

**Grand Valley State University Annis Water Resources Institute
Science Advisory Board Review
March 3 & 5, 2021**

FINAL REPORT

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Introduction and General Observations

At the invitation of the Director of the Annis Water Resources Institute (AWRI), Dr. Alan Steinman, the Science Advisory Board (SAB) conducted a remote review of the Institute via Zoom, held as two 4.5 hour sessions on March 3 and March 5, 2021. The most recent previous review was held on site on March 10-11, 2017. SAB members in 2021 included Dr. Carol A. Johnston (Chair), who participated in the 2017 and earlier SAB reviews, Dr. Harvey Bootsma, who chaired the 2014 SAB review, and new member Jennifer Haverkamp. We appreciate being selected for this opportunity, and thank Dr. Steinman, AWRI faculty, staff and graduate students, and the GVSU administration for their thoughtful and stimulating input.

The primary purpose of the review is to provide an assessment of AWRI's programs and to offer direction as to how the Institute may most effectively fulfill its mission. The SAB is charged with writing a report that provides a general evaluation of science, programmatic directions, future needs, and strengths and weaknesses at AWRI.

AWRI is an important and unique educational and research facility. It is the only educational institution on the eastern shores of Lake Michigan dedicated to the study of aquatic ecosystems. AWRI is an important player in the graduate program of GVSU, providing a facility that is well equipped for training students in aquatic science and technology. Considering the increasing importance of water as an economic resource, particularly for Michigan, and the challenge of aquatic ecosystem stewardship in the face of growing threats and stressors, the research and education provided through AWRI makes a significant contribution to the maintenance of healthy ecosystems and economies within the state of Michigan.

The SAB was impressed with the continued growth of AWRI's research program, and pleased that most of the issues raised during 2017 SAB review were addressed. Prestigious faculty awards and honors include the naming of Dr. Steinman as a Fellow of the Society for Freshwater Science, the Blue Planet Award to Dr. Vail for her 20 years as the Michigan Project WET Coordinator, a Fulbright Scholarship to Dr. Biddanda, a \$190,000 grant from the National Science Foundation (NSF) Biological Oceanography Program (Biddanda, Hamsher), a \$184,000 NSF Major Research Instrumentation award (Partridge, Biddanda, Strychar, Rediske), a \$127,000 award from the Michigan Invasive Species Grant Program (McNair), 2020 GVSU Outstanding Community Service Award (Rediske), an award from the GVSU Provost to Sean Woznicki for Exceptional Efforts with Student Success & Retention, and renewed funding for the Great Lakes Coastal Wetland Monitoring Program (Ruetz). Faculty publishing remains strong and increasingly involves students. AWRI has become an integral part of the Western Michigan and GVSU communities.

Personnel: There has been little turn-over in personnel since the last review, an indication of a supportive working environment. John Koches has retired, and his position has been filled by Dr. Sean Woznicki, who has an excellent skill set in physical geography that complements several of the other AWRI disciplines. The recruitment of Dr. Sarah Hamsher (75% Biology, 25% AWRI) brings valuable expertise in algal ecology / taxonomy, and she has been quick to integrate graduate and undergraduate students into her research program. Lead captains have been hired for both the D.J. Angus and W.G. Jackson passenger vessels, and Fleet Captain Fiore has identified and is training a successor in anticipation of his retirement. Semi-retired faculty (Rick Rediske) and staff (Kurt Thompson) continue to work part-time, and Heidi Feldpausch returned as Office Coordinator after a ~10-year hiatus. **Anticipated retirements of several key people will pose a challenge over the next three years, addressed below.**

Embracing Change: Director Steinman's column in the Institute's 2020 Year in Review described the challenges posed by the COVID pandemic, and how AWRI rose to the occasion by adapting operations and research directions. An unexpected benefit was the receipt of a \$318,000 grant and \$250,000 equipment MOU to monitor SARS-CoV-2 in wastewater, thereby serving the Michigan Department of Environment, Great Lakes and Energy and Ottawa and Muskegon counties. **This economic windfall was possible only due to the unique combination of expertise (Partridge, Rediske, Strychar) and facilities present at AWRI.**

Review Format: The COVID pandemic required that we meet "virtually." This format worked well, but we missed having informal conversations with AWRI personnel during breaks, the reception, and dinner. Such informal interaction allowed the SAB to get to know the AWRI scientists and exchange scientific ideas, a benefit for both groups given our common interests. These conversations sometimes raised issues that did not emerge during the formal presentations. We recommend that the SAB resume the in-person format in 2024. We also request that a tab listing technical/support staff with a brief description of their roles be included in the SAB notebook.

