

PROJECT 5: INTEGRATION AND COORDINATION

5.D. ABSTRACT

Applying Spatial and Temporal Modeling of Statistical Surveys to Aquatic Resources

Research Category: Research Program on Statistical Survey Design and Analysis for Aquatic Resources

5.1. Sorting Code: 2001-STAR-D1, responding to Statistical Research Area 2

5.2. Title: Integration and Coordination for the National Research Program for Spatial and Temporal Modeling of Statistical Surveys for Aquatic Resources

5.3. Investigators: N. Scott Urquhart (CO-Principal Investigator and Program director, CSU), Richard Davis (CO-Principal Investigator, CSU)

5.4. Institution: Colorado State University (CSU)

5.5. Project Period: October 1, 2001 - September 30, 2005

5.6. Project Cost: \$95,300, first year cost
\$344,010, total cost over four years

5.7. Overall Summary:

Objective:

This Project has one overriding objective: Obtain appropriate personnel, data and equipment in a timely fashion so that the other Projects can pursue their respective lines of endeavor with a minimum of administrative distraction.

Approach: The managers, Urquhart and Davis, need to remain in continuing and effective communication with all members of the team, and various clientele groups. As opportunities arise resources can be directed toward the opportunities before they become problems. Frequent informal meetings with members of the team will be a major tool to accomplish this.

Expected Results or Benefits:

Regular, continuing, but low-level management will produce a comfortable work and learning environment. In turn, this will lead to more results for a fixed financial input than would more formal means of management.

5.8. Supplemental Keywords: management, efficiency

5.E. OVERALL DESCRIPTION

Applying Spatial and Temporal Modeling of Statistical Surveys to Aquatic Resources Integration and Coordination

5.1. OBJECTIVES

This Project has one overriding objective:

- ◆ Obtain appropriate personnel, data and equipment in a timely fashion so that the other Projects can pursue their respective lines of endeavor with a minimum of administrative distraction.

To achieve this, several well defined steps will be followed:

- ◆ Define the primary attributes for post-doctoral fellows in collaboration with the other Project Principal Investigators; follow CSU's established recruitment practices to advertize and otherwise locate qualified candidates; interview them in collaboration with the appropriate Project PI's; and hire the one offering the most potential for achieving all of the Program's goals.
- ◆ Identify specific computational requirements of each of the Projects, and seek the best available computing equipment within budget constraints.
- ◆ Proceed to recruit graduate students in the same manner, but coordinate this with the graduate admissions committee of the academic unit in which the student will be enrolled.

This proposed Program is designed to encourage interaction of the members of the Program with diverse audiences. If not closely managed, this could greatly erode the time available for the planned tasks. To maximize the value of interaction, the Director will

- ◆ Communicate with diverse parties, including, but not limited to EPA's Project Officer for this Program, EPA personnel known to the Director, the Companion Program, State, Tribal, and local agency personnel, and other interested parties, including the Project PI's and a variety of statisticians.
- ◆ This communication is intended to identify opportunities for input, data sets, professional collaboration, and outreach.
- ◆ The Director will compile these opportunities, prioritize them in collaboration with EPA's Project Officer and the Project PI's, and identify who can best serve them. The Director will endeavor to minimize the distractions on the Project personnel. But when an opportunity presents itself, appropriate personnel will be encouraged to participate. Special effort will be made to include the apprentice statisticians, as part of their professional development.
- ◆ Assure that needed data, metadata, and related information is available in a timely fashion.
- ◆ Determine what information about aquatic systems is needed by the statistical investigators, and assure its timely availability.

5.2 APPROACH

There is a style of management known as “management by wandering.” Practically speaking this means going to where people are working and talking to them in their own setting. To the extent possible this will be the management style Urquhart, as Director, would follow. Further, he likes to see others succeed. That is especially important in helping the apprentice and junior members of the proposed team mature. Occasionally constructive criticism may be needed, but continuing attention to all participants will minimize the need for this form of management. Namely, he expects to be aware of all features of the Program to foresee most possibly difficult situations before they become problems needing remediation.

