

Science Advisory Board Review - 2005

Annis Water Resources Institute

August 31, 2005

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 10-11, 2005. We think that having a Science Advisory Board 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, the State of Michigan and the region.

Overall, the AWRI has undergone tremendous progress and maturation over the last two years and it appears the scientific productivity is growing (i.e. was higher in 2004 than 2003). 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. We endorse the recommendations from the AWRI retreat as well as the goals and objectives for 2005-06, specifically; a) growing the graduate program; b) resolving the tenure status for faculty; and c) continuing to develop external collaboration. Below, we provide a more detailed assessment of individual programs with additional recommendations.

Information Services Center (ISC)

John Koches and his staff at the ISC continue to provide important land use and water quality information to guide regional planning and zoning efforts. The ISC brought in an impressive \$474,000 in new projects during 2004-05. The ISC staff are well-informed about new databases available (e.g., Shuttle Topographic Radar elevation data). Kurt Thompson of the ISC staff provides significant computer maintenance services that benefit all of AWRI, such as virus protection for the server. John Koches taught Advanced Watershed Management at GVSU for the first time in Winter 2004, which seems an appropriate subject matter for his area of expertise.

The ISC has increased its role as a repository and server of digital GIS data, and one of its goals is continued development of a GIS portal for western Michigan. The Science Advisory Board endorses this goal, because it will make the work of the ISC more transferable and widely used as low-cost media and dissemination methods (e.g., CDs, internet map server) are increasingly embraced by the public. An infrastructure barrier to becoming such a portal is the low bandwidth of internet accessibility to the AWRI

building. The existing T1 line to the building is inadequate to meet current demands, causing delays in some computer operations. ISC staff are investigating ways to increase bandwidth capacity, including the possibility of remote wireless link.

Writing metadata and reports that document the work of the ISC should continue to be emphasized. These written materials will increase the utility of its products to current and future users. Metadata are often overlooked in times of deadlines and tight budgets, but are important given the loss of institutional memory that accompanies staff turnover. If they do not do so already, the ISC staff should work with the AWRI and GVSU libraries to index and archive at least the digital copies (CDs) of its products. It is important that ISC staff members look for opportunities to publish their work in the peer-reviewed literature to help validate their work beyond the region.

Two potential sources of funding that the ISC might pursue include Department of Homeland Security funding and the NSF Digital Government program.

Individual Research Programs and Faculty

Dr. Rick Rediske

The environmental chemistry group continued to build on its core work in the areas of environmental chemistry and toxicology by obtaining funding from EPA/GLNPO and MDEQ. In addition, Dr. Rediske's group diversified by obtaining research funding in the areas of landfill remediation, beach monitoring, TMDLs, and environmental policy. He also has been very active in expanding collaborative research with external partners (NOAA, MSU, and USGS) and within AWRI (Steinman, Uzarski, Chu, Biddanda, Luttenton, and Koches) and GVSU (Biology, Chemistry, and Computer Science). His research portfolio indicates he is comfortable as a PI and a collaborator; which are important qualities for the growth of his program and AWRI. Dr. Rediske's grant record of repeat funding and his professional/community service are strong indication of quality work product and his ability to effectively network with others. His laboratory remains well organized and equipped with instrumentation. He has identified two interesting research areas for future work; algal toxins and ³¹P NMR characterizations of phosphorus compounds. Both areas appear to hold promise for future funding and collaborations. Although Dr. Rediske has an excellent facility and track record with respect to grants and technical reports, it is very important that he publish his results in scientific journals. While some progress has been made in this area, he should strive for a minimum of two publications as primary author per year.

The laboratory currently performs a variety of research activities including trace organic chemical testing, nutrient analyses, sediment bioassays, microbiology, physical characterization, taxonomy, field work and public policy development. Dr. Rediske's roles are the technical mentor/manger for his group, the primary grant and report writer, and the main interface with his scientific/regulatory/local community base. In 2002, his group was understaffed with respect to the variety of services offered. Currently, his staff is adequate and at a point where sustainable funding will become an issue. Taxonomy,

microbiology, and public policy are important areas for water quality research and within the scope of AWRI. It will be critical in the future to develop other lines of funding for staff in these areas (from other PIs, or hard money support) to keep these positions sustainable. In addition to staff sustainability, the long term success of Dr. Rediske's program will depend on the development of capabilities in the area of molecular biology at AWRI, GVSU, or through external collaborations. Molecular biology has become a critical component of research in environmental toxicology, microbiology, and algal toxins. The addition of a post doc position in this area would benefit his program in addition to the work of Dr. Biddanda. It is very encouraging to see that AWRI has a role in the GVSU graduate program in Biology with respect to teaching and student research; however a disconnect remains between AWRI and the academic departments on campus. The expertise of AWRI staff and facilities, their record for grant funding and the number of graduate students selecting aquatic sciences as an emphasis clearly reflect the need for a more direct linkage. The absence of tenure track positions, as referenced by Rediske and Uzarski, will make it difficult for AWRI to retain qualified staff and diminish the effectiveness of the graduate program.

