



National Science Foundation
4201 Wilson Boulevard
Arlington, Virginia 22230

September 28, 2009

Dear Dr. Michener,


Thank you for your participation and presentation at the recent Reverse Site Visit (RSV). The RSV is an important mechanism that the NSF EPSCoR Office uses for project management and oversight, and for providing feedback and guidance to awardees. The NSF EPSCoR Office would like to complement you and your fellow team members for your professional approach to the RSV activity. Your presentation provided a clear indication of the progress made during the first year of your jurisdiction's current Research Infrastructure Improvement (RII) - Track-1 Award. Based on the well-organized presentation, it was obvious that you approached this task with appropriate deliberation, dedication, and diligence.

The attached report is based upon the RSV panel's review of written materials (complete proposal, review panel summary, review analysis, original grant letter, RII strategic plan, annual reports and budget) provided prior to the meeting, the oral presentation made by the project team, visual aids supporting that presentation, and subsequent discussion with the team.

Please review the report and share it with the appropriate individuals in your jurisdiction to develop responses and action plans that address the issues and recommendations identified in the RSV report. Please contact your cognizant NSF EPSCoR Program Director if you have any questions related to the panel's report or if you need further clarification regarding the requested responses. The response to Recommendation #1 should consist of a revised diversity plan to increase the participation of women and underrepresented minorities on the faculty. In response to #8, provide the date and agenda for the planned advisory committee meeting and also provide the date for the EPSCoR state-wide meeting to be held in 2009. In the case of #9, it is anticipated that New Mexico EPSCoR response will consist of a revised evaluation plan to NSF. In addition to the panel recommendations included in the report, also provide a plan for collaboration between the water quality researchers at New Mexico Highlands University and New Mexico Tech, specifically addressing data compatibility and calibration issues.

The NSF EPSCoR Office would like to receive your written responses to each of the RSV panel's recommendations described in the report no later than **October 23, 2009**. Please note that the Year 2 Annual Report for the RII award (and subsequent reports, as appropriate) should include the progress on the RSV recommendation responses and action plans.

Best Regards,


Uma D. Venkateswaran
Program Director
NSF/EPSCoR

Reverse Site Visit Report

NSF EPSCoR Jurisdiction: New Mexico
RII Award Number: EPS-0814449
Principal Investigator: William Michener
RII Program Solicitation: NSF 08-500
Reverse Site Visit Date: September 14, 2009

Précis

One year into its third RII, New Mexico EPSCoR (NM EPSCoR) is making impressive progress, guided by a visionary statewide science and technology plan, which features energy/environment/water as one of the five innovation clusters. The major research initiatives of this project focus on observation, modeling, and analysis of high-elevation hydroclimatology and on understanding and forecasting the effects of global climate change on water supply and water quality—clearly both timely and important topics. The extensive cyberinfrastructure effort builds on the high performance computing infrastructure in the state. Education and outreach are well integrated with research and strategically engage K-12 schools and regional universities serving minority populations. Additional attention to diversity planning (especially at the faculty level), evaluation, and broader scientific/economic impacts will pay dividends. Special award conditions have mostly been met.

Progress to Date

Intellectual Merit

This project has clear intellectual merit. The importance of understanding the changes in hydrology and water quality predicted under climate change was well demonstrated. Improved modeling of changes in the distribution of water from high to low elevations that accommodates the distribution of the population centers, and inclusion of the role of community-run water supply systems will allow better prediction of the impacts of change on the systems. The infrastructure investments and planned research appear to be quite strong.

Broader Impacts

In addition to the science component, this project clearly intends to have a significant impact in the educational arena and with the public in general. Several educational efforts are well integrated to the overall project plan, so this was clearly intentional from the start. The exhibits planned for museums are well designed to attract the public's interest and attention. Once the project is completed, it will leave a legacy of well instrumented observatories for the state. Additionally, the data sets collected, when

combined with similar data from the other EPSCoR projects in the Tri-State Consortium, will provide a regional data set.

Progress towards goals and objectives:

1. Strategic Fidelity and Impact

The team's presentation clearly showed that they are on-track with respect to fidelity to the project goals and essentially on schedule with respect to the project timeline. Likewise, the NM EPSCoR project addresses key components in the current state-wide research and technology plan, and has beneficial collaborative connections with the state planning body.

