APPENDIX C

California's Pesticide Use Report:
An Assessment of Spatial Data Quality

California's Pesticide Use Report: An Assessment of Spatial Data Quality

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Summary

The pesticide use report (PUR) database has been identified as one of the best databases for tracking pesticide applications temporally and spatially. Over two to three and a half million records have been reported annually for all pesticides applied in California and millions of dollars have been spent in the data collection process. Since the PUR is unique in tracking pesticide use, researchers, environmentalists, and regulators nationally and internationally have used the database for various purposes such as in human risk assessments, worker health and safety assessments, and endangered species, air, and water quality investigations.

The California Department of Pesticide Regulation (DPR) together with the California Department of Food and Agriculture recognize the importance of the PUR data quality. Although the PUR probably provides reasonable estimates of pesticide use for regional and statewide evaluations, there are concerns about data quality for some specific and more localized assessments. There is also a question about the level of compliance with use reporting, i.e., level of under-reporting of pesticide use. In this report we will not attempt to assess the degree of under-reporting. However, we will attempt to understand the quality of the pesticide use data that is collected by DPR.

The purpose of this project was to examine the accuracy of spatial attribute and other data reported in the PUR during the years 1990 to 1997. The error types evaluated for errors or potential errors include duplicate records, inconsistent county codes in the first two digits of the grower identification, meridian/township/range/section (MTRS) values outside county boundaries, missing location identifiers for an agricultural field, inconsistent MTRS values for a geographic location, inconsistent acres planted, and treated acreage greater than acres planted. In addition, we attempted to assess potential errors in the commodity code (also known as site code). However, this last assessment was only partly effective and will be described briefly in this report.

To achieve the objectives of the project, we developed a computer program to check the errors relating to the above data fields. This program used Access 97, ArcView 3.2, and Visual Basic 6.0 software. The error checking application was written mostly in Access Visual Basic Application (VBA), while the GIS maps of the error checking results were produced with ArcView 3.2. Visual Basic provided the front end of the interface between the users and the software. Access and ArcView were used for entering the directory path names for input and output data files. The program allows users to select single or multiple years of pesticide data for error checking.

Error rates were evaluated for PUR data collected from 1990 through 1997. Error rates averaged over this eight-year period were less than 5% for the following error types: duplicate records, inconsistent county code, MTRS outside reporting county, missing location identifiers, inconsistent MTRS for a geographic location, and acres treated greater than the acres planted. In contrast, potential error rates for inconsistent acres planted averaged 8.1% of all agricultural fields and 17% of all agricultural records. In

general, error rates decreased from 1990 to 1997 for inconsistent county codes, MTRS outside reporting county, missing location identifiers, and inconsistent MTRS, while error rates fluctuated from year to year for duplicate records, inconsistent acres planted, and acres treated greater than acres planted. Declining error rates in some of these error types illustrates the effort devoted to improvements in data quality. In addition, low error rates indicate the PUR database is of good quality for many uses.

We also evaluated error-rate distribution spatially by county for this eight-year period. Northern California coastal counties had higher error rates for missing location identifiers than other counties. Mountain areas had higher error rates for inconsistent county codes and MTRS values outside the county boundary. Higher rates for inconsistent acres planted were distributed primarily in the coastal range of southern California and Bay area counties. Lastly, urban and coastal counties generally had higher rates of records with acres treated greater than acres planted. The spatial distribution of these errors may ultimately give us some idea of why they occur.

Although there are errors in the PUR, error rates are generally less than 5% so these data are still useful for many purposes. The results of our analyses provide researchers a sense of how reliable particular data fields are in the PUR. These results should also be useful in prioritizing future efforts to improve the PUR data collection system in both the counties and at DPR.

Introduction

The state of California has required some kind of pesticide use reporting since at least 1950. In 1989, the California Department of Pesticide Regulation (DPR) was given authority to require full pesticide use reporting by the Food Safety Act of 1989 (Chapter 1200, AB 2161) and full use reporting began in 1990. Over two to three and half million records of pesticide use were compiled each year since 1990 (Figure 1; California Department of Pesticide Regulation, 1990-1999). Pesticide use reporting data collected in California is unique nationwide and worldwide (Wauchope and Hornsby, 1992, California Department of Pesticide Regulation, 2000), and is a valuable source of information for many users.

Pesticide use data provide the history of pesticide use for each commodity and pesticide temporally and spatially. The temporal and spatial distribution of the data allows researchers to extrapolate patterns in farming practices, pest population dynamics, human and environmental exposure, as well as loading of pesticides in vulnerable environmental regions. The data have been widely used by staff from federal and state governmental agencies, universities, industrial organizations, environmental groups, and local farmers/citizens for human risk assessments, worker health and safety assessments, and endangered species, air, and water quality studies (Epstein et al., 2000; Domagalski, 1997, 1999; Kratzer, 1997; Troiano and Garretson, 1998; Zhang et al. 1997, 2000; Kegley et al., 2000).

Pesticide use information is compiled into a database, called the Pesticide Use Report, or PUR. Growers and applicators submit use reports to their County Agricultural Commissioner's office. The counties compile the reports and submit these to DPR where the data are error-checked, entered into a database and distributed to interested parties. For their efforts, counties are compensated $0.30 for each record of pesticide use data provided to DPR (California Department of Pesticide Regulation, 2001).

Although regulations and enforcement letters were distributed to each county to ensure that the PUR data were correctly collected and entered into the computer, many types of errors appear in the PUR. Errors enter the PUR in several ways. Many come from inevitable typing mistakes during data entry. Others result from misunderstanding of the meaning of or requirements for the different data fields. These kinds of errors are exacerbated by complicated or confusing requirements and inadequate documentation. Also, different counties may have different data entry programs and different definitions for certain data fields, such as the site location identification.

To use the PUR for any analysis, researchers have used various statistical methods to overcome perceived problems with data quality (Epstein et al., 2000 a, b; Zhang et al., 1997). The diverse statistical methods used for pre-processing PUR data can make it difficult to compare results between various studies. To address the need for a standard data set available to all researchers, DPR and the California Department of Food and Agriculture jointly funded this and other related projects.

The purpose of this project was to examine the accuracy of spatial attribute and other data reported in the PUR during the years 1990 to 1997. The error types studied include:

1. Duplicate records
2. Inconsistent county code in the grower identifier
3. Meridian/township/range/section (MTRS) outside the county boundary
4. Missing location identifiers for an agricultural field
5. Inconsistent MTRS values for a geographic location
6. Inconsistent acres planted for an agricultural field during a growing season
7. Acres treated greater than acres planted
8. Inconsistent site code.

Methods and Criteria

1. Data fields in the PUR database

The PUR contains over 30 database fields. The most important fields (with database field names in parentheses) are pesticide active ingredient (chem._code), pesticide product used (prodno), pounds of active ingredient applied (lbs_chm._used), area or volume treated by this pesticide (acre_treated), area planted (acre_planted), pesticide application method (aer_gnd_ind), grower identification (grower_id), application date (applic_dt), county of application (county_cd), agricultural field location (base_ln_mer, township, tship_dir, range, range_dir, section-these are described below), agricultural field identification (site_loc_id), and crop (site_code).

Each production agricultural record or row in the PUR refers to one active ingredient applied by one application to an individual agricultural field. If a pesticide contains more than one active ingredient, the PUR will contain more than one record. Each non-production agricultural record in the PUR refers to the sum of all applications of an active ingredient by an applicator in a county for one month. In this report, calculations were only made for production agricultural records.

Every record for production agricultural use contains all the information relating to the pesticide application and the geographical location in the Public Land Survey System (PLSS). The PLSS is recorded as meridian/base, township, range, and section (MTRS) and specifies the geographic location of a square-mile area. Thus the PUR only provides agricultural field locations to within a square-mile section.

In the PUR, each grower is identified by a unique string of characters comprising the grower_id, and each agricultural field is also assigned a unique code (site_loc_id) for each grower. However, for this report we assume that an agricultural field is uniquely identified in the PUR by the combination of grower_id, site_loc_id, and MTRS. MTRS is part of the definition of an agricultural field because for the PUR a field must be less than one section (one square mile) in area. An individual agricultural field can receive multiple pesticide applications and therefore the total number of agricultural records is greater than the total number of agricultural fields.

In this study we based our calculations on the number of agricultural fields (distinct values of the combination of grower_id, site_loc_id, and MTRS) and on the number of production agricultural records.

2. Error checking program and its main functions

To achieve the objectives of the project, we developed a computer program to check the errors relating to the above data fields. This program was developed with Access 97, ArcView 3.2, and Visual Basic 6.0 software and requires a Windows 95/98 or Windows NT (4.0 or later) computer with at least 128 MB of RAM and 10GB of hard disk. The error checking application was written mostly in Access VBA, while the GIS maps of the

error checking results were produced with ArcView 3.2. Visual Basic provided the front end of the interface between the users and the software. Access and ArcView were used for entering the directory path names for input and output data files. The program allows users to select single or multiple years of pesticide data for error checking. A detailed description of this program can be found in Appendix I. The program is also available for distribution upon request.

The eight error types evaluated for errors include duplicate records, inconsistent county codes, MTRS values outside the county boundary, missing location identifiers for an agricultural field, inconsistent MTRS values for a geographic location, inconsistent acres planted, acres treated greater than acres planted, and site (commodity) code inconsistency (Diagram 1).

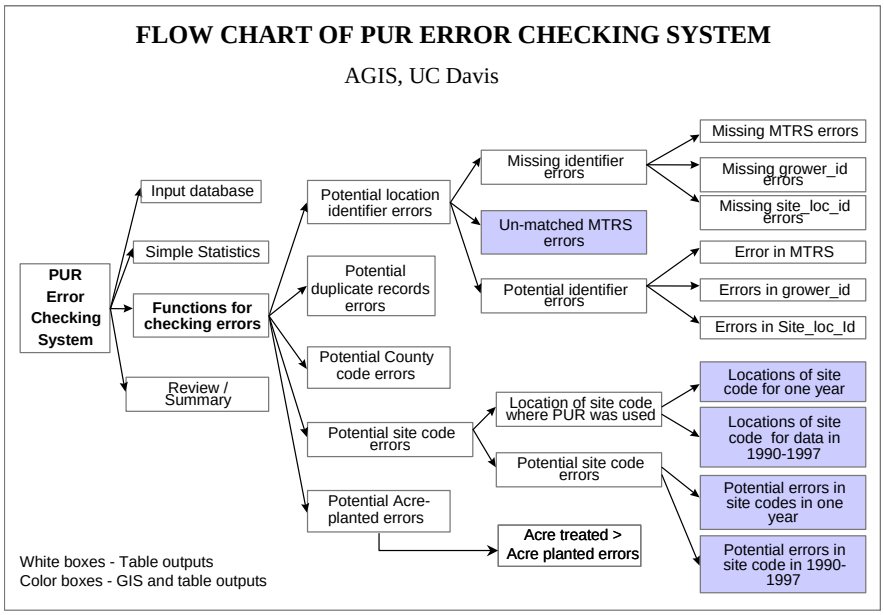

Diagram 1. Chart for the error checking program for spatial attributes.

3. Error types

Duplicate records

Each record in the PUR represents one pesticide application for one chemical active ingredient. Records were considered duplicates of one another if they contained the same values in each of nine data fields: grower_id, site_loc_id, acre_planted, acre_treated, prodno, chem_code, lbs_chm_used, applic_dt, and site_code (See Appendix I for details).

Duplicate records were extracted from the PUR database and saved in a separate file for later examination (see Appendix I for file conventions). The number of duplicate records in the saved file is used to estimate the potential duplicate error rate for each county and each year. If two or more records were found with identical values for the nine data fields, only one record was counted when calculating the duplicate error rate.

Inconsistent county code

In the grower identification string, the first two digits in the grower_id field signify the reporting county code. This should be the same as the county code reported for the record. If the first two digits were not the same as the county code, these records were saved into a separate file for further examination. For example, Yolo County has a code of 57. The program will find any records submitted from Yolo County that do not have "57" in the first two digits of the grower_id field, and will save these records in a separate file. The number of records in the saved file was used to estimate the error rate for inconsistent county code.

MTRS outside the county boundary

The MTRS value reported for an agricultural field in the PUR should be within the reporting county's boundary. MTRS values outside the reporting county were treated as errors. The program compares the MTRS from the PUR to a PLSS GIS county map. Records with MTRS errors were then saved into a separate file for later use. The number of distinct MTRS values that occurred in a record where the MTRS was outside of the reporting county's boundary was used to estimate the error rate. The error rate was calculated in two different ways: 1) 100 times the number of distinct MTRS values outside of the county boundary divided by the number of all agricultural fields and 2) the percent of all agricultural production records with MTRS values outside the county.

Missing location identifiers for an agricultural field

An agricultural field is defined here as a unique combination of three data fields: grower_id, site_loc_id, and MTRS. A missing location identifier refers to missing information in the PUR for any of one of these data fields. If one or more location identifiers were missing in that record, the record was saved in a different file for future use. The number of records with missing location identifiers was used to estimate the error rate.

Inconsistent MTRS for a geographic location

To perform this calculation, we assumed that the combination of grower_id and site_loc_id uniquely identified a single geographic location within a section. Under this assumption, all records with applications to this location should have the same MTRS value. Records with different MTRS values for the same combination of grower_id and site_loc_id are considered inconsistent and are considered possible errors. These records were saved in a file and the number of saved records was used in estimating the error rate. The error rate was calculated in two different ways: 1) 100 times the number of distinct grower_id and site_loc_id values with inconsistent MTRS values divided by the number of all agricultural fields and 2) the percent of all production agricultural records with inconsistent MTRS values.

Inconsistent acres planted

The value of acres planted should be the same for an agricultural field during one growing cycle for one crop. However, acres planted reported in the PUR were sometimes different at different times for one field and one crop. Again, each agricultural field is identified by the grower_id, site_loc_id, and MTRS, but we considered acres planted to be inconsistent for a field only if the acres planted differed between records for the same agricultural field and the same crop. We saved those records with inconsistent acres planted values into a separate file. We calculated the error rate in two different ways: 1) 100 times the number of agricultural field and crop combinations which had inconsistent acres planted divided by the number of agricultural fields and 2) the percent of all production agricultural records with inconsistent acres planted.

Acres treated greater than acres planted

Within each PUR record, the reported acres treated should be smaller than or equal to the acres planted. If the acres treated are greater than the acres planted in any record, then either the acres treated or the acres planted is wrong. The error checking program extracted the records with acres treated greater than the acres planted after the inconsistent acre planted records were removed. These records were then saved to a file and later used to estimate the error rate as a percent of the total number of production agricultural records.

Site code

Site code in the PUR identifies the commodity that receives a pesticide application. Together with grower_id, site_loc_id and MTRS, site code can help identify the location of pesticide applications reported in the PUR. Site code is another important data field to be considered in spatial aspects for the PUR. To get some idea of the data quality for site code, we compared the PUR commodity locations with the crop maps from the California Department of Water Resources (DWR). DWR had maps for the major crops in 16 central valley counties. But these DWR maps were only produced for certain years, i.e., only one year for one or two counties. We made comparisons for the following 10 commodities: almonds, grapes, cotton, rice, alfalfa, tomatoes, walnuts, oranges, lettuce, and broccoli.

The comparison between site code from the PUR and crops from DWR maps was made in the interface of ArcView and Access. We prepared two tables, each containing site codes and all MTRS values where those crops were reportedly grown. One table contained the values from the PUR and the other values from the DWR crop maps. The tables contained data only for those crops that appeared in the DWR crop maps. Then we compared the two tables. If any discrepancies occurred, the program generated a difference map and displayed it on the screen in ArcView. Users can save the maps and/or data files. Differences could result from errors in either the PUR or DWR and either in the site code or location of the crop. Since land-use maps exist for only one year for any county, we could not analyze error rate trends. However, information concerning

potential errors for the commodities mentioned above is available upon request.

Results

Duplicate records

The proportion of duplicate records averaged 2.3% of all agricultural records for the eight-year period (Table 1). Annually, the percent of duplicate records ranged from 1.4 to 4.1% from 1990 to 1997 (Table 1, Figure 2). The highest duplicate record rate, 4.1%, occurred in 1993, and the lowest rate, 1.4%, in 1996. There appears to be a slight decreasing trend in percent of duplicate records after 1993.

The percent of duplicate records were highest in Imperial, Monterey, Santa Cruz, Sonoma, and Mono Counties (Figure 3). However, in each of these counties, the percent of duplicate records was unusually high only during one year. In all other years, the error rates were similar to the rates in the other counties, mostly less than 3%.

There were no clear trends in percent of duplicate records within the different counties, with percentages fluctuating from year to year (Table 2). However, the high duplicate record rate in 1993 was dominated by Monterey County, which was an unusually high 16%.

Inconsistent county code

The proportion of records with inconsistent county codes averaged <1% of all agricultural records for the eight-year period (Table 1). Annually, error rates ranged from near 0 to 4.5% from 1990 to 1997 (Table 1). The error rate for inconsistent county code decreased dramatically from 1990 to 1992 (Table 1, Figure 4). The inconsistent county code error rate was less than 0.04% for each year from 1993 to 1997 although the highest average error rate was 4.5% in 1990.

Most counties had very low error rates except for San Benito County and those in the mountain regions where agriculture is less important (Figure 5). During 1995 to 1997 most counties had no errors in county code (Table 3). The only exceptions were 1 error in Sutter in 1995, 1 error in Santa Barbara in 1996, and 74 errors in Napa in 1997.

MTRS outside the county boundary

The error rate for MTRS values outside the county boundary averaged <0.06% of all agricultural fields for the eight-year period (Table 1). Annually, error rates decreased from 0.4% in 1990 to nearly 0 in 1997 (Table 1).

The error rate for MTRS values outside the county boundary averaged 0.79% of all agricultural records for the eight-year period (Table 1). Annually, error rates decreased from 4.3% in 1990 to 0.001% in 1997 (Table 1, Figure 6). Most of the errors appeared in the mountain area and some coastal counties (Table 4, Figure 7). Although some of the mountain area counties had high error rates, above 10%, agricultural activities in these counties were minimal. The error rates for most of the valley counties were lower than 3% during 1990 to 1997.

Missing location identifiers

Location identifiers include the data fields: grower_id, site_loc_id and MTRS. The error rate for missing location identifiers averaged 0.004% of all agricultural production records for the eight-year period. Annually, error rates decreased from 0.01% in 1990 to 0.0006% in 1997 (Table 1, Figure 8). Most of the missing location identifiers were in the northern coastal counties (Figure 9). The highest average error rates, 0.04 to 0.17%, were in the counties of Mono, Mendocino and Marin (Figure 9). However, these counties had few agricultural records and the total number of records in these counties with errors was rather small during 1990 to 1997. In 1994, nearly all of these errors were in Mendocino (Table 5). Most of the valley counties had error rates less than 0.01%.

Inconsistent MTRS for a geographic location

The error rate for inconsistent MTRS values averaged 1.66% of all agricultural fields over the eight-year period. Annually, error rates calculated as a proportion of total number of agricultural fields ranged from a high of 3.1% in 1990, to a low of 0.4% in 1995 (Table 1, Figure 10).

The error rate for inconsistent MTRS values averaged 4.6% of all agricultural production records for the eight-year period. Annually, error rates for inconsistent MTRS calculated as a proportion of total number of agricultural production records ranged from a high of 8.6% in 1990, to 1.1% in 1995 (Table 1, Figure 12). In general, error rates decreased during the eight-year period.

San Luis Obispo, Ventura, and Los Angeles counties had the highest error rates (both by agricultural fields and PUR records) during 1990 to 1997, with rates above 10% for most years. However, in all three counties, the error rates generally decreased from 1994 to 1997 (Tables 6 and 7, Figures 11 and 13). Most of the counties in the state had error rates less than 5%.

Inconsistent acres planted

Potential error rates for inconsistent acres planted averaged 8.1% of all agricultural fields over the eight-year period. Annually, potential error rates ranged from a high of 20% in 1992, to a low of 11% in 1990 (Table 1, Figure 14). Potential error rates for inconsistent acres planted averaged 17% of all agricultural production records over the eight-year period. Annually, potential error rates for inconsistent acres planted calculated as a

proportion of total number of agricultural production records ranged from a high of 10% in 1992, to a low of 11% in 1990 (Table 1, Figure 16). Potential error rates for this error type varied from year to year with no increasing or decreasing trend.

Higher error rates appeared in southern coastal and bay areas counties, especially in Ventura, San Luis Obispo, Santa Barbara, Monterey, and San Benito Counties, where error rates exceeded 30% in many years (Tables 8 and 9, Figures 15 and 17). Although error rates remained nearly constant for most counties from 1993 to 1997, error rates decreased in many valley counties (Tables 8 and 9).

Acres treated greater than acres planted

The proportion of records with acres treated greater than acres planted averaged 0.72% of all agricultural records for the eight-year period (Table 1). Annually, error rates ranged from a high of 1.4% in 1991, to a low of 0.30% in 1995 (Table 1, Figure 18). The error rate varied from year to year with no increasing or decreasing trend.

The highest error rates were in the Bay Area counties and Los Angeles County (Figure 19). However, the highest errors in these counties occurred in one or two years during 1990 to 1997 (Table 10). These counties include Alameda, Contra Costa, Los Angeles, Marin, Orange, San Mateo, and Santa Clara counties.

Site code

The discrepancies between the site code in the PUR and the crop/land use data from DWR were saved for 16 central valley counties that have available crop/land use digital files. Results of this analysis are available for distribution upon request.

Discussion

Statewide, error rates averaged for the eight-year period (1990-1997) were less than 5% for the following error types: duplicate records, inconsistent county code, MTRS outside reporting county, missing location identifiers, inconsistent MTRS for a geographical location, and acres treated greater than the acres planted. In contrast, the statewide average error rates for inconsistent acres planted were 8.1% of all agricultural fields and 17% of all agricultural records. In general, error rates decreased for inconsistent county codes, MTRS outside reporting county, missing location identifiers, and inconsistent MTRS, while error rates fluctuated from year to year for duplicate records, inconsistent acres planted, and acres treated greater than acres planted.

The decline in error rate of some error types demonstrates the effort that has been devoted to improvements in data quality. In addition, low error rates indicate the PUR database is of good quality for many uses.

Error rates for inconsistent county codes, MTRS outside of county boundaries, and missing location identifiers in the PUR declined almost to 0% in 1997. It is possible this decline is a result of increased experience and familiarity of growers, pesticide applicators, and county agricultural staff with county codes, MTRS designations, and field location identifiers. Although average error rates for most of these error types are rather small, it is still important to consider them when analyzing pesticide impacts or trends in a localized area.

Most of these errors could be caught in the data entry programs used by the counties. Errors indicate areas where the data entry programs can be improved, such as identifying incorrect MTRS values in certain counties. Incorrect MTRS values in the PUR show that either the county data entry program contained the wrong MTRS information or the county staff altered the values for MTRS during data entry.

Not all of the records found for these different error types are actually errors, especially for duplicate records and inconsistent acres planted. For example, if a grower separately reported individual spot treatments to an agricultural field with the same active ingredient, pounds applied, and area treated, the records in the PUR would appear to be duplicates when in fact they are not. Meanwhile, erroneous duplicates can occur in several ways. For example, when two people are responsible for pesticide applications on a farm and both send in a report for the same application, a duplicate record will result. Or, when the same report unknowingly gets entered into the database two or more times, a duplicate record will result. Therefore, the error rate calculated in this study is only an estimate of the actual error rate.

Duplicate records directly influence the estimate of the total amount of pesticide used in a county, region, or state. Many studies reference the PUR as the pesticide use data source when assessing pesticide impacts on the environment (Troiano, 1998; Domagalski, 1997). Reducing the number of erroneous duplicate records is an essential step in providing accurate impact assessments. To reduce duplicate record errors, better guidelines should be developed such as always reporting actual acreage treated for spot treatments.

Inconsistency in acres planted is one of the data fields in the PUR with a potentially high error rate. Not all of these are necessarily errors and it may be that in some situations most of them are not errors. In this report we distinguished agricultural fields by grower_id, site_loc_id, and MTRS. The potential errors for acres planted in this report were considered crops growing on the field. If the agricultural field grows multiple crops in a year, the number of fields in this case will be more than the actual physical number of agricultural fields. Therefore, the high potential error rate in acres planted may reflect multiple cropping as well as actual errors. It is important that we pay attention to the trends of these error rates rather than the absolute values.

In the real world, an agricultural field is an individual physical contiguous area of land that undergoes the same cultural practices. Ideally, we would hope that each grower

assigns a unique and distinct site_loc_id to each separate agricultural field. MTRS is part of our definition of an agricultural field because for the PUR a field must be less than one section (one square mile) in area and sometimes a grower will assign one site_loc_id to a field larger than one square mile. Also, some growers apparently assign only one site_loc_id to all their fields. In this case the only way to know from the PUR that they are different fields is if they are in different sections and this requires the use of the MTRS value to distinguish the fields.

However, including MTRS in the definition of an agricultural will overestimate the number of fields if errors occur in assigning MTRS. The magnitude of this problem, however, can be seen from the error rates for inconsistent MTRS. That error rate was found by looking for inconsistent MTRS values for each distinct combination of grower_id and site_loc_id. That error rate was much lower than the error rate for inconsistent acres planted so including MTRS in the definition of agricultural field seems reasonable.

However, if a grower uses the same site_loc_id for several distinct fields all in one section and if two or more fields are different sizes but with the same crop, then these would appear as inconsistent acres planted. However, these inconsistent acres planted values would not actually be errors.

In other situations, these inconsistent acres planted are errors. At the beginning of each calendar year, growers who plan to apply pesticides must get a permit or an operator identification from their county. When applying for this form, the grower indicates the anticipated crops and acreage planned for the coming year. It is this estimated acreage that is first entered into the pesticide use report database. There are a few potential sources of errors for this data field. One error could occur when the person requesting the form enters the wrong acreage. Another error could occur during data entry. A third type of error could occur if changes are made to the amount of acreage planted for a particular crop. For various reasons either economic or climatic considerations, the grower may alter the acreage actually planted during the season. Therefore, it is possible that the value of acres planted originally reported may differ from the actual acres of an agricultural field at some point in the season. When changes in acres planted occur during the year, the acres planted originally reported to the county is not necessarily corrected retroactively. Therefore, without further information from each county, we can only consider these potential errors in acres planted.

The method we used to calculate percent of errors based on the number of agricultural fields artificially increases the values. We calculated the number of distinct values of grower_id, site_loc_id, MTRS, and site_code which had inconsistent acres planted and divided by the number of distinct values of grower_id, site_loc_id, and MTRS (our definition of an agricultural field). If many fields had several different crops planted on them during a season, then it would even be possible for this ratio to be greater than 1. For this error rate, it would be better to divide by the total number of distinct values of grower_id, site_loc_id, MTRS, and site_code. However, to avoid the confusion of the definition of an agricultural field, we used the same agricultural field values for this

calculation. The error rates for counties where a high proportion of agricultural fields grow multiple crops in one year are expected to be higher than for counties that grow a high proportion of annual and perennial crops. Since the PUR does not contain multiple cropping data, we cannot further separate the information.

If the fields with inconsistent acres planted happened to have a large number of applications, then the record error rate would be increased because all records for these applications would be marked as inconsistent. This might explain why the record error rate was consistently higher than the agricultural field based error rate.