Research Program

Scientific research continues to be AWRI's forté, providing a vital service to the western Michigan community and a platform for graduate student training, while elevating the status of AWRI and GVSU within the regional and national scientific community. The faculty represents a range of disciplines that cover many aspects of aquatic research and management while allowing for inter-disciplinary synergy. This is evidenced in the numerous collaborative research proposals and publications.

AWRI faculty as a whole author or co-author 25-30 peer-reviewed papers per year, equivalent to approximately 3 papers per PI per year. This is reasonably good, and a standard that is balanced with the faculty's teaching load. It is encouraging to see that students are actively contributing to publications and presentations.

Research grants have steadily increased from <\$3 million for the period 2001-05 to almost \$6 million in 2016-20, which is encouraging. The most recent numbers indicate that annual grant funding averaged across all 9 PI's is around \$80,000 per PI (not including development funds). While AWRI receives research funding from several benefactors, it remains important to seek competitive funding from agencies such as Sea Grant and NSF. A review of individual PI's activities over the past triennium indicates that most faculty members are doing this, and the SAB was informed that funding prospects look good for 2021. For some PI's, funding consists primarily of numerous small grants. This can result in a heavier administrative burden, especially if projects are not synergistic. Acquiring larger grants from a smaller number of sources, such as Sea Grant and NSF, will likely result in greater administrative efficiency and research output. A reasonable funding goal for PI's to aim for is 1 to 1.5 times annual salary.

As university budgets become tighter the demand for teaching to bring in tuition dollars may increase, which has the potential to negatively affect research. Considering AWRI's unique assets and expertise, there are several options for revenue generation that could allow AWRI to maintain its research emphasis. In addition to continuing to pursue corporate and philanthropic sponsorship, at which Dr. Steinman has excelled, other potential sources of revenue include increased use of AWRI's lab facilities for commercial genomic and toxicology services, and the development of workshops (both online and in-person) addressing high-demand topics such as genomic analyses (academic and private sector),

shoreline management (homeowners and natural resource managers), and ecosystem modeling (academic, environmental consultants). It is important to conduct a market analysis before pursuing these options, to determine the need and the extent to which that need is being met by other providers. Some courses and workshops may be pursued as online options. However, while this format may be effective for some types of basic training, much of the training related to aquatic research and management includes skills that can only be gained through hands-on experience in the field and/or lab.

Recent and nascent initiatives, particularly the undergraduate program in Fisheries and Aquatic Science and the graduate program in Water Resource Policy, will likely also increase net revenue for AWRI and/or GVSU. While admission into AWRI's existing graduate program is usually limited by the number of assistantships available, this will not be an issue for the Policy program. To maximize enrollment in this program, AWRI should consider several approaches to advertisement in addition to its current strategies. For example: 1) Allow applicants to sign up online for facility tours. 2) Provide virtual tours online. 3) Use social media mining techniques to develop targeted online advertising. AWRI's annual "Year In Review" newsletter is very attractive and an effective way of communicating with both donors and prospective students.

Graduate Program

AWRI continues to maintain a dynamic graduate program, with a good selection of courses and a diversity of water-related research options. The quality of the students is high, and the inclusion of students in publications and the support for student attendance at professional meetings are strong points of the program. It appears that comradery among the students is good, with numerous opportunities for social interaction (Covid-19 pandemic notwithstanding).

Most students enter the program in September, and students indicate that the onboarding process within AWRI and GVSU is generally good. One exception is that not all incoming students appear to be aware of how the funding for their assistantships will be distributed throughout the year, with monthly income being greater during the summer than during the academic year. Some students indicated that this results in financial stress during the academic year. In addition to ensuring that students are well informed of the disbursement schedule when they begin their program, the SAB has two recommendations: 1) Graduate student support needs to be included in more research grant proposals. In cases where full support of a student may appear too costly for a funding agency, partial support augmented by matching funds from AWRI may be acceptable. 2) Competitive scholarships within AWRI ranging from \$500 to \$5,000 are an effective means of incentivizing students and augmenting assistantships, and can add weight to a student's CV. A common approach is to secure modest donations from individuals or industry for which the scholarships are named.

