2021 STATEWIDE LAND USE MAPPING ACCURACY ASSESSMENT

After the final classification dataset was determined, a comprehensive accuracy assessment was completed. On average, over all crops including multi-crops, about one quarter of the independent ground truth samples were set aside for this purpose. A stratified random sampling method was used for accuracy assessment sample selection. The datasets were stratified by land cover type and county boundary. Prior to the accuracy assessment, the validation dataset was cleaned so that each data point corresponded to a single crop at a single point in time in a single field.

Accuracy assessment can be divided into three components:

1. Reference data sampling design – how much reference data is collected, when and where
2. Reference data response design – how reference data is collected
3. Analysis – how the reference data is used to determine accuracy and how that accuracy is expressed

In this section, Land IQ's approach to all three of these components is described, and results of the accuracy assessment are provided.

SAMPLING DESIGN

In conventional accuracy assessment theory, the minimum number of samples corresponding to a specific accuracy level is calculated. This method of minimum sample size determination is not always applicable to statistics with a spatial or temporal component. In this instance, it would require knowledge of the exact location and timing of cropping statewide in advance of the ground surveys, which is not available. Therefore, Land IQ collects reference data by region or county and then partitions it into training and reference data sets for each crop based on an approximate 75%-25% split, respectively.

There are several reasons for this approach, but the main reason is that it is far more efficient to collect both training and validation data simultaneously when the reference data is collected by ground survey, particularly in the case of time sensitive crops such as annuals that need to be sampled within a narrow window of time. This approach results in both types of data being concentrated where crops are concentrated (e.g., in counties with high acreage of agricultural crops). This approach also results in more data (for both calibration and validation) being collected for predominant, high acreage crops and less data being collected for minor, low acreage crops. While this method may result in unequal distribution of samples across classes, the distribution represents the true extent and probability of each class, ensuring that the overall accuracies are truly representative of hydrologic regions and the State as a whole. Additionally, a portion of data collection efforts is focused on crops for which data are sparser, adjusting routes each year to capture more data in areas where these less prevalent crops are produced.

RESPONSE DESIGN

Reference data can be collected by different means from different sources. Currently, Land IQ collects reference data for model training and validation from cropped areas in California by conducting on-the-ground "ground truth" survey. For the purposes here, ground truth data and reference data are synonymous.

Because the ground truth surveys are real-time (as opposed to using previously acquired data such as archival imagery) and require the presence of staff, logistical considerations must be made. First, on-the-ground reference data surveys must be made when the crop is growing. This requirement introduces an element of timing, which is especially important for short-season crops. Second, because the area mapped in California is so large, knowledge of where some cropped fields are, especially for minor crops, is approximate and often changes from year to year. In addition, because so many crops are mapped that vary in acreage, some crops for which there is little existing reference data are prioritized for reference point data collection.

For these reasons, Land IQ uses the basic concepts of sampling design to achieve independent and random samples in addition to considering criteria to prioritize reference point data collection:

- Confidence level – Crops with estimated lower accuracy and confidence levels from the previous year's mapping effort are prioritized for ground truth data collection.
- Peak date – Time series analysis is used to find dates of peak reflectance in fields to determine the seasonality of crops and help optimize timing of ground truth data collection around peak growing seasons.

Despite these efforts to gather representative data across cropping systems, the validation dataset may still contain a statistically small sample size for certain low prevalence crop classes. To include as much validation data as possible without skewing overall accuracies and maintaining statistical validity, a minimum sample size of 10 data points was enforced for inclusion in accuracy assessments. In the rare instance where a crop with high prevalence in a region did not have enough validation data from ground surveys, supplemental data was independently added using photo interpretation and/or prior year's ground truthing data.

ANALYSIS

Uncertainty in crop classification is related to two issues: accuracy and precision.

ACCURACY

Accuracy is a relative measure of the exactness of an estimate and accounts for systematic errors. Therefore, an accurate estimate does not systematically over- or underestimate the true value. Map accuracy can be quantified by creating an error matrix (also commonly called a confusion matrix), which compares the map classification with a reference classification.

The underlying principle of the accuracy assessment is that it compares the mapped land classification to reliable reference data, collected through sample-based approaches, as described above. The objective of a validation data set, therefore, is to provide a statistically sound estimate of the accuracy of the output map based on an independent reference information source. The accuracy of a map is assessed by measuring the degree of agreement between the output map and the validation data set. An error matrix can be generated that compares the pixels or polygons in the resulting classification map to the known reference points. From this matrix, overall accuracy and accuracy of each class can be determined.

There are three measures of accuracy that can be determined from an error matrix:

1. Overall accuracy
2. Producer's accuracy (omission error)
3. User's accuracy (commission error

Typically, accuracy of remotely sensed maps is demonstrated using an error (or confusion) matrix (Table 14). Accuracy measures that can be derived from an error matrix are described below.

OVERALL ACCURACY

Overall accuracy is calculated as the total number of correctly classified fields divided by the total number of fields. It measures the accuracy of the whole map but does not refer to any individual classes. It is the probability that a randomly selected location on the map is correctly classified. Overall accuracy is sensitive to sample size and is thus more reliable in classes with larger samples. It is the sum of the major diagonal in an error matrix that runs from the upper left corner to the bottom right corner of the matrix.

OMISSION ERROR

Omission error refers to the number of reference samples that were incorrectly classified. It is reported on the right side of the matrix.

PRODUCER'S ACCURACY

Producer's accuracy is described by the probability that a reference point is correctly classified. It indicates how well the area represented by the map can be classified. It is also reported on the right side of the matrix and can be calculated as the inverse of the omission error.

COMMISSION ERROR

Commission error refers to the number of classified samples that were incorrectly classified. It is reported at the bottom of the matrix.

USER'S ACCURACY

User's accuracy is described as the probability that a predicted point is correctly classified. It indicated the reliability that a field classified on the map truly represents that class on the ground. It is also reported at the bottom of the matrix and can be calculated as the inverse of the commission error.

PRECISION

Precision is related to the random error, which can be quantified by a confidence interval. A confidence interval gives a range that encloses the true value of an unknown fixed quantity with a specified probability. A precise estimate would thus have a small confidence interval.

RESULTS

In the WY 2021 analysis, 12,964 samples were used for accuracy assessment. These sites were not used to train the classification process and therefore represent unbiased reference information. Accuracy was assessed based on both the DWR Crop Class legend level and the more refined subclass legend level and results are generated geographically for statewide mapping, as well as hydrologic regions. Hydrologic region-based accuracy assessments in WY 2020 and WY 2021 post-dated the completion of ground truthing efforts. Therefore, the distribution of ground truth data in certain classes and regions was not sufficient to complete a regional accuracy assessment.

The hydrologic regions used for the accuracy assessment are displayed in Figure 1. The North Lahontan, San Francisco Bay, South Lahontan Hydrologic Regions were excluded from the regional accuracy assessment due to the lack of available validation data for the 2021 mapping year. These regions also contain relatively smaller crop production areas. A concerted effort will be made in future ground surveys to capture data in these remote regions.

In the statewide and regional accuracy assessment, crops with less than 10 data points in the validation dataset were excluded. All excluded crops represent < 2% of the total cropped area in their respective regions. This indicates minimal impact of crop exclusion on the overall accuracy of the region.

In some cases, crop classes are closely related, making accuracy assessment more difficult. This primarily occurs in forage crop classes where the class designation depends on the way the crop is managed and/or harvested (e.g., miscellaneous grasses and mixed pasture). In these cases, a field may alternate between these in any given season.

Validation data was further cleaned and pre-processed using the following methods:

1. Data points that were not representative of the entire field were excluded from the analysis. This was evaluated by comparing against high to medium resolution imagery.

2. In the case of perennial fields, multiple ground survey points could have been recorded for the same field and the same class during consecutive survey events. This would result in an over-representation of the field in the validation dataset. Such points were cleaned such that a single field contained only a single reference point.
3. In the case of annual fields, as these are grown over shorter periods, a crop may or may not have been observed during the ground survey depending on the timing or may have been observed multiple times in areas that are surveyed multiple times per year. In such cases, the reference points were linked to the corresponding cropping segment to correctly assess accuracy. In this way, multi-cropping instances were included in the accuracy assessment.

Figure 1. Hydrologic Regions Used for WY 2021 Regional Accuracy Assessment

Overall Accuracy

Accuracy statistics were calculated independently for each region (statewide and hydrologic) as well as each level of legend (DWR Class and Subclass). The overall accuracy for WY 2021 crop mapping statewide was 98% at the DWR Crop Class legend level and 97% at the Subclass legend level (Table 1). Overall accuracy by hydrologic region is displayed in Table 2. Only crop classes represented by at least 10 fields in the validation data for a hydrologic region were included in the assessment.

Table 1. WY 2021 Overall Statewide Land Use Mapping Weighted Accuracy

Crop Legend	Overall Accuracy (%)
DWR Class	98%
Subclass (Land IQ)	97%

Table 2. WY 2021 Overall Land Use Mapping Weighted Accuracy by Hydrologic Region

Crop Legend	Central Coast	Colorado River	North Coast	Sacramento River	San Joaquin River	South Coast	Tulare Lake
DWR Class	98.6%	98.0%	96.0%	99.0%	99.5%	96.5%	99.0%
Subclass (Land IQ)	94.8%	96.3%	92.7%	97.0%	98.0%	94.5%	98.5%

The error matrices for crops at the DWR Crop Class legend level and the Subclass legend level for statewide and hydrologic regions (Tables 13 – 21 at the end of this report) show overall accuracy, omission and commission error, and kappa statistics by crop class (in acres).

Accuracy by Crop Class

Accuracy was calculated for each crop (percentage of reference fields correctly classified in each crop category) for both DWR Class and Subclass legends statewide (Tables 3 and 4). In addition to the statewide assessment, accuracy was also determined at the hydrologic region level (Tables 5– 11). Some land cover types (e.g., apples, kiwis, subtropical fruits) and hydrologic regions are not included in the accuracy assessment due to insufficient data. In these cases, there were either no or less than ten samples available for accuracy assessment. A weighted accuracy assessment was conducted for each crop class by hydrologic region. Count based accuracies were first calculated for each crop class as the percent of reference fields correctly classified. Weights for each crop were independently calculated as the percent of total cropped area represented by the respective crop. The count-based accuracies were then multiplied by their respective weight by crop category and region. These weighted accuracies were then summed across all crops in the region to yield the overall weighted accuracy for the respective region. Crop weights and accuracies by region are included in Tables 5-11. Results for the same calculations applied to area-based accuracies are included starting with Table 22.

In total, the multi-crop resolution of mapping data in WY 2021 captures the vast majority of the cropping year-round in the state, allowing data users to characterize crop production and water use more accurately. Some crop rotations may occasionally be missed; this is because satellite data are intermittent and cropping is rotational and, in some cases, very short term. For this reason, available data will occasionally miss a rotational crop timing. However, any missed crops are short season in nature and

therefore have a smaller impact on total water use analysis. It should also be noted that young perennials, while a smaller class, are challenging to detect with remote sensing approaches and can be confused with fallow until features are detectable. This is particularly true in years when higher resolution (e.g., NAIP) image resources are not available.

