



## Conclusions from the “Enhancing the Value and Sustainability of Field Stations and Marine Laboratories in the 21st Century” submitted to the National Research Council of the National Academies

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The value of field stations is widely acknowledged but unevenly documented by scientists in anecdotal evidence and in qualitative and semi quantitative form. Measures of effectiveness that are aligned with field stations’ science, education, and business plans can lead to improvement in performance and impact but typically are lacking. In the absence of metrics, it is impossible to manage for improved outcomes.

Effective practices involve supporting and training leaders, collection of metrics, and networking among field stations. It is essential that all field stations have effective leadership and a strong support base that includes scientists, donors, and stakeholders that extend beyond the field station. It also is essential that field stations collect data that can be transformed into at least a minimal number of metrics to document their performance and successes. A strong communication program is necessary for both leaders and the institution and should include an effective and current Web presence. Finally, many functions of field stations could be enhanced by the formation of partnerships and networks, both nationally and international.

**Recommendation:** Field stations should work together to develop a common set of metrics of performance and impact. The metrics should be designed so that they can be aggregated for regions and the entire nation. Universities and other host institutions and funding organizations should support the gathering and transparent reporting of fieldstation performance metrics because such information will enhance the stations’ ability to document the contributions of field stations to the nation’s research and education enterprise.

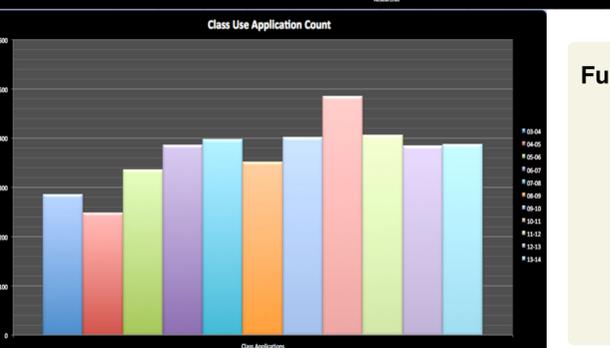
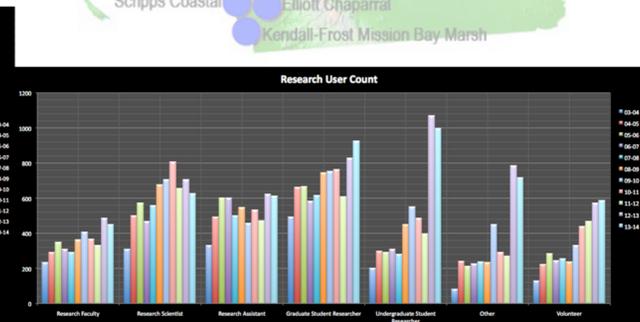
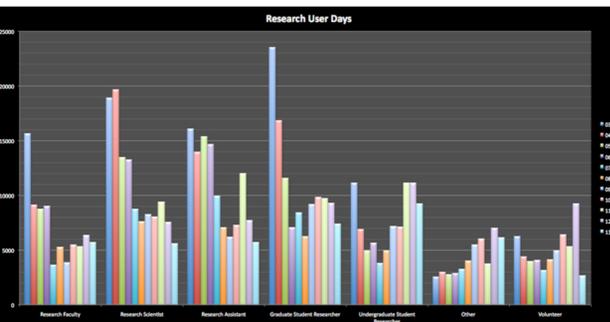
**Recommendation:** New mechanisms and funding need to be developed to collect, aggregate, and synthesize performance data for field stations, and to translate these data into metrics and information that can be used to document the value of the community of field stations to science and society.

## Metrics for Achieving Goals and Demonstrating Impact

The University of California Natural Reserve System’s (UC NRS) 39 field stations needed a way to track the use of the reserves so that they could report to the supporting campus administrators and supporters in the private sector and state and federal agencies. Gathering information on the wide variety of uses of field stations is complicated. Visits are made by different people from different research projects that can span different periods and include more than one reserve.

The Reserve Application Management System (RAMS) was created in 2000 to capture information from users of UC field stations by asking them to fill out an application before they were provided access to the reserves. The application gleans input information for inclusion in the core ecologic metadata on every approved research project. RAMS metadata follow the format (EML) developed by the Knowledge Network for Biocomplexity ([www.ecoinformatics.org](http://www.ecoinformatics.org); see Michener and Jones 2012). Information requested is available on line and includes location, temporal span, abstract of research, author, contact information, and funding sources and amounts (<http://rams.ucnrns.org/PDF/rams2-researchappandres.pdf>). RAMS requires a user’s research permit information and provides a liability waiver form on line. In 2012, RAMS was upgraded to a MySQL relational database. Some NRS reserves were slow to adopt RAMS, so underreporting is an issue.

From January 2010 to January 2013, 683 peer-reviewed journal articles, books, and book chapters were enabled by the 38 reserves. Users included 26,600 people, who spent a total of 84,237 user-days on the 38 reserves. Over 2,500 university-level researchers used the reserves. Research grants enabled by the reserves totaled \$386.4 million. Research projects enabled by more than one reserve accounted for \$74.6 million of the total extramural grant funding. More than 150 undergraduate courses were offered at one or more NRS reserves, including 3,900 university students. Over 1,700 K-12 students participated in learning on the reserves. The graph above is based on this summary data. It reports user-days (a day and generally a night spent on the field station) in various self-defined categories as follows: Grad = graduate student, Faculty = research faculty, Class = university-level students (note: undergraduate and graduate student user-days were lumped together prior to 2012); k-12= kindergarten through 12 grade students; vol = volunteers; and grants = total budgets of research grants that were approved to use one more of the UC NRS reserves.



