

## **Science Advisory Board Review - 2003**

Annis Water Resources Institute

November 12, 2003

### **Introduction and General Observations**

Firstly, the Science Advisory Board would like to thank Dr. Alan Steinman and the AWRI staff for their tremendous hospitality, the thoroughness of their presentations and the open access that we had to the staff during our review on March 6-7, 2003. We think that having a SAB is a creative and valuable approach. We appreciate being selected for this opportunity. The purpose of this report is to provide continued advice and counsel on how to make the AWRI a valuable asset to Grand Valley State University and the State of Michigan.

AWRI Water Resources Institute (AWRI) has made significant progress since our last review. We commend Dr. Alan Steinman for his leadership and the university administration for their heightened support for AWRI. These have truly combined to ensure the recent success of AWRI. Below we provide a review and some general recommendations of the three main components of AWRI.

### **Information Services Center (ISC)**

The Information Services Center (ISC), under the direction of John Koches, continues to disseminate spatial data important to regional natural resource management. The Science Advisory Board (SAB) was pleased to note progress in the preparation of

peer-reviewed publications by the ISC, including one drafted and one submitted manuscript. A slight increase in peer-reviewed publications from the ISC was recommended by the SAB after its May 2002 meeting, and it is gratifying to see that recommendation taken to heart.

Another development of note is the ISC's collaboration with investigators from the University of Michigan and other academic partners on the Mega Model Project. The ISC has much to contribute to this scientific partnership, and could benefit from becoming involved in this larger group of stakeholders from throughout Michigan. The reputation of the ISC's good work seems to be spreading! We continue to encourage close collaboration between the ISC and the other research investigators on watershed issues.

### **Education and Outreach Program**

The Education and Outreach (E&O) program at AWRI is directed by Dr. Janet Vail, who is assisted by 10 part-time instructors and an occasional high school or college intern. The program consists of 8 ongoing educational foci and a general outreach program. The educational activities range from the vessel-based K-12 water education program to regional conferences to teacher continuing education. The outreach program includes state and federally funded demonstration projects, involvement with regional and municipal organizations, and sponsorship of student internships. Under the leadership of Dr. Vail, the E&O program continues to be extremely active, very responsive to the local community, and well integrated into the overall objectives of

AWRI. Examples of important regional activities organized and sponsored by this program are the “Lake Michigan: State of the Lake” conference scheduled for October 2003 and the GLOBE and WET programs for teacher training. The program is well invested in local, regional, and state environmental activities that focus on water, and is beginning to have a national and even international impact.

A particularly impressive aspect of E&O is the K-12 educational program for local school children conducted in the AWRI classrooms and aboard the vessels. The vessel and classroom instruction combines modern technology with hands-on experimentation and exploration. In 2002, the vessel program accommodated over 7500 students, and was fully subscribed during the in-school periods of late spring and early fall. The vessels are fully booked a year in advance of cruises. The vessel educational program is extremely effective at reaching the local population and clearly builds good will and support within the local community. The fleet captain, Mr. Tony Fiore, is a highly professional individual who has clear control and full knowledge of the vessel operations. He also assists with other aspects of the field laboratory, including the construction and maintenance of the mesocosm facility. Two of the part-time instructors whom we met, Chuck Vanderlaan and Gus Unseld, appeared to be very effective instructors who were both enthusiastic and knowledgeable about water resources.

The vast majority of the vessel time is currently invested in education and outreach. Vessel time is nearly fully allocated during the school periods, but vessel time in the summer could be more effectively used by AWRI, or other, researchers. In summer 2002, approximately 15 vessel-days were used to study the Muskegon River plume in Lake Michigan, but that appears to be the extent of the research time, which was

underwritten by GVSU internal funds. Extramurally funded research by AWRI investigators could take more full advantage of the vessels during the summer “down” period. However, the port-of-call program (Making Lake Michigan Great 2002) has helped to fill in the summer and develops good relations with communities and local governments around Lake Michigan.

A major budgetary problem looms on the horizon for the E&O program, if not already present. Mr. Fiori recently performed a detailed cost accounting of vessel operations, as directed by Dr. Steinman. In short, return on endowment has drastically declined, as vessel operational costs continue to increase. Up until now, vessel cruises for educational activities have been heavily subsidized by endowment and AWRI. This may no longer be possible with the current budget crisis, and so users will have to shoulder an increasing amount of the real costs. This is an ominous possibility, because school districts are themselves experiencing the same budgetary problems. AWRI will need to work closely with the local community and with the GVSU administration to address this issue. A diminishment of this excellent educational program would be a serious development.

