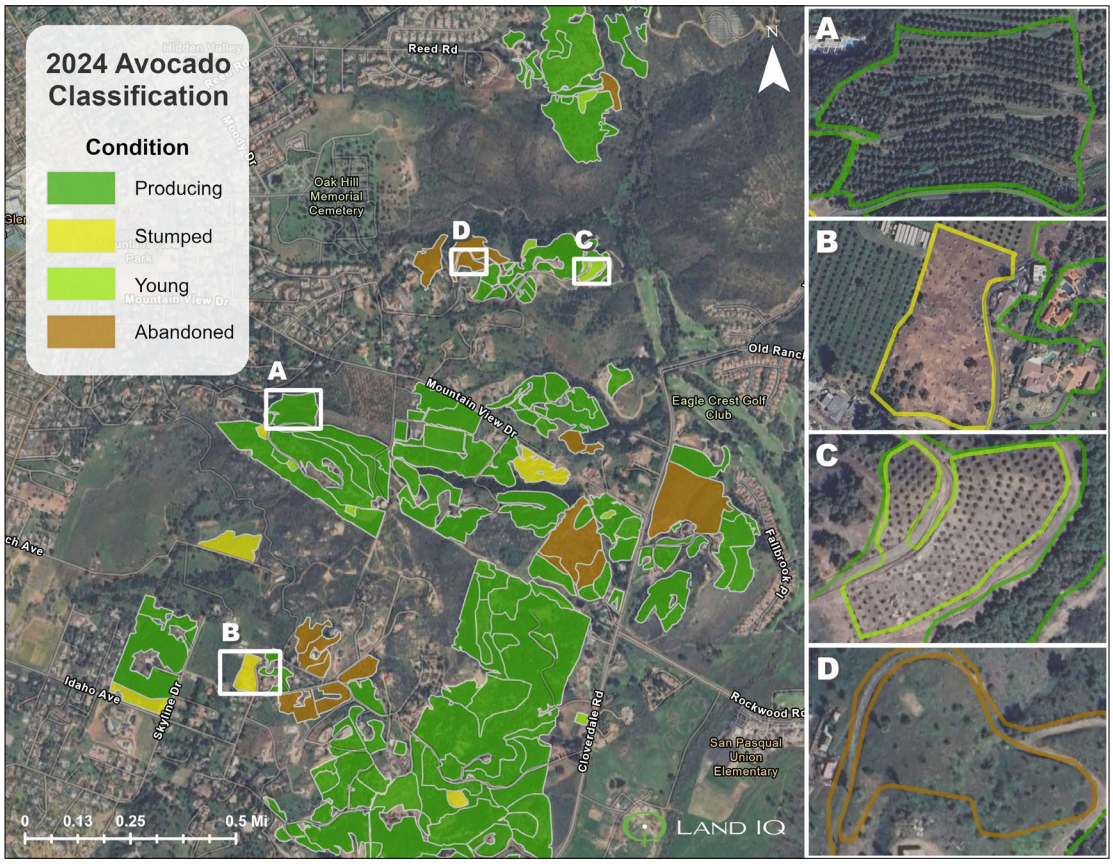
Data Deliverables

References
List of Figures
List of Tables

Mapping Results

A series of maps are provided to demonstrate the avocado classification results. Figures 6 through 11 show the avocado acreage and condition classification example as well as maps of the five CAC districts.

