

2020 STANDING ACREAGE - FINAL ESTIMATE

In cooperation with the Almond Board of California

Released: November 20, 2020



RESULTS

Each year Land IQ produces an in-year, statewide almond acreage estimate. This estimate is the result of extensive ground truthing and advanced remote sensing analytics allowing Land IQ to differentiate almond orchards from other tree and annual crops.

The result is a highly accurate mapping of almonds that are a minimum of three years old. Almond trees that are one and two years old cannot be consistently differentiated from other similarly aged tree crops using remotely sensed methods. The ground truthing data, proportionality of almonds to other tree crops, and other lines of evidence are used to numerically estimate acreage for orchards that are one and two years old. Both the remotely sensed and numerical estimates are combined for a total statewide acreage estimate. The 2020 estimate is 98.8% accurate.

As a result, the 2020 acreage estimate is:

- **310,551 non-bearing acres**
(defined as those orchards planted in 2018, 2019, and 2020)
- **1,242,203 bearing acres**
(defined as anything planted in 2017 and earlier)
- **1,552,754 total acres**
(defined as total standing acres during the growing season of 2020)

Each mapping year, Land IQ not only maps all almond orchards within the state, but also applies a separate algorithm to quantify the age of each individual orchard. The accuracy of this estimate is greater than 95% at +/- 1 year. Based on that analysis, Land IQ determined that :

- 20 percent of California's almond orchards were 1-3 years old,
- 37 percent were between 4 and 10 years old,
- 30 percent were between 11 to 20 years old,
- 7 percent were between 21 to 25 years old, and
- 6 percent were over 25 years old.

INTRODUCTION

Beginning in 2019, the ABC began an annual mapping process with two acreage summaries, one delivered in April and one delivered in November, of the same production year. The Land IQ April delivery aligns with the United States Department of Agriculture (USDA) – National Agricultural Statistics Service (NASS) California Almond Forecast, which is an initial subjective forecast for acreage and yield.

APPROACH

Land IQ draws upon on multiple lines of evidence including agronomic and remote sensing knowledge, unique field boundaries, robust on-the-ground verification, customized image analysis, artificial intelligence and machine learning algorithms to classify almond orchards.

For each mapped year, the following steps are taken. This is the basis for the determination of bearing acreage and the numerical estimate of non-bearing acreage.

Imagery Acquisition

Evaluate and acquire imagery from various sources based upon cost and spectral, spatial and temporal resolution suitability. New imagery sources allow for annual mapping of almonds.

Field Boundary Delineation

Utilize imagery and other resources to delineate individual fields defined as a homogenous crop. These boundaries are not legal boundaries of the property and do not include roads, homes or farmsteads. Irrigated field boundary positional accuracies are +/- 6 feet at a 95% confidence interval.

Ground Truthing

Identify and geo-reference crops through thousands of miles of actual verified orchards from Tehama to Kern County. These data provide necessary training data for algorithms as well as validation data for the classification.

Remote Sensing Analysis

Utilize custom image analysis, artificial intelligence, and machine learning algorithms to determine crop type. This allows for the differentiation of almond orchards from other tree and annual crops. Accuracy assessments are performed using statistical probability and validated against ground truth information.

Change Analysis and Update

Determine which orchards have been removed or added using a change analysis as part of the overall remote sensing efforts.

Non-Bearing Estimate

During the second mapping event, an estimate of non-bearing acreage is conducted, taking into account the data collected with ground truthing in the summer months.