Knowing the rates of various kinds of errors is important in helping PUR users determine what kinds of analyses are more or less reliable. It is clear that the highest error rates are associated with acres planted, which is important in many kinds of analyses. Implementing the Food Quality Protection Act requiring estimates of percent of the planted acres of a crop that are treated is one example. Accurate estimates depend on accurate data on acres treated and acres planted.

Thus, knowing these potential error rates is also important in helping DPR determine where the PUR collection system needs improvement. Further study is required to more clearly understand which of these potential errors are really problems, to develop methods to correct or minimize the errors in analyses, and to improve the PUR collection process. The error rates we have reported here will help us choose the kinds of errors and particular counties with the largest problems for further investigation. In phase 2 of the overall error-checking project, we will report on the results of a survey sent to each county to document their PUR collection procedures and definitions. We will use the historical error rates to help us determine which data fields need further study through the survey and its follow up.

Although this report documents the potential error rates for various data fields in the PUR, the PUR is one of the best databases in the world for tracking pesticide use. Most of the errors could easily be caught and fixed at the county during data entry. This database has been and will continue to be widely used for risk assessment, pest management, protecting air and water resources and marketing research. Therefore we should strive to improve data quality wherever possible.

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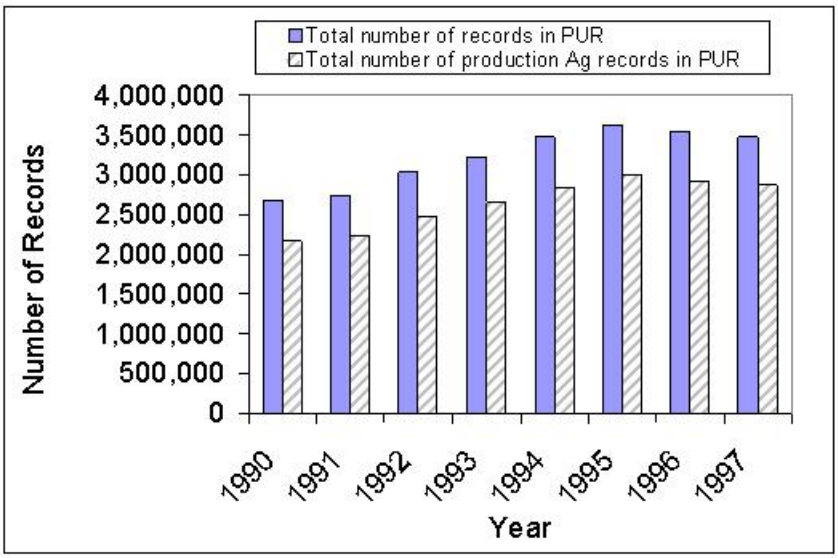


Figure 1. Total number of records in PUR (1990 to 1997)

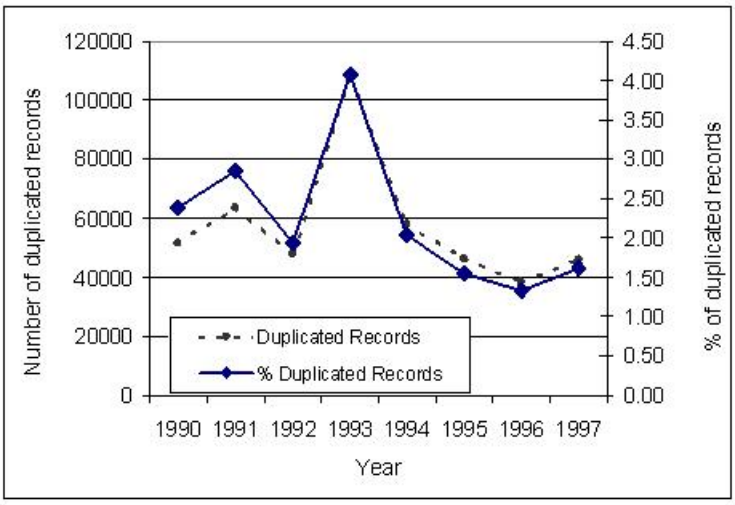


Figure 2. Number and percent of production Ag duplicate records in PUR 1990-1997

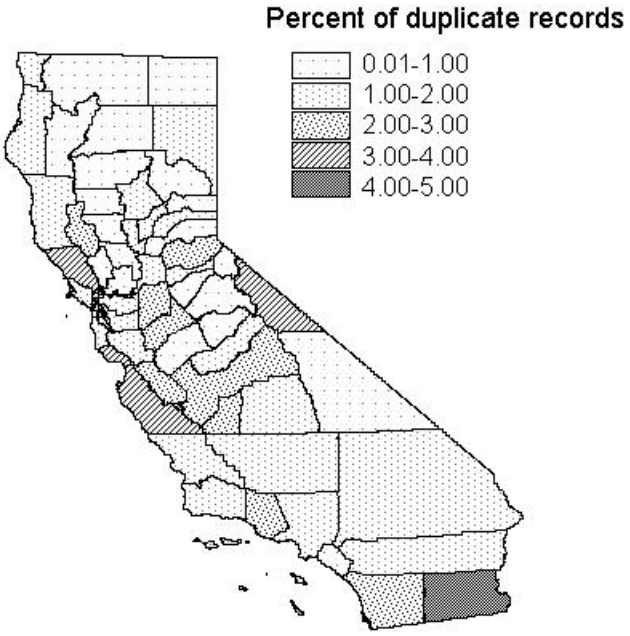


Figure 3. Spatial distribution of the county average percent of duplicate records in PUR 1990-1997.

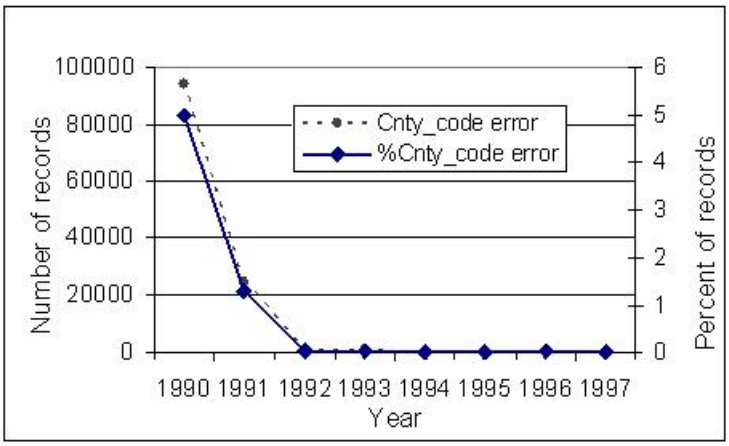


Figure 4. Number and percent of production agricultural records with inconsistent county codes in grower_id.

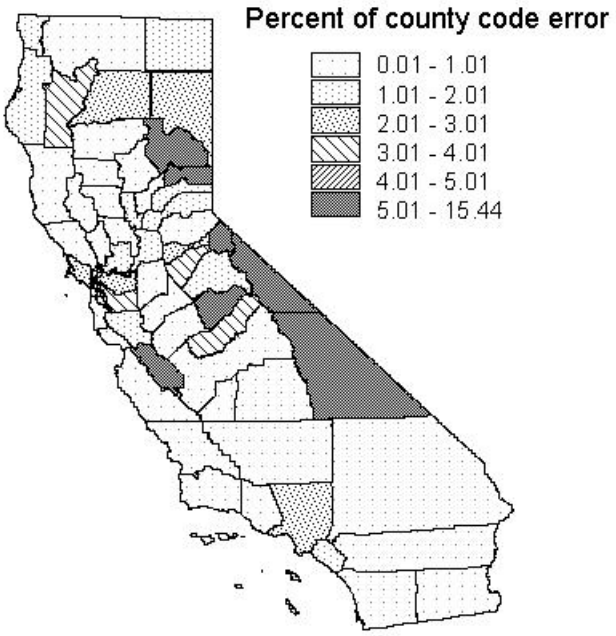


Figure 5. Spatial distribution of the county average percent of county code errors in grower_id 1990-1997.

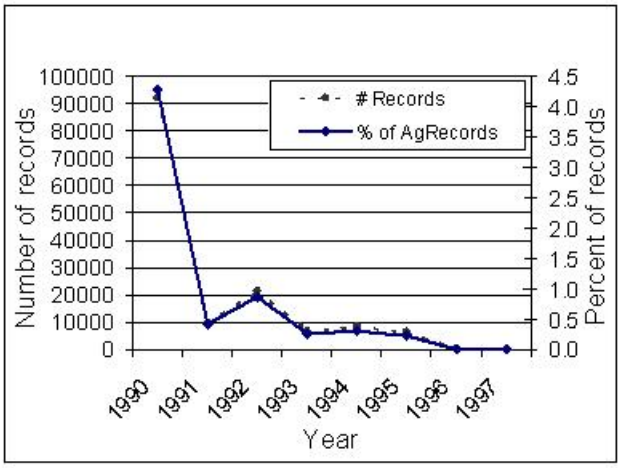


Figure 6. Number and percent of production agricultural records with of township/range/section (MTRS) outside county boundaries.

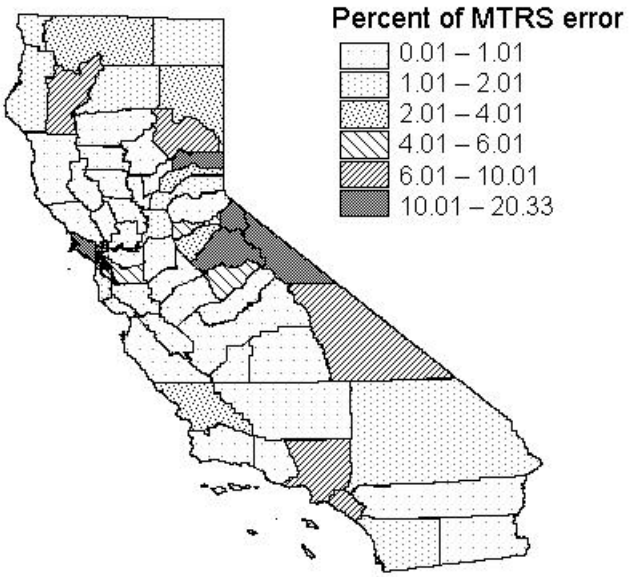


Figure 7. Spatial distribution of the county average percent of township /range/section (MTRS) records outside county boundaries (1990 -1997).

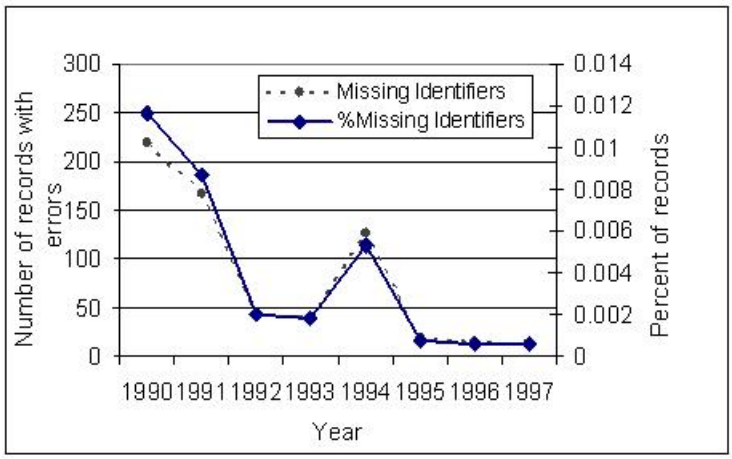


Figure 8. Number and percent of production agricultural with missing location identifiers (MTRS, grower_id, and site_loc_id) 1990-1997.

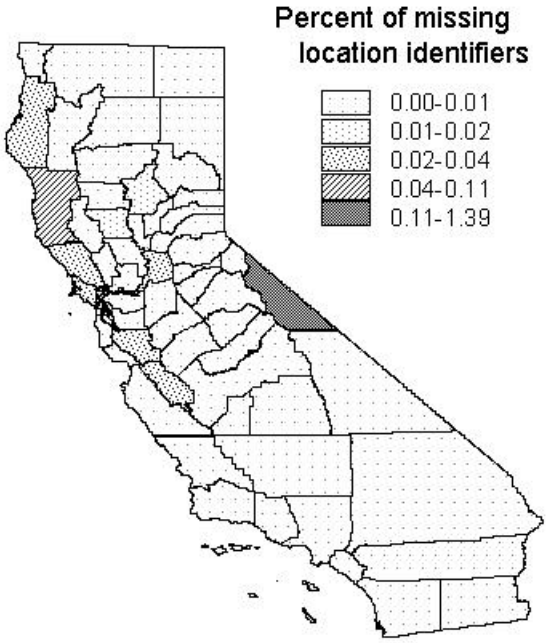


Figure 9. Spatial distribution of the county average percent of missing location identifiers (MTRS, grower_id, site_loc_id) 1990-1997.

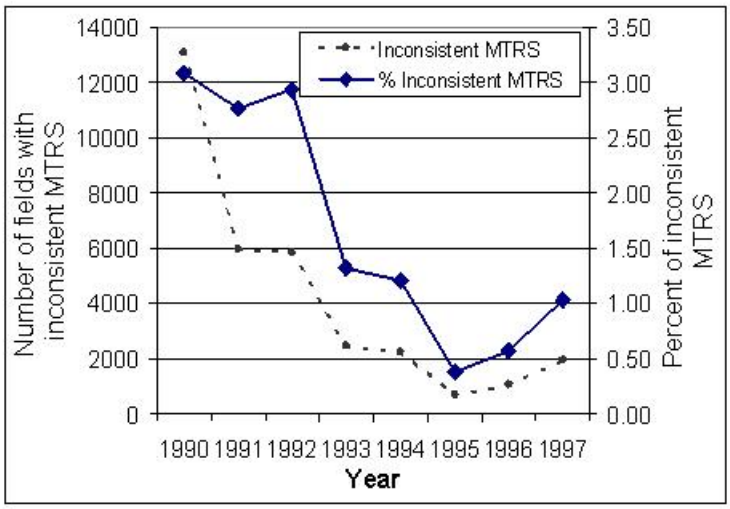


Figure 10. Number and percent of agricultural fields with inconsistent MTRS for grower_id and site_loc_id 1990-1997

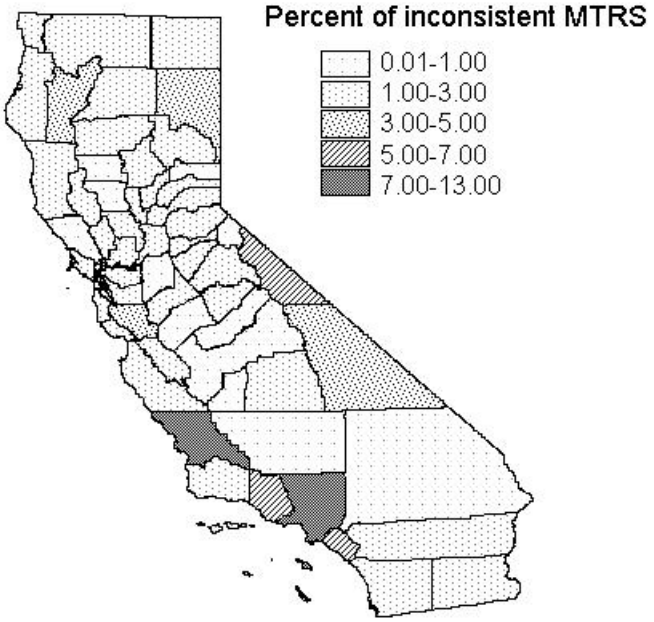


Figure 11. Spatial distribution of the county average percent of fields with inconsistent MTRS for grower_id and site_loc_id 1990-1997

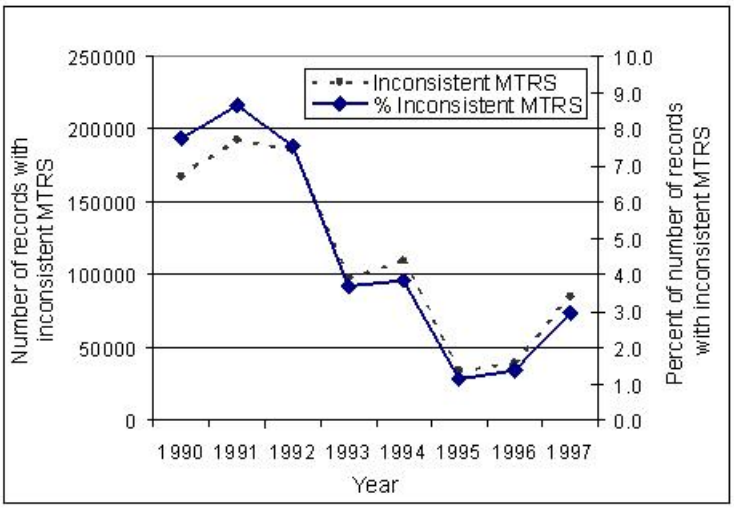


Figure 12. Number and percent of production agricultural records with inconsistent MTRS for grower_id and site_loc_id

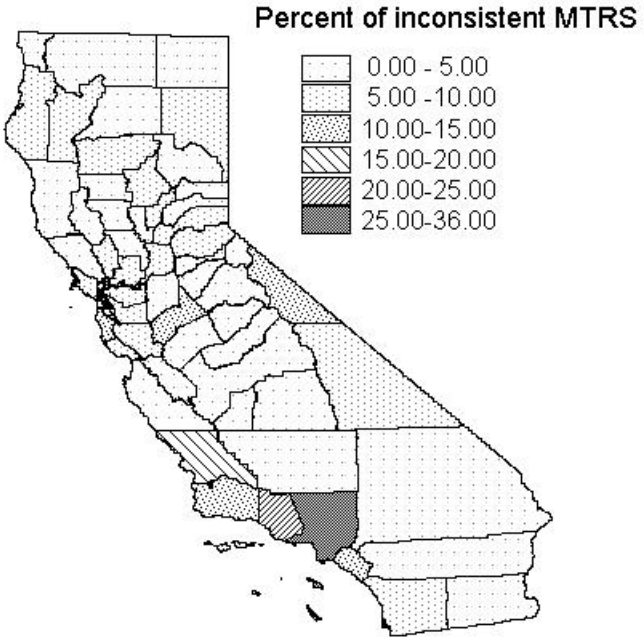


Figure 13. Spatial distribution of the county average percent of records with inconsistent MTRS for grower_id and site_loc_id 1990-1997

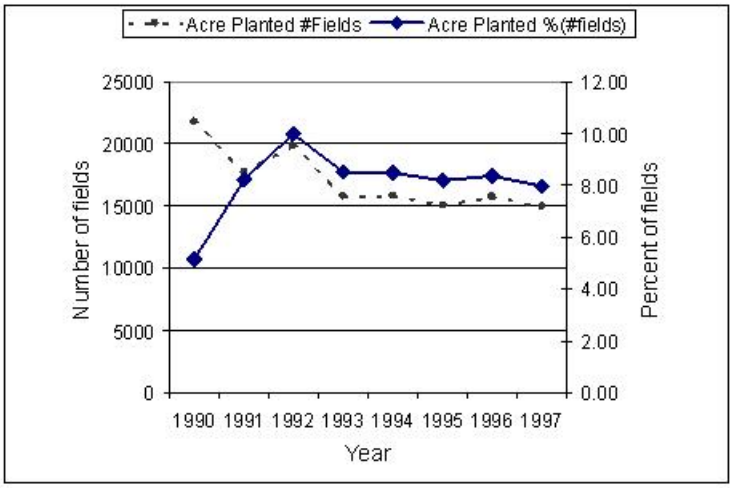


Figure 14. Number and percent of agricultural fields inconsistent acres planted

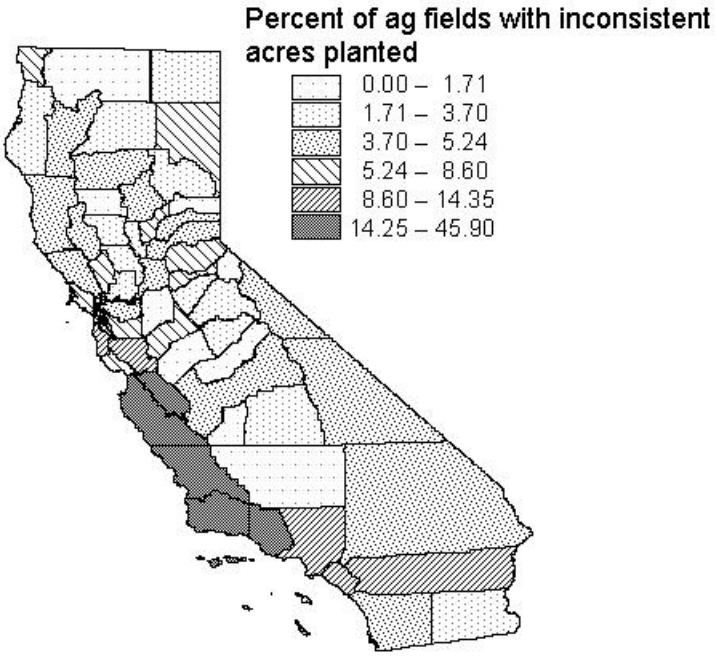


Figure 15. Spatial distribution of the county average percent for agricultural fields with inconsistent acres planted 1990-1997.

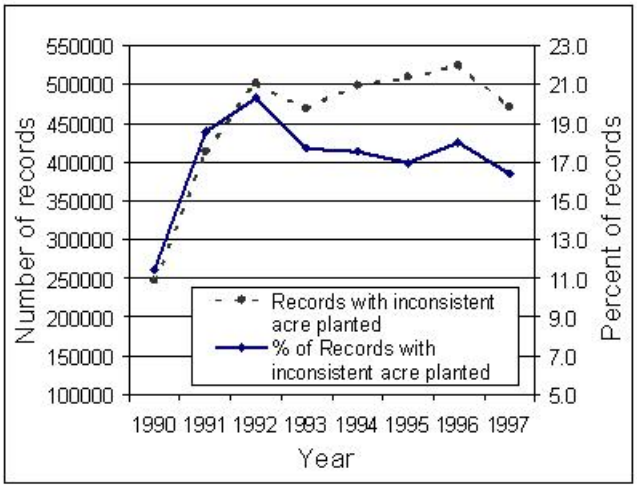


Figure 16. Number and percent of production agricultural records with inconsistent acres planted.

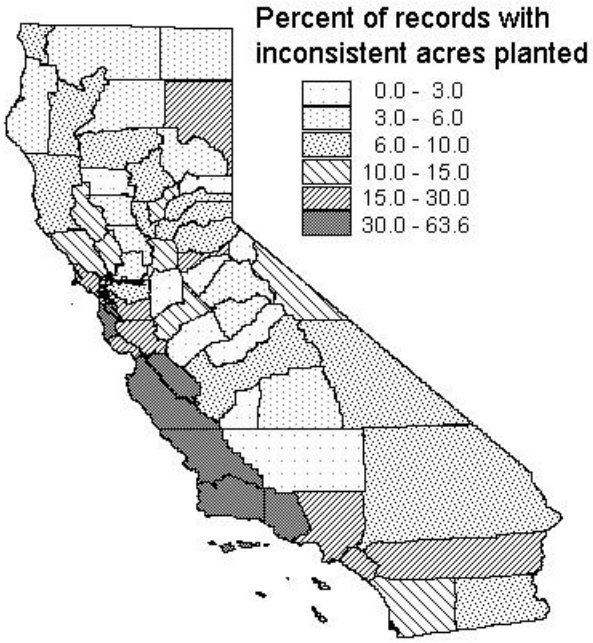


Figure 17. Spatial distribution of the county average percent of the records with inconsistent acres planted 1990-1997.

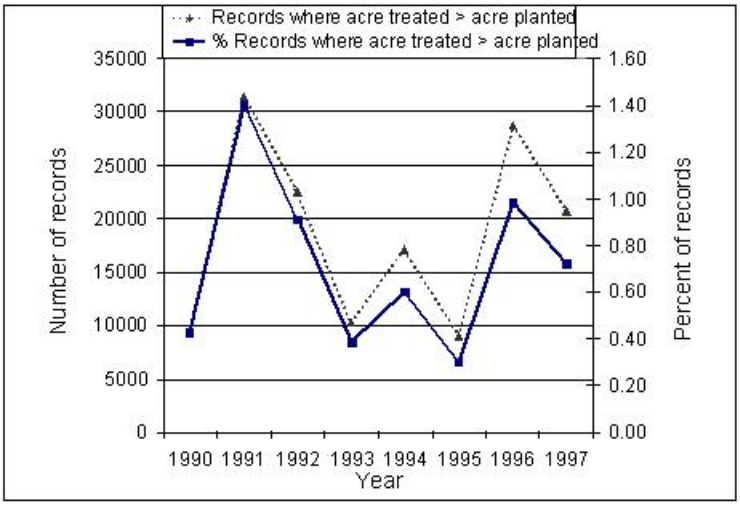


Figure 18. Number and percent of production agricultural records where acre treated was greater than acre planted.

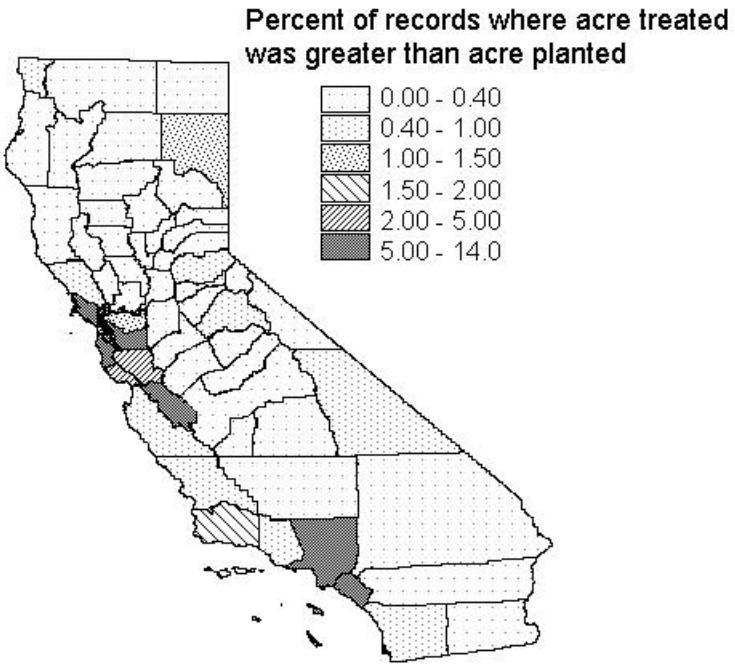


Figure 19. Spatial distribution of the county average percent of records where acre treated was greater than acre planted 1990-1997.

Table 1. Number and percent of errors for selected error types in the PUR from 1990 to 1997.