Figure 6. Example of 2024 Avocado Classification Conditions



Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

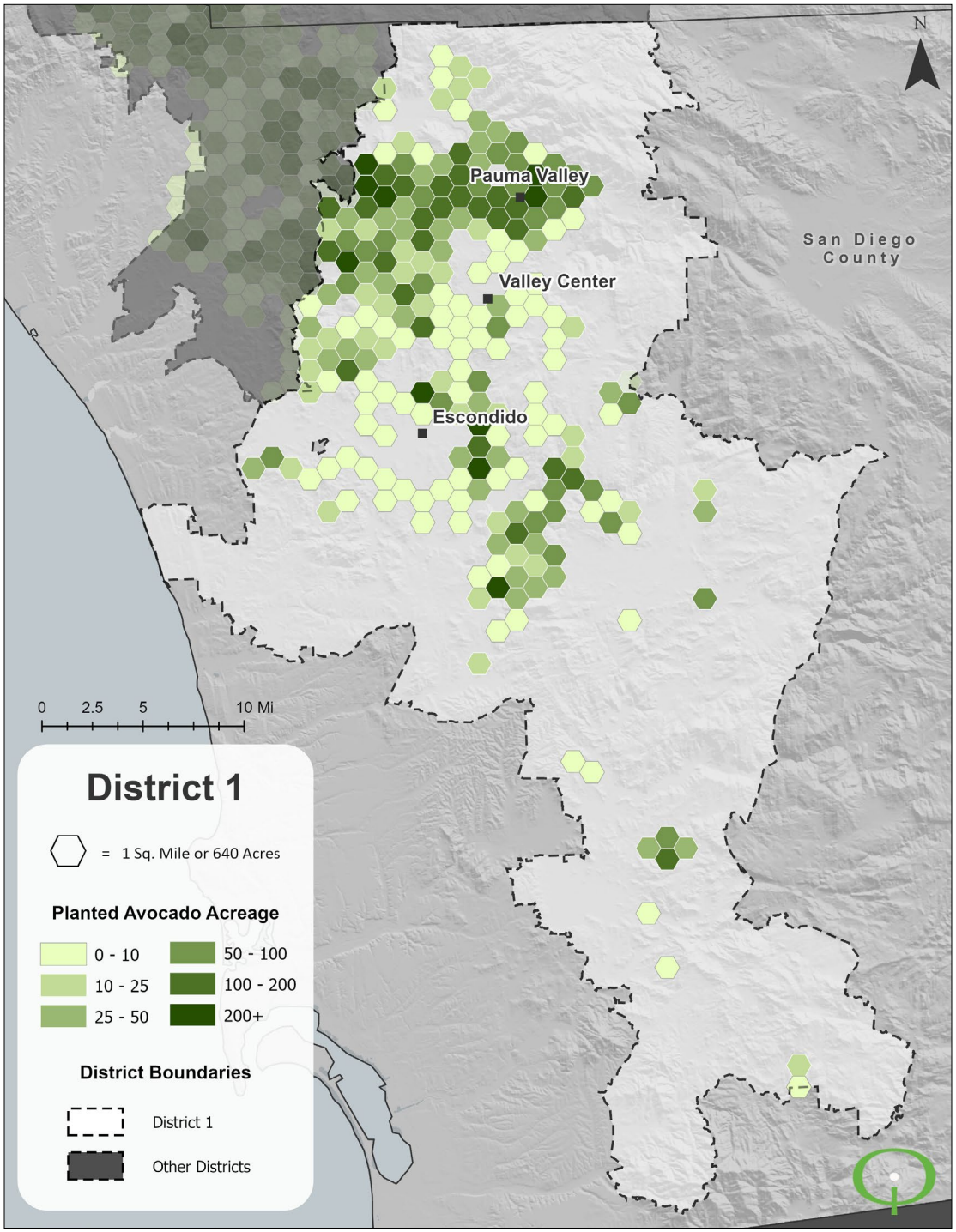
Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

