Science Advisory Board Review of Annis Water Resources Institute

Grand Valley State University

March 9-10, 2009

FINAL REPORT

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Introduction and General Observations

The Science Advisory Board (SAB) conducted its biennial review of the Annis Water Resources Institute (AWRI) of Grand Valley State University on March 9-10, 2009. The SAB thanks Dr. Alan Steinman and the entire AWRI staff for their cooperation, hospitality, thoroughness of presentations, and open access that was provided to us during our review. We believe that having a Science Advisory Board is a creative and valuable approach and we appreciate being selected for this opportunity. The administration of GVSU is to be complimented for their facilitation and encouragement of this review. 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 southwestern Michigan region.

Overall, the AWRI continues to make significant progress in its mission and has experienced further maturation of its programs under the leadership of Dr. Alan Steinman and the continued strong support from the Grand Valley State University administration. AWRI has developed a solid reputation in the state of Michigan and around Lake Michigan for its academic and outreach programs. The SAB feels that AWRI is now "on the cusp" of garnering national recognition for its program in freshwater research. We feel that collaboration by AWRI faculty on program grants to federal agencies will catalyze scholarship that will bring national and international attention to AWRI. Successful efforts will also attract postdoctorates to AWRI who will enhance the research enterprise. Recent (post-review) developments show additional progress in this area, including (1) the recent NABS meeting hosted by AWRI in Grand Rapids, and (2) the decision by GVSU to grant academic unit status to AWRI. The SAB is impressed with these developments and feels that the trajectory of AWRI is very positive. Long-term funding issues, especially for the ISC, will be challenging but such issues are being experienced by academic institutions at a national level. Support by GVSU is needed to "weather" these periods and minimize the permanent loss of talented staff. Below, we provide a more detailed assessment of individual programs with additional recommendations.

Information Services Center (ISC)

The staffing of the ISC remained relatively stable in the two years since the SAB's prior visit. Jon VanderMolen, who was previously a student, was added to the ISC in 2008. Lea Markowski, who was a technical call-in during 2007 and 2008, has left. Kurt Thompson, who provides essential (and highly valued) computer support services to all of AWRI, is now supported by the Steinman lab. Jean Conzelmann's efforts were split with GVSU Administration as of the SAB visit, but she has since taken a full-time position with Admissions at GVSU. Nicol De Mol completed graduate studies in addition to her role in the ISC, and in 2007 was awarded Outstanding Graduate in the Master of Science in Biology program. The staff has 87 combined years of experience with ISC.

The ISC staff is highly engaged in community collaborations that have synergized the work of the ISC, helping to procure external funding. Examples include:

- All staff - West Michigan Strategic Alliance (various projects and councils)
- Rod Denning - Sand Creek Watershed Partners, Muskegon Area-wide Plant Implementation Committee, West Michigan Trails/Greenways Coalition

- Kurt Thompson - Muskegon River Watershed Assembly Data Repository Committee
- Nichol De Mol - White River Watershed Partnership, Rogue River Watershed Council, Muskegon River Watershed Assembly
- Brian Hanson - Grand River DIP and Information and Education Subcommittees.
- John Koches - Muskegon Area Sustainability Coalition, West Michigan Regional Sustainability Initiative, Muskegon Environmental Indicators Committee, Lower Grand River Watershed Steering Committee. In recognition of his contributions, John Koches was honored as a Sustainability Champion at the First Annual Sustainability Champions Breakfast in October 2008.

Providing continued funding for salary support of the very experienced ISC staff is a concern. Two very large ISC projects, the "Sustainable Future: Muskegon" (Wege Foundation funding) and the "Mega Model Project" (Great Lakes Fisheries Trust funding) are ending or have ended, and the few remaining projects are much smaller in amount (< $102,000 each) and duration. The lack of long-term projects is problematic. Due to the need to provide adequate notice (i.e., either 3 or 6 months in advance) to employees about possible layoffs, ISC must have in hand essentially 15 to18 months of salary in order to renew annual appointments. In the past, the ISC's "repository" fund provided this funding cushion, but that reserve is almost depleted. The ISC hopes to regain funding from the Great Lakes Fisheries Trust for "Mega Model II," continuing its collaboration with Mike Wiley (University of Michigan) and Bryan Pijanowski (Purdue) on that project. Initial conversations with the GLFT have been promising, but that funding decision is still pending. Several other proposals are also pending for smaller amounts, but a strategy for sustained long-term funding should be a priority for ISC.