While students entering the program in the fall are generally well informed of opportunities and program structure, students entering the program at other times of year may not be given the same amount of attention. In addition to having these students meet with an administrator to bring them up to speed on opportunities, policies, etc., it is recommended that a website be set up with AWRI-specific information for graduate students, as the link on AWRI's current website ("Information for Current Students") sends students to a general site for all GVSU students, with no information specific to AWRI. This site could include AWRI-specific information with regard to program requirements, facilities, research resources, and careers / professional development.

Several mechanisms can be put in place to help students envision career paths and transition into positions following graduate school. 1) Make students aware of the regular job announcements released

through many professional organizations (e.g. ASLO, IAGLR); 2) Set up mock interviews with potential employers in the field. 3) Organize a “brown bag” speaker series with professionals from outside academia. 4) For students in the new Water Resources Policy program, internships (paid or unpaid) with government agencies or the private sector can help them to make connections outside of academia. These steps will help to advance the GVSU presidential priorities of entrepreneurial training and experiential learning.

While ombuds services are available on the GVSU main campus, due to the physical separation and the unique learning environment at AWRI, students would benefit from having a designated AWRI faculty member who can be consulted when they have concerns that they may prefer not to take directly to their major advisor.

At the graduate level, many universities struggle to increase diversity, and AWRI is no exception. This is partly due to barriers lower down the academic chain that are difficult to remedy at the graduate level. Correcting for these discrepancies requires a proactive approach, such as the exploration of the potential for internships with local community colleges that Dr. Steinman is currently conducting. Other approaches to consider include pairing with initiatives at the GVSU undergraduate level, and even at secondary and primary school levels (a great example of this strategy is the National Ocean Science Bowl program). In addition, SAB recommends that research opportunities be made available to undergraduate students whenever possible, with a specific focus on engaging underrepresented students.

The new MS program in Water Resource Policy is a positive development for AWRI that will likely bring in additional tuition revenue. There are several points to consider as this program gets off the ground. 1) To the extent possible, students in this program should be linked to AWRI’s research projects, many of which have direct relevance to natural resource management and policy in the western Michigan region. The student internships with management agencies, non-profits and the private sector is an especially valuable program component. 2) It is unclear to the SAB how this program will be administered, whether AWRI will need help with internship placements, and whether there may be associated costs. AWRI currently does not have a faculty member whose area of expertise is water policy, and there is no formalization of water policy within AWRI. 3) There is a tendency for students (and instructors) in natural resource policy programs to minimize the importance of training in the natural sciences. Experience shows that the best policy makers are those who know the science.

Currently the proportion of AWRI graduate students that come out of GVSU’s undergraduate program is relatively small. A potential remedy is to offer an accelerated MS degree within GVSU. These programs typically allow for courses taken in students’ senior year to be counted as credit toward both their undergraduate and graduate degrees, thereby allowing them to complete both the Bachelor’s and Master’s degrees in as little as 5 years. The new MS in Water Resource Policy program seems especially amenable to this, as it requires no assurance of assistantship funding for students to be admitted.

The SAB was informed that AWRI has initiated a memorandum of understanding with Michigan State University that allows for student exchanges. This is a positive move as it will open doors for AWRI students interested in pursuing a PhD degree, and has the potential to promote research synergies between the two institutions.

Teaching

AWRI faculty are responsible for teaching multiple courses at GVSU (Appendix 1). The Faculty Activity Reports (FAR) for faculty with primary appointments in AWRI showed that half of the courses

they taught in 2020 had enrollments of 25 or more (the GVSU average is 26 students per class), two of the courses had workload credits > 4 because of combined labs, and two of them (BIO 105, GPY 100) are core courses within their majors. Additionally, every AWRI faculty member teaches BIO 695 Graduate Thesis Research and other one-on-one courses (e.g., graduate and Honors College independent study courses), and provides guest lectures. Experiential learning is highlighted in GVSU promotional materials (“25% students participate in research with faculty”).