Figure 7. 2024 Avocado Planted Polygons in CAC District 1



Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

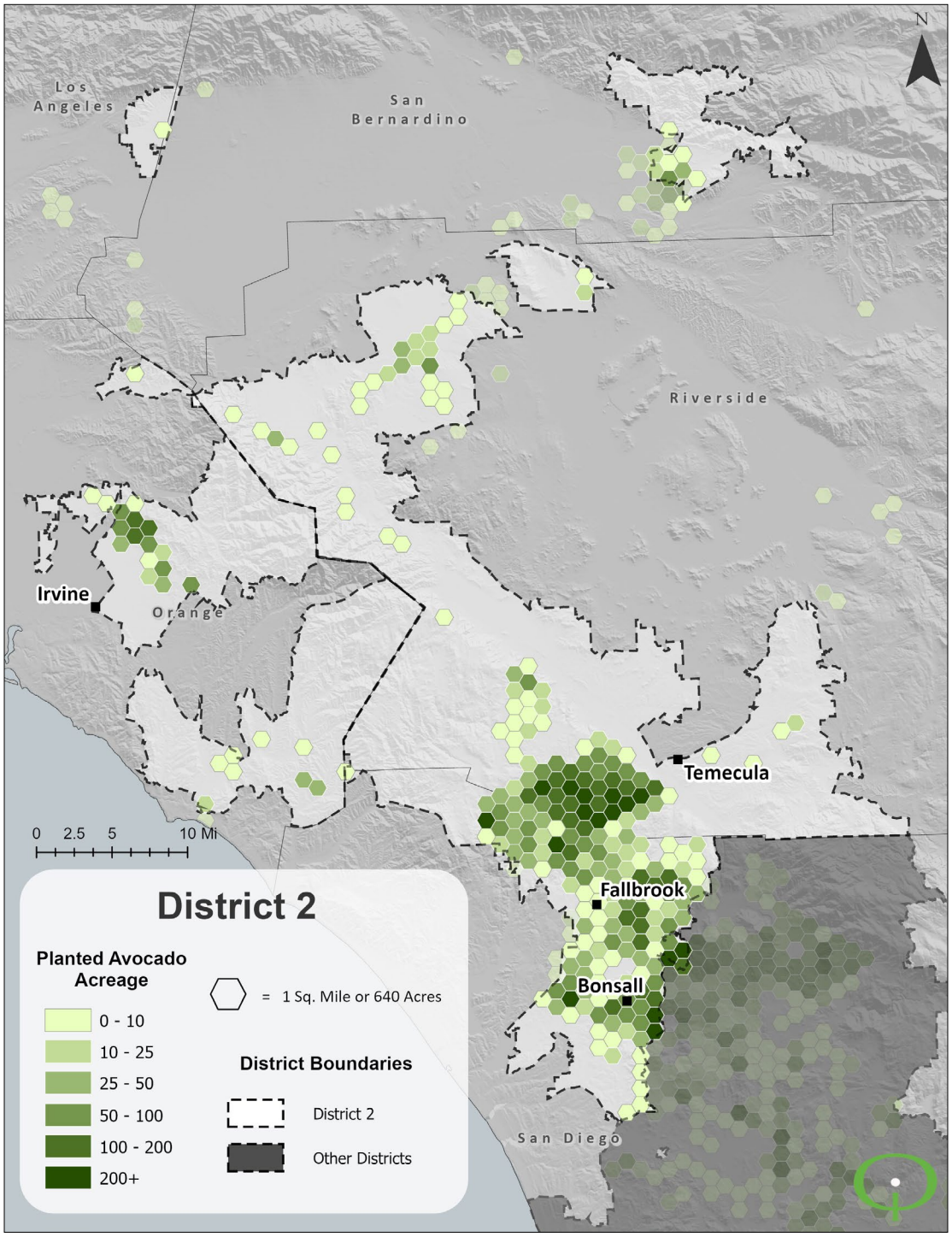
Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

Figure 8. 2024 Avocado Planted Polygons in CAC District 2



Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

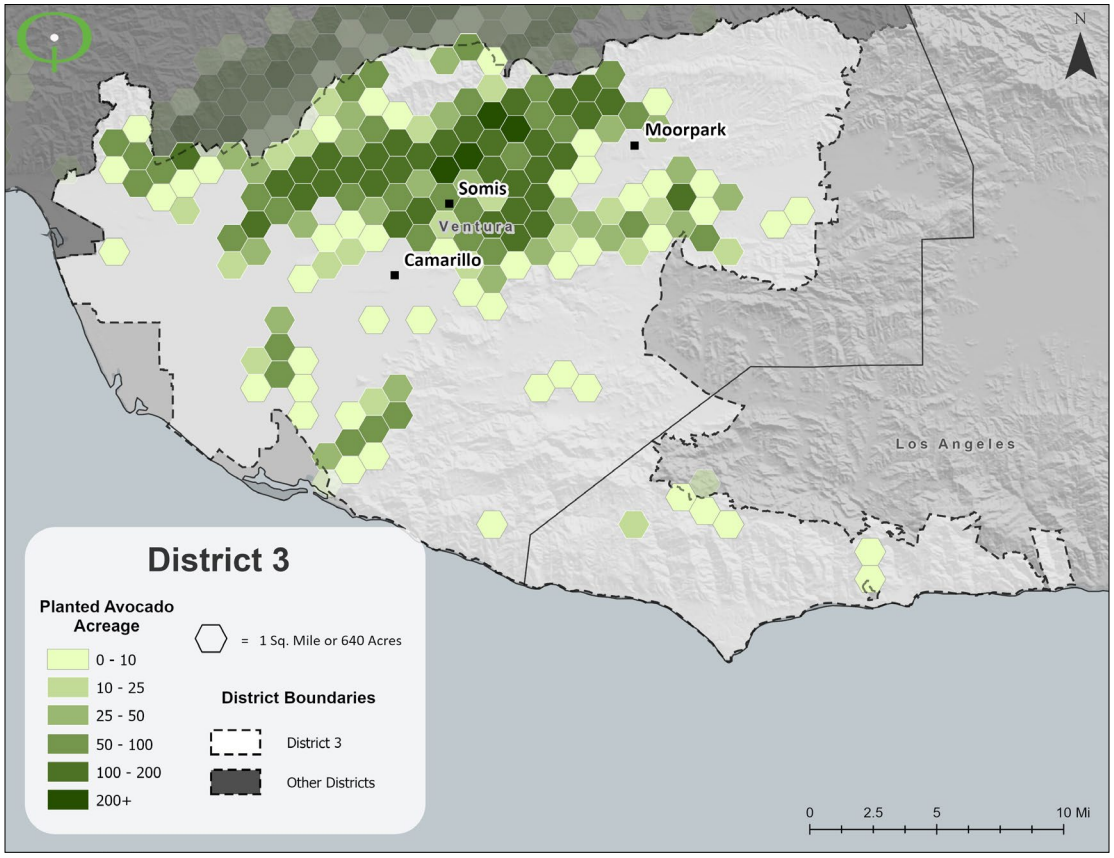
Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

