Phase I Needs Assessment Report

First Project Deliverable for:

Pesticide Permitting and Use Reporting IT System Analysis and Recommendation Project

Presented To:

California Agricultural Commissioners and Sealers Association

And California Department of Pesticide Regulation

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Table of Contents

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Pesticide Permitting and Use Reporting IT System Analysis and Recommendation

1. Project Overview

The first computerized tools used to help implement California's full use reporting regulations for restricted materials and other pesticides were introduced more than two decades ago. Almost from the beginning, the proliferation of different tools and different approaches taken by counties to meet local needs has created a challenging environment - technically, managerially, and financially. The emergence since 2000 of two competing private vendor tool suites now deployed almost equally among 50 counties (so far) has gradually fed the perception that the pesticide regulation program is paying too much for information technology (IT).

If that perception is accurate, it is partly because the cost efficiencies inherent in either standardization or competition have not been fully exploited, and it is partly because pesticide IT has been too loosely governed and overseen by the collective of state and county stakeholders. As this dilemma came to head within the past year, the California Agricultural Commissioners and Sealers Association (CACASA) and California Department of Pesticide Regulation (DPR) jointly agreed to initiate an investigation of the current status of pesticide IT and to obtain recommendations including an implementation plan to overcome technical, financial, and governance problems revealed by the investigation. In December 2008 CACASA/DPR hired the Lancaster, Pennsylvania IT consulting firm *geographIT* to conduct the study and make recommendations. Employees of *geographIT* are the sole authors of this report.

1.A Project Objectives and Deliverables

Very broadly, this project's objectives are to inform, evaluate, and chart a recommended path toward solutions that are both beneficial and workable. Consultants from *geographIT* are responsible for collecting information and stakeholder observations, for evaluating the information, and for giving advice on solutions. CACASA/DPR is responsible for endorsing or modifying the advice and making sure it gets implemented.

Inform:

Since this is the first ever comprehensive review of pesticide IT, it's not surprising that a lack of information in the past has contributed to misunderstandings, divisiveness, and lagging appreciation for the magnitude of problems needing to be solved. It will never be possible for each county to know exactly what the other 57 are doing, but this exercise should go a long way toward perfecting all stakeholders' understanding on many key topics. This is essential to build the trust and appreciation people need in order to enthusiastically, or at least willingly, buy into solutions that may entail short term difficulties for some or all of them.

Evaluate:

As initially conceived, this project entailed evaluation and ranking of the two existing private vendor IT solutions (AgGIS and RMMS), followed by a plan to deploy the higher ranking system in every county. Shortly after the project got underway it became apparent that this approach might be improved by considering a broader range of alternative approaches to system selection. The various "options" still under consideration are described in Section 10 of this report. At a minimum, *geographIT* will objectively rate the two existing systems in relation to a desired statewide standard, but the results of that evaluation as well as other considerations may alter the course of the project depending on how CACASA/DPR wish to proceed.

The evaluation encompasses three main areas:

- System capabilities (functions and performance) directly related to current user needs across all counties. There is a strong emphasis on system qualities that directly affect users' productivity in carrying out core pesticide regulation business functions. Strengths, weaknesses, and deficiencies of each system will be assessed with respect to these core needs.
- System flexibility and potential for future growth - both in adapting to new technology and the accommodation of expanding/evolving user needs. This assessment will look at the basic framework of each system to measure how easy it is to make modifications; to maintain compliance with related software, hardware, networks, and operating systems as they are upgraded over time; and to support or even absorb new applications directly related to pesticides and other county Ag Department functions.
- Vendor business capacity and stability. The likelihood of a positive long term relationship with a software product depends just as much or more on the business abilities of the product's vendor as it does on the product itself. To survive as a business requires the ability to budget, plan, manage risk, communicate effectively, retain and secure new customers, and stay competitive through innovation. Technical competence may be enough to develop a superior product, but if the business falters because of deficiencies in these other areas then the product and the support needed to keep it going will falter as well.

Together, these system and vendor characteristics are a measure of *sustainability.* Information that will be used in the eventual evaluation is summarized in Sections 5 through 7 of this report. The actual evaluation criteria and recommended analysis methods are described in Section 9, and final results of the evaluation will be revealed in the Phase II Recommended IT Solution Report.

Recommend:

During Phase II of this project, recommendations will be offered on two levels. The first level concerns system/vendor characteristics required to satisfy a 58 county solution that meets near-term needs and that can be sustained over a longer horizon. It will essentially define a realistically achievable "ideal" in terms of both system and vendor capabilities.

The second level concerns the pathway needed to reach a 58 county solution, with the most critical elements being an implementation plan and a governance structure to carry out that plan as well as provide ongoing oversight.

Project Phases and Deliverables:

The objectives above are divided among three deliverables in three project phases as follows:

Phase I: **Needs Assessment Report.** Investigation with findings on the current situation surrounding user needs, system and vendor characteristics, IT organization/governance, and potential strategies to attain a sustainable 58 county solution.

Phase II: **Recommended Solution Report.** Analyze Phase I findings in greater detail to establish desirable and achievable system/vendor/governance standards, evaluate existing systems in relation to these standards, and propose a broad strategy to implement the standards.

Phase III: **Implementation Plan Report.** Depending on the strategy direction emerging from Phase II, this phase will either specify the tasks needed to accomplish the transition to a system selected on the basis of Phase II evaluation alone, or specify tasks needed to carry out a successful bid solicitation and evaluation process. In either case, transition steps for a new approach to technology governance will be described as well. More information on these implementation plan variations will be provided in a memorandum to be prepared between Phases I and II.

1.B Phase I Needs Assessment Methodology

The following information gathering tasks were completed during Phase I:

1. **Background Information Review.** Existing documented information on California's pesticide permitting and use reporting system was transmitted to *geographIT* consultants for them to review.
2. **Kickoff Meeting with DPR & CACASA.** Two *geographIT* consultants participated in an all day meeting on January 7, 2009 at DPR headquarters. Also attending were:

   DPR's Information Technology Branch Chief
   DPR's Director and two Associate Directors
   Agriculture Commissioners from San Luis Obispo, Napa, and Amador

   The meeting agenda focused on hearing DPR's perspectives, but also ranged widely into the history, technical and financial background, and politics surrounding pesticide IT.
3. **AgGIS and RMMS system demonstrations.** On January 8, the *geographIT* team was given demonstrations of AgGIS at Sacramento County and RMMS at San Joaquin County.

4. **County site visits.** Between January 20th and 29th one *geographIT* consultant traveled to eight regional host counties to gather information and opinions from users and administrators in nearby Ag Departments. Meetings were held in these counties:

Shasta	Merced
Glenn	Kings
Napa	San Luis Obispo
Monterey	Riverside

   A total of 110 people from 38 different counties participated in these sessions, which lasted between five and six hours each. Morning sessions focused on Ag Department business functions, system characteristics, and technical concerns expressed by everyday users. Afternoon sessions were used to discuss topics from an administrative and implementation perspective. A four page questionnaire was sent out to every county in advance of the site visits, and 26 individual questionnaires were filled out and returned during the visits or shortly thereafter.

5. **Vendor Interviews.** Two *geographIT* consultants conducted all day interviews with AgGIS vendor Patrick Way Consulting, Inc. in Chico on February 10th and with RMMS vendor Streamline Business Solutions, Inc. in El Segundo on February 12th. Prior to these interviews, both vendors arranged for *geographIT* to access their systems (either on dedicated hardware or through remote terminal access). Before and after the in-person interviews, extended hands-on sessions were conducted on each system while vendors gave instructions and answered questions on the telephone.

6. **Comprehensive Online Survey.** A nine page Internet survey was published on February 11th to collect input from all counties about their pesticide IT preferences, impressions on current systems, and baseline information on permits, use reports, and field sites. During the two weeks the survey was open, 86 individuals representing all but two of the 58 counties responded.

Over a period of just 6½ weeks these activities proved very effective in transferring large amounts of information and in fostering a tremendous appreciation for the variety of opinions, approaches, and needs regarding pesticide IT found across California. All participants deserve high commendation for the energy and openness that made information gathering both productive and pleasurable.

2. Evolution of Pesticide IT Systems

2.A Regulatory and Technical Requirements

Pesticide IT systems are designed to help administer regulations for restricted materials usage in both agricultural and non-agricultural settings. The background for these regulations is best summarized in the Pesticide Use Enforcement Program Standards Compendium as follows:

> Permits for pesticide use originated in Imperial County in 1931. The concept of restricted materials was enacted into law in 1950, incorporating permits as a general requirement at the State level.
>
> In 1976, an opinion by the California Attorney General determined that the issuance of county permits was subject to the requirements of the California Environmental Quality Act (CEQA) and therefore, required an environmental impact report (EIR) for the pesticide permit.
>
> The Restricted Materials Permit Program (RMPP) was developed as an alternative program to provide for an abbreviated environmental review procedure that serves as the "functional equivalent" to a full-scale EIR normally required by CEQA. (For information on CEQA, see Public Resources Code section 21050, et seq. and Appendix D, *Environmental Impact Report Functional Equivalency*.) Although the State and the CACs do not need to prepare an EIR, documentation of environmental impacts, mitigation measures, and alternatives are required. The RMPP was designed to meet these requirements. This program requires the CACs to issue time specific and site specific permits for the agricultural use of restricted materials.[1]

In December 1979 the pesticide regulatory program was certified as "EIR functionally equivalent" by the Secretary of the Resources Agency. To achieve and retain this certification, the regulatory program must (among other things):

- Use an interdisciplinary and inter-agency approach to evaluate and register pesticide products for use in California.
- Provide guidelines for the orderly and timely evaluation of permit applications, as well as a process for directly affected persons to petition for an approved permit to be reviewed.
- Include evaluation and enforcement of mitigation measures (permit conditions) and consideration of feasible alternatives that would substantially lessen the adverse effect that the activity (pesticide application) may have on the environment.
- Fully describe the proposed activity, which in the case of pesticide application includes the type and amount of product used, purpose of use (type of pest to control), commodity treated (if an agricultural use), and the time and place of application. Information supplied with the permit itself is incomplete for some of the above;

[1] Volume 3, "Restricted Materials and Permitting", *Pesticide Use Enforcement Program Standards Compendium*; California Department of Pesticide Regulation, September 2008, p. 1-1.

therefore, Notices of Intent (NOI) for individual applications are required to supply the missing information (specifically time and location) and in that sense "complete" the permit and are components of it.

- Take into account local environmental conditions that may be sensitive to the proposed action.
- Comply with certain notification and information access requirements to insure that other agencies and the public are adequately informed.
- Provide enforcement mechanisms to "protect, rehabilitate, and enhance the environmental quality of the State" (CEQA Chapter 1).

Pesticide IT systems have an integral role in all of the compliance criteria listed above, in terms of:

- Efficiently managing the flow of required information.
- Keeping complete and accurate records.
- Providing tools for environmental impact analysis and enforcement activities.

In addition to the guidelines and paper forms used to assist CACs in carrying out their role in the regulatory program, DPR has also developed electronic data standards covering the content, format, and transmittal requirements to which each county and pesticide IT system must adhere. These standards are well known and need not be detailed in this report. Electronic data standards have also been quite stable. In part this reflects the need for integration with a diversity of information systems at the state and county levels, and in part it reflects the stability of the underlying regulations themselves. When the pesticide regulatory program was being designed in the late 1970's there was much tension between environmental advocates and the agriculture and pesticide industries. Both sides made significant compromises, but tensions remain and neither regulators nor policy makers are anxious to revisit those negotiations without very compelling reasons to do so. Expectations are that data standards will remain stable absent a major overhaul of the current regulatory program.

Minor modifications do occur, however, prompted by either technological advances or new regulations. Two such modifications were made in 2008. One involved a change in operator license number formatting when DPR switched to a new license management application. The other was a modification to an existing database field and the addition of a new field to comply with new VOC (Volatile Organic Compound) regulations on soil fumigants used in designated air quality non-attainment areas. Both modifications were very minor and could be carried out without much fanfare.

2.B Pesticide IT Components

All major pesticide IT systems and components either currently in use or that have been proposed in the recent past are listed in chronological order of their appearance below.

RMPP – Restricted Materials Permit Program. In a perhaps confusing collision of nomenclature conventions, this *software* program has the same name as the *regulatory* program described in the previous subsection. The RMPP application was developed by DPR in the early 1980's, and is used for preparing both restricted material permits and use reports. It is written in the original DOS version of the DataFlex programming language and uses a file based non-relational database structure. The application has undergone minor modifications through the years, many of them performed by the counties themselves. As a result, several versions of RMPP existed but the underlying technology was basically unchanged and, while stable, is now considered to be extremely obsolete. Still, eight counties currently use RMPP exclusively, an additional dozen or so counties used it as recently as two years ago, and a handful of counties still use RMPP alongside other systems. Examples of the latter include Monterey which uses RMMS but finds RMPP to be an efficient use report data entry tool, Napa and Solano which use RMPP as a component of AgGIS v2, and San Bernardino which uses RMPP to perform contracted data entry of Riverside's use reports.

"Homegrown" systems – At least three Central Valley counties (Fresno, Tulare, and Merced) were reported to have "always" used alternatives to RMPP (or highly customized versions of it) that were developed in-house. Fresno and Tulare have since migrated to RMMS, and Merced continues to use its own system (see Permit6 description below).

"GMSAs" – Grower Management Software Applications. This is a generic term used in this report to describe a variety of commercial software applications that growers and others use to manage wide ranging aspects of their operations in addition to pesticide management, use reporting, and notices of intent. At least one system, Tiger Jill from Orange Enterprises, has been around since 1984 and two of the other widely used systems today are provided by CDMS, Inc. and Agrian, Inc. These systems export electronic PUR and NOI data directly to counties and some have Internet data entry modules for these reports that their customers (and in some cases any permit holder) can use.

CEDTS (*old*) – California Electronic Data Transfer Standard. This is both a data format standard and a hardware/software data transmission protocol first introduced in 1991. It was developed by DPR and Kern County with assistance from the University of California primarily to facilitate the transfer of PUR and NOI data from GMSAs. Over time, data validation features were added in order to check for errors in the data submissions, and counties could also run their own PUR data entries (from RMPP or other systems) through CEDTS to perform the validation function.

RMMS – Restricted Materials Management System. Developed by Streamline Business Solutions, Inc. (SBS) and introduced in nine counties beginning in 1999. Now RMMS is deployed or planned to be deployed in about half of California counties. RMMS improved on RMPP by adding a more functional Windows interface, new productivity features, and somewhat modernized software coding using Visual DataFlex. For the first several years RMMS borrowed the same file-based data structure as RMPP but a transition to Microsoft SQL Server was completed about two years ago. Much more detail on RMMS is provided in Sections 3 and 5.

AgGIS – Agriculture GIS. Developed by Patrick Way Consulting, Inc. (PWC) and gradually introduced as an evolving project in a handful of counties prior to 2004. Now AgGIS is deployed or deployment is planned in the other half of California counties not using RMMS. In its earliest iteration AgGIS was a mapping module on an ArcView 3.2 platform programmed using Avenue scripts and loosely integrated with RMPP. The next version, AgGIS v2, used an ArcView 8.X platform with a highly customized mapping interface programmed using ArcObjects and VisualBasic. AgGIS v2 also included a permit management interface tightly integrated with RMPP. The current version, AgGIS v3, is an entirely new product written in Java and it has adopted the same PostgreSQL (open source) relational database as Permit6 (see below), and uses a PostGIS open source spatial database, mapping interface, and tools that are completely integrated with the permitting database (no ArcView or vestiges of RMPP remain). A more detailed description of AgGIS v3 is provided in Sections 4 and 5.

Permit6 – This is the latest iteration in a long line of permitting and use reporting applications developed for use in Merced County by Michael Quinn. The software is written in Perl and its PostgreSQL database platform and table structure are now integrated with AgGIS v3. In a database sense, AgGIS v3 and Permit6 are virtually the same application. However, each has its own interfaces, Permit6 lacks a GIS module, and AgGIS lacks its own PUR data entry module. Only Merced County now uses Permit6 exclusively, while all AgGIS v3 counties use the Permit6 database as well as its PUR interface. Plans are in place for AgGIS v3 to get its own PUR and other interfaces needed to fully absorb Permit6 into AgGIS.

Permit6 Web and CEDTS (*new*) - Permit6 Web is an Internet module used for PUR and NOI data entry by any permit holder or authorized contact. It works in conjunction with a completely revised version of CEDTS that automates the data transmittal to counties and the data validation functions of the old CEDTS. The web application was developed by Merced County (Mike Quinn is the developer) around 2006 and is used by all counties using CEDTS. Permit holders using GMSAs in those counties transmit Internet PUR and NOI through CEDTS as well.

RMMSWeb and PUReData – These Internet modules appeared around the same time as Permit6 Web and perform the same kinds of PUR/NOI data entry, validation, and transmittal functions for counties using RMMS. PUReData's purpose and functionality is comparable to CEDTS.

SPURS – Statewide Permitting and Use Reporting System. DPR commissioned a feasibility study in 2003-04 that recommended procurement of a custom pesticide IT solution that was Internet-based, consolidated all county level permit data into a single statewide database, and featured direct integration with county and state GIS data as well as DPR's product label, PUR, and licensing/certification databases. The proposal was not well received by CACs and quickly faded away. Chief reasons for this lack of support included:

- Over-centralization of data and rules-based functions would impinge upon local control issues such as the ability to manage for localized conditions.
- Business concerns over the potential for increased information access to interfere with legal agricultural operations.
- By this time many counties had already invested in RMMS or AgGIS. They and other counties did not consider the estimated $4 million up front costs, $1 million annual operating cost, and the 3-5 year development horizon of SPURS to be a cost effective investment.
- Perhaps most importantly, input from counties was not sufficient to let them register these concerns while the SPURS proposal was being developed.

So far during this current pesticide IT recommendation project, large numbers of county-level stakeholders have indicated a desire for some of the same features recommended with SPURS such as a full Internet interface and connectivity, GIS integration, better integration with DPR databases, and data sharing among adjacent counties. The challenge appears to be finding ways to have some or all of these features while still preserving local autonomy and flexibility.

2.C Current Systems Deployment and Workload

The table on the following page shows responses to questions in the online survey designed to obtain workload statistics for currently deployed systems. The entry "NR" is for "no response".

County Name: AgGIS County RMMS County RMPP County	Software Version	Restrict Matl. Permits	Op-ID	Registered Contacts	Annual PUR	Annual MSPUR
Amador	3	65	143	35	352	1788
Butte	3	900	300	NR	72000	14000
El Dorado/Alpine	3	176	392	314	NR	NR
Glenn	3	1200	100	573	22953	8866
Humboldt	3	40	80	25	NR	NR
Imperial	3	275	75	250	60000	2600
Lake	3	61	36	71	6900	2300
Madera	3	500	400	1500	60000	4000
Nevada	3	40	200	100	250	5000
Placer	3	78	232	366	600	3000
Sacramento	3	296	135	285	41800	3600
Sutter	3	800	400	723	20500	3207
Trinity	3	50	NR	NR	1096	NR
Yolo	3	702	148	137	25667	10040
Yuba	3	553	61	152	8156	3019
Napa	2	146	581	293	28749	4779
Solano	3	306	210	470	17487	3792
Merced	Permit6	1594	252	4313	75000	7800
Alameda	4	140	160	500	725	4800
Calaveras	4	24	65	100	580	1300
Contra Costa	4	389	254	1462	7707	16564
Fresno	4	1800	6800	1200	298000	15000
Inyo	4	55	33	15	15	130
Kern	4	942	100	450	125000	10450
Kings	4	750	150	500	53820	4309
Lassen	NR	153	23	13	457	276
Marin	4	34	43	NR	500	6330
Mono	4	20	23	5	10	70
Monterey	2.5	600	250	500	360000	10000
San Bernardino	4	350	150	1200	5000	18000
San Diego	4	700	4200	1100	75000	30000
San Joaquin	4	1827	225	700	90000	10000
San Luis Obispo	4	841	370	1327	71345	8396
San Mateo	4	92	60	266	1288	3200
Santa Barbara	4	512	411	3034	115582	9221
Santa Clara	4	235	408	1012	25000	22000
Shasta	4	175	125	40	NR	NR
Sonoma	4	311	894	3019	55000	10000
Stanislaus	4	2067	237	6840	100229	8548
Tehama	4	286	222	268	12516	3853
Tulare	1.41	4300	NR	NR	195000	NR
Tuolumne	4	65	200	80	2000	1200
Ventura	4	400	600	1469	75000	10000
Colusa	N/A	535	58	190	27277	1540
Del Norte	N/A	20	23	25	75	2500
Mariposa	N/A	18	38	74	300	700
Mendocino	N/A	50	450	NR	NR	NR
Riverside	N/A	600	600	1000	60000	60000
San Benito	N/A	158	95	30	34000	300
San Francisco	N/A	12	17	215	2580	2580
Santa Cruz	N/A	330	130	220	21000	5000

3. RMMS Overview

3.A Current Configuration and Status of the Program

RMMS stands for Restricted Materials Management System, a program developed by Streamline Business Solutions, Inc. (SBS) in Long Beach, CA. The program is actually a suite of integrated applications, principally comprised of:

RMMSWin - a Windows desktop application
RMMSWeb - a web site for PUR, MSPUR and NOI data entry
PUReData - a web services interface to support electronic submission of PUR and NOI data from third party GMSA providers.

Modules/Capabilities:

RMMSWin application modules and capabilities:

RMMSWin is a Windows 32-bit application installed on client (desktop) computers. Application data are stored in a (Microsoft) SQL Server database housed on a server connected to a county's regular network infrastructure.

The RMMSWin interface consists of a standard looking window with a navigation menu bar at the top and an organized series of forms containing input fields and other widgets (scrolling lists, checkboxes, dropdown lists, buttons, etc.). The permit forms are arranged as a series of tabbed menus that are analogous to RMPP screens. This feature makes for a smooth transition from RMPP to RMMS because each tabbed menu contains the same information as the corresponding RMPP screen and because the ordering of the tabs at least implies the same screen by screen work flow as RMPP.

RMMSWin makes heavy use of standard drop down menus, information displays in a tabular format, and several methods to sort and search for information. It also supports a shortcut bar that can be customized by system administrators to provide quick access to various portions of the application.

1. Permit Management Module – Used for modifying an existing permit or creating a new one. Various search methods for permits are available including searches by permit number, permit holder, or primary contact. This is where all aspects of a permit are entered and maintained, and where permit printing is controlled.

2. Master Module – Used to maintain master tables, including those downloaded from DPR such as the registered product database that is retrieved nightly by an automated web process. From this module, administrators have the ability to manage and augment the following tables:
    - EPA Product table
    - Pesticide ingredient table
    - Commodities table
    - Permit conditions table

- County Ag Department headquarters and district office addresses
- Cross-reference between ingredients and products

This module also manages replication services from the central RMMSWeb web server out to county servers. All of a county's permit data, PUR, and the associated databases listed above are maintained as synchronized copies on both the county server(s) and the central RMMSWeb server maintained by SBS. "Replication" is the name of the process that manages synchronization.

3. Permit Conditions – Commonly used conditions can be stored in a master repository where they can easily be searched and retrieved to place on permits when appropriate, or custom conditions can be placed on a permit and optionally saved to the repository for use elsewhere . Conditions can also be defined to automatically apply to any permit with specific pesticides. Condition text can be entered using a rich text format in order to provide special text formatting (bold, underline) on the printed permit.

4. Master Contacts Repository – Used to manage PCO's, PCA's, QAL's, etc. Recently DPR has provided an electronic copy of the official registrations which is synchronized with RMMS. Web user logins are also managed here since only those contacts associated with a particular permit can view it or enter PUR/NOI for it from RMMSWeb web site.

5. Web Administrator - Administrative interface with controls to manage the following aspects of the RMMSWin and RMMSWeb applications:
    - Control how information is shared between the RMMS web server, DPR and the county servers. Several replication modes are supported, including manual start, periodic start and a scheduled start for automation.
    - Advanced tab providing diagnostic routines for debugging purposes.
    - Transaction (login) logging and other event notifications such as replication status and web submission statistics for PUR/NOI.
    - Automated printing of all NOI and any PUR with validation exceptions.
    - Data export facility.
    - RMMSWeb input form preferences.