John Koches and the staff of the ISC have done a commendable job in the past of maintaining a steady stream of funding to support their work. The ISC has worked as a regional service center, providing essential tools and information needed for water quality and land use planning. The cumulative area of the watersheds for which the ISC has prepared environmental and water quality plans is about one-fourth of Michigan's lower peninsula. In this respect, the ISC has operated in a quasi-governmental capacity, providing services needed by local governments (e.g., for planning under Section 319 of the Clean Water Act), but which those governments could not easily provide themselves. However, AWRI's Science Strategy notes this significant challenge to the ISC:

> "Funding opportunities are becoming more competitive, especially in the areas of geospatial technologies. In the past, GIS expertise was limited to a few entities, including the Information Services Center at AWRI. However, this is no longer the case, and there is less demand for this service."

The use of GIS is becoming more widespread, and many local governments now have in-house GIS expertise. In an era of tightening budgets, these entities seem to have become less inclined to contract for the type of services formerly offered by the ISC. John Koches noted that funding opportunities would essentially present themselves in the early years of ISC operation, but now more effort is required to procure grants and contracts.

This may be a time for the ISC to reevaluate its niche. Clearly, the expertise of the ISC staff extends far beyond the provision of basic GIS services. Quoting again from the AWRI Science Strategy:

> "Staff involvement goes beyond just gathering and manipulating data. Participation is tailored to address not only customer requirements, but includes AWRI expertise to create and deliver products that are transferable, dynamic, and accessible, and supported by scientific principles from which they were derived."

The ISC's unofficial role in providing regional planning expertise has never been formally sanctioned nor subsidized as such. If the ISC's "customers" are less inclined to pay for the services that the ISC has heretofore rendered, then it may be time to identify a new customer base. That change seems to be taking place in the form of increasing collaborations with other AWRI investigators (e.g., collaboration with Rick Rediske on the White River 319) and with university consortia (e.g., Mega Model). The SAB encourages these efforts.

Giving presentations at scientific meetings such as those of the International Association of Great Lakes Research (IAGLR) may be one way to increase the customer base. The "lessons learned" by the ISC in addressing water quality and quantity issues in west Michigan may aid others in the Great Lakes region who are grappling with similar issues. The sustainability of water resources will be key to the future of Great Lakes states. Another organization that may be relevant is URISA, the Urban and Regional Information Systems Association: http://www.urisa.org/

The 2007 SAB review requested a list of ISC publications, and we were pleased that it was provided this time. It is good to see that Kurt Thompson and John Koches are co-authors on several peer-reviewed journal articles and book chapters. Publishing (particularly in peer-reviewed journals) should continue to be a goal for the ISC. Given the group's experience with environmental indicators, they might consider the new journal *Ecological Indicators* as an outlet for some of their work.

The ALURE (Aerial Land Use Resource Experiment) UAV is appealing, but given the budget problems currently facing the ISC, we feel that John Koches' efforts on ALURE development should be reduced and redirected toward developing and refining a new niche, and identifying new partners. The Lake Color Index proposal with Rick Rediske and Bopi Biddanda is a worthwhile idea, but the lack of progress since the SAB's 2007 visit in obtaining funding for ALURE deployment is an indication of limited demand for this technology.

In summary:

- The ISC has displayed an excellent long-term record of providing service in geospatial technology. However, regional opportunities are becoming more limited because of increased competition from in-house GIS labs.
- We recommend immediate attention to a long-term strategy to re-invent ISC, including (1) making more presentations at regional and national meetings and (2) developing a new strategy for marketing ISC skills and products.

- Where appropriate, we recommend publishing selected ISC products in peer-reviewed journals to enhance the national visibility of the ISC and AWRI.

Graduate Program

The SAB was pleased to note that the AWRI graduate program continues to grow. The number of students has increased, and the students are of the opinion that solidarity has improved within the group. The SAB discussed several issues with the graduate student group, including facilities, financial support, academic environment, and scholarly output. With regard to facilities, the students are generally content. While most students do not have individual offices, there appears to be adequate desk space for their needs. Computer facilities and support are also good. While there are occasional computer problems, conditions appear to be better than for students on the GVSU main campus. Overall, the students are also satisfied with their financial support, which can vary in amount over the course of a year but provides a dependable stipend.