Dr. Bopi Biddanda

Dr. Biddanda joined AWRI in June 2000 and has addressed various aspects of carbon cycling in his research program. The graduate courses he teaches, Ecosystem Biogeochemistry and Plankton Ecology, reflect broad research interests. He has four funded research projects and three pending proposals. Proposals submitted but not funded include those to the highly competitive National Science Foundation. From 2003-2005, Dr. Biddanda published five papers, one as senior author, and has published a review paper (senior author) and a book review. He has participated in national scientific meetings serving as co-chair of organized sessions. His publications deal mainly with research conducted before arriving at AWRI. However, at least two of the four papers in preparation deal with work at AWRI. He is the senior author on both of these papers. Present collaboration with AWRI and external scientists will also provide future contributions on the Great Lakes and Michigan lakes. Dr. Biddanda also collaborates with scientists in Japan and Brazil.

Dr. Biddanda teaches two graduate courses, Ecosystem Biogeochemistry (Fall 2004) and Plankton Ecology (Fall 2005), in the Biology Department at GVSU. Teaching courses on campus provides an opportunity to identify students interested in employment. He provided summer employment for four undergraduate students and mentors students. Dr. Biddanda also gives guest lectures on campus and serves on academic committees.

Given his relatively short tenure at AWRI, Dr. Biddanda is still establishing a research program. For the future, he should concentrate on activities that will maintain research funding and enhance his research program. In addition, he should make certain that papers continue to be published, at least one per year as a senior author should be a goal.

Dr. Biddanda's research on the ecology of a submerged sinkhole in Lake Huron is very exciting due to its unique features. Unfortunately, funding for such unique work may be difficult to obtain. This research should be pursued, but not at the expense of eliminating other routine projects that provide more stable funding. Overall, the direction of the research program appears to follow the availability of funding.

Dr. Biddanda referees papers for different journals and serves on the Editorial Board, Journal of Plankton Research.

In the future, Dr. Biddanda plans to continue studies on carbon cycling along natural gradients such as land to water and in vents from submerged sinkholes in Lake Huron. He also would like to continue studies of UV effects on biota and organic matter and studies of microbial ecology as it relates to Great Lakes health. One of the challenges in his research is to utilize molecular biological techniques for analysis of natural and impacted microbial communities. This requires additional training in laboratories with the required expertise.

Dr. Don Uzarski

Dr. Uzarski began his current position at GVSU in July 2001 and is appointed half time in the Biology Department. External support (2003-2005) is provided through nine grants and contracts totaling \$1.2 million with Dr. Uzarski's share being \$295,000. He is the principal investigator on four of these. Five papers were published (four as senior author) and three joint papers with other authors have been submitted. He is also a joint author on a book chapter. He and his students were active at professional meetings, presenting eleven papers (2003), six by Uzarski, four by graduate students, and one by an undergraduate. He was a co-author for three additional presentations. Dr. Uzarski service activities include being a member of the Project Management Team of the Great Lakes Wetlands Consortium, authoring two contributions to the US EPA State of the Lakes Ecosystem Conference (SOLEC), and providing invited expert testimony to the Michigan State Senate Committee on Natural Resources and Environmental Affairs. This joint appointment appears to be working well. He appears to be making sound contributions to the Biology Department and has developed an excellent research program at AWRI.

Dr. Uzarski teaches Limnology each year in the fall semester and Wetland Ecology every other year in the winter semester. He serves as the major advisor for three MS students and is on two other graduate student committees. Dr. Uzarski is well versed in multivariate statistics, which is an asset to his teaching and direction of student research.