RMMSWeb application description:

RMMSWeb is an Internet application used mostly by growers and small Pest Control Businesses (PCBs) to browse permit information (including submitted PUR) and for PUR/NOI data entry. The URL is www.RMMSWeb.com which directs users to a page listing links for each RMMS county. After clicking on a county a login form appears with prompts for a user name, password, and the reporting year. Authorized users can browse any permits they are associated with and submit PUR/NOI using a form interface. PUR are validated for: permit number, site number, and commodity code. This data validation process has substantially reduced county staff time devoted to error checking.

PUReData application description:

PUReData is a web services interface designed to receive PUR records submitted by PCBs or growers using GMSAs (e.g. Agrian, TigerJill, LadyBug) and perform real-time error checking on these records . GMSAs can also pull permit information electronically from the PUReData interface. PUReData is the RMMS functional equivalent to CEDTS, and while the PUReData format provides backwards compatibility with CEDTS, it uses XML and has been modified with additional layout and field requirements.

Framework/Architecture

RMMS software code is written in Visual Dataflex with a custom driver connecting to the Microsoft SQL Server database. Implementing SQL Server with RMMS version 4.0 was a major evolutionary step because the original RMMS database was virtually identical to the DataFlex flat embedded file database developed for RMPP.

The RMMS desktop application and associated database are capable of running in several network topologies depending on the county's supported architecture and infrastructure. The application and database can be run on the same machine, on two separate machines in a client/server environment, or running under Microsoft Terminal Services and Citrix.

Replication between the central RMMSWeb server (currently co-located at a hosting facility) and the servers in each RMMS county employs a custom built synchronization process, though it is anticipated that data synchronization may eventually take advantage of inherent capabilities within SQL Server.

3.B Planned Upgrades and Enhancements

RMMSGeo is a GIS module that will run within a web browser embedded in the RMMSWin desktop application. The GIS module will have a mapping window and display controls to view digitized field boundary (site) polygons, aerial imagery, and other GIS layers of relevance. Editing tools will be included for modifying or adding new field polygons and linking these polygon features to site records in the permit database. All counties using RMMSGeo must upgrade to SQL Server 2008, because it contains native geospatial data types to support GIS functionality. It is yet to be determined how web servers for the GIS web application and spatial data should be deployed for optimal performance. It may be possible to distribute these servers regionally and not need to have them deployed in every county. The RMMSGeo application is also designed to run from a standard web browser completely separate from RMMSWin on the desktop.

SQL Server Reporting Services will be replacing several less efficient query and report generation tools now in use, including Crystal Reports, Visual Dataflex reporting system, and RMPP legacy reports. This will improve performance by redirecting the processing load to the SQL Server database server, it will have a more intuitive interface, and it will support database search expressions consisting of logical and mathematical operators that are either user defined (sometimes called "ad hoc") or predefined and stored in the system for regular and repeated use.

Multi-year database support will enable multiple years of permit and PUR data to reside in the same database, thus freeing users from having to choose a year when first entering the application.

All of these enhancements are scheduled for Beta release with RMMS v.5.0 later this year.

3.C Vendor Profile

Streamline Business Solutions Inc. (SBS) is located in Long Beach, CA and was established almost 15 years ago. Before getting its first contract to develop RMMS in 1999, the company had several clients and it specialized in delivering private sector business IT services and products. RMMS quickly became SBS's largest project, with deployments in nine counties at first, then 15 after a few years, and deployment is anticipated to plateau at 28 counties by next permit season. The company is anchored by brothers Richard and James Miller, and currently has three other employees, some of whom may be part time.

4. AgGIS Overview

4.A Current Configuration and Status of the Program

Like RMMS, AgGIS is actually a suite of integrated applications, including:

AgGIS – a desktop database and mapping application
Permit6 – a database management application
CEDTS – a web services interface to support electronic submission of PUR and NOI
Permit6 Web – a web site for online PUR and NOI data entry

Modules/Capabilities:

The AgGIS application was designed and is supported by Patrick Way Consulting, Inc. (PWC) in Chico, CA. AgGIS integrates spatial and temporal awareness and analysis into the permitting process. The program is designed, among other things, to provide agricultural biologists and growers with a simplified method for evaluating potential site-specific environmental impacts during the permit issuing process. Access to spatially accurate environmental data and impact analysis tools can improve county biologists' ability to incorporate site-specific pesticide use conditions into restricted materials permits.

The AgGIS application includes these modules and capabilities:

1. Grower Manager – Includes tools and user interface screens to process Restricted Materials Permits:
    - Create new permits
    - Update and renew permits from previous year to current year
    - Modify permits during the current year if certain changes are made, such as: adding a new site, adding a commodity, adding a pesticide, adding a "contact" (PCA, PCO, etc.)
    - Manage pesticides database
    - Manage Master Contacts List

2. Conditions Manager - Manages pesticide use conditions included in permits. Conditions may be defined for the following situations:
    - Conditions applied automatically based on permit type.
    - Location specific conditions associated with a specified Township, Range, Section grid location.
    - Location conditions also associated with specified pesticides
    - Location conditions associated with a specified distance to a specified crop
    - Location conditions associated with a specified distance of a specified geographic feature (e.g. a sensitive facility)

3. Map Controller - An interactive map window and toolbar with the following features:
    - Select a feature from the selected layer in the Layer List on the mapping toolbar
    - Query for information about a selected feature
    - Clear the selected feature from memory

- Pan and Zoom the map
- Create, Edit and Modify feature geometry or attributes

4. License Manager – used to manage records for PCOs, PCAs, Pilots, Dealers, etc.

Permit6 is a comprehensive permitting and use reporting application that is used by itself as a standalone application only in Merced County. In other AgGIS counties it is used primarily for PUR data entry, to view and interact with data flowing through CEDTS, or as an alternative means to access the database Permit6 shares with AgGIS.

Permit6 components that are currently used in AgGIS counties include:

1. Database structure for Permits, Licensed Entities, Field Sites, Pesticide Use Conditions, Sensitive Receptors, EPA Registration, PUR, and NOI.
2. PUR and NOI desktop data entry interface
3. PUR and NOI web data entry application
4. PUR data validation application
5. Grower Permit Access Web Application

Most other Permit6 components are used only in Merced County

CEDTS

CEDTS was automated in 2000 by Mike Quinn and has essentially been taken over by Merced County so that DPR now has nothing to do with supporting it. CEDTS is used to validate and transfer PUR and NOI submitted by RMPP, Permit6, and the various GMSA providers. All of these automated systems use the CEDTS server at Merced to accomplish these tasks. Portions of the Permit6 database stored on each county's local server(s) are replicated via Apache to the CEDTS server to ensure synchronization with permit data.

Framework/Architecture

The AgGIS application is based on a client/server architecture whereby a suite of application software is installed on client (desktop) computers and a server houses the underlying database. The AgGIS desktop application is developed on the Java platform via the NetBeans development program and utilizes open source components. The database is provided by PostgreSQL which has been spatially enabled with a PostGIS extension to provide spatial data types and functions. The mapping interface uses GeoTools for spatial data viewing and editing. All of these components are open source.

The AgGIS server(s) installed in each county have a Linux operating system which is custom configured with Slackware 12.1. It has no graphical user interface (administrative functions are completely command line driven) and minimal software packages installed. This is a local dedicated application database server that responds to SQL (Structured Query Language) commands generated by client computers running the AgGIS v3 desktop application. The server can be included in daily backups on a Windows network via Samba, and it also uses Apache to replicate some of the permitting data (for use reporting verification) with the centralized CEDTS server in Merced County. Aerial mapping imagery

is not served from a file but processed via AgGIS v3 into the PostgreSQL database. An iptables firewall is configured onsite to only allow access to needed ports and clients.

This system requires a modern computer network serving every Ag Department. Computers connected to the network should have the processing power of a modern off the shelf computer and have at least 1024 Mb of memory.

It is recommended that counties with multiple district offices have a Linux AgGIS server in each district. All servers within such counties are configured to replicate (maintain synchronization) with each other and maintain copies of database backup files. This offers another level of redundancy so that in the event one office server is down the server(s) in other office(s) can still be accessed remotely. This arrangement also synchronizes all servers in the county to ensure that backup files are stored in multiple locations.

Network infrastructure can be a limiting factor for accessing data on any AgGIS server. AgGIS is most efficient to use when the client machine is able to ping (send a message and receive a response from) the server in less than 10 milliseconds. Ping times greater than 10 milliseconds affect the GIS imagery layer display, and the speed at which spatial memory data stores are initialized and refreshed.

The Permit6 desktop application was developed by Mike Quinn and the source code is written in Perl, a scripting language that can be run on a number of operating systems. The underlying object relational database is PostGreSQL and is shared with the AgGIS desktop application.

Design History of the Program

The first pesticide permitting version of AgGIS (version 2) combined the RMPP DataFlex permitting database with ESRI's ArcView 8.x and was programmed with VisualBasic and ArcObjects. AgGIS v2 was eventually deployed in 13 counties. In 2005 a grant was obtained from the State Water Resources Control Board to upgrade the program. Rather than create a new permitting database structure from scratch, the decision was made to use the Permit6 PostgreSQL permitting database developed by Mike Quinn in Merced County. Permit6 tools are written in the Perl scripting language, for which a modern GIS toolkit is not available. Therefore, to accommodate geospatial functions and mapping Patrick Way first worked with Mike Quinn to translate Perl code into Java, and then coded a new permitting interface and PostGIS mapping module to work with the Permit6 database.

Permit6 is a mature application but it continues to evolve in small ways. Counties that have implemented both AgGIS and Permit6 only use a subset of the features within Permit6, generally limited to:

- PUR data entry
- NOI data entry
- Integration with third party software through CEDTS.

The combined AgGIS/Permit6 solution is a work in progress that currently lacks cohesiveness in terms of usability and underlying technology. Both applications share the same database

platform and schema, but the technology used to implement their respective desktop applications is entirely different. Permit6 uses Perl for its user interface and business logic while AgGIS uses Java and other toolkits for this purpose. Once AgGIS is "completed" it will incorporate all remaining Permit6 functionality and allow Permit6 to be retired, thus achieving the level of cohesion necessary to provide users with a consistent interface across the full range of functionality and also to reduce support and development costs. The next major step in that direction will be an AgGIS interface for PUR data entry.

In terms of GIS design, GIS layers are spatially indexed and validated as spatial data are created and edited. At this time the process is a simple re-cache of the entire data store (all data reloaded at once, not just the changed records). A user on a machine that is remote from the AgGIS server can review spatial data, but may become impatient while trying to add or modify features. This will be improved with the next version where it will be possible to modify individual records within the memory store.

The aerial photo image catalog is configured to send raster data to clients at variable resolution so that the volume of transferred data is between 1 and 10 Mb. This threshold was determined by ergonomic testing which showed that the time it takes to move 5 Mb of data from the server to the client is the average time a biologist will comfortably wait for images to draw. The system is currently configured to connect to a separate image catalog. It is possible that a remote office needing to manage spatial data can set up an inexpensive server configured with an image catalog so that their images are on their local area network, thus eliminating the need for a more expensive fully configured AgGIS server.

4.B Planned Upgrades and Enhancements

Immediate plans are to complete the AgGIS PUR data entry module by end of June 2009 and make other finishing touches on the reporting module that will allow retiring these portions of Permit6 by the next permitting season. After that, efforts will be focused on making sure the system is stable and ready for the next permit season, which includes understanding and addressing user bug fix and modification requests.

Medium term plans are to "complete" both the desktop and web applications by cleaning up the user interfaces and ensuring that all code is immaculate, fully documented, and has standards in place so that other developers can step in to help keep the product current. Since the code is open source, the intent is to cultivate developer resources from within the user community.

Potential GIS enhancements include:

- More robust spatial analysis tools such as buffer overlays and rules to assign pesticide use conditions automatically based on spatial interactions among various features.
- Allowing direct connections to external spatial databases, such as GIS enterprise layers in counties. Currently, any spatial data displayed in AgGIS first needs to be exported to the PostgreSQL database.
- Add various editing and measurement tools.

- Improve the symbology editor to allow features to be displayed with symbols representing different attribute values.
- Enable map display capabilities on the web so that growers can see maps of their sites.

Query module to support user defined database searches and reporting.

4.C Vendor Profile

Patrick Way was an agricultural biologist in Glenn County in 1999 when he started programming with GIS (ArcView 3.2) to create a tool dubbed AgGIS v1 that managed agricultural land use data for the Open Biomass Burn Program in the Sacramento Valley. Pat left Glenn County to start a consulting business in Chico, CA called Patrick Way Consulting, Inc., (PWC) where he created AgGIS v2. The company now has two full time and two part time employees, and has had as many as five employees at once including contracted personnel.

Other significant contributors to the AgGIS/Permit6 program include Michael Quinn, an IT deputy with the Ag Department in Merced County, and Steven Anderson, an employee with the Yuba County Ag Department.

5. User Needs & How Systems Address Them

This section provides an overview of user needs and how they are tied to productivity, accuracy, good record keeping, timeliness, diversity of needs among different counties, and the potential for broader integration with other Ag Department business functions. The specific capabilities discussed in each subsection were picked based on user input indicating importance for core regulatory functions as well as a means to help differentiate between the existing systems.

Explanation of Survey Results

Most of the subsections below include online survey results indicating how important specific application capabilities are to users and how well users believe their current system meets expectations for these capabilities. This was not intended to be a scientific survey and potential biases can be introduced either inadvertently - by responders interpreting questions differently; or intentionally - if responders do not answer objectively. Also, the sample size is relatively small.

Therefore, making hard quantitative judgments based on the summarized results is not advised. Instead, results should be interpreted for their illustrative value showing both similarities and differences among a broad cross section of this diverse community of users. One of the more striking results is the consistency with which users rated the importance of most features/capabilities regardless of which system they currently use. That consistency lends credence to responder objectivity - otherwise people might have tried to downplay the importance of things their system doesn't do or that it doesn't do well. Besides encouraging responders to be objective, two other measures were taken to control for bias:

1. All ratings questions included a "Don't Know" choice for those who either didn't understand the question or had no opinion.
2. When a county had more than one person responding, results from all of that county's responders were averaged (after excluding "Don't Know" responses) to compute a single response from each county. Three counties had six responses each, three had three each, eight had a pair of responses, and the rest had one response each.

The table below breaks down the number of responses by system:

	AgGIS/Permit6	RMMS	RMPP
Counties:	19*	27	8
Individuals:	27	47	10

* El Dorado/Alpine and Plumas/Sierra each had a single combined response, so a total of 56 counties were represented in the survey.

A copy of the complete online survey form can be found in Appendix B

5.A System Performance and Stability

Description

During normal operating conditions, system performance is based on application responsiveness. Slow or delayed responses can be caused by hardware limitations on either the client or server side or in the network itself. Problems due to deficient computing infrastructure are exacerbated as the number of simultaneous system users increases. Slow performance can also be caused by inefficient software code, which typically affects particular functions only and does not usually lead to general slowdowns.

Software code is also the most likely source of more serious problems such as system hangs, lockups, or crashes. In a hang or lockup, the application becomes unresponsive and must be closed and restarted. In a crash, the application spontaneously closes by itself.

Why it is important

There is no greater annoyance for computer users than an application program that is slow or unstable. In fact, most users consider responsiveness to be more important than ease of use because ease of use is no good if the system responds unpredictably. This is even more critical when system lockups or crashes occur with any frequency especially if these cause any work to be lost when the application must be forced to terminate.

Implementation in RMMS – current and planned

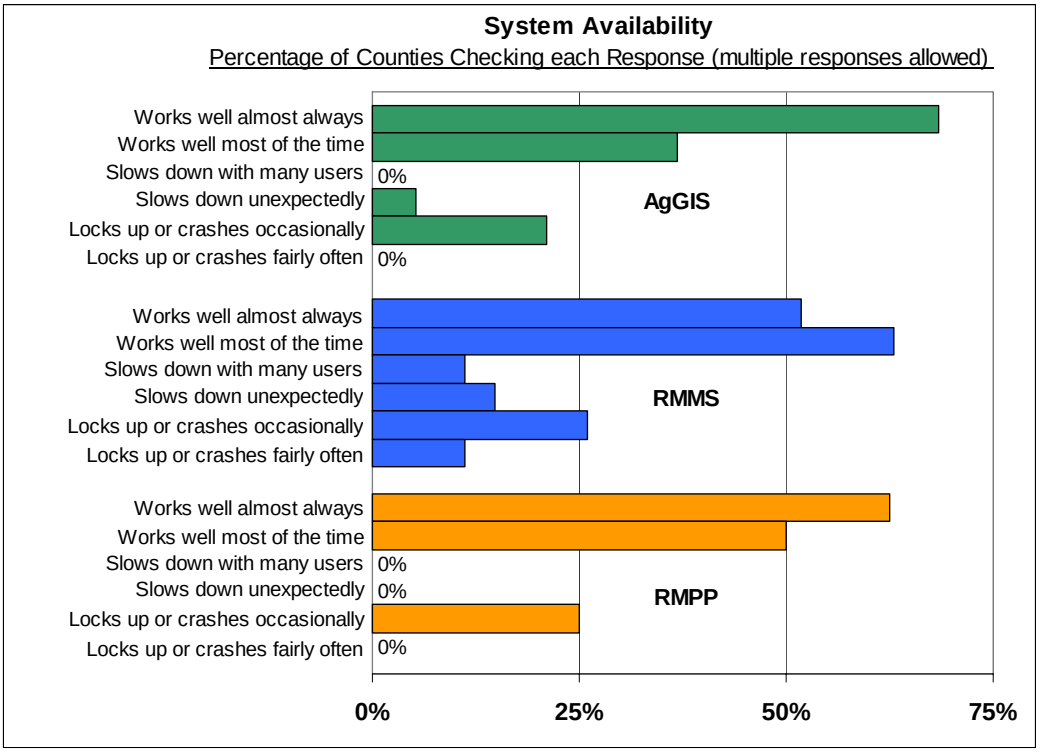
The specifications for RMMS servers in counties call for relatively mild performance since the user load and volume of data transfer is generally light. Also, counties with multiple district offices still typically share a single county server. Therefore, during peak permit renewal season the limits of servers and networks can be tested when high numbers of simultaneous users are seeking access. The most frequently reported performance issue with RMMS is the frequent delay users experience when printing (or print previewing) permits. This may be an issue with the Crystal Reports printing engine, and work is underway to improve performance by using SQL Server Reporting Services to transfer report generation processing onto the database server.

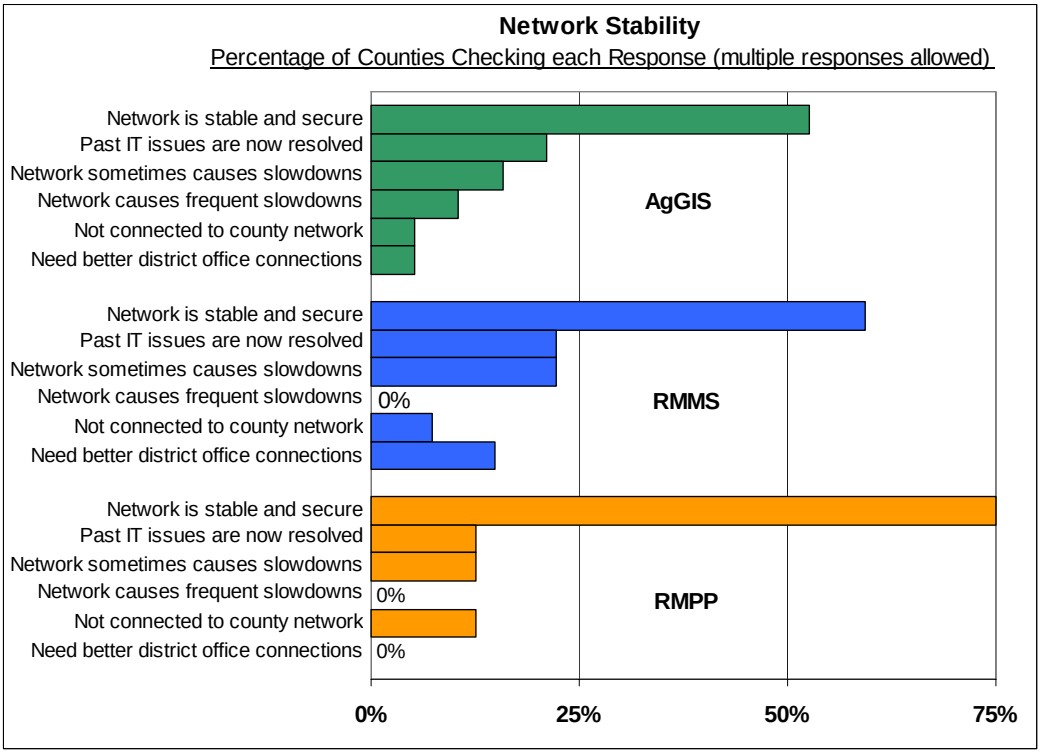
Implementation in AgGIS – current and planned

AgGIS specifies a more robust server due to the extra volume of data transfer capacity needed to feed spatial (GIS) data to clients. On a fast network, these servers appear to be more than adequate. Pixel resolution of aerial imagery is automatically adjusted to avoid transferring so much data that performance is impaired, which is especially useful on slower networks. Also, AgGIS recommends placing a server within each county office where the application is accessed, which effectively overcomes any limitations in the networks connecting these offices.

User Impressions

Answers to online survey questions pertaining to both pesticide IT system and network performance are reported in the following charts.





5.B Integrated GIS

Description

Almost everyone in Ag Departments has at least a rudimentary understanding of Geographic Information System (GIS) technology and how it's used. Somewhat less well understood are the differing degrees to which GIS can be integrated with other information systems, including pesticide IT. The potential scope of GIS usage in Ag Departments is quite large, and one of the most striking examples of diversity in technical implementation among counties lies in how each one employs GIS tools and data. It is so diverse, in fact, that it's difficult even to define a limited number of general categories into which most counties fall.

For simplification purposes the discussion is confined to the integration between field locations and field site records stored in the permit database. There are five currently observed methods of integration for this particular task:

1. **Full Integration:** Mapping and permit interfaces are contained within the same application, and both GIS field boundary polygons and permit data reside in the same database. Simple mapping interface with query and editing tools requiring little or no specialized GIS training. Production of site maps for permits is fully automated. This is the AgGIS v3 configuration, but it still isn't considered to be "perfectly" integrated because external data layers such as those maintained in a county's enterprise GIS library cannot be viewed or interacted with unless they are manually converted and exported to the AgGIS spatial database.
2. **Semi-Full Integration:** Mapping and permit interfaces are in two separate applications, most commonly ArcView for mapping and RMMS (or AgGIS v2) for permits. Spatial and permit data reside in different databases. GIS field boundaries are digitized and maintained as a shapefile (or geodatabase feature class) by GIS technicians and the attribute linkage between field polygons and permit site records is maintained by an established ODBC (Open Database Connectivity) connection between the GIS and permit databases. Site map production for permits could be fully automated but printouts are usually created manually by GIS personnel.
3. **Manual Integration:** Same as #2, but no ODBC connection, and attribute linkages between field polygons and site records are maintained (coded) manually by GIS technicians. Site map printouts for permits are created manually from the GIS and in some cases polygons and/or site labels are drawn in by hand.
4. **Partial Integration:** Same as #3, but field polygons either don't exist or are not kept up to date. In some cases, a more generalized surrogate for fields (e.g. parcels, sections, or lat/long points) is stored in the GIS with manual linkage to the permit database. This arrangement is only useful for performing spatial searches to find the approximate vicinity of field sites and creating printed templates on which field boundaries and site labels are drawn by hand.
5. **No GIS:** No GIS whatsoever, although commercial Internet mapping applications (e.g. Google Maps, MapQuest) may be used to create printed templates on which some fields and site labels are drawn by hand. Other site maps may be drawn by hand from scratch, on photocopies of parcel maps, or supplied by growers.