Most students are working toward publication of their research, and several have also had experience co-authoring proposals, which is excellent preparation for their post-graduate careers. Expectations with regard to publication appear to be set primarily by individual students' advisors. Some students appear to have a clear understanding of expectations with regard to publication, while others are uncertain about what their advisors expect. Some students who are preparing manuscripts for publication expressed frustration in trying to publish and complete a thesis at the same time. This is a challenge common to graduate students, but there may be mechanisms that minimize this conflict. Currently all students present the results of their research in traditional thesis format, as prescribed by the GVSU Biology Department. The SAB suggests that AWRI consider thesis models that facilitate publication in the peer-reviewed literature. Possible models include the acceptance of a published paper as the primary thesis product, or thesis chapters prepared following the format of a journal to which the chapter is submitted. The second model may require little or no revision of the current guidelines. Rather, it may simply require an agreement between the student and his/her advisory committee. While publication in peer-reviewed literature need not be considered a requirement for the M.S. degree, it should be pursued when possible, as it will enhance the students' career opportunities and promote the scholarly reputation of AWRI. To the extent possible, M.S. graduates should be encouraged to consider Ph.D. programs as their next academic option.

Several other observations by students were noted during the board's group meeting with them. A number of the students indicated a need for more course offerings within the field of aquatic sciences. While it is difficult to address this issue with the limited number of AWRI faculty, joint courses with other campuses may be a mechanism worth exploring, possibly through distance learning technologies. This issue is further exacerbated by the lack of a curriculum specific to AWRI, despite its recent designation as an academic unit. Some attention to this issue in collaboration with Biology, where the M.S. students are housed, is warranted. Library access limitations noted in previous reviews are no longer a problem, largely due to enhanced electronic journal access. An increased number of research assistantships would allow more focus on thesis research, which are of course dependent on PI funding success. In the absence of RAs, GVSU teaching assistantships are competitive and require a split life between AWRI and the main campus. Physical separation from the main campus continues to an issue for some graduate

students. The distance between AWRI and the GVSU main campus is logistically challenging, in particular if students are teaching a course on campus while conducting research at AWRI. Finally, the availability of vehicles and boats at AWRI for student fieldwork has improved since the last review. Overall, the Graduate Program is active and robust, and is absolutely critical to the success of AWRI as a research and educational facility.

Faculty and Individual Research Programs

Dr. Mark Luttenton

Dr. Mark Luttenton has a half-time appointment at AWRI combined with half-time on campus in the Biology Department, and he continues to serve as an important bridge between the Biology Department and AWRI, facilitating communication and cooperation. Dr. Luttenton's teaching duties are considerable. On campus, Dr. Luttenton teaches Scientific Methodology in the fall semester and Freshwater Algae in the winter semester (W07 & W09). He also taught Biology II in Winter semester 2008. After Dr. Don Uzarski's departure from AWRI in 2007, Dr. Luttenton assumed the teaching of two courses that were previously taught by Uzarski – Limnology (F07) and Wetland Ecology (W08). The Wetland Ecology course will probably be dropped from the curriculum in the future. Dr. Luttenton also taught Stream Ecology as a sabbatical replacement during Fall 2008, and Environmental Science as a summer course in 2008. Notably, Dr. Luttenton was the 2007 GVSU nominee for the Michigan Distinguished Professor award, and the 2007 GVSU nominee for U.S. Professors of the Year, a national competition sponsored by the Carnegie Foundation for the Advancement and Support of Education. These nominations are prestigious honors.

Dr. Luttenton's direction of the growing graduate program continues to be significant. He serves as Coordinator of the Graduate Program in Biology, is a member of the Graduate Directors Discussion Panel, and chairs the University Graduate Council. As a member of Graduate Council Policy Subcommittee, Dr. Luttenton helped to create a new Graduate Assistantship Policy and define the qualifications of faculty engaged in graduate education, in particular the qualifications required for chairing a graduate committee, which are issues of importance to AWRI. The graduate program continues to expand, with increasing numbers of students and course offerings. About 75% of the Biology graduate program's graduates chose the Aquatic Sciences Emphasis, which has now been formalized. Dr. Luttenton plans to expand graduate recruiting efforts, seeking to increase the number and qualifications of applicants to the Biology Department graduate program. Dr. Luttenton currently directs two graduate students in his own research projects.

Dr. Luttenton's University service during 2007-2009 included participation on the Regional Science and Math Center Advisory Board, several review panels for scholarships and awards, and chairing a Biology Department Search Committee for a Quantitative Ecologist position. His Society service has been to the American Fisheries Society - Michigan Chapter and to the North American Benthological Society, for which he is local arrangements chair for the May 2009 conference.

During the summer of 2007, Dr. Luttenton had the opportunity to spend time at the Hancock Biological Station in western Kentucky, operated by Murray State University. While there, he taught a summer Freshwater Biology course and conducted research on biomonitoring of western Kentucky rivers, collaborating with Drs. Susan Hendricks and David White. His research resulted in a peer-reviewed paper on benthic algal taxa, published in the Journal of the Kentucky Academy of Science. Three other peer-reviewed publications were published or are in press since 2007.