	1990	1991	1992	1993	1994	1995	1996	1997	Average
Duplicate Records									
# Records	52376	64963	48670	109074	60337	48629	39527	46235	58726
% of AgRecords	2.423	2.912	1.972	4.122	2.119	1.618	1.355	1.611	2.267
Inconsistent County Code									
# Records	96327	26261	676	926	9	1	468	74	15593
% AgRecords	4.457	1.177	0.027	0.035	0.000	0.000	0.016	0.003	0.714
MTRS Outside the County Boundary									
# MTRS	8751	585	534	254	189	129	30	4	1310
# Records	92310	9165	21527	6732	8630	6561	194	27	18143
% AgFields	0.405	0.026	0.022	0.010	0.007	0.004	0.001	0.000	0.059
% AgRecords	4.271	0.411	0.872	0.254	0.303	0.218	0.007	0.001	0.792
Missing Location Identifier for an Agricultural Field									
# Records	219	167	42	40	127	19	15	14	80
% AgRecords	0.0116	0.0087	0.002	0.0018	0.0053	0.0007	0.0006	0.0006	0.004
Inconsistent MTRS for a Geographic Location									
# Fields	13068	5979	5850	2461	2250	702	1082	1947	4167
# Records	167293	192962	185951	97827	109797	34197	39850	84869	114093
% AgFields	3.085	2.765	2.938	1.320	1.207	0.380	0.573	1.035	1.663
% AgRecords	7.741	8.650	7.536	3.697	3.856	1.138	1.366	2.957	4.617
Inconsistent Acres Planted									
# Fields	21790	17773	19863	15849	15800	15095	15769	14989	17116
# Records	247014	413931	501255	468807	498653	509467	525075	470385	454323
% AgFields	5.144	8.218	9.975	8.499	8.478	8.165	8.353	7.970	8.100
% Ag Records	11.429	18.555	20.314	17.718	17.514	16.950	17.994	16.388	17.108
Acres Treated Greater Than Acres Planted									
# Records	9260	31367	22464	10216	17092	8993	28735	20694	18603
% AgRecords	0.428	1.406	0.910	0.386	0.600	0.299	0.985	0.721	0.717

Table 2. The number and percent of duplicate records reported in the PUR, summarized by county and year.

Cnty_Name	Data	1990	1991	1992	1993	1994	1995	1996	1997
Alameda	# of Records	120	30	0	15	186	269	14	259
	% of Ag Records	1.33	0.41	0.00	0.28	2.16	3.81	0.29	3.29
Alpine	# of Records	6	0	0	0	0	0	0	0
	% of Ag Records	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amador	# of Records	36	134	9	16	17	52	0	0
	% of Ag Records	1.74	4.33	0.53	0.83	1.09	2.49	0.00	0.00
Butte	# of Records	41	377	560	708	610	373	427	396
	% of Ag Records	0.18	1.43	1.97	2.42	1.62	1.07	1.25	1.23
Calaveras	# of Records	11	4	6	7	1	0	0	0
	% of Ag Records	1.26	0.68	0.84	0.78	0.10	0.00	0.00	0.00
Colusa	# of Records	249	187	207	301	81	194	44	36
	% of Ag Records	1.21	1.18	0.96	1.28	0.34	0.72	0.18	0.17
Contra Costa	# of Records	97	44	73	123	110	140	98	103
	% of Ag Records	1.51	0.59	0.88	1.21	1.17	1.46	0.95	0.80
Del Norte	# of Records	288	8	6	70	31	28	71	75
	% of Ag Records	7.73	0.27	0.23	1.76	0.87	0.76	1.81	1.76
El Dorado	# of Records	150	47	92	38	112	1	0	0
	% of Ag Records	5.80	2.04	3.44	1.32	3.88	0.05	0.00	0.00
Fresno	# of Records	7024	19723	5340	6346	8274	9810	7116	9437
	% of Ag Records	2.54	7.37	1.67	1.85	2.31	2.31	2.00	2.50
Glenn	# of Records	167	702	205	57	47	49	33	99
	% of Ag Records	0.84	3.35	1.03	0.28	0.20	0.21	0.15	0.42
Humboldt	# of Records	50	65	27	99	49	25	12	27
	% of Ag Records	1.27	1.78	0.75	3.83	1.88	0.90	0.41	1.10
Imperial	# of Records	2193	15236	1047	2478	1636	2196	2025	2138
	% of Ag Records	2.89	15.91	1.85	3.31	1.94	2.28	2.14	2.32
Inyo	# of Records	0	0	1	0	0	0	0	0
	% of Ag Records	0.00	0.00	1.18	0.00	0.00	0.00	0.00	0.00
Kern	# of Records	19157	632	842	552	1178	1208	935	1377
	% of Ag Records	11.88	0.50	0.55	0.34	0.68	0.58	0.54	0.80
Kings	# of Records	463	2218	564	1662	1795	556	542	4507
	% of Ag Records	1.03	4.31	1.00	2.67	2.47	0.92	0.74	5.61
Lake	# of Records	283	993	321	161	8	5	0	0
	% of Ag Records	4.63	10.82	4.25	1.90	0.21	0.06	0.00	0.00
Lassen	# of Records	4	0	2	2	6	2	2	27
	% of Ag Records	1.26	0.00	0.42	0.59	1.37	0.57	0.42	4.40
Los Angeles	# of Records	212	117	65	147	248	116	249	204
	% of Ag Records	1.97	1.23	0.59	1.22	1.81	1.11	1.64	1.41
Madera	# of Records	880	1085	2375	1171	241	183	60	283
	% of Ag Records	1.48	1.80	3.50	1.64	0.35	0.25	0.09	0.43
Marin	# of Records	12	69	1	19	3	21	4	0
	% of Ag Records	1.66	6.06	0.08	1.65	0.22	1.81	0.90	0.00
Mariposa	# of Records	3	0	1	7	0	0	0	0
	% of Ag Records	1.85	0.00	0.61	2.26	0.00	0.00	0.00	0.00
Mendocino	# of Records	200	118	157	125	27	48	8	51

	% of Ag Records	2.54	1.43	1.78	1.29	0.27	0.44	0.08	0.48
Merced	# of Records	806	80	41	49	2	0	3	22
	% of Ag Records	1.04	0.10	0.04	0.04	0.00	0.00	0.00	0.02
Modoc	# of Records	7	28	117	57	2	2	3	10
	% of Ag Records	0.35	1.30	3.49	1.63	0.08	0.05	0.08	0.22
Mono	# of Records	11	1	0	0	4	4	0	0
	% of Ag Records	4.95	1.75	0.00	0.00	4.00	15.38	0.00	0.00
Monterey	# of Records	1435	5134	6680	68602	13719	7631	5375	3391
	% of Ag Records	0.52	1.64	1.91	15.91	2.95	1.66	1.16	0.75
Napa	# of Records	241	150	152	361	51	15	70	90
	% of Ag Records	1.45	0.79	0.68	1.25	0.20	0.05	0.25	0.30
Nevada	# of Records	53	9	14	20	2	0	1	0
	% of Ag Records	7.52	1.74	2.12	3.06	0.28	0.00	0.15	0.00
Orange	# of Records	202	64	316	290	104	168	155	186
	% of Ag Records	1.62	0.72	1.19	1.77	0.29	0.45	0.45	0.56
Placer	# of Records	125	26	47	44	8	15	7	14
	% of Ag Records	3.23	0.75	1.19	1.21	0.21	0.39	0.20	0.36
Plumas	# of Records	1	1	0	0	0	0	0	0
	% of Ag Records	0.65	1.32	0.00	0.00	0.00	0.00	0.00	0.00
Riverside	# of Records	627	1534	3125	2017	1450	2048	345	588
	% of Ag Records	0.88	1.87	4.24	2.99	1.92	2.52	0.45	0.78
Sacramento	# of Records	213	572	261	312	283	71	140	287
	% of Ag Records	1.57	3.44	1.58	1.80	1.76	0.34	0.74	1.32
San Benito	# of Records	3490	193	256	256	377	185	499	490
	% of Ag Records	16.35	0.98	0.96	1.04	1.01	0.51	1.19	1.39
San Bernardino	# of Records	173	273	155	33	23	38	579	30
	% of Ag Records	2.27	2.78	1.47	0.32	0.21	0.30	5.35	0.30
San Diego	# of Records	1447	2070	2026	1649	1929	1827	2147	2182
	% of Ag Records	2.05	2.77	2.49	1.95	2.08	2.04	2.35	1.96
San Francisco	# of Records	1	1	2	0	0	1	0	0
	% of Ag Records	0.57	5.00	5.13	0.00	0.00	4.76	0.00	0.00
San Joaquin	# of Records	1503	1203	1295	1087	4096	2407	2647	1395
	% of Ag Records	1.79	1.66	1.54	1.21	4.20	2.34	2.49	1.26
San Luis Obispo	# of Records	999	748	1288	974	811	1987	2685	3611
	% of Ag Records	1.33	0.86	1.31	1.06	0.83	2.29	2.34	3.01
San Mateo	# of Records	311	228	208	281	502	271	291	328
	% of Ag Records	2.06	1.36	1.06	1.31	2.14	1.28	0.93	1.08
Santa Barbara	# of Records	1294	2306	1694	3052	2365	2944	2503	4418
	% of Ag Records	0.97	1.50	1.12	1.92	1.52	1.81	1.42	2.38
Santa Clara	# of Records	340	171	364	235	366	656	216	347
	% of Ag Records	2.04	1.07	1.65	1.10	1.42	2.59	0.83	1.20
Santa Cruz	# of Records	687	432	10286	4538	627	468	570	621
	% of Ag Records	1.33	0.85	16.26	8.19	1.07	0.87	0.99	1.18
Shasta	# of Records	33	8	10	21	3	8	1	6
	% of Ag Records	2.88	0.59	0.78	2.08	0.22	0.52	0.06	0.29
Sierra	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Siskiyou	# of Records	114	15	95	28	10	52	16	24

	% of Ag Records	2.58	0.45	2.34	0.61	0.17	0.86	0.30	0.40
Solano	# of Records	271	91	125	231	112	103	60	84
	% of Ag Records	1.47	0.50	0.52	1.00	0.48	0.46	0.28	0.41
Sonoma	# of Records	409	790	1070	1211	6214	1073	1405	608
	% of Ag Records	1.59	2.49	3.48	2.93	12.02	2.17	2.84	1.40
Stanislaus	# of Records	943	524	759	2501	4214	3028	2203	3715
	% of Ag Records	1.21	0.59	0.86	2.50	3.75	2.83	1.95	3.33
Sutter	# of Records	398	209	389	349	219	102	147	562
	% of Ag Records	1.93	1.01	1.42	1.40	0.87	0.37	0.50	1.98
Tehama	# of Records	227	59	59	87	59	44	34	37
	% of Ag Records	2.70	0.70	0.63	0.93	0.69	0.36	0.29	0.31
Trinity	# of Records	1	1	0	0	0	0	0	0
	% of Ag Records	1.05	0.45	0.00	0.00	0.00	0.00	0.00	0.00
Tulare	# of Records	1669	2884	3093	3289	3198	3297	3532	3643
	% of Ag Records	0.84	1.49	1.41	1.41	1.28	1.25	1.45	1.54
Tuolumne	# of Records	17	5	0	0	0	0	0	1
	% of Ag Records	2.01	1.14	0.00	0.00	0.00	0.00	0.00	0.11
Ventura	# of Records	1310	1656	1387	1658	2440	2419	1112	214
	% of Ag Records	1.62	2.05	1.61	2.03	2.86	2.79	1.30	0.20
Yolo	# of Records	527	273	520	339	169	173	183	75
	% of Ag Records	1.81	0.95	1.46	0.92	0.45	0.43	0.51	0.24
Yuba	# of Records	74	57	68	80	47	70	29	98
	% of Ag Records	1.32	0.99	1.05	1.27	1.06	0.94	0.37	1.22

Table 3. The number and percent of records reported in the PUR with inconsistent county codes, summarized by county and year.

Cnty_Name	Data	1990	1991	1992	1993	1994	1995	1996	1997
Alameda	# of Records	1797	393	0	0	0	0	0	0
	% of Ag Records	19.99	5.37	0.00	0.00	0.00	0.00	0.00	0.00
Alpine	# of Records	373	6	0	0	0	0	0	0
	% of Ag Records	76.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amador	# of Records	413	19	0	0	0	0	0	0
	% of Ag Records	20.01	0.61	0.00	0.00	0.00	0.00	0.00	0.00
Butte	# of Records	1749	94	1	0	0	0	0	0
	% of Ag Records	7.61	0.36	0.00	0.00	0.00	0.00	0.00	0.00
Calaveras	# of Records	247	22	0	0	0	0	0	0
	% of Ag Records	28.29	3.73	0.00	0.00	0.00	0.00	0.00	0.00
Colusa	# of Records	783	109	0	0	0	0	0	0
	% of Ag Records	3.80	0.69	0.00	0.00	0.00	0.00	0.00	0.00
Contra Costa	# of Records	853	249	0	0	0	0	0	0
	% of Ag Records	13.26	3.33	0.00	0.00	0.00	0.00	0.00	0.00
Del Norte	# of Records	450	0	0	9	0	0	0	0
	% of Ag Records	12.08	0.00	0.00	0.23	0.00	0.00	0.00	0.00
El Dorado	# of Records	139	42	0	0	4	0	0	0
	% of Ag Records	5.38	1.82	0.00	0.00	0.14	0.00	0.00	0.00
Fresno	# of Records	8377	228	0	0	0	0	0	0
	% of Ag Records	3.03	0.09	0.00	0.00	0.00	0.00	0.00	0.00
Glenn	# of Records	1361	55	0	0	0	0	0	0
	% of Ag Records	6.84	0.26	0.00	0.00	0.00	0.00	0.00	0.00
Humboldt	# of Records	456	3	0	0	0	0	0	0
	% of Ag Records	11.54	0.08	0.00	0.00	0.00	0.00	0.00	0.00
Imperial	# of Records	450	157	0	0	0	0	0	0
	% of Ag Records	0.59	0.16	0.00	0.00	0.00	0.00	0.00	0.00
Inyo	# of Records	112	16	0	0	0	0	0	0
	% of Ag Records	52.34	25.81	0.00	0.00	0.00	0.00	0.00	0.00
Kern	# of Records	3531	127	0	0	0	0	0	0
	% of Ag Records	2.19	0.10	0.00	0.00	0.00	0.00	0.00	0.00
Kings	# of Records	1583	43	0	1	0	0	0	0
	% of Ag Records	3.52	0.08	0.00	0.00	0.00	0.00	0.00	0.00
Lake	# of Records	348	0	0	0	0	0	0	0
	% of Ag Records	5.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lassen	# of Records	60	17	0	0	0	0	0	0
	% of Ag Records	18.87	4.96	0.00	0.00	0.00	0.00	0.00	0.00
Los Angeles	# of Records	743	1162	0	13	1	0	0	0
	% of Ag Records	6.90	12.17	0.00	0.11	0.01	0.00	0.00	0.00
Madera	# of Records	15791	23	0	0	0	0	0	0
	% of Ag Records	26.54	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Marin	# of Records	85	127	0	0	0	0	0	0
	% of Ag Records	11.74	11.16	0.00	0.00	0.00	0.00	0.00	0.00
Mariposa	# of Records	39	28	0	0	0	0	0	0
	% of Ag Records	24.07	26.67	0.00	0.00	0.00	0.00	0.00	0.00
Mendocino	# of Records	191	0	0	0	0	0	0	0

	% of Ag Records	2.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Merced	# of Records	3450	106	0	0	0	0	0	0
	% of Ag Records	4.44	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Modoc	# of Records	154	15	0	0	0	0	0	0
	% of Ag Records	7.70	0.70	0.00	0.00	0.00	0.00	0.00	0.00
Mono	# of Records	96	13	0	3	1	0	0	0
	% of Ag Records	43.24	22.81	0.00	4.23	1.00	0.00	0.00	0.00
Monterey	# of Records	3257	246	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Napa	# of Records	890	25	1	0	0	0	0	74
	% of Ag Records	5.37	0.13	0.00	0.00	0.00	0.00	0.00	0.25
Nevada	# of Records	72	23	0	0	0	0	0	0
	% of Ag Records	10.21	4.45	0.00	0.00	0.00	0.00	0.00	0.00
Orange	# of Records	812	365	0	0	0	0	0	0
	% of Ag Records	6.53	4.10	0.00	0.00	0.00	0.00	0.00	0.00
Placer	# of Records	343	43	0	0	0	0	0	0
	% of Ag Records	8.85	1.24	0.00	0.00	0.00	0.00	0.00	0.00
Plumas	# of Records	104	3	0	0	0	0	0	0
	% of Ag Records	67.53	3.95	0.00	0.00	0.00	0.00	0.00	0.00
Riverside	# of Records	2726	511	2	2	0	0	0	0
	% of Ag Records	3.84	0.62	0.00	0.00	0.00	0.00	0.00	0.00
Sacramento	# of Records	1379	440	0	45	0	0	0	0
	% of Ag Records	10.15	2.65	0.00	0.26	0.00	0.00	0.00	0.00
San Benito	# of Records	7522	17474	0	0	0	0	0	0
	% of Ag Records	35.24	88.30	0.00	0.00	0.00	0.00	0.00	0.00
San Bernardino	# of Records	308	141	0	0	0	0	0	0
	% of Ag Records	4.04	1.44	0.00	0.00	0.00	0.00	0.00	0.00
San Diego	# of Records	1824	881	0	0	0	0	0	0
	% of Ag Records	2.58	1.18	0.00	0.00	0.00	0.00	0.00	0.00
San Francisco	# of Records	16	125	0	0	0	0	0	0
	% of Ag Records	9.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
San Joaquin	# of Records	2646	247	0	0	0	0	0	0
	% of Ag Records	3.14	0.34	0.00	0.00	0.00	0.00	0.00	0.00
San Luis Obispo	# of Records	882	193	0	0	0	0	0	0
	% of Ag Records	1.17	0.22	0.00	0.00	0.00	0.00	0.00	0.00
San Mateo	# of Records	251	455	0	0	0	0	0	0
	% of Ag Records	1.66	2.71	0.00	0.00	0.00	0.00	0.00	0.00
Santa Barbara	# of Records	7501	213	0	0	3	0	1	0
	% of Ag Records	5.64	0.14	0.00	0.00	0.00	0.00	0.00	0.00
Santa Clara	# of Records	801	583	2	62	0	0	0	0
	% of Ag Records	4.81	3.66	0.01	0.29	0.00	0.00	0.00	0.00
Santa Cruz	# of Records	2271	108	1	0	0	0	0	0
	% of Ag Records	4.39	0.21	0.00	0.00	0.00	0.00	0.00	0.00
Shasta	# of Records	74	221	0	0	0	0	0	0
	% of Ag Records	6.47	16.31	0.00	0.00	0.00	0.00	0.00	0.00
Sierra	# of Records	19	6	0	0	0	0	0	0
	% of Ag Records	40.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Siskiyou	# of Records	191	33	0	0	0	0	0	0

	% of Ag Records	4.32	0.99	0.00	0.00	0.00	0.00	0.00	0.00
Solano	# of Records	2465	164	0	0	0	0	0	0
	% of Ag Records	13.33	0.90	0.00	0.00	0.00	0.00	0.00	0.00
Sonoma	# of Records	486	73	0	0	0	0	0	0
	% of Ag Records	1.88	0.23	0.00	0.00	0.00	0.00	0.00	0.00
Stanislaus	# of Records	3551	179	0	0	0	0	0	0
	% of Ag Records	4.57	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Sutter	# of Records	2425	81	6	0	0	1	0	0
	% of Ag Records	11.73	0.39	0.02	0.00	0.00	0.00	0.00	0.00
Tehama	# of Records	365	95	1	0	0	0	0	0
	% of Ag Records	4.35	1.13	0.01	0.00	0.00	0.00	0.00	0.00
Trinity	# of Records	26	6	0	0	0	0	0	0
	% of Ag Records	27.37	2.68	0.00	0.00	0.00	0.00	0.00	0.00
Tulare	# of Records	7460	76	0	0	0	0	0	0
	% of Ag Records	3.74	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Tuolumne	# of Records	37	34	0	0	0	0	0	0
	% of Ag Records	4.37	7.76	0.00	0.00	0.00	0.00	0.00	0.00
Ventura	# of Records	3464	143	0	2	0	0	0	0
	% of Ag Records	4.28	0.18	0.00	0.00	0.00	0.00	0.00	0.00
Yolo	# of Records	1443	195	0	0	0	0	0	0
	% of Ag Records	4.94	0.68	0.00	0.00	0.00	0.00	0.00	0.00
Yuba	# of Records	342	71	0	0	0	0	0	0
	% of Ag Records	6.10	1.24	0.00	0.00	0.00	0.00	0.00	0.00

Table 4. The number and percent of records reported in the PUR with MTRS values outside the county boundary, summarized by county and year.

CountyName	Data	1990	1991	1992	1993	1994	1995	1996	1997
ALAMEDA	# of Records	3700	47	9	25	42	39	0	0
	% of Ag Records	41.19	0.64	0.14	0.47	0.49	0.55	0.00	0.00
ALPINE	# of Records	486	0	0	0	0	0	0	0
	% of Ag Records	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMADOR	# of Records	824	1	8	1	0	0	0	0
	% of Ag Records	39.92	0.03	0.47	0.05	0.00	0.00	0.00	0.00
BUTTE	# of Records	1024	150	107	63	76	73	0	0
	% of Ag Records	4.45	0.57	0.38	0.22	0.20	0.21	0.00	0.00
CALAVERAS	# of Records	227	0	1	0	0	0	0	0
	% of Ag Records	26.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00
COLUSA	# of Records	395	1	1	7	2	25	0	0
	% of Ag Records	1.92	0.01	0.00	0.03	0.01	0.09	0.00	0.00
CONTRA COSTA	# of Records	277	50	35	0	0	17	0	0
	% of Ag Records	4.31	0.67	0.42	0.00	0.00	0.18	0.00	0.00
DEL NORTE	# of Records	355	14	51	5	0	0	0	0
	% of Ag Records	9.53	0.47	1.94	0.13	0.00	0.00	0.00	0.00
EL DORADO	# of Records	189	0	0	0	0	0	0	0
	% of Ag Records	7.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FRESNO	# of Records	4082	822	631	481	145	28	0	0
	% of Ag Records	1.48	0.31	0.20	0.14	0.04	0.01	0.00	0.00
GLENN	# of Records	793	10	15	0	31	24	0	0
	% of Ag Records	3.99	0.05	0.08	0.00	0.13	0.10	0.00	0.00
HUMBOLDT	# of Records	321	174	5	15	0	5	0	0
	% of Ag Records	8.12	4.77	0.14	0.58	0.00	0.18	0.00	0.00
IMPERIAL	# of Records	1863	504	124	329	714	1575	0	0
	% of Ag Records	2.46	0.53	0.22	0.44	0.85	1.64	0.00	0.00
INYO	# of Records	167	0	0	0	0	0	0	0
	% of Ag Records	78.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KERN	# of Records	3428	0	1	0	166	72	0	0
	% of Ag Records	2.13	0.00	0.00	0.00	0.10	0.03	0.00	0.00
KINGS	# of Records	592	0	0	3	0	0	20	0
	% of Ag Records	1.32	0.00	0.00	0.00	0.00	0.00	0.03	0.00
LAKE	# of Records	211	7	2	11	58	2	0	0
	% of Ag Records	3.45	0.08	0.03	0.13	1.54	0.02	0.00	0.00
LASSEN	# of Records	65	1	12	0	9	4	0	0
	% of Ag Records	20.44	0.29	2.51	0.00	2.06	1.15	0.00	0.00
LOS ANGELES	# of Records	3195	33	370	769	976	617	0	0
	% of Ag Records	29.65	0.35	3.38	6.38	7.05	5.89	0.00	0.00
MADERA	# of Records	1646	0	0	1	2	0	0	0
	% of Ag Records	2.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARIN	# of Records	182	2	1	97	250	419	0	0
	% of Ag Records	25.14	0.18	0.08	8.42	18.33	36.12	0.00	0.00
MARIPOSA	# of Records	52	0	7	0	0	0	0	0
	% of Ag Records	32.10	0.00	4.24	0.00	0.00	0.00	0.00	0.00
MENDOCINO	# of Records	223	30	36	5	0	0	0	0

	% of Ag Records	2.83	0.36	0.41	0.05	0.00	0.00	0.00	0.00
MERCED	# of Records	2205	12	5	0	4	8	0	0
	% of Ag Records	2.84	0.01	0.00	0.00	0.00	0.01	0.00	0.00
MODOC	# of Records	241	0	7	3	0	6	0	4
	% of Ag Records	12.04	0.00	0.21	0.09	0.00	0.15	0.00	0.09
MONO	# of Records	150	4	4	0	0	0	0	1
	% of Ag Records	67.57	7.02	5.63	0.00	0.00	0.00	0.00	11.11
MONTEREY	# of Records	8842	393	110	160	289	111	0	0
	% of Ag Records	3.18	0.13	0.03	0.04	0.06	0.02	0.00	0.00
NAPA	# of Records	588	113	159	19	36	41	0	0
	% of Ag Records	3.55	0.60	0.71	0.07	0.14	0.13	0.00	0.00
NEVADA	# of Records	143	9	5	0	1	3	0	0
	% of Ag Records	20.28	1.74	0.76	0.00	0.14	0.51	0.00	0.00
ORANGE	# of Records	2926	174	13373	205	161	238	0	0
	% of Ag Records	23.53	1.96	50.31	1.25	0.44	0.63	0.00	0.00
PLACER	# of Records	269	27	37	47	57	53	18	21
	% of Ag Records	6.94	0.78	0.93	1.29	1.53	1.39	0.52	0.54
PLUMAS	# of Records	116	2	0	0	0	0	0	0
	% of Ag Records	75.32	2.63	0.00	0.00	0.00	0.00	0.00	0.00
RIVERSIDE	# of Records	2992	18	29	33	102	407	0	0
	% of Ag Records	4.21	0.02	0.04	0.05	0.14	0.50	0.00	0.00
SACRAMENTO	# of Records	647	271	298	455	171	446	0	0
	% of Ag Records	4.76	1.63	1.80	2.62	1.06	2.17	0.00	0.00
SAN BENITO	# of Records	929	20	4	7	0	0	0	0
	% of Ag Records	4.35	0.10	0.02	0.03	0.00	0.00	0.00	0.00
SAN BERNARDINO	# of Records	804	146	0	0	0	0	0	0
	% of Ag Records	10.54	1.49	0.00	0.00	0.00	0.00	0.00	0.00
SAN DIEGO	# of Records	6642	773	793	532	606	784	0	0
	% of Ag Records	9.39	1.04	0.97	0.63	0.65	0.88	0.00	0.00
SAN FRANCISCO	# of Records	176	0	0	0	0	0	0	0
	% of Ag Records	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SAN JOAQUIN	# of Records	2334	118	0	10	0	20	0	0
	% of Ag Records	2.77	0.16	0.00	0.01	0.00	0.02	0.00	0.00
SAN LUIS OBISPO	# of Records	11787	927	684	884	726	190	0	0
	% of Ag Records	15.67	1.07	0.70	0.96	0.74	0.22	0.00	0.00
SAN MATEO	# of Records	360	420	514	532	477	289	0	0
	% of Ag Records	2.38	2.51	2.61	2.48	2.04	1.36	0.00	0.00
SANTA BARBARA	# of Records	4404	1317	1866	1386	967	727	0	0
	% of Ag Records	3.31	0.86	1.23	0.87	0.62	0.45	0.00	0.00
SANTA CLARA	# of Records	921	41	25	22	29	0	0	0
	% of Ag Records	5.54	0.26	0.11	0.10	0.11	0.00	0.00	0.00
SANTA CRUZ	# of Records	2658	723	595	0	0	1	0	0
	% of Ag Records	5.14	1.42	0.94	0.00	0.00	0.00	0.00	0.00
SHASTA	# of Records	123	2	6	0	0	0	0	0
	% of Ag Records	10.75	0.15	0.47	0.00	0.00	0.00	0.00	0.00
SIERRA	# of Records	30	1	0	0	2	0	0	0
	% of Ag Records	63.83	25.00	0.00	0.00	13.33	0.00	0.00	0.00
SISKIYOU	# of Records	614	22	68	2	10	10	1	0

	% of Ag Records	13.87	0.66	1.67	0.04	0.17	0.17	0.02	0.00
SOLANO	# of Records	352	96	197	169	111	69	4	0
	% of Ag Records	1.91	0.53	0.82	0.73	0.48	0.31	0.02	0.00
SONOMA	# of Records	882	61	0	0	0	0	0	0
	% of Ag Records	3.42	0.19	0.00	0.00	0.00	0.00	0.00	0.00
STANISLAUS	# of Records	3178	77	175	32	1	50	0	0
	% of Ag Records	4.09	0.09	0.20	0.03	0.00	0.05	0.00	0.00
SUTTER	# of Records	891	302	113	40	59	108	0	0
	% of Ag Records	4.31	1.47	0.41	0.16	0.24	0.39	0.00	0.00
TEHAMA	# of Records	312	61	27	0	0	0	1	0
	% of Ag Records	3.72	0.73	0.29	0.00	0.00	0.00	0.01	0.00
TRINITY	# of Records	45	1	8	6	0	0	0	0
	% of Ag Records	47.37	0.45	4.02	2.11	0.00	0.00	0.00	0.00
TULARE	# of Records	7053	193	136	49	45	48	0	0
	% of Ag Records	3.54	0.10	0.06	0.02	0.02	0.02	0.00	0.00
TUOLUMNE	# of Records	53	4	NA	NA	0	0	NA	0
	% of Ag Records	6.26	0.91	NA	NA	0.00	0.00	NA	0.00
VENTURA	# of Records	4118	492	207	113	268	0	0	0
	% of Ag Records	5.08	0.61	0.24	0.14	0.31	0.00	0.00	0.00
YOLO	# of Records	766	238	297	214	45	57	0	0
	% of Ag Records	2.62	0.83	0.83	0.58	0.12	0.14	0.00	0.00
YUBA	# of Records	302	66	85	0	2	3	0	0
	% of Ag Records	5.38	1.15	1.31	0.00	0.05	0.04	0.00	0.00

NA – refers to the unavailability of the data.