Note that counties employing methods #2 through #4 often use a variety of methods to produce permit site maps (including the hand methods described in #5) depending on the individual permit inspector's familiarity with mapping tools and on the availability of spatial data. The diversity of map production methods is shown in the table below.

County Name: AgGIS County RMMS County RMPP County	**Percentage of Permit Site Maps produced using each of the following methods** (Only counties responding to this question are included. Reflects methods used during most recent permit season, which may differ for the current season in counties transitioning from RMPP)						
	Permit System GIS	External GIS	Hand drawn on GIS Template	Grower Maps	Hand Drawn on Web map	Hand Drawn on photocopy map	Hand Drawn only
Amador	5	75		10		10	
Butte		100					
El Dorado/Alpine	100						
Glenn	100						
Humboldt	20			75		5	
Imperial				100			
Lake	1		97	2			
Madera	99			1			
Nevada	100						
Placer	100						
Sacramento		75	20	5			
Sutter	99			1			
Yolo	100						
Yuba	100						
Napa	90		10				
Solano	100						
Merced				60	30	10	
Alameda				5	5	45	45
Calaveras				90	10		
Contra Costa		50	1	4	43	2	
Fresno	10	30	20	20	10	5	5
Inyo				5	95		
Kern		100					
Kings			100				
Lassen				90	9	1	
Marin		90		10			
Mono				5	95		
Monterey				80	20		
San Bernardino				40	5	55	
San Diego		99		1			
San Joaquin		100					
San Luis Obispo		100					
San Mateo				15	85		
Santa Barbara		100					
Santa Clara			100				
Shasta		40	10	40		10	
Sonoma		85	10	4		1	
Stanislaus		100					
Tehama			45	35	10	10	
Tuolumne		10	5	50	5	30	
Ventura	5	5	10	60	10	10	
Colusa				45	50	5	
Del Norte				70	10	20	
Mariposa				100			
Riverside				25	5	70	
San Benito			5	10	5	80	
San Francisco					50	50	
Santa Cruz		100					

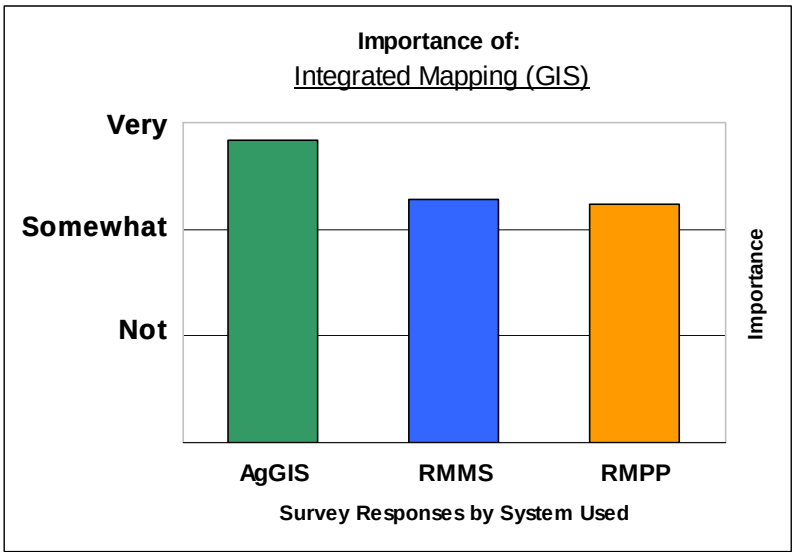
The next table contains survey responses on field site information.

County Name: AgGIS County RMMS County RMPP County	Approximate # of Fields/sites	Are any field boundaries Digitized in a GIS?	Estimated # of annual edits to Fields/sites
Amador		Partial Only	
Butte	7200	Yes - Complete and Updated	
El Dorado/Alpine	601	Yes - Complete and Updated	100
Glenn	4598	Yes - Complete and Updated	200
Humboldt	5000	Partial Only	5
Imperial	10000	Partial Only	10000
Lake	636	Partial Only	630
Madera	5000	Yes - Complete and Updated	250
Nevada	250	Partial Only	40
Placer	700	Partial Only	20
Sacramento	4000	Yes - Complete and Updated	2000
Sutter	6000	Yes - Complete and Updated	1000
Yolo	10000	Yes - Complete and Updated	33
Yuba	1396	Yes - Complete and Updated	150
Napa	3592	Yes - Complete and Updated	25
Solano	3657	Yes - Complete and Updated	1800
Merced	12300	Partial Only	3
Alameda	4000	Partial Only	1000
Calaveras	1900	No	100
Contra Costa	2159	No	20
Fresno	65000	Partial Only	50
Inyo	250	No	5
Kern	13200	Yes - Complete and Updated	20
Kings	8200	Partial Only	5500
Lassen	1300	No	500
Marin	68	Yes - Complete and Updated	5
Mono	75	No	75
Monterey	32000	Partial Only	32000
San Bernardino	1800	No	
San Diego	7500	Yes - Complete and Updated	250
San Joaquin	17000	Yes - Complete and Updated	10000
San Luis Obispo	4191	Yes - Complete and Updated	2515
San Mateo	606	No	0
Santa Barbara	2100	Yes - Complete and Updated	500
Santa Clara	2540	Yes - Complete and Updated	200
Shasta	2100	Yes - Complete and Updated	500
Sonoma	4269	Partial Only	750
Stanislaus	12426	Yes - Complete and Updated	1500
Tehama	2301	No	1000
Tuolumne	2000	No	1500
Ventura	8500	Yes - Complete and Updated	400
Colusa	7025	No	1000
Del Norte	130	No	130
Mariposa	120	No	120
Riverside	9000	No	3000
San Benito	5000	No	1500
San Francisco	0	No	8
Santa Cruz	2500	Yes - Complete and Updated	300

Why it is important

GIS use and integration affects the efficiency of business processes used to comply with regulations. First and foremost, a well integrated GIS can boost productivity by automating what can be a very time consuming part of the permit drafting and evaluation process. Second, the ability to easily retrieve and analyze information about crops and pesticide use on properties adjacent to one another (but on separate permits), as well as spatial locations of other sensitive environmental and cultural features would appear to contribute significantly to the overall program's functional equivalence with an EIR process.

Survey results on the importance of GIS:



Implementation in RMMS – current and planned

Currently, there is no GIS capability integrated with RMMS, but several RMMS counties maintain "semi-full", "manual", or "partial" integration of field boundaries in an external GIS system as described at the beginning of this subsection.

SBS (Streamline Business Solutions) is currently preparing to roll out an Alpha version of the RMMSGeo GIS with the RMMS v5 product release. A demonstration of the in-progress work on RMMSGeo showed that there is still much more work to be done, but the underlying technology is able to support basic map display and navigation functions, field boundary feature editing capability, and displays of sensitive areas and sites with buffer zones in order to visualize situations requiring spatially determined permit conditions.

Right now RMMSGeo only runs as a standalone web browser application separate from the RMMS desktop application. The intent is to merge both applications together into a single deliverable with tight integration between the GIS functions and the existing permitting functions.

The GIS toolset that RMMSGeo is implementing is capable of supporting external sources of GIS information including shape files, web mapping services, Oracle

Spatial, SQL Server 2008 native GIS data types and others – meaning that it's possible to connect with other spatial databases and web services and display these externally maintained layers in RMMSGeo.

Implementation in AgGIS – current and planned

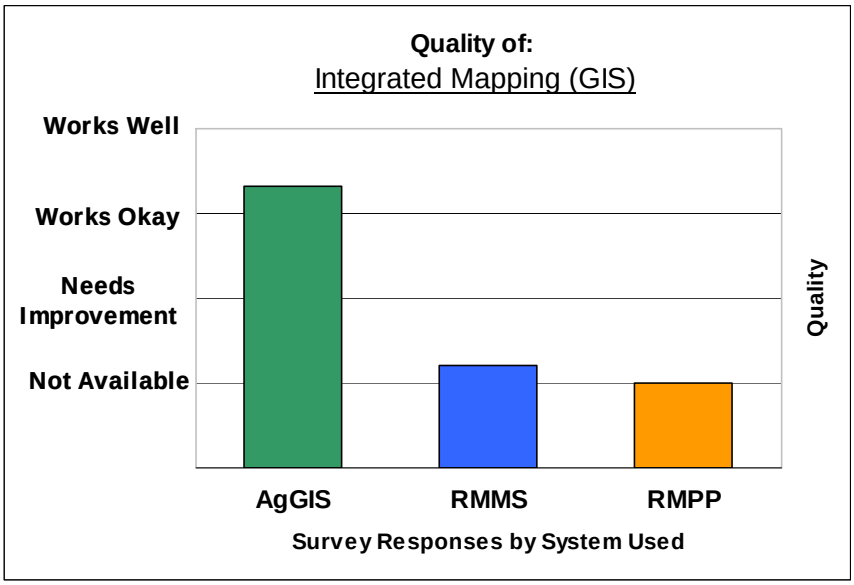
AgGIS has full GIS integration as described in method #1 at the beginning of this subsection. Spatial data resides in the same database as all other permitting and PUR data. Edits to permit data can be performed from either the tabular or mapping interfaces. Map display and spatial editing tools are provided in the Map Controller.

The only aspect of GIS that is not well integrated is the inability to connect with and display GIS datasets external to the AgGIS database. If a county wants to use their own enterprise data layers in AgGIS they must export and load them into the PostgreSQL format, effectively creating a copy of the GIS datasets. This limitation can *potentially* be overcome by configuring the AgGIS "profiles database" to store external GIS database connection profiles that, when combined with specific GeoTools plug-ins, will allow AgGIS to be a consumer of disconnected GIS datasets in their native format. Another potential workaround solution would be to create an ArcObjects extension that would allow ArcView users to view AgGIS spatial data layers.

Other significant future enhancements may include movement toward an "expert system" where site specific pesticide use conditions can be automatically assigned based on spatial relationships to sensitive environmental and cultural features. These same spatial analysis capabilities open up avenues for greater interagency cooperation regarding the management and analysis of a broad spectrum of environmental concerns.

User Impressions

Survey results on the quality of GIS:



5.C Online Submission of PUR / NOI

Description

PUR (Pesticide Use Reports) and NOI (Notices of Intent) can be submitted to counties using three different methods:

1. Hardcopies of handwritten or computer printed forms (hand delivered, mailed, emailed, or faxed)
2. Submitted electronically from users of data entry web sites operated by GMSAs (Agrian, LadyBug, etc.). These submissions pass through CEDTS or PUReData when they are transmitted to counties.
3. Submitted electronically from users of the county data entry web sites operated by RMMSWeb or Permit6 Web.

Why it is important

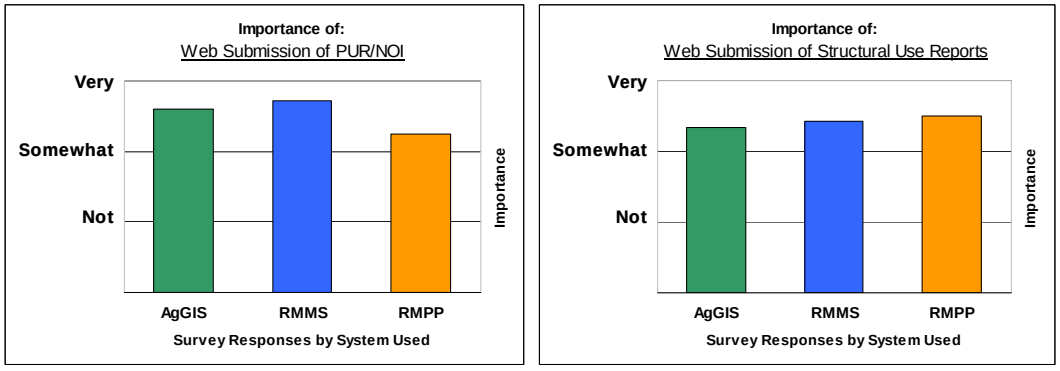
Getting more growers and applicators to submit their own PUR and NOI online saves counties time and money by reducing the burdens of both data entry and error investigation.

The table on the following page contains survey results for total PUR and NOI received, percentages of each received electronically, how counties currently handle NOI, and how they would like to handle NOI if more resources were available for data entry.

County Name: AgGIS County RMMS County RMPP County	Total PUR	Total NOI	* Percentage of PUR from RMMSWeb or Permit6Web:	* Percentage of PUR received electronically – all sources:	Percentage of NOI received electronically:	How much NOI data entry does your county perform?	Would you do NOI data entry if you had sufficient resources?
Amador	352	73	0	5	0	None	Possibly
Butte	72000	4500	30	30	0	None	Possibly
El Dorado/Alpine		228			0	None	Possibly
Glenn	22953	3674		15	0	None	Definitely
Humboldt			0	0	0	None	Possibly
Imperial	60000	3700	5	0	0	None	Possibly
Lake	6900	62	5	0	0	None	Possibly
Madera	60000	2500	0	10	0	All	N/A
Nevada	250	75	0	0	15	None	Possibly
Placer	600	120	0	1	0	All	N/A
Sacramento	41800	22058	15	15	1	None	Possibly
Sutter	20500	5549	1	39	0	All	N/A
Yolo	25667	3734	0	33	0	All	N/A
Yuba	8156	1500	1	32	0	None	Yes, definitely
Napa	28749	198	0	25	0	All	N/A
Solano	17487	1408	0	20	0	All	N/A
Merced	75000	2700	1	11	0	None	Possibly
Alameda	725	240	0	0	0	None	Possibly
Calaveras	580	84	2	1	1	Some	Definitely
Contra Costa	7707		1	1	0	None	Possibly
Fresno	298000	6000	80	10	40	None	Not interested
Inyo	15	24	0	0	0	None	Possibly
Kern	125000	9918	0	10	0	None	Not interested
Kings	53820	5000	10	27	10	None	Not interested
Lassen	457	377	0	0	0	All	N/A
Marin	500		0	0	0	None	Possibly
Mono	10	7	0	0	0	None	Possibly
Monterey	360000	20000	0	35	0	None	Not interested
San Bernardino	5000	1575	0	0	0	All	N/A
San Diego	75000	1100	47	2	1	None	Possibly
San Joaquin	90000	6000	16	23	10	None	Definitely
San Luis Obispo	71345	0	8	42	0	None	Possibly
San Mateo	1288	425	5	48	0	None	Possibly
Santa Barbara	115582	0	13	44	0	None	Not interested
Santa Clara	25000	1540	5	10	0	None	Not interested
Shasta			50	0	0	None	Possibly
Sonoma	55000	350	5	31	0	None	Possibly
Stanislaus	100229	100229	50	52	5	Some	Definitely
Tehama	12516	2000	17	30	2	All	N/A
Tuolumne	2000	25	0	0	0	None	Possibly
Ventura	75000	4000	5	35	0	None	Yes, definitely
Colusa	27277	2230	0	72	15	None	Possibly
Del Norte	75	130	0	0	0	All	N/A
Mariposa	300	8	0	0	0	None	Possibly
Mendocino						None	Possibly
Riverside	60000	1000	0	20	0	None	Possibly
San Benito	34000	1880	0	29	0	None	Possibly
San Francisco	2580	150	0	0	0	None	Definitely
Santa Cruz	21000	1030	5	5	0	None	Not interested

* Some responders found the survey wording for these two questions confusing. The "all sources" column is the percentage of total PUR that is submitted electronically from all web tools - both from GMSA providers and permitting/reporting web applications. When the numbers in both columns are equal, it is *supposed* to mean that *all* electronic PUR come from either RMMSWeb or Permit6Web.

Survey results on the importance of electronic PUR/NOI submissions:



Implementation in RMMS – current and planned

RMMSWeb is an easy to use web data entry tool for PUR and NOI. Users must first obtain login account access from the county RMMS administrator, and after that they can use RMMSWeb to view all permits and PUR with which they are associated and submit both PUR and NOI on the web. Submitted records are run through validation checks and either accepted or flagged as "in mitigation" if any errors are found. Currently, Ag Department users cannot correct faulty PUR records by editing them. Instead, faulty records must be deleted and recreated.

Electronic PUR/NOI submitted from GMSA users are transmitted to the PUReData web service where they are validated and faulty records are sent back in real time to the GMSA web site so that users can correct the errors and resubmit.

Electronic NOI and faulty PUR sent from either RMMSWeb or GMSA web sites can be automatically redirected to a specific Ag Department printer or fax machine because most counties prefer this to avoid having these time sensitive documents accumulate invisibly inside the computer network.

Future plans include changes to the web interface to use more modern "Web 2.0" technologies such as AJAX in order to provide a cleaner interface that would allow the PUR/NOI web form to closely mimic the appearance of the standard paper form. Also envisioned is more extensive and faster field level (as opposed to form level) validation so that each PUR line item is validated when an entry is made instead of waiting until the entire form is submitted.

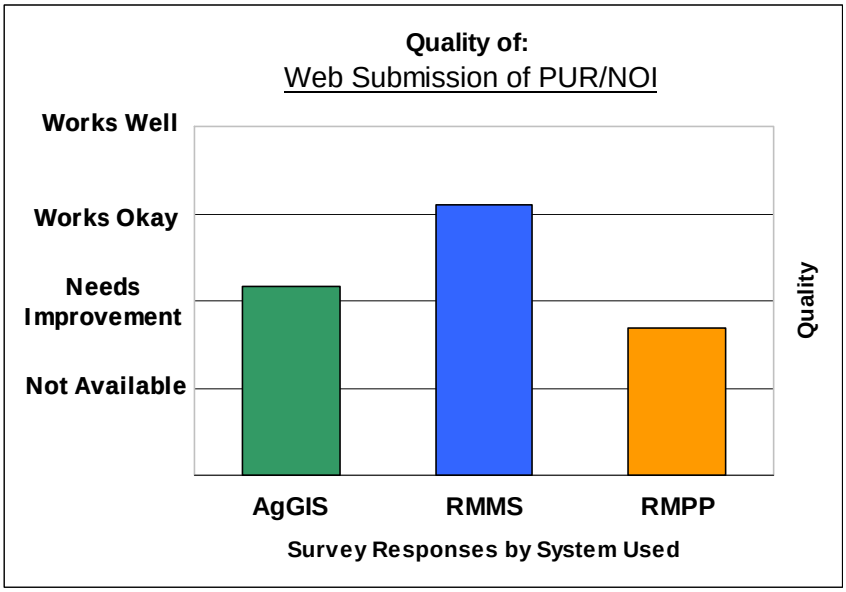
Implementation in AgGIS – current and planned

The Permit6 Web application accomplishes all of the same basic functions as RMMSWeb, and CEDTS accomplishes the same functions as PUReData. Future plans are to clean up the user interface and make it more user-friendly.

User Impressions

The bulk of online submissions in most counties come from GMSA web tools via CEDTS or PUReData. Some GMSA tools are widely regarded to have superior usability compared to either RMMSWeb or Permit6Web. Even so, several counties have enjoyed considerable success increasing online submissions with outreach programs focused on growers/applicators. These counties have proven that pesticide users are receptive to the convenience of submitting reports online, and that outreach is necessary to educate growers/applicators about the Internet tools that are available and how to use them.

Survey results on the quality of electronic PUR/NOI submission tools:



5.D PUR Data Entry and Quality Control

Description

PUR errors can occur during data entry at Ag Departments or when submitted by growers/applicators using web tools. Errors can be detected at four different places in the PUR workflow:

- Individually during PUR entry on Ag Department desktop applications
- Individually during online PUR entry
- In bulk after entry or transmission to the county
- In bulk after transmission to DPR

Error detection on individual records as they are entered provides instant feedback so that users themselves can make corrections right away. When multiple records are processed in bulk, someone has to go back and investigate all of the rejects. This creates a delay of anywhere from days to months between the time a faulty PUR is created and when it is finally investigated. Delays are longest for records transmitted to DPR that are then "kicked back" to counties after failing DPR verification tests.

Different verification tests are applied in each situation. For example, tests for actual violations (e.g. off-label pesticide use or inappropriate quantities applied) are not performed at the moment of an online submission because that might create an incentive for the grower/applicator to falsify the report.

In addition to error detection, a robust QA/QC process should also include tools to fix correctable PUR errors efficiently. This is especially true in a system like this where the vast majority of rejects are caused by human error or system technicalities and not by actionable regulatory transgressions.

Why it is important

A great deal of time is spent investigating and correcting faulty PUR. Effective automated methods to detect and correct errors allow investigators to spend less time on data clean up and more time investigating suspected violations. Long delays between faulty PUR creation and QA/QC rejection complicate both error investigations and possible enforcement actions. Therefore, it is especially important to develop and run robust tests to catch errors before PUR are transmitted to DPR. The table below shows an increasing trend in total PUR errors detected by DPR over the past few years:

PUR Errors				
Year	Total Records	Records with Errors	Percent with Errors	Total Errors Generated
2004	2,589,086	57,032	2.20%	58,004
2005	2,756,016	90,594	3.30%	95,471
2006	2,825,613	129,133	4.60%	134,309
2007	2,725,541	128,311	4.70%	133,275
2008	1,942,353	113,189	5.80%	115,626

No questions were asked in the online survey about PUR QA/QC, but the user community provided an indication of its importance when the RMMS Technical Users Group ranked two requests pertaining to QA/QC on PUR submitted through RMMSWeb as the second and third highest priorities for future program enhancements.

Implementation in RMMS – current and planned

PUR validation rules reside in a single repository that is used to perform QA/QC on PUR submitted electronically or entered into the database from hardcopy forms delivered to Ag Departments. Individual validation rules can be turned on and off depending on the PUR source (RMMSWeb, GMSA web site via PUReData, or in-house data entry on RMMSWin). There are no plans to substantively change the process as it is considered mature and returns good results.

Implementation in AgGIS – current and planned

PUR validation is a Permit6, Permit6Web, and CEDTS function that operates almost exactly the same as it does in RMMS. Individual rules can be turned on and off depending on the PUR source, and the validation rules used are largely the same in both systems.

User Impressions

No data has been found pertaining to the effectiveness of PUR QA/QC. Potentially, a breakdown by county of the PUR errors summarized in the preceding table could offer some insights.

5.E Training, Documentation, Technical Support

Description

Software support serves two basic purposes:

1. Help users learn to use the software.
2. Provide assistance when problems arise.

These functions can be further broken down as follows:

a) Training: Includes on or off site courses, "train the trainers" programs, interactive group or individual web training, video or printed training manuals.

b) Documentation: Online help, user manuals, system administration manuals, error messaging.

c) Technical Support: Answer questions, assist with problems, diagnose and repair broken software (bugs), make changes to enhance performance.

d) User Community Input: Organized groups that share tips and tricks, discuss and prioritize wish lists of program enhancements, perform user customization.

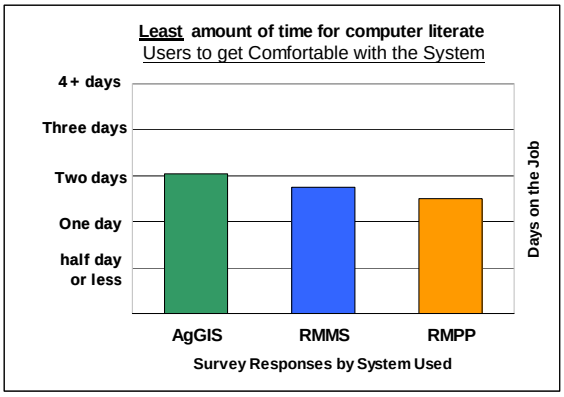
Most of these functions are vendor provided and vendor driven, though some, such as documentation, "train the trainers", and user groups are directed toward giving users tools to help themselves without relying on the vendor alone.