Dr. Luttenton's grant funding was $4,100 during 2007-2009, which is less than his funding during previous SAB visits. His research collaboration with Alex Nikitin on brown trout mitochondrial DNA garnered an internal grant from the GVSU Research and Development Office. This collaboration has been productive, resulting in two of Dr. Luttenton's peer-reviewed publications during the time period, and seems like a promising future avenue of research. Completed research includes the White Lake Nutrient Loading Project (with A. Steinman and R. Rediske), the Henry's Fork River Biomonitoring project, and Muskegon River Invertebrates. In Dr. Luttenton's self-assessment, increasing extramural grant funding was a goal for 2007-2009, and remains a goal for 2009-2011, with which we agree.

In summary:

- Dr. Luttenton is an outstanding instructor and advisor and plays a vital role in the Biology Department while serving as an important liaison with AWRI.
- Acquisition of external funding continues to be challenging for Dr. Luttenton, and we recommend collaboration with other AWRI or Biology researchers to submit grant proposals as PI or co-PI. Dr. Luttenton is able to succeed with relatively modest amounts of funding, say in the $25-50K range, which could be an annual goal.
- Publication of 1-2 papers annually in peer-reviewed journals would be a reasonable scholarly goal for Dr. Luttenton's laboratory.

Dr. Rick Rediske

Dr. Rediske and colleagues in the environmental chemistry group have been active in a number of projects, including a beach monitoring program assessing the links between nuisance algae, E. coli and algal toxins, the dynamics of cyanobacteria and algal toxins in Muskegon Lake, the development of a fish contaminant database, patterns of contaminants in biota of several Michigan lakes, and an assessment of nutrient dynamics contributing to excess algal growth in Bear Lake. All of these projects benefit from the contributions of the outstanding technical staff that work under Dr. Rediske's direction who, in addition to supporting research, provide training to graduate students.

In addition to his research projects, Dr. Rediske taught two courses in 2008 – Great Lakes Water Resources, and Water Pollution Biology, which has received greater enrollment following a change from the former course title, Aquatic Toxicology. Apart from formal courses, Dr. Rediske has done an excellent job of promoting graduate education through his research program, serving as the main advisor for four M.S. students, and a committee member for several others. Dr. Rediske expressed some frustration in motivating recent graduates to publish

the results of their research. While this is not an uncommon problem in M.S. programs, it is incumbent on Dr. Rediske to demand that graduate students write their theses in "publish-ready" units that can be readily submitted to journals. He then needs to follow up on their submission in a timely manner, taking "control" of the paper if the student is unwilling. In relation to this issue, some other AWRI graduate students spoke with the SAB about the challenges of publishing while writing a thesis. Several possible actions that might be considered with regard to this issue are outlined in the section of this review addressing the AWRI graduate program.

Dr. Rediske's research program consists of a number of collaborative projects, and his grant and publication record reflect his capacity to form strong working relationships with partners within and outside of AWRI. Dr. Rediske has indicated he would like to continue to develop his research collaborations. Expertise in environmental chemistry and toxicology can certainly contribute to other disciplines within the natural sciences, ranging from trophic dynamics to human health, and so there is plenty of scope for collaboration and interdisciplinary research. Within this context, it is important that partnerships are truly collaborative research efforts, and that the lab not fall into the trap of becoming a service provider for other researchers and clients. Currently, Dr. Rediske's lab provides valuable support to a number of research, monitoring, and assessment projects. It is important that the lab also take a leading role in pursuing basic and applied research. As suggested in the previous review, this might be done by exploring opportunities in the area of molecular biology or contaminant modeling, and attempts at developing further collaborations should be directed toward these disciplines. This would allow the skills and expertise in Dr. Rediske's lab to be leveraged in pursuit of major research grants. This should also lead to the publication of more first-authored papers, which should be a goal for the coming years.

In summary:

- Dr. Rediske has a strong record of university and community service. He is very active in volunteer outreach activities, and is an ambassador for AWRI and GVSU within the Muskegon region.
- Dr. Rediske's laboratory provides valuable services in the area of environmental chemistry to a range of AWRI research projects, but a goal should be to generate new projects and grants that sustain long-term productivity and direction.
- We recommend that Dr. Rediske publish 2-3 papers annually from his laboratory, which will increase competitiveness for external grants and enhance his scholarly reputation. Collaborative papers would be a part of this goal.