Table 5. The number and percent of records reported in the PUR with a missing location identifier, summarized by county and year.

Cnty_Name	Data	1990	1991	1992	1993	1994	1995	1996	1997
Alameda	# of Records	2	0	0	0	0	0	0	0
	% of Ag Records	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Alpine	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amador	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Butte	# of Records	23	18	0	0	0	0	0	0
	% of Ag Records	0.10	0.07	0.00	0.00	0.00	0.00	0.00	0.00
Calaveras	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Colusa	# of Records	5	0	2	2	3	7	10	9
	% of Ag Records	0.02	0.00	0.01	0.01	0.01	0.03	0.04	0.04
Contra Costa	# of Records	2	0	1	0	1	0	0	0
	% of Ag Records	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.00
Del Norte	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Dorado	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fresno	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Glenn	# of Records	3	0	0	0	0	0	0	0
	% of Ag Records	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Humboldt	# of Records	8	0	0	0	0	0	0	0
	% of Ag Records	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Imperial	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Inyo	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kern	# of Records	7	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kings	# of Records	1	0	0	0	0	0	1	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lake	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lassen	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Los Angeles	# of Records	1	0	0	0	0	0	0	0
	% of Ag Records	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Madera	# of Records	11	0	0	0	0	0	0	0
	% of Ag Records	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Marin	# of Records	1	0	0	2	0	0	0	0
	% of Ag Records	0.14	0.00	0.00	0.17	0.00	0.00	0.00	0.00
Mariposa	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mendocino	# of Records	0	3	0	0	81	0	0	0
	% of Ag Records	0.00	0.04	0.00	0.00	0.82	0.00	0.00	0.00
Merced	# of Records	9	0	0	0	0	0	0	0
	% of Ag Records	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Modoc	# of Records	0	2	0	0	0	0	0	0
	% of Ag Records	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00
Mono	# of Records	0	0	0	0	0	0	0	1
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.11

Monterey	# of Records								
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Napa	# of Records	0	0	1	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nevada	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Orange	# of Records	0	3	0	0	0	0	0	0
	% of Ag Records	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Placer	# of Records	0	1	0	0	0	0	0	0
	% of Ag Records	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Plumas	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Riverside	# of Records	1	0	0	4	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Sacramento	# of Records	6	0	21	5	0	0	0	0
	% of Ag Records	0.04	0.00	0.13	0.03	0.00	0.00	0.00	0.00
San Benito	# of Records	2	63	0	0	0	0	0	0
	% of Ag Records	0.01	0.32	0.00	0.00	0.00	0.00	0.00	0.00
San Bernardino	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
San Diego	# of Records	3	0	8	0	0	0	0	2
	% of Ag Records	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
San Francisco	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
San Joaquin	# of Records	36	2	0	0	0	0	0	2
	% of Ag Records	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
San Luis Obispo	# of Records	2	3	3	1	4	1	4	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
San Mateo	# of Records	3	0	0	11	0	0	0	0
	% of Ag Records	0.02	0.00	0.00	0.05	0.00	0.00	0.00	0.00
Santa Barbara	# of Records	18	5	0	0	0	0	0	0
	% of Ag Records	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Santa Clara	# of Records	0	0	0	12	38	11	0	0
	% of Ag Records	0.00	0.00	0.00	0.06	0.15	0.04	0.00	0.00
Santa Cruz	# of Records	6	7	3	0	0	0	0	0
	% of Ag Records	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Shasta	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sierra	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Siskiyou	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Solano	# of Records	3	0	0	0	0	0	0	0
	% of Ag Records	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sonoma	# of Records	47	55	0	0	0	0	0	0
	% of Ag Records	0.18	0.17	0.00	0.00	0.00	0.00	0.00	0.00
Stanislaus	# of Records	7	0	0	0	0	0	0	0
	% of Ag Records	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sutter	# of Records	3	0	0	0	0	0	0	0
	% of Ag Records	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tehama	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trinity	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tulare	# of Records	1	0	0	0	0	0	0	0

	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tuolumne	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ventura	# of Records	5	4	2	3	0	0	0	0
	% of Ag Records	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yolo	# of Records	3	1	1	0	0	0	0	0
	% of Ag Records	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yuba	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 6. The number and percent of agricultural fields reported in the PUR containing inconsistent MTRS values, summarized by county and year.

Cnty_Name	Data	1990	1991	1992	1993	1994	1995	1996	1997
Alameda	# of Fields	42	19	32	12	0	4	0	0
	% of Ag Fields	3.63	5.16	9.36	4.29	0.00	1.54	0.00	0.00
Alpine	# of Fields	2	0	0	0	0	0	0	0
	% of Ag Fields	1.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amador	# of Fields	16	10	17	14	9	3	0	0
	% of Ag Fields	2.81	3.92	6.69	6.09	3.30	1.06	0.00	0.00
Butte	# of Fields	276	283	241	11	23	6	2	21
	% of Ag Fields	3.89	6.23	6.10	0.43	0.84	0.23	0.07	0.75
Calaveras	# of Fields	1	4	8	0	1	0	0	0
	% of Ag Fields	0.40	3.88	6.84	0.00	0.57	0.00	0.00	0.00
Colusa	# of Fields	317	4	11	3	7	8	13	11
	% of Ag Fields	4.73	0.14	0.32	0.09	0.19	0.22	0.35	0.31
Contra Costa	# of Fields	77	137	72	1	3	2	1	8
	% of Ag Fields	3.82	9.88	5.79	0.18	0.51	0.35	0.20	1.62
Del Norte	# of Fields	20	6	5	1	4	0	3	0
	% of Ag Fields	4.27	2.27	3.09	0.65	2.90	0.00	4.29	0.00
El Dorado	# of Fields	23	13	27	5	0	0	0	1
	% of Ag Fields	3.58	3.89	7.74	2.62	0.00	0.00	0.00	0.60
Fresno	# of Fields	1272	306	144	59	73	63	66	90
	% of Ag Fields	3.13	1.47	0.68	0.27	0.33	0.28	0.31	0.42
Glenn	# of Fields	153	7	0	1	3	1	5	2
	% of Ag Fields	2.00	0.23	0.00	0.03	0.10	0.03	0.16	0.06
Humboldt	# of Fields	20	9	18	0	0	0	0	1
	% of Ag Fields	3.86	3.56	6.29	0.00	0.00	0.00	0.00	0.43
Imperial	# of Fields	715	22	26	155	169	32	211	174
	% of Ag Fields	4.31	0.33	0.36	2.57	2.82	0.38	3.32	2.80
Inyo	# of Fields	4	0	5	3	0	0	1	0
	% of Ag Fields	4.94	0.00	10.87	6.52	0.00	0.00	3.23	0.00
Kern	# of Fields	745	13	19	13	13	20	17	3
	% of Ag Fields	3.61	0.15	0.21	0.14	0.14	0.20	0.17	0.03
Kings	# of Fields	193	26	12	40	7	18	8	1
	% of Ag Fields	2.41	0.66	0.30	0.97	0.16	0.40	0.17	0.02
Lake	# of Fields	24	27	29	2	13	0	0	0
	% of Ag Fields	1.76	3.90	4.79	0.51	4.04	0.00	0.00	0.00
Lassen	# of Fields	7	3	5	5	5	5	8	6
	% of Ag Fields	4.09	1.97	3.31	4.00	2.59	3.94	4.85	3.03
Los Angeles	# of Fields	144	98	123	81	111	93	7	20
	% of Ag Fields	9.94	15.91	18.72	14.26	14.32	16.76	2.00	5.83
Madera	# of Fields	379	19	31	6	10	6	17	23
	% of Ag Fields	2.93	0.37	0.70	0.14	0.21	0.13	0.37	0.51
Marin	# of Fields	2	2	0	3	1	1	1	0
	% of Ag Fields	1.39	3.57	0.00	6.12	0.74	1.39	2.94	0.00
Mariposa	# of Fields	1	0	4	0	0	0	0	0
	% of Ag Fields	1.67	0.00	8.70	0.00	0.00	0.00	0.00	0.00
Mendocino	# of Fields	65	42	67	7	9	0	4	2

	% of Ag Fields	4.33	5.17	8.54	0.93	1.51	0.00	0.65	0.33
Merced	# of Fields	0	35	48	15	23	8	11	19
	% of Ag Fields	0.00	0.48	0.63	0.20	0.29	0.10	0.14	0.24
Modoc	# of Fields	34	14	13	2	1	0	0	4
	% of Ag Fields	2.98	2.19	1.84	0.40	0.17	0.00	0.00	0.63
Mono	# of Fields	3	5	1	1	4	2	0	0
	% of Ag Fields	3.57	11.63	2.08	1.85	11.11	11.76	0.00	0.00
Monterey	# of Fields	764	101	1	3	3	28	208	1235
	% of Ag Fields	1.76	0.39	0.01	0.02	0.02	0.18	1.20	6.30
Napa	# of Fields	108	108	101	16	4	3	3	6
	% of Ag Fields	3.23	6.59	6.49	1.29	0.34	0.24	0.22	0.45
Nevada	# of Fields	4	13	8	0	0	0	0	0
	% of Ag Fields	1.71	9.63	5.93	0.00	0.00	0.00	0.00	0.00
Orange	# of Fields	137	43	263	35	12	12	10	8
	% of Ag Fields	6.93	5.74	15.77	8.93	1.79	1.75	1.56	1.19
Placer	# of Fields	30	31	30	38	1	4	5	3
	% of Ag Fields	2.56	4.84	4.72	5.36	0.22	0.96	1.23	0.68
Plumas	# of Fields	1	2	1	0	0	0	0	0
	% of Ag Fields	1.49	4.55	3.45	0.00	0.00	0.00	0.00	0.00
Riverside	# of Fields	788	17	57	103	380	44	123	22
	% of Ag Fields	5.27	0.32	1.10	2.23	7.52	0.86	1.74	0.40
Sacramento	# of Fields	118	169	147	159	6	11	37	17
	% of Ag Fields	3.26	5.24	4.47	4.87	0.23	0.40	1.32	0.62
San Benito	# of Fields	152	121	0	1	5	19	9	3
	% of Ag Fields	3.98	4.81	0.00	0.05	0.30	1.20	0.52	0.18
San Bernardino	# of Fields	75	4	15	3	1	0	1	0
	% of Ag Fields	3.74	0.36	2.10	0.39	0.14	0.00	0.14	0.00
San Diego	# of Fields	327	248	4	4	5	2	9	15
	% of Ag Fields	3.68	6.82	0.14	0.14	0.19	0.09	0.38	0.62
San Francisco	# of Fields	2	0	0	0	0	0	0	0
	% of Ag Fields	5.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
San Joaquin	# of Fields	42	42	6	5	12	7	20	17
	% of Ag Fields	0.16	0.44	0.08	0.07	0.16	0.10	0.26	0.21
San Luis Obispo	# of Fields	759	904	919	732	704	138	7	11
	% of Ag Fields	6.82	13.04	13.41	11.51	10.60	3.42	0.27	0.45
San Mateo	# of Fields	19	24	15	24	35	12	11	12
	% of Ag Fields	0.96	2.66	1.60	2.79	3.78	1.60	4.04	3.14
Santa Barbara	# of Fields	1028	182	954	28	30	28	35	29
	% of Ag Fields	6.04	1.95	10.50	0.37	0.38	0.35	0.42	0.35
Santa Clara	# of Fields	71	99	129	127	74	0	2	24
	% of Ag Fields	1.97	4.43	6.13	6.39	3.70	0.00	0.16	1.97
Santa Cruz	# of Fields	206	176	145	0	2	4	10	2
	% of Ag Fields	3.02	6.83	5.13	0.00	0.13	0.28	0.67	0.16
Shasta	# of Fields	25	16	16	0	1	0	0	2
	% of Ag Fields	4.26	4.08	4.23	0.00	0.30	0.00	0.00	0.53
Sierra	# of Fields	0	0	0	0	0	0	0	0
	% of Ag Fields	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Siskiyou	# of Fields	57	75	29	1	3	3	5	4

	% of Ag Fields	3.21	6.59	2.67	0.12	0.32	0.36	0.50	0.39
Solano	# of Fields	187	220	177	56	11	8	15	23
	% of Ag Fields	2.82	5.66	4.50	1.35	0.39	0.30	0.53	0.89
Sonoma	# of Fields	119	110	3	0	2	4	1	3
	% of Ag Fields	2.48	2.95	0.22	0.00	0.12	0.26	0.06	0.13
Stanislaus	# of Fields	620	455	570	7	42	29	91	39
	% of Ag Fields	3.75	6.02	7.44	0.11	0.67	0.49	1.47	0.66
Sutter	# of Fields	268	295	250	7	15	22	30	7
	% of Ag Fields	3.47	5.86	4.65	0.21	0.45	0.67	0.85	0.20
Tehama	# of Fields	80	96	90	2	0	2	2	6
	% of Ag Fields	3.77	7.17	6.32	0.22	0.00	0.20	0.20	0.56
Trinity	# of Fields	1	0	0	2	0	2	0	6
	% of Ag Fields	2.22	0.00	0.00	2.33	0.00	11.76	0.00	8.33
Tulare	# of Fields	1409	542	243	149	69	30	22	37
	% of Ag Fields	2.85	2.28	1.50	0.93	0.43	0.18	0.14	0.23
Tuolumne	# of Fields	5	3	NA	NA	0	0	NA	7
	% of Ag Fields	2.44	4.05	NA	NA	0.00	0.00	NA	1.84
Ventura	# of Fields	784	416	432	425	321	12	38	3
	% of Ag Fields	7.89	11.96	10.92	11.74	7.78	0.75	2.33	0.18
Yolo	# of Fields	255	280	219	92	19	3	13	19
	% of Ag Fields	2.65	4.60	3.53	1.47	0.45	0.07	0.29	0.46
Yuba	# of Fields	92	83	68	0	4	3	0	1
	% of Ag Fields	5.40	7.85	5.54	0.00	0.98	0.62	0.00	0.10

NA: refers the unavailability of the data.

Table 7. The number and percent of records reported in the PUR containing inconsistent MTRS values for a geographic location, summarized by county and year.

Cnty_Name	Data	1990	1991	1992	1993	1994	1995	1996	1997
Alameda	# of Records	740	987	907	517	0	306	0	0
	% of Ag Records	8.23	13.49	13.69	9.75	0.00	4.34	0.00	0.00
Alpine	# of Records	12	0	0	0	0	0	0	0
	% of Ag Records	2.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amador	# of Records	120	160	88	99	48	38	0	0
	% of Ag Records	5.81	5.17	5.16	5.13	3.07	1.82	0.00	0.00
Butte	# of Records	2615	4304	4140	135	813	82	50	490
	% of Ag Records	11.37	16.37	14.60	0.46	2.16	0.23	0.15	1.53
Calaveras	# of Records	3	10	33	0	13	0	0	0
	% of Ag Records	0.34	1.69	4.63	0.00	1.29	0.00	0.00	0.00
Colusa	# of Records	2171	30	89	104	157	124	205	126
	% of Ag Records	10.53	0.19	0.41	0.44	0.65	0.46	0.84	0.61
Contra Costa	# of Records	535	1460	970	4	23	28	7	147
	% of Ag Records	8.32	19.53	11.65	0.04	0.24	0.29	0.07	1.15
Del Norte	# of Records	411	83	93	87	62	0	400	0
	% of Ag Records	11.03	2.79	3.53	2.18	1.73	0.00	10.22	0.00
El Dorado	# of Records	397	264	363	28	0	0	0	7
	% of Ag Records	15.36	11.46	13.57	0.97	0.00	0.00	0.00	0.24
Fresno	# of Records	10676	6975	3442	925	1951	1414	1976	2765
	% of Ag Records	3.87	2.61	1.07	0.27	0.54	0.33	0.55	0.73
Glenn	# of Records	976	45	0	69	76	9	80	12
	% of Ag Records	4.91	0.21	0.00	0.34	0.32	0.04	0.35	0.05
Humboldt	# of Records	607	591	564	0	0	0	0	4
	% of Ag Records	15.36	16.20	15.75	0.00	0.00	0.00	0.00	0.16
Imperial	# of Records	6492	769	818	3660	4082	1538	6538	4481
	% of Ag Records	8.57	0.80	1.44	4.89	4.85	1.60	6.92	4.87
Inyo	# of Records	17	0	12	46	0	0	5	0
	% of Ag Records	7.94	0.00	14.12	37.10	0.00	0.00	10.00	0.00
Kern	# of Records	8931	337	353	216	425	685	514	33
	% of Ag Records	5.54	0.27	0.23	0.13	0.24	0.33	0.29	0.02
Kings	# of Records	1415	354	121	916	140	255	247	32
	% of Ag Records	3.15	0.69	0.22	1.47	0.19	0.42	0.34	0.04
Lake	# of Records	266	376	615	87	266	0	0	0
	% of Ag Records	4.35	4.10	8.15	1.03	7.08	0.00	0.00	0.00
Lassen	# of Records	24	9	47	23	19	23	40	29
	% of Ag Records	7.55	2.62	9.81	6.80	4.35	6.61	8.35	4.72
Los Angeles	# of Records	3986	4493	6237	5390	7009	2660	201	2994
	% of Ag Records	36.99	47.06	56.90	44.70	51.13	25.41	1.32	20.76
Madera	# of Records	3860	344	584	141	160	93	438	603
	% of Ag Records	6.49	0.57	0.86	0.20	0.23	0.13	0.68	0.91
Marin	# of Records	22	24	0	75	626	7	31	0
	% of Ag Records	3.04	2.11	0.00	6.51	45.89	0.60	6.95	0.00
Mariposa	# of Records	2	0	29	0	0	0	0	0
	% of Ag Records	1.23	0.00	17.58	0.00	0.00	0.00	0.00	0.00
Mendocino	# of Records	865	719	1364	62	186	0	25	69

	% of Ag Records	10.99	8.73	15.45	0.64	1.88	0.00	0.25	0.65
Merced	# of Records	0	818	859	234	912	153	226	428
	% of Ag Records	0.00	1.00	0.85	0.21	0.80	0.11	0.18	0.35
Modoc	# of Records	110	65	79	26	3	0	0	92
	% of Ag Records	5.50	3.02	2.35	0.74	0.12	0.00	0.00	2.01
Mono	# of Records	33	16	3	2	27	7	0	0
	% of Ag Records	14.86	28.07	3.19	2.82	27.00	26.92	0.00	0.00
Monterey	# of Records	9198	1053	53	42	155	603	7647	43648
	% of Ag Records	3.30	0.34	0.02	0.01	0.03	0.13	1.66	9.65
Napa	# of Records	1285	2309	2242	2501	128	98	66	133
	% of Ag Records	7.76	12.21	10.02	8.65	0.50	0.31	0.24	0.45
Nevada	# of Records	46	114	71	0	0	0	0	0
	% of Ag Records	6.52	22.05	10.77	0.00	0.00	0.00	0.00	0.00
Orange	# of Records	2280	285	15363	2283	2521	24	20	17
	% of Ag Records	18.34	3.20	57.80	13.94	6.92	0.06	0.06	0.05
Placer	# of Records	281	328	469	526	3	77	94	79
	% of Ag Records	7.25	9.46	11.85	14.49	0.08	2.01	2.69	2.05
Plumas	# of Records	3	7	2	0	0	0	0	0
	% of Ag Records	1.95	9.21	5.71	0.00	0.00	0.00	0.00	0.00
Riverside	# of Records	8210	981	958	2186	9469	845	2142	426
	% of Ag Records	11.55	1.19	1.30	3.25	12.54	1.04	2.78	0.57
Sacramento	# of Records	1457	1595	1326	1702	47	109	476	226
	% of Ag Records	10.72	9.59	8.03	9.81	0.29	0.53	2.50	1.04
San Benito	# of Records	1486	1169	0	9	127	480	156	49
	% of Ag Records	6.96	5.91	0.00	0.04	0.34	1.33	0.37	0.14
San Bernardino	# of Records	548	49	326	158	6	0	34	0
	% of Ag Records	7.19	0.50	3.10	1.52	0.06	0.00	0.31	0.00
San Diego	# of Records	8885	18683	152	37	376	163	463	1399
	% of Ag Records	12.57	25.02	0.19	0.04	0.41	0.18	0.51	1.26
San Francisco	# of Records	32	0	0	0	0	0	0	0
	% of Ag Records	18.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
San Joaquin	# of Records	976	976	78	133	142	133	586	281
	% of Ag Records	1.16	1.35	0.09	0.15	0.15	0.13	0.55	0.25
San Luis Obispo	# of Records	11626	28479	36016	25697	27482	3166	1169	1552
	% of Ag Records	15.46	32.80	36.65	27.84	28.02	3.65	1.02	1.29
San Mateo	# of Records	471	809	3865	6349	4349	569	756	1610
	% of Ag Records	3.12	4.83	19.61	29.64	18.56	2.68	2.41	5.30
Santa Barbara	# of Records	23011	41428	36848	5500	5260	5664	2152	4605
	% of Ag Records	17.32	26.91	24.38	3.46	3.39	3.49	1.22	2.48
Santa Clara	# of Records	545	1644	3299	3064	1458	0	11	999
	% of Ag Records	3.28	10.33	14.99	14.39	5.65	0.00	0.04	3.46
Santa Cruz	# of Records	4307	9652	7063	0	74	292	163	316
	% of Ag Records	8.33	19.02	11.17	0.00	0.13	0.54	0.28	0.60
Shasta	# of Records	92	149	71	0	3	0	0	0
	% of Ag Records	8.04	11.00	5.54	0.00	0.22	0.00	0.00	0.00
Sierra	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Siskiyou	# of Records	231	572	171	7	14	43	56	56

	% of Ag Records	5.22	17.09	4.21	0.15	0.24	0.71	1.04	0.94
Solano	# of Records	1410	2448	3996	490	211	101	103	227
	% of Ag Records	7.63	13.47	16.69	2.13	0.91	0.45	0.47	1.11
Sonoma	# of Records	2382	1445	48	0	66	128	36	49
	% of Ag Records	9.24	4.55	0.16	0.00	0.13	0.26	0.07	0.11
Stanislaus	# of Records	6023	8035	10483	341	22350	12837	6025	15462
	% of Ag Records	7.74	9.04	11.92	0.34	19.87	11.98	5.34	13.85
Sutter	# of Records	1501	2830	2274	118	223	305	433	121
	% of Ag Records	7.26	13.74	8.33	0.47	0.89	1.11	1.47	0.43
Tehama	# of Records	1036	1263	1175	16	0	149	17	272
	% of Ag Records	12.34	15.06	12.51	0.17	0.00	1.20	0.14	2.26
Trinity	# of Records	5	0	0	18	0	33	0	26
	% of Ag Records	5.26	0.00	0.00	6.34	0.00	33.33	0.00	15.12
Tulare	# of Records	11049	8180	4121	2369	1255	474	372	715
	% of Ag Records	5.55	4.24	1.87	1.02	0.50	0.18	0.15	0.30
Tuolumne	# of Records	23	6	0	0	0	0	0	33
	% of Ag Records	2.72	1.37	0.00	0.00	0.00	0.00	0.00	3.66
Ventura	# of Records	20999	31096	30412	30583	16735	370	5716	11
	% of Ag Records	25.92	38.42	35.20	37.52	19.65	0.43	6.68	0.17
Yolo	# of Records	1773	3113	2403	834	248	72	174	231
	% of Ag Records	6.07	10.83	6.73	2.25	0.67	0.18	0.49	0.75
Yuba	# of Records	836	1031	856	0	97	40	0	14
	% of Ag Records	14.90	17.95	13.16	0.00	2.19	0.54	0.00	0.17

Table 8. The number and percent of agricultural fields with inconsistent acres planted reported in the PUR, summarized by county and year.