2. Value Added

One of the benefits of a large-scale integrated project is that the whole is greater than the sum of the parts. For the NM EPSCoR project, this is clearly evident. The data collection projects contribute well to the modeling effort; the science projects have an integrated education or outreach component often in conjunction with a variety of informal science education groups which provides an additional avenue for dissemination of information. By fostering collaborative relationships with other research groups, ties to other institutions beyond the EPSCoR group are fostered.

3. Cyberinfrastructure

In general, the CI aspects of this project are very well formed. The project enjoys strong support at the state level in terms of funding for cyberinfrastructure (for example the Encanto machine). The state has consciously decided to train more students in computational climate research with a strong high performance computing (HPC) educational component. Currently, the main universities are experiencing hiring freezes, but work with DOE National Labs involving graduate student and post docs is moving forward.

In terms of data, this group is well versed in the problems associated with large-scale data sets. NM EPSCoR is engaged with the Tri-State Consortium in looking at these issues, and has a preliminary archive in place leveraging from experience with the New Mexico Resource Geographic Information System (RGIS). There is an expectation of integration with the NSF funded DataNetONE (Observation Network for Earth) infrastructure when that gets up and running, but that is still at least a year away. The fact that the PI for this project is also the PI for the DataNetOne project ensures communication.

The group has thought about data policy issues, and has cross-project agreement (both policy and enforcement plans) to sharing data. The automatically collected data will be accessible immediately from the web site when the basic infrastructure is in place; it is currently only logged. Quality assurance issues will need to be

addressed with data, but this appears to be straight forward and common with this type of project.

Data connections to education are well understood. Instead of trying to share large-scale data, the team is considering reduced data sets, real world data examples, and use of visualizations from the research data for teaching and museum exhibits.

4. Dissemination and Communication

The dissemination and communication strategies being employed to date are multi-faceted and serve a wide range of target audiences. Significant progress has been made in the planning and implementation of the cyber infrastructure as a means of enhancing not only research productivity, but outreach and dissemination as well. A new web portal is available at <http://www.nmepscor.org> with specific foci around research, education, outreach and publications. The portal serves both stakeholders (e.g. the public and government entities) as well as project participants for annual reporting and ongoing informational highlights. Plans for Year 2 upgrades include online registration capabilities as well as direct interfacing of EPSCoR participant information with the project's database.

Cyberinfrastructure activities of this RII will facilitate the utilization of shared resources among the Tri-State Consortium. One of the activities enables improved efficiency in document sharing, collaborative writing and messaging, while the other is a shared versioning system.

In helping to prepare faculty to effectively communicate their science to larger audiences, the NM EPSCoR office sponsored a Faculty Leadership Fellowship Program that addressed "Communicating science to decision makers".

One of the strengths of this RII is communication with the public. Mechanisms include statewide lecture series, leveraging National Association of Science and Technology Centers (ASTC) and EPSCoR funding to partner with the New Mexico Museum of Natural History and Science to create a "Climate Change Impacts in New Mexico" exhibit that works with Science on a Sphere, science cafes, and other seminar series in northern New Mexico.

Cultural sensitivity and a demonstrated commitment to diversity permeate dissemination and communication efforts. These include the dissemination of printed materials in Spanish and English, plans to incorporate oral Navajo interpretations at the Climate Change science exhibit, and partnering with the Northern New Mexico Network for Rural Education to reach over 30,000 students. The latter represents a significant broader impact as well as dissemination mechanism that goes beyond a few selected school districts or programs.

As the project moves into Year 2, the panel would encourage the team to document and report progress on publications, conference proceedings, poster/paper presentations by NM EPSCoR-affiliated scientists, students and other participants.

A new climate change exhibit to be developed in partnership with the New Mexico Museum of Natural History and Science will facilitate dissemination of research outcomes and is likely to have substantial impact in strengthening public climate literacy in the state. Importantly, there has been a conscious effort to invite input from variety of stakeholders in the community, including underrepresented populations, in the design and execution of this exhibit.