## Further Information

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Figure Application List Page



Figure: Reservation Information Page

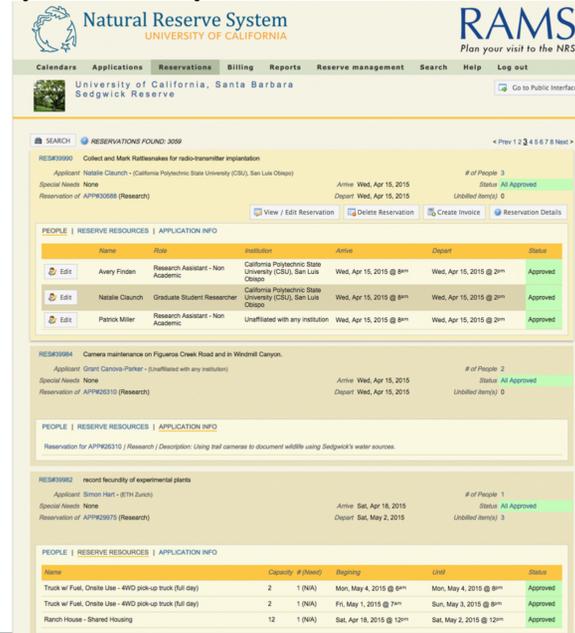


Figure: Rams calendar interface



## Introduction

The University of California’s Natural Reserve System needed an effective way of collecting data from their users and present this data in a report at the end of the year. RAMS, the reserve application management system, was initially created for this purpose. It provides a means for reserve manager to access a researcher’s application data and to made decisions on how they want to manage that user when they visit their research station. Over the years though it has grown to become a valuable tool for meta-data collection of research being done on the reserves and as a source of biometric data that is used in reports and grant proposals. The system currently has more than 50 research stations in it’s database that are managing users applications and reservations to visit the location. At this time RAMS is currently managing more than 20,000 different applications and more than 35,000 reservations.

## Materials and Methods

In it’s infancy, RAMS started out as a Filemaker database, but as it’s potential grew the system was transitioned to a MYSQL database that is running on an Mac X-Serve. The system uses a scripting language called LASSO (lassosoft.com) to bridge the communication between the web interface and the database. A large rework of the database schema and the interface were performed during this time in the hope of normalizing the database and providing greater flexibility for the future. (See Schema Diagram). Data collected by the manager can be submitted to the KNB (Knowledge Network for Biocomplexity) Meta Data database and through that to DataOne.

## Results

Reserve managers have faster and greater access to the data describing the usage of their reserve. Researcher have access to research meta data to further efforts to promote collaboration with other researchers. Managers and NRS staff have the ability to export biometric data for reports and add meta-data to other data aggregators. The NRS has a uniform interface to promote the fact that all these reserves belong to a system and promote research projects that span multiple locations in CA. Administration can access information at any time and get biometrics from a reserve which releases the reserve manager from this task.

## Conclusion and Future Development

RAMS can continue to provide valuable data and generate trend information over time. In RAMS’s next iteration we plan to transition the database interface to PHP code and make the interface more usable by reserves outside California. We are researching the viability of converting RAMS into a Content Management System in the hope of better managed users data and integrating the database with other meta-data collection tools such as DEIMS. Improvements to better intergrate DataOne with the use of EML file export.

Figure: Usage Table

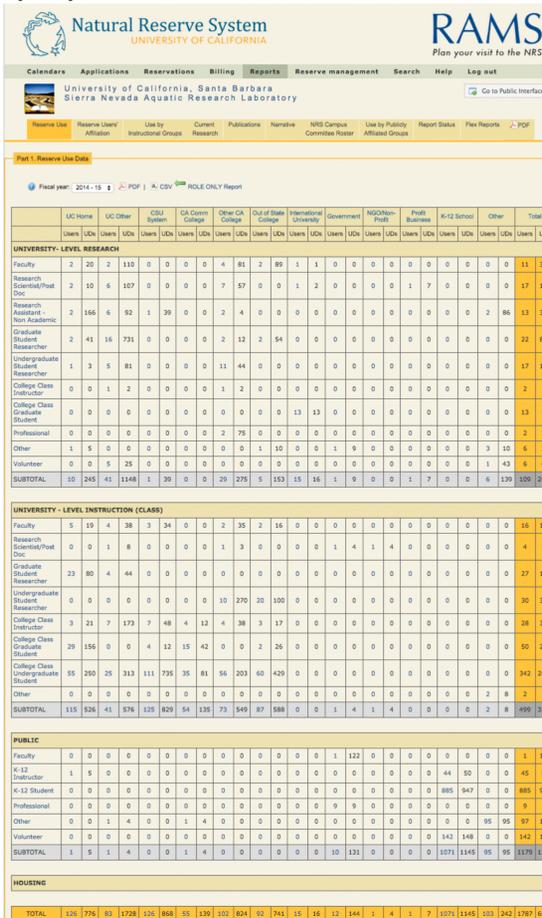


Figure: Schema for the RAMS Database