Dr. Ryan Thum

In general, Dr. Thum is taking all the necessary steps to develop his career and establish a funded research program. Since acquiring his Ph.D. in 2004 he has published regularly. Most of his publications are first-authored, and some are in high-impact journals. At the time of this review he has only been at AWRI for about 16 months. In that time he has acquired a modest amount of funding to study hybridization in water milfoil, and he has submitted a number of other proposals, two of which were submitted to the National Science Foundation. He currently teaches a course in molecular ecology and does some guest lecturing. He also supervises one

graduate student, three graduate interns, and four undergraduate interns, as well as serving on two graduate committees.

In the next year it will be critical for Dr. Thum to continue pursuing funding opportunities. A new research program has a lot of inertia, and the first one to two years are often when the most work is required in order to establish some momentum. Dr. Thum has initiated the process by submitting a number of grant proposals. He has indicated that one of his immediate priorities is to obtain sufficient funds to hire a lab/field technician. This would certainly help to accelerate his research program, as he is currently doing most of the technical work himself. Once this funding hurdle is cleared it is expected that Dr. Thum's research output and funding capacity will both increase. During this period it will be important to define long-term research goals and strategies. Dr. Thum indicated that he plans to submit a proposal to NSF's Faculty Early Career Development Program. A well defined, long-term research vision that includes interdisciplinary links will be essential for this proposal. Dr. Thum expressed some uncertainty about the best time to apply for this grant. His record suggests that he can probably submit a competitive proposal immediately. Communication with the NSF CAREER program director would help to resolve this question.

Some steps that may help to establish momentum and develop a well funded research program may include: (1) Collaboration with other established colleagues, both within and outside of AWRI. This can allow for involvement in larger research programs that are already well funded, and can also lead to novel, interdisciplinary science. The challenge is to make sure that collaborative roles are clearly defined, and that individual contributions are clearly discernable. Dr. Thum's publication history and his project with Dr. Ruetz suggest he is able to do this effectively. (2) Dr. Thum appears to have a moderate work load on committees, although he is advising a significant number of students. Committee and advisory work loads should remain modest so that he can focus on submission of proposals and establishing a research program. (3) Development of formal or informal mentoring relationships. Advice from more senior scientists may be useful in determining how to balance the multiple demands of teaching, advising, writing, and research.

In summary:

- Dr. Thum is off to a strong start at AWRI, and brings new molecular expertise to the group. His NSF grant proposals suggest a strong commitment to high-level national funding and the SAB is confident that he will be successful.
- If funds become available, Dr. Thum should consider recruiting a postdoctorate to his laboratory to enhance scholarship and publication. Overall, the academic climate at AWRI would be enhanced by the addition of postdoctorates.
- Dr. Thum has been actively publishing in leading journals, and the SAB recommends that he sustain that level of publication even as he starts up new projects.

Dr. Bopi Biddanda

Dr. Biddanda joined AWRI in June 2000 and has continued to address important aspects of carbon cycling and microbial ecology in his research program. In the past two years, he has

maintained his high level of progress in research and scholarship and should be recognized for his efforts. He has three funded research projects (2 NSF, 1 NOAA) and one pending. He continues to submit proposals to both state and highly competitive programs including 3 to NSF and 1 to NOAA, and 2 to state programs. While he seems despondent that none of these 6 has been funded, he should be reminded that his 50% success rate is laudable.

During this review cycle, Dr. Biddanda published, or has in press, 8 papers (two as senior author). He has submitted two others and has 4 in preparation for scientific journals, in addition to 4 popular science articles. These make an impressive set in leading journals. He has participated in national scientific meetings, as well as Great Lakes educator workshops. He has been a prolific reviewer of proposals (8 for NSF) and journal articles (>16), and currently serves on the editorial boards for the Journal of Plankton Research and Aquatic Microbial Ecology and on the NSF Microbial Observatories Program Panel. Collaborations with AWRI and external scientists continue to provide contributions on the Great Lakes and Michigan lakes.

The graduate courses he teaches, Aquatic Microbial Ecology (Fall 2007) and Ecosystem Biogeochemistry (Fall 2008) reflect his broad research interests, and teaching courses on campus provides an opportunity to identify students interested in employment. It is curious that, in the last cycle, he taught Plankton Ecology instead of Aquatic Microbial Ecology. Was that a title change or new course?

He supports two graduate students and a technician, and mentors four undergraduates. Dr. Biddanda has given an impressive array of invited and contributed seminars across Michigan and has presented his research in national meetings. He provides significant service to AWRI and GVSU through graduate student committee work and AWRI service committees (e.g., radiation, seminars, scholarship days).