These facts illustrate that: (1) AWRI’s cumulative contribution to teaching is substantial, (2) AWRI’s teaching benefits undergrads as well as graduate students, and (3) AWRI’s contribution is spread across six departments and majors at GVSU: Biology Department (Biology and Natural Resource Management majors), Cellular and Molecular Biology Department, Chemistry Department, Geography Department, Environmental Science and Sustainability Program. This disciplinary spread may mean that the cumulative teaching contribution of AWRI faculty is undervalued by GVSU administration.

University teaching is not nor should it be the primary focus of AWRI faculty, but AWRI’s teaching at both the undergrad and graduate level clearly benefits GVSU education. This is important given President Mantella’s priorities of “knowledge & skills for the 21st Century” and “the reciprocity of learning.” **We recommend that AWRI distribute an annual report of its teaching contributions to the four department heads (Biology, Cellular and Molecular Biology, Chemistry, Biology) and the Provost. A list of courses taught by AWRI faculty should also be added to the “Year in Review.”**

Distance Learning: The SAB’s prescient recommendation in 2017 that AWRI pursue distance teaching options was facilitated by university-wide distance learning mandates in response to COVID. AWRI faculty took training courses on remote teaching, such as GVSU’s workshop on “Foundations of Online/Hybrid Course Development.” Some faculty members commented that they liked the online format for lectures, but teaching labs was a challenge. One faculty member reflected that “this was my first time teaching this format and it seemed to almost double the workload from my previous time teaching this course.” It is commendable that AWRI faculty rose to these teaching challenges while maintaining research productivity.

Distance learning may be a mechanism to expand specialized courses, such as Dr. McNair’s “Modeling Techniques for Biological Systems,” to an audience beyond GVSU. Scientists from around the country may be willing to pay to take such training. If GVSU has a mechanism to support course marketing and registration to an external audience, this should be pursued.

Education and Outreach

The Education and Outreach (E&O) Program, under the direction of Dr. Janet Vail, provides a fantastic environmental education opportunity for students and teachers in western Michigan and beyond, advancing the mission and visibility of AWRI. Cruises on the D.J. Angus and the W.G. Jackson provide experiential learning to elementary, middle school, high school, and GVSU students. The cost is heavily subsidized by the vessel program’s endowments; schools typically pay only registration fees. K-12 students also participate in hands-on activities in the Annis Educational Foundation Classroom before or after their cruise.

AWRI is the host institution for Project WET (Water Education Today) within the State of Michigan. Project WET is a global non-profit organization that seeks to advance water education to understand global challenges and inspire local solutions. Dr. Vail organized the Project WET 2017 Annual Conference in Traverse City, MI. AWRI also provides training under NASA’s GLOBE (Global

Learning and Observations to Benefit the Environment) Program, an international science and education program that provides students the opportunity to participate in data collection and the scientific process.

The E&O program staff include Dr. Janet Vail and science education specialist Amanda Syers, several seasonal instructors who do the vessel and classroom teaching, and secretary Roxanna Taylor who works with the schools to make boat trip reservations. The seasonal staff of the E&O Program have returned to work year after year (Paula Capizzi has been an instructor for 20 years), and the program has benefited from their experience as teachers and as returning staff.

Both the D.J. Angus and the W.G. Jackson had active schedules of 107 to 152 events per year in 2017-2019. The Angus conveyed 2,211-2,249 participants and the Jackson conveyed 2,996-3,443 participants, the variation largely due to fluctuations in the market that affect revenue from the endowments. Since 1998, the W.G. Jackson has visited 33 ports of call throughout Lake Michigan, supported in part by funding from “Making Lake Michigan Great.”

The COVID pandemic halted in-person education and boat trips in 2020, but offered new opportunities. E&O staff conducted “virtual” teacher training workshops for Project WET and GLOBE. They also developed a virtual lab for the Biology 107 class at GVSU simulating data collection on the D.J. Angus. Dr. Vail and Amanda Syers partnered with Dr. Elena Lioubimtseva of the GVSU Department of Geography and Sustainable Planning on MiRCLE – Michigan Resources for Climate and Land Cover Change. Funded by the Michigan Space Grant Consortium, it provided Michigan-specific place-based interdisciplinary resources for 6-12 grade science and social studies teachers integrating NASA Land Cover and Land Use Change (LCLUC) materials into their curricula.