Dr. Janet Vail is the only full-time staff member dedicated to Education and Outreach, other than the fleet captain. Dr. Vail is fully extended in managing the many projects and activities conducted by this arm of AWRI and she also coordinates the useful AWRI publications – *Review* and *Year in Review*. Despite her heavy commitments to education and outreach, Dr. Vail will have three publications (one peer-reviewed) in 2003. This is a very impressive achievement. As we recommended in 2002, if the budget allows, the Director should consider hiring a second permanent staff member to

assist Dr. Vail with this very important and successful component of AWRI. This might also allow outreach activities to be more fully integrated with the other arms of AWRI – the ISC and Research programs – and allow more effective ‘technology transfer’ to potential users.

#### Conclusions and Recommendations:

- Overall, the Education and Outreach program appears to be very well run and has demonstrated that it addresses many important needs of Lake Michigan users. The program has nurtured strong ties to the local community and to the Lake Michigan community as a whole, especially with the vessel program.
- Opportunities to use the vessels more extensively for research should be explored and supported, especially during the historical ‘slow’ period of midsummer. Researchers recently hired at AWRI should consider how the vessels could enhance their research and educational efforts.
- Budgetary issues for the E&O program should be carefully considered and projections made for scenarios of reduced institutional support. It may be useful to hold a “stakeholders” meeting to fully discuss the implications of reduced funding and to consider alternatives to reductions in educational activities.

#### **Research Programs and Faculty**

##### Dr. Richard Rediski

The environmental chemistry laboratory diversified in 2002 by obtaining research grants in the areas of PCB congener analysis (NOAA/USGS) and nutrient loadings (U of M). These grants represent work with new collaborators that provide an excellent

opportunity for publication and future research. Dr. Rediske has also been active in expanding collaborative research with Hope College and AWRI staff. The DGT/PIXE research that is under development with Hope College has both fundamental and applied merit with respect to sediment chemistry and toxicology. In addition, the Rediske's collaborations with Dr. Chu (modeling and GIS) and Dr. Uzarski (statistical and ecological analysis) provide more of a multidimensional approach to his research in sediment chemistry. Dr. Rediske continues to be successful in obtaining and completing research grants with the EPA Great Lakes National Program Office and Muskegon Community Foundation. He was also able to significantly expand his equipment holdings with donations and a combination of internal and external funds. While Dr. Rediske has an excellent facility and track record with respect to grants, it is very important that he publish his results in peer reviewed journals. A record of publication is critical for obtaining future grant funding and establishing credibility in the scientific research.

The laboratory currently performs a variety of research activities including trace organic chemical testing, nutrient analyses, sediment bioassays, microbiology, and physical characterization. It has a very small staff (PI, 1 technician, and several undergraduate students) and is struggling with issues related to equipment maintenance, data management, and personnel training/continuity. The current variety of services offered plus the small/transient staff provide an environment where a focus on daily operational issues inhibits the development of more scholarly approach to research. Recommendations to improve this situation include developing more collaborative partners and the addition of a second technician. The current focus of AWRI in the area

of aquatic ecosystems will increase the requirement for nutrient analyses. The addition of a technician dedicated to nutrient chemistry should be evaluated. A second option would be expanding collaborations with Hope College or another institution.

Dr. Boppi Biddanda

This Principal Investigator with less than one year at AWRI shows much potential for future contributions. He has published papers in refereed journals and has three papers in press, two manuscripts in review and others in preparation. In addition, he has obtained and is seeking external funding. All provide evidence for future success in developing a research program. In addition, he has a working laboratory for microbial ecology, an important accomplishment.

Challenges for the future including establishing a record of accomplishment based on research at AWRI. Collaboration with Jim Cotner, Gary Fahnenstiel and other NOAA researchers should be beneficial in this respect. This goal might be accomplished through research on regional problems that fit into the global perspective presented during the review. Studying the role of microbial processes as influenced by one tributary input may be one avenue. Collaboration that utilizes strengths at AWRI in modeling and organic geochemistry might be important as well.

Dr. Mark Lutenton

This GVSU faculty member has a half time appointment at AWRI. His AWRI related activities include directed research for students and research projects. He supervised two undergraduate research projects, one on algae as environmental indicators

in subtropical streams and the other on influence of zebra mussels on fish feeding. He is involved in various projects that include collaboration with students, GVSU faculty and AWRI principal investigators. Important results from these collaborations include data that suggest native fish are more common than hatchery produced brown trout in the Rogue River and an analysis of benthic invertebrate community structure in the Muskegon River that shows hydropsychid larvae (caddis flies) were replaced by zebra mussels. The first result will be important in evaluating stocking practices for brown trout. The second result indicates that expanding zebra mussel populations will affect the abundance of food for steelhead parr because hydropsychids when present were an important component of parr diets.

The strength of these activities is in their diversity and their contribution to student training and collaborative efforts. However, the impact of such activities will depend on publication in the refereed literature.

#### Dr. Michael Chu

Dr. Michael Chu is a new member of the AWRI faculty. He has a clear vision for research, and his hydrologic modeling capabilities are a excellent complement to AWRI's existing strengths in watershed science. He has quickly found a niche in studies of local watersheds, such as his work on GIS-Based Hydrologic Modeling for the Mona Lake Watershed. Dr. Chu's use of simulation modeling visualization in his presentation was impressive.