Figure 9. 2024 Avocado Planted Polygons in CAC District 3



Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

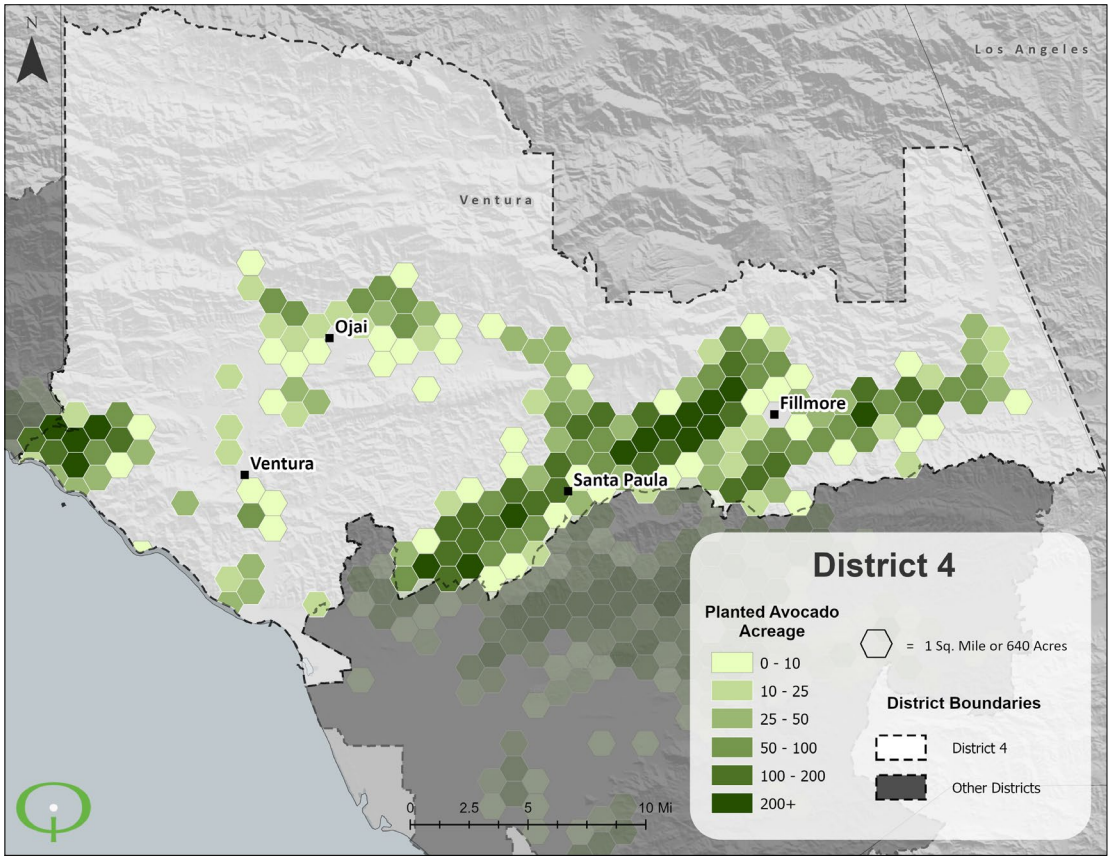
Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