5. Outreach Strategy and Diversity

Excellent progress is being made in the implementation of the education, outreach, and diversity activities, which are very strong and well-integrated with the research components of the project. The program has developed strategic partnerships with non-profit organizations to develop a portfolio of very synergistic activities. There is clear evidence that the goal of broadening participation is viewed as a priority in both the management activities and the implementation of the education and outreach efforts. The numbers of students and educators participating to date have not been large, but the experiences are of very high quality and based on best practices. Evaluation activities need to be more formative and there needs to be an increased focus on outcomes, as well as outputs; effective strategies for tracking the progress of these students in the future are needed.

The geographic location of the field investigations has allowed education and outreach efforts to focus on a largely low income, Hispanic population at the K-12 level. A partnership with the Northern New Mexico Network for Rural Education is providing field-based summer professional development institutes, supported by academic year follow-up, for teachers from 27 school districts serving 30,000 students. These enrichment experiences, as well as the curricular resources developed by the teachers for their classrooms, are likely to have profound impact in an area where there may be only one multi-grade math/science teacher for the entire school. There is a lot of potential for leveraging existing climate and watershed resources developed by earlier programs (e.g., SAHRA, GLOBE) and disseminating teacher-produced resources more widely through the Tri-State Consortium network, the Digital Library for Earth System Education (DLESE), the National Science Digital Library (NSDL), or the AAAS BioSciEdNet (BEN).

Partnerships with institutions throughout the state are providing extended hands-on research experiences for undergraduate students, with strong mentoring components. Use of field-based research experiences, including hands-on deployment of instrumentation, is viewed as a strength of the program. Emphasis is being given to recruiting minority students from smaller institutions, and there has been success in attracting a significant proportion of female and minority

students. The program has shown good flexibility in accommodating the particular needs of non-traditional students, but may need to think more strategically about scale-up. The heavy reliance on one faculty member to manage the outreach and recruitment for the UROP program is a vulnerability that should be addressed. Additional resources to support the participation of students/educators with disabilities (e.g., NSF Facilitation Awards for Scientists and Engineers with Disabilities, FASED) should be explored.

Graduate student education programs are focused on development of interdisciplinary science and modeling skills, which appropriately leverages the research activities and other resources available through the Tri-State Consortium. There have been some challenges in building a core graduate student cohort at the smaller, predominantly undergraduate institutions. There have also been institutional barriers to facilitating cross-institution articulation agreements, which could help to solve this problem. A new graduate seminar series on climate change that will be offered via distance learning coordinated through the Tri-State Consortium and a semester long course offered via distance learning in 2010 may also alleviate this problem.

Faculty leadership programs focused on project management, communication, mentoring, and grant-writing skills should catalyze additional research success in the state. The current hiring freeze caused by budget shortfalls should be used as an argument for breaking down institutional barriers to sharing of faculty expertise and leadership development among graduate students.

6. Evaluation and Assessment

New Mexico EPSCoR has engaged Kirk Minnick of Minnick and Associates as the external evaluator. New Mexico's strategic planning is based on the Kellogg Foundation logic model, with assumptions, resources, activities, deliverables, outcomes, and impacts. A centralized survey site for collecting inputs has been established to survey faculty, leadership, students, and teachers. In addition, the project has an external advisory committee (which hasn't met yet) and has engaged the AAAS to provide forward-looking guidance based on a strategic review to be conducted in Years 2 and 4. These efforts, while valuable and positive and highly structured, did not appear to be integrated into a coherent evaluation and assessment approach that would provide timely formative and summative feedback and help the New Mexico EPSCoR team both improve its execution and demonstrate and maximize impact.

The Panel commends New Mexico for having Minnick conduct a session on research program evaluation in the professional development workshop held for faculty (faculty leadership fellowships).

7. Sustainability

NM appears to have significant commitment to the activities in the project through the state Science and Technology plan and the research infrastructure provided with state funding. The core area of Energy, Environment and Water encompasses the climate change focus of the RII and the investment in the supercomputer Encanto is a substantial contribution to the cyberinfrastructure capacity for research and education. Further, the state recently established a “Research Application Center” to oversee the S&T plan which includes overseeing various coordinated statewide STEM initiatives. While these administrative and capacity building components are helpful, there were some concerns with regard to infrastructure and leadership efforts on various aspects of the project. The long-term support for meteorology instrumentation and how this will be transferred and sustained by other agencies was not clear in the strategic plan. In particular, the reliance on the work of primarily one faculty member for the UROP effort is of concern, especially given the tenure-track status of the individual. The matter of succession planning with regard to scientific and education leadership on the participating campuses and outside of the EPSCoR Office management was also a concern. Clearly this is a state-wide / well dispersed program at many levels. This not only fits with the general goals of EPSCoR, but increases the base of interest so that there will be broad popular support for sustaining the program locally when the EPSCoR funding ends.