2020 Standing Almond Acreage by Age and County

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Alameda										
Butte	6,914	52	203	270	171	182	409	210	490	589
Calaveras	12									5
Colusa	1,193	10	50	54	55	56	573	120	165	367
Contra Costa	3	4								
Fresno	363	84		1	106	450	633	199	544	488
Glenn	1,168	47	58	78	86	286	223	230	329	547
Kern	473	112			127	264	57	287	175	254
Kings									2	
Lake							23			38
Los Angeles	2									
Madera	1,931	46	190	183	140	287	298	196	212	1,338
Mariposa										
Merced	8,828	296	209	400	581	767	1,499	800	1,083	2,217
Placer	47									
Riverside										
Sacramento	8									2
San Joaquin	5,308	249	84	185	317	301	332	183	433	606
San Luis Obispo	75	19	21	24	9	31	59	6	45	12
Shasta										2
Solano	227		36		50	7	43	6	53	87
Stanislaus	11,054	316	384	632	773	385	1,016	942	1,061	2,439
Sutter	502	61	2	51	42	36	143	56	71	42
Tehama	582	7	23			11	21			
Tulare	187					26	3	78	75	262
Yolo	129		1		30	23	283	1	112	353
Yuba	25							4		24
Grand Total	39,032	1,304	1,262	1,876	2,484	3,113	5,614	3,319	4,851	9,671

Source: Land IQ. California Statewide Almond Mapping - 2020. Based on imagery from USDA National Agricultural Imaging Program (NAIP), USGS Landsat, and other private imagery resources.

2020 Standing Almond Acreage by Age and County

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Alameda										
Butte	201	666	172	679	1,091	649	573	369	621	608
Calaveras										
Colusa	771	631	646	2,120	1,173	2,560	1,343	1,612	1,142	2,158
Contra Costa					6			2		
Fresno	588	517	1,805	3,809	4,025	5,383	6,189	4,583	6,761	6,427
Glenn	838	552	564	1,424	767	2,060	553	1,317	563	1,658
Kern	1,840	239	2,014	2,327	6,220	6,338	2,662	2,495	3,427	6,560
Kings				242	727	394	288	299	1,281	154
Lake										
Los Angeles										
Madera	1,453	1,247	1,465	2,935	2,155	1,216	2,355	1,424	2,432	4,222
Mariposa										
Merced	1,511	1,267	3,027	3,019	2,414	2,716	2,220	2,488	2,225	3,266
Placer										
Riverside										
Sacramento					2					
San Joaquin	330	540	1,341	879	998	1,455	1,201	1,353	1,270	1,397
San Luis Obispo	1,722	139	3							9
Shasta					3					
Solano	31	117		5	228	87	215	146	70	149
Stanislaus	2,441	1,726	2,550	3,004	4,472	3,776	3,327	1,788	3,580	3,168
Sutter	125	53	80	613	172	173	74	114		272
Tehama	119	85	196	387	158	146	346	301	299	239
Tulare	152	215	352	432	588	813	890	194	663	1,182
Yolo	94	173	256	530	251	565	200	326	188	762
Yuba				138		48	47			
Grand Total	12,217	8,166	14,471	22,544	25,451	28,381	22,482	18,812	24,521	32,231

Source: Land IQ. California Statewide Almond Mapping - 2020. Based on imagery from USDA National Agricultural Imaging Program (NAIP), USGS Landsat, and other private imagery resources.