Figure 10. 2024 Avocado Planted Polygons in CAC District 4



Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

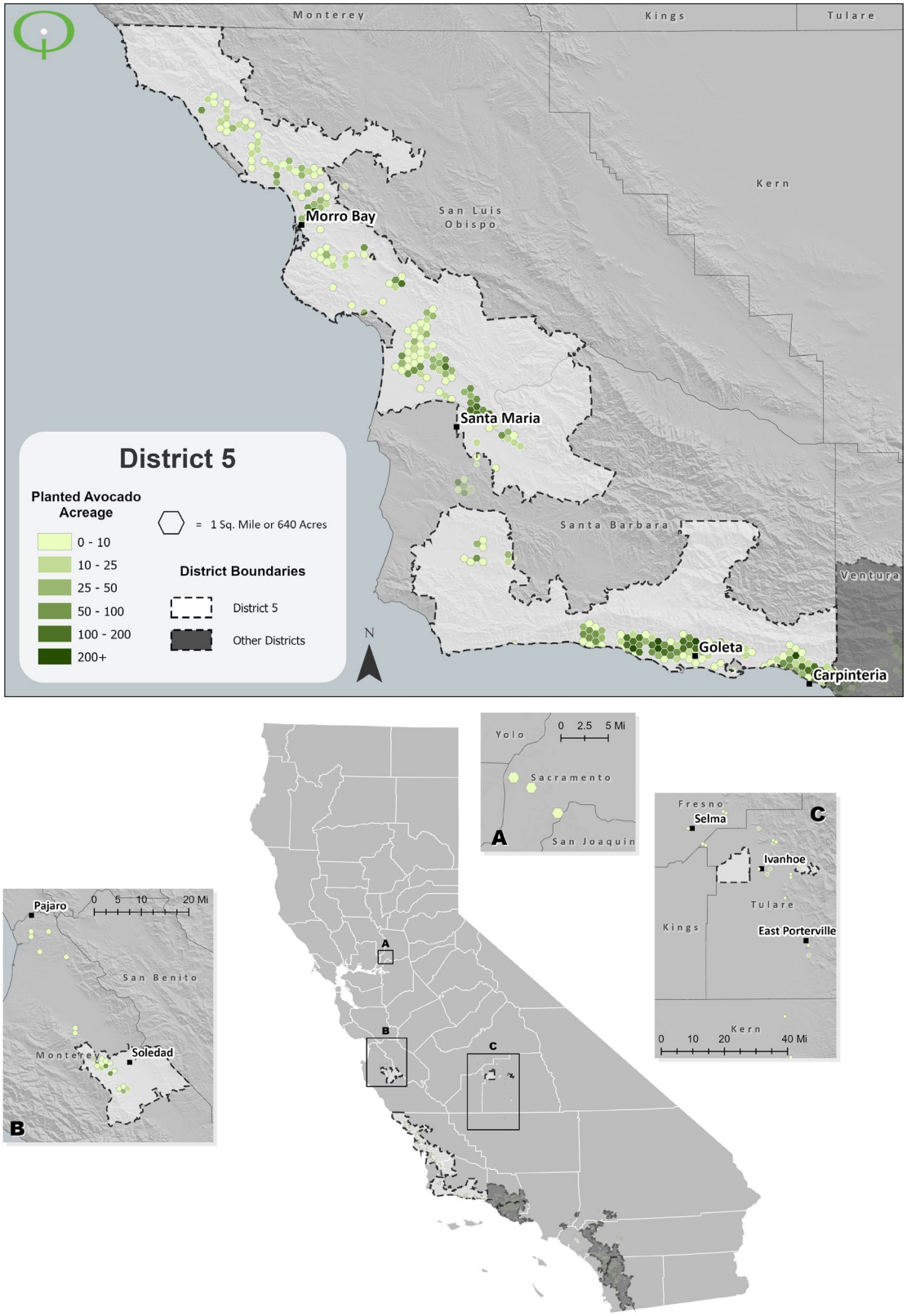
Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

Figure 11. 2024 Avocado Planted Polygons in CAC District 5



Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

DATA DELIVERABLES

Data delivered to CAC as a part of the 2024 avocado mapping effort are listed and described in Table 9.