Table 3. WY 2021 Statewide Land Use Mapping Weighted Accuracy by DWR Crop Class Legend Level

DWR Crop Class	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Citrus and Subtropical	972	969	4.3%	99.7%	4.3%
Deciduous Fruits and Nuts	3,210	3,201	26.5%	99.7%	26.4%
Field Crops	1,173	1,145	8.5%	97.6%	8.3%
Grain and Hay	984	931	9.0%	94.6%	8.5%
Pasture	1,882	1,839	13.0%	97.7%	12.7%
Rice	311	307	4.0%	98.7%	4.0%
Truck, Nursery and Berry Crops	2,463	2,420	11.8%	98.3%	11.6%
Unclassified	1,072	1,028	14.7%	95.9%	14.1%
Vineyard	798	795	7.0%	99.6%	7.0%
Young Perennial	99	94	1.2%	94.9%	1.2%
Total Weighted Accuracy Statewide				**98.2%**	**98.0%**

Table 4. WY 2021 Statewide Land Use Mapping Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	1,027	990	6.1%	96.4%	5.8%
Almonds	1,817	1,810	14.9%	99.6%	14.8%
Apples	15	14	0.1%	93.3%	0.1%
Apricots	13	13	0.1%	100.0%	0.1%
Avocados	429	427	0.5%	99.5%	0.5%
Beans (Dry)	24	17	0.2%	70.8%	0.1%
Bush Berries	95	93	0.2%	97.9%	0.2%
Carrots	55	55	0.6%	100.0%	0.6%
Cherries	89	89	0.4%	100.0%	0.4%
Citrus	348	331	2.9%	95.1%	2.8%
Cole Crops	513	481	1.6%	93.8%	1.5%

Crop Subclass	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Corn, Sorghum and Sudan	851	834	6.1%	98.0%	5.9%
Cotton	164	161	1.1%	98.2%	1.1%
Dates	111	109	0.1%	98.2%	0.1%
Flowers, Nursery and Christmas Tree Farms	118	114	0.4%	96.6%	0.3%
Grapes	796	795	7.0%	99.9%	7.0%
Lettuce/Leafy Greens	512	496	2.7%	96.9%	2.6%
Melons, Squash and Cucumbers	91	88	0.7%	96.7%	0.7%
Miscellaneous Deciduous	17	17	0.2%	100.0%	0.2%
Miscellaneous Field Crops	984	931	9.0%	94.6%	8.5%
Miscellaneous Grain and Hay	331	293	1.9%	88.5%	1.6%
Miscellaneous Grasses	363	342	1.6%	94.2%	1.5%
Miscellaneous Truck Crops	521	494	5.1%	94.8%	4.8%
Mixed Pasture	71	71	0.5%	100.0%	0.5%
Olives	83	79	0.7%	95.2%	0.6%
Onions and Garlic	103	98	0.6%	95.1%	0.6%
Peaches/Nectarines	35	35	0.1%	100.0%	0.1%
Pears	12	12	0.1%	100.0%	0.1%
Pecans	37	31	0.1%	83.8%	0.1%
Peppers	350	346	5.0%	98.9%	5.0%
Pistachios	28	25	0.2%	89.3%	0.2%
Plums	18	18	0.2%	100.0%	0.2%
Pomegranates	36	32	0.3%	88.9%	0.3%
Potatoes	71	71	0.5%	100.0%	0.5%
Prunes	311	307	4.1%	98.7%	4.0%
Rice	24	22	0.4%	91.7%	0.4%
Safflower	246	233	0.6%	94.7%	0.5%
Strawberries	40	40	0.2%	100.0%	0.2%
Sugar Beets	65	62	0.5%	95.4%	0.4%

Crop Subclass	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Sunflowers	41	41	0.2%	100.0%	0.2%
Sweet Potatoes	273	271	2.3%	99.3%	2.2%
Tomatoes	1,072	1,028	14.7%	95.9%	14.1%
Unclassified Fallow	642	631	4.3%	98.3%	4.3%
Walnuts	99	94	1.2%	94.9%	1.2%
Young Perennials	1,027	990	6.1%	96.4%	5.8%
Total Weighted Accuracy Statewide				**96.9%**	**97.0%**

Table 5. WY 2021 Central Coast Hydrologic Region Land Use Mapping Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Apples	14	13	0.3%	92.9%	0.3%
Avocados	50	49	1.5%	98.0%	1.5%
Bush Berries	48	47	0.9%	97.9%	0.9%
Cole Crops	12	12	0.2%	100.0%	0.2%
Cherries	13	13	0.6%	100.0%	0.6%
Citrus	403	374	15.9%	92.8%	14.8%
Flowers, Nursery and Christmas Tree Farms	34	34	0.9%	100.0%	0.9%
Grapes	166	164	15.4%	98.8%	15.3%
Lettuce/Leafy Greens	380	369	25.8%	97.1%	25.1%
Miscellaneous Grain and Hay	47	37	6.4%	78.7%	5.0%
Miscellaneous Truck Crops	184	178	10.2%	96.7%	9.9%
Mixed Pasture	11	8	1.8%	72.7%	1.3%
Peppers	14	12	0.4%	85.7%	0.4%
Strawberries	182	170	5.3%	93.4%	4.9%
Tomatoes	11	9	0.2%	81.8%	0.2%
Unclassified Fallow	112	109	13.6%	97.3%	13.2%
Walnuts	12	12	0.6%	100.0%	0.6%
Total Weighted Accuracy by Region					**94.8%**

Table 6. WY 2021 Colorado River Hydrologic Region Land Use Mapping Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	423	407	28.1%	96.2%	27.1%
Carrots	36	36	2.4%	100.0%	2.4%
Citrus	50	49	2.5%	98.0%	2.4%
Cole Crops	85	82	3.9%	96.5%	3.7%
Corn, Sorghum and Sudan	77	71	8.2%	92.2%	7.6%
Cotton	35	35	1.3%	100.0%	1.3%
Dates	111	109	1.8%	98.2%	1.8%
Grapes	26	26	0.8%	100.0%	0.8%
Lettuce/Leafy Greens	127	123	7.7%	96.9%	7.5%
Melons, Squash and Cucumbers	20	20	1.4%	100.0%	1.4%
Miscellaneous Grain and Hay	100	97	3.9%	97.0%	3.8%
Miscellaneous Grasses	180	167	14.1%	92.8%	13.1%
Miscellaneous Truck Crops	48	45	2.4%	93.8%	2.2%
Mixed Pasture	12	12	0.2%	100.0%	0.2%
Onions and Garlic	37	37	2.8%	100.0%	2.8%
Peppers	12	12	0.4%	100.0%	0.4%
Sugar Beets	40	40	3.5%	100.0%	3.5%
Unclassified Fallow	148	145	14.5%	98.0%	14.2%
Total Weighted Accuracy by Region					**96.3%**

Table 7. WY 2021 North Coast Hydrologic Region Land Use Mapping Weighted Accuracy by Subclass Legend Level

Crop Subclass[1]	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	119	106	15.0%	89.1%	13.4%
Grapes	103	103	15.9%	100.0%	15.9%
Miscellaneous Grain and Hay	83	80	13.2%	96.4%	12.7%
Mixed Grasses	76	62	5.5%	81.6%	4.5%
Mixed Pasture	194	182	33.6%	93.8%	31.6%

Crop Subclass[1]	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Pears	11	11	0.3%	100.0%	0.3%
Potatoes	14	14	1.4%	100.0%	1.4%
Unclassified Fallow	73	63	15.1%	86.3%	13.0%
Total Weighted Accuracy by Region					**92.7%**

[1] A high proportion of mixed forage crops exist in this region that commonly can be confused and impact accuracy.

Table 8. WY 2021 Sacramento River Hydrologic Region Land Use Mapping Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	132	126	4.3%	95.5%	4.1%
Almonds	385	382	12.6%	99.2%	12.5%
Corn, Sorghum and Sudan	73	71	2.4%	97.3%	2.3%
Grapes	112	112	2.6%	100.0%	2.6%
Melons, Squash and Cucumbers	23	21	0.7%	91.3%	0.6%
Miscellaneous Grain and Hay	137	125	7.9%	91.2%	7.3%
Miscellaneous Grasses	42	37	1.9%	88.1%	1.7%
Mixed Pasture	127	119	12.0%	93.7%	11.2%
Olives	53	53	1.3%	100.0%	1.3%
Peaches/Nectarines	29	27	0.5%	93.1%	0.4%
Pears	24	24	0.3%	100.0%	0.3%
Pistachios	17	17	0.7%	100.0%	0.7%
Prunes	69	69	1.8%	100.0%	1.8%
Rice	305	302	18.3%	99.0%	18.1%
Safflower	11	9	0.4%	81.8%	0.3%
Sunflowers	64	61	2.1%	95.3%	2.0%
Tomatoes	90	90	3.2%	100.0%	3.2%
Unclassified Fallow	229	223	14.6%	97.4%	14.2%
Walnuts	355	351	11.1%	98.9%	11.0%
Young Perennial	20	20	1.2%	100.0%	1.2%
Total Weighted Accuracy by Region					**97.0%**

Table 9. WY 2021 San Joaquin River Hydrologic Region Land Use Mapping Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	212	212	5.9%	100.0%	5.9%
Almonds	870	866	28.9%	99.5%	28.7%
Cherries	53	53	1.1%	100.0%	1.1%
Corn, Sorghum and Sudan	370	367	11.2%	99.2%	11.1%
Cotton	86	85	1.7%	98.8%	1.6%
Grapes	119	118	8.6%	99.2%	8.5%
Melons, Squash and Cucumbers	29	29	1.2%	100.0%	1.2%
Miscellaneous Grain and Hay	299	287	13.3%	96.0%	12.7%
Miscellaneous Grasses	18	16	0.6%	88.9%	0.6%
Miscellaneous Truck Crops	17	16	0.4%	94.1%	0.3%
Mixed Pasture	134	130	3.8%	97.0%	3.7%
Peaches/Nectarines	12	12	0.3%	100.0%	0.3%
Pistachios	74	74	4.3%	100.0%	4.3%
Sweet Potatoes	41	41	0.8%	100.0%	0.8%
Tomatoes	102	102	3.0%	100.0%	3.0%
Unclassified Fallow	151	136	7.4%	90.1%	6.6%
Walnuts	175	170	5.5%	97.1%	5.4%
Young Perennial	26	25	2.0%	96.2%	1.9%
Total Weighted Accuracy by Region					**98.0%**

Table 10. WY 2021 South Coast Hydrologic Region Land Use Mapping Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Avocados	379	378	19.1%	99.7%	19.0%
Bush Berries	38	37	2.5%	97.4%	2.4%
Citrus	213	198	17.7%	93.0%	16.5%

Crop Subclass	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Cole Crops	23	23	2.7%	100.0%	2.7%
Flowers, Nursery and Christmas Tree Farms	53	52	5.5%	98.1%	5.4%
Miscellaneous Grain and Hay	50	42	8.6%	84.0%	7.2%
Miscellaneous Grasses	10	6	2.0%	60.0%	1.2%
Miscellaneous Truck Crops	90	81	14.6%	90.0%	13.2%
Strawberries	54	54	5.0%	100.0%	5.0%
Unclassified Fallow	58	57	22.3%	98.3%	21.9%
Total Weighted Accuracy by Region					**94.5%**

Table 11. WY 2021 Tulare Lake Hydrologic Region Land Use Mapping Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	123	122	3.7%	99.2%	3.7%
Almonds	562	562	17.6%	100.0%	17.6%
Cherries	17	17	0.3%	100.0%	0.3%
Citrus	67	66	6.9%	98.5%	6.8%
Corn, Sorghum and Sudan	317	315	7.5%	99.4%	7.4%
Cotton	41	39	1.9%	95.1%	1.8%
Grapes	266	266	8.0%	100.0%	8.0%
Melons, Squash and Cucumber	13	12	0.5%	92.3%	0.4%
Miscellaneous Grain and Hay	268	263	8.9%	98.1%	8.7%
Miscellaneous Truck Crops	19	17	0.6%	89.5%	0.5%
Mixed Pasture	20	20	0.5%	100.0%	0.5%
Onions and Garlic	28	27	1.0%	96.4%	1.0%
Peaches/Nectarines	62	59	1.3%	95.2%	1.3%
Pistachios	258	254	11.9%	98.4%	11.7%
Plums	28	25	0.5%	89.3%	0.5%

Crop Subclass	Ground Truth Count	Classified Count	Weight	Unweighted Accuracy	Weighted Accuracy
Pomegranates	11	11	0.5%	100.0%	0.5%
Potatoes	20	16	0.6%	80.0%	0.4%
Safflower	11	11	0.9%	100.0%	0.9%
Tomatoes	70	70	2.6%	100.0%	2.6%
Unclassified Fallow	300	294	20.7%	98.0%	20.3%
Walnuts	100	98	2.0%	98.0%	2.0%
Young Perennial	46	43	1.4%	93.5%	1.3%
Total Weighted Accuracy by Region					**98.5%**

PRECISION BY CROP

Two-tailed confidence intervals (95%) were calculated using the method in Olofsson et al. (2014) for the commission error of each crop class and are shown in Table 17. As noted above, precision is related to the random error, which can be quantified by a confidence interval. A confidence interval gives a range that encompasses the true value of an unknown fixed quantity with a specified probability. A precise estimate would thus have a small confidence interval. For example, citrus were mapped at 99% accuracy with a confidence interval of plus or minus 1%. This means that 99% of the time, we are confident that the citrus classification was between 97 and 99% correct.