The Project PI's will be expected to report their plans and accomplishments for their projects on a regular basis, probably monthly. From this the Director can compile a report to the Project Officer at a mutually agreeable frequency, like perhaps quarterly. The director will welcome exploration of means of communication proposed by the investigators, such as postings to a local web site.

The geographical separation of the Investigators and various client groups presents a management challenge, and is one of the reasons we have budgeted substantial travel. Most of the faculty research time will occur during the summer, and we plan to have a colloquium of all the Program investigators once every summer. We may be able to schedule this colloquium to coincide with the annual joint meeting of the two Programs or an annual professional meeting, such as the Joint Statistical Meetings (JSM). We will also make full use of electronic communication, including conference calls, email, and video conferencing, to maintain tight links between the individual Projects. For the Projects centered at Colorado State University, we plan on frequent interaction between the Investigators.

Members of the client groups gather in various settings. For example, about 50 people in several of the client groups gathered for three days in Phoenix, AZ to participate in a “Workshop on Reference Conditions for Western Streams and Rivers” for three days in the middle of February. Urquhart attended that meeting to make initial contacts with several of the diverse client groups represented there. The people gathered there represented 13 western states, at least seven Tribes, several EPA organizations, three EPA regions, and several other federal agencies. The Director will endeavor to identify similar future gatherings as places for statistical researchers to initiate contact with client groups. In later years, such gatherings could be ideal venues for conducting some of the outreach. Two things were obvious from Urquhart's discussion with participants: Such people welcome the opportunity to interact with personnel in the proposed Program, and their information needs about sampling and statistics vary GREATLY.

Statistical investigations and analyses of the sort envisioned by this proposed Program will be computer intensive, but heavy computing demands will probably not occur at exactly the same time. The Program proposes to have one substantial computer available for statistical investigations for Projects 1, 2, 4, and parts of 3. That computer will be supported by a suitable level of systems and software support. The computing systems will be networked with the Statistics Department's state-of-the-art networking and computer facilities. Of course each investigator will have access to other lower level computing resources, most provided by the Statistics Department. We believe that a

Sparc Ultra 80 (A27-ULD4-9T-024AQ) with 4 450 mhz processors, 1.5 GByte of RAM and an 18 GByte drive will be well suited for this project's needs.

This Program focuses on aquatic systems. Statisticians are not trained to be particularly aware of such systems. Thus the Program has made arrangements for a well-qualified aquatic scientist to be readily available to provide needed information, and initially explain important features of their character. From his past 10 years of experience with EMAP Urquhart has learned quite a lot about streams and wetlands, but has only limited exposure to large rivers and estuaries. As a second level of information, three of the team's investigators have spent most of their professional careers dealing with aquatic systems. Alan Herlity of OSU's Fisheries and Wildlife Department has been trained as an environmental water chemist, but has worked cooperatively with EMAP's surface water component since its beginnings. In fact, earlier he worked on a series of lake surveys. Although he is not a statistician, he understands statistics well enough to be very aware what statisticians know about aquatic systems. (For several years his work with EMAP was supported on a cooperative agreement Urquhart had.) James Loftis of CSU's Civil Engineering Department has worked with the environmental engineering aspects of water for many years, and has team-taught a course in environmental statistics with another team member. Steven Weisberg of the Southern California Coastal Water Research Project will be working with Project 1. He is trained as an aquatic biologist and has become very familiar with estuarial and near-coastal systems. Together, these three can provide many further insights into aquatic systems. Further, the Director has identified two other aquatic scientists who welcomed the opportunity to collaborate with the Program, but currently have no funding proposed in it. Brian Bledsoe and Robert Ward, also of CSU's Civil Engineering Department, have expressed a strong desire to collaborate. Bledsoe has an EPA STAR grant under which he is beginning to examine some spatial aspects of macroinvertebrates in the mountains and plains. He welcomes the possibility that his data could be examined spatially by some member of the team, and would provide substantial insight into its physical and biological setting. Robert Ward, the Director of Colorado's Water Resources Research Institute (WRI) has substantial interests in the uniform definition of water quality measures across the country. As that activity led by a national organization of directors of WRI's is approaching fruition, his interests have turned to how the resulting quality data should be summarized. The Program may be able to assist in this need, and gain further aquatic insights as a result.