8. Management Plan

The overall management structure is deemed appropriate. The 14 member EPSCoR Management Team convenes by conference call at least quarterly to respond to relevant problems, and make decisions on science and education issues of import to the project. A state advisory committee has met and the external advisory committee has been formed but needs to meet. The panel strongly recommends a succession plan be put in place to mitigate any future loss of senior personnel.

9. Fulfillment of Special Grant Conditions

The Cooperative Agreement includes five state-specific special grant conditions: a revised cyberinfrastructure plan; a detailed plan to address the socioeconomic impacts of hydrologic changes to acequias; a revised diversity plan focused on (a) faculty and leadership, and (b) regional and tribal colleges; and not to spend more than \$3 million in year 1. All have been accomplished, except that the revised diversity plan should be more aggressive and proactive in increasing the participation of women and underrepresented minorities on the faculty, especially at the research universities.

10. Progress Relative to Strategic Plan

The general consensus of the committee was that the team was right about where they should be at this point in the project. Most of the year one goals are on schedule with only three delayed and a few of the year two goals are already in progress.

11. Other

The New Mexico EPSCoR team had a very well organized and clear presentation.

Feedback to Project Team

Summary

How effective has the leadership team been in addressing barriers and challenges?

The team has a good sense of the challenges and barriers. Plans are in place for dealing with some of these, for example training students in use of HPC and overcoming distance barriers between team members. While other challenges such as sustainability or cross-registration are recognized, solutions are not presented. The team is acknowledging and developing plans to address these issues.

As noted earlier, the state acquisition of the super-computer array was a major benefit to the EPSCoR project. There seems to be a good relationship between the state science and technology plan and the EPSCoR project. The team is encouraged to keep channels of communication with stakeholders open.

Is there sufficient integration of research and education?

There is good integration of education and research through all aspects and levels of the project even though the human resource component is modest. The panel finds this to be by design and not an after-thought. Given the investment in instrumentation and technology, the engagement of engineering disciplines is encouraged.

Appropriateness of Investments to Increase Research Capacity

The purchase of the various field and laboratory instruments for water quality analysis seems to be entirely related to the project goals. Furthermore, acquiring all of these instruments at the beginning of the field campaign makes good sense so that they will be available for the duration of the program.

Specific Recommendations

1. Enhance the diversity of faculty at the PhD degree granting institutions. Recognizing that hiring decisions are the prerogative of the various universities, the panel encourages the NM EPSCoR team to do some creative thinking about mechanisms to inform the universities of the diversity goals of the RII program.

2. Develop mechanisms to follow-up with the summer workshop participants, especially students, so that long-term outcomes can be tracked, quantified and reported.
3. Develop a succession plan to grow junior staff, with the added benefit of increasing institutional diversity in leadership roles over the course of the project. Leadership should understand all aspects of the project to ease transitions while vacancies are being filled.
4. Develop a plan for scientific synthesis across the interdisciplinary research projects.
5. Consider working with pre-service teachers at the undergraduate institutions as a means of further impacting K-12 students in New Mexico.
6. Consider additional dissemination of the Spanish translated educational resources and other educator-produced resources through DLESE, NSDL and Windows to the Universe, which has a multilingual web site.
7. Increase the leadership diversity and include senior faculty from the lead institutions in the working group on diversity.
8. Schedule a meeting of the advisory committee.
9. Prepare and implement a coherent, evaluation and assessment plan that utilizes qualitative and quantitative approaches to provide both formative feedback and summative assessment. Evaluation results should be used systematically to guide program improvement.
10. Develop a plan to sustain the meteorological stations at the end of EPSCoR funding. Sustainability of SNOTEL and SCAN network stations seems to be well addressed in the proposal by planning for their incorporation into other programs.