Cnty_Name	Data	1990	1991	1992	1993	1994	1995	1996	1997
Alameda	# of Fields	35	45	31	23	13	9	5	5
	% of Ag Fields	3.03	12.23	9.06	8.21	3.53	3.46	3.09	1.53
Alpine	# of Fields	4	0	0	0	0	0	0	0
	% of Ag Fields	2.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amador	# of Fields	14	22	34	21	12	11	2	3
	% of Ag Fields	2.46	8.63	13.39	9.13	4.40	3.89	1.13	1.61
Butte	# of Fields	456	505	520	72	60	50	40	58
	% of Ag Fields	6.42	11.11	13.17	2.83	2.19	1.91	1.44	2.06
Calaveras	# of Fields	5	6	9	0	1	3	0	1
	% of Ag Fields	2.02	5.83	7.69	0.00	0.57	2.65	0.00	0.70
Colusa	# of Fields	409	20	47	41	56	59	57	50
	% of Ag Fields	6.10	0.72	1.36	1.19	1.53	1.62	1.56	1.41
Contra Costa	# of Fields	94	136	119	9	15	27	12	29
	% of Ag Fields	4.66	9.81	9.57	1.59	2.53	4.79	2.42	5.86
Del Norte	# of Fields	26	20	12	16	5	6	5	4
	% of Ag Fields	5.56	7.58	7.41	10.46	3.62	8.57	7.14	5.19
El Dorado	# of Fields	39	45	47	13	10	3	1	2
	% of Ag Fields	6.07	13.47	13.47	6.81	5.78	2.01	0.63	1.19
Fresno	# of Fields	1641	494	1408	1216	1010	1001	832	858
	% of Ag Fields	4.04	2.37	6.62	5.52	4.59	4.43	3.92	3.96
Glenn	# of Fields	230	19	16	39	22	37	62	37
	% of Ag Fields	3.01	0.62	0.58	1.34	0.71	1.26	1.98	1.20
Humboldt	# of Fields	15	7	40	1	0	2	2	2
	% of Ag Fields	2.90	2.77	13.99	0.57	0.00	1.01	0.83	0.85
Imperial	# of Fields	1031	240	114	244	199	135	204	272
	% of Ag Fields	6.21	3.65	1.58	4.05	3.32	1.59	3.21	4.37
Inyo	# of Fields	3	2	8	2	0	0	0	0
	% of Ag Fields	3.70	6.67	17.39	4.35	0.00	0.00	0.00	0.00
Kern	# of Fields	626	43	64	44	41	35	39	34
	% of Ag Fields	3.03	0.50	0.72	0.47	0.44	0.35	0.39	0.35
Kings	# of Fields	361	33	31	62	56	37	28	37
	% of Ag Fields	4.51	0.84	0.77	1.51	1.32	0.82	0.60	0.82
Lake	# of Fields	33	54	65	12	29	6	4	17
	% of Ag Fields	2.42	7.80	10.73	3.05	9.01	1.84	1.49	4.68
Lassen	# of Fields	11	14	12	17	12	11	19	10
	% of Ag Fields	6.43	9.21	7.95	13.60	6.22	8.66	11.52	5.05
Los Angeles	# of Fields	89	127	118	117	94	50	33	31
	% of Ag Fields	6.14	20.62	17.96	20.60	12.13	9.01	9.43	9.04
Madera	# of Fields	549	25	50	23	38	15	23	18
	% of Ag Fields	4.24	0.49	1.12	0.52	0.81	0.33	0.50	0.40
Marin	# of Fields	3	5	4	3	9	6	2	0
	% of Ag Fields	2.08	8.93	9.09	6.12	6.67	8.33	5.88	0.00
Mariposa	# of Fields	0	3	2	0	1	1	0	1
	% of Ag Fields	0.00	9.38	4.35	0.00	1.69	1.69	0.00	0.50
Mendocino	# of Fields	70	79	108	12	3	5	7	9
	% of Ag Fields	4.66	9.73	13.76	1.60	0.50	0.89	1.14	1.50
Merced	# of Fields	0	137	109	130	105	91	82	128
	% of Ag Fields	0.00	1.89	1.43	1.74	1.34	1.15	1.04	1.63
Modoc	# of Fields	31	18	27	7	9	11	4	9
	% of Ag Fields	2.71	2.82	3.81	1.42	1.52	2.55	0.68	1.42
Mono	# of Fields	2	5	1	4	2	2	0	0
	% of Ag Fields	2.38	11.63	2.08	7.41	5.56	11.76	0.00	0.00

Monterey	# of Fields	1680	2763	5208	4693	4819	5447	5832	5847
	% of Ag Fields	3.86	10.65	32.90	29.68	31.03	35.26	33.69	29.82
Napa	# of Fields	156	258	282	88	34	68	55	48
	% of Ag Fields	4.67	15.73	18.12	7.11	2.86	5.44	4.07	3.60
Nevada	# of Fields	7	18	22	0	0	0	0	0
	% of Ag Fields	2.99	13.33	16.30	0.00	0.00	0.00	0.00	0.00
Orange	# of Fields	179	137	264	37	55	58	50	31
	% of Ag Fields	9.06	18.29	15.83	9.44	8.22	8.48	7.82	4.60
Placer	# of Fields	58	85	66	68	2	2	5	7
	% of Ag Fields	4.96	13.26	10.39	9.59	0.43	0.48	1.23	1.58
Plumas	# of Fields	3	2	0	2	0	0	0	0
	% of Ag Fields	4.48	4.55	0.00	8.00	0.00	0.00	0.00	0.00
Riverside	# of Fields	968	206	461	587	690	570	871	888
	% of Ag Fields	6.47	3.89	8.93	12.69	13.66	11.18	12.30	16.05
Sacramento	# of Fields	231	298	221	295	25	40	38	17
	% of Ag Fields	6.37	9.23	6.72	9.04	0.95	1.46	1.35	0.62
San Benito	# of Fields	321	380	639	566	696	708	754	698
	% of Ag Fields	8.41	15.12	29.18	29.68	41.33	44.84	43.61	41.16
San Bernardino	# of Fields	75	20	47	49	35	36	11	20
	% of Ag Fields	3.74	1.79	6.58	6.40	4.73	4.83	1.58	2.77
San Diego	# of Fields	380	394	96	57	91	95	47	72
	% of Ag Fields	4.28	10.83	3.27	2.01	3.42	4.12	1.97	2.97
San Francisco	# of Fields	1	1	2	0	0	1	0	0
	% of Ag Fields	2.56	12.50	16.67	0.00	0.00	14.29	0.00	0.00
San Joaquin	# of Fields	640	95	42	108	75	73	92	83
	% of Ag Fields	2.39	0.99	0.56	1.51	1.03	1.00	1.21	1.00
San Luis Obispo	# of Fields	1419	1635	1617	1621	1777	1552	1598	1686
	% of Ag Fields	12.75	23.59	23.60	25.49	26.75	38.49	61.87	69.53
San Mateo	# of Fields	118	208	338	115	78	75	26	32
	% of Ag Fields	5.94	23.09	36.03	13.36	8.42	9.99	9.56	8.38
Santa Barbara	# of Fields	2220	2706	2405	2665	2659	2550	2929	3066
	% of Ag Fields	13.05	29.06	26.46	35.68	33.70	32.26	35.23	37.44
Santa Clara	# of Fields	222	333	350	354	209	17	55	63
	% of Ag Fields	6.18	14.91	16.62	17.82	10.44	1.58	4.32	5.16
Santa Cruz	# of Fields	382	573	355	103	136	93	37	32
	% of Ag Fields	5.59	22.25	12.55	6.53	8.79	6.49	2.48	2.59
Shasta	# of Fields	19	27	20	5	3	1	2	7
	% of Ag Fields	3.24	6.89	5.29	1.92	0.90	0.38	0.63	1.85
Sierra	# of Fields	0	0	0	0	0	0	0	0
	% of Ag Fields	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Siskiyou	# of Fields	37	16	52	12	8	3	18	10
	% of Ag Fields	2.08	1.41	4.78	1.41	0.85	0.36	1.79	0.98
Solano	# of Fields	179	253	261	62	58	43	45	44
	% of Ag Fields	2.70	6.51	6.63	1.49	2.04	1.62	1.60	1.71
Sonoma	# of Fields	212	225	74	64	84	59	73	145
	% of Ag Fields	4.41	6.04	5.33	4.42	5.22	3.80	4.53	6.46
Stanislaus	# of Fields	1266	1092	1000	88	162	70	240	263
	% of Ag Fields	7.67	14.44	13.05	1.44	2.57	1.17	3.88	4.43
Sutter	# of Fields	360	485	404	35	39	92	85	3
	% of Ag Fields	4.66	9.63	7.52	1.05	1.17	2.81	2.40	0.09
Tehama	# of Fields	100	158	121	18	19	27	19	24
	% of Ag Fields	4.71	11.80	8.50	1.96	2.37	2.72	1.86	2.22
Trinity	# of Fields	0	5	7	5	1	0	2	3
	% of Ag Fields	0.00	6.02	10.45	5.81	2.27	0.00	5.88	4.17
Tulare	# of Fields	2240	1107	516	294	320	316	138	115

	% of Ag Fields	4.52	4.65	3.18	1.84	2.01	1.92	0.85	0.71
Tuolumne	# of Fields	10	5	NA	NA	0	0	NA	5
	% of Ag Fields	4.88	6.76	NA	NA	0.00	0.00	NA	1.31
Ventura	# of Fields	2137	1625	1532	1607	1869	1435	1214	111
	% of Ag Fields	21.49	46.74	38.73	44.38	45.28	89.63	74.30	6.83
Yolo	# of Fields	295	420	330	110	33	33	27	33
	% of Ag Fields	3.07	6.91	5.32	1.75	0.79	0.79	0.61	0.80
Yuba	# of Fields	103	137	130	13	21	18	41	21
	% of Ag Fields	6.04	12.96	10.59	2.81	5.12	3.71	4.30	2.20

NA: refers to the unavailability of the data.

Table 9. The number and percent of records reported in the PUR with inconsistent acres planted, summarized by county and year.

Cnty_Name	Data	1990	1991	1992	1993	1994	1995	1996	1997
Alameda	# of Records	1276	3268	2278	3551	2538	1241	1184	139
	% of Ag Records	14.19	44.67	34.38	66.94	29.47	17.60	24.64	1.77
Alpine	# of Records	21	0	0	0	0	0	0	0
	% of Ag Records	4.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amador	# of Records	97	2263	340	275	116	121	11	128
	% of Ag Records	4.70	73.09	19.93	14.25	7.42	5.80	0.63	4.63
Butte	# of Records	3496	5894	7472	1182	1097	1255	614	747
	% of Ag Records	15.21	22.42	26.34	4.05	2.91	3.59	1.79	2.32
Calaveras	# of Records	32	28	65	0	19	9	0	2
	% of Ag Records	3.67	4.75	9.13	0.00	1.88	1.11	0.00	0.23
Colusa	# of Records	2238	528	492	905	773	879	678	337
	% of Ag Records	10.85	3.33	2.28	3.86	3.22	3.25	2.78	1.62
Contra Costa	# of Records	677	1899	1200	111	248	408	273	673
	% of Ag Records	10.52	25.40	14.41	1.09	2.63	4.24	2.65	5.25
Del Norte	# of Records	388	345	191	470	84	274	440	302
	% of Ag Records	10.41	11.59	7.26	11.80	2.35	7.39	11.24	7.08
El Dorado	# of Records	333	506	463	276	293	118	13	19
	% of Ag Records	12.89	21.96	17.31	9.55	10.15	5.35	0.51	0.65
Fresno	# of Records	13357	9371	32453	28793	23954	26102	21200	20475
	% of Ag Records	4.84	3.50	10.13	8.38	6.69	6.14	5.95	5.43
Glenn	# of Records	1338	97	156	625	260	336	858	628
	% of Ag Records	6.72	0.46	0.78	3.09	1.09	1.43	3.78	2.67
Humboldt	# of Records	166	93	1327	5	0	45	10	9
	% of Ag Records	4.20	2.55	37.06	0.19	0.00	1.62	0.35	0.37
Imperial	# of Records	7946	6964	2483	6515	5883	3952	5475	6612
	% of Ag Records	10.49	7.27	4.38	8.70	6.99	4.11	5.80	7.18
Inyo	# of Records	8	17	33	12	0	0	0	0
	% of Ag Records	3.74	27.42	38.82	9.68	0.00	0.00	0.00	0.00
Kern	# of Records	7009	578	1088	861	1095	1330	636	800
	% of Ag Records	4.35	0.46	0.71	0.54	0.63	0.64	0.36	0.47
Kings	# of Records	2243	671	795	1314	1275	656	678	1264
	% of Ag Records	4.99	1.30	1.42	2.11	1.76	1.09	0.92	1.57
Lake	# of Records	374	3502	1464	451	575	358	62	695
	% of Ag Records	6.12	38.15	19.39	5.32	15.30	4.24	1.36	7.71
Lassen	# of Records	33	94	82	68	62	46	107	51
	% of Ag Records	10.38	27.41	17.12	20.12	14.19	13.22	22.34	8.31
Los Angeles	# of Records	1138	3456	3954	3913	3234	3093	1736	3367
	% of Ag Records	10.56	36.20	36.07	32.45	23.59	29.55	11.41	23.35
Madera	# of Records	5856	483	1320	555	690	254	586	418
	% of Ag Records	9.84	0.80	1.94	0.78	0.99	0.34	0.91	0.63
Marin	# of Records	18	636	790	71	114	225	32	0
	% of Ag Records	2.49	55.89	64.49	6.16	8.36	19.40	7.17	0.00
Mariposa	# of Records	0	19	17	0	3	4	0	3
	% of Ag Records	0.00	18.10	10.30	0.00	1.36	1.42	0.00	0.38

Mendocino	# of Records	819	1400	2215	118	52	257	71	154
	% of Ag Records	10.41	17.00	25.08	1.22	0.52	2.37	0.72	1.46
Merced	# of Records	0	2966	2531	2976	2302	2617	1619	3352
	% of Ag Records	0.00	3.62	2.51	2.71	2.02	1.82	1.29	2.71
Modoc	# of Records	100	110	230	136	63	181	24	137
	% of Ag Records	5.00	5.11	6.86	3.88	2.62	4.39	0.61	3.00
Mono	# of Records	30	14	2	13	13	7	0	0
	% of Ag Records	13.51	24.56	2.13	18.31	13.00	26.92	0.00	0.00
Monterey	# of Records	18668	55924	132803	155248	175550	179034	175122	166202
	% of Ag Records	6.71	17.83	38.04	36.01	37.74	39.05	37.91	36.73
Napa	# of Records	1823	5719	6687	3323	1101	2446	1041	1411
	% of Ag Records	11.00	30.25	29.89	11.49	4.29	7.82	3.73	4.73
Nevada	# of Records	27	130	186	0	0	0	0	0
	% of Ag Records	3.83	25.15	28.22	0.00	0.00	0.00	0.00	0.00
Orange	# of Records	1781	2319	13132	1710	5540	4191	9891	3251
	% of Ag Records	14.32	26.08	49.41	10.44	15.20	11.16	28.82	9.76
Placer	# of Records	285	650	611	545	27	66	368	102
	% of Ag Records	7.36	18.74	15.43	15.01	0.73	1.73	10.55	2.64
Plumas	# of Records	12	10	0	4	0	0	0	0
	% of Ag Records	7.79	13.16	0.00	7.69	0.00	0.00	0.00	0.00
Riverside	# of Records	9666	5168	9143	10498	13658	11692	16591	16568
	% of Ag Records	13.60	6.29	12.41	15.59	18.09	14.38	21.53	22.00
Sacramento	# of Records	2335	3999	2534	3332	653	602	666	498
	% of Ag Records	17.18	24.04	15.34	19.20	4.06	2.92	3.50	2.29
San Benito	# of Records	4206	6477	13361	11963	22650	22239	23818	17246
	% of Ag Records	19.70	32.73	50.13	48.73	60.95	61.48	56.72	48.81
San Bernardino	# of Records	778	424	1135	1661	1103	1590	319	576
	% of Ag Records	10.20	4.32	10.80	15.98	10.29	12.68	2.95	5.75
San Diego	# of Records	6671	24605	5288	3256	13890	16215	6334	7831
	% of Ag Records	9.44	32.95	6.50	3.86	15.00	18.11	6.93	7.04
San Francisco	# of Records	22	11	29	0	0	2	0	0
	% of Ag Records	12.50	55.00	74.36	0.00	0.00	9.52	0.00	0.00
San Joaquin	# of Records	4876	1640	589	2378	1825	1759	1828	1924
	% of Ag Records	5.79	2.26	0.70	2.65	1.87	1.71	1.72	1.74
San Luis Obispo	# of Records	19537	41096	45580	41767	48973	45112	67317	71655
	% of Ag Records	25.98	47.33	46.38	45.24	49.93	51.96	58.65	59.79
San Mateo	# of Records	4569	10000	12802	11622	10880	8052	7985	7077
	% of Ag Records	30.24	59.65	64.95	54.26	46.44	37.89	25.50	23.28
Santa Barbara	# of Records	36430	71957	66980	77689	68233	75454	87545	96647
	% of Ag Records	27.42	46.74	44.32	48.83	43.92	46.45	49.80	51.98
Santa Clara	# of Records	2452	5772	6768	8136	4971	1066	1753	3325
	% of Ag Records	14.74	36.27	30.75	38.20	19.25	4.21	6.75	11.51
Santa Cruz	# of Records	7442	24412	17027	8530	9785	5223	3949	2350
	% of Ag Records	14.39	48.11	26.92	15.39	16.71	9.67	6.84	4.48
Shasta	# of Records	85	169	95	43	32	5	15	72
	% of Ag Records	7.43	12.47	7.41	4.27	2.33	0.32	0.87	3.52
Sierra	# of Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Siskiyou	# of Records	123	106	376	183	177	50	176	77
	% of Ag Records	2.78	3.17	9.25	4.02	2.99	0.83	3.28	1.29
Solano	# of Records	1045	2681	2422	572	679	507	360	682
	% of Ag Records	5.65	14.75	10.12	2.48	2.92	2.28	1.65	3.34
Sonoma	# of Records	2820	3029	4380	7952	3794	2526	5655	8061
	% of Ag Records	10.94	9.54	14.26	19.21	7.34	5.10	11.42	18.51
Stanislaus	# of Records	12559	19223	19299	2454	7171	6573	7343	16677
	% of Ag Records	16.15	21.62	21.95	2.45	6.38	6.13	6.50	14.94
Sutter	# of Records	2087	3721	3346	574	550	1071	1278	585
	% of Ag Records	10.10	18.06	12.25	2.30	2.19	3.91	4.33	2.06
Tehama	# of Records	1033	1957	1320	316	365	585	216	738
	% of Ag Records	12.30	23.33	14.05	3.39	4.28	4.72	1.82	6.12
Trinity	# of Records	0	29	28	23	5	0	6	17
	% of Ag Records	0.00	12.95	14.07	8.10	3.14	0.00	4.00	9.88
Tulare	# of Records	17752	15711	10839	7535	7526	8448	6151	2483
	% of Ag Records	8.91	8.14	4.93	3.23	3.02	3.19	2.53	1.05
Tuolumne	# of Records	50	33	NA	NA	0	0	NA	21
	% of Ag Records	5.91	7.53	NA	NA	0.00	0.00	NA	2.33
Ventura	# of Records	35903	56210	56007	52867	53852	70357	62068	3156
	% of Ag Records	44.32	69.46	64.82	64.85	63.22	81.02	72.53	48.22
Yolo	# of Records	2138	4022	3545	1137	370	432	340	363
	% of Ag Records	7.32	13.99	9.93	3.07	0.99	1.08	0.95	1.18
Yuba	# of Records	846	1525	1474	270	550	402	627	478
	% of Ag Records	15.08	26.54	22.65	4.30	12.41	5.39	8.10	5.94

NA: refers the unavailability of the data.

Table 10. The number and percent of records reported in the PUR with acres treated greater than acres planted, summarized by county and year.

Cnty_Name	Data	1990	1991	1992	1993	1994	1995	1996	1997
Alameda	# Records	544	1370	470	1120	90	21	1	0
	% of Ag Records	6.05	18.73	7.09	21.11	1.04	0.30	0.02	0.00
Alpine	# Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amador	# Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Butte	# Records	19	181	100	3	0	0	1	0
	% of Ag Records	0.08	0.69	0.35	0.01	0.00	0.00	0.00	0.00
Calaveras	# Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Colusa	# Records	0	3	0	0	0	0	0	0
	% of Ag Records	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Contra Costa	# Records	25	570	100	0	0	0	0	0
	% of Ag Records	0.39	7.62	1.20	0.00	0.00	0.00	0.00	0.00
Del Norte	# Records	72	83	0	1	0	0	0	0
	% of Ag Records	1.93	2.79	0.00	0.03	0.00	0.00	0.00	0.00
El Dorado	# Records	4	11	0	0	103	73	0	0
	% of Ag Records	0.15	0.48	0.00	0.00	3.57	3.31	0.00	0.00
Fresno	# Records	49	27	0	0	0	0	2	0
	% of Ag Records	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Glenn	# Records	1	1	0	0	0	0	0	0
	% of Ag Records	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Humboldt	# Records	12	12	9	0	0	32	0	0
	% of Ag Records	0.30	0.33	0.25	0.00	0.00	1.15	0.00	0.00
Imperial	# Records	0	0	3	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Inyo	# Records	0	2	0	0	0	0	0	0
	% of Ag Records	0.00	3.23	0.00	0.00	0.00	0.00	0.00	0.00
Kern	# Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kings	# Records	2	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lake	# Records	0	4	7	0	1	0	0	0
	% of Ag Records	0.00	0.04	0.09	0.00	0.03	0.00	0.00	0.00
Lassen	# Records	2	23	12	0	1	0	1	0
	% of Ag Records	0.63	6.71	2.51	0.00	0.23	0.00	0.21	0.00
Los Angeles	# Records	217	768	1812	1126	406	220	69	448
	% of Ag Records	2.01	8.04	16.53	9.34	2.96	2.10	0.45	3.11
Madera	# Records	237	0	0	0	0	0	0	0
	% of Ag Records	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Marin	# Records	0	447	81	0	155	108	32	0
	% of Ag Records	0.00	39.28	6.61	0.00	11.36	9.31	7.17	0.00
Mariposa	# Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mendocino	# Records	6	198	54	0	0	0	0	1

	% of Ag Records	0.08	2.40	0.61	0.00	0.00	0.00	0.00	0.01
Merced	# Records	0	17	2	5	0	12	11	13
	% of Ag Records	0.00	0.02	0.00	0.00	0.00	0.01	0.01	0.01
Modoc	# Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mono	# Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Monterey	# Records	1313	1034	0	0	4320	1813	5674	3784
	% of Ag Records	0.47	0.33	0.00	0.00	0.93	0.40	1.23	0.84
Napa	# Records	1	60	9	0	0	0	0	0
	% of Ag Records	0.01	0.32	0.04	0.00	0.00	0.00	0.00	0.00
Nevada	# Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Orange	# Records	468	462	8963	0	0	0	4	0
	% of Ag Records	3.76	5.20	33.72	0.00	0.00	0.00	0.01	0.00
Placer	# Records	29	20	9	47	0	0	7	4
	% of Ag Records	0.75	0.58	0.23	1.29	0.00	0.00	0.20	0.10
Plumas	# Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Riverside	# Records	213	0	0	0	0	0	79	1
	% of Ag Records	0.30	0.00	0.00	0.00	0.00	0.00	0.10	0.00
Sacramento	# Records	5	1	45	54	5	0	0	0
	% of Ag Records	0.04	0.01	0.27	0.31	0.03	0.00	0.00	0.00
San Benito	# Records	354	1398	0	0	1655	1	13232	8990
	% of Ag Records	1.66	7.06	0.00	0.00	4.45	0.00	31.51	25.44
San Bernardino	# Records	217	0	0	0	0	0	0	0
	% of Ag Records	2.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00
San Diego	# Records	1160	3188	0	0	261	73	1136	324
	% of Ag Records	1.64	4.27	0.00	0.00	0.28	0.08	1.24	0.29
San Francisco	# Records	5	0	9	0	0	0	0	0
	% of Ag Records	2.84	0.00	23.08	0.00	0.00	0.00	0.00	0.00
San Joaquin	# Records	0	689	5	0	2	5	3	2
	% of Ag Records	0.00	0.95	0.01	0.00	0.00	0.00	0.00	0.00
San Luis Obispo	# Records	230	1729	2025	42	1	0	976	1129
	% of Ag Records	0.31	1.99	2.06	0.05	0.00	0.00	0.85	0.94
San Mateo	# Records	2013	6063	4057	2515	3931	1990	911	288
	% of Ag Records	13.32	36.17	20.58	11.74	16.78	9.36	2.91	0.95
Santa Barbara	# Records	948	3491	1960	3998	2946	2826	4781	5087
	% of Ag Records	0.71	2.27	1.30	2.51	1.90	1.74	2.72	2.74
Santa Clara	# Records	109	3832	365	765	499	343	46	155
	% of Ag Records	0.66	24.08	1.66	3.59	1.93	1.35	0.18	0.54
Santa Cruz	# Records	401	4444	1537	0	1722	319	177	368
	% of Ag Records	0.78	8.76	2.43	0.00	2.94	0.59	0.31	0.70
Shasta	# Records	0	2	0	0	0	0	0	0
	% of Ag Records	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00
Sierra	# Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Siskiyou	# Records	0	0	6	0	0	0	0	0

	% of Ag Records	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00
Solano	# Records	0	1	8	0	0	0	0	0
	% of Ag Records	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00
Sonoma	# Records	165	218	0	0	669	676	1166	100
	% of Ag Records	0.64	0.69	0.00	0.00	1.29	1.37	2.35	0.23
Stanislaus	# Records	65	39	49	0	0	0	0	0
	% of Ag Records	0.08	0.04	0.06	0.00	0.00	0.00	0.00	0.00
Sutter	# Records	4	12	0	0	0	0	0	0
	% of Ag Records	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Tehama	# Records	0	10	4	0	0	0	0	0
	% of Ag Records	0.00	0.12	0.04	0.00	0.00	0.00	0.00	0.00
Trinity	# Records	0	0	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tulare	# Records	8	4	0	0	0	0	0	0
	% of Ag Records	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tuolumne	# Records	0	15	NA	NA	0	0	NA	0
	% of Ag Records	0.00	3.42	NA	NA	0.00	0.00	NA	0.00
Ventura	# Records	342	926	763	540	325	481	424	0
	% of Ag Records	0.42	1.14	0.88	0.66	0.38	0.55	0.50	0.00
Yolo	# Records	1	21	0	0	0	0	0	0
	% of Ag Records	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00
Yuba	# Records	4	6	0	0	0	0	2	0
	% of Ag Records	0.07	0.10	0.00	0.00	0.00	0.00	0.03	0.00

NA: refers the unavailability of the data.

Appendix I

1. Field names in this document

MTRS – Township, range and sections
Grower_id - Grower identifications
Site_loc_id - Site location identifications
Acre_planted - values of the acres planted for the field and the crop
Acre_treated - values of the acres treated for the field and the crop
Site_code - Commodity code for which pesticide is applied on.

2. File naming conventions for the outputs in error checking

(a) Potential duplicated error - D_D90_45 refers to the duplicated error checking results for the data of 90 county 45.
(b) Potential acre planted error - A_D90_45 refers to the number of fields containing inconsistent values of acre planted for the data of 90 and county 45.
(c) Error records for the values of acre treated greater than acre planted - A_t_90_45 refers to the file containing the number of records that the values of acre treated are greater than the values of acre planted for the data of 90 and county 45.
(d) Not matched MTRS – nmd90_45 refers to the not matched number of MTRS and the records of not matched MTRS for the data of 90 and county 45.
(e) Missing location identifiers – M_m90_45 refers to the missing records for the MTRS for the data of 90 and county 45; G_M90_45 refers to the missing records for the grower_id for the data of 90 and county 45; M_S90_45 refers to the missing records for the site_loc_id for the data of 90 and county 45.
(f) Potential errors in MTRS - M_D9045 refers to the file containing the records that have the potential errors in MTRS for the data of 90 and county 45.
(g) Potential errors in county code - C_D90_45 refers to the file containing records that have the potential errors in county code for the data of 90 and county 45.
(h) Simple statistics – stati_45 refers to the simple statistics of the data.