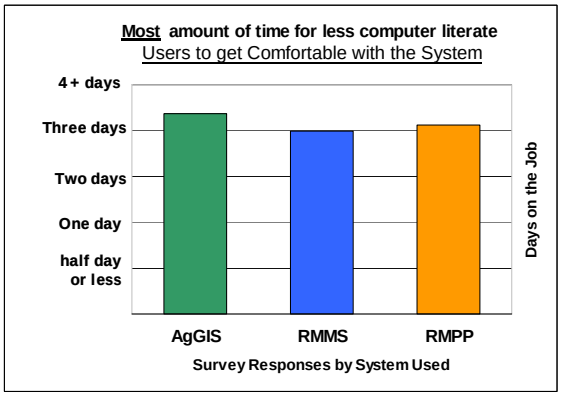
Why it is important

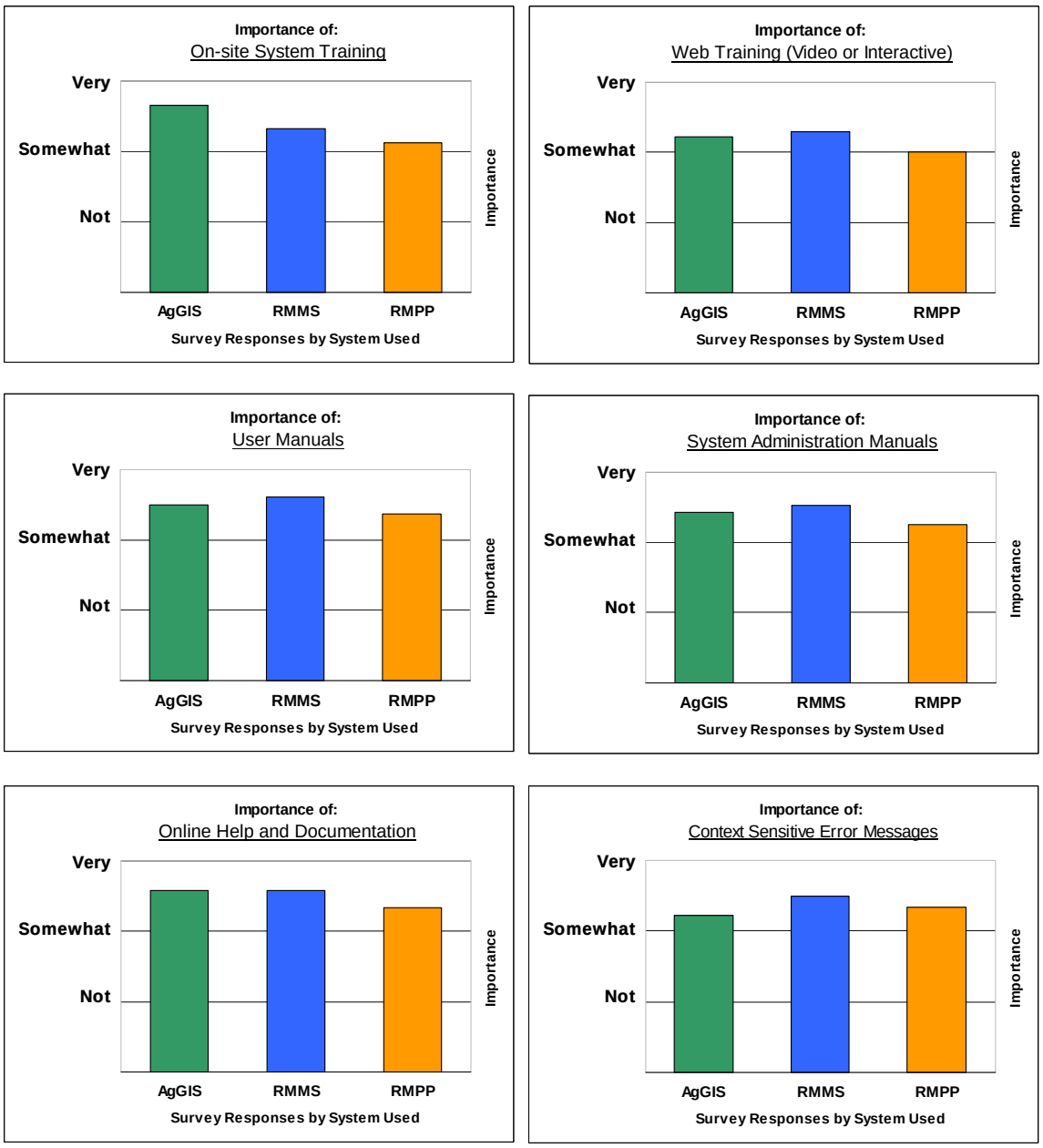
By all accounts both RMMS and AgGIS are easy to learn, so an increased focus on training is not warranted. Even so, users are entitled to program documentation to help them be more self-sufficient and as a resource to discover program features they might otherwise miss. Organized user groups provide similar benefits.

As for technical support, various types of problems crop up with some frequency in both applications, so vendor responsiveness is directly tied to user productivity.

The online survey results summarized in the following graphs show user community views about the importance of several aspects of software support.







Implementation in RMMS – current and planned

Technical Support: Some of the specific technical and user support tools available to RMMS users include:

- "Quick Base" – an online application allowing users to submit problem reports and scan all user reports to look for commonly reported problems. Bulletins from the vendor are posted here to keep users informed about modifications made to resolve issues and about the status of upcoming software releases. Some bulletins direct RMMS administrators to an ftp site where they can download a software patch.

- Phone and email support – users can always call or email to report problems and request help and service. Issues reported by phone, email, and Quick Base are regularly copied to a spreadsheet containing the master list of issues to prioritize and resolve.
- "GoToMeeting" – an online application for communicating with a tech support operator who can remotely see the user's computer desktop to diagnose problems or guide the user through a particular task.
- "SharePoint" – is an online collaboration tool that in the future will take over all of the communications tasks now performed with Quick Base.

Training is usually accomplished in two phases for a new county installation. First, there is some remote advance training of the county's RMMS Administrator using GoToMeeting. These sessions involve going through a checklist of administrative functions and can last three to four hours. A separate administrative training session is performed remotely and covers RMMSWeb use, SQL Server maintenance, database backups, and data replication settings.

Once the RMMS Administrator has the system up and running properly, the next phase is user training conducted on site. These sessions include three to four hours of classroom demonstrations with a projection monitor, followed by a hands-on session of similar length.

Less formal "ad hoc" training sessions are also possible, but the future direction envisioned for these is to hold what is being called "Training Tuesdays" in which relatively short GoToMeeting sessions with an announced agenda and schedule will be held for anyone who wants to log in and participate.

Documentation for RMMS consists of a high level overview document covering the permitting and PUR processes, and a technically oriented help document in HTML that can be accessed by pressing the desktop application's help button. There is no printed documentation for administrative functions. There is some discussion about producing video help files, but no firm plans.

Implementation in AgGIS – current and planned

Technical Support is mainly accomplished by telephone and "GoToMeeting" sessions. Every employee of Patrick Way Consulting is responsible for helping field customer calls and tracking the status of reported issues. Issue tracking recently moved away from informal "white board" notes towards a new system consisting of a simple custom application that logs issues in the PostgreSQL database and will eventually be linked to a menu in the AgGIS interface that allows users to connect with the issues database on the vendor's server (or this server will replicate the data out to county servers) to create entries and browse other submitted issues and actions taken to resolve them.

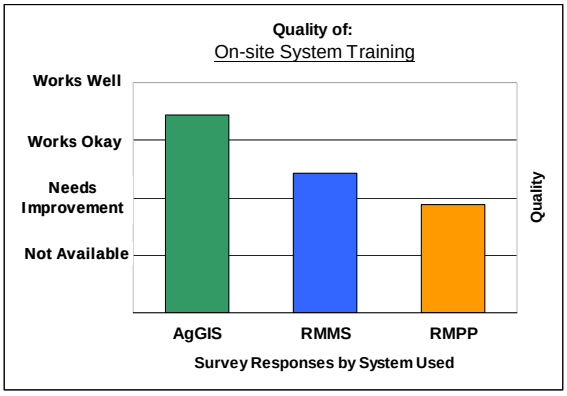
An AgGIS Developers Group has been established to cultivate tech savvy users interested in learning how to program in Java and learning about the nuts and bolts inside AgGIS. There are expectations that this group will grow in both numbers and skills to the point where its members will share responsibility with the vendor for incremental improvements needed to keep the application up to date and able to meet changing user needs.

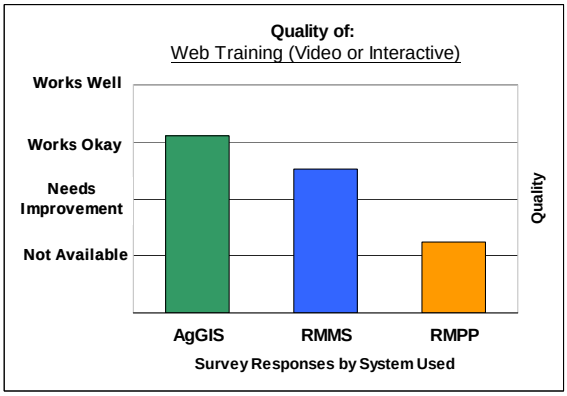
Training for new county installations is performed onsite with both classroom and hands on sessions, usually lasting a total of four to seven hours. A training manual is available but it needs to be updated for the current iteration of AgGIS v3. Less formal remote training is also frequently conducted using GoToMeeting.

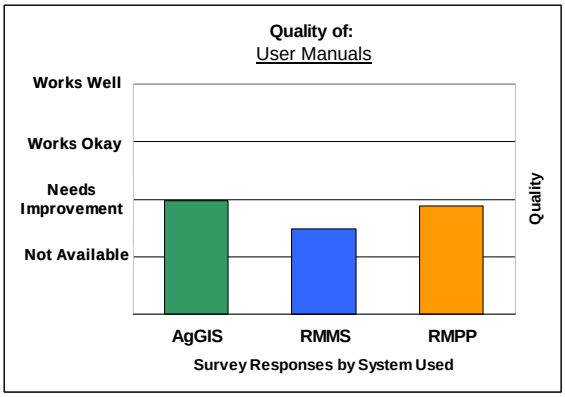
Documentation consists of a technical document for an IT oriented audience that describes the architecture of system components. User documentation is nonexistent except for the aforementioned training manual, and there is no online help accessible within the application. There is a contractual obligation to produce system documentation and that will be done using JavaDocs – probably with considerable assistance from members of the Developers Group. By using JavaDocs, it is possible to have both hardcopy manuals and implement a rich online help system within the application.

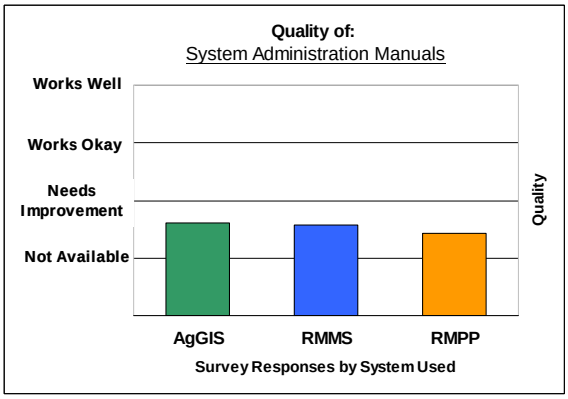
User Impressions

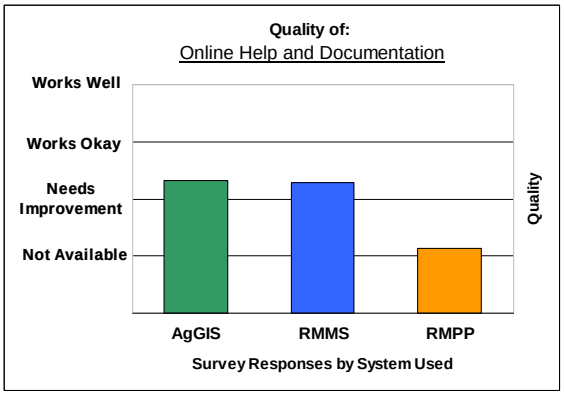
Survey results on the quality of various aspects of software support.

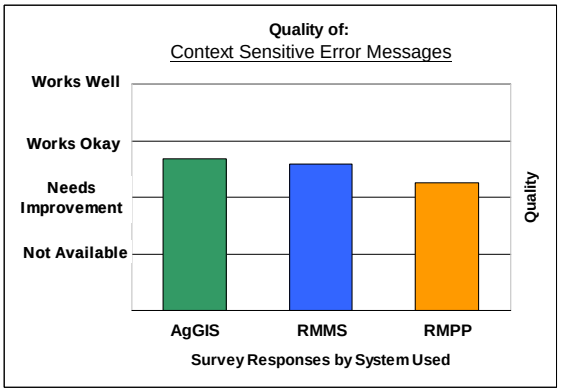


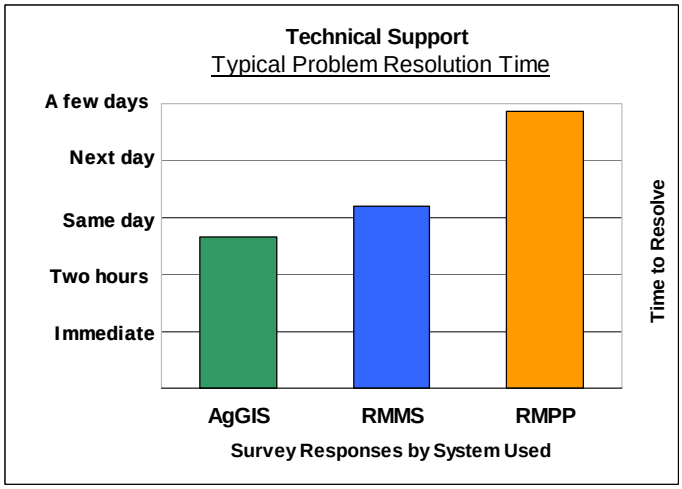


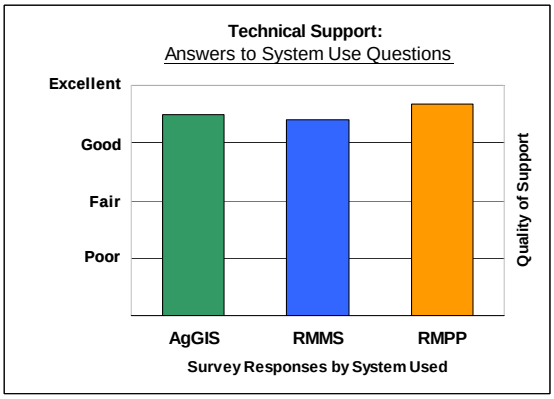


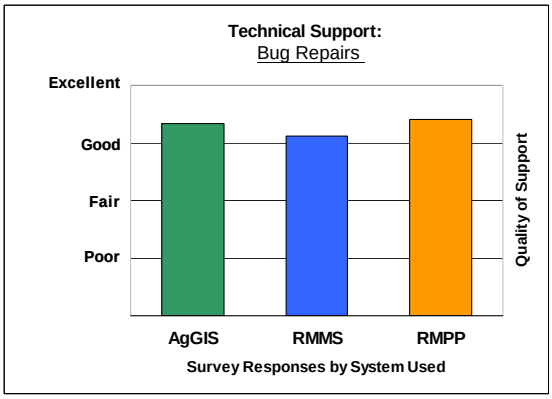


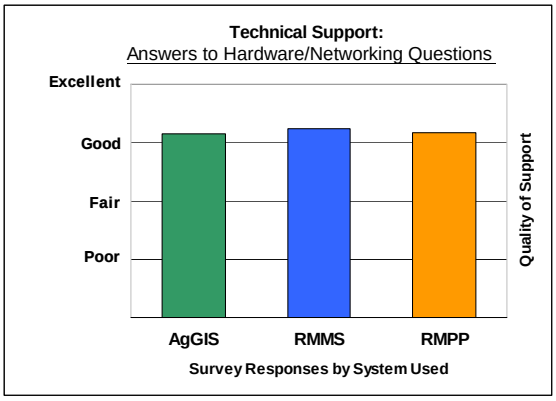

Quality of:
Online Help and Documentation
Works Well
Works Okay
Needs Improvement
Not Available
Quality
AgGIS
RMMS
RMPP
Survey Responses by System Used

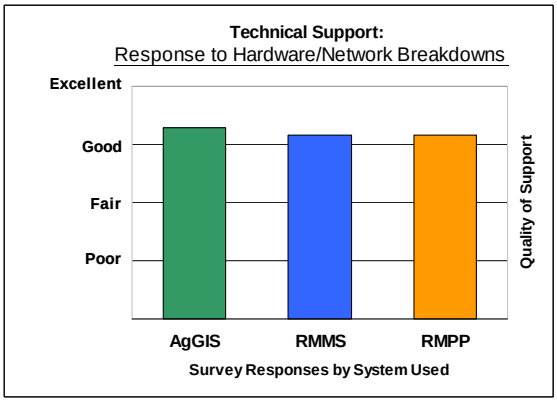

Quality of:
Context Sensitive Error Messages
Works Well
Works Okay
Needs Improvement
Not Available
Quality
AgGIS
RMMS
RMPP
Survey Responses by System Used

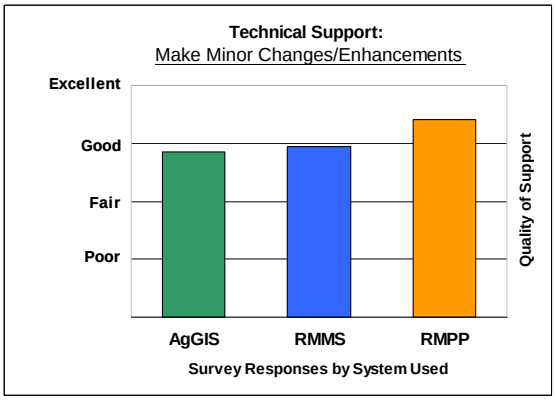

Technical Support
Typical Problem Resolution Time
A few days
Next day
Same day
Two hours
Immediate
Time to Resolve
AgGIS
RMMS
RMPP
Survey Responses by System Used

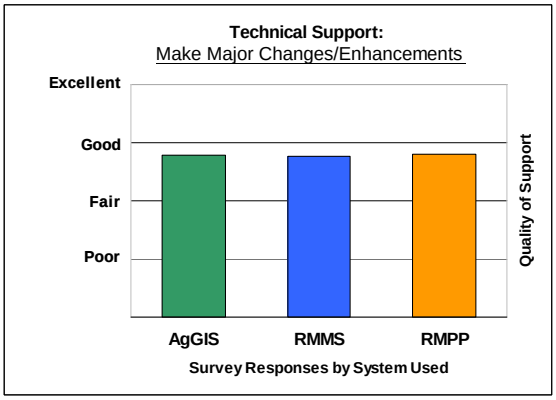

Technical Support:
Answers to System Use Questions
Excellent
Good
Fair
Poor
Quality of Support
AgGIS
RMMS
RMPP
Survey Responses by System Used

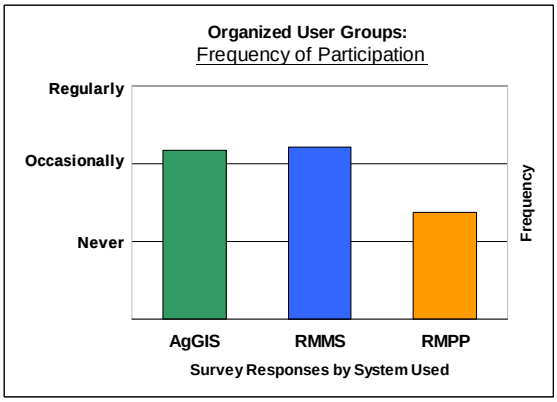

Technical Support:
Bug Repairs
Excellent
Good
Fair
Poor
Quality of Support
AgGIS
RMMS
RMPP
Survey Responses by System Used

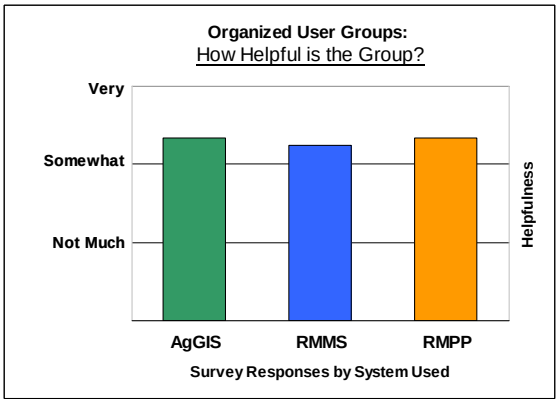

Technical Support:
Answers to Hardware/Networking Questions
Excellent
Good
Fair
Poor
Quality of Support
AgGIS
RMMS
RMPP
Survey Responses by System Used


Technical Support:
Response to Hardware/Network Breakdowns
Excellent
Good
Fair
Poor
Quality of Support
AgGIS
RMMS
RMPP
Survey Responses by System Used


Technical Support:
Make Minor Changes/Enhancements
Excellent
Good
Fair
Poor
Quality of Support
AgGIS
RMMS
RMPP
Survey Responses by System Used


Technical Support:
Make Major Changes/Enhancements
Excellent
Good
Fair
Poor
Quality of Support
AgGIS
RMMS
RMPP
Survey Responses by System Used


Organized User Groups:
Frequency of Participation
Regularly
Occasionally
Never
Frequency
AgGIS
RMMS
RMPP
Survey Responses by System Used


Organized User Groups:
How Helpful is the Group?
Very
Somewhat
Not Much
Helpfulness
AgGIS
RMMS
RMPP
Survey Responses by System Used

5.F Timely Access to DPR Registered Product Database

Description

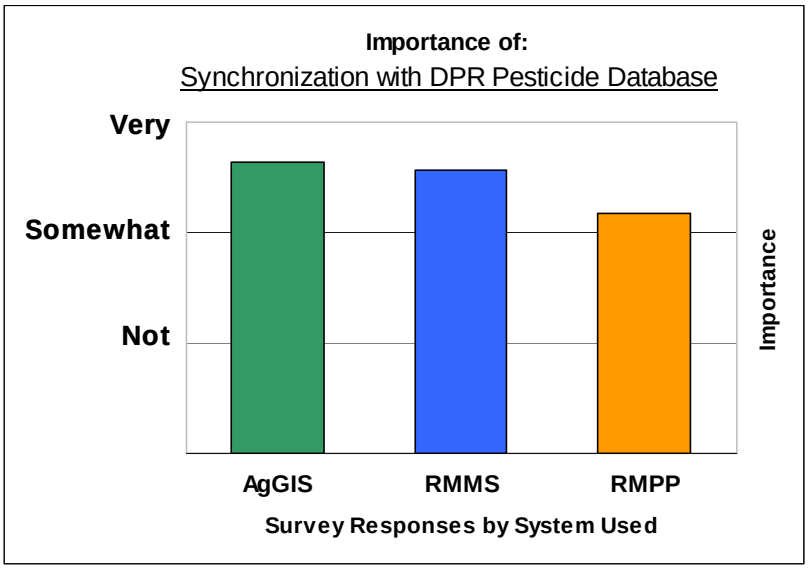
DPR has exclusive responsibility for evaluating and registering pesticide products for use in California. These activities are tracked in what is called the Product Label database. Until some time in 2007 an updated version of this database was not available to counties on a real-time basis, so it was only distributed on a more or less quarterly basis. It is now updated daily and accessible both through query tools on the DPR web site and via ftp (file transfer protocol). Even so, most counties lack the expertise required to successfully download this database and integrate the changes into their pesticide IT systems.

Another problem that still remains is that the daily updated version of DPR's product label database lags six to eight weeks behind the time when new products are actually approved by DPR and registered for use. Shortly after approval, partial information about new products may appear in the database, but there is still several weeks' delay before "product label indexing" occurs and all the details about a newly registered product appear in the database. This is a priority item DPR intends to work on in the very near future.

Why it is important

When a county inspector prepares a permit, examines NOI, or encounters a PUR with a product that is not found in the county's pesticide database, further (and sometimes time consuming) investigation is required to determine whether or not the product is registered. Hundreds of new products are registered each year, so being able to quickly access current DPR updates saves a lot of time.

Survey results on the importance of DPR synchronization:



Implementation in RMMS – current and planned

Last year the RMMS Technical Users Group (TUG) selected automated synchronization with DPR's product label database as the highest priority item in a list of eight potential system modification requests. That request has now been satisfied by an automated tool that downloads the DPR updates on a nightly basis to the central RMMS server (managed by SBS in Long Beach) where changes are processed and replicated out to each RMMS server in the counties. No further enhancements are planned or known to be needed at this time.