As Table 17 shows, 10 crops were mapped with 100% accuracy and 0% confidence interval (100% confidence or precision). Table 17 also shows that the number of ground truth points directly influences the level of precision. As the number of ground truth points increases, precision (confidence) generally also increases, and the confidence interval becomes smaller. Some crops are mapped with high accuracy with few ground truth points because they are very distinct and relatively easy to distinguish from other crops. Other crops have a lower accuracy but relatively high precision (miscellaneous grasses) because the number of ground truth points was relatively high. Some crops were mapped with high accuracy but lower precision because of very few ground truth points.

Table 12. WY 2021 Statewide Land Use Mapping Accuracy and Precision by Crop

Crop Class	User's Accuracy (area correctly classified/total area classified)	Total validation area (counts)	95% Two-tailed Confidence Interval
Alfalfa and Alfalfa Mixtures	97%	1,027	1%
Almonds	100%	1,817	0%
Apples	100%	15	0%
Apricots	93%	13	14%
Avocados	96%	429	2%
Beans (Dry)	77%	24	18%
Bush Berries	98%	95	3%
Carrots	98%	55	4%
Cherries	98%	89	3%
Citrus	99%	348	1%
Cole Crops	96%	513	2%
Corn, Sorghum and Sudan	98%	851	1%
Cotton	100%	164	0%
Dates	99%	111	2%
Flowers, Nursery and Christmas Tree Farms	94%	118	4%
Grapes	99%	796	1%
Lettuce/Leafy Greens	94%	512	2%
Melons, Squash and Cucumbers	92%	91	6%
Miscellaneous Deciduous	100%	17	0%
Miscellaneous Field Crops	95%	984	1%
Miscellaneous Grain and Hay	85%	331	4%
Miscellaneous Grasses	97%	363	2%
Miscellaneous Truck Crops	95%	521	2%
Mixed Pasture	96%	71	5%
Olives	100%	83	0%
Onions and Garlic	99%	103	2%
Peaches/Nectarines	100%	35	0%
Pears	86%	12	19%
Pecans	91%	37	10%
Peppers	98%	350	1%
Pistachios	100%	28	0%
Plums	100%	18	0%
Pomegranates	97%	36	6%

Crop Class	User's Accuracy (area correctly classified/total area classified)	Total validation area (counts)	95% Two-tailed Confidence Interval
Potatoes	97%	71	4%
Prunes	100%	311	0%
Rice	96%	24	9%
Safflower	99%	246	1%
Strawberries	100%	40	0%
Sugar Beets	98%	65	3%
Sunflowers	91%	41	8%
Tomatoes	99%	273	1%
Unclassified Fallow	95%	1,072	1%
Walnuts	99%	642	1%
Young Perennials	90%	99	6%

Table 13. Statewide Land Use Mapping Validation Data Error Matrix by DWR Class Legend Level (count)

		Predicted													
		Citrus and Subtropical	Deciduous Fruits and Nuts	Field Crops	Grain and Hay Crops	Pasture	Rice	Truck, Nursery and Berry Crops	Unclassified Fallow	Vineyard	Young Perennial	**Reference Total**	**Omission Error**	**Producers Accuracy**	**Kappa Coefficient**
Reference	Citrus and Subtropical	969	0	0	0	0	0	2	0	1	0	972	0%	100%	
	Deciduous Fruits and Nuts	1	3,201	1	2	2	0	2	0	1	0	3,210	0%	100%	
	Field Crops	0	1	1,145	0	10	0	15	2	0	0	1,173	2%	98%	
	Grain and Hay Crops	0	0	0	931	20	0	9	24	0	0	984	5%	95%	
	Pasture	0	0	10	32	1,839	0	1	0	0	0	1,882	2%	98%	
	Rice	0	0	1	0	0	307	0	3	0	0	311	1%	99%	
	Truck, Nursery and Berry Crops	5	0	7	7	1	0	2,420	22	1	0	2,463	2%	98%	
	Unclassified Fallow	0	2	0	8	17	0	0	1,028	6	11	1,072	4%	96%	
	Vineyard	2	0	0	1	0	0	0	0	795	0	798	0%	100%	
	Young Perennial	1	3	0	0	0	0	0	1	0	94	99	5%	95%	
	Predicted Total	978	3,207	1,164	981	1,889	307	2,449	1,080	804	105	12,964			
	Commission Error	1%	0%	2%	5%	3%	0%	1%	5%	1%	10%				
	Users Accuracy	99%	100%	98%	95%	97%	100%	99%	95%	99%	90%				
	Kappa Coefficient														0.98

Table 14. Statewide Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (count)

Reference \ Predicted	Alfalfa and Alfalfa Mixtures	Almonds	Apples	Apricots	Avocados	Beans (Dry)	Bush Berries	Carrots	Cherries	Citrus	Cole Crops	Corn, Sorghum and Sudan	Cotton	Dates	Flowers, Nursery and Christmas Tree Farms	Grapes	Lettuce/Leafy Greens	Melons, Squash and Cucumbers	Miscellaneous Deciduous	Miscellaneous Grain and Hay	Miscellaneous Grasses	Miscellaneous Truck Crops	Mixed Pasture	Olives	Onions and Garlic	Peaches/Nectarines	Pears	Pecans	Peppers	Pistachios	Plums	Pomegranates	Potatoes	Prunes	Rice	Safflower	Strawberries	Sugar Beets	Sunflowers	Sweet Potatoes	Tomatoes	Unclassified Fallow	Walnuts	Young Perennials	Reference Total	Omission Error	Producers Error	Kappa Coefficient
Alfalfa and Alfalfa Mixtures	990	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	8	24	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,027	4%	96%	
Almonds	0	1,810	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5	0	1,817	0%	100%	
Apples	0	0	14	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	7%	93%	
Apricots	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0%	100%	
Avocados	0	0	0	0	427	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	429	0%	100%	
Beans (Dry)	0	0	0	0	0	17	0	0	0	0	0	2	0	0	0	0	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	24	29%	71%	
Bush Berries	0	0	0	0	0	0	93	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	95	2%	98%	
Carrots	0	0	0	0	0	0	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	0%	100%	
Cherries	0	0	0	0	0	0	0	0	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89	0%	100%	
Citrus	0	0	0	0	15	0	0	0	0	331	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	348	5%	95%	
Cole Crops	0	0	0	0	0	0	0	1	0	0	481	0	0	0	1	0	22	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	4	0	513	6%	94%	
Corn, Sorghum and Sudan	3	0	0	0	0	0	0	0	0	0	1	834	0	0	0	0	0	3	0	0	4	2	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	851	2%	98%	
Cotton	1	0	0	0	0	0	0	0	0	0	0	1	161	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	164	2%	98%	
Dates	0	0	0	0	0	0	0	0	0	2	0	0	0	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111	2%	98%	
Flowers, Nursery and Christmas Tree Farms	0	0	0	0	1	0	0	0	0	0	0	1	0	1	114	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	118	3%	97%	
Grapes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	795	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	796	0%	100%	
Lettuce/Leafy Greens	0	0	0	0	0	0	1	0	0	0	10	0	0	0	0	0	496	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	512	3%	97%	
Melons, Squash and Cucumbers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	91	3%	97%	
Miscellaneous Deciduous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0%	100%	
Miscellaneous Grain and Hay	10	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	931	7	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	24	0	0	984	5%	95%	
Miscellaneous Grasses	17	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	1	0	13	293	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	331	11%	89%	
Miscellaneous Truck Crops	0	0	0	1	4	0	0	0	0	2	0	0	0	0	0	1	0	0	0	2	1	342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	363	6%	94%	
Mixed Pasture	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	14	0	494	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	521	5%	95%	
Olives	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	0%	100%	
Onions and Garlic	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	83	5%	95%	
Peaches/Nectarines	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	98	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	103	5%	95%	
Pears	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0%	100%	
Pecans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0%	100%	
Peppers	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	0	0	0	0	1	0	37	16%	84%	
Pistachios	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	346	0	0	0	0	0	0	0	0	0	0	0	0	0	350	1%	99%	
Plums	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	1	0	28	11%	89%	
Pomegranates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	18	0%	100%	
Potatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	4	0	0	0	36	11%	89%	
Prunes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	0	0	0	0	0	0	0	0	0	71	0%	100%	
Rice	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	307	0	0	0	0	0	3	0	0	311	1%	99%	
Safflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	1	0	0	24	8%	92%	
Strawberries	0	0	0	0	0	0	1	0	0	0	4	0	0	0	2	0	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	233	0	0	0	0	0	0	246	5%	95%	
Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	40	0%	100%	
Sunflowers	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	0	1	0	0	65	5%	95%	
Sweet Potatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	0	0	0	41	0%	100%	
Tomatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	271	1	0	273	1%	99%	
Unclassified Fallow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	8	0	0	17	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1,028	0	1,072	4%	96%	
Walnuts	0	4	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	631	642	2%	98%	
Young Perennials	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	99	5%	95%	
Predicted Total	1,023	1,817	14	14	445	22	95	56	91	336	501	848	161	110	121	803	526	96	17	981	344	352	521	74	79	99	35	14	34	352	25	18	33	73	307	23	235	40	63	45	275	1,080	638	105	12,941			
Commission Error	3%	0%	0%	7%	4%	23%	2%	2%	2%	1%	4%	2%	0%	1%	6%	1%	6%	8%	0%	5%	15%	3%	5%	4%	0%	1%	0%	14%	9%	2%	0%	0%	3%	3%	0%	4%	1%	0%	2%	9%	1%	5%	1%	10%			
Users Accuracy	97%	100%	100%	93%	96%	77%	98%	98%	98%	99%	96%	98%	100%	99%	94%	99%	94%	92%	100%	95%	85%	97%	95%	96%	100%	99%	100%	86%	91%	98%	100%	100%	97%	97%	100%	96%	99%	100%	98%	91%	99%	95%	99%	90%			
Kappa Coefficient																																														0.97

Table 15. Central Coast Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (count)