3. Program descriptions

(see next page for the full description)

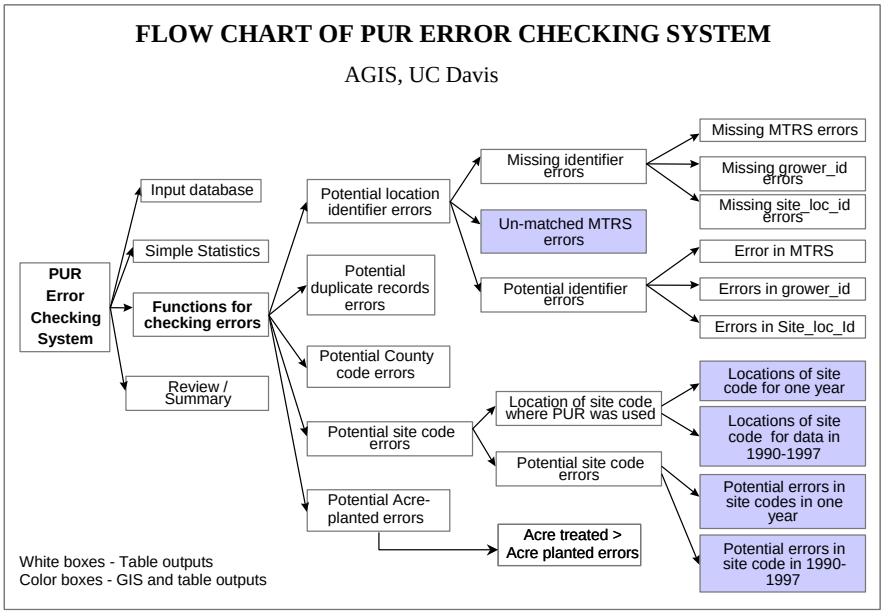
Descriptions of the Error Checking System for Spatial Attributes

Limei Yan, Yinyan Guo and Minghua Zhang
AGIS laboratory, UC Davis, September 15, 2000

With increasing awareness of the potential environmental impacts of pesticides, the database of Pesticide Use Records (PUR) is becoming more valuable to researchers, regulators, farmers and policy makers. To accurately assess the impacts of pesticides on the environments, the quality of the pesticide use data is extremely important. Therefore, we attempted to develop the computer system to check the errors relating to the spatial attributes.

This PUR error checking system is to examine pesticide use data of 1990 to 1997 and to identify the potential errors of various types that exist in the PUR database. Six functions were included in the system such as checking for duplicated errors, acre planted errors, commodity code errors, location identifier errors and county code errors. The location identifier errors included the errors in grower_id, site_loc_id and the township, range and sections. Diagram 1 illustrates the detail and relational structures of the system.

Diagram 1. Frame of PUR Error Checking System (ECS)



System Requirements and installation of PUR ECS

PUR ECS operates in the environment of Windows 95/98 or Windows NT (4.0 or later). The program was developed through standard Windows techniques, and requires software of MS Access 97 and ArcView3.1.

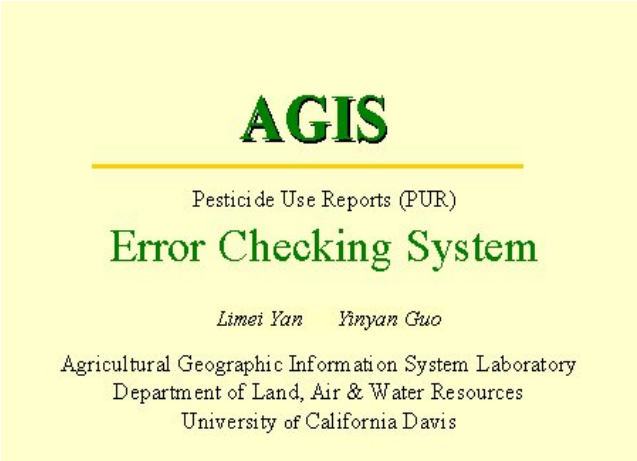
To install the PUR ECS, follow the steps listed below:

Organize the PUR data and get ready for error checking (data on CDs, that are organized by county code as directories and in the dBase (dbf) format; each county/directory contains multiple years of data for the same county).
Copy the county GIS coverage (shape file of PLSS – public land survey system, and DWR land use data file) from the specified CD to your local hard disk.
Create your working directory where you want to save your error checking results
Copy the files of PUR_ERROR_CHECKING_SYSTEM.exe and PUR_ErrorCheckingSystem90_99.mdb from the specified CD to your local working directory.
The setup process is completed and the program is ready to run in your local computer.

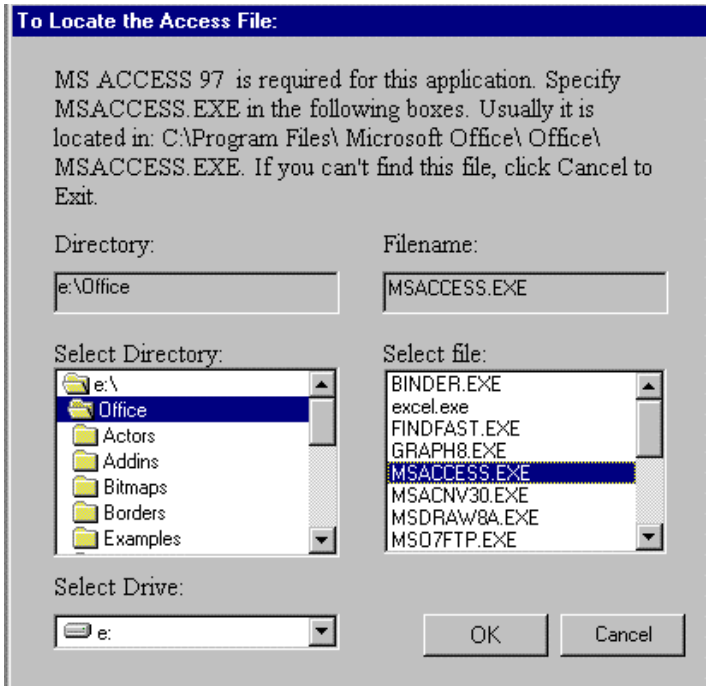
Getting Started with PUR Error Checking System

Select the correct path to each of the software location and prepare to run the program: double click "PUR_ERROR_CHECKING_SYSTEM.exe" from the Windows Explorer.
Following the instructions in the popup screen to locate the correct path for the Access.Exe program.
Following the instructions in the popup screen to locate the correct path for the ArcView.Exe program.
Locate the directory where county GIS coverages and the land use data from the Department of Water Resources (if any) are stored.
Specify the directory where the data are stored (use the CD including county 01 to verify the correct settings for the data, then insert the CD that contains the data for the county that you are interested to run the errors for).
Specify the working directory where you will save the results while running the program.

Screen of step 1.

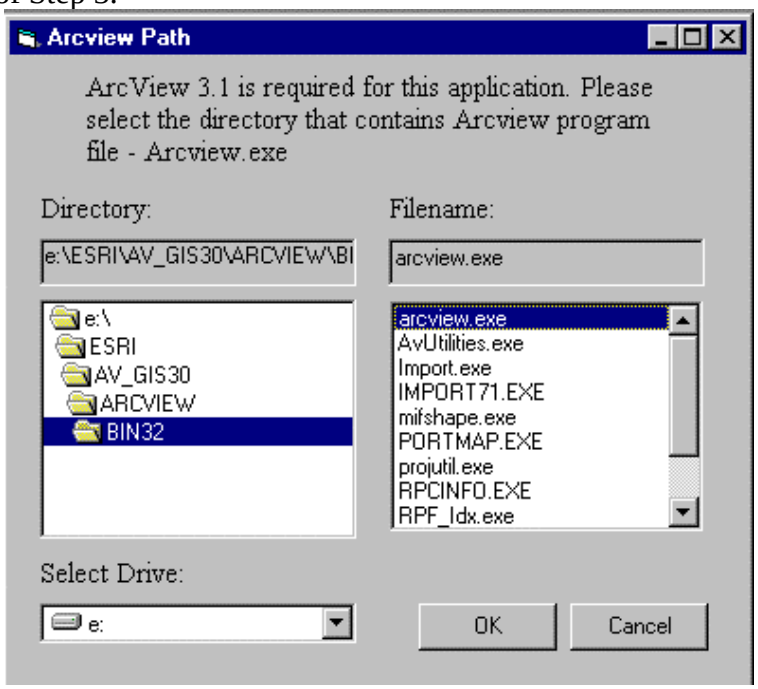


Screen of step 2.



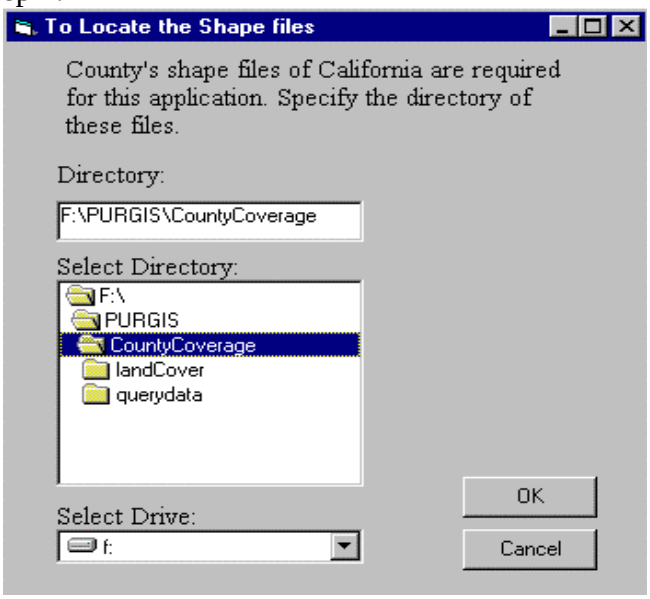
Use the Combo-boxes to select the location (drive and directory) of Access.exe program file. Find the Directory and program file for Access.exe. Then Double click the Access.exe program file. Or highlight Access.exe file, then click OK button.

Screen of Step 3.



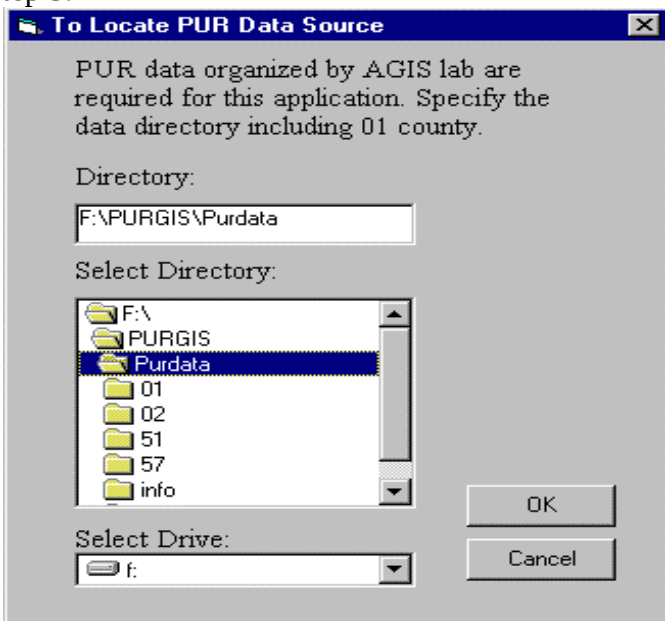
Locate the directory and the program file for ArcView.exe. Then Double click the Access.exe program file. Or highlight Access.exe file, then click OK button.

Screen of Step 4.



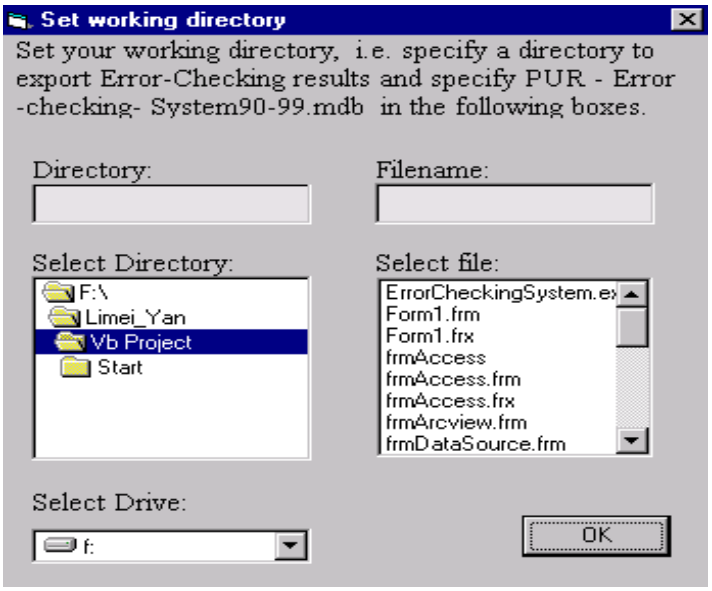
After find your County Coverage directory, click OK button.

Screen of Step 5.



Locate the data where the program will use.

Screen of Step 6.

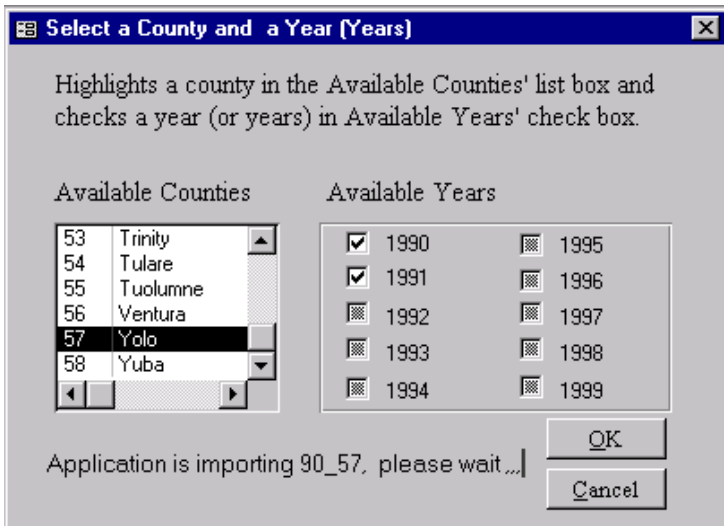


Select a working directory (for output files), and highlight PUR-Error-Checking System90_99.mdb.

Select County and Year(s) of data for inputting the data and calculating the simple statistics

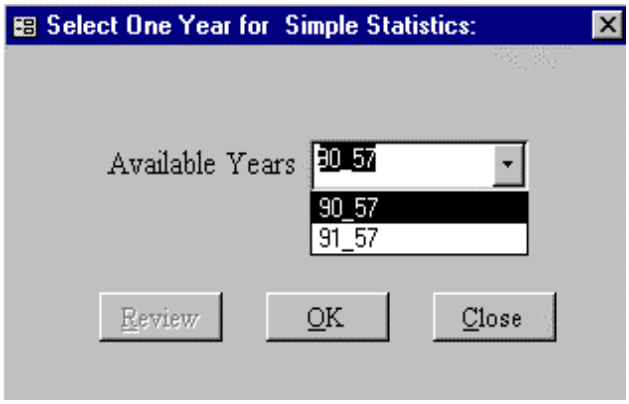
After all the necessary information is organized, the application will start running MS Access. One usually starts with inputting data to the system. You can select the county and year(s) of data you wish to check for the errors by highlighting or checking the boxes, respectively.

Press the button of “Input Data” in the above screen to launch the following form for the selection of county and year(s) of data.

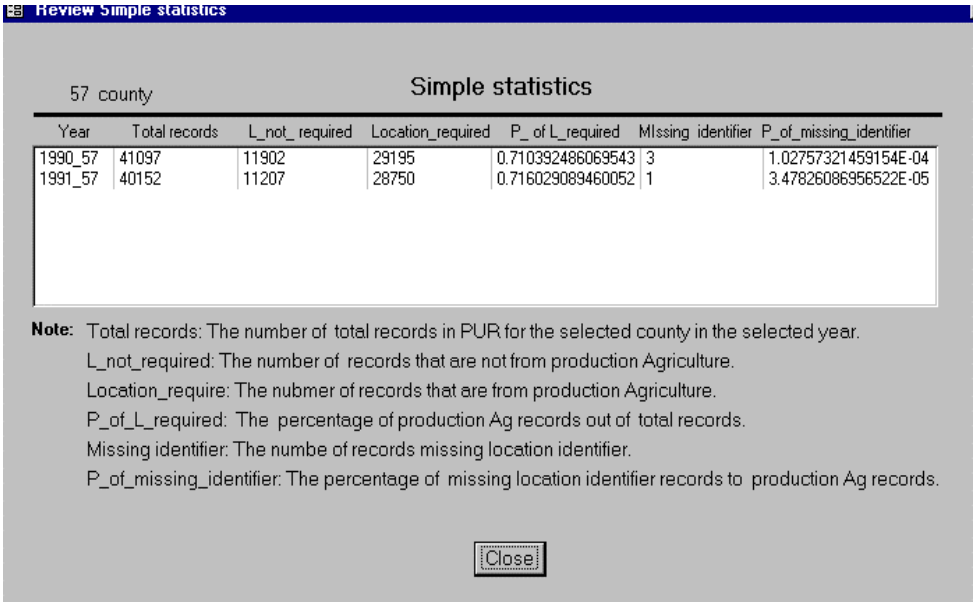


After inputting the data, one can press the button of “Simple Statistics” in the following screen to obtain the summary for the total records, agricultural production record, percent of the agricultural records etc. simple statistics. These results are saved in the file under your working directory that you setup previously.

As soon as the button of “Simple Statistics” is pressed, the following form will appear on screen to request a selection of a year for the simple statistics.



Then users can select the year and press the "OK" button. Repeat the same process for all the years that users want to check for, then press the button of “Review” to view the results. The following screen provided a view of the simple statistics for two years of data in Yolo County. The explanation for the columns is described in the note of the form below.



Year	Total records	L_not_ required	Location_required	P_ of L_required	MIssing identifier	P_of_missing_identifier
1990_57	41097	11902	29195	0.710392486069543	3	1.02757321459154E-04
1991_57	40152	11207	28750	0.716029089460052	1	3.47826086956522E-05

Basic PUR Error Checking System Functions

We designed the system to check for the errors of the following aspects:
Duplicate records, i.e., any records containing the same information for the following nine fields, then we extract the duplicate records and save them into a file for further examination. These nine fields include grower_id, site_loc_id, acre_planted, acre_treated, prodno, chem-code, lbs_chm_us, applic_dt, and site_code.

Records with potential errors in the values of acre_planted. First of all, we select the records that were from agricultural productions. Then we extract the records that have different values for the acre_planted for the same combination of grower_id, site_loc_id

and site_code. The rational is that the same field growing the same crop during the same season should have the same values for acre_planted. Therefore, if there are different values for the field of acre_planted in the combination of grower_id, site_loc_id and site_code, then it has the potential that one or more than one records contains wrong information in acre_planted. If the values of the field for acre_treated are greater than the values of the field for acre_planted for the same field designated by grower_id, site_loc_id and MTRS, then we concluded that the records with larger acre_treated values are likely the fields with reporting mistakes.

Location identifier, this item includes not-matched MTRS, missing location identifiers and mistakes within identifiers.
Not matched means that some of the township, range and sections in the PUR does not belong to the township, range and section for the county. We compared the existing MTRS in the PUR with the county GIS MTRS and then extracted the not-matched MTRS records and saved these records in a file in the working directory for further examination.
Missing location identifier refers to the missing information in the PUR including missing grower_id, or site_loc_id or MTRS in any of the records. We also saved these records for further checking in determining exact errors.
Mistakes within the identifiers refer to the potential mistakes in each of the location identifiers. These include grower_id, site_loc_id and MTRS. We attempted to find the records that contained different grower_ids for the same combination of site_loc_id and MTRS, different site_loc_ids for the same combination of grower_id and MTRS as well as different MTRS for the same combination of grower_id and site_loc_id. All these records are stored in the file for further examination.

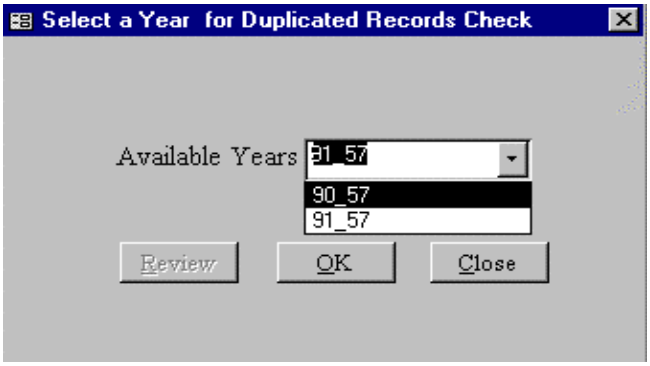
Records with inconsistent county code in the first two digits of the grower_id field. For example, Yolo County should have a code of 57, the program will check for any records that are not 57 in the first two digits of the grower_id field, and then save these records into a file for further examination.

Site Code potential errors.
The site code potential errors refer to the possible mis-report on commodity use for some of the pesticides. The program allows users to select the commodity code and make maps to check for the potential errors on site code. The potential errors may not be obvious to these people who are not familiar with the area. However, it will be clear to the people who have a good knowledge about the area or region.
If the landuse from the Department of Water Resources is available for the county of interest, the program allows users to select the site code (commodity code) to compare with the landuse map for the discrepancies on the actual physical locations. The differences of the spatial locations will be mapped after the comparison. The difference map may mean that the report of the site code in PUR contains potential errors in these locations, or it could mean the landuse map is out of date. Therefore, the maps are only references in assisting the determination of whether there are errors in these locations for the commodity of interest.

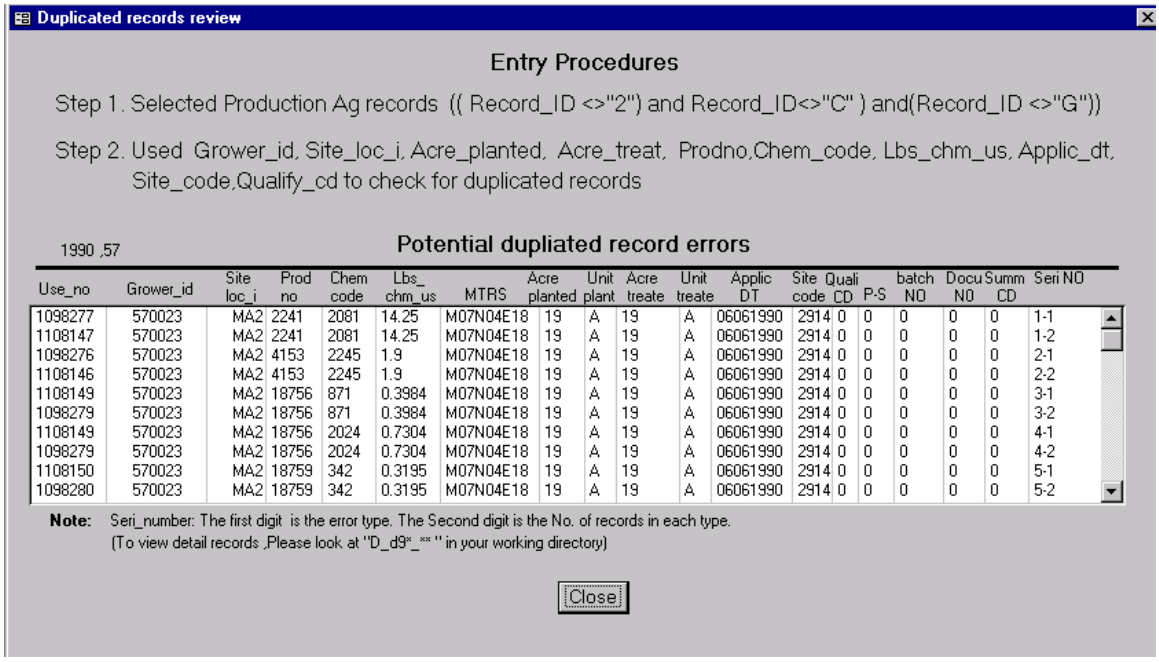
Detail Screen Displays for Each Functions

1. Checking for duplicate records:
Highlight the duplicate records in the Checking Error box.

Enter the year of interest:



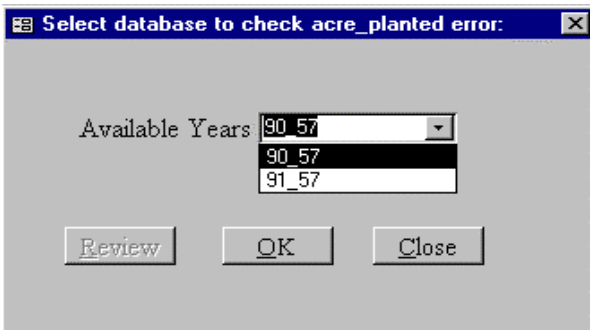
Review the results after checking the records for each year. Or repeat the process until all the data from multiple years are completed and then press the “Review” button to view the results for multiple years. One can check the files generated during this process for each year under the working directory.



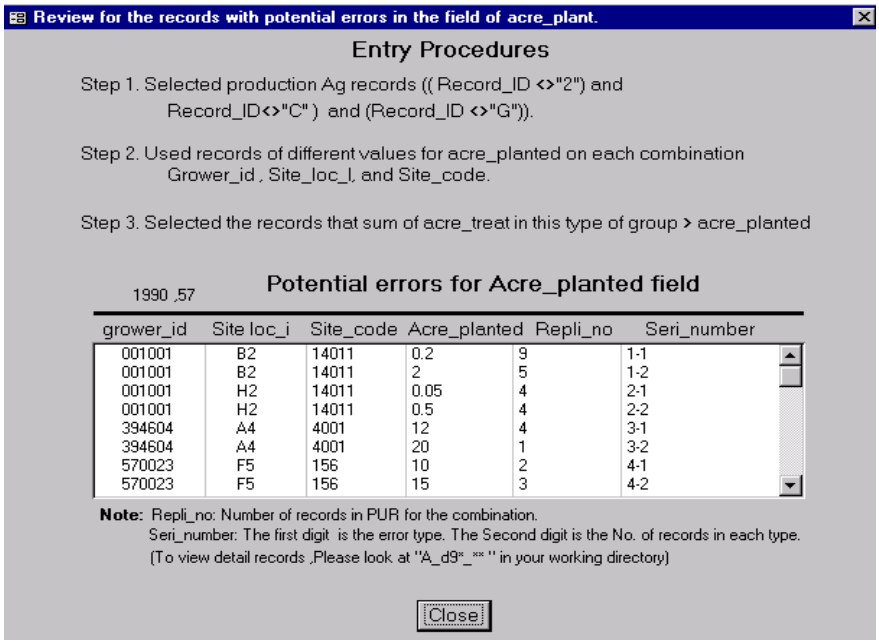
Use_no	Grower_id	Site loc_i	Prod no	Chem code	Lbs_ chm_us	MTRS	Acre planted	Unit plant	Acre treate	Unit treate	Applic DT	Site code	Quali CD	P-S	batch NO	Docu NO	Summ CD	Seri NO
1098277	570023	MA2	2241	2081	14.25	M07N04E18	19	A	19	A	06061990	2914	0	0	0	0	0	1-1
1108147	570023	MA2	2241	2081	14.25	M07N04E18	19	A	19	A	06061990	2914	0	0	0	0	0	1-2
1098276	570023	MA2	4153	2245	1.9	M07N04E18	19	A	19	A	06061990	2914	0	0	0	0	0	2-1
1108146	570023	MA2	4153	2245	1.9	M07N04E18	19	A	19	A	06061990	2914	0	0	0	0	0	2-2
1108149	570023	MA2	18756	871	0.3984	M07N04E18	19	A	19	A	06061990	2914	0	0	0	0	0	3-1
1098279	570023	MA2	18756	871	0.3984	M07N04E18	19	A	19	A	06061990	2914	0	0	0	0	0	3-2
1108149	570023	MA2	18756	2024	0.7304	M07N04E18	19	A	19	A	06061990	2914	0	0	0	0	0	4-1
1098279	570023	MA2	18756	2024	0.7304	M07N04E18	19	A	19	A	06061990	2914	0	0	0	0	0	4-2
1108150	570023	MA2	18759	342	0.3195	M07N04E18	19	A	19	A	06061990	2914	0	0	0	0	0	5-1
1098280	570023	MA2	18759	342	0.3195	M07N04E18	19	A	19	A	06061990	2914	0	0	0	0	0	5-2

2. Checking for potential errors in acre planted:

If a user selects "Checking potential errors for the field of acre planted" in the comb box, the following form will appear for you to select the year of the data.