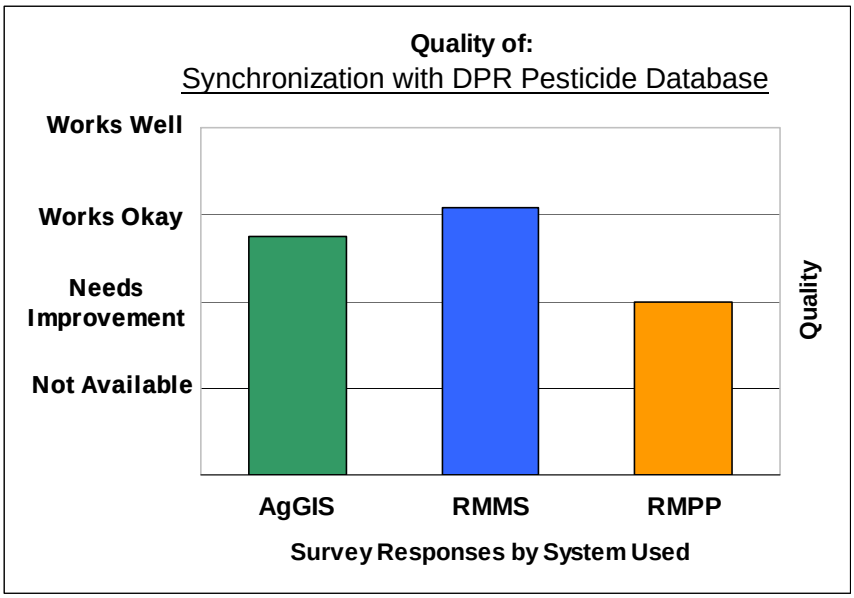
Implementation in AgGIS – current and planned

After DPR began posting its daily updated database, Mike Quinn developed a tool that allowed county users of AgGIS and Permit6 to manually query the DPR database using the DPR web site query tool when a product was encountered (usually in a PUR) with no record in the county's pesticide database. If the product is present in the DPR database, users can manually enter partial information for it in the county database but synchronization is not really complete until someone performs a manual download of DPR data and updates county data manually.

A prototype application has been developed and installed by Steven Anderson in Yuba County which automates the process in much the same way RMMS has done. The main difference is that downloads and processing would occur nightly at each AgGIS county and changes would then be replicated to the central CEDTS server managed by Merced County. Once Mike Quinn validates and approves this application for universal use it can be distributed to all other AgGIS/Permit6 counties and no further enhancements are known to be needed.

User Impressions

Survey results on the quality of DPR synchronization:



5.G Annual vs. Temporal Database Structure

Description

A permitting database can be configured to track changes over time using one of three basic approaches:

- ***Single Year*** - Store "snapshots" of each year's data in a separate database.
- ***Multi-Year*** – Store "snapshots" for several years in one database.
- ***True Temporal*** – Store all data in one database with advanced date stamping.

A "snapshot" in this case refers to the collection of field values in records defining a completed or revised permit. Both the Single Year and Multi-Year approaches are "static" in that once a permit record is completed it will not change. When a permit renewal or revision is made, either the old record is overwritten or a new set of records (new snapshot) is generated to define the updated permit. In a True Temporal approach, there is one basic set of records for a permit, and the changes made over time (whether they are renewals, revisions, or other changes) are tracked as date stamped "events" describing each change.

In the single year snapshot approach, each year's permits are stored in separate databases, making it difficult to view multiple years side by side. In the multi-year snapshot approach, all previous years or revision states of a permit can be viewed side by side because they are stored in the same database as separate static records. The true temporal approach is more like a motion picture in that it dynamically captures every change and can be rolled back to view the status of permits at a particular point in time.

Why it is important

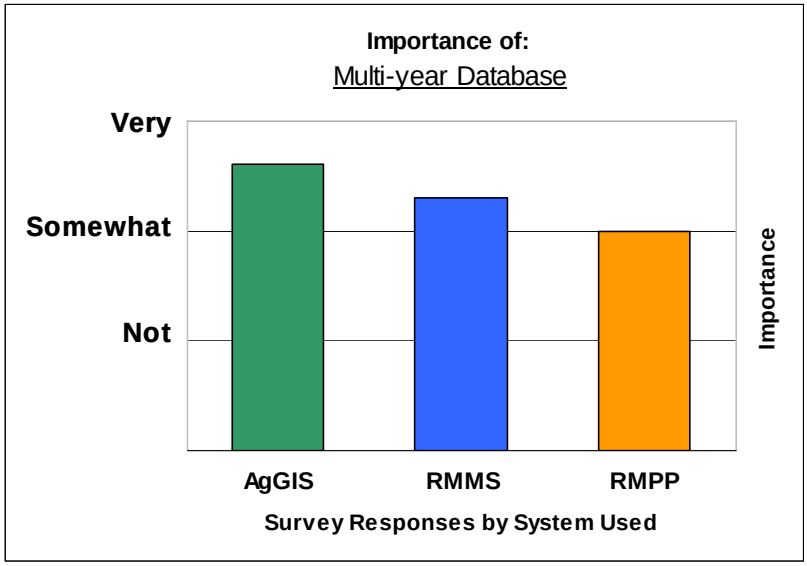
RMPP was configured as a static single year database primarily due to the technological limitations of its file-based data structure and early 1980's computing technology. Storing records for multiple years with that technology would greatly increase database size and adversely impact performance. The chief tradeoffs for improved performance are that one cannot conveniently go back in time to view past permits, and a "rollover" operation must be performed every year to copy the current year's permit records into a new database so they can be used as templates for the next year. The rollover process can be bumpy depending on the complexity of permits and whether they have certain errors.

Modern relational database management technology with advanced indexing largely overcomes performance impacts in very large databases. Even so, a multi-year static snapshot configuration would not be considered optimum in terms of normalization because most of the data stored in a current permit snapshot is redundant with all of its other previous snapshots. As for rollover, with a multi-year database there is a choice whether to do it in bulk (create new snapshot templates for all permits at once) or to create new snapshot records individually as each permit is renewed or revised.

The true temporal approach is the most normalized (least amount of data redundancy) and the most flexible in terms of tracking every change. This is particularly important

in situations where changes are extensive or frequent (i.e. rotational cropping – discussed below in Section 5.K), and in counties with very large databases where every bit of optimization can boost performance. The ability to move more easily back and forth through time could have positive ramifications for research and enforcement activities when it's important to know what was going on with multiple (possibly adjacent) permit holders at a particular moment in time.

Survey results on the importance of databases storing multiple years of permit data:



Implementation in RMMS – current and planned

The RMMS database is structured so that each year of permits and use reports are segregated. This is an artifact of RMPP and can pose a number of problems if data are entered mistakenly for the wrong year or when inspectors need to examine data from multiple years. Some counties also experience "rollover" problems when the previous year's permit data are copied to create templates for the upcoming year. On the other hand, some counties like the single year database because they think combining years together would cause the database to become cumbersome, and they are fine with having access to one year at a time.

It is not quite clear whether the RMMS database schema has the ability to recreate the permit at any point in time, but as of now the exposure of that information (if it's all there) to the user has not yet been implemented. In the past, RMMS counties have not placed a high priority on the ability to see a historical snapshot of a permit.

Implementation in AgGIS – current and planned

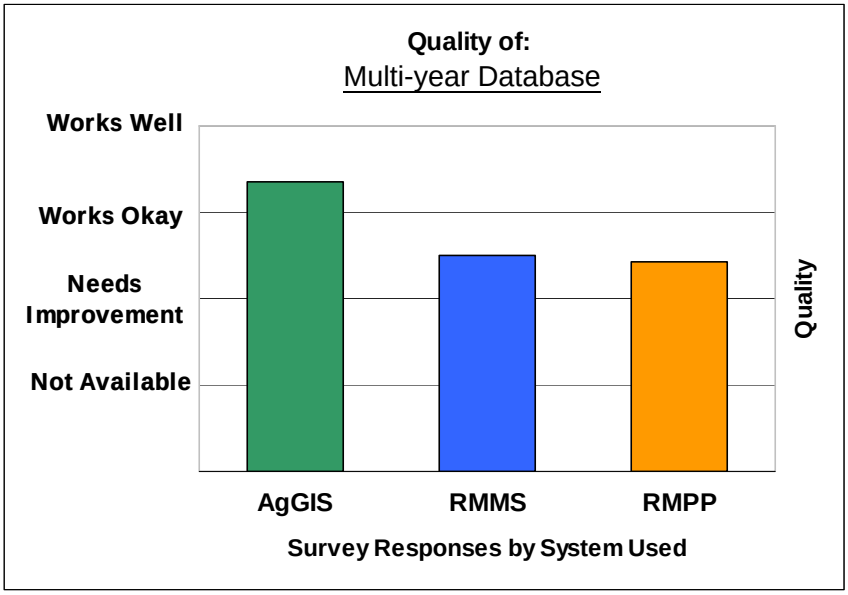
A true temporal database model was developed for Permit6 to avoid creating extra work for biologists and loss of information. For example, in a rotational cropping situation where two different commodities are grown on the same site at different times of year, the information on the first crop would be lost when the permit is

updated for the second crop. Also, PUR records dated and used for the first crop could be rejected because the product is an off label use for the subsequent crop which is the one recorded on the updated permit.

Other issues related to enforcement (timing of accidental releases) and organic certification are more easily managed with temporally accurate data.

User Impressions

Survey results on the quality of multi-year database implementations:



5.H License and Registration Management

Description

DPR is responsible for certification and licensing of the various pesticide professionals. These professionals must also be registered with every county in which they perform work. Counties are responsible for managing all registrations and renewals, which includes tracking DPR license and certification data as well as the equipment inventories for each registrant. Most counties used homegrown Excel and Access applications to track license and registration information, and many still do.

Why it is important

There was not a lot of discussion centered on this topic during information gathering, and the survey did not include any questions on it. However, registration management is an important Ag Department function and both vendors have made considerable investments in their "contact databases" to assist this function. Therefore, a comprehensive registration management function would be a natural extension of pesticide IT that would eliminate the need to manage this information separately in a redundant system, and could be standardized across all counties.

Implementation in RMMS – current and planned

RMMS' Master Contacts database is used to store and manage registration number, official business entity name, address, contact information, and sub-services the entity performs (certain types of entities are only authorized to perform certain services).

SBS periodically synchronizes each county's Master Contacts database with a tabular listing provided by DPR. Synchronization with the DPR table is not an automated process. DPR periodically announces that an update is available and someone must then manually download and install it onto county servers. Changes to this table are infrequent.

Implementation in AgGIS – current and planned

The AgGIS licensing module stores all attributes associated with professional contacts. In addition to those attributes specified above in the RMMS description, AgGIS includes comprehensive lists of equipment used for pesticide storage and application that belongs to each contact. Equipment inventories are included because it is information that licensees are required to report to DPR.

Counties use AgGIS to maintain and track county registration data. Among other things, these data are used during the inspection process to validate inventoried equipment registered with the county so that it can be certified.

User Impressions

No survey results or user feedback available for this topic.

5.I General Permit Preparation

Description

The "front end" human interface of a desktop software product embodies appearance and productivity characteristics that greatly influence the quality of a user's experience while operating the product. Some of the characteristics most important to users are:

- Inclusion of automated field fill-in, choice lists, and flexible search features that enhance productivity.
- Program features that work intuitively.
- An expressed or implied work flow that guides users through a series of tasks. The highest expression of that are software wizards that guide a user through a workflow consisting of a series of data input forms.
- Clean and uncluttered look, controls are easy to find.
- Ability to customize the layout of the interface so tools can be arranged to support workflows that might be implemented differently by different people (similar to controlling the appearance or content of toolbars in standard business applications).
- Options to navigate the interface by mouse cursor or keyboard shortcuts.
- Ability to program custom functions or shortcuts and add them to the interface.
- High level of software interactivity in the form of program prompts providing feedback to the user about expected inputs and indicators to inform users to stand by while the system is processing data.

In the context of a pesticide permitting application, a couple more specific features of importance are:

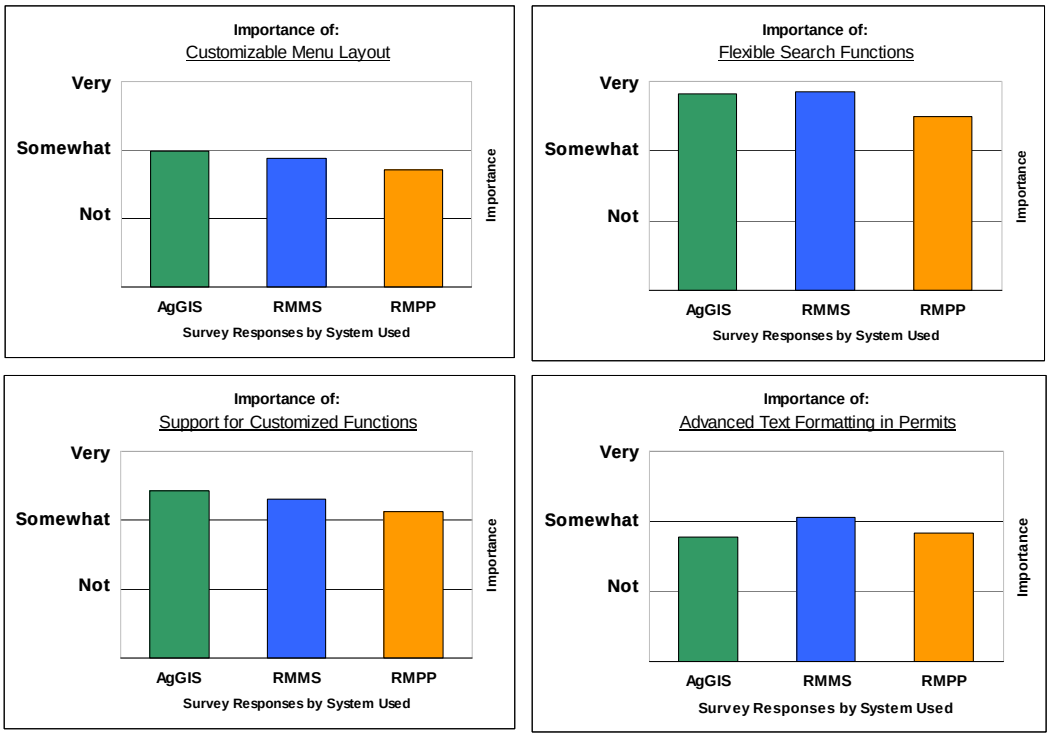
- Advanced permit condition management, such as automating the inclusion of certain conditions according to rule-based criteria.
- Efficient permit printing, and the possibility to apply custom text formatting (e.g. bold, italics, underline, colors) to specific text in the permit.

In general, a more flexible interface that adapts to user's preferences and informs the user is better than one that is rigid and requires users to do the adapting.

Why it is important

All the characteristics listed above influence how quickly users learn to operate the application, and how quickly and accurately they can perform their work with it. Productivity enhancements are equally important whether operators are primarily data entry technicians or inspectors conducting investigations, research, or processing permit renewals. During peak permit renewal season productivity takes on an added dimension because often the permit applicant is there standing by waiting for the permit to be processed and printed.

Survey results on the importance of certain aspects of the permit software interface.



Implementation in RMMS – current and planned

Some of the productivity-enhancing niceties incorporated into the RMMS interface include:

- User can search for permits by entering a permit number, permit holder name, or permit level information such as expiration date.
- Drop down widget contents can be managed as preferences through the administrative interface.
- New contacts are automatically added to the master contacts list when they are entered onto a permit for the first time.
- Interface judiciously uses color coding in various controls to signal things like the availability of an item for selection or modification.
- Tabular data lists can be sorted on any of the columns displayed in the list.
- Searches are performed by moving the cursor to any column in a list and then typing a few letters to make the list position itself to the record that most closely matches the typed text.
- Data entry is performed within input fields that are separate from the data lists described above. Clicking on a record in the data list will auto-fill the input fields in the data entry area.

- When adding a pesticide to a permit the default values associated with that pesticide (e.g. application type) are automatically added to the permit. Default values for a pesticide are maintained in the master module repository. Each pesticide may have default values assigned to it.
- Conditions can be attached to permits automatically based on characteristics specified in the Permit Conditions module.
- Standard conditions are stored in a master repository. They can be retrieved automatically or copied into a permit manually and then customized for that permit.
- Condition text can be entered using "rich text" formatting (bold, underline).
- Site information can be duplicated and edited to quickly create multiple site records with similar pesticide and commodity information.
- A particular pesticide can be automatically assigned to all sites containing a particular commodity.
- Permit printing is customizable using system preferences to adjust settings such as:
  - Whether a permit is first previewed before being printed.
  - Whether to print with no conditions text, or
  - use a preprinted conditions form, or
  - print with all conditions text, or
  - only print custom conditions.
  - Order the line items on the printout by site id order or commodity.

The only significant interface/productivity enhancement that is planned is the RMMSGeo application that will include a mapping window, field boundary polygons linked to permit sites, and editing tools to create or modify field polygons.

Implementation in AgGIS – current and planned

The AgGIS user interface is clean and uncluttered, with separate areas in the main window to access each category of permit components. Navigation is straightforward and intuitive, but the prevalence of search, sort, and auto-entry controls is less extensive compared to the RMMS interfacel. Most of the same controls are there – just not quite as plentiful or functional.

One very useful feature is that virtually any permit attribute can be "inactivated", which is especially handy for growers who plant different crops from one year to the next in the same field. When an attribute value is inactivated, it remains in the database, but only active values are printed in the permit. Inactive values can be turned on and off in the interface, so it's possible to see only what is currently active in the permit or see things that were active before but are now inactive. Restoring an inactive value takes just one click, and avoids having to re-enter data.

AgGIS also has a robust facility to automatically assign permit conditions, using many of the same rules and mechanisms as described above for RMMS.

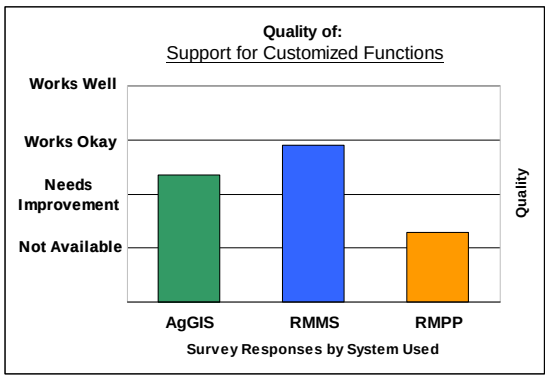
The primary distinguishing feature in the AgGIS interface is the map viewing/editing window. Field boundary polygons are linked to sites, boundaries can be added or edited, and site attributes can be edited either in the mapping interface or the tabular form interface. When the permit is printed, site maps are formatted automatically and added to the printout.

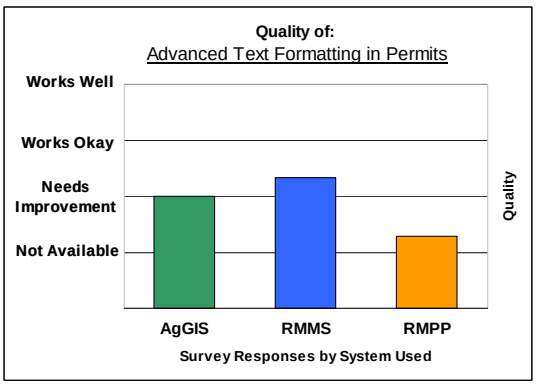
AgGIS also stores user profile information on custom settings (such as map display properties) that are retained and reapplied automatically from one session to the next.

The only significant planned interface enhancement is the addition of a PUR data entry module.

User Impressions

Survey results on the quality of certain aspects of the permit software interface.





5.J Standard and User Defined Queries and Reports

Description

Database driven applications support two core functions. One is to manage (store and retrieve) information one record (or collection of related records) at a time, and one is to execute criteria-based queries to retrieve, summarize, and/or create reports on a set of selected records.

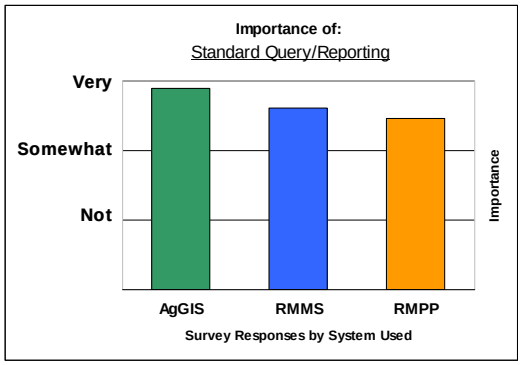
Standard queries are preprogrammed to run more or less at the touch of a button. Standard queries are particularly useful for generating specific reports on a regular basis, or for less frequent queries that are complex and therefore require specialized expertise to be structured properly.

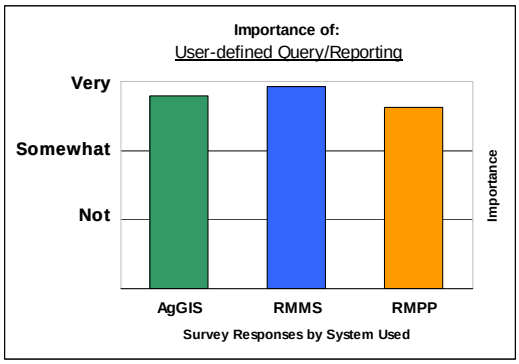
User defined queries and reports are created and executed on as needed (ad hoc) basis. Ideally, simple queries can be built without specialized knowledge of the underlying database schema or programming skills. That typically requires interface tools that display current values in fields users want to query on and a means to translate logical selection criteria into SQL (Structured Query Language) statements that are interpreted by the database software.

Why it is important

Saved standard queries are a practical necessity for the efficient generation of summary reports and monitoring the database. Ad hoc query capability is less critical, but enterprising users are always going to request the flexibility to explore and analyze their data to better support their operations, and they should have the tools to do that productively.

Survey results on the importance of query/report functions:





Implementation in RMMS – current and planned

Various RMMS applications currently use three different reporting and printing systems, including Crystal Reports, Visual Dataflex reports, and legacy RMPP reports. One of the more common complaints from RMMS users is slow performance when creating and printing reports.

For queries, RMMS supports a strong standard query capability which comes with many predefined queries and allows any query that is built to be saved as a standard query for later retrieval. But building queries with the ad hoc (user defined) query system is not very user friendly and requires well above average knowledge of the SQL Server database schema to operate effectively.

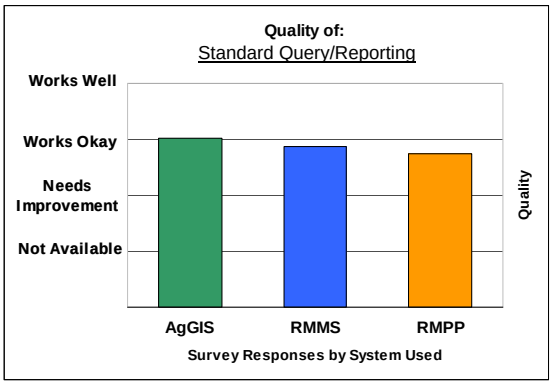
An upgrade process is underway to correct many of these problems by transitioning to query and reporting tools within SQL Server Reporting Services. When implemented in the upcoming RMMS v5, Reporting Services should improve performance, provide better interface tools, and reduce costs by dropping license fees for Crystal Reports.