Dr. Biddanda has responded well to the 2007 review (as he did in response to the 2005 review) and his program has shown a high degree of maturation during that time. He should continue to concentrate on building and maintaining a strong research funding base and enhancing his research program. In addition, he should continue to publish at least two papers per year as a lead or senior (last) author. Dr. Biddanda's research on the ecology of a submerged sinkhole in Lake Huron is very exciting due to its unique features, and he has done a nice job of expanding his microbial ecology and carbon cycling work. He should continue along this path.

In summary:

- Dr. Biddanda is developing a national reputation for his work on carbon cycling and microbial ecology in lakes, and his work on Great Lakes sinkholes has received considerable attention in the scientific and popular press. Overall, his program has shown an impressive degree of maturation over the last two SAB review cycles.
- While funding is certainly challenging, and rejection can be demoralizing, we recommend that Dr. Biddanda continue to submit grants to NSF and other federal agencies, perhaps as collaboratives. The SAB believes that success is imminent.
- Dr. Biddanda has published steadily and has papers in the pipeline on a continuous basis. We laud that productivity, and expect that it will be maintained.

Dr. Carl Ruetz

Dr. Carl Ruetz joined AWRI in 2002 and remains an Assistant Professor at GVSU. He seems to be at the appropriate length of service to be considered for promotion and tenure in the near future. His research focuses on fisheries biology in the Lake Michigan drainage system. Since the 2007 review, Dr. Ruetz has participated in successful extramural grant proposals totaling over $500,000 of which $167,000 has flowed directly into his own program. Funding has primarily come from in-state sources, although attempts for federal funding have been made. In the 2-year period since the last review, Dr. Reutz has published 5 papers in peer-reviewed journals, with 1 as first author and 1 as senior (last) author. While this is a good rate of publication, journal quality could still be improved by targeting higher impact journals (e.g., *Ecology*, *Ecological Applications*) with more broad-based and integrative papers.

Dr. Ruetz continues to provide exemplary teaching and mentorship to GVSU students, as evidenced by his "Outstanding Faculty Mentor Award" in 2007 along with awards bestowed upon his graduate students. He has graduated 2 M.S. students, has 2 current M.S. students, and serves on the thesis committee of numerous others. Dr. Reutz appears to be an excellent teacher, advisor, and mentor. He continues to have a very active scientific presentation record with 20 presentations over two years at mostly regional conferences. At this juncture, the SAB believes that Dr. Ruetz should consider attending a larger national conference (e.g., ESA, AFS) on an annual basis to further enhance his reputation and to network with national or international scientists and officers of funding agencies. We also suggest that AWRI support a trip by Dr. Reutz to Washington, DC, to visit funding agencies that could support his research. Dr. Reutz should also volunteer to serve on a NSF panel (most program officers are very receptive to this).

Dr. Reutz contributes substantial professional service including serving as the 2008 President of the Michigan Chapter of the American Fisheries Society and in several other society positions and editorships. He is also an active contributor to the Biology program at GVSU, which enhances his ability to recruit undergraduate students to his research program.

The major projects in Dr. Reutz's laboratory focus on fish populations (e.g., walleye, sturgeon) in western Michigan. These projects are quite interesting, have attracted funding and graduate students, and have good potential for expansion and longevity. Some attention to collaborative research efforts with other AWRI researchers, or scientists from elsewhere, may allow Dr. Reutz to write larger research grants that would allow him to recruit a postdoctorate into his laboratory.

In summary:

- Dr. Reutz has steadily developed his program at AWRI and now has substantial funding in place, is publishing regularly, and is a role model for strong mentoring of graduate students. His trajectory is clearly positive.
- Dr. Reutz continues to rely heavily on local and regional sources of funding for his projects, but the SAB advises him to continue to pursue federal funding via grant submission and direct involvement in review panels.
- The SAB acknowledges the strong regional activities that Dr. Reutz has developed but urges greater activity at the national level to enhance his reputation.

Dr. Jim McNair

Dr. McNair joined AWRI just a short time ago and we have a sense that he will make a significant difference, both in his individual contributions and as an integrator across the other scientific staff. AWRI has long needed a scientist (in addition to the Director) that has a personal research agenda that naturally connects to and integrates the interests and skills of the other scientists. McNair's historical areas of research interest, as well as those he presented at the review, should provide that glue.