Dr. Uzarski has an active research program in wetland ecology at AWRI. His laboratory functions very well in supporting his research and training of graduate students. The staff includes a competent laboratory manager and a person responsible for field and data management. This excellent research activity benefits from Dr. Uzarski's relatively long-term research on coastal wetlands. Approximately 70% of coastal wetlands in the Great Lakes have been lost historically. The remaining wetlands are heavily fragmented by

draining for agriculture and urbanization and by constructing boat launches and navigation channels. The research addresses the effects of fragmentation on biodiversity in coastal wetlands and shows the importance of coastal wetlands in the larger lake ecosystems. Wetlands, as one example, provide habitat for 90% of Great Lakes fishes. The research provides scientific information that is essential for management of coastal wetlands and the Great Lakes ecosystem. It also has proved to be valuable in establishing legislation.

Self-described goals and objectives for 2005-06 are good and include promotion to Associate Professor and improvement in quality of teaching, number and quality of publications, and number and size of grants. Number and quality of publications is an important goal relative to promotion to Associate Professor. Publishing papers in a more diverse set of prestigious journals will enhance quality of publications. Grants should be sought that will strengthen the research activities and certainly should not be driven by dollars alone. Dr. Uzarski should broaden the scope of funding by applying to new sources. A grant from NSF, for example, might broaden the research perspective and add national prestige to the program. Successfully placing students in professional positions is an excellent goal that depends on the prestige of teaching and research.

Dr. Uzarski is concerned about tenure. He also is concerned about the lack of an academic position for his spouse, a problem commonly encountered by dual career couples. Not having a suitable position for a spouse leads to the couple seeking positions elsewhere where both sets of professional ambitions can be realized.

Dr. Carl Ruetz

Dr. Ruetz joined AWRI in November 2002 and has focused his teaching and research in Fisheries Biology. His primary areas of interest are fish ecology, invasive species, predator-prey interactions, and stream ecology. At AWRI, Dr. Ruetz has acquired a modest amount of funding externally from the USFWS (\$10,000) to study invasive round gobies and internally from GVSU (\$3000) to test fisheries gear bias. He has submitted one NSF grant with Dr. Steve Kohler at Western Michigan University, which was not funded. From 2003-2005, Dr. Ruetz published 5 papers, 4 as senior author, and has made 17 professional presentations. Most of the published papers concern research conducted as a graduate student at Minnesota or his post doctorate in Florida. Apparently, no papers from AWRI research have emerged to date, although Dr. Ruetz is developing good collaborations with various AWRI and external scientists.

Dr. Ruetz contributes substantial teaching to the Biology Department at GVSU. He currently teaches a Fisheries Biology course in the Fall term and alternates Fisheries Management and Modeling in the Winter term, along with various guest lectures in other courses. He advises one M.S. student and one undergraduate student, while serving on the graduate committees of 5 other M.S. students. These courses and advising appear to be well conducted and received by students.

At this juncture, Dr. Ruetz should concentrate on acquiring more external funding for his program and publication of new results as a critical mass of new data develops. His focus on fisheries in coastal watersheds and on invasive fishes in Lake Michigan is appropriate, but he should consider working on “potential” invasive fishes rather than already established round gobies. For example, Asian carp are close to invading the Great Lakes, with very little knowledge about their potential impacts. Agencies such as GLNPO, GLFT, Michigan Sea Grant, or National Sea Grant might be receptive to such a proposal. Simultaneously, he can resubmit his NSF proposal, realizing that funding rates are very low. Therefore, regional or non-NSF sources of support may be more realistic at this point.

Dr. Ruetz identifies “funding” and “tenure” as his main priorities. To achieve these 2 related things, Dr. Ruetz should focus most of his energy on research, including grant-writing and journal publications. Although Dr. Ruetz clearly enjoys teaching on campus, it appears that a substantial portion of his effort is devoted to that activity, which inevitably drains time from research. A somewhat more modest teaching commitment would free up time for research while still maintaining a teaching presence on campus.

Dr. Mark Luttenton

Dr. Luttenton has a half-time appointment at AWRI combined with half-time on campus in the Biology Department. He currently is acting chair of Biology, while the chair is on sabbatical, and naturally must devote most of his energies to administration. Dr. Luttenton was on sabbatical in 2003-2004. His teaching duties on campus in 2004-2005 consisted of 2 courses, and he also advises 3 graduate students and a number of undergraduate researchers. He also directs the graduate program for the department, which has expanded with the new aquatic M.S. program at AWRI, while maintaining substantial community involvement on natural resource issues.