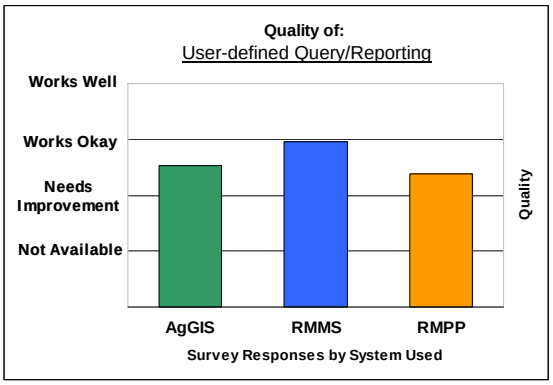
Implementation in AgGIS – current and planned

There are several standard queries and reports preprogrammed in Permit6, but no viable way at present for average users to design custom queries. Developing a flexible query and reporting interface for AgGIS is something that has been discussed, but it is not clear when it will be acted upon.

User Impressions

Survey results on the quality of query/report tools.





5.K Support for Rotational Cropping

Description

RMPP was designed to support a one-to-one relationship between a field site and the commodity grown in it each year. One commodity type per field per year is the situation that predominates, but many counties have at least a few growers who either grow more than one crop in a field at a time (multi-cropping), rotate different crops through some fields during the growing season, or both – particularly in some coastal counties where multi-rotational cropping is dominant.

If *time* was factored into the site/commodity relationship then rotational cropping would not be a special case. But in most systems time is treated as a static annual event, so one of the following workarounds must be used. One is to add duplicate site records with a suffix (e.g. A, B, C) appended to the site-ID for each different commodity grown in that field. So a site called "WEST1" becomes "WEST1A" when broccoli is planted there and "WEST1B" later in the season when the crop is lettuce. This satisfies the one-to-one data relationship between "virtual" sites and commodities, but it creates very long and complicated permit records when there are large numbers of sites and commodities.

The other common workaround is to simply list every site one time and assign the designation "Undeclared Commodities" to each one. Then on the commodities list each crop is listed once and assigned to a null site-ID (e.g. '00000'). It is then understood that any of the listed commodities can be grown in any of the undeclared commodity sites at any point in time. This workaround greatly simplifies the permit because it doesn't list every combination of sites/commodities.

Time is not a factor with multi-cropping, since multiple crops are present at the same time. The best way to accommodate this is with a database structure that allows a one-to-many relationship between sites and commodities.

Why it is important

State regulations require that pesticides can only be applied if there is knowledge of: A) the location where pesticide will be applied, B) the surrounding crops present, and C) proximity to any sensitive features that could be adversely affected by drifting residue.

A site can have acreage allocated to more than one commodity type, so multiple commodities may be grown at one time or may be rotated during the permitting period. With a permit database that supports multiple commodities per location, as long as the commodity and chemical on the PUR exists on the permit, regardless of when the commodity was planted and the chemical used, there won't be any issues or exceptions with the submitted PUR.

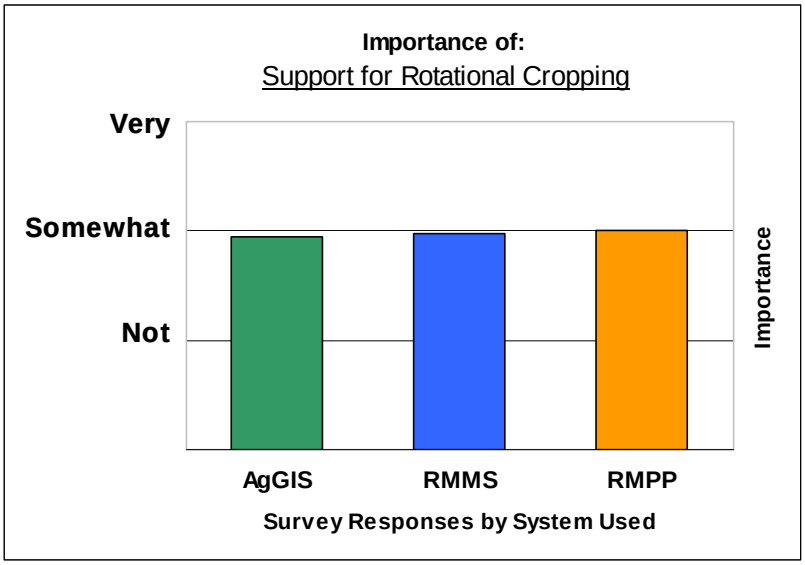
This is important because growers need to respond to the market, and therefore may not know ahead of time what they will be growing and when. So growers can and will anticipate everything they *might* grow during the permitting period.

The suffix identifier workaround creates a technically accurate permit, though it would be better (less ambiguous) if the suffix was contained in a separate database field rather than relying on use of a special coding convention for site-IDs. The undeclared commodities workaround creates permits that are more ambiguous, but can cut down the length of the printed permit by up to 90% (one reported permit in Monterey was 300 pages long before the undeclared commodities workaround cut it to 32 pages).

Ideally, a more refined method should be devised to support rotational cropping that is both efficient and unambiguous. The main problem with ambiguity is that when a pesticide is applied to one of these rotational sites there is no good way to tell what other crops are present nearby that could be affected by drift. In a database that supports temporal events as well as multiple commodities per site, it is possible to code each site with the commodity(ies) grown in it at any given time.

Perhaps most important is that all counties should adopt consistent methods for handling multi, rotational, and multi-rotational cropping situations. The current proliferation of different methods is neither necessary nor desirable.

Survey results on the importance of a rotational cropping solution.



Implementation in RMMS – current and planned

RMMS has implemented the undeclared commodities approach in some coastal counties, and there are some variations among them. Other counties employ a variety of methods as well, but the temporal approach described above is not one of them.

Implementation in AgGIS – current and planned

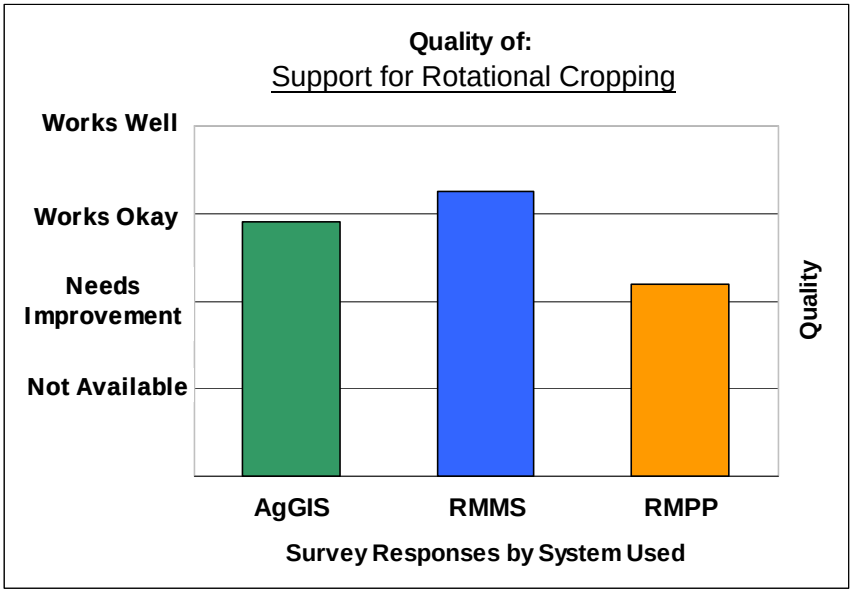
The AgGIS database supports multiple commodities per location (many-to-one relationship), but only a few counties use the feature for multi-cropping situations (two

crops inter-planted in one field). No "coastal" counties have deployed AgGIS yet, though San Benito and Santa Cruz are planning to. The AgGIS county with the most significant rotational crop implementation is Imperial, but they actually change each permit when crops change by inactivating the old crop and activating the new one, thus preserving a one-to-one site to commodity relationship at any given point in time.

AgGIS developers are currently engaged in early discussions with the rotational cropping counties mentioned above to devise a data structure and procedure that can be implemented consistently and meets the objectives described in the "Why it is important" section above. At this time it isn't clear what that solution will look like.

User Impressions

Survey results on the quality of support for rotational cropping.



5.L Adjustable User Access Permissions

Description

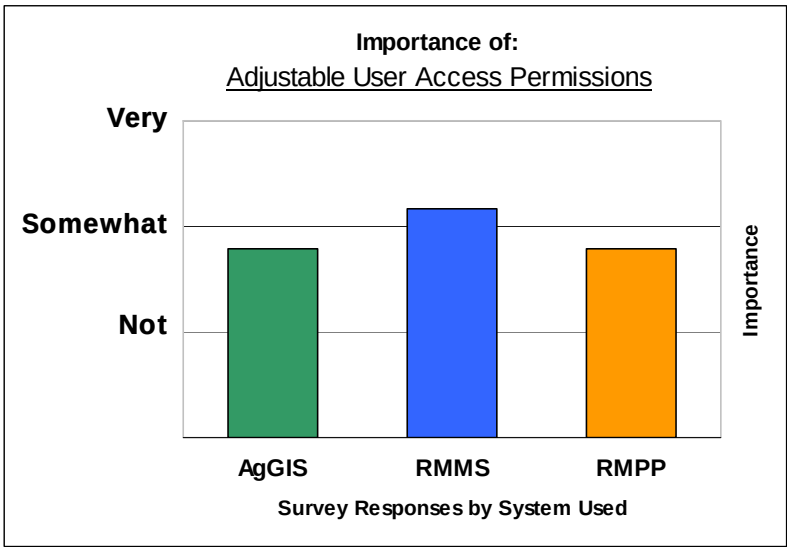
Most enterprise business software products include an administrative interface that allows system overseers to adjust view/use permissions on program modules and interface tools, and to adjust read/write permissions in the underlying database. These adjustments prevent unauthorized users from mistakenly corrupting data and in some software can tailor the appearance of the interface to better support specific types of tasks by rearranging controls and/or eliminating controls that are not needed for a particular task.

Typically, users are assigned to various groups and consistent permissions are established for the group, although it is sometimes possible to set permissions specific to individual users.

Why it is important

Adjustable permissions are most useful in large operations where applications and data are used by many people whose jobs can be categorized into specialized tasks they need to perform with the data. Smaller operations where most users are generalists may find adjustable permissions to be unnecessary or cumbersome.

Survey results on the importance of adjustable access permission.



Implementation in RMMS – current and planned

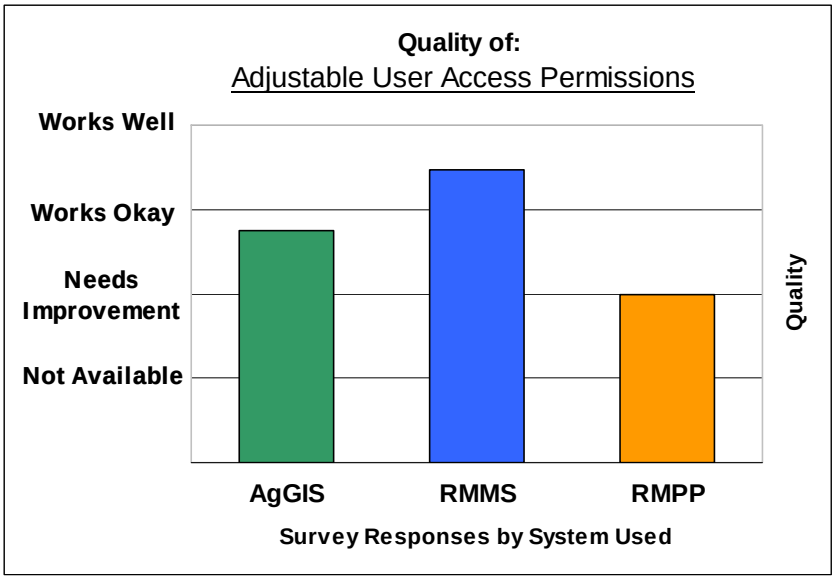
RMMS has a built-in security layer managed by the RMMS Administrator. It allows various groups to be established, and each group is assigned specific permissions to access certain menus and modules. Access groups can be used to disable access to or even hide various modules and functions within the application.

Implementation in AgGIS – current and planned

At the database system level, there are several defined roles that control users' ability to read and write data to and from specific parts of the database. Both Permit6 and AgGIS make heavy use of these roles as security measures. However, these roles do not have any application logic that can hide parts of the interface from users. The security just prevents them from modifying data. There hasn't been any great demand from AgGIS users to apply any additional layers of security.

User Impressions

Survey results on the quality of adjustable access permission functions.



5.M Integration with Other Ag Department Business Functions

Description

Some stakeholders have suggested that the Permitting/Reporting system and database could become a "keystone" application that is closely integrated with other Ag Department information systems and functions. Integration can occur on many levels:

- Indirect data sharing – data managed in one application or system is periodically copied for use by a different application.
- Direct data sharing – data in one system can be accessed synchronously by another application. This includes use of web services capable of passing data across diverse platform types in a neutral data format.
- Common platforms – two systems (or applications) that once had separate data storage or interface platforms are reconfigured to share the same platform, thus facilitating communication and data sharing between them.
- Combined functionality – two closely related systems are combined into a single system sharing one interface and one database.

Why it is important

Perhaps more than most county level agencies, Ag Departments have very diverse responsibilities and correspondingly diverse information systems, databases, and applications to manage them. Yet, many of these information system components manage closely related functions or would work better if data could be shared across applications and platforms. One of the most immediate examples is the county registration and inspection function for pesticide professionals described previously in Section 5.H. Another is in the area of sharing spatial data and GIS platform functionality among different applications that depend on mapping and spatial relationships, including enterprise applications at the state and county levels that are outside Ag Departments. And of course, the statewide presence of a standardized pesticide IT solution will greatly assist information exchanges among counties.

To facilitate integration, major systems should be built with openness and flexibility in mind, and users should be encouraged to think of how many ways productivity can be enhanced through increased connectivity among information systems. When new or newly integrated functionality is being planned, it is important to take advantage of existing data formatting and software standards (or revise existing standards) in order to get the best possible results from integration.

Implementation in RMMS – current and planned

Read access to the RMMS SQL Server database allows anyone to access the database without the ability to modify data. Applications like AIRS (Automated Incident Reporting System) are heavily reliant on master contacts and permits information and

could use the RMMS Reader role in order to connect to and read the RMMS database.

If there was strong rationale for allowing other applications to edit the RMMS database, then it would be possible to develop validation rules implemented with stored procedures to permit some degree of editing while also protecting data integrity and consistency.

A couple of counties currently support Microsoft Access applications that connect directly to the RMMS database for retrieval of information but with no capability to edit the RMMS data. San Mateo and Sonoma County GIS departments both have applications that access permit and site data from RMMS with a relate key between permit records and spatial features within the GIS database. San Diego County's GIS connects directly to the RMMS database via ODBC.

Implementation in AgGIS – current and planned

Requests have been made to integrate AgGIS with a weed management program database. This could be accomplished with a custom application that would use database security roles to protect the integrity of the Permit6 database while allowing access to the underlying data.

There are many integration opportunities involving interagency communications and data sharing. For example, the Department of Water Resources needs agricultural land use information and Ag Departments need ground and surface water information. There could be an opportunity here for integration at two different levels – the application level direct to the county server using a read-only account, or an intermediary server that is replicating data between the two systems.

User Impressions

Here is a sampling of responses to the online survey question asking for ideas to integrate pesticide IT with other applications:

- Being able to check of the status of a RMP/OP Id for someone out of county would be helpful. It would have to be such that only in county people would be able to change the info but there is no reason why others couldn't be allowed to view what is on their system.
- Crop loss Annual crop report Apiary Episode investigations Urbanization implications (Acres/income lost) Export certification Staffing planning Pest trapping Organic ground certification Environmental impact studies (All of the above rely on a robust GIS permitting component)
- The capability to map data from other departmental programs (Pest Detection, Weed Management, Organic Program) could be included in the Permit Program. This would be an improvement as all mapping needs could be accomplished with one program.
- Organic Certification-it would be useful to have a database that can store information for the organic program and spatially display the organic sites with permitted sites on

maps to be given to the grower to help the conventional growers know if they have organic sites

- Bee hive locations-integration with a layer that shows where hive locations are for the purpose of notifying beekeepers of applications of insecticides that may affect their colonies as well as for tracking beehive proximity to seedless mandarin groves.
- AIRS program - to see what inspections have been done and be able to review at time of registration.
- Incorporate the CDFA organic program into the system, the AIRS program, and the Air Resources Board weather data.
- The master contact list can be, if accurately maintained/implemented by staff, the office "rolodex" for generating lists, mailings for various purposes, such as training sessions, regulatory publications, inquiries, etc.
- Pesticide Monitoring and Record Inspection Tracking Database system tied to permit holders
- Integrate local county registration process for pest control businesses, pest control advisors, pilots, structural pest control businesses and associated database collecting this information with permit program.
- Integrate collection of data for submitting pesticide regulatory monthly activity report (PRMR) to DPR.
- Land Use Planning - tracks work done by Ag Staff on County land use projects.
- We would like to have our Permitting system interact with our State Acreage Database, our Organic Database, and our Device Registration System (for our Weights and Measures division). Also, it would be nice to be able to see AIRS (Automated Inspection Reporting System) data in RMMS. In addition it would be helpful to track enforcement actions in RMMS as well)
- Phytosanitary and Quarantine Compliance Certificates: Many quarantines, such as GWSS, require treatment of a commodity in the field prior to movement of the commodity.

6. IT Systems' Funding and Cost

Funding and development for both RMMS and AgGIS began around the same time (1999-2000). Since then, the combination of funding sources has been extremely convoluted and variable, as has been the allocation of expenditures toward development (software design and coding), deployment (hardware purchases, software licenses, installations), and support (training, technical support, documentation, etc.).

Since cost is an extremely important criterion both for comparing existing products and looking ahead to a future solution, in a more typical situation it would be ideal to know how much money has been spent thus far to develop, deploy, and support existing products. With that information in hand it would be possible to:

1. Assess the relative "value" of each product in terms of dollars spent for the capabilities present in each product.
2. Generate estimates for what it should cost to bring either product's capabilities up to a near term standard that meets user needs.
3. Generate estimates for what it should cost to deploy and support a statewide solution based on one of the products.
4. Recommend a sustainable funding model adequate to meet estimated near and long term expenditures.

Unfortunately, it has been difficult to obtain complete financial information and much of the information that has been obtained is difficult to decipher. The difficulties encountered thus far surrounding the financial information for one or both products include:

- Incomplete information prior to FY 2006.
- Overlapping information from multiple sources (vendors, counties, CACASA, DPR) in multiple formats – much of it informal or undated and therefore difficult to corroborate.
- Information that in some cases is too granular and in other cases too aggregated.
- Mixture of fiscal and calendar year expenditure summaries.
- Inadequate itemization of estimated future expenditures.
- Status of amounts designated as "not yet invoiced" is unclear (will they be invoiced, and if so, when?).
- Significant in-progress amounts spent on developing features not yet in the products, therefore making it difficult to assess "value."

This project lacks the budget and time required to perform the forensic accounting exercise needed to assemble a clean and complete financial summary. But it is also questionable whether such an exercise would contribute that much to the forward looking objectives of the project. The first three items in the first bulleted list above anticipate using past experience to predict future performance. In this case, however, the circumstances of the past and present (technical, financial, and logistical) are so different from the anticipated circumstances

surrounding development and deployment of a 58 county solution that the predictive value of the past is fairly low.

Furthermore, the recommended funding and governance models are certain to deviate from those tried in the past. The current combination of allocated funding and each vendor's plans for how to spend those funds represents a specific glide path that CACASA/DPR now wishes to change. To do that, one of the strategic options outlined in Section 10 of this report will be selected and pursued. All of these options involve, in one way or another, getting additional vendor input on the cost to achieve a certain application capability standard and to deploy and support the application as a 58 county solution.

In essence, whatever vendors have said they would do in the past (and for how much money) may be thrown out the window because they will now be asked to do something different. In a competitive environment, the vendors are the only ones qualified to commit themselves to a competitive price needed to do the job.

With these assumptions in mind, the greatest contribution that an investigation of financial history can make is to provide context for proposals from vendors that may be forthcoming, and to illustrate past accounting and oversight problems that nobody wants to repeat. The next subsection summarizes all of the funding and expenditure information gathered to date. This summary clearly identifies information gaps, and these gaps persist even as this report is finalized. An updated accounting of mill trust fund allocations and expenditures will be available at the CACASA 2009 Spring conference held the last week in April.

6.A Funding Sources and Allocations

Between 2000-06, all pesticide IT funding came from either state agencies or individual counties. These were in the form of both one time appropriations and annual renewable appropriations. In general, one time appropriations supported software development and deployment, while annual appropriations were allocated to maintenance and support, though there were exceptions as explained in the next subsection.

Beginning in FY 2006, virtually all funding was consolidated into a single source – the "residual mill fund" jointly managed by CACASA and DPR under a June 2006 Memorandum of Understanding. Funding comes from the mill rate assessed on pesticide sales, a portion of which is distributed to counties to support their pesticide regulation management and enforcement activities. The residual fund is a pooled portion of the total county mill allocation. Separate from the residual mill fund, DPR paid both vendors for modifications it requested relating to new VOC (Volatile Organic Compound) regulations and new license management software requirements. All known funding sources are itemized below.

Pre-2006 one time appropriation sources included:

- DPR funds diverted from the "Colusa rice study" to instead support pilot development and deployment of RMMS
- Funds from the nine original RMMS counties to support pilot deployment
- Funds from six additional counties to purchase and deploy RMMS
- State Water Control Board grant to support development of AgGIS
- Funds from AgGIS counties for consultation/installations

Pre-2006 annual appropriation sources included:

- Funds from RMMS counties for maintenance/support costs
- Funds from AgGIS counties for maintenance/support contracts
- Accumulated funds from Merced County to support Mike Quinn's development of Permit6, CEDTS

FY 2006, FY2007, FY2008 (7/1/06 – 6/30/2009) appropriation sources:

- DPR 2006 initial contribution to residual mill fund
- Variable annual allocation from CACASA residual mill fund
- Accumulated funds from Merced County to support Permit6 and CEDTS
- Funds from Yuba County to support Steve Anderson's AgGIS development work
- Additional funds direct from counties (if any)
- DPR one time funds for VOC and license modifications

Everything that has been communicated about these funding sources is summarized in the table below. Note that while attempts were made to further break down these amounts into separate expenditure categories for development, deployment, and maintenance/support, the effort was abandoned because vendors have not consistently itemized their expenses this way.

Also, while it would be valid to compare systems based on capabilities and costs strictly allocated to software development, it would be misleading to compare aggregated deployment and support costs without factoring in the number of counties supported (and for how long), as well as characteristics such as the number of district offices and simultaneous system users in a county which may incur variable deployment and support costs. If all costs for deployment and support were itemized, and if all county-specific information was available, then it would be possible to compute unit deployment cost per county and unit support cost per county per year, which could be validly compared between systems.

With these complications in mind, every attempt has been made to break down the funding sources by expenditure categories as shown in the table on the following page. Once a system selection strategy and process is approved, it is critical to get an accurate account of the amounts remaining from previous residual mill fund allocations. An interim update of mill fund allocations and expenditures to date will be available in late April at the CACASA Spring Conference.

Funding Source Description	RMMS	AgGIS / Permit6
DPR funds for RMMS Pilot development	Unknown	n/a
County funds for RMMS, first 9 (one time funds)	Unknown	n/a
County funds for RMMS, next 6 (one time funds)	Unknown	n/a
County funds for RMMS service contracts	Unknown	n/a
State Water Control Board Grant for AgGIS	n/a	$433,765
County funds for AgGIS consultation/installation	n/a	$12,000
County funds for AgGIS service contracts	n/a	$50,000
Merced County funds for Permit6 (accumulated)	n/a	$200,000
Yuba County funds for AgGIS development	n/a	$30,000
FY 2006 DPR allocation (total)	n/a	**$250,000**
Allocated for development:		**$75,000
Allocated for installs or support:		**$75,000
Allocated for hardware purchases:		**$100,000
FY 2006 CACASA allocation (total)	**$227,000**	**$23,000**
Allocated for development:	*$108,000	**$11,500
Allocated for installs or support:	*$179,000	**$11,500
FY 2007 CACASA allocation (total)	**$695,000**	***$135,000**
Allocated for development:	*$95,000	No breakdown
Allocated for installs or support:	*$0	No breakdown
FY 2008 CACASA allocation (total)	**$169,000**	**$684,000**
Allocated for development:	*$10,000	**$105,500
Allocated for installs or support:	*$104,000	**$105,500
FY2006-2008 CACASA (3 yr. totals)		
Allocated :	$1,092,000	***$842,000
Spent :	*$496,000	*$211,000
CACASA unspent balance (2/19/09):	**$596,000**	***$631,000**
DPR Funds for license and VOC modifications	$27,030	$19,980
Total Software Development 2000-2008 :	**Unknown**	****$970,000**
Total Deployment & Support 2000-2008 :	**Unknown**	****$230,000**

Notes: * Actual amounts invoiced
** From high level summary supplied by vendor
*** A discrepancy between the two sources for these figures is yet to be resolved

6.B Vendor Business Model Ramifications on Appropriation Requests

Without a doubt, the most striking figures in the preceding table are the large backlogs of unspent CACASA allocations for both vendors. This is money that was originally planned to be spent by the end of this coming June. There are a number of reasons why these unspent balances exist, and some of them carry significant ramifications for future financial arrangements between CACASA/DPR and vendors regardless of what recommendations from this project are ultimately pursued.