A scientific area that Dr. Chu wants to pursue in the future is pesticide transport modeling. This makes sense given his postdoctoral experience at the University of

California, Davis. It would be advisable for Dr. Chu to determine what pesticide transport or degradation research may be ongoing at the state's land-grant college, Michigan State University. In that way, he could identify potential collaborators, and also make sure that he is not duplicating the efforts of others.

Dr. Don Uzarski

Dr. Uzarski has been at AWRI for about two years, and has developed an active, extramurally funded research program that includes 7 projects totaling over \$800,000 including collaborator funds. Most projects are funded by state or regional entities, such as USEPA pass-down funds to MDEQ and GLNPO. Dr. Uzarski's research focuses on coastal wetlands of the Great Lakes, in particular the environmental factors influencing biological structure and development of metrics of ecosystem 'health'. Since arriving at AWRI, Dr. Uzarski has published or submitted 8 papers to refereed journals, with two as senior author. The journals are of good quality although not in the upper tier of ecological journals. Dr. Uzarski is highly involved in instruction at GVSU, where he now teaches an undergraduate course in Limnology and will be teaching a graduate course at AWRI in Wetland Ecology. In general, Dr. Uzarski has developed a strong research program that is well integrated into the mission of AWRI. A next step for Dr. Uzarski would be to seek funding from national agencies (e.g., NSF) to enhance his scientific reputation at the national level. Collaborations at AWRI could increase the competitiveness of such proposals. For example, Dr. Uzarski might consider teaming with Dr. Chu to bring hydrological modeling expertise to a NSF proposal. Overall, Dr. Uzarski is functioning as a true academic in terms of teaching, research, and

grantsmanship, and will profit considerably when he is allowed to mentor graduate students in the new M.S. program.

Dr. Carl Reutz

Dr. Reutz is a very recent hire at AWRI and is currently developing his research and teaching program. His primary fields of interest are fish ecology, predator-prey interactions, and stream ecology. At AWRI, Dr. Reutz intends to develop a research program concentrating on fish ecology in streams and wetlands associated with Lake Michigan. In the near term, he plans to submit proposals to NSF (stream food web controls) and GLNPO (invasive fishes). NSF is a difficult agency from which to acquire funding, typically requiring multiple submissions before funding is acquired. At this point, Dr. Reutz should consider developing his program with regional funding before (or while) pursuing more risky funding opportunities. For example, the invasive fish research could be submitted to various agencies concerned with the Great Lakes including GLNPO, Michigan Sea Grant, National Sea Grant, and other outlets. These agencies provide a higher chance of success although typically lower funding. Given the tremendous amount of ongoing research in this field, Dr. Reutz should strongly consider developing strong partnerships with NOAA and the University of Michigan. Also, a focus on fisheries of the Great Lakes (cf. tributary streams) would increase the probability of funding, as most funding agencies still do not fully appreciate the importance of watersheds draining into the Great Lakes. Expertise exists both on campus (Drs. Eric Snyder, Mark Luttenton) and at AWRI (Drs. Steinman, Uzarski) that could provide effective collaborations for Dr. Reutz.

## **Administration, Graduate Program and Facilities**

The scientific staff and (internal and external) funding levels have increased significantly over the past few years. This, coupled with Dr. Steinman's statement that he wants to reduce his administrative time and do more research will place an increased burden on the administrative staff. Dr. Steinman might want to consider maintaining his current level of administrative activity for one more year to help ensure that the program continues to evolve and adjust.

The development of a Graduate Program in Biology that can be used by AWRI scientific staff is applauded! The participation of AWRI staff in a graduate program at GVSU is imperative in future development and a strong research program will only be successful if there is a graduate program associated with it. We suggest that the AWRI faculty participate in the new Biology Graduate Program and that new AWRI appointees should be given faculty status in the Biology Graduate Program. We still believe that pursuing a Master of Science Degree in Water Resources is premature due to a lack of critical mass of AWRI staff and dedicated GVSU faculty.

Excellent facilities are available at AWRI, such as the GIS lab, analytical lab, and classrooms. In 2002, we encouraged the further development of the “warehouse” lab, such as with mesocosms, for experiments. We applaud this development.

## **Summary**

We reiterate that the AWRI has made significant and outstanding advances in their research (staff and facilities) and educational (M.S. Biology) capabilities over the past two years.

Once the new staff and graduate program have an opportunity to mature, we believe that the AWRI will be well-poised to achieve its stated objectives. Of major importance for the future is the need to develop coordinated and integrated programs as one means to strengthen efforts of individual investigators and to provide increased regional and national visibility for such programs as AWRI. Connecting the new research with ISC and external partners will be critical. Such an effort will strengthen current and future research, teaching and outreach activities and provide an avenue for collaboration with interested participants.