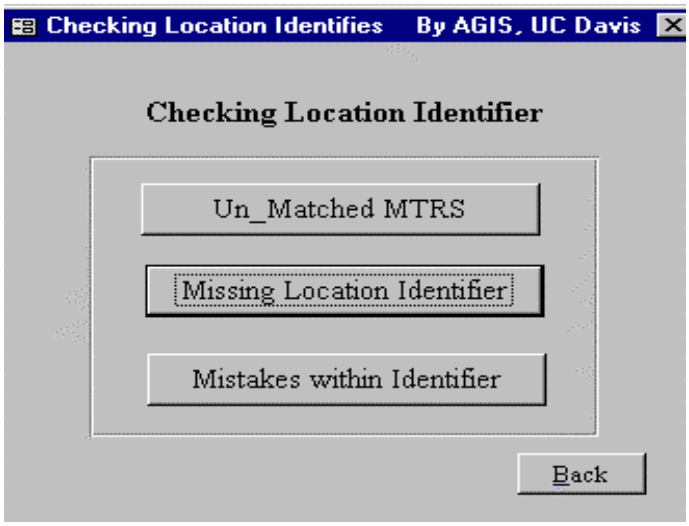


After a user selects the year, the application will check the potential acre planted error for the selected year. "Review" button then will be activated. If a user presses the "Review" button, a form similar to the following will appear to show the results.

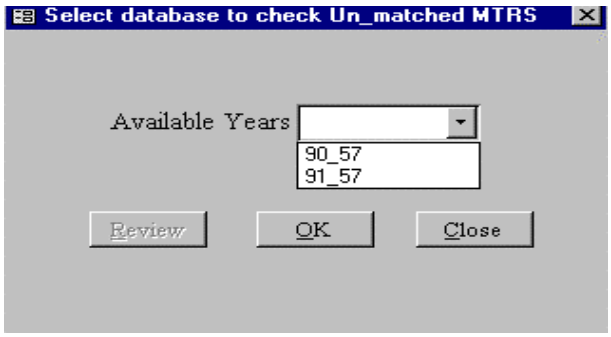


3. Checking errors for the location identifiers.

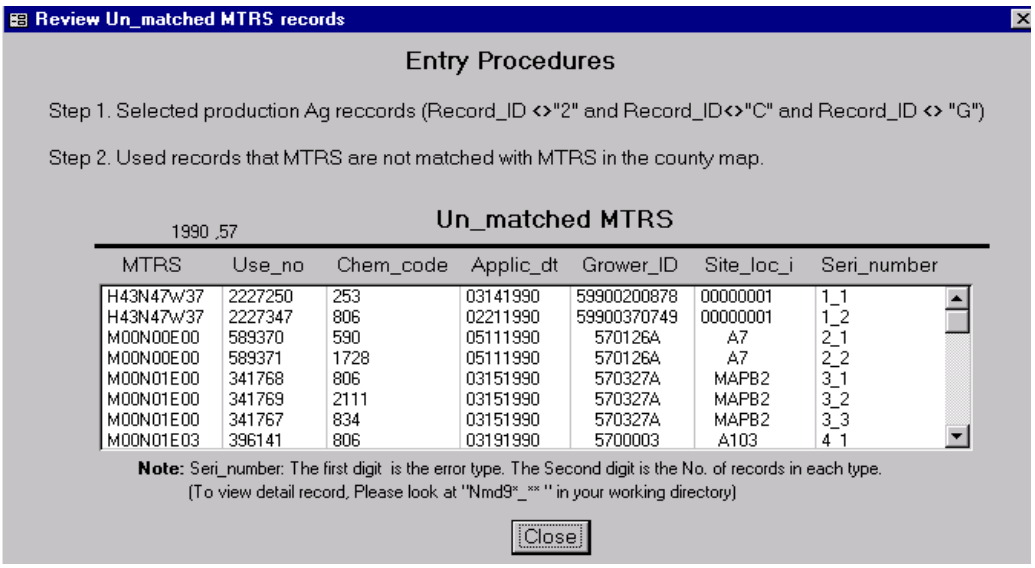
The screen below displays the submenu for checking for the errors in location identifiers.



Un-Matched MTRS (which, called as “extra MTRS”, existed in the PUR database, but not present in county GIS coverage). By pressing this button, the application will first input the corresponding county GIS coverage attribute file in DBF format. Then one form with combo box will pop up for the selection of a preferred year to check for errors in this item:

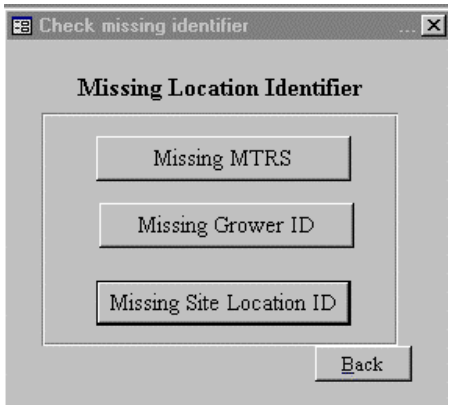


After a user selects the year, the application will find un-matched MTRS comparing with county GIS coverage. If some Un_matched records are found, the "Review" button will be activated. By pressing this “Review” button, a user can view the records of the un-matched MTRS.

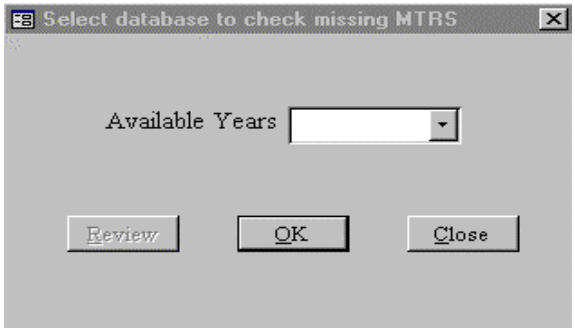


If one found no un-matched records, a message box will be displayed on the screen indicating “there is no un-matched records in the database”.

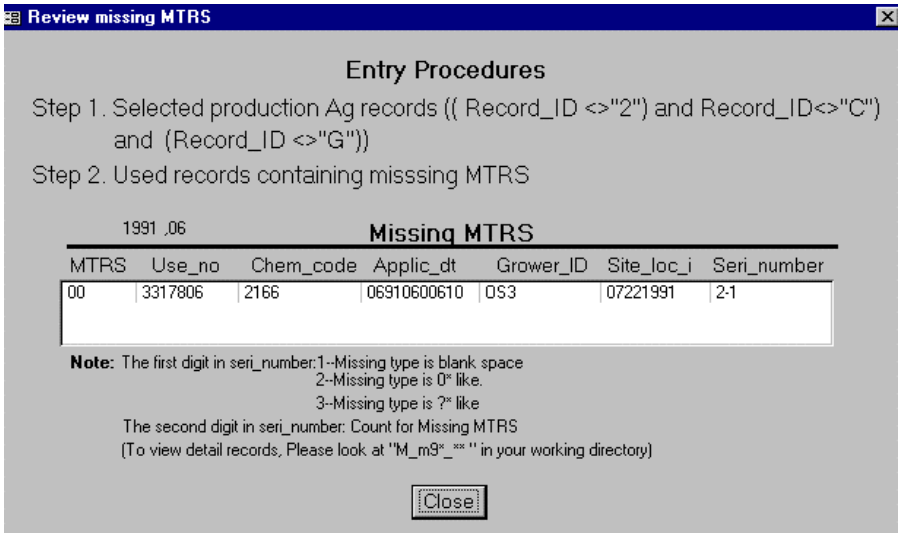
Missing Location Identifier (Missing MTRS or grower id or site location id).



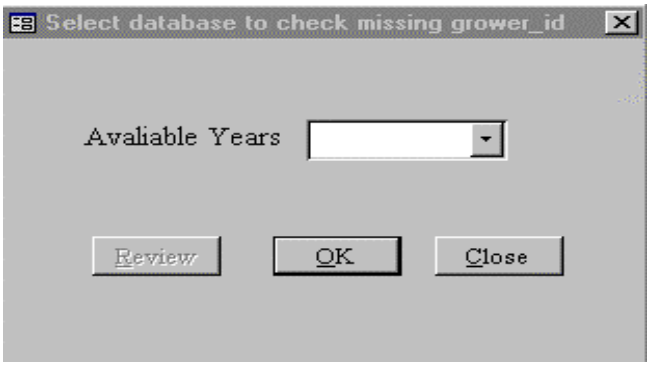
For checking the missing MTRS, pressing this button, the application will prompt to select the year. Once the year is selected, the program will find the missing MTRS in the selected database.



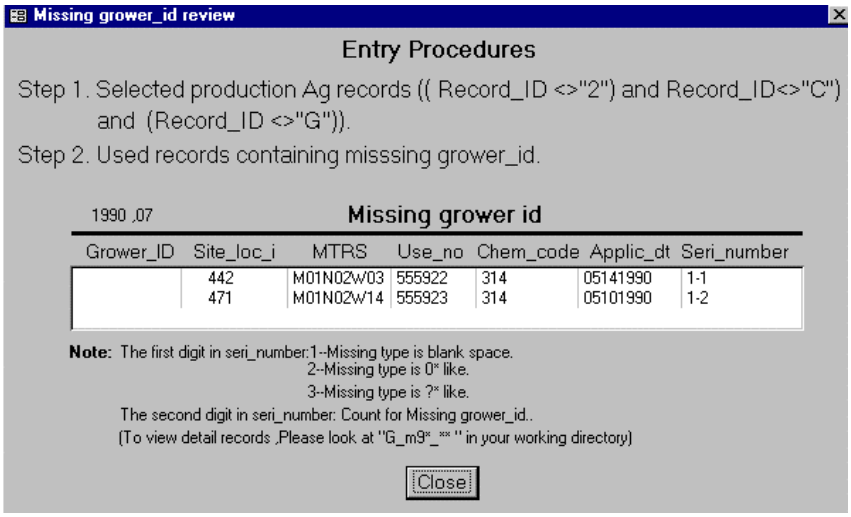
If the program found missing MTRS among the data of the selected year, the "Review" button will be activated. By pressing the "Review" button, a user can view the Missing MTRS records.



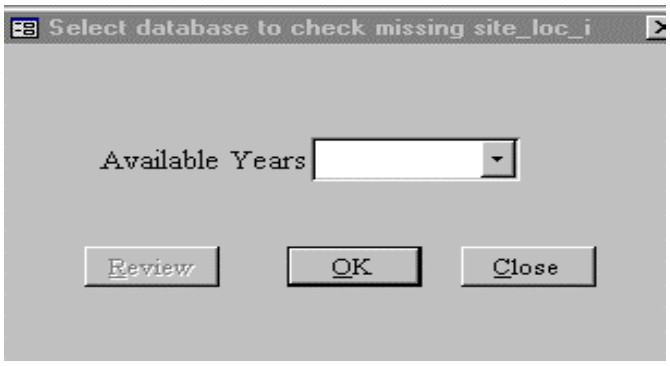
Checking missing grower_id: Pressing the button of “Missing Grower_id”, the application will prompt a user to select the year for the database. Once a user enters the year, the program will find the missing grower id in the selected database.



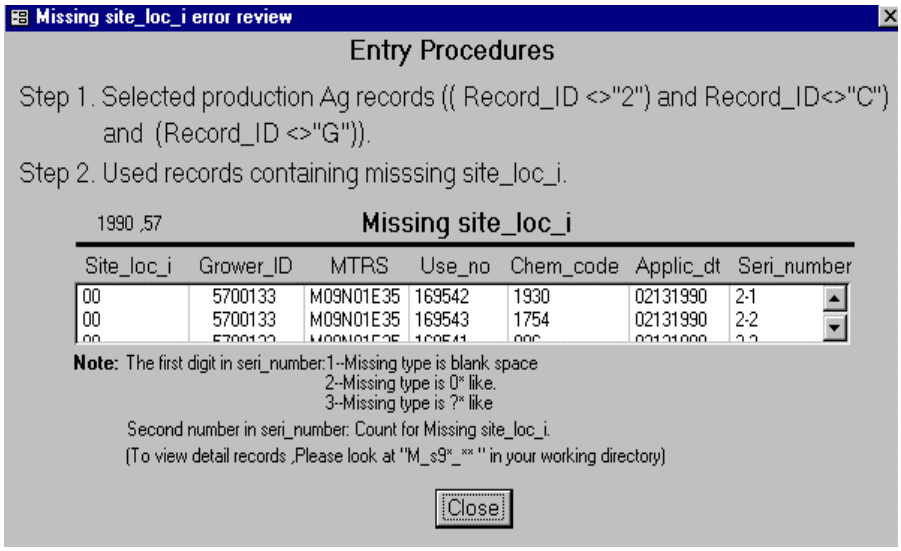
If there are records with missing grower id in the selected year, the "Review" button will be activated. By pressing the "Review" button, users can view the “Missing grower id” records.



Checking missing Site Location ID: Pressing this button of “Missing site_loc_id”, the application will prompt a user to select the year of the database. Once a user enters the year, the program will find the missing site location id in the selected database.



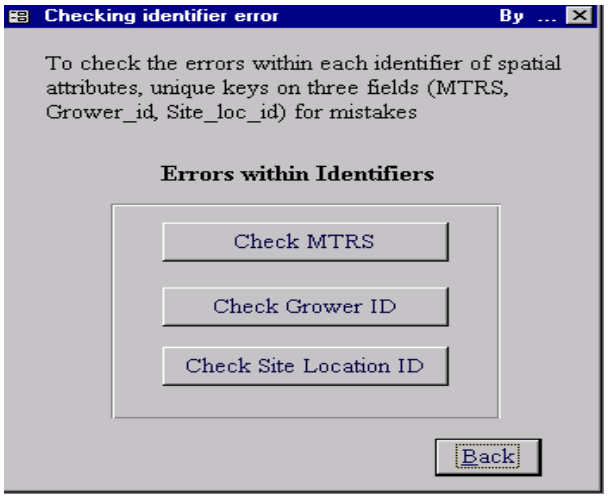
If there are missing Site_loc_i in the selected year, the "Review" button will be activated. By pressing the "Review" button, users can view the Missing Site_loc_i records.



Use “Back” button to return to the “Check Location Identifier” form.

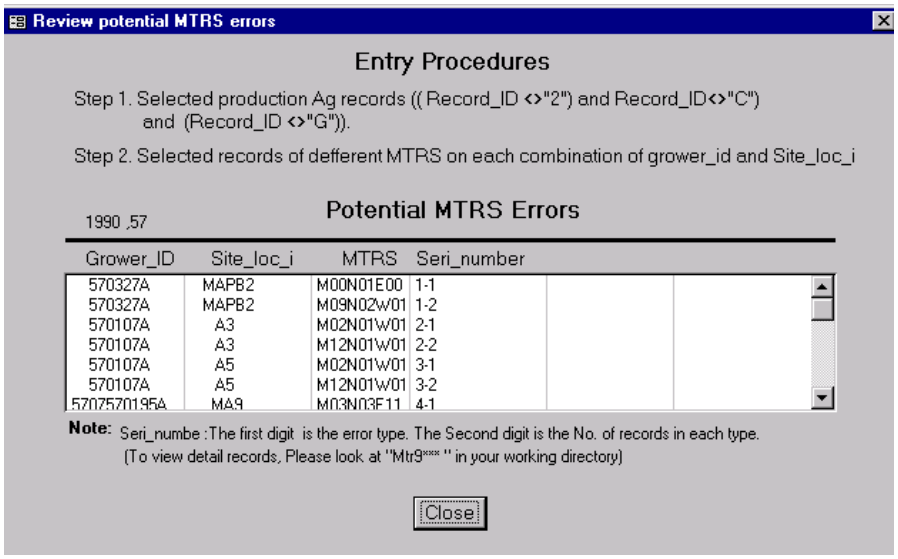
(3) Mistakes within Identifiers

This form will be displayed after selecting the button of “Mistakes within identifiers”.

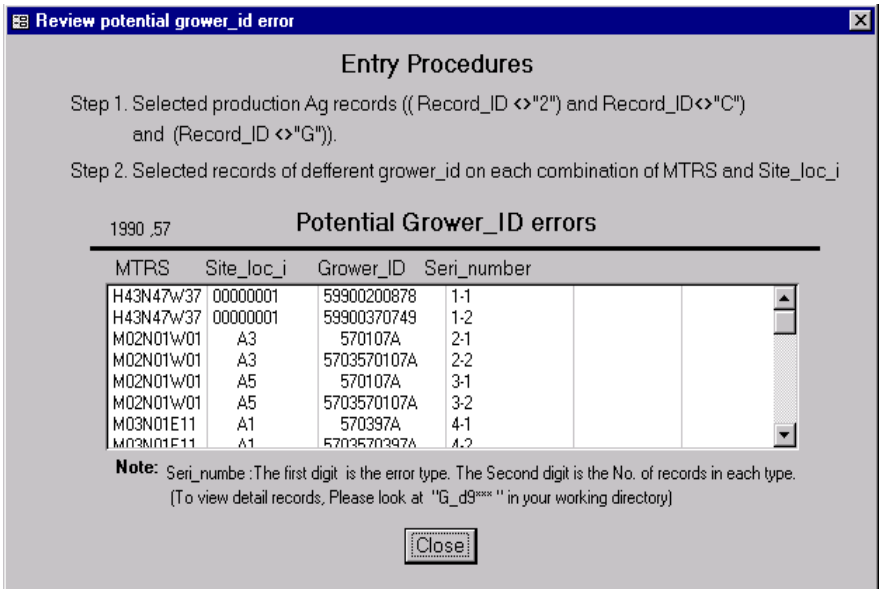


Users can press "Check MTRS" button to obtain the potential MTRS error records and press "Check Grower_id" button to obtain the potential Grower_id error records, or press "Check Site location ID" button to obtain the potential site_loc_i error records. After one finishes checking any of these functions, the "Review" button will be activated, and one of following forms can be viewed by pressing "Review" button.

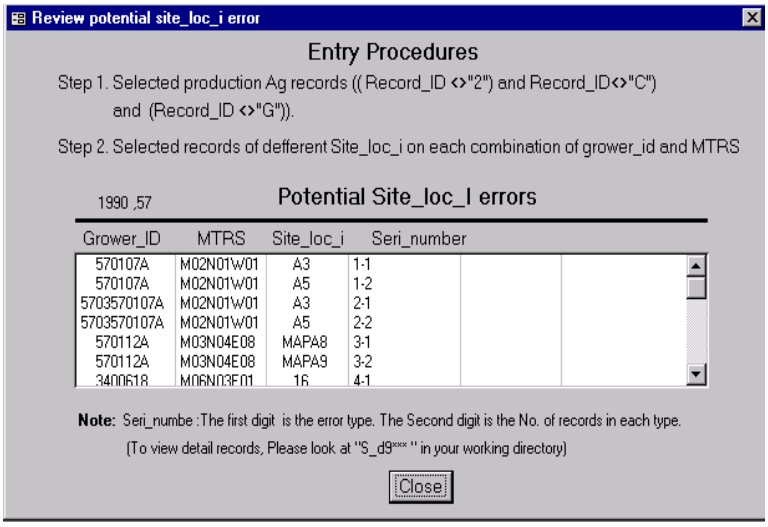
Review Potential MTRS Errors:



Review Potential Grower ID Errors:

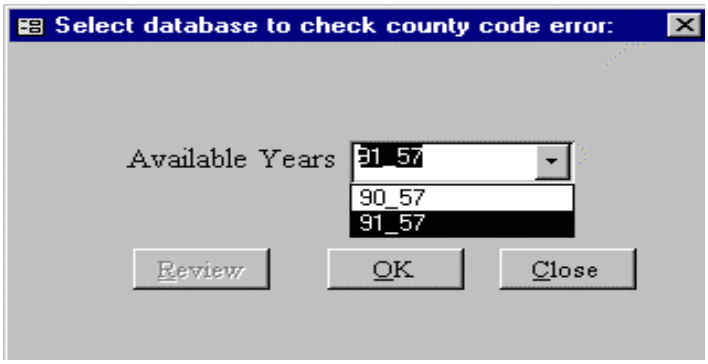


Review Potential Site Location ID error:

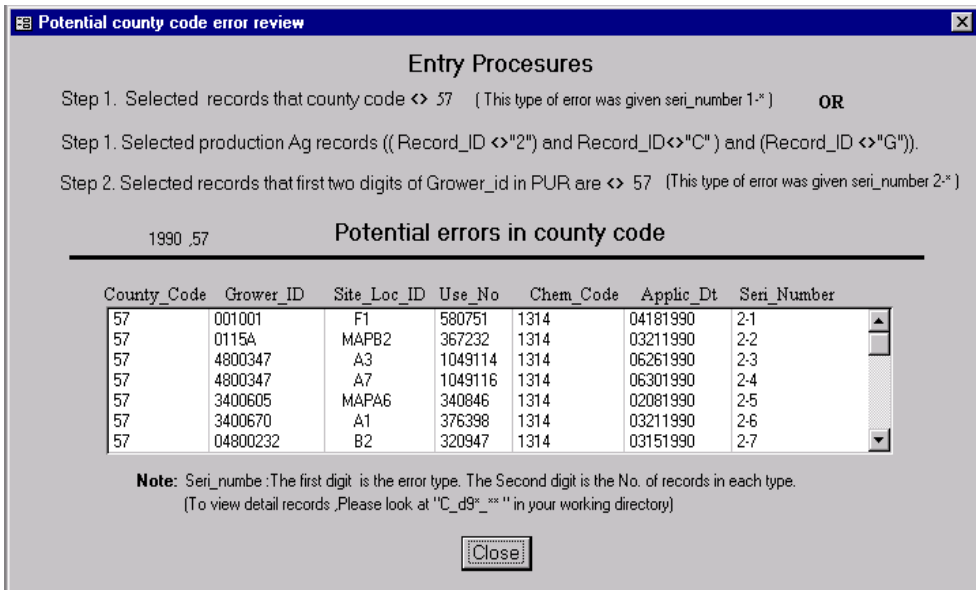


4. Checking errors for County codes:

After selecting the function for checking county code, users need to select the year to check for the errors in the data.

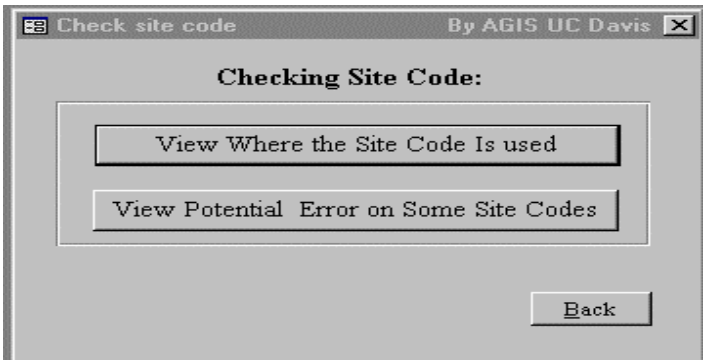


After a user selects the year, the application will check for the potential county code error. If there are county code errors, the "Review" button will be activated. By pressing the "Review" button, the following form will be displayed on screen.

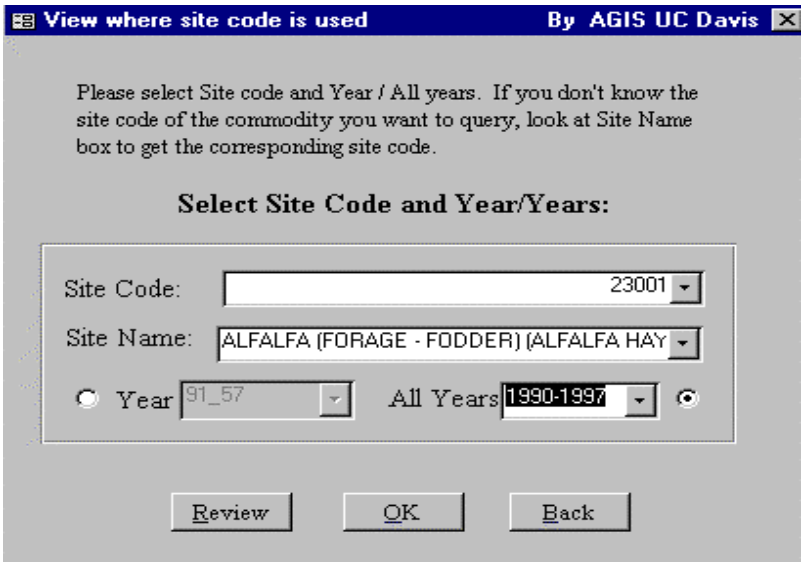


Checking errors for Site codes:

In the comb box, users need to select one of the two choices.



If a user pressing the "View Where the Site Code Is Used" button, the following form will be displayed on screen to request an input for site code. The site name is informational to assist users to locate the correct and corresponding site code for the commodity name of their interest. However, site name cannot be used to link the data. Therefore, users have to select the correct site code for checking the errors in site code.



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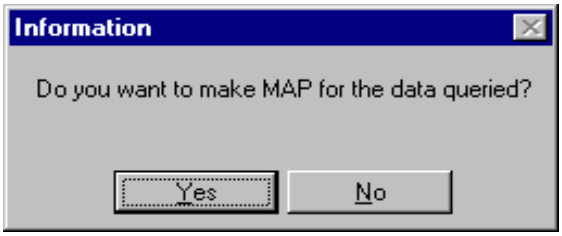
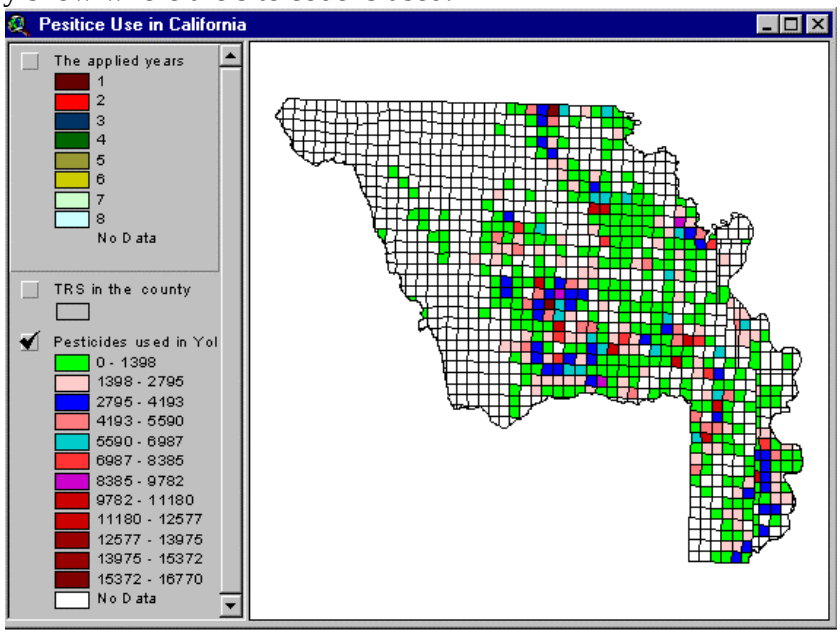
If a user wants to view where site code is used in 8 years (1990-1997), one should select the site code comb box and all years comb box. Press the "OK" button, the application will query for these records. Then the application will ask whether making a map in a message box.