Reference	Apples	Avocados	Bush Berries	Cherries	Citrus	Cole Crops	Flowers, Nursery and Christmas Tree Farms	Grapes	Lettuce/Leafy Greens	Miscellaneous Grain and Hay	Miscellaneous Truck Crops	Mixed Pasture	Peppers	Strawberries	Tomatoes	Unclassified Fallow	Walnuts	**Reference Total**	**Omisison Error**	**Producers Accuracy**	**Kappa Coefficient**
	Predicted																				
Apples	13	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	14	7%	93%	
Avocados	0	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	0%	100%	
Bush Berries	0	0	47	0	0	0	1	0	0	0	0	0	0	0	0	0	0	48	2%	98%	
Cherries	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0%	100%	
Citrus	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	13	0%	100%	
Cole Crops	0	0	0	0	0	374	1	0	20	1	0	0	0	2	0	4	0	402	7%	93%	
Flowers, Nursery and Christmas Tree Farms	0	0	0	0	0	0	34	0	0	0	0	0	0	0	0	0	0	34	0%	100%	
Grapes	0	0	0	0	0	0	0	164	0	0	0	0	0	0	0	0	0	164	0%	100%	
Lettuce/Leafy Greens	0	0	1	0	0	8	0	0	369	0	0	0	0	0	0	2	0	380	3%	97%	
Miscellaneous Grain and Hay	0	0	0	0	0	1	0	0	1	37	1	2	0	0	0	4	0	46	20%	80%	
Miscellaneous Truck Crops	0	0	0	0	0	0	0	1	0	2	178	0	0	0	0	2	0	183	3%	97%	
Mixed Pasture	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	8	0%	100%	
Peppers	0	0	0	0	0	0	0	0	1	0	0	0	12	0	0	1	0	14	14%	86%	
Strawberries	0	0	1	0	0	4	2	0	5	0	0	0	0	170	0	0	0	182	7%	93%	
Tomatoes	0	0	0	0	0	0	0	0	0	0	0	0	1	0	9	1	0	11	18%	82%	
Unclassified Fallow	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	109	0	112	3%	97%	
Walnuts	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	12	0%	100%	
Predicted Total	13	49	49	12	13	387	39	166	396	40	179	12	13	172	9	123	12	1,684			
Commision Error	0	0%	4%	0%	0%	3%	13%	1%	7%	8%	1%	33%	8%	1%	0%	11%	0%				
Users Accuracy	1	100%	96%	100%	100%	97%	87%	99%	93%	93%	99%	67%	92%	99%	100%	89%	100%				
Kappa Coefficient																					0.95

Table 16. Colorado River Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (count)

Reference	Predicted: Alfalfa and Alfalfa Mixtures	Carrots	Citrus	Cole Crops	Corn, Sorghum and Sudan	Cotton	Dates	Grapes	Lettuce/Leafy Greens	Melons, Squash and Cucumbers	Miscellaneous Grain and Hay	Miscellaneous Grasses	Miscellaneous Truck Crops	Mixed Pasture	Onions and Garlic	Peppers	Sugar Beets	Unclassified Fallow	Reference Total	Omission Error	Producers Accuracy	Kappa Coefficient
Alfalfa and Alfalfa Mixtures	407	0	0	0	2	0	0	0	0	0	4	10	0	0	0	0	0	0	423	4%	96%	
Carrots	0	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0%	100%	
Citrus	0	0	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	0%	100%	
Cole Crops	0	1	0	82	0	0	0	0	2	0	0	0	0	0	0	0	0	0	85	4%	96%	
Corn, Sorghum and Sudan	1	0	0	1	71	0	0	0	0	2	0	2	0	0	0	0	0	0	77	8%	92%	
Cotton	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	0	0	0	35	0%	100%	
Dates	0	0	2	0	0	0	109	0	0	0	0	0	0	0	0	0	0	0	111	2%	98%	
Grapes	0	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	0	0	26	0%	100%	
Lettuce/Leafy Greens	0	0	0	2	0	0	0	0	123	0	0	0	0	0	0	0	0	2	127	3%	97%	
Melons, Squash and Cucumbers	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	20	0%	100%	
Miscellaneous Grain and Hay	1	0	0	1	0	0	0	0	0	0	97	1	0	0	0	0	0	0	100	3%	97%	
Miscellaneous Grasses	6	0	0	0	3	0	0	0	0	1	2	167	0	1	0	0	0	0	180	7%	93%	
Miscellaneous Truck Crops	0	0	0	0	0	0	0	0	0	0	0	0	45	0	0	0	0	3	48	6%	94%	
Mixed Pasture	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	12	0%	100%	
Onions and Garlic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	0	0	0	37	0%	100%	
Peppers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	12	0%	100%	
Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	40	0%	100%	
Unclassified Fallow	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	145	147	1%	99%	
Predicted Total	415	37	51	86	76	35	109	27	125	23	103	180	45	14	37	12	40	150	1,565			
Commission Error	2%	3%	4%	5%	7%	0%	0%	4%	2%	13%	6%	7%	0%	14%	0%	0%	0%	3%				
Users Accuracy	98%	97%	96%	95%	93%	100%	100%	96%	98%	87%	94%	93%	100%	86%	100%	100%	100%	97%				
Kappa Coefficient																						0.96

Table 17. North Coast Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (count)

Reference	Predicted: Alfalfa and Alfalfa Mixtures	Grapes	Miscellaneous Grain and Hay	Miscellaneous Grasses	Mixed Pasture	Pears	Potatoes	Unclassified Fallow	Reference Total	Omission Error	Producers Accuracy	Kappa Coefficient
Alfalfa and Alfalfa Mixtures	106	0	2	10	1	0	0	0	119	11%	89%	
Grapes	0	103	0	0	0	0	0	0	103	0%	100%	
Miscellaneous Grain and Hay	0	0	80	0	0	0	0	3	83	4%	96%	
Miscellaneous Grasses	5	0	5	62	2	0	0	0	74	16%	84%	
Mixed Pasture	0	0	2	10	182	0	0	0	194	6%	94%	
Pears	0	0	0	0	0	11	0	0	11	0%	100%	
Potatoes	0	0	0	0	0	0	14	0	14	0%	100%	
Unclassified Fallow	0	0	3	0	7	0	0	63	73	14%	86%	
Predicted Total	111	103	92	82	192	11	14	66	671			
Comission Error	5%	0%	13%	24%	5%	0%	0%	5%				
Users Accuracy	95%	100%	87%	76%	95%	100%	100%	95%				
Kappa Coefficient												0.91

Table 18. Sacramento River Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (count)

Reference	Alfalfa and Alfalfa Mixtures	Almonds	Corn, Sorghum and Sudan	Grapes	Melons, Squash and Cucumbers	Miscellaneous Grain and Hay	Miscellaneous Grasses	Mixed Pasture	Olives	Peaches/Nectarines	Pears	Pistachios	Plums, Prunes and Apricots	Rice	Safflower	Sunflowers	Tomatoes	Unclassified Fallow	Walnuts	Young Perennials	Reference Total	Omission Error	Producers Accuracy	Kappa Coefficient
Predicted																								
Alfalfa and Alfalfa Mixtures	126	0	0	0	0	1	4	1	0	0	0	0	0	0	0	0	0	0	0	0	132	5%	95%	
Almonds	0	382	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	385	1%	99%	
Corn, Sorghum and Sudan	1	0	71	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	73	3%	97%	
Grapes	0	0	0	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	112	0%	100%	
Melons, Squash and Cucumbers	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	23	9%	91%	
Miscellaneous Grain and Hay	1	0	0	0	0	125	3	0	0	0	0	0	0	0	0	0	1	7	0	0	137	9%	91%	
Miscellaneous Grasses	3	0	1	0	0	0	37	0	0	0	0	0	0	0	0	0	0	0	0	0	41	10%	90%	
Mixed Pasture	0	0	0	0	0	8	0	119	0	0	0	0	0	0	0	0	0	0	0	0	127	6%	94%	
Olives	0	0	0	0	0	0	0	0	53	0	0	0	0	0	0	0	0	0	0	0	53	0%	100%	
Peaches/Nectarines	0	0	0	0	0	0	0	0	0	27	0	0	1	0	0	0	0	0	1	0	29	7%	93%	
Pears	0	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0	24	0%	100%	
Pistachios	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	17	0%	100%	
Prunes	0	0	0	0	0	0	0	0	0	0	0	0	69	0	0	0	0	0	0	0	69	0%	100%	
Rice	0	0	1	0	0	0	0	0	0	0	0	0	0	302	0	0	0	2	0	0	305	1%	99%	
Safflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	1	0	0	10	10%	90%	
Sunflowers	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	61	1	0	0	0	64	5%	95%	
Tomatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	0	0	0	90	0%	100%	
Unclassified Fallow	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	223	0	1	229	3%	97%	
Walnuts	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	351	0	354	1%	99%	
Young Perennials	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	20	0%	100%	
Predicted Total	131	383	74	112	22	136	44	124	53	28	24	18	71	302	9	62	93	233	354	21	2,294			
Comission Error	4%	0%	4%	0%	5%	8%	16%	4%	0%	4%	0%	6%	3%	0%	0%	2%	3%	4%	1%	5%				
Users Error	96%	100%	96%	100%	95%	92%	84%	96%	100%	96%	100%	94%	97%	100%	100%	98%	97%	96%	99%	95%				
Kappa Coefficient																								0.97

Table 19. San Joaquin River Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (count)

Reference	Predicted: Alfalfa and Alfalfa Mixtures	Almonds	Cherries	Corn, Sorghum and Sudan	Cotton	Grapes	Melons, Squash and Cucumbers	Miscellaneous Grain and Hay	Miscellaneous Grasses	Miscellaneous Truck Crops	Mixed Pasture	Peaches/Nectarines	Pistachios	Sweet Potatoes	Tomatoes	Unclassified Fallow	Walnuts	Young Perennials	Reference Total	Omission Error	Producers Accuracy	Kappa Coefficient
Alfalfa and Alfalfa Mixtures	212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	212	0%	100%	
Almonds	0	866	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0	870	0%	100%	
Cherries	0	0	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53	0%	100%	
Corn, Sorghum and Sudan	0	0	0	367	0	0	0	0	1	1	0	0	0	0	0	0	0	0	369	1%	99%	
Cotton	1	0	0	0	85	0	0	0	0	0	0	0	0	0	0	0	0	0	86	1%	99%	
Grapes	0	0	0	0	0	118	0	1	0	0	0	0	0	0	0	0	0	0	119	1%	99%	
Melons, Squash and Cucumbers	0	0	0	0	0	0	29	0	0	0	0	0	0	0	0	0	0	0	29	0%	100%	
Miscellaneous Grain and Hay	6	0	0	0	0	0	0	287	1	0	0	0	0	0	1	4	0	0	299	4%	96%	
Miscellaneous Grasses	2	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	18	11%	89%	
Miscellaneous Truck Crops	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	1	0	0	17	6%	94%	
Mixed Pasture	2	0	0	0	0	0	0	1	1	0	130	0	0	0	0	0	0	0	134	3%	97%	
Peaches/Nectarines	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	12	0%	100%	
Pistachios	0	0	0	0	0	0	0	0	0	0	0	0	74	0	0	0	0	0	74	0%	100%	
Sweet Potatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	41	0	0	0	0	41	0%	100%	
Tomatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102	0	0	0	102	0%	100%	
Unclassified Fallow	0	0	0	0	0	1	0	2	0	0	3	0	0	0	0	136	0	9	151	10%	90%	
Walnuts	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	170	0	173	2%	98%	
Young Perennials	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	25	26	4%	96%	
Predicted Total	223	868	54	367	85	119	29	291	19	17	134	12	74	41	103	142	173	34	2,785			
Comission Error	5%	0%	2%	0%	0%	1%	0%	1%	16%	6%	3%	0%	0%	0%	1%	4%	2%	26%				
Users Accuracy	95%	100%	98%	100%	100%	99%	100%	99%	84%	94%	97%	100%	100%	100%	99%	96%	98%	74%				
Kappa Coefficient																						0.98

Table 20. South Coast Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (count)

Reference	Predicted: Avocados	Bush Berries	Citrus	Cole Crops	Flowers, Nursery and Christmas Tree Farms	Miscellaneous Grain and Hay	Miscellaneous Grasses	Miscellaneous Truck Crops	Strawberries	Unclassified Fallow	Reference Total	Omission Error	Producers Accuracy	Kappa Coefficient
Avocados	378	0	1	0	0	0	0	0	0	0	379	0%	100%	
Bush Berries	0	37	0	0	1	0	0	0	0	0	38	3%	97%	
Citrus	15	0	198	0	0	0	0	0	0	0	213	7%	93%	
Cole Crops	0	0	0	23	0	0	0	0	0	0	23	0%	100%	
Flowers, Nursery and Christmas Tree Farms	1	0	0	0	52	0	0	0	0	0	53	2%	98%	
Miscellaneous Grain and Hay	0	0	0	0	0	42	1	3	0	4	50	16%	84%	
Miscellaneous Grasses	0	0	0	0	0	4	6	0	0	0	10	40%	60%	
Miscellaneous Truck Crops	1	0	2	0	0	0	0	81	0	2	86	6%	94%	
Strawberries	0	0	0	0	0	0	0	0	54	0	54	0%	100%	
Unclassified Fallow	0	0	0	0	0	1	0	0	0	57	58	2%	98%	
Predicted Total	395	37	201	23	53	47	7	84	54	63	964			
Comission Error	4%	0%	1%	0%	2%	11%	14%	4%	0%	10%				
Users Accuracy	96%	100%	99%	100%	98%	89%	86%	96%	100%	90%				
Kappa Coefficient														0.95