Dr. Luttenton has several active research projects on nutrient loading, habitat improvement, and aquatic fauna totaling about \$73,000 during a 2-year period, and several collaborations outside of GVSU. He has published 3 papers during that 2-year period, 2 as senior author which are in press. Dr. Luttenton identifies a higher publication rate as a future goal, which presumably will also target high quality journals. Additional publications will also enhance the funding potential for Dr. Luttenton’s program. Overall, Dr. Luttenton serves an integral role in the Biology Department and an important liaison between campus and the AWRI.

Dr. Michael Chu

Dr. Michael Chu's research program in Hydrology has matured in the two years since the last Science Advisory Board meeting. He has collaborated with other AWRI staff on 4 ongoing projects to provide essential hydrologic information. He has one proposal pending in the USDA-NRI program. He has demonstrated versatility in expanding his research into a broad spectrum of hydrologic topics: aquifer analyses, groundwater modeling, stream hydrology, and sediment and metal transport modeling. Although his

Ph.D. dissertation and most of his publications since 2000 dealt with pesticide transport in surface and subsurface environments, he has not pursued pesticide transport research since coming to AWRI. In part, this is due to the need for his expertise on projects dealing with aquatic ecology. It appears that most of Dr. Chu's effort has been spent on developing software for a broadly applicable model for integrated transport of pesticides. Although the potential application of this model to research questions is high and the simulations comprehensive and impressive, Dr. Chu should consider re-focusing his effort on those applications. We strongly recommend that Dr. Chu establish strong ties with other hydrologists in the region (e.g. NOAA, USGS-Lansing, University of Michigan, Michigan State) thorough visits; joint project development, and enhanced participation at regional and national scientific meetings. Carol Johnston spoke with Dr. Phil Robertson (Director of the Kellogg Biological Station LTER) and he would be happy to put Michael in contact with researchers at Michigan State University who could be possible collaborators in pesticide transport research. The LTER site itself does not apply pesticides to its agroecosystems, but Dr. Robertson knew of some field sites in western Michigan that have been the subject of atrazine research.

Dr. Chu is developing courses in Hydrology and Environmental and Ecological Modeling. Unlike other AWRI faculty, his academic expertise is in an area that does not have a large student clientele (particularly graduate students) at GVSU. It has been a challenge for him to work with students who lack the mathematics backgrounds needed for groundwater modeling, so he has developed Windows-based hydrologic and environmental modeling software that eliminates the need for a student to know differential calculus. He has clearly given a lot of thought to pedagogy, but this goal should be secondary to developing his research program and procuring external research grants. It is difficult for Dr. Chu to recruit graduate students to work with, so the Science Advisory Board recommends that he try to get enough external funding to hire a Post-Doc instead. He could also try to get an adjunct appointment at a nearby university that has a stronger hydrology program, such as MSU or Western Michigan University, and co-advise graduate students there.

Dr. Chu has about 2-3 journal articles published or in review per year, which seems like a good publication rate. He has appropriately identified procuring external research grants as a goal for 2005-06.

Dr. Alan Steinman

Dr. Steinman's scientific record is outstanding. He has received 14 new grants and contracts (11 as P.I.) totaling \$850K from a number of agencies, has published 7 journal articles (5 senior author) as well as 3 book chapters and has made 26 scientific presentations. He is also very active in professional and community service activities. He does all of this while having full administrative responsibilities as Director. Most of his research is focused on local and regional issues, which is appropriate given the logistics and overall mission of the AWRI. His research is clearly of high quality and provides a good example for his more junior scientific staff. It is clear he plays a mentorship role.

Presently, the balance he has between administrative demands and scientific productivity seems good and highly successful in both areas.

Technical Staff

The research associates and technicians at AWRI have an impressive array of expertise, and are clearly very valuable to the research effort. The technical staff enthusiastically expressed satisfaction with their jobs ("I love my job"), citing the diversity of work as one factor in keeping their jobs fresh and interesting. There was a good spirit of comradery.

Recent reductions in government budgets during the past two years have reduced grants and contracts to the ISC, and two staff members had to be let go. The ISC staff understood the need for this and did not seem to be concerned about their own job security, but reported that this loss placed increased work demands on them. These increased demands made it more difficult for ICS staff to provide gratis assistance to students and faculty from elsewhere in AWRI and GVSU, but they still tried to accommodate requests to the extent possible.

There was a general confusion among the technical staff about promotion procedures and standards that prompted lengthy discussion with the Board. The technicians also thought that workloads were sometimes disproportionate among staff, or in cases about proportionate but with substantial pay differential. The committee recommends that Director Steinman work with the technical staff to make sure that they understand the different position classes and their benefits, and the promotional ladder at AWRI and how it relates to the "AP" ladder at GVSU.