Dr. McNair should be encouraged to both pursue his own interests in modeling and analysis and provide leadership for the AWRI scientific staff in developing multidisciplinary, multi-investigator proposals that can take advantage of the skills, interests, and regional competitive advantage of their location in Muskegon.

Prior to joining AWRI, Dr. McNair was a Senior Scientist and Head of the Modeling Section at the Patrick Center for Environmental Research, Academy of Natural Sciences of Philadelphia, as well as an Adjunct Professor in the Department of Biology at the University of Pennsylvania. Since 2000, Dr. McNair published 11 peer reviewed articles and 22 technical reports. The peer-reviewed publication rate is a bit lower than one would expect, but with a reduced burden of technical report preparation, the SAB would expect this rate to accelerate.

In summary:

- The SAB urges Dr. McNair to serve as the intellectual nexus for collaborative, or program, grants that would emanate from AWRI, such as to special programs of the NSF. His natural interdisciplinary skills and experience would serve this goal well.
- Dr. McNair should focus significant energy on publication in peer-reviewed journals, with the goal of 2-3 published papers per year.

Dr. Alan Steinman

Dr. Steinman's scientific record and leadership continues to excel. He has received 11 new grants and contracts (10 as P.I.), including a new Fellowship program from the Annis Foundation that should provide important graduate support in the future. He published 9 journal articles (4 senior author) as well as 2 book chapters, 4 technical reports, and has 4 manuscripts in review. He made an impressive (and exhausting) 28 scientific presentations and 26 community presentations. He does all of this while having full administrative responsibilities as Director – many of the grants and contracts are for lab-wide activities in addition to his personal research.

Dr. Steinman teaches BIO 680a (Emerging Issues in Water Resources) every other year and provides guest lectures in many other courses. He advises 3 graduate students, is on the committee for 4 others, including students at MSU, Notre Dame, and the University of Mysore. He is also very active in professional and community service activities, including serving on several national, regional, and state advisory boards and committees. These are time-consuming activities but very important for the AWRI Director to do – they well serve AWRI, GVSU, the community, and the environment.

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 of high quality and provides a good example for his more junior scientific staff. It is clear he plays an important mentorship role. Presently, the balance he has between administrative demands and scientific productivity seems good and highly successful in both areas. It is difficult to juggle scientific, academic, and administrative roles but it is important for Dr. Steinman to maintain an active research program. To this end, GVSU should give consideration to creating and funding as Assistant/Associate Director position for AWRI. Such a position would reduce the administrative load on Dr. Steinman, and allow him to focus more of his time and energy on programmatic development, collaborative proposals, and personal research that would enhance the overall research and educational enterprise at AWRI.

In summary:

- Dr. Steinman continues to serve as a role model for other faculty at AWRI, given his ability to maintain a very active and externally-funded research program along with excelling in his duties as AWRI Director.
- Although the SAB realizes that current economic climate in Michigan is not ideal for this, GVSU should consider funding an Assistant/Associate Director position for AWRI to ensure that Dr. Steinman can maintain his strong research program, which benefits the entire AWRI mission.

Other Faculty Notes

Since the last (2007) review by the Board, Drs. Michael Chu and Don Uzarski have departed AWRI for other academic positions. The GVSU administration should consider conducting a College-level review of these key departures to evaluate the reasons for departure and if preventative measures could be taken to minimize future attrition. While a clear loss for AWRI and GVSU, their positions have been filled by a junior scientist (Dr. Ryan Thum) and a senior scientist (Dr. Jim McNair) who show great potential for contributing to the mission of AWRI.

Technical Staff

Members of the technical staff are a critical component of the overall program at AWRI and, as in the past, continue to display camaraderie, dedication, and a strong sense of purpose. The major concern of the staff in 2009 revolved around continued funding of their positions, with a majority of the concern surrounding the ISC (see above). While some uncertainty is to be expected for soft-money positions in research organizations such as AWRI, the current situation appears to be especially acute. The PIs are working hard to obtain the external funding needed to retain positions, but a real possibility exists for position cuts during the remainder of 2009. Al Steinman is aware of these challenges and is helping to motivate the needed activities to prevent staff reduction. The staff can also contribute to their own future by becoming further engaged in proposal development and submission. This is particularly important for entities that have large numbers of technical staff (e.g., ISC) and therefore very high overhead.

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 seasonal instructors (generally retired teachers) and 3 student interns. Activities of the E&O 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, (4) new curriculum development, and (5) career fairs and state and federally funded demonstration projects. In 2007-2009, the program received grant, contract, and endowment support from ~11 sources, totaling about $200,000 in external and internal funding. Dr. Vail has initiated a new program "Project Webfoot" with Ducks Unlimited and received a MDEQ grant to develop, with Dr. Rick Rediske, a Chemical Management program and manual for K-12 schools. Dr. Vail is also highly engaged in science instruction at GVSU, having taught a core course in Life Science for education students and 4 specialized courses to teachers seeking certificates.