Table 21. Tulare Lake Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (count)

Reference	Alfalfa and Alfalfa Mixtures	Almonds	Cherries	Citrus	Corn, Sorghum and Sudan	Cotton	Grapes	Melons, Squash and Cucumbers	Miscellaneous Grain and Hay	Miscellaneous Truck Crops	Mixed Pasture	Onions and Garlic	Peaches/Nectarines	Pistachios	Plums	Pomegranates	Potatoes	Safflower	Tomatoes	Unclassified Fallow	Walnuts	Young Perennials	Reference Total	Omission Error	Producers Accuracy	Kappa Coefficient
Predicted																										
Alfalfa and Alfalfa Mixtures	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	122	0%	100%	
Almonds	0	562	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	562	0%	100%	
Cherries	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0%	100%	
Citrus	0	0	0	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	0%	100%	
Corn, Sorghum and Sudan	1	0	0	0	315	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	317	1%	99%	
Cotton	0	0	0	0	1	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	3%	98%	
Grapes	0	0	0	0	0	0	266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	266	0%	100%	
Melons, Squash and Cucumnbers	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	1	0	0	0	0	13	8%	92%	
Miscellaneous Grain and Hay	2	0	0	0	0	0	0	0	263	0	1	0	0	0	0	0	0	0	0	2	0	268	2%	98%	
Miscellaneous Truck Crops	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	2	0	19	11%	89%	
Mixed Pasture	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	20	0%	100%	
Onions and Garlic	0	0	0	0	0	0	0	0	0	0	0	27	0	0	0	0	0	0	0	1	0	28	4%	96%	
Peaches/Nectarines	0	2	1	0	0	0	0	0	0	0	0	0	59	0	0	0	0	0	0	0	0	62	5%	95%	
Pistachios	0	0	0	0	0	0	0	0	2	1	0	0	0	254	0	0	0	0	0	0	0	257	1%	99%	
Plums, Prunes and Apricots	0	0	0	0	0	0	1	0	0	0	0	0	0	0	25	0	0	0	0	0	1	27	7%	93%	
Pomegranates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	11	0%	100%	
Potatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	16	0%	100%	
Safflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	11	0%	100%	
Tomatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70	0	0	70	0%	100%	
Unclassified Fallow	0	0	0	0	0	0	3	0	0	0	1	0	0	2	0	0	0	0	0	294	0	300	2%	98%	
Walnuts	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	98	100	2%	98%	
Young Perennials	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	43	46	7%	93%	
Predicted Total	125	566	18	66	317	39	270	12	265	18	22	27	59	259	25	11	17	11	70	299	99	43	2,638			
Comission Error	2%	1%	6%	0%	1%	0%	1%	0%	1%	6%	9%	0%	0%	2%	0%	0%	6%	0%	0%	2%	1%	0%				
Users Accuracy	98%	99%	94%	100%	99%	100%	99%	100%	99%	94%	91%	100%	100%	98%	100%	100%	94%	100%	100%	98%	99%	100%				
Kappa Coefficient																										0.99

ACCURACY ASSESSMENT BY AREA (ACRES)

WEIGHTED ACCURACY BY CROP CLASS

Table 22. WY 2021 Statewide Land Use Mapping Weighted Accuracy by DWR Crop Class Legend Level

DWR Crop Class	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Citrus and Subtropical	11,801	11,776	4%	100%	4%
Deciduous Fruits and Nuts	133,150	132,877	26%	100%	26%
Field Crops	59,306	58,179	8%	98%	8%
Grain and Hay	42,780	40,693	9%	95%	9%
Pasture	80,519	78,591	13%	98%	13%
Rice	17,385	17,155	4%	99%	4%
Truck, Nursery and Berry Crops	69,656	68,890	12%	99%	12%
Unclassified	46,855	45,891	15%	98%	14%
Vineyard	20,157	20,138	7%	100%	7%
Young Perennials	3,438	3,292	1%	96%	1%
Total Weighted Accuracy Statewide				**98%**	**98%**

Table 23. WY 2021 Statewide Land Use Mapping Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	52,839	50,950	6.1%	96.4%	5.8%
Almonds	81,233	81,045	14.9%	99.8%	14.9%
Apples	133	132	0.1%	99.6%	0.1%
Apricots	116	116	0.1%	100.0%	0.1%
Avocados	2,716	2,713	0.5%	99.9%	0.5%
Beans (Dry)	1,091	870	0.2%	79.7%	0.2%
Bush Berries	794	786	0.2%	99.1%	0.2%
Carrots	2,280	2,280	0.6%	100.0%	0.6%
Cherries	1,739	1,739	0.4%	100.0%	0.4%
Citrus	5,353	5,290	2.9%	98.8%	2.9%
Cole Crops	11,749	11,099	1.6%	94.5%	1.5%
Corn, Sorghum and Sudan	39,714	39,065	6.1%	98.4%	6.0%
Cotton	8,977	8,740	1.1%	97.4%	1.1%
Dates	1,473	1,433	0.1%	97.3%	0.1%
Flowers, Nursery and Christmas Tree Farms	812	746	0.4%	91.9%	0.3%

Crop Subclass	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Grapes	20,150	20,138	7.0%	99.9%	7.0%
Lettuce/Leafy Greens	11,565	11,277	2.7%	97.5%	2.6%
Melons, Squash and Cucumbers	3,907	3,733	0.7%	95.6%	0.7%
Miscellaneous Deciduous	154	154	0.2%	100.0%	0.2%
Miscellaneous Grain and Hay	42,780	40,693	9.0%	95.1%	8.6%
Miscellaneous Grasses	15,790	14,164	1.9%	89.7%	1.7%
Miscellaneous Truck Crops	7,888	7,712	1.6%	97.8%	1.6%
Mixed Pasture	11,852	11,573	5.1%	97.6%	5.0%
Olives	1,997	1,997	0.5%	100.0%	0.5%
Onions and Garlic	4,872	4,597	0.7%	94.4%	0.6%
Peaches/Nectarines	1,793	1,711	0.6%	95.5%	0.6%
Pears	533	533	0.1%	100.0%	0.1%
Pecans	273	273	0.1%	100.0%	0.1%
Peppers	1,099	920	0.1%	83.7%	0.1%
Pistachios	24,654	24,451	5.0%	99.2%	5.0%
Plums	345	293	0.2%	85.1%	0.2%
Pomegranates	756	756	0.2%	100.0%	0.2%
Potatoes	2,237	1,992	0.3%	89.0%	0.3%
Prunes	2,037	2,037	0.5%	100.0%	0.5%
Rice	17,385	17,155	4.1%	98.7%	4.0%
Safflower	2,070	2,024	0.4%	97.8%	0.4%
Strawberries	3,926	3,732	0.6%	95.0%	0.5%
Sugar Beets	3,424	3,424	0.2%	100.0%	0.2%
Sunflowers	3,646	3,403	0.5%	93.3%	0.4%
Sweet Potatoes	953	953	0.2%	100.0%	0.2%
Tomatoes	17,573	17,533	2.3%	99.8%	2.3%
Unclassified Fallow	46,855	45,891	14.7%	97.9%	14.4%
Walnuts	19,385	19,146	4.3%	98.8%	4.3%
Young Perennials	3,438	3,292	1.2%	95.8%	1.2%
Total Weighted Accuracy Statewide				**97.6%**	**97.8%**

Table 24 .WY 2021 Central Coast Hydrologic Region Land Use Mapping Acreage Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Apples	115	115	0.3%	99.7%	0.3%
Avocados	334	332	1.5%	99.5%	1.5%
Bush Berries	297	293	0.9%	98.6%	0.9%
Cherries	190	190	0.2%	100.1%	0.2%
Citrus	94	94	0.6%	99.9%	0.6%
Cole Crops	7,509	7,062	15.9%	94.0%	15.0%
Flowers, Nursery and Christmas Tree Farms	167	167	0.9%	100.1%	0.9%
Grapes	3,379	3,372	15.4%	99.8%	15.4%
Lettuce/Leafy Greens	7,179	7,056	25.8%	98.3%	25.4%
Miscellaneous Grain and Hay	682	529	6.4%	77.6%	5.0%
Miscellaneous Truck Crops	3,763	3,733	10.2%	99.2%	10.1%
Mixed Pasture	141	120	1.8%	85.1%	1.6%
Peppers	242	225	0.4%	92.8%	0.4%
Strawberries	2,603	2,416	5.3%	92.8%	4.9%
Tomatoes	235	194	0.2%	82.5%	0.2%
Unclassified Fallow	1,525	1,512	13.6%	99.2%	13.5%
Walnuts	128	128	0.6%	100.0%	0.6%
Total Weighted Accuracy					**96.2%**

Table 25. WY 2021 Colorado River Hydrologic Region Land Use Mapping Acreage Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	22,473	21,573	28.1%	96.0%	27.0%
Carrots	1,576	1,576	2.4%	100.0%	2.4%
Citrus	1,112	1,111	2.5%	99.9%	2.5%
Cole Crops	3,630	3,427	3.9%	94.4%	3.6%

Crop Subclass	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Corn, Sorghum and Sudan	4,494	4,130	8.2%	91.9%	7.6%
Cotton	968	968	1.3%	100.0%	1.3%
Dates	1,473	1,433	1.8%	97.3%	1.8%
Grapes	435	435	0.8%	100.0%	0.8%
Lettuce/Leafy Greens	4,129	4,040	7.7%	97.9%	7.5%
Melons, Squash and Cucumbers	884	884	1.4%	99.9%	1.4%
Miscellaneous Grain and Hay	4,339	4,228	3.9%	97.4%	3.8%
Miscellaneous Grasses	11,347	10,677	14.1%	94.1%	13.3%
Miscellaneous Truck Crops	1,542	1,495	2.4%	97.0%	2.3%
Mixed Pasture	96	96	0.2%	99.9%	0.2%
Onions and Garlic	2,352	2,352	2.8%	100.0%	2.8%
Peppers	231	231	0.4%	100.0%	0.4%
Sugar Beets	3,424	3,424	3.5%	100.0%	3.5%
Unclassified Fallow	5,132	5,114	14.5%	99.7%	14.5%
Total Weighted Accuracy					**96.7%**

Table 26. WY 2021 North Coast Hydrologic Region Land Use Mapping Acreage Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	7,245	6,760	15.0%	93.3%	14.0%
Grapes	819	819	15.9%	100.0%	15.9%
Miscellaneous Grain and Hay	2,767	2,693	13.2%	97.3%	12.8%
Miscellaneous Grasses	1,430	998	5.5%	69.8%	3.8%
Mixed Pasture	4,380	4,235	33.6%	96.7%	32.5%
Pears	218	218	0.3%	100.0%	0.3%
Potatoes	809	809	1.4%	100.0%	1.4%
Unclassified Fallow	2,184	1,976	15.1%	90.5%	13.6%
Total Weighted Accuracy					**94.4%**