Overall Scientific Direction

Dr. Steinman clearly leads much of the AWRI scientific research as lead P.I. on a number of projects involving other scientists at the lab. Overall there is a lot of scientific collaboration among scientists at the lab but this could be improved. There are also a lot of individual small projects. One of Dr. Steinman's stated goals for his own research is to "expand research into new areas as opportunities present themselves". However, we believe that the AWRI research program has reached sufficient maturity to set its own goals by identifying priority scientific issues that could be addressed using the breadth of expertise at the lab as a focal point, combined with regional and national collaboration. This steered research direction could be done through the vetted development of a 5-year science strategic plan that would focus the efforts of the group towards cross-disciplinary issues and targeted funding (rather than opportunistic funding). Increased collaborative efforts across the scientific staff at AWRI will help promote individual scientific productivity and lead to further integration of the research science programs with the Information Services Center and Education and Outreach Programs. 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.

Education and Outreach Program

The Education and Outreach program at AWRI is directed by Dr. Janet Vail, who is assisted by 8 part-time seasonal instructors and several student interns. The program receives external support from 12 grants and contracts, totaling about \$200,000, in addition to a recently established endowment. Educational and outreach projects can be broadly classified into (1) local and extended vessel cruises for educational activities, (2) sponsorship and organization of regional conferences, (3) teacher continuing education programs, and (4) career fairs and state and federally funded demonstration projects. The program appears to be extremely active and well integrated into the overall objectives of AWRI. Examples of particularly important regional activities organized and sponsored by this program from 2003-2005 are the "Lake Michigan: State of the Lake" conference in 2003, "Making Lake Michigan Great" summer cruises, and the GLOBE and WET programs for teacher training. The program is very well integrated into local, regional, and state environmental activities that focus on water, especially Lake Michigan.

A particularly impressive aspect of the program is the K-12 educational program for school children in the tri-city area, which is conducted in the AWRI classrooms and onboard the vessels. The classroom and vessel instruction combines modern technology with hands-on experimentation and exploration. All 6th graders in Muskegon and all 7th graders in Grand Haven participate in this program each year, totaling about 2300 students served over the 2-year period of 2003-2005. In total, over 6500 people participated in the vessel program in 2003 and about 5400 participated in 2004. The decline from 2003 to 2004 was related to lower revenues in 2004, especially return on endowment (see below). The reports that we received at AWRI suggest that the vessel educational program is extremely effective at reaching the local population and clearly builds good will and support within the local community. This is a very important activity because the local community has funded and supported the Lake Michigan Center, and should continue to be a strong advocate for AWRI with proper involvement.

Dr. Janet Vail is the only fulltime staff member dedicated to Education and Outreach. She is fully extended in managing the many projects and activities conducted by this very important arm of AWRI, and makes considerable efforts to remain current by attending relevant meetings and workshops. Dr. Vail also maintains a modest research program on detection and monitoring of *E. coli* bacteria. It is notable that the GLOBE program directed by Dr. Vail was recently selected as an outstanding U.S. partner. Overall, the Education and Outreach program appears to be very well run and represents an excellent means of nurturing strong ties to the local community. The program has regional and statewide activities and could be competitive for national education grants with continued development and possibly additional staffing.

The fleet captain, Mr. Tony Fiore, and the captains, crew, and instructors of the W.G. Jackson and D.J. Angus are highly professional individuals who effectively serve both

the educational and research missions of AWRI with their top-notch care of the fleet. Mr. Fiore has successfully implemented the additional measures needed to meet 9-11 security upgrades and has negotiated a new moorage for the Angus in Grand Haven. He also has overseen the conversion of both vessels to 20% biodiesel fuel, which has resulted in both reduced emissions and improved fuel consumption. AWRI has also purchased a used pontoon boat for trailering to smaller lakes, and Mr. Fiore is retrofitting the boat for limnological sampling. Overall, the AWRI vessels are extremely well managed for the multiple purposes of education, outreach, and research.