Table 9. Summary of 2024 Avocado Acreage Deliverables

File Name	Description
CAC_2024_Avocados_Districts_Zips	Spatial file of statewide avocado acreage with condition, age, density, zipcode and CAC district.
CAC_2024_Avocado_Acreage_Tables	Tabular data summarizing acreage by county, condition, age, density, zip code and CAC district.
2024_Statewide_Avocado_Mapping	Report

The net change in acreage from 2023 to 2024 is summarized in Table 10.

Table 10. Net Acreage Change from 2023 to 2024 by County

County	Producing	Young	Stumped	Abandoned	Total
San Diego	161	(134)	28	44	99
Riverside	231	(64)	(42)	99	223
Ventura	401	352	(235)	(5)	513
Santa Barbara	112	133	(15)	(21)	208
San Luis Obispo	205	(198)	(14)	0	(7)
Orange	41	55	(21)	(70)	4
San Bernardino	62	24	0	(0)	86
Monterey	28	78	(16)	0	89
Tulare	(4)	0	0	(0)	(4)
Los Angeles	3	0	0	(3)	(0)
Fresno	7	(7)	0	(1)	(1)
Kern	(0)	(8)	0	3	(0)
Sacramento	11	0	0	0	11
Total	**1,257**	**232**	**(316)**	**45**	**1,223**

Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

The change in avocado classification from 2023 to 2024 is summarized in Table 11.

Table 11. Change in California Avocado Acreage Classification from 2023 to 2024

County	2023 Classification	2024 Classification			
		Producing	Top/Stump	New/Young	Abandon
San Diego	Producing	12,556	189	26	54
	Top/Stump	163	117	1	
	New/Young	189	5	384	
	Abandon	91	2	1	3,524
	Not Classified	54	2	48	104
Riverside	Producing	3,982	38	0	
	Top/Stump	82	27		2
	New/Young	103		472	
	Abandon		1		590
	Not Classified	136	3	58	125
Ventura	Producing	18,612	76	6	
	Top/Stump	316	245		
	New/Young	246		1,429	
	Abandon	5			413
	Not Classified	103	4	593	
Santa Barbara	Producing	6,274	12	6	18
	Top/Stump	26	22	0	1
	New/Young	61		157	1
	Abandon	40			244
	Not Classified	36		188	
San Luis Obispo	Producing	4,058	19	10	
	Top/Stump	33	16		
	New/Young	262		55	
	Abandon				5
	Not Classified	42		53	0

Executive Summary

Introduction

Forecasting Methods
Data Collection
Analysis

Numeric Results
Acreage by County
Acreage by Condition
Acreage by Zip Code
Acreage by Year Planted

Mapping Results

Data Deliverables

References
List of Figures
List of Tables

REFERENCES

United States Department of Agriculture. 2023. Cropland Data Layer. National Agricultural Statistics Service.

Department of Water Resources. 2023. Statewide Land Use Layer. Land IQ.

California Avocado Commission. 2023. Statewide Avocado Acreage and Condition Layer. Land IQ.

List of Figures

Figure 1 Summary of 2024 Statewide Avocado Acreage by County 7
Figure 2 2024 Avocado Acreage by Condition and County 8
Figure 3 2024 Avocado Acreage by Bearing and New/Young Acres by County 9
Figure 4 Age as a Percentage of Planted Acres 12
Figure 5 Young Avocado Acreage by Planting Year 13
Figure 6 Example of 2024 Avocado Classification Condition 14
Figure 7 2024 Avocado Acreage in CAC District 1 15
Figure 8 2024 Avocado Acreage in CAC District 2 16
Figure 9 2024 Avocado Acreage in CAC District 3 17
Figure 10 2024 Avocado Acreage in CAC District 4 18
Figure 11 2024 Avocado Acreage in CAC District 5 19

List of Tables

Table 1 Avocado Condition Description 4
Table 2 Definition of Database Fields 6
Table 3 Summary of 2024 Statewide Avocado Acreage by County 7
Table 4 Summary of 2024 Statewide Avocado Acreage by Condition 8
Table 5 Summary of 2024 Statewide Avocado Acreage by Zip Code 10
Table 6 2024 Planted Avocado Acreage by Year Planted or Stumped 12
Table 7 2024 Age as a Percentage of Planted Acreage 12
Table 8 New Acres by County and Planting Year 13
Table 9 Summary of 2024 Avocado Acreage Data Deliverables 20
Table 10 Net Acreage Change from 2023 to 2024 by County 20
Table 11 Change in California Avocado Acreage Classification from 2023 to 2024 21