Table 27. WY 2021 Sacramento River Hydrologic Region Land Use Acreage Weighted Mapping Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	6,756	6,619	4.3%	98.0%	4.2%
Almonds	17,284	17,182	12.6%	99.4%	12.5%
Corn, Sorghum and Sudan	3,089	3,038	2.4%	98.3%	2.3%
Grapes	2,730	2,730	2.6%	100.0%	2.6%
Melons, Squash and Cucumbers	1,086	1,032	0.7%	95.0%	0.7%
Miscellaneous Grain and Hay	5,234	4,577	7.9%	87.5%	7.0%
Miscellaneous Grasses	1,834	1,642	1.9%	89.5%	1.7%
Mixed Pasture	3,363	3,302	12.0%	98.2%	11.8%
Olives	1,006	1,006	1.3%	100.0%	1.3%
Peaches/Nectarines	413	369	0.5%	89.3%	0.4%
Pears	315	315	0.3%	100.0%	0.3%
Pistachios	845	845	0.7%	99.9%	0.7%
Prunes	1,965	1,965	1.8%	100.0%	1.8%
Rice	17,116	16,923	18.3%	98.9%	18.1%
Safflower	463	417	0.4%	90.0%	0.3%
Sunflowers	3,574	3,330	2.1%	93.2%	2.0%
Tomatoes	5,511	5,511	3.2%	100.0%	3.2%
Unclassified Fallow	9,963	9,667	14.6%	97.0%	14.1%
Walnuts	11,699	11,564	11.1%	98.8%	11.0%
Young Perennials	699	699	1.2%	100.1%	1.2%
Total Weighted Accuracy					**97.3%**

Table 28. WY 2021 San Joaquin River Hydrologic Region Land Use Mapping Acreage Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	8,050	8,050	5.9%	100.0%	5.9%
Almonds	32,728	32,641	28.9%	99.7%	28.8%
Cherries	1,008	1,008	1.1%	100.0%	1.1%
Corn, Sorghum and Sudan	13,942	13,876	11.2%	99.5%	11.1%
Cotton	3,050	3,049	1.7%	100.0%	1.7%
Grapes	4,703	4,692	8.6%	99.8%	8.6%
Melons, Squash and Cucumbers	1,176	1,176	1.2%	100.0%	1.2%
Miscellaneous Grain and Hay	11,525	10,778	13.3%	93.5%	12.4%
Miscellaneous Grasses	617	512	0.6%	82.9%	0.5%
Miscellaneous Truck Crops	197	197	0.4%	99.8%	0.4%
Mixed Pasture	2,630	2,578	3.8%	98.0%	3.8%
Peaches/Nectarines	194	194	0.3%	100.1%	0.3%
Pistachios	5,113	5,113	4.3%	100.0%	4.3%
Sweet Potatoes	953	953	0.8%	100.0%	0.8%
Tomatoes	5,377	5,377	3.0%	100.0%	3.0%
Unclassified Fallow	5,566	5,193	7.4%	93.3%	6.9%
Walnuts	4,847	4,805	5.5%	99.1%	5.5%
Young Perennials	1,081	1,044	2.0%	96.6%	1.9%
Total Weighted Accuracy					**98.2%**

Table 29. WY 2021 South Coast Hydrologic Region Land Use Mapping Acreage Weighted Accuracy by Subclass Legend Level

Crop Subclass	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Avocados	2,382	2,381	19.1%	100.0%	19.1%
Bush Berries	369	366	2.5%	99.2%	2.5%

Crop Subclass	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Citrus	2,137	2,077	17.7%	97.2%	17.2%
Cole Crops	536	536	2.7%	100.0%	2.7%
Flowers, Nursery and Christmas Tree Farms	254	245	5.5%	96.5%	5.3%
Miscellaneous Grain and Hay	1,504	1,334	8.6%	88.7%	7.6%
Miscellaneous Grasses	269	180	2.0%	66.9%	1.3%
Miscellaneous Truck Crops	2,020	1,931	14.6%	95.6%	14.0%
Strawberries	875	875	5.0%	99.9%	5.0%
Unclassified Fallow	865	860	22.3%	99.5%	22.2%
Total Weighted Accuracy					**96.9%**

Table 30. WY 2021 Tulare Lake Hydrologic Region Land Use Mapping Acreage Weighted Accuracy by Subclass Legend Level

Crop	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Alfalfa and Alfalfa Mixtures	7,197	6,954	3.7%	96.6%	3.6%
Almonds	31,222	31,222	17.6%	100.0%	17.6%
Cherries	458	458	0.3%	100.0%	0.3%
Citrus	1,944	1,942	6.9%	99.9%	6.9%
Corn, Sorghum and Sudan	17,832	17,769	7.5%	99.6%	7.4%
Cotton	4,764	4,529	1.9%	95.1%	1.8%
Grapes	8,079	8,079	8.0%	100.0%	8.0%
Melons, Squash and Cucumbers	695	575	0.5%	82.8%	0.4%
Miscellaneous Grain and Hay	16,729	16,553	8.9%	98.9%	8.8%
Miscellaneous Truck Crops	321	312	0.6%	97.1%	0.6%
Mixed Pasture	137	137	0.5%	100.3%	0.5%
Onions and Garlic	1,683	1,605	1.0%	95.4%	1.0%
Peaches/Nectarines	1,185	1,148	1.3%	96.9%	1.3%

Crop Subclass	Ground Truth Area	Classified Area	Weight	Unweighted Accuracy	Weighted Accuracy
Pistachios	18,688	18,485	11.9%	98.9%	11.8%
Plums	345	293	0.5%	85.0%	0.5%
Pomegranates	609	609	0.5%	99.9%	0.5%
Potatoes	1,357	1,111	0.6%	81.9%	0.5%
Safflower	1,586	1,586	0.9%	100.0%	0.9%
Tomatoes	6,451	6,451	2.6%	100.0%	2.6%
Unclassified Fallow	21,583	21,530	20.7%	99.8%	20.7%
Walnuts	2,711	2,650	2.0%	97.7%	2.0%
Young Perennials	1,600	1,493	1.4%	93.3%	1.3%
Total Weighted Accuracy					**99.0%**

PRECISION BY CROP

Table 31. Statewide Land Use Mapping Validation Data Error Matrix by DWR Class Legend Level (acres)

Reference	Citrus and Subtropical	Deciduous Fruits and Nuts	Field Crops	Grain and Hay Crops	Pasture	Rice	Truck, Nursery and Berry Crops	Unclassified Fallow	Vineyard	Young Perennial	Reference Total	Omission Error	Producers Accuracy	Kappa Coefficient
Citrus and Subtropical	11,776	0	0	0	0	0	24	0	1	0	11,801	0%	100%	
Deciduous Fruits and Nuts	13	132,877	41	18	183	0	9	0	9	0	133,150	0%	100%	
Field Crops	0	4	58,179	0	481	0	614	28	0	0	59,306	2%	98%	
Grain and Hay Crops	0	0	0	40,693	491	0	348	1,247	0	0	42,780	5%	95%	
Pasture	0	0	689	1,143	78,591	0	96	0	0	0	80,519	2%	98%	
Rice	0	0	110	0	0	17,155	0	120	0	0	17,385	1%	99%	
Truck, Nursery and Berry Crops	26	0	194	175	7	0	68,890	363	1	0	69,656	1%	99%	
Unclassified Fallow	0	30	0	279	273	0	0	45,891	47	335	46,855	2%	98%	
Vineyard	7	0	0	11	0	0	0	0	20,138	0	20,157	0%	100%	
Young Perennial	2	107	0	0	0	0	0	37	0	3,292	3,438	4%	96%	
Predicted Total	11,824	133,018	59,212	42,320	80,026	17,155	69,982	47,686	20,196	3,627	485,046			
Commission Error	0%	0%	2%	4%	2%	0%	2%	4%	0%	9%				
Users Accuracy	100%	100%	98%	96%	98%	100%	98%	96%	100%	91%				
Kappa Coefficient														0.98

Table 32. Statewide Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (acres)

Reference \ Predicted	Alfalfa and Alfalfa Mixtures	Almonds	Apples	Apricots	Avocados	Beans (Dry)	Bush Berries	Carrots	Cherries	Citrus	Cole Crops	Corn, Sorghum and Sudan	Cotton	Dates	Flowers, Nursery and Christmas Tree Farms	Grapes	Lettuce/Leafy Greens	Melons, Squash and Cucumbers	Miscellaneous Deciduous	Miscellaneous Grain and Hay	Miscellaneous Grasses	Miscellaneous Truck Crops	Mixed Pasture	Olives	Onions and Garlic	Peaches/Nectarines	Pears	Pecans	Peppers	Pistachios	Plums	Pomegranates	Potatoes or Sweet Potatoes	Prunes	Rice	Safflower	Strawberries	Sugar Beets	Sunflowers	Sweet Potatoes	Tomatoes	Unclassified Fallow	Walnuts	Young Perennials	Reference Total	Omission Error	Producers Error	Kappa Coefficient
Alfalfa and Alfalfa Mixtures	50,950	0	0	0	0	243	0	0	0	0	0	231	0	0	0	0	0	0	0	508	852	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52,839	3.6%	96.4%	
Almonds	0	81,045	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	156	0	81,233	0.2%	99.8%	
Apples	0	0	132	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	133	0.8%	99.2%	
Apricots	0	0	0	116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	116	0.0%	100.0%	
Avocados	0	0	0	0	2,713	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,716	0.1%	99.9%	
Beans (Dry)	0	0	0	0	0	870	0	0	0	0	0	111	0	0	0	0	24	36	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	1,091	20.3%	79.7%	
Bush Berries	0	0	0	0	0	0	786	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	794	1.0%	99.0%	
Carrots	0	0	0	0	0	0	0	2,280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,280	0.0%	100.0%	
Cherries	0	0	0	0	0	0	0	0	1,739	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,739	0.0%	100.0%	
Citrus	0	0	0	0	60	0	0	0	0	5,290	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,353	1.2%	98.8%	
Cole Crops	0	0	0	0	0	0	0	37	0	0	11,099	0	0	0	21	0	481	33	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	42	0	0	11,749	5.5%	94.5%	
Corn, Sorghum and Sudan	120	0	0	0	0	0	0	0	0	0	35	39,065	0	0	0	0	0	119	0	0	277	51	4	0	0	0	0	0	18	4	0	0	0	0	0	20	0	0	0	0	0	0	0	0	39,714	1.6%	98.4%	
Cotton	1	0	0	0	0	0	0	0	0	0	0	156	8,740	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,977	2.6%	97.4%	
Dates	0	0	0	0	0	0	0	0	0	39	0	0	0	1,433	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,473	2.7%	97.3%	
Flowers, Nursery and Christmas Tree Farms	0	0	0	0	9	0	0	0	0	0	0	17	0	4	746	0	0	0	0	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	812	8.1%	91.9%	
Grapes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20,138	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20,150	0.1%	99.9%	
Lettuce/Leafy Greens	0	0	0	0	0	0	11	0	0	0	157	0	0	0	0	0	11,277	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	0	11,565	2.5%	97.5%	
Melons, Squash and Cucumbers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,733	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	0	0	0	0	0	43	0	11	0	0	0	3,907	4.5%	95.5%	
Miscellaneous Deciduous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	154	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	154	0.0%	100.0%	
Miscellaneous Grain and Hay	328	0	0	0	0	0	0	0	0	0	76	0	0	0	0	0	14	0	0	40,693	140	100	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	159	1,247	0	0	42,780	4.9%	95.1%	
Miscellaneous Grasses	763	0	0	0	0	0	0	0	0	0	0	177	0	0	0	0	0	96	0	522	14,164	0	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,790	10.3%	89.7%	
Miscellaneous Truck Crops	0	0	0	0	3	56	0	0	0	11	0	0	0	0	0	1	0	0	0	13	7	7,712	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85	0	0	7,888	2.2%	97.8%	
Mixed Pasture	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	113	143	0	11,573	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11,852	2.4%	97.6%	
Olives	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,997	0.0%	100.0%	
Onions and Garlic	0	0	0	0	0	0	0	0	0	0	92	0	0	0	0	0	0	0	0	106	0	0	0	0	4,597	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	77	0	0	4,872	5.6%	94.4%	
Peaches/Nectarines	0	34	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,711	0	0	0	0	0	0	0	41	0	0	0	0	0	0	0	0	4	0	1,793	4.6%	95.4%	
Pears	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	533	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	533	0.0%	100.0%	
Pecans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	273	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	273	0.0%	100.0%	
Peppers	0	0	0	0	0	0	0	0	0	0	43	78	0	0	0	0	7	42	0	0	0	0	0	0	0	0	0	0	920	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	1,099	16.3%	83.7%	
Pistachios	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	176	9	0	0	0	0	0	0	0	24,451	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24,654	0.8%	99.2%	
Plums	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	293	0	0	0	0	0	0	0	0	0	0	0	24	0	345	15.1%	84.9%	
Pomegranates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	756	0	0	0	0	0	0	0	0	0	0	0	0	756	0.0%	100.0%	
Potatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,992	0	0	0	0	0	0	246	0	0	0	0	2,237	11.0%	89.0%	
Prunes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,037	0	0	0	0	0	0	0	0	0	0	2,037	0.0%	100.0%	
Rice	0	0	0	0	0	0	0	0	0	0	0	110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17,155	0	0	0	0	0	0	120	0	0	17,385	1.3%	98.7%	
Safflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	0	0	0	0	0	0	0	0	0	0	0	2,024	0	0	0	0	0	4	0	0	2,070	2.2%	97.8%	
Strawberries	0	0	0	0	0	0	8	0	0	0	108	0	0	0	9	0	62	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,732	0	0	0	0	0	0	0	3,926	4.9%	95.1%	
Sunflowers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,424	0	0	0	0	0	0	3,424	0.0%	100.0%	
Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	61	0	0	0	0	0	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,403	0	160	0	0	0	3,646	6.7%	93.3%	
Sweet Potatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	953	0	0	0	0	953	0.0%	100.0%	
Tomatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	17,533	28	0	0	17,573	0.2%	99.8%	
Unclassified Fallow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	0	0	0	279	0	0	273	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	45,891	0	335	46,855	2.1%	97.9%	
Walnuts	0	80	0	0	0	0	0	0	10	0	0	41	0	0	0	0	0	0	0	0	0	0	0	13	0	43	0	51	0	1	0	0	0	0	0	0	0	0	0	0	0	0	19,146	0	19,385	1.2%	98.8%	
Young Perennials	0	42	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65	0	0	0	0	0	0	0	0	0	0	0	37	0	3,292	3,438	4.2%	95.8%	
Predicted Total	52,187	81,200	132	135	2,787	1,169	805	2,316	1,752	5,341	11,609	40,047	8,740	1,437	785	20,195	11,865	4,083	154	42,320	15,760	7,940	12,001	2,013	4,597	1,755	533	323	1,031	24,550	293	756	2,111	2,104	17,155	2,044	3,757	3,424	3,445	1,199	17,862	47,686	19,330	3,627	484,355			
Commission Error	2%	0%	0%	14%	3%	26%	2%	2%	1%	1%	4%	2%	0%	0%	5%	0%	5%	9%	0%	4%	10%	3%	4%	1%	0%	3%	0%	15%	11%	0%	0%	0%	6%	3%	0%	1%	1%	0%	1%	21%	2%	4%	1%	9%				
Users Accuracy	98%	100%	100%	86%	97%	74%	98%	98%	99%	99%	96%	98%	100%	100%	95%	100%	95%	91%	100%	96%	90%	97%	96%	99%	100%	97%	100%	85%	89%	100%	100%	100%	94%	97%	100%	99%	99%	100%	99%	79%	98%	96%	99%	91%				
Kappa Coefficient																																															0.97