5.3 EXPECTED RESULTS OR BENEFITS

The expected results and benefits of management, integration and coordination described above will be achieving more usable results for the fixed available budget. More statistical problems will be identified and solved; more results communicated to client groups than would be possible without fairly active management.

5.4 MANAGEMENT PLAN AND MILESTONES

The management plan for the Program was outlined in the information supplied earlier in this document for the whole Program. The Integration and Coordination will have no further management plan and milestones, other than what has been described earlier and above in this Project proposal.

Useful management requires feedback. The Chair of the Statistics Department also is an investigator on two of the Projects proposed by this Program. In that and other roles he will receive information about the Director's management actions. He will conduct semi-annual reviews of the Director's management efforts, in collaboration with the Director of CSU's Natural Resource Ecology Laboratory which will house a large part of one of the Program's Projects. He will also oversee the infrastructure needs of the Program such as office space, secretarial support, and computer resources. It will be important to ensure that this Program is integrated smoothly into other outreach and research activities of the Department.

5.5 GENERAL INFORMATION

The Proposed Director and Co-Principal Investigator for the proposed Program has managed a number of research, development and instructional efforts during his career. While at New Mexico State University (NMSU) he served as the acting department head of an experimental statistics department and of a home economics department. (Internal strife demanded an outside administrator for a period while an external head was hired!) For the past 10 years he has managed research budgets of varying sizes, including up to 4 professionals and 10 support personnel. These diverse management responsibilities give him some insight into budget, project and personnel management. When needed, the Program Co-Pi, Richard Davis, can serve as a backup to Urquhart, because he also is the Chair of the Statistics Department.

Urquhart is respected as a teacher and research collaborator. Throughout his teaching career he has used innovative instructional techniques, several resulting in publications. NMSU has a bi-annual award for excellence in teaching; Urquhart received that in 1987, specifically cited for his innovative teaching of statistical methods. His citation for Fellowship in the American Statistical Association the next year recognized his contributions as a statistical collaborator, a much more involved role than typical consulting or data analysis, as well as his contributions to the profession and the development of younger statisticians.

These recognized experiences give Urquhart the insights to management insight needed for both the Projects for the development of statistical techniques and the extension and outreach Project. During the past 10 years he has worked closely with EMAP ecologists in a number of roles. One relevant role for the present consideration has been his efforts in helping define and evaluate cost effective measurement processes. In his collaboration with EMAP he has worked with a number of geographers and GIS specialists, thus giving him some of the insights needed to provide oversight and coordination of Project 3 with the others.

The Co-PI of this program, Richard Davis, also has a great deal of administrative experience. He is chair of the Department of Statistics and Director of both the Franklin Graybill Statistical Laboratory and the Center for Applied Statistical Expertise. Since 1981, he has received continuous NSF support for his research in time series. He is co-author (with Peter Brockwell) of the best selling books, "Time Series: Theory and Methods" and "Introduction to Time Series and Forecasting" and the time series analysis computer software package, ITSM2000. He has served as an associate editor of major journals and, since 1995, he has delivered 42 invited lectures at international meetings and universities.

With Robin Reich from the Department of Forest Sciences, Davis developed an interdisciplinary course on spatial statistics which has attracted a wide audience from around the university. A 500 page set of lectures notes and a spatial software library for the statistical computer package Splus was written by Reich and Davis for instructional purposes. Davis' experience in producing commercial caliber software for students and researchers will play an instrumental role in the Outreach component of this project. Davis also has a great deal of experience in hosting and organizing conferences. He was the host of two NSF/NBER sponsored workshops on time series and has been appointed Co-Organizer of all future NBER/NSF Workshops in Time Series. These organization skills will be instrumental in arranging for the Project's workshops and meetings.

During the past four years, Davis has been largely responsible for the Department's success in graduate student and faculty recruitment. This experience will be vital for recruiting postdoctoral fellows and graduate students to the Program. The integration of this Program with the Department of Statistics should provide a symbiotic bond that produces quality interdisciplinary research in environmental statistics.