On the simpler side, some of the unspent balances will be drawn on to pay for work that has been completed or is in progress but hasn't been invoiced yet. In addition, both vendors have had difficulty meeting the target completion dates for various system enhancement deliverables that were set when CACASA allocations for them were requested, so payments for these deliverables are going to be spread out over a correspondingly longer time period. More importantly, as each system matures and approaches the point where it is "built out" according to currently envisioned specifications, the funding focus shifts away from software development and toward long term maintenance and support. This shift is already showing up in vendor plans for FY 2009. Following are brief summaries of the evolving pesticide IT business models for both vendors.

RMMS - Streamline Business Solutions (SBS)

SBS was able to build RMMS and launch it in the first nine counties with one time funding from DPR and lesser amounts from the counties themselves. Once those funds were exhausted, it quickly became apparent that further product development would stall without a funding source beyond maintenance agreements with the nine counties. SBS would either need to shrink, find new products to build for other clients, or productize RMMS and sell licenses to more counties. The latter strategy was pursued, but sales were completed in only six additional counties.

When the CACASA residual mill fund for pesticide IT was established at the beginning of FY 2006, two things happened. First, 10 additional counties indicated they would now deploy RMMS (three more were added later) so the total SBS client base almost doubled to a total of 28 counties. Second, the "product sales" business model for RMMS reverted back to a "service delivery" model, as it had been in the beginning. From that point forward, planning and budgeting for RMMS was all based on costs for user-driven product development, costs for new installations, and costs for maintenance and support.

SBS has since completed its development and deployment cycle for version 4.x and is currently working through the cycle for version 5.x. This version will include major enhancements including a GIS module, a new query and reporting module, and multi-year database support. It was originally supposed to be released for Beta testing exactly one year ago, but that probably won't happen until this coming summer.

SBS has not identified specific plans or a budget request for FY 2009 software development enhancements, but it has estimated a FY 2009 budget of $159,000 for support and license purchases/renewals in its 28 client counties.

AgGIS – Patrick Way Consulting (PWC)

Unlike SBS, PWC has always pursued a service delivery business model for AgGIS – never being put in a position to try and raise money through product sales. Like RMMS, AgGIS development was initially supported by one time state funding. Later infusions from CACASA and DPR supported further software development and (eventual) system deployment in 30 counties.

Since the CACASA residual mill fund was established, PWC hasn't even spent half of its allocations for FY 2006 and FY 2007. It is assumed the main reason for this is because PWC was first working through the $250,000 one time allocation from DPR which also came in 2006, though it's difficult to tell because PWC does not itemize cost estimates relative to planned tasks and funding sources. For the past two years, PWC efforts have been focused on development and deployment of AgGIS v3, which is now largely complete as envisioned but there is still significant work to be done such as an interface for PUR entry and absorbing other functionality from the Permit6 application.

With its FY 2008 CACASA funding allocation request, PWC made a significant shift toward what would be considered a "service bureau" business model. Instead of an itemized list of tasks with cost estimates (the "service delivery" model), PWC based its funding request on the total costs (salaries and overhead) to maintain the critical mass of personnel needed to provide long term maintenance and support for AgGIS. It was estimated that only about one-third of these employees' time would be consumed by maintenance and support tasks, so their remaining time would be spent on further development of AgGIS. Planned and possible enhancements were mentioned in the request, but without associated cost estimates.

The initial request for FY 2008 that was granted ($684,000) was enough to support five employees for one year. Just three months ago, PWC proposed a revision that would extend the allocation to the end of FY 2009 and support just three employees. So the FY 2008 allocation now covers two years instead of one, and provides cost support for three employees instead of five. It was estimated that maintenance/support would consume about $150,000 per year ($300,000 over the two years) and so the remaining $394,000 would be available for AgGIS enhancements.

Assuming that SBS only requests a FY 2009 CACASA allocation equal to its $159,000 estimate for support services (and nothing additional to develop enhancements), then adding that to its existing unspent balance for this year leaves a total balance of $755,000 to spend by June 2010, which is $124,000 more than PWC.

The evolution of business models undertaken by both vendors should be revelatory to CACASA/DPR as it contemplates future relationships with software providers. Key issues to consider in these relationships are presented in the next section.

7. Vendor Sustainability Considerations

The sustainability of CACASA/DPR's pesticide IT solution depends to a very large extent on the business sustainability of the vendor behind it. Even the most technically adept software product will suffer breakdowns or become obsolete if deprived of continued support and innovation. Business failure is a risk that must be accounted for, particularly with businesses that are very small and have very limited client bases.

Factors contributing to a thriving software business include:

- Proficiency with the entire technical infrastructure on which its products depend.
- Identifiable areas of specialization.
- A competitive vision seeking new areas in which to apply its current specialties and to acquire new specialties in order to stay current and fresh.
- Standard business skills in the areas of planning, marketing, communications, and personnel management.
- An appropriate mix of employee skills with clearly defined (but still flexible) roles.
- A system and culture that accommodates employee growth, minimizes turnover, and allows new hires to assume responsibilities quickly.
- Strong instincts toward cost competitiveness.

This project is barely two months old, so there has been limited time to assess most of these characteristics in either Streamline Business Solutions (SBS) or Patrick Way Consulting (PWC). What follows are quick critical commentaries centered on key business characteristics gathered from conversations and materials reviewed thus far.

Organization and Personnel

At four or five employees each, both SBS and PWC are on the small side for companies that develop and support enterprise solutions deployed in about 30 locations each. Both have a single leader/spokesperson, one technically proficient lieutenant, and a supporting cast with mixed skill sets in software development, customer service, and business development/support. One of the leaders, Richard Miller of SBS, is proficient in business skills, and the other, Patrick Way, is proficient at software development. The personnel mix in both companies appears to satisfactorily meet customer needs and also support development of their respective products – but often just barely. New county deployments are particularly stressful for both companies, and that has caused delivery timelines for many important product enhancements to slip.

Business Development – Client Base

SBS was established in 1994, and prior to the dotcom bubble it had a number of different clients, some of them large and recognizable. Since the first RMMS contract, however, SBS has had very few other clients and has derived most of its revenue from the RMMS project.

PWC began when Pat Way single-handedly developed AgGIS, and the operation remained an essentially one-person company for several years until enough interest and resources came together to deploy it outside of Glenn and Solano counties. PWC has had few other projects

or clients beyond the counties deploying AgGIS, though a concerted attempt was made to secure funding for related products/services from the Department of Water Resources before the state budget crisis set in with a vengeance. Similar opportunities in California or elsewhere may come forward in the future, but it is an open question whether PWC will be able to seize them.

Business Communications

PWC communications have at times lacked clarity and detail. Some of the narratives in proposals, on its web site, and in other materials are extremely informative in defining context and objectives, but fall short when it comes to detailing a sequence of tasks, task interdependencies, and task duration needed to execute a plan. Background materials obtained from PWC during this investigation included no spreadsheets, itemized lists of tasks and associated cost estimates, or detailed schedules. This informal approach to communications has impaired relationships with DPR staff, and staff in some counties who expect more formal documentation and structured business communications.

SBS is well versed in the communications area. Its proposals and product descriptions are thorough, detailed, and professional in appearance. If there is any shortcoming, it's that sometimes the tone is excessively promotional and can therefore make certain products or features appear bigger or more complex than is necessary The business-to-business arena is accustomed to this approach, and typically much more receptive or at least tolerant of it than the public sector.

It has been noted that both SBS and PWC have failed to meet promised timelines for rolling out product enhancements – sometimes by many months and without clear explanation to customers. This can quickly erode confidence and trust, so it's far better to offer realistic schedules and keep customers regularly informed about the progress being made, reasons for the delays, and revised schedules to accommodate the setbacks.

Vision and Innovation

As an organization, SBS is straightforward, by the book, and innovative within constraints. This is accurately reflected in the RMMS product itself, which incrementally improved upon RMPP with strong database management tools built on mature industry standard commercial products. SBS seems to do a good job following industry standard practices when it comes to designing, coding, testing, installing, and maintaining their products, but the product vision – as SBS readily admits – is almost entirely user-driven. The trouble is that users generally focus on narrow advances or problem fixes and they lack the perspective on software fundamentals that may be needed to drive true innovation. For example, most users aren't going to suggest that migrating to a more modern development platform or new database structure will open up all kinds of possibilities for advanced functionality. It's the product developer's job to anticipate where users can and should go, and then make sure the underlying system configuration will support it.

With AgGIS, PWC set out from the beginning to pursue the then innovative idea to manage the permitting function with both spatial and tabular interfaces. GIS is frequently touted as

an integrative technology – sometimes inappropriately – but in this case it made perfect sense and opened up previously unexplored possibilities by making interactive mapping tools available to non-GIS specialists including inspectors and biologists. Independently in Merced County, Mike Quinn was also innovative in developing Permit6 as a true temporal and highly normalized object-relational database using an open source SQL platform. Bringing AgGIS together with Permit6 on Linux using an open source Java development platform was perhaps more risky than building the system using the technology of a single commercial vendor, but it was also very innovative. The downside (alluded to previously) is the benefits of innovation are blunted if not accompanied by effective communications and business discipline. Not to be overly metaphorical, but if you are outside the box and trying to convince people still inside the box to come out and join you, then you had better be able to speak their language and make an extremely compelling case.

Business Planning

During separate interviews with the vendors, both were asked whether they had a plan to implement a 58 county solution. Responses from both indicated they hadn't previously thought too far beyond servicing their existing collections of counties. This is understandable in that this is all fairly new and nobody is sure what will happen and when. Still, it couldn't have been a surprise question and either vendor could have differentiated himself from the other with an answer indicating more forethought or, better yet, a documented plan outline.

What this signals, if anything, about these vendors' general business planning abilities is difficult to say. Moreover, even the best short term business plan in the world would be sorely tested in the current economic climate. SBS did not share any of its overall plans beyond RMMS, but if their FY 2009 budget really is mostly confined to application support, then SBS may recognize that its business cannot rely indefinitely on the level of funding it has received in the past for RMMS software development.

As for PWC, its latest business model proposal (to be paid a flat fee as a service bureau) is "innovative" in a way, but PWC also needs to consider alternative projects or products in the not too distant future when AgGIS system maturity means much less funding beyond maintenance and support.

Ramifications for CACASA/DPR

The foregoing discussion is intended to impress upon CACASA/DPR that fostering a stable long term relationship with a software vendor requires an active role as a stakeholder in the vendor's business. This awareness was lacking seven years ago when SBS (and RMMS) was left to fend on its own after one time funding from DPR was exhausted. Establishment of the residual mill fund was a huge step in the right direction toward stable and predictable funding, but another challenge looms if support and maintenance funding for a mature pesticide IT application alone is not enough to support a viable small business enterprise. In that case, the business must either scale back its operational costs to accommodate lower funding levels, or it must seek additional sources of revenue to maintain its current operational capacity.

None of this discussion is meant to imply that CACASA/DPR cannot sustainably work with either of the incumbent vendors, but it is important to understand and manage the inherent risks. Here are some key measures that can help control risk:

1. First and foremost, *obtain legal rights of ownership* or *rights of free access and reuse of* all application source code and documentation. It is even better if those rights are exercised (see #3 below) by encouraging others to understand the source code and documentation well enough to write custom add-ons or integrated applications.
2. Insist that all systems and the application code itself are thoroughly documented so that new software developers can easily pick up and continue with system maintenance and/or enhancements.
3. Cultivate a knowledgeable and technically savvy community of Ag Department personnel who are able to provide technical assistance to other counties and even become proficient at programming within the application.
4. Maintain awareness of the vendor's business plans and any challenges they are facing in fulfilling contracted obligations.
5. Be an advocate for your vendor by providing assistance wherever possible to help them thrive. Of course there are limits within the public sector about how overt such assistance can be, but there are still plenty of ways to help even if it's only being on the lookout for opportunities or offering advice.
6. Consider voluntary absorption (reverse privatization) of all or a portion of the vendor's operation needed to provide ongoing pesticide IT support. The result would be similar to the model used for RMPP where public employees provide the software maintenance and support. However, DPR has made it very clear that state IT contracting constraints would make it difficult or impossible for these services to be rendered by DPR employees. Therefore, any public employee involvement under this scenario would come from the public entity governing pesticide IT. As the analysis in the following section indicates, it is extremely unlikely that DPR could effectively serve as that governing entity. Any sort of public takeover could be considered as a last resort, but it can also be explored as a planned evolutionary option and is discussed as such in Section 10.

In whatever direction CACASA/DPR decides to go, keen awareness of risk is of paramount importance.

8. Organization, Oversight, and Governance

The legislation that established California's pesticide regulations clearly defines state and county roles and responsibilities for implementing the regulations. That same clarity does not extend to the oversight and governance of specific implementation tools, including those for pesticide permitting and use reporting. Effective governance of pesticide IT begins by designating an authority responsible for making all necessary funding, deployment, and contractual decisions. After that, mechanisms for how decisions will be made and implemented need to be established.

Many problems past and present can be traced back to loosely defined and inconsistent IT governance over time. It is not necessary to rehash history here, so long as stakeholders appreciate the need for a central controlling authority as well as the inherent challenges for designating and maintaining this authority within a large stakeholder group that has differing objectives because it is multi-layered and multi-jurisdictional.

Those challenges became apparent in the many conversations with a diversity of stakeholders held over the past two months. Many, though not all, at the county level believe DPR should take charge. A familiar paraphrased refrain was, "these are the state's regulations and the state should provide the tools to manage them." The word "provide" in this context sometimes meant only "pay for", and sometimes meant "pay for and provide governance." The refrain on the other side was, "this is the counties' software and the counties should maintain control over it." The remainder of this section summarizes state and county perspectives, followed by some important governance guidelines. Specific governance recommendations will be included in the Phase II Recommended Solution Report.

DPR Perspective

DPR has taken the firm position that its role in pesticide IT is, and should remain, narrowly defined. That role includes managing the specifications for use report data transmitted to it from the counties and supplying the counties with up to date information within DPR's sphere of influence, including the registered product label database and licenses/certification of pesticide professionals. DPR is also responsible for distributing pesticide mill assessment funds to counties, continuing to make additional financial contributions (when needed) from other funding sources, and like all stakeholders wants these funds to be spent as efficiently and effectively as possible.

DPR understands, and wants counties to appreciate, the bureaucratic and legal constraints state agencies have in matters involving IT product and services contracting. These constraints affect DPR's ability to respond quickly and effectively to changing county needs and restrict its ability to work closely with private vendors. Philosophically, the State does not view its role as dictating to counties how they should conduct their business. Also, the tenor and quality of communications between DPR and counties depends on DPR's appointed leadership, and therefore is not necessarily consistent over time. That problem surfaced most recently in the rise and demise of the SPURS proposal.

For these reasons, and due to the fact that DPR is not itself a user of pesticide permitting and use reporting software, DPR feels it is not in a position to dictate anything regarding the software to counties beyond those items in the first paragraph above.

County Perspectives

Some county stakeholders yearn for the IT governance model associated with RMPP whereby DPR took care of everything counties couldn't or didn't want to handle. Others recoil from the demonstrated pitfalls in this model, which include getting stuck for too long with obsolete software and overly centralized proposals like SPURS which were developed without adequate county input. The model where individual counties or groups of them go out on their own has now also been tried and proven to be problematic. There is a happy medium somewhere, and CACASA, as the only umbrella organization with representation from every county, seems to be the most likely possibility.

CACASA is analogous to an association of state governors, whose members have overlapping and commonly held interests, but each is fundamentally responsible for protecting interests within his or her own jurisdiction. Unlike legislative bodies, where rules for debate and decision making are well defined and binding, governor's associations and analogs like CACASA are more loosely organized and serve primarily as a forum to exchange ideas and develop consensus strategies for lobbying up to the next highest level of government. Getting CACASA to the point where it can smoothly and consistently appropriate money and implement policy may require some degree of transformation, but it needn't be radical because much of the necessary motivation and structure is already present.

Governance Guidelines

These are some of the main organizational and oversight components needed for effective IT governance:

1. A proportioned pool of funds like the residual mill fund should be maintained so that IT funding is consistent and predictable. DPR should continue its past practice to supplement this fund from other available sources *as needed*, for example, to support system transition and oversight activities.
2. Decision making bodies should include diverse representation by geography and other relevant circumstances.
3. Decision making by unanimous consensus is preferred, but will not always happen. Therefore, voting rules should be as democratic as possible and *may* include provisions for proportional voting in situations where stakeholder interests are far from being level.
4. When important information or advice is needed, it should be provided by an independent entity (staff or contracted) that is not beholden to any individual or group of stakeholders.
5. The current "County Project Manager" arrangement should be phased out by channeling state IT support funds through CACASA rather than individual counties.

9. System Evaluation Methodology

This section discusses the components involved with system evaluation. These components are:

1. Criteria to be considered
2. Methods used for assessment and rating
3. Methods used for weighting and tallying assessed ratings

Before discussing these components, it is extremely important to understand how they are linked with the system selection strategy options listed in Section 10. Depending on which one of those selection strategies is pursued, the distinction between system *evaluation* and system *selection* may either be blurred or sharpened. If CACASA/DPR decides to pick one of the existing systems for statewide implementation without a competitive bid process (Option A or B in Section 10), then the conclusions reached in the system evaluation would be the de facto system selection. But if there is to be a bid solicitation process (Option C or D), then the evaluation serves two entirely different purposes, which are:

- Establishing a target level of system performance/functionality that bid proposals must meet.
- Measuring the gaps between current systems and the desired level of performance/functionality should improve the quality of bids and make it easier to evaluate them.

If competitive bids will be solicited, then one thing this pre-bid evaluation process *should not do* is introduce unnecessary bias into the bidding process. Setting forth selection criteria and making a qualitative assessment of how well incumbent systems meet those criteria is fine, because it tells vendors what to shoot for when preparing bids and helps those who will evaluate the bids determine whether bidders have met their marks. But what should be avoided is a quantitative assessment that applies a weighting scheme to the ratings of the current systems in order to generate an overall score that ranks the incumbent systems.

It is difficult to predict how much or how little attention individual stakeholders will pay to the details behind the overall ranking, but the general perception will inevitably be that one system has received an official endorsement. That could give the appearance that the favored solution has already been identified, which could .make the subsequent bidding process seem like a waste of time because it will reach a foregone conclusion.

Therefore, it is strongly recommended that if a bid solicitation process is desired, then to preserve both its effectiveness and fairness an overall ranking of the incumbent systems based on weighted criteria *should be avoided*. But, since it isn't known yet which selection strategy is preferred, potential weighting and scoring methods are discussed below in subsections 9.B and 9.C.

9.A Evaluation Criteria

Systems and vendors should be evaluated on criteria that bear on meeting user needs and on long term sustainability of the system. The purpose of this section is to introduce the concept of evaluation criteria, with the understanding that the detailed list of criteria that will actually be applied for evaluation will be developed at the start of Phase II. These criteria may be categorized and described as follows:

A) **System Quality.** Includes considerations about the hardware/software architecture's ability to meet performance and stability standards required of an enterprise-level IT solution. Individual criteria will include:

- Quality of engineering in the software and hardware platforms.
- Cohesiveness among all system components working together.
- Performance optimization strategies pursued and planned.
- Quality of technical system documentation for all system components and documented source code that follows industry best practices.
- Quantity and/or frequency of bugs reported to vendors over the past year.
- Actual experience or susceptibility to system outages or data loss.

B) **System Functionality.** Features and functions necessary to meet user needs in a 58 county solution. This includes the presence or absence of specific features as well as how well features are optimized to increase user productivity. Most of the individual features/functions discussed in Section 5 of this report are expected to be assessed as individual criteria within this category.

C) **System Scalability.** Scalability will be considered on three different levels:

- Geography – Prospects for expanding system deployment to the entire state.
- Time – Prospects for the system to keep pace with technological change.
- Functional – Prospects for adding or integrating with new functionality.

D) **Vendor Qualities.** This includes consideration of individual vendor characteristics discussed in Section 7, all of which influence the quality and sustainability of vendor support for the system.

E) **System Cost.** This is extremely important, but there is currently insufficient information to differentiate between the two incumbent systems based on cost, or to predict the future cost to implement either system as a 58 county solution. Even if all of the cost information described in Section 6.A was available, those costs were incurred under different circumstances (often volatile and confusing) and in a non-competitive environment. The only accurate and binding way to inject cost considerations into system selection is to follow through with a bidding process that binds the bidders to the terms of their bids. If CACASA/DPR agrees to take that direction, then cost and value will become major criteria considered as part of the bid evaluation process.

9.B Assessment and Rating Methods

Each individual criterion within the categories identified above will first have a standard defined for it. The standard will be a short "statement of expectations" that describes a realistically attainable level of proficiency (not to be confused with absolute perfection) for each criterion. A qualitative assessment (narrative description) of how well each system meets these expectations will be provided. If a quantitative assessment is requested (in case the decision is to forego a bid solicitation process), a 10 point scale could be applied to each criterion so that a score of "10" means that the expected standard is completely met.

Next, two members of the *geographIT* consulting team would independently assign a rating between zero and 10 on each system for each of the criteria. Ratings for individual criteria in each category would then be reviewed by the team, and a single consensus rating for the entire category would be assigned by *geographIT*.

9.C Weighting and Ranking Methods

The only purpose for a criteria weighting process is to compute an overall system evaluation score (ranking) that takes all criteria into account in a way that is meaningful because it acknowledges that some criteria are more important than others. If criteria *scoring* is considered subjective, then criteria *weighting* is doubly so, and the only ones really qualified to do it for this project are the stakeholders themselves – for two reasons:

A) Consultants lack the long term experience needed to make fine determinations about the relative importance of each characteristic. Any weighting assigned by consultants will reflect what they think *should* be most important, and unless this agrees with what stakeholders think *are* most important, the entire ranking process will be rejected.

B) To reduce the introduction of statistical bias, criteria rating and weighting should be done as independently as possible. In this case one group, consultants, would perform the rating at the same time that stakeholders independently assign weights. Neither group can know what the other's assignments are until both sets are brought together.

As noted in the beginning of this section, CACASA/DPR is cautioned to first decide on a system selection strategy (Section 10) before deciding whether or not to undertake a potentially very controversial criteria scoring, weighting, and ranking process unless it will lead to productive conclusions. If a quantitative weighting and ranking process is deemed necessary and desirable, it should be conducted in this sequence:

1. Consultants publish categorized individual criteria and the "statement of expectations" for each one. DPR/CACASA sign-off on the evaluation categories and criteria that will be used.
2. Stakeholders designate a decision making group or some other method to assign weights to each criterion. The numeric system used is not important, as long as it accurately reflects *relative* importance among all criteria. So if one criterion is twice as important as another, the weight value of the more important item must be twice as large as the weight assigned to the less important item.

3. While stakeholders are assigning weights, consultants proceed with criteria rating using a 0 to 10 scale. Neither side will divulge anything to the other during this process.
4. When both groups are finished, the assigned weights and ratings will be combined and overall scores computed.