Table 33. Central Coast Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (acres)

Reference		Predicted																			
		Apples	Avocados	Bush Berries	Cherries	Citrus	Cole Crops	Flowers, Nursery and Christmas Tree Farms	Grapes	Lettuce/Leafy Greens	Miscellaneous Grain and Hay	Miscellaneous Truck Crops	Mixed Pasture	Peppers	Strawberries	Tomatoes	Unclassified Fallow	Walnuts	**Reference Total**	**Omisison Error**	**Producers Accuracy**	**Kappa Coefficient**
	Apples	115	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	115	0%	100%	
	Avocados	0	332	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	332	0%	100%	
	Bush Berries	0	0	293	0	0	0	4	0	0	0	0	0	0	0	0	0	0	297	1%	99%	
	Cherries	0	0	0	190	0	0	0	0	0	0	0	0	0	0	0	0	0	190	0%	100%	
	Citrus	0	0	0	0	94	0	0	0	0	0	0	0	0	0	0	0	0	94	0%	100%	
	Cole Crops	0	0	0	0	0	7,062	21	0	314	12	0	0	0	25	0	42	0	7,476	6%	94%	
	Flowers, Nursery and Christmas Tree Farms	0	0	0	0	0	0	167	0	0	0	0	0	0	0	0	0	0	167	0%	100%	
	Grapes	0	0	0	0	0	0	0	3,372	0	0	0	0	0	0	0	0	0	3,372	0%	100%	
	Lettuce/Leafy Greens	0	0	11	0	0	103	0	0	7,056	0	0	0	0	0	0	9	0	7,179	2%	98%	
	Miscellaneous Grain and Hay	0	0	0	0	0	7	0	0	14	529	29	12	0	0	0	73	0	665	20%	80%	
	Miscellaneous Truck Crops	0	0	0	0	0	0	0	1	0	13	3,733	0	0	0	0	10	0	3,757	1%	99%	
	Mixed Pasture	0	0	0	0	0	0	0	0	0	0	0	120	0	0	0	0	0	120	0%	100%	
	Peppers	0	0	0	0	0	0	0	0	7	0	0	0	225	0	0	11	0	242	7%	93%	
	Strawberries	0	0	8	0	0	108	9	0	62	0	0	0	0	2,416	0	0	0	2,603	7%	93%	
	Tomatoes	0	0	0	0	0	0	0	0	0	0	0	0	13	0	194	28	0	235	17%	83%	
	Unclassified Fallow	0	0	0	0	0	0	0	3	0	0	0	10	0	0	0	1,512	0	1,525	1%	99%	
	Walnuts	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	128	128	0%	100%	
	Predicted Total	115	332	312	190	94	7,280	202	3,376	7,454	555	3,763	142	238	2,441	194	1,684	128	28,498			
	Commision Error	0	0%	6%	0%	0%	3%	17%	0%	5%	5%	1%	15%	5%	1%	0%	10%	0%				
	Users Accuracy	1	100%	94%	100%	100%	97%	83%	100%	95%	95%	99%	85%	95%	99%	100%	90%	100%				
	Kappa Coefficient																					0.95

Table 34. Colorado River Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (acres)

		Predicted																				
		Alfalfa and Alfalfa Mixtures	Carrots	Citrus	Cole Crops	Corn, Sorghum and Sudan	Cotton	Dates	Grapes	Lettuce/Leafy Greens	Melons, Squash and Cucumbers	Miscellaneous Grain and Hay	Miscellaneous Grasses	Miscellaneous Truck Crops	Mixed Pasture	Onions and Garlic	Peppers	Sugar Beets	Unclassified Fallow	**Reference Total**	**Omission Error**	**Producers Accuracy**	**Kappa Coefficient**
Reference	Alfalfa and Alfalfa Mixtures	21,573	0	0	0	231	0	0	0	0	0	246	423	0	0	0	0	0	0	22,473	4%	96%	
	Carrots	0	1,576	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,576	0%	100%	
	Citrus	0	0	1,111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,111	0%	100%	
	Cole Crops	0	37	0	3,427	0	0	0	0	166	0	0	0	0	0	0	0	0	0	3,630	6%	94%	
	Corn, Sorghum and Sudan	14	0	0	35	4,130	0	0	0	0	107	0	207	0	0	0	0	0	0	4,494	8%	92%	
	Cotton	0	0	0	0	0	968	0	0	0	0	0	0	0	0	0	0	0	0	968	0%	100%	
	Dates	0	0	39	0	0	0	1,433	0	0	0	0	0	0	0	0	0	0	0	1,473	3%	97%	
	Grapes	0	0	0	0	0	0	0	435	0	0	0	0	0	0	0	0	0	0	435	0%	100%	
	Lettuce/Leafy Greens	0	0	0	54	0	0	0	0	4,040	0	0	0	0	0	0	0	0	35	4,129	2%	98%	
	Melons, Squash and Cucumbers	0	0	0	0	0	0	0	0	0	884	0	0	0	0	0	0	0	0	884	0%	100%	
	Miscellaneous Grain and Hay	4	0	0	68	0	0	0	0	0	0	4,228	39	0	0	0	0	0	0	4,339	3%	97%	
	Miscellaneous Grasses	357	0	0	0	130	0	0	0	0	96	71	10,677	0	15	0	0	0	0	11,347	6%	94%	
	Miscellaneous Truck Crops	0	0	0	0	0	0	0	0	0	0	0	0	1,495	0	0	0	0	47	1,542	3%	97%	
	Mixed Pasture	0	0	0	0	0	0	0	0	0	0	0	0	0	96	0	0	0	0	96	0%	100%	
	Onions and Garlic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,352	0	0	0	2,352	0%	100%	
	Peppers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	231	0	0	231	0%	100%	
	Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,424	0	3,424	0%	100%	
	Unclassified Fallow	0	0	0	0	0	0	0	5	0	0	0	0	0	3	0	0	0	5,114	5,123	0%	100%	
	Predicted Total	21,948	1,612	1,150	3,584	4,491	968	1,433	440	4,207	1,087	4,546	11,347	1,495	114	2,352	231	3,424	5,196	69,626			
	Commission Error	2%	2%	3%	4%	8%	0%	0%	1%	4%	19%	7%	6%	0%	16%	0%	0%	0%	2%				
	Users Accuracy	98%	98%	97%	96%	92%	100%	100%	99%	96%	81%	93%	94%	100%	84%	100%	100%	100%	98%				
	Kappa Coefficient																						0.96

Table 35. North Coast Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (acres)

		Predicted											
		Alfalfa and Alfalfa Mixtures	Grapes	Miscellaneous Grain and Hay	Miscellaneous Grasses	Mixed Pasture	Pears	Potatoes	Unclassified Fallow	**Reference Total**	**Omission Error**	**Producers Accuracy**	**Kappa Coefficient**
Reference	Alfalfa and Alfalfa Mixtures	6,760	0	112	322	50	0	0	0	7,245	7%	93%	
	Grapes	0	819	0	0	0	0	0	0	819	0%	100%	
	Miscellaneous Grain and Hay	0	0	2,693	0	0	0	0	74	2,767	3%	97%	
	Miscellaneous Grasses	90	0	264	998	50	0	0	0	1,403	29%	71%	
	Mixed Pasture	0	0	38	107	4,235	0	0	0	4,380	3%	97%	
	Pears	0	0	0	0	0	218	0	0	218	0%	100%	
	Potatoes	0	0	0	0	0	0	809	0	809	0%	100%	
	Unclassified Fallow	0	0	128	0	80	0	0	1,976	2,184	10%	90%	
	Predicted Total	6,850	819	3,236	1,427	4,416	218	809	2,050	19,825			
	Comission Error	1%	0%	17%	30%	4%	0%	0%	4%				
	Users Accuracy	99%	100%	83%	70%	96%	100%	100%	96%				
	Kappa Coefficient												0.91

Table 36. Sacramento River Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (acres)