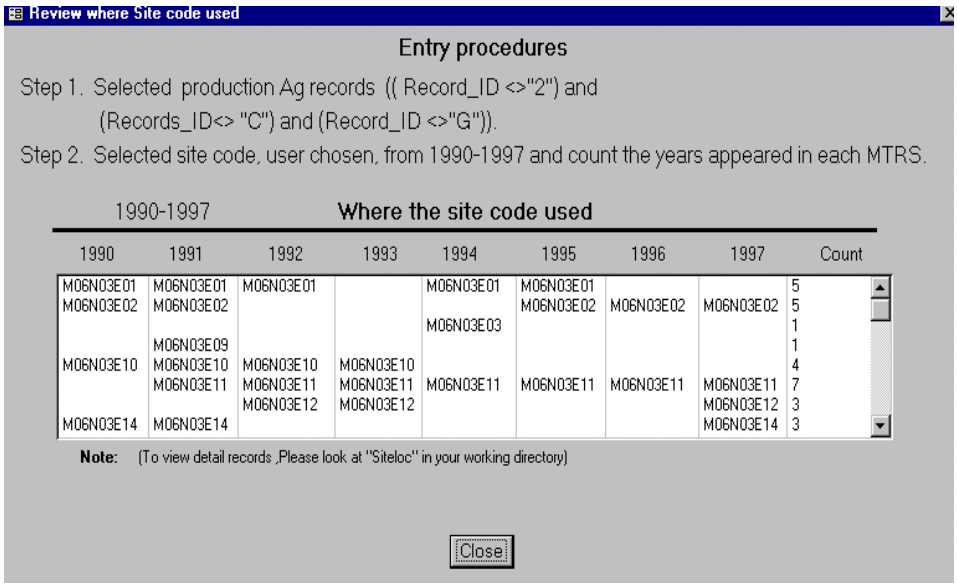
By pressing Yes, the application will automatically start the ArcView.exe, and automatically show where the site code is used.



The above graph is an example from the pesticide use for alfalfa fields in 1990 to 1997 in Yolo County.

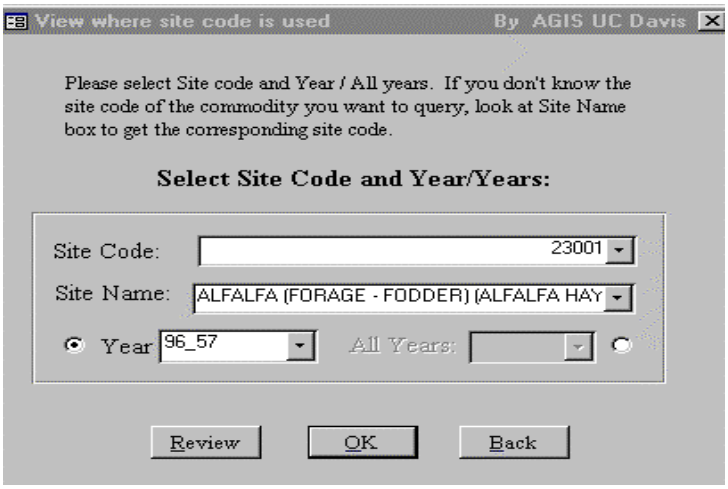
Pressing "Exit" button in ArcView in the View environment to exit the ArcView, or saving the map in the layout before exiting ArcView.

The "Review" button in "view where site code is used" form will be activated. By pressing the "Review" button, the following form will show on screen to inform where site code, in terms of township, range and section, is used in each year from 1990-1997.

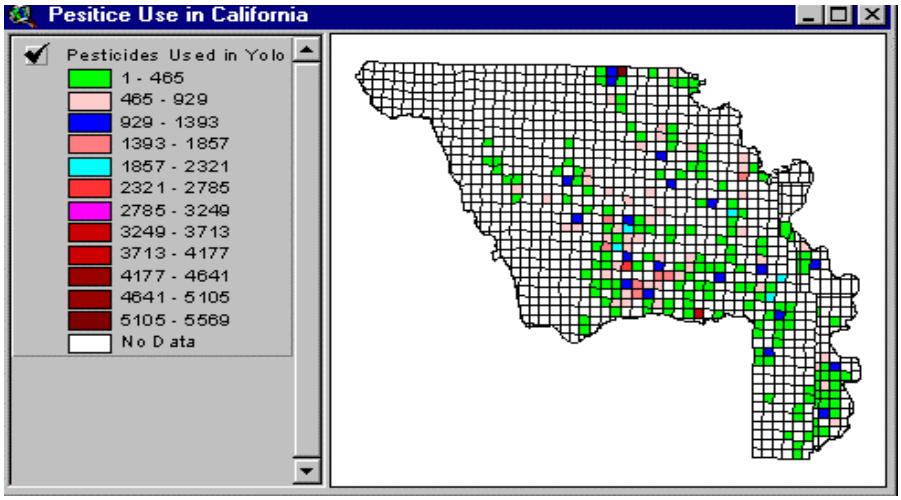


1990	1991	1992	1993	1994	1995	1996	1997	Count
M06N03E01	M06N03E01	M06N03E01		M06N03E01	M06N03E01			5
M06N03E02	M06N03E02				M06N03E02	M06N03E02	M06N03E02	5
				M06N03E03				1
	M06N03E09							1
M06N03E10	M06N03E10	M06N03E10	M06N03E10					4
	M06N03E11	M06N03E11	M06N03E11	M06N03E11	M06N03E11	M06N03E11	M06N03E11	7
		M06N03E12	M06N03E12				M06N03E12	3
M06N03E14	M06N03E14						M06N03E14	3

If a user selects a year in the comb box as indicated in the following form, only one year's data will be queried.

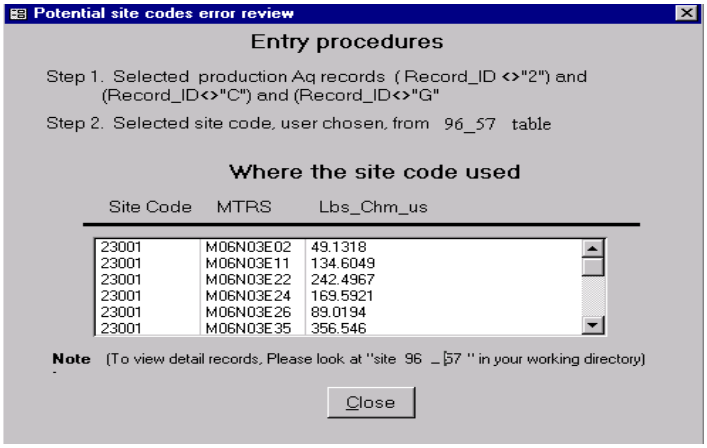


If a user wishes to view the map, the following map will be shown on screen in ArcView.



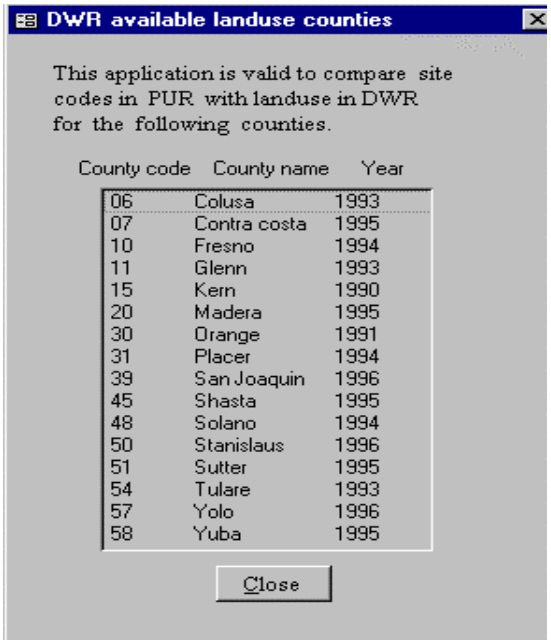
This graph displayed the pesticide uses in 1996 on alfalfa fields in Yolo County.

Press "exit" button to exit ArcView program. Then press the "Review" button to review the results.

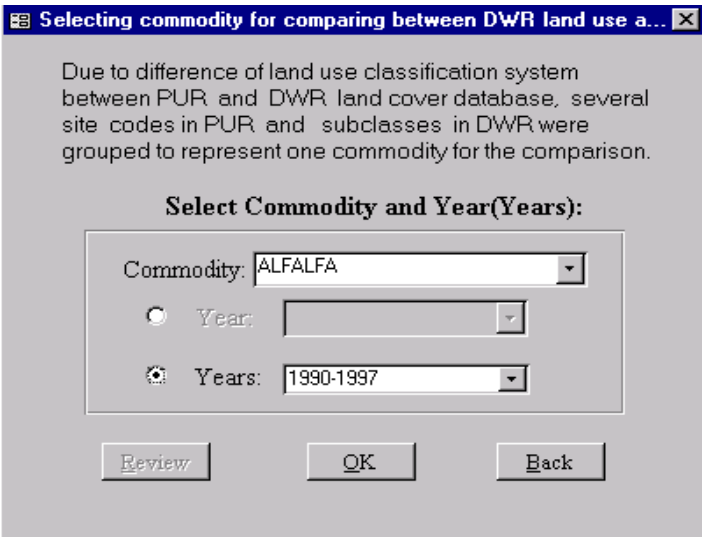


Comparing the site code with the landuse from Department of Water Resources: Assuming the landuse from DWR is more accurately reflecting the actual field boundaries, we can compare the site code in the PUR database with the landuse from DWR to see whether site code is correctly reported in the PUR. As noted previously, there may be time differences in landuse map and PUR data. The differences between the two databases only serve as a reference.

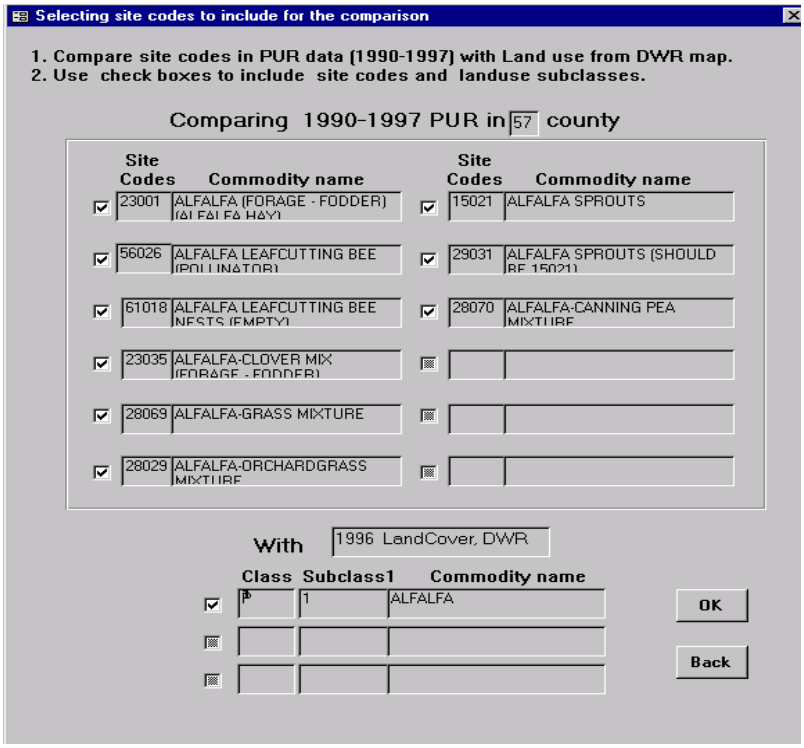
The following steps allow us to check for the site code errors in the PUR when comparing the site code with the landuse from DWR. However, only 16 counties of landuse from DWR are available to use at the time. Therefore, if a user presses "view potential error on some site codes" button, when there is no landuse coverage available in this county, the following form will pop up to show you the available landuse data.



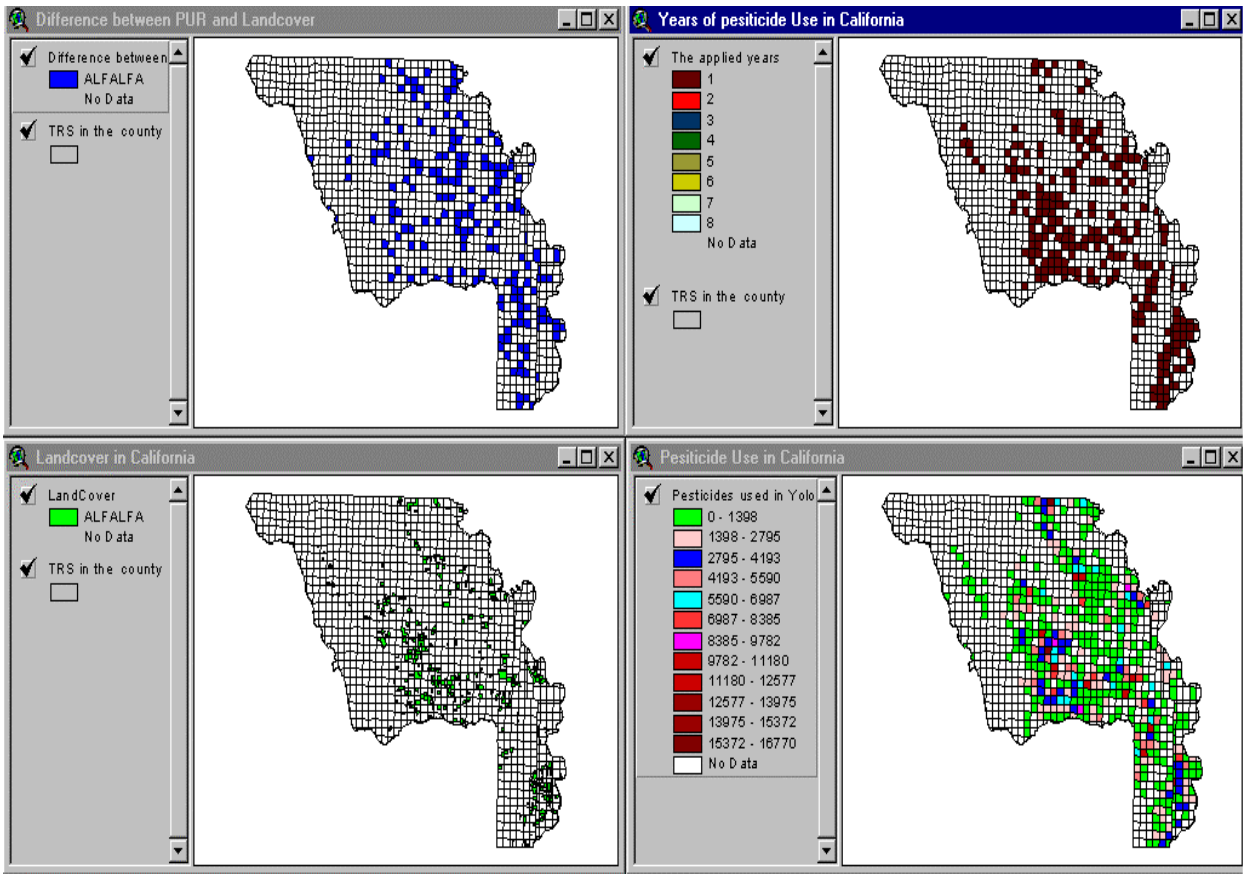
If a user presses "view potential error on some site codes" button and when there is a landuse coverage available for this county, the following form will be displayed.



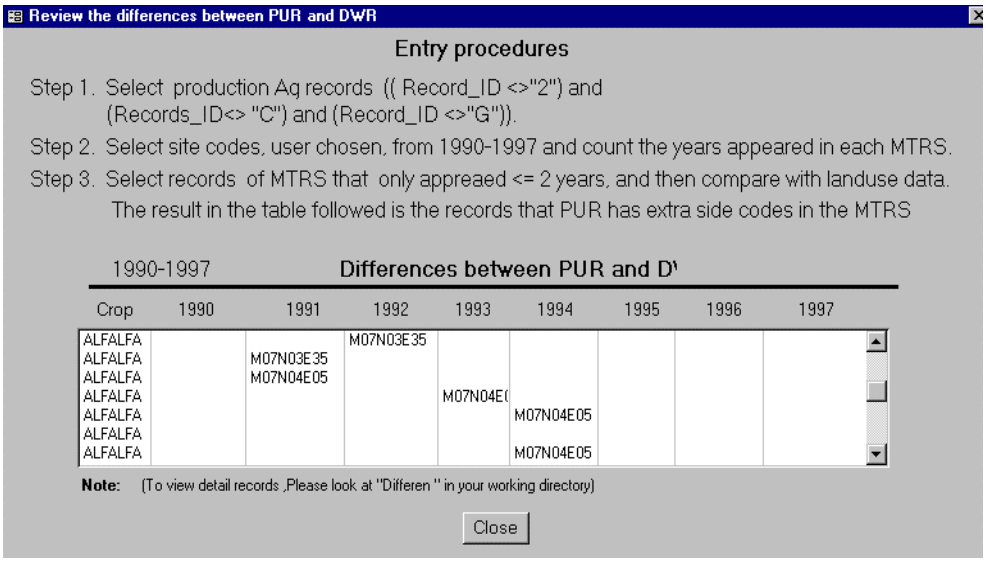
If one selects "years" in the comb box of “Commodity and Year”, the following form will pop up to the screen.



Following the instructions in the comb box, one can select site codes and click "OK" button, the application will compare PUR with DWR landuse coverage. If one selects "Yes" to display the maps, the following results will be shown in ArcView.



A user can get the difference between PUR and DWR by pressing the "Review" button in "Selecting commodity for comparing between DWR land cover and PUR site codes" form to get the following results.



Review the differences between PUR and DWR

Entry procedures

Step 1. Select production Aq records ((Record_ID <>"2") and (Records_ID<> "C") and (Record_ID <>"G")).

Step 2. Select site codes, user chosen, from 1990-1997 and count the years appeared in each MTRS.

Step 3. Select records of MTRS that only appreaed <= 2 years, and then compare with landuse data. The result in the table followed is the records that PUR has extra side codes in the MTRS

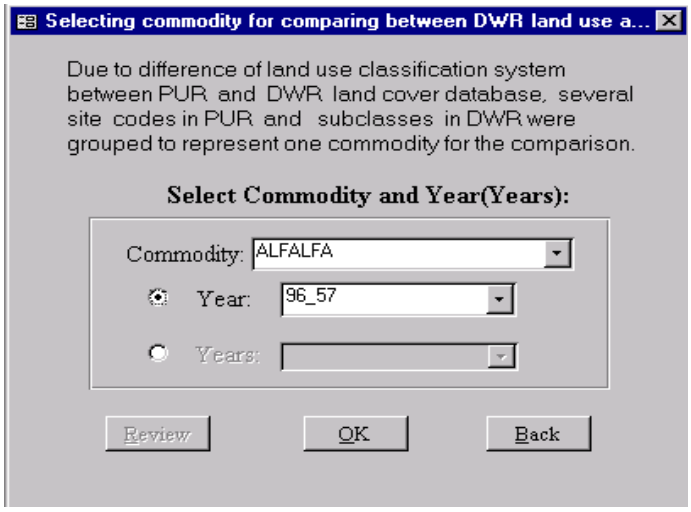
1990-1997 Differences between PUR and D

Crop	1990	1991	1992	1993	1994	1995	1996	1997
ALFALFA			M07N03E35					
ALFALFA		M07N03E35						
ALFALFA		M07N04E05						
ALFALFA				M07N04E(				
ALFALFA					M07N04E05			
ALFALFA								
ALFALFA					M07N04E05			

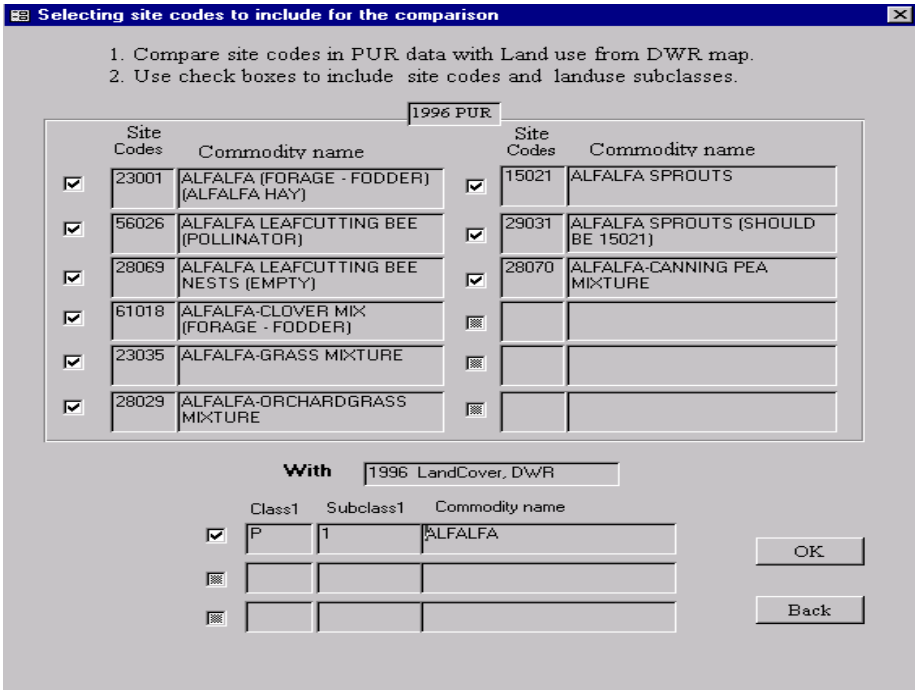
Note: (To view detail records ,Please look at "Differen " in your working directory)

Close

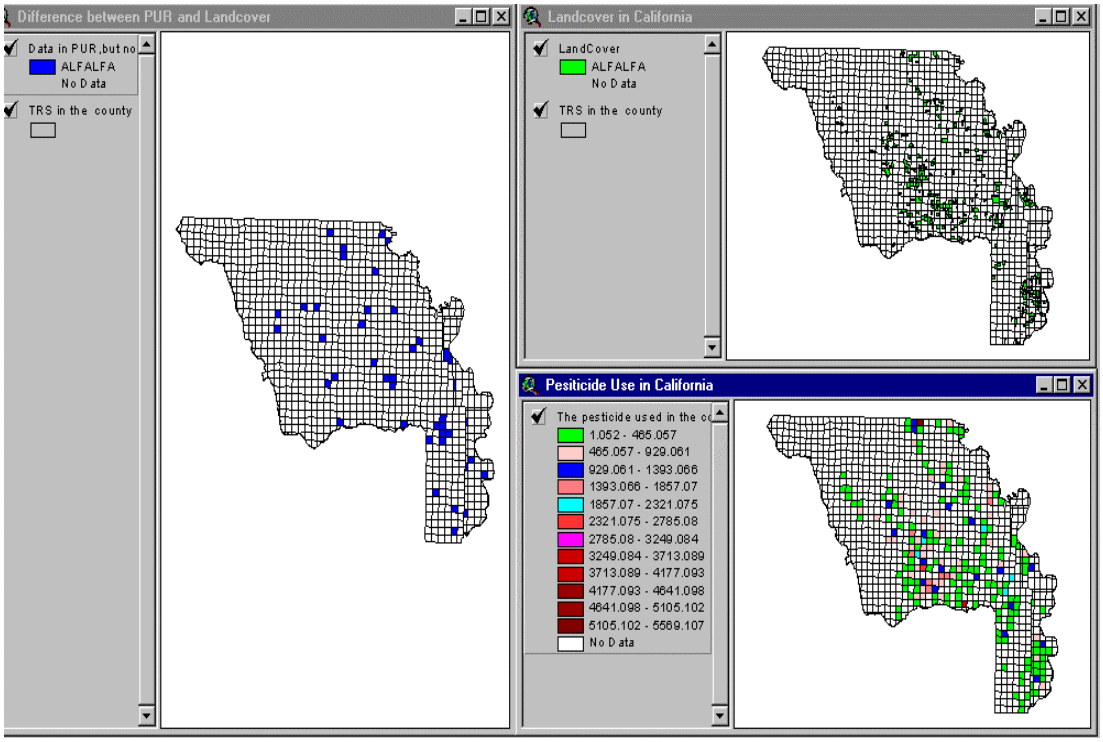
If a user selects "year" comb box and commodity comb box in the following form.



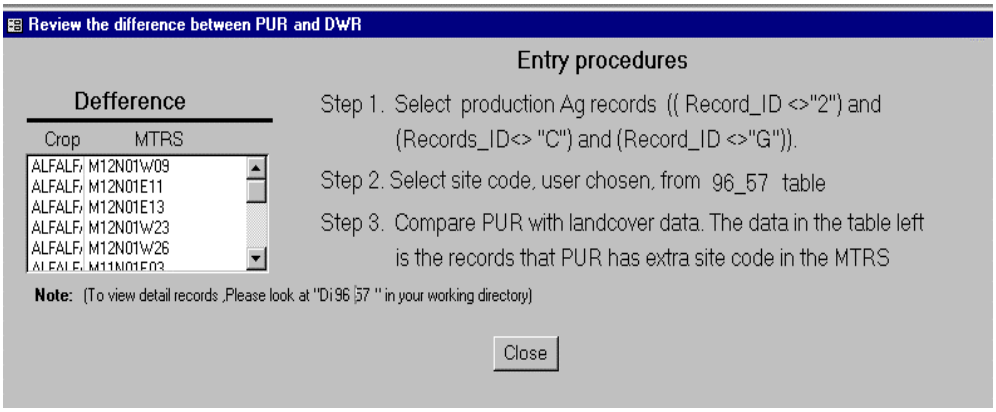
By pressing "OK", the application will pop up the following form.



By selecting site codes and click "OK" button, the application will compare PUR with DWR landuse coverage. If a user selects "Yes" do display maps, the following results will be shown in ArcView.



A user can get the difference between PUR and DWR by pressing the "Review" button in "Selecting commodity for comparing between DWR land cover and PUR site codes" form to get following results.



If all the MTRS in"View Potential Error on some site codes" section is not matched with the county GIS coverage MTRS, no map of potential errors will be displayed on screen, and the legends in the ArcView view is shown as " ".

In summary, a user can view the Review/Summary to get error checking results in this step by pressing "Review/Summary" button in main form. The following form will be displayed on the screen.

Summary of checked error types in this run

1. This table provides the checked error types and their associated output filenames at given county of PUR data.
2 Double click on the filename in the box to review the records details.

(Please do not change the text in the boxes!)

57 County

Error Types you have checked

Error Types	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Potential Duplicated Records										
Potential Acre Plant Error										
Not Matched MTRS Error										
Missing MTRS Error										
Missing Grower_id Error										
Missing Site_loc_I Error										
Potential error in MTRS										
Potential Error in Grower ID										
Potential Error in Site_loc_I										
Potential Site Code Error (one year)										
Potential Site Code Error (90-99)										
Site Code Location(one year)							Site9657			
Site Code Location (90-99)	Siteloc	Siteloc	Siteloc	Siteloc	Siteloc	Siteloc	Siteloc	Siteloc		
Potential County Code Error										
Simply Statistics										

Note: All files have been exported to F:\Limei_Yan\Workingfiles\Try\

Close

Note: Due to the size capability limitation in MS Access, if "Access has reached maximum size" error message appears, Please compact the database and rerun the desired checking functions. For the county with large PUR data records this application may have its limitation.