10. System Selection Strategy Options

During Phase I, a February 17th memorandum was prepared by *geographIT* for the CACASA IT Consultant Committee presenting alternative options, or strategies, for proceeding with system selection for Phase II. CACASA/DPR stakeholders must soon weigh in on both the strategies outlined in that memo and the evaluation methods described above in Section 9. Decisions on both will greatly influence the direction of this project.

The various system selection strategy alternatives (Options) outlined in the memorandum and the potential advantages and disadvantages of each are summarized below. There are two important changes. First, Option F (no action alternative) is now referred to as "Scenario F" due to feedback from the Committee indicating that this *was not* something stakeholders wanted to actively pursue. Second, a "Scenario G" has been added which describes the "reverse-privatization" scenario listed under bullet #6 near the end of Section 7 under the heading "Ramifications for CACASA/DPR."

The rationale for any of the options other than A or B (simply picking one of the incumbent systems to become the single 58 county solution based on this project's evaluation) is twofold:

1. Critical information that would be highly desirable to select between A or B is currently lacking. This includes information about the cost to implement either system statewide. Also, since neither vendor prior to this study has seriously planned for this degree of expansion including the potential impact on their capacity to absorb the additional work load, there is no away to accurately assess the plans and capabilities of either vendor to undertake the transition and continue providing support for a 58 county implementation.

2. Prior to this, there has not been an effective element of competition between vendors that could potentially reduce costs and increase accountability and predictability regarding future costs. Options contemplating a bid solicitation process were offered as a means to introduce a competitive element. Furthermore, the terms regarding the rights of ownership of source code and system documentation could be clearly defined in a competitive award so that CACASA would control the risk of a vendor who is either incapable or unwilling to continue the contracted development or maintenance of the system. And, once developed, CACASA could periodically rebid system support contracts in order to maintain a competitive process.

Options A and B

Based solely on an evaluation of the existing AgGIS and RMMS systems, the vendor of the higher ranking system is endorsed to receive funding for system enhancements and expansion into all 58 counties.

Advantages:

- Past investments in the prevailing system are not lost.
- Transition costs and disruptions affect no more than half of the counties.
- Future software development and documentation costs are lowered by funding a single system.
- Uniform statewide solution increases opportunities for counties to collaborate with one another in sharing data, technical methods, and user support.

Disadvantages:

- Existing shortcomings of the prevailing system and vendor may persist.
- Future development, product support, and system transition costs are based on non-binding estimates by one vendor with no competitive incentive to contain costs.
- Implementation success and future stability depends upon capacity and stability of the prevailing vendor.
- Current vendor may be unwilling to negotiate the terms of ownership of system source code due to a perception they have inherited intellectual property rights or retain their right of ownership due to their own investment in the software
- Strengths/weaknesses of existing systems may be difficult to differentiate when evaluated against diverse county needs, making the ranking itself not a compelling enough reason for some counties to switch vendors.

Project Ramifications:

- None in terms of scope or schedule.
- Potential for significant implementation obstacles in counties where the higher ranked system is not perceived to deliver significant benefits relative to transition costs and future needs.

Option C

Prepare detailed product specifications and a process to put the software development and support out for competitive bids. The specifications might include software capabilities and technical support elements from each of the two existing systems but might also include specifications for features not present in either system. Bidders could include the existing vendors as well as other interested and qualified firms. Ongoing software maintenance, technical support, and product enhancement could be periodically re-bid in an open competitive manner if CACASA retains ownership of the software source code. The key rationale for this option is to solicit a firm price for a specific level of performance, and to introduce a competitive element to control costs while ensuring a high level of customer support and requesting vendors to demonstrate they have the capacity to fulfill contracted obligations.

Advantages:

- Future development and support costs are more predictable.
- Performance expectations are well defined and can be enforced.
- Competition among bid respondents acts as an incentive to reduce costs.
- Specifications can address matters such as software ownership by CACASA
- Shortcomings of existing vendors can be avoided by selecting a different vendor without these shortcomings, or corrected with a defined and enforceable plan submitted by existing vendors.
- A more rigorous and objective selection process may promote county buy-in.
- Future software development and documentation costs are lowered by funding a single system.
- Uniform statewide solution increases opportunities for counties to collaborate with one another in sharing data and technical methods.

Disadvantages:

- Additional expense and time needed to prepare detailed bid specifications and evaluate bids.
- Potential for losing a greater amount of past investment and increased transition cost if neither existing vendor wins the bid.
- If neither of the current vendors are selected, it is necessary to fund software maintenance and technical support for both vendors while incurring the additional costs of developing an entirely new system so costs could be significantly higher until a new system is ready for implementation.
- With two vendors already in place with installed systems, the likelihood of attracting new parties to bid may be diminished unless the specifications for the new system are significantly broader than the current vendor solutions.

Project Ramifications:

- Some or all of the implementation planning phase of this project will need to be modified. It could be extended and expanded to include bid solicitation and evaluation, or these tasks could become part of a separate project, or the implementation plan could be delayed until after selection of a winning bid.

Option D

This is a variation of Option C in which *only* the two existing vendors would be invited to bid. Bid specifications would not be generic as in Option C, but instead tailored to what each vendor must accomplish to "build out" their current system. Specifications would still require each vendor to propose a binding cost structure to complete development of their current system, deploy it in all counties, provide ongoing software maintenance and technical support, and any compensation to convey full ownership of system source code, databases, and documentation or at least providing rights for CACASA to use system source code and documentation for any CACASA funded initiative, including contracting with other vendors for additional system enhancements without incurring additional fees.

Advantages:

- All advantages listed for Option C also apply to Option D.
- Compared to Option C, much less time and expense needed to prepare specifications and evaluate bids.
- Past investment losses and transition costs will not exceed what would be incurred by Options A or B.
- This option avoids the risk of undergoing Option C's more rigorous and expensive bid solicitation process but then failing to attract outside bidders.

Disadvantages:

- Additional expense and time will be needed to solicit and evaluate bids (but much less than Option C).
- If neither existing vendor is able to prepare a credible or attractive bid, no third party option is available.
- Potential competition benefits are reduced with only two bidders.

Project Ramifications:

- Same as Option C, but with less delay and expense.

Scenario F

This is essentially the status quo option, analogous to the "no action alternative" in an Environmental Impact Statement. It is an important scenario to keep in mind because it is what would most likely happen by default if recommendations made in this project are not followed. Also, stakeholders may wish to evaluate the tradeoffs between inefficiency and perceived benefits of the status quo situation relative to the other options. One way to get additional input on these tradeoffs would be if, in conjunction with Option D, vendors were requested to include planning and bid pricing just to support their existing customer bases as well as unit pricing to take on counties that might switch to their system.

Advantages:

- No transition costs – except for counties that decide to switch systems.
- Potential for competition based on both functionality and price – though this would require modifying the current funding mechanism where all funds are pooled and counties receive 100% funding regardless of system choice.
- Better risk management. If something happens to one of these small vendors that impairs the ability to continue supporting their product, another product is immediately available for use.
- After the existing systems are built-out to comparable functionality, development costs will decline sharply (but won't go away entirely) and ongoing maintenance and support costs should be similar on a per-county basis regardless of whether one vendor is supporting all counties or two vendors are each supporting about half of the counties. Thus, the (redundant) cost to achieve build-out for both systems can be directly weighed against the cost to transition one built-out system into all counties.

- The two existing systems have different design "philosophies" and it could be that each one is truly better suited to meet certain needs in certain counties. Diverse needs are usually best served by the availability of diverse choices, but this is a calculation that resists quantification.

Disadvantages:

- All the existing disadvantages of the current situation (e.g. redundant development costs now and recurring into the future until the systems are fully developed,).
- The competitive element is not as strong or well defined as in one of the competitive bidding options – though the competition would be ongoing.
- Overall costs and oversight demands will be higher with two vendors.
- Ability to seamlessly share permit data between counties is made more difficult because of differences in technologies and database schemas. This could potentially be overcome with development of web services but this would require yet additional development costs.

Scenario G

Under circumstances in which a vendor could no longer continue supporting their product, CACASA/DPR could either find a new vendor to take over, or under this scenario, the designated governing entity for pesticide IT could absorb product support as a function carried out by public employees – similar to the model used for the RMPP system. This is the scenario presented as a possible risk management strategy near the end of Section 7 in this report. It could be considered either as a fall back or "last resort", or it could be pursued as an affirmative evolutionary strategy. It is listed here because responses to perceivable risks should be considered regardless of the selection method that is chosen. No specific advantages or disadvantages have been developed for this scenario, though it should be noted that it would be difficult or impossible for employees of DPR to perform this function. This should not be an issue however, since nobody is suggesting that DPR is in a position to become the governing entity for pesticide IT.

Appendix A – Glossary of Terms and Acronyms

AgGIS	A pesticide IT product developed by Patrick Way Consulting, Inc., stands for Agricultural Geographic Information System (see page 9)
CACASA	California Agricultural Commissioners and Sealers Association. Professional association whose members are County Agriculture Commissioners.
CAC	County Agriculture Commissioner (and Sealer)
CEDTS	California Electronic Data Transfer Standard (see pages 8,9)
DPR	(also CDPR) – California Department of Pesticide Regulation
EIR	Environmental Impact Report
GIS	Geographic Information System
GMSA	Grower Management Software Application, a generic term for computer applications used by private agriculture and pesticide businesses to manage farming operations (see page 8)
Mb	Megabyte (one million bytes of information)
NOI	Notice(s) of Intent to apply pesticides
PCA	Pest Control Advisor – person licensed to consult on pest management plans
PCB	Pest Control Business (employer of PCAs, PCOs, QALs, etc.)
PCO	Pest Control Operator – person licensed to handle and apply pesticides
Permit6	A pesticide IT product developed by Merced County (see page 9)
Pesticide IT	Generic term for Information Technology (software/hardware system) used to manage pesticide regulations
PUR	Pesticide Use Report(s)
PWC	Patrick Way Consulting, Inc., vendor of AgGIS
QA/QC	Quality Assurance / Quality Control
QAL	Qualified Applicator Licensee– person licensed to handle and apply pesticides
RMMS	A pesticide IT product developed by Streamline Business Solutions, Inc., stands for Restricted Materials Management System (see page 9)
RMPP	A pesticide IT product developed by the State of California, stands for Restricted Materials Permit Program (see page 8)
SBS	Streamline Business Solutions, Inc., vendor of RMMS
SPURS	Statewide Pesticide Use Reporting System, a proposed statewide pesticide IT system (see page 10)
SQL Server	A computer database product sold by Microsoft Corp. SQL stands for "Structured Query Language", a syntax standard used to query databases.

Appendix B – Online Survey Form

The full survey is printed on the following pages.

Pesticide IT Needs Analysis Survey

1. Information about you and your County

Instructions:

1) We need at least one survey response from each county.
2) Any number of people from a county may submit responses to this survey.
3) Everyone must answer questions marked with *, use "Don't Know" responses if necessary.
4) Note that questions beyond *page 7* only require a *single response* from each county. If you are not the one answering those questions, follow instructions on page 6 to exit the survey early.
5) Please do not "exit" before finishing, as only partial results will be recorded for you.
6) Please try to complete the survey by February 20, 2009

-For questions/problems contact John Gless jgless@geographit.com (970) 420-9114
Thank you for your time, ideas, and patience!

* 1. Your County

County name

* 2. Your Title

Position

* 3. How many years of Agriculture Department experience do you have? (include total for all counties where you've worked)

◯ <3 ◯ 3-5 ◯ 5-10 ◯ 10-15 ◯ 15-20 ◯ 20+

* 4. Do you personally use your county's Permit/Reporting Software?

◯ Daily ◯ Weekly ◯ Occasionally ◯ Seldom ◯ Never

* 5. Please give us your Name, Email, and (optional) Phone# if we need to follow up on your responses.
(Private - for consultant's use only)

Name:
Email Address:
Phone Number:

Pesticide IT Needs Analysis Survey

2. Importance of various System Features

All responders should answer these questions

When answering these questions, focus on what you *want* or *need,* and not on what your current system offers.

* 1. Please rate the importance of these features to your county's operational goals:

	Very Important	Somewhat Important	Not Important	Don't Know
Adjustable User Access Permissions	◯	◯	◯	◯
Customizable Menu Layout	◯	◯	◯	◯
Support for Customized Functions	◯	◯	◯	◯
Integrated Mapping (GIS)	◯	◯	◯	◯
User-Defined Query/Reporting	◯	◯	◯	◯
Standard Query/Reporting	◯	◯	◯	◯
Flexible Search Functions	◯	◯	◯	◯
Advanced Text Formatting in Printouts	◯	◯	◯	◯
Web Application for PUR/NOI submissions	◯	◯	◯	◯
Change "sticker requirement" to promote electronic submission of structural use reports	◯	◯	◯	◯

* 2. Please rate the importance of these features to your county's operational needs:

	Very Important	Somewhat Important	Not Important	Don't Know
Support for Rotational Cropping	◯	◯	◯	◯
Multi-year Database	◯	◯	◯	◯
Real-time Access to DPR Pesticides Database	◯	◯	◯	◯
Context Sensitive Error Messages	◯	◯	◯	◯
Online Help and Documentation	◯	◯	◯	◯
On-site System Training	◯	◯	◯	◯
Web Training (Video or Interactive)	◯	◯	◯	◯
User Manuals	◯	◯	◯	◯
System Manuals (for system administrators or programmers)	◯	◯	◯	◯

3. Please list and briefly explain other (new or improved) features you consider important:

Pesticide IT Needs Analysis Survey

4. Many counties have suggested that the Permitting/Reporting system and database could become a "keystone" application that is closely integrated with other Ag. Department information systems and functions. Please list and briefly explain any functions you think would be improved if they could directly access the Permitting/Reporting database or even be added to an extended system:

Pesticide IT Needs Analysis Survey

3. Performance of existing System Features

All responders should answer these questions.

Now, please rate how well features work on your *existing* system.

* 1. Please rate how well these features work *in your county's current system:*

	Works Well	Works Okay	Needs Improvement	Not Available	Don't Know
Adjustable User Access Permissions	◯	◯	◯	◯	◯
Customizable Menu Layout	◯	◯	◯	◯	◯
Support for Customized Functions	◯	◯	◯	◯	◯
Integrated Mapping (GIS)	◯	◯	◯	◯	◯
User-Defined Query/Reporting	◯	◯	◯	◯	◯
Standard Query/Reporting	◯	◯	◯	◯	◯
Flexible Search Functions	◯	◯	◯	◯	◯
Advanced Text Formatting in Printouts	◯	◯	◯	◯	◯
Web Application for PUR/NOI submissions	◯	◯	◯	◯	◯

Optional Comments:

* 2. Please rate the quality of these features *in your county's current system:*

	Works Well	Works Okay	Needs Improvement	Not Available	Don't Know
Support for Rotational Cropping	◯	◯	◯	◯	◯
Multi-Year Database	◯	◯	◯	◯	◯
Access to DPR Pesticides Database	◯	◯	◯	◯	◯
Context Sensitive Error Messages	◯	◯	◯	◯	◯
Online Help and Documentation	◯	◯	◯	◯	◯
On-site System Training	◯	◯	◯	◯	◯
Web Training (Video or Interactive)	◯	◯	◯	◯	◯
User Manuals	◯	◯	◯	◯	◯
System Manuals (for system administrators or programmers)	◯	◯	◯	◯	◯

Optional Comments:

3. Please list other features (not listed above) that you think are *distinctive* and that you *especially like* about your system:

4. Please list other features (not listed above) that you *wish you had* or *should be improved* on your system:

Pesticide IT Needs Analysis Survey

4. General Performance of your System

All responders should answer these questions.

* 1. Which statements apply to the *overall performance* of your system? (check all that apply)

- [ ] Works well without delays almost always.
- [ ] Works well most of the time.
- [ ] Slows down when there are many users.
- [ ] Slows down for no apparent reason.
- [ ] Locks up or crashes on rare occasions.
- [ ] Locks up or crashes fairly often.
- [ ] Don't Know

Other (please describe)

* 2. Are you aware of any network infrastructure or county IT issues that may affect your Permitting/Reporting system?
(check any that apply)

- [ ] No, network is stable and secure.
- [ ] Have had issues in the past but they are now resolved.
- [ ] Network/IT issues sometimes reduce system performance.
- [ ] Network/IT issues frequently reduce stability/availability.
- [ ] Special arrangements were needed to connect our system.
- [ ] County IT has not connected our system to the county's network.
- [ ] County IT has technical or security concerns with our system.
- [ ] We need improved network infrastructure to district offices.
- [ ] Don't Know

Other (please describe)

* 3. What is the *LEAST* number of days (on average) needed for computer savvy users to become comfortable with the system?

- ◯ half day or less
- ◯ one day
- ◯ two days
- ◯ three days
- ◯ four days or more
- ◯ no answer

Pesticide IT Needs Analysis Survey

* 4. What is the *MOST* number of days (on average) needed for less computer savvy users to become comfortable with the system?

- ◯ half day or less
- ◯ one day
- ◯ two days
- ◯ three days
- ◯ four days or more
- ◯ no answer

Pesticide IT Needs Analysis Survey

5. Technical Support Questions

All responders should answer these questions.

* 1. When you encounter a problem, who do you consult *FIRST* to resolve it?

- ◯ A colleague in my county
- ◯ A colleague in another county
- ◯ System vendor
- ◯ Documentation or website help
- ◯ Don't know

* 2. When you contact your vendor about an immediate problem, how long, on average, does it take to resolve?

- ◯ Immediately - or close to it
- ◯ Within two hours
- ◯ Same day
- ◯ Next day
- ◯ A few days
- ◯ Longer...
- ◯ Don't know

Other (please specify)

* 3. How often does your county have problems that take longer to fix than the "typical" response time above?

- ◯ Several times per month during peak season
- ◯ Once or twice a month
- ◯ A few times each year
- ◯ Hardly ever
- ◯ Don't know

Other (please specify)

Pesticide IT Needs Analysis Survey

* 4. Please rate the service of your *system vendor* in attempting to resolve...

	Excellent	Good	Fair	Poor	Don't Know
Questions about system usage	◯	◯	◯	◯	◯
Unexpected errors (bugs)	◯	◯	◯	◯	◯
Requests for minor changes/enhancements	◯	◯	◯	◯	◯
Requests for major changes/enhancements	◯	◯	◯	◯	◯
Questions about hardware or networking	◯	◯	◯	◯	◯
Network or hardware breakdowns	◯	◯	◯	◯	◯

Optional Comments:

* 5. If you have ever attended training offered by the vendor, how would you rate its effectiveness?

- ◯ Very helpful, could operate system at work right away.
- ◯ Helpful, but needed more on the job practice.
- ◯ Waste of time, learned much more from peers or on the job.
- ◯ Don't know, never had vendor training

Further comments on vendor training:

* 6. Do you participate in an organized user group from multiple counties to discuss issues/concerns with your system?

- ◯ Yes, regularly
- ◯ Yes, but not often
- ◯ No, never
- ◯ Don't know

Briefly describe this group:

* 7. Do you find this user group to be helpful?

- ◯ Very helpful
- ◯ Somewhat helpful
- ◯ Not that helpful
- ◯ I don't belong to one now but would like to
- ◯ Don't know

Pesticide IT Needs Analysis Survey

8. Please comment on your overall impression of customer service offered by your system vendor.
(e.g. promptness, professionalism, knowledge, communication abilities)

Pesticide IT Needs Analysis Survey

6. You are getting close to done!

The final three sections only need to be filled in by one designee for your county. If that is you, please proceed to the next page.

Otherwise,you ARE done, so click "Yes" and then "Next" below to skip to the concluding page.

* 1. I want to complete and submit my response now.

- ◯ Yes, I am done
- ◯ No, I will complete the rest of the survey

Pesticide IT Needs Analysis Survey

7. Information about your County's Restricted Material Permits and Use Reports

Skip this page *unless you are the one person* designated to respond to these questions.

1. Permits/Licenses - please enter approximate numbers for the most recent year.

Number of Restricted Material Permits issued (both Ag and non-Ag):

Number of Operator-ID issued (unrestricted materials):

Number of Business and Individual Licensed/Registered contacts:

2. Does your county issue multi-year permits for permanent crops?

- ◯ Yes
- ◯ No

3. Reports - please enter either last year's number or average of recent years (if highly variable).

Number of Pesticide Use Reports (single use):

Number of Monthly Summary Use Reports:

Number of Notices of Intent received (single use):

4. Electronic Submissions - please enter most recent values expressed as a Percentage (but don't type in "%" and don't use a decimal point).

Percentage of PUR received only from RMMSWeb or Permit6Web:

Percentage of total PUR received electronically:

Percentage of total NOI received electronically:

5. Is any of your county's use report data entry contracted out to another county?

- ◯ No
- ◯ Yes

6. If the preceding answer was "Yes", which county performs your data entry?

County name

7. Does your county perform data entry of NOI? (non-structural only)

- ◯ None at all
- ◯ Yes, nearly all of them
- ◯ Yes, but not all

8. If you ***do not*** enter NOI, would you do so if resources were available?

- ◯ Yes, definitely
- ◯ Possibly
- ◯ Not interested
- ◯ N/A (already enter all NOI)

Pesticide IT Needs Analysis Survey

8. Information about your County's Permitting and Reporting software

Skip this page *unless you are the one person* designated to respond to these questions.

1. Which system are you using right now?

- ◯ RMMS
- ◯ AgGIS/Permit6
- ◯ Permit6 only
- ◯ RMPP only
- ◯ Other (please specify)

2. Year your county first began issuing permits with this system:

Year

3. If using RMMS or AgGIS, what *version* is installed?

4. How many people, in total, use this system?

Total users:

5. How many people are *frequent* users?

Frequent users:

6. What is the maximum number of *simultaneous* users during peak usage periods?

- ◯ < 3
- ◯ 3-5
- ◯ 5-10
- ◯ 10-15
- ◯ 15-25
- ◯ 25+

7. Are there remote users of the system in District offices?

- ◯ Yes
- ◯ No

8. How many District offices are there?

District Offices:

Pesticide IT Needs Analysis Survey

9. Questions about Field Maps and GIS

Skip this page *unless you are the one person* designated to respond to these questions.

1. What is the approximate number of permit sites (potential # of field polygons)in your county:

# of Fields/sites

2. Does your county maintain a field boundary (permit site) layer in a GIS?

- ◯ Yes, all fields (permit sites) digitized and they are updated annually
- ◯ Yes, but fields only partially digitized or not up to date
- ◯ No

Other (please describe)

3. Please estimate how many of your fields (sites) would require either a site-ID coding change or boundary shape change in an average year? (Either actual edits if you use GIS now or projected edits if you don't use GIS)

Edits to Fields/sites

4. Please estimate the *PERCENTAGE* of permits with site maps generated by each of the following methods:(total of all rows must equal 100)

1) Integrated GIS in Permitting system (AgGIS), field polygons coded with site ID	
2) External GIS field polygons coded with site ID attributes	
3) External GIS map template, with hand-drawn polygons/IDs	
4) Grower-supplied field map	
5) Web-based map template (e.g. Google, MapQuest) with hand-drawn polygons/IDs	
6) Other photocopied map with hand-drawn polygons/IDs	
7) Other (please describe in next question)	

5. Describe method #7 in the previous question, if applicable.

6. Does your office have access to GIS software *EXTERNAL* to your Permitting software?

- ◯ No
- ◯ Yes, ArcView or ArcInfo
- ◯ Yes, but only county Web mapping

Yes, other GIS software (please specify)

Pesticide IT Needs Analysis Survey

7. Please list additional GIS layers and/or procedures you *currently* use for Pesticide Permitting (if applicable):

8. Please list additional GIS layers and/or procedures you *currently* use for *other Ag. Dept. functions* (if applicable):

9. Finally, pleasue describe additional GIS layers and/or procedures you *would like to use* for *any* function if the data/application was available:

Pesticide IT Needs Analysis Survey

10. You are done!

Thank you for taking the time to complete this survey! Your responses will be extremely valuable for helping to improve Permitting and Use Reporting systems in the future.

You may go back and review each page of answers now, leave final comments below, or click "Submit" to finish and send the survey.

1. Enter below any final comments on this survey, this project, or other opinions you may have.