		Predicted																						
		Alfalfa and Alfalfa Mixtures	Almonds	Corn, Sorghum and Sudan	Grapes	Melons, Squash and Cucumbers	Miscellaneous Grain and Hay	Miscellaneous Grasses	Mixed Pasture	Olives	Peaches/Nectarines	Pears	Pistachios	Plums, Prunes and Apricots	Rice	Safflower	Sunflowers	Tomatoes	Unclassified Fallow	Walnuts	Young Perennials	**Reference Total**	**Omission Error**	**Producers Accuracy**	**Kappa Coefficient**
Reference	Alfalfa and Alfalfa Mixtures	6,619	0	0	0	0	25	107	5	0	0	0	0	0	0	0	0	0	0	0	0	6,756	2%	98%	
	Almonds	0	17,182	0	0	0	0	0	0	0	0	0	0	26	0	0	0	0	0	75	0	17,284	1%	99%	
	Corn, Sorghum and Sudan	47	0	3,038	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	3,089	2%	98%	
	Grapes	0	0	0	2,730	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,730	0%	100%	
	Melons, Squash and Cucumbers	0	0	0	0	1,032	0	0	0	0	0	0	0	0	0	0	43	11	0	0	0	1,086	5%	95%	
	Miscellaneous Grain and Hay	38	0	0	0	0	4,577	51	0	0	0	0	0	0	0	0	0	67	500	0	0	5,234	13%	87%	
	Miscellaneous Grasses	134	0	47	0	0	0	1,642	0	0	0	0	0	0	0	0	0	0	0	0	0	1,824	10%	90%	
	Mixed Pasture	0	0	0	0	0	61	0	3,302	0	0	0	0	0	0	0	0	0	0	0	0	3,363	2%	98%	
	Olives	0	0	0	0	0	0	0	0	1,006	0	0	0	0	0	0	0	0	0	0	0	1,006	0%	100%	
	Peaches/Nectarines	0	0	0	0	0	0	0	0	0	369	0	0	41	0	0	0	0	0	4	0	413	11%	89%	
	Pears	0	0	0	0	0	0	0	0	0	0	315	0	0	0	0	0	0	0	0	0	315	0%	100%	
	Pistachios	0	0	0	0	0	0	0	0	0	0	0	845	0	0	0	0	0	0	0	0	845	0%	100%	
	Prunes	0	0	0	0	0	0	0	0	0	0	0	0	1,965	0	0	0	0	0	0	0	1,965	0%	100%	
	Rice	0	0	110	0	0	0	0	0	0	0	0	0	0	16,923	0	0	0	83	0	0	17,116	1%	99%	
	Safflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	417	0	0	4	0	0	420	1%	99%	
	Sunflowers	0	0	61	0	23	0	0	0	0	0	0	0	0	0	0	3,330	160	0	0	0	3,574	7%	93%	
	Tomatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,511	0	0	0	5,511	0%	100%	
	Unclassified Fallow	0	0	0	0	0	119	0	124	0	0	0	0	0	0	0	0	0	9,667	0	53	9,963	3%	97%	
	Walnuts	0	48	0	0	0	0	0	0	0	43	0	1	0	0	0	0	0	0	11,564	0	11,656	1%	99%	
	Young Perennials	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	699	699	0%	100%	
	Predicted Total	6,838	17,230	3,256	2,730	1,055	4,783	1,800	3,435	1,006	412	315	845	2,031	16,923	417	3,373	5,749	10,254	11,643	752	94,846			
	Comission Error	3%	0%	7%	0%	2%	4%	9%	4%	0%	10%	0%	0%	3%	0%	0%	1%	4%	6%	1%	7%				
	Users Error	97%	100%	93%	100%	98%	96%	91%	96%	100%	90%	100%	100%	97%	100%	100%	99%	96%	94%	99%	93%				
	Kappa Coefficient																								0.97

Table 37. San Joaquin River Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (acres)

Reference	Alfalfa and Alfalfa Mixtures	Almonds	Cherries	Corn, Sorghum and Sudan	Cotton	Grapes	Melons, Squash and Cucumbers	Miscellaneous Grain and Hay	Miscellaneous Grasses	Miscellaneous Truck Crops	Mixed Pasture	Peaches/Nectarines	Pistachios	Sweet Potatoes	Tomatoes	Unclassified Fallow	Walnuts	Young Perennials	Reference Total	Omission Error	Producers Accuracy	Kappa Coefficient
Predicted																						
Alfalfa and Alfalfa Mixtures	8,050	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,050	0%	100%	
Almonds	0	32,641	0	0	0	0	0	0	0	0	7	0	0	0	0	0	80	0	32,728	0%	100%	
Cherries	0	0	1,008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,008	0%	100%	
Corn, Sorghum and Sudan	0	0	0	13,876	0	0	0	0	43	2	0	0	0	0	0	0	0	0	13,922	0%	100%	
Cotton	1	0	0	0	3,049	0	0	0	0	0	0	0	0	0	0	0	0	0	3,050	0%	100%	
Grapes	0	0	0	0	0	4,692	0	11	0	0	0	0	0	0	0	0	0	0	4,703	0%	100%	
Melons, Squash and Cucumbers	0	0	0	0	0	0	1,176	0	0	0	0	0	0	0	0	0	0	0	1,176	0%	100%	
Miscellaneous Grain and Hay	161	0	0	0	0	0	0	10,778	17	0	0	0	0	0	92	477	0	0	11,525	6%	94%	
Miscellaneous Grasses	106	0	0	0	0	0	0	0	512	0	0	0	0	0	0	0	0	0	617	17%	83%	
Miscellaneous Truck Crops	0	0	0	0	0	0	0	0	0	197	0	0	0	0	0	0	0	0	197	0%	100%	
Mixed Pasture	24	0	0	0	0	0	0	14	15	0	2,578	0	0	0	0	0	0	0	2,630	2%	98%	
Peaches/Nectarines	0	0	0	0	0	0	0	0	0	0	0	194	0	0	0	0	0	0	194	0%	100%	
Pistachios	0	0	0	0	0	0	0	0	0	0	0	0	5,113	0	0	0	0	0	5,113	0%	100%	
Sweet Potatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	953	0	0	0	0	953	0%	100%	
Tomatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,377	0	0	0	5,377	0%	100%	
Unclassified Fallow	0	0	0	0	0	18	0	27	0	0	54	0	0	0	0	5,193	0	273	5,566	7%	93%	
Walnuts	0	11	10	0	0	0	0	0	0	0	0	0	0	0	0	0	4,805	0	4,826	0%	100%	
Young Perennials	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	0	1,044	1,081	3%	97%	
Predicted Total	8,341	32,652	1,017	13,876	3,049	4,710	1,176	10,831	586	199	2,638	194	5,113	953	5,469	5,708	4,886	1,317	102,715			
Comission Error	3%	0%	1%	0%	0%	0%	0%	0%	13%	1%	2%	0%	0%	0%	2%	9%	2%	21%				
Users Accuracy	97%	100%	99%	100%	100%	100%	100%	100%	87%	99%	98%	100%	100%	100%	98%	91%	98%	79%				
Kappa Coefficient																						0.98

Table 38. South Coast Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (acres)

		Predicted													
		Avocados	Bush Berries	Citrus	Cole Crops	Flowers, Nursery and Christmas Tree Farms	Miscellaneous Grain and Hay	Miscellaneous Grasses	Miscellaneous Truck Crops	Strawberries	Unclassified Fallow	**Reference Total**	**Omission Error**	**Producers Accuracy**	**Kappa Coefficient**
Reference	Avocados	2,381	0	1	0	0	0	0	0	0	0	2,382	0%	100%	
	Bush Berries	0	366	0	0	3	0	0	0	0	0	369	1%	99%	
	Citrus	60	0	2,077	0	0	0	0	0	0	0	2,137	3%	97%	
	Cole Crops	0	0	0	536	0	0	0	0	0	0	536	0%	100%	
	Flowers, Nursery and Christmas Tree Farms	9	0	0	0	245	0	0	0	0	0	254	4%	96%	
	Miscellaneous Grain and Hay	0	0	0	0	0	1,334	15	71	0	84	1,504	11%	89%	
	Miscellaneous Grasses	0	0	0	0	0	89	180	0	0	0	269	33%	67%	
	Miscellaneous Truck Crops	3	0	11	0	0	0	0	1,931	0	19	1,963	2%	98%	
	Strawberries	0	0	0	0	0	0	0	0	875	0	875	0%	100%	
	Unclassified Fallow	0	0	0	0	0	4	0	0	0	860	865	1%	99%	
	Predicted Total	2,452	366	2,089	536	248	1,428	195	2,001	875	963	11,153			
	Comission Error	3%	0%	1%	0%	1%	7%	8%	3%	0%	11%				
	Users Accuracy	97%	100%	99%	100%	99%	93%	92%	97%	100%	89%				
	Kappa Coefficient														0.95

Table 39. Tulare Lake Hydrologic Region Land Use Mapping Validation Data Error Matrix by Subclass Legend Level (acres)

Reference	Alfalfa and Alfalfa Mixtures	Almonds	Citrus	Cherries	Corn, Sorghum and Sudan	Cotton	Grapes	Melons, Squash and Cucumbers	Miscellaneous Grain and Hay	Miscellaneous Truck Crops	Mixed Pasture	Onions and Garlic	Peaches/Nectarines	Pistachios	Plums, Prunes and Apricots	Pomegranates	Potatoes	Safflower	Tomatoes	Undassified Fallow	Walnuts	Young Perennials	Reference Total	Omission Error	Producers Accuracy	Kappa Coefficient
Predicted																										
Alfalfa and Alfalfa Mixtures	6,954	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,954	0%	100%	
Almonds	0	31,222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31,222	0%	100%	
Citrus	0	0	458	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	458	0%	100%	
Cherries	0	0	0	1,942	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,942	0%	100%	
Corn, Sorghum and Sudan	60	0	0	0	17,769	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	17,832	0%	100%	
Cotton	0	0	0	0	156	4,529	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,685	3%	97%	
Grapes	0	0	0	0	0	0	8,079	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,079	0%	100%	
Melons, Squash and Cucumbers	0	0	0	0	0	0	0	575	0	0	0	0	0	0	0	0	120	0	0	0	0	0	695	17%	83%	
Miscellaneous Grain and Hay	125	0	0	0	0	0	0	0	16,553	0	11	0	0	0	0	0	0	0	0	40	0	0	16,729	1%	99%	
Miscellaneous Truck Crops	0	0	0	0	0	0	0	0	0	312	0	0	0	0	0	0	0	0	0	9	0	0	321	3%	97%	
Mixed Pasture	0	0	0	0	0	0	0	0	0	0	137	0	0	0	0	0	0	0	0	0	0	0	137	0%	100%	
Onions and Garlic	0	0	0	0	0	0	0	0	0	0	0	1,605	0	0	0	0	0	0	0	77	0	0	1,683	5%	95%	
Peaches/Nectarines	0	34	3	0	0	0	0	0	0	0	0	0	1,148	0	0	0	0	0	0	0	0	0	1,185	3%	97%	
Pistachios	0	0	0	0	0	0	0	0	18	9	0	0	0	18,485	0	0	0	0	0	0	0	0	18,512	0%	100%	
Plums	0	0	0	0	0	0	9	0	0	0	0	0	0	0	293	0	0	0	0	0	24	0	326	10%	90%	
Pomegranates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	609	0	0	0	0	0	0	609	0%	100%	
Potatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,111	0	0	0	0	0	1,111	0%	100%	
Safflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,586	0	0	0	0	1,586	0%	100%	
Tomatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,451	0	0	0	6,451	0%	100%	
Unclassified Fallow	0	0	0	0	0	0	20	0	0	0	3	0	0	30	0	0	0	0	0	21,530	0	0	21,583	0%	100%	
Walnuts	0	21	0	0	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,650	0	2,711	2%	98%	
Young Perennials	0	42	0	0	0	0	0	0	0	0	0	0	0	65	0	0	0	0	0	0	0	1,493	1,600	7%	93%	
Predicted Total	7,139	31,318	461	1,942	17,966	4,529	8,108	575	16,571	320	151	1,605	1,148	18,584	293	609	1,231	1,586	6,451	21,657	2,673	1,493	146,411			
Comission Error	3%	0%	1%	0%	1%	0%	0%	0%	0%	3%	9%	0%	0%	1%	0%	0%	10%	0%	0%	1%	1%	0%				
Users Accuracy	97%	100%	99%	100%	99%	100%	100%	100%	100%	98%	91%	100%	100%	99%	100%	100%	90%	100%	100%	99%	99%	100%				
Kappa Coefficient																										0.99