2020 Standing Almond Acreage by Age and County

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Alameda										
Butte	1,364	1,140	686	799	3,643	1,288	1,191	641	435	587
Calaveras							33			
Colusa	5,443	3,718	3,559	2,089	3,140	2,515	2,075	2,058	1,219	1,896
Contra Costa										
Fresno	12,654	16,097	17,048	11,676	6,568	5,549	5,775	8,639	9,297	12,358
Glenn	1,952	3,008	2,552	1,744	5,686	1,137	612	2,224	1,603	2,020
Kern	14,104	19,229	17,222	8,482	5,528	6,068	4,643	9,021	6,439	8,854
Kings	1,191	1,652	1,693	1,119	854	921	808	405	1,448	2,204
Lake										
Los Angeles										
Madera	6,412	7,063	8,756	7,870	12,019	5,779	2,943	9,133	4,650	7,695
Mariposa							4			
Merced	6,981	6,788	6,424	8,358	2,721	3,150	2,629	3,388	3,489	4,974
Placer										
Riverside			6							
Sacramento				95	14					
San Joaquin	2,617	2,288	1,923	2,137	1,767	1,196	1,367	3,000	3,134	4,081
San Luis Obispo	2			5			1			
Shasta										
Solano	183	476	361	112	65	125	41	128	13	178
Stanislaus	10,719	7,767	6,443	7,045	5,933	5,077	3,547	8,536	6,797	9,866
Sutter	771	201	614	656	218	434	156	367	60	366
Tehama	589	268	511	1,112	1,516	341	109	327	578	1,211
Tulare	2,444	2,541	3,754	2,685	1,668	2,348	2,361	3,073	1,964	1,080
Yolo	1,559	1,563	1,810	1,233	1,224	1,963	487	1,904	537	2,658
Yuba	110	46	214	36	9			31		222
Grand Total	69,094	73,847	73,577	57,254	52,575	37,890	28,781	52,876	41,663	60,251

Source: Land IQ. California Statewide Almond Mapping - 2020. Based on imagery from USDA National Agricultural Imaging Program (NAIP), USGS Landsat, and other private imagery resources.

2020 Standing Almond Acreage by Age and County

	2014	2015	2016	2017	2018*	2019-2020**	Bearing Total	Non-Bearing Estimate	Grand Total
Alameda	146	376	166				687		687
Butte	644	940	1,870	970	608		31,318		31,925
Calaveras		101	81				232		232
Colusa	1,447	2,228	5,460	3,390	3,636		57,034		60,670
Contra Costa			55	236			307		307
Fresno	17,560	21,232	25,759	22,673	16,554		235,838		252,393
Glenn	2,443	469	5,451	3,894	3,009		48,142		51,152
Kern	9,556	11,459	18,787	12,020	12,843		187,282		200,125
Kings	2,501	4,026	6,970	1,948	1,652		31,127		32,779
Lake							61		61
Los Angeles							2		2
Madera	12,107	7,722	11,312	11,464	5,583		140,651		146,234
Mariposa							4		4
Merced	10,695	7,341	11,353	8,158	12,873		127,285		140,157
Placer	21		1,029		712		1,097		1,809
Riverside							6		6
Sacramento	68	184	756	173	690		1,302		1,992
San Joaquin	7,333	4,446	7,605	7,086	8,564		68,742		77,306
San Luis Obispo	31						2,213		2,213
Shasta							5		5
Solano	2,662	4,874	4,558	2,397	1,887		17,731		19,618
Stanislaus	12,639	9,168	12,541	9,243	11,484		164,154		175,638
Sutter	380	417	2,453	395	1,672		10,173		11,845
Tehama	1,483	691	3,070	240	207		14,968		15,175
Tulare	8,041	7,823	11,928	5,397	8,744		63,218		71,961
Yolo	3,998	4,215	5,487	4,012	2,916		36,929		39,845
Yuba	163	215	362		245		1,695		1,939
Grand Total	93,918	87,927	137,052	93,695	93,878		1,242,203	310,551	1,552,754

Source: Land IQ. California Statewide Almond Mapping - 2020. Based on imagery from USDA National Agricultural Imaging Program (NAIP), USGS Landsat, and other private imagery resources.

*The county level, non-bearing acreages for 2018 are approximately 75% spatially mapped and age-verified orchards. The remaining 2018 acreages are numerically estimated and partitioned across counties according to the spatially mapped acreage and ground truthing during 2020. While bearing acreage mapping has been validated with an accuracy of 98.8%, non-bearing numerical acreage estimates should be understood to have an estimated +/-10% potential variability.

**The estimated non-bearing acreages for 2019 and 2020 are numeric estimates only, however based on extensive ground truthing, image analysis, and other lines of evidence. While bearing acreage mapping has been validated with an accuracy of 98.8%, non-bearing numerical acreage estimates should be understood to have an estimated +/-10% potential variability.