“Expand access to new learners” is a GVSU priority announced by President Mantella in 2019. E&O programs have heretofore focused primarily on K-8 environmental education. **The SAB recommends that the E&O program investigate expanding its offerings to senior learners.** Environmental education is just as relevant to elders as it is to younger learners, and COVID-weary (and vaccinated) seniors may be seeking new outdoor education opportunities. Road Scholar (formerly Elderhostel) is an organization that seeks to advance lifelong learning, and may be a potential partner. Such a program might be self-sustaining. The vessel program is also a way that AWRI could reach out to underserved communities.

Technical/Support Staff

AWRI is well-served by its dedicated and competent technical and support staff. Retention rates are good, providing continuity and institutional memory, which is especially valuable given the two-year tenures and high turnover of graduate students. The technical staff in particular fill an important role in helping train their labs’ new graduate students in the use of instruments and research methods, and otherwise filling the research lab ecosystem niche more typically occupied by PhDs and post-docs. During the pandemic their contributions were key – and their workloads commensurately greater – as they took on additional projects (e.g., covid testing) and filled in for absent graduate students and post-docs, which led to lead authorships and other new opportunities.

In meeting with the technical and clerical staff, the SAB found them to be generally pleased with AWRI. They spoke favorably about interesting work, a good variety of projects, and a sense that their contributions to the institute were recognized and appreciated. Several expressed satisfaction with the balance between their technician roles and opportunities to contribute to publications. One indicator of a

positive work environment is the successful recruitment of the institute's office coordinator, Heidi Feldpausch, to return to AWRI after a ten-year hiatus from the workforce.

Technical staff, most of whose positions are funded on soft money, can find the uncertainty around job security and limited opportunities for professional advancement to be challenging, especially in the current context of university-wide budgetary concerns. A couple who had transitioned from graduate student to staff positions seemed somewhat baffled to find themselves still in the labs several years later. Open and frank communication between supervisors and staff can help mitigate the challenges.

One area for improvement is internal communication with respect to institute-wide opportunities for training and professional development. For example, not all staff were aware the institute would pay for their attendance at one professional workshop per year (whether they could find the time away from their lab responsibilities was a different question). A more intentional and structured onboarding for new employees (including those who newly transition from student to technician) should help address this concern, and should address career track advancement potential. Tonya Brown's offer to write a handbook of staff policies and opportunities will also be useful.

Facilities

Captain Tony Fiori gave a brief presentation about the AWRI fleet, which includes 2 U. S. Coast Guard inspected passenger vessels (the D.J. Angus and the W.G. Jackson), 5 small boats, and 3 vehicles. Staffing was an SAB concern in 2017 because the D.J. Angus captain position was vacant and it was difficult to employ deckhands. At that time, the SAB recommended planning to remedy staffing shortages and to anticipate Captain Fiore's replacement upon retirement. Captain Fiori reported at the current SAB Review that Eric Hecox is now the captain of the D.J. Angus, and Fiori is training a successor for when he retires. The COVID pandemic basically halted boat operation during 2020, but the vessel crew is gearing up to resume operations in September 2021. Overall, the AWRI vessel fleet is extremely well managed and operated.

The digital droplet Polymerase Chain Reaction (ddPCR) instrument for COVID testing in wastewater was a major new piece of instrumentation. This equipment had to be up and running within a month. The AWRI faculty (Partridge, Rediske, Strychar) and technicians (Molly Lane, Brian Scull) were able to respond rapidly to this unexpected need because of their instrumentation expertise. An Illumina MiSeq Sequencing System acquired through the \$183,747 NSF Major Research Instrumentation grant headed by Dr. Partridge has already enhanced research capabilities at AWRI. Service contracts for maintenance of major instruments are covered by contract or by the AWRI budget, but lab specific instruments are the responsibility of the various faculty members.

One of AWRI's high profile research activities is its operation of the Muskegon Lake Observatory buoy, which provides a valuable service to the public and managers while also advancing basic science. Long-term observation programs are notoriously difficult to keep funded, which is more a reflection of funding agency limitations than the importance of these programs. An option to consider is citizen support. Experience shows that if citizens are informed of data availability and management benefits of an observing system (e.g., with signboards posted at public docks and recreational areas), the increased interest in (and reliance on) real-time data can create a willingness to support.