The E&O program is very active and well integrated into the overall objectives of AWRI. Examples of particularly important regional activities organized and sponsored by this program include the "Lake Michigan: State of the Lake" conferences in 2007 and 2009, "Making Lake Michigan Great" summer cruises, and the GLOBE and WET programs for teacher training. The program is well integrated into local, regional, and state environmental activities that focus on water, especially Lake Michigan, and now on air. Dr. Vail is also highly involved in professional service at the community, regional, and state levels, with clear benefits to AWRI and GVSU.

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 AWRI vessels. The classroom and vessel instruction combines modern technology with hands-on experimentation and exploration. Over the 2-year period of 2007-2009, over 12,000 people participated in the vessel program including >2500 grade-school students in the tri-city area. An additional 1000 students and 100 teachers participated in other O&E activities. Many of these activities are subsidized by AWRI endowments to make them accessible to most participants, but current low returns on endowment are a concern for this program. The vessel educational program is very 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 is highly invested in the Lake Michigan Center, and should continue to be a strong advocate for AWRI with continued engagement. As noted in previous SAB reviews, E&O and Dr. Vail should embrace and integrate recent research findings of AWRI PIs into the vessel curriculum to reflect the most up-to-date findings on the lake and enhance continuity among the AWRI programs.

Dr. Janet Vail is the only full time staff member dedicated to Education and Outreach. She effectively manages 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. Overall, the Education and Outreach program is very well run and represents an excellent means of nurturing strong ties to the local community as well as with regional and state governing bodies. Declines in return on endowments (e.g., for Jackson and Angus vessels),

however, have already begun to limit the ability of Dr. Vail to run her educational programs. Short of new resources, the current options are to (1) increase user fees or (2) reduce programs. Neither is a satisfactory outcome. GVSU may need to insert new resources into the program to allow this vital component of AWRI to function at past levels.

In summary:

- E&O is a vibrant and active component of AWRI that positively integrates AWRI into the local community, the state, and the greater Lake Michigan region. Dr. Vail, with minimal administrative assistance, runs an impressive program under challenging economic conditions.
- Declining return on endowment threatens the activities of E&O, such that bridging resources are currently needed until economic conditions improve. GVSU should work hard to prevent any rollback of these vital educational and outreach activities.

Overall Scientific Direction of AWRI

The overall scientific direction of AWRI is strong and the SAB considers the faculty to have now reached a "critical mass" in terms of numbers and expertise to make larger integrative projects feasible. For example, the expertise of the faculty now spans from molecular and cellular to landscape and ecosystem modeling. Opportunities now exist for groups of AWRI faculty to collaborate on interdisciplinary program grants to federal agencies such as the NSF. In particular, periodic NSF calls for special competitions (e.g., CNH) should be heeded by AWRI faculty and submissions made as appropriate. The larger grants that can result from such projects can also support postdoctoral fellows, a major component of the academic enterprise that appears to be mostly missing from AWRI. In addition, collaborations between AWRI scientists and external Great Lakes partners should continue to be promoted by Dr. Steinman, or possibly by an Associate Director if such a position could be created and funded by GVSU. However, leadership from among the AWRI faculty will still need to emerge to spearhead these larger program grants. To this end, PIs should consider having periodic "brainstorming sessions" or retreats to identify opportunities for cross-disciplinary projects. It would be best if this were a "grassroots" effort rather than something dictated by Dr. Steinman.

The SAB was pleased to note that the positions held by departed Drs. Uzarski and Chu were quickly replaced by scientists (Drs. Thum and McNair) who bring new expertise to AWRI. Potential new hires identified by Dr. Steinman in resource economics, landscape ecology, and climate science are timely and will further enhance the research enterprise at AWRI. In response to the SAB review in 2007, Dr. Steinman has developed a short draft "Science Strategy" to help guide AWRI into the future. The SAB encourages continued development of this plan into a 5-year scientific strategic plan that would focus the efforts of the group towards cross-disciplinary issues and targeted funding (rather than opportunistic funding) including federal program grants. As also noted in 2007, enhanced collaboration across the scientific staff at AWRI will help promote individual scientific productivity and lead to further integration of the research programs with the ISC and E&O programs. AWRI is clearly poised to make this leap forward in the near future with strong leadership and institutional support.