Graduate Program

The M.S. program in Aquatic Science was initiated at AWRI in Fall 2003 and currently has 6 graduate students at AWRI. Several other graduate students in the Biology Department also spend time at AWRI for employment or thesis-related work. For example, some students doing work in the policy arena are concurrently working at AWRI. AWRI-supported students are reasonably well supported, with a stipend of \$4000 per semester (on the low side compared to other institutions) and \$8000 for the summer (on the high side), plus a tuition waiver. This assumes half-time research during the academic year and fulltime in the summer. Policy students from campus are less well supported by GVSU (\$2000 per semester and only ½ tuition waiver), and must try to secure their own grants or work on unrelated projects for income. The disparity in funding between GVSU and AWRI students was identified by students as an area of concern. TA-ships apparently require some rather strange and inconsistent titles such as “Adjunct Professor” for support. Also, it is unclear to some AWRI students about how much of their half-time research employment should be spent on their research cf. the projects of their advisors.

The students praised the high quality of instruction they receive from GVSU and AWRI professors, and the open-door policy of the professors. They appreciate the extra skills they can acquire in the Analytical Chemistry and ISC labs at AWRI. They also have access to travel funds to attend conferences. They did comment, however, about the limited library collection of GVSU, especially electronic periodicals. They also would like more access to undergraduate researchers, who can provide a mentoring experience while serving as useful assistants. Overall, the new M.S. program in aquatic science appears to be vibrant and is attracting good students, although mostly GVSU and other regional students at this time. As the program grows, more students from other institutions likely will apply to the program. A goal to double the size of the program in the next few years, so that each AWRI professor averages 2 graduate students would be desirable to build critical mass but this will require additional resources including stipends and some additional space.

Faculty Tenure

The lack of tenure-track opportunities was a concern raised at the 2005 meeting. The committee agrees on several aspects of this issue. First, no policy exists that is applicable for the primary research staff. Scientists have no formal mechanism for promotion since

they are considered by Human Resources as administrative/professional staff, not faculty. Second, although a decision has not been made by GVSU, tenure for primary research staff may not be available through the academic track. Therefore, a different policy may be necessary for this special case. In this case, the primary research staff should determine how tenure is handled at other research institutes. The list should include the most successful and prestigious centers such as Woods Hole, Institute of Ecosystem Studies, and Ecosystems Center and other successful centers such as the Hancock Biological Station. Such a review may lead to the development of an appropriate model for AWRI primary research staff. Third, AWRI investigators have diverse capabilities and interests that will not fit the academic tenure track at GVSU. Extension and outreach probably may not be recognized for their importance. It should be pointed out, however, that some land grant institutions reward extension faculty with tenure showing that service activities are an important and valuable component in these institutions. Presently, many AWRI investigators are performing very important extension and outreach functions. Finally, because appointments are primarily for research, the expected level of achievement for primary research staff relative to grants and publications may be greater than that for the typical GSVU academic evaluation.

Facilities

AWRI has excellent laboratory facilities to carry out their mission. We did find that students were in somewhat crowded conditions and had difficulties with access to library resources. Electronic library services should be made available. More effective use could also be made of the front building (field station). As the AWRI continues to grow, renovation of the front building should be considered as an option to meet future needs. This should be done through the development of a 5-year facilities plan that complements the scientific strategic plan.

SAB Review Process

More time is needed in the on-site review process so SAB can consider long-term planning and discuss new programs and activities. For example, the issue of tenure raised at the 2005 meeting falls into this category. SAB did not have adequate time to address this important issue. Another long-term issue (not discussed) is establishing endowments for improvement and stabilization of scientific staff. Achieving this objective would provide funding for appointments to Senior Scientists, Visiting Scientists, and Post Doctoral Scientists. In addition, endowments could provide funds for development and training within the existing primary research staff.

The present format for SAB meeting has two shortcomings. First, time should be available for one-on-one meetings with primary research staff. As an alternative, it may be desirable for two or three SAB members to meet with individual investigators. Second, more time is needed for committee deliberation. With the present format and past history, one option would be to schedule this session at the time now used for the evening social gathering. The social gathering could be held on the evening before the

formal sessions or could be truncated the next day so the committee could deliberate during and after dinner

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 further mature, we believe that the AWRI will be well-poised to achieve its stated objectives. Some of the major overarching recommendations for the future are:

- Provide clear opportunities for promotion and advancement for professional and technical staff and ensure graduate student support is fair and equitable across disciplines
- P.I.s should strive for a minimum of two publications as primary author per year and at least one presentation at a national meeting.
- Develop a 5-year science strategic plan that would focus efforts of AWRI towards cross-disciplinary issues and targeted funding.
- Develop a 5-year facilities plan that complements the scientific plan and includes facilities as well as library services.