Administration and Director Transition

GVSU's senior leadership with oversight responsibility for AWRI has experienced significant turnover since the SAB's last review. While Jeff Potteiger (Dean of the Graduate School), Maria Cimitile (Provost) and Robert Smart (Vice Provost for Research Administration) have served in their positions for a number of years, other senior leaders, including Jennifer Drake, Dean of the College of Liberal Arts and Sciences (2020) are relatively new to their roles. Most notably, Philomena Mantella became GVSU's fifth president in 2019 and is leading the university in new directions, with a particular focus on virtual/distance learning and supporting lifelong learners. Dr. Steinman appropriately appreciates the need to strengthen AWRI's relationships with GVSU's new leadership and newcomers to the philanthropic community. Senior administrators will play an important role in helping raise awareness of AWRI's unique position within the university and the excellent reputation it has earned in the community, the region, and the state. At the same time, updating AWRI's strategic plan to ensure alignment with President Mantella's strategic priorities for GVSU will be a near term priority for Dr. Steinman and his team.

In our last two reviews, the SAB recommended reducing the level of indirect funds returned to the faculty and retaining a higher proportion centrally to enhance collaboration across the faculty, increase technical and student support where needed, and seed innovation and new directions. We continue to encourage further consideration of this recommendation, along with strengthening the expectation that faculty should build funding for graduate assistantships into their grant proposals.

AWRI continues to be led efficiently and effectively by Dr. Steinman, leading to a scientific, education, technical, and student staff that are productive both individually and collectively. As in our 2017 report, we continue to be impressed by Dr. Steinman's ability to generate interest and support from the local community while maintaining an active research program and garnering professional recognition, including becoming a Fellow of the Society of Freshwater Science and being named to the U.S. EPA Administrator's newly reconstituted Great Lakes Advisory Board. As he prepares to move from the directorship and phase into retirement (anticipated to commence in about 2 years), it is critical that a transition plan be put in place. The core components of this plan should include the appointment of an Assistant Director as soon as possible, and the development of a recruitment plan for a new Director.

As Director, Dr. Steinman has carried an inordinately heavy workload, balancing administration, outreach, pursuing of funds, research, graduate student advising, teaching, and service on several professional committees and boards. In recognition of this, the SAB has previously recommended that an Assistant Director be appointed, and this recommendation is the more urgent in light of Dr. Steinman's pending retirement. AWRI benefits greatly from endowments provided by several generous donors, but the long-term continuity of these funding sources is uncertain, and over the next few years it may be necessary to replace or augment these funding streams with new sources. The appointment of an Assistant Director who can take on much of the administrative load will allow Dr. Steinman to apply more effort to securing funds to ensure AWRI is in a strong financial position when a new Director takes over. From both a functional and financial perspective, it makes sense to appoint an Assistant Director from within the current AWRI faculty.

Although budgetary constraints may make it tempting to consider promoting a current AWRI faculty member to the Director position following Dr. Steinman's retirement, the SAB strongly feels that this would not be in the best interest of AWRI and GVSU. The growth of AWRI's productivity and reputation is to a large degree the result of Dr. Steinman's unique combination of skills in the areas of science, administration, communication, and outreach. Maintaining and growing AWRI's capacity as an educational and research institution will require a new Director with similar strengths, and this will require a national search. It is the SAB's understanding that Dr. Steinman will commence retirement by

stepping down from the directorship to a faculty research role in about two years and will then transition into full retirement over a 2-3 year period. This is an ideal transition scenario, as it should allow for a relatively smooth transfer of leadership if a new Director can be hired before Dr. Steinman's full retirement. Ideally, the new Director will start in the first year of Dr. Steinman's transition period. While this will result in a temporary increase in AWRI's salary budget, the cost will likely be outweighed by the benefits, including research grants, continued donor support, and minimal disruption of AWRI's educational and research programs.

Faculty Transitions

Many universities are currently under financial stress, and a common solution to this challenge is to not re-fill positions that have been left vacant by retirement or job transition. This would be a mistake in the case of Rick Rediske's positions.

Dr. Rick Rediske began the research program in environmental chemistry and toxicology at AWRI in 1994. Rick's retirement date, while undetermined, is nearing and plans should be initiated for a replacement. Rick's toxicology / genomics lab has been a major resource for AWRI, for many collaborators, and for the western Michigan community in general. The value of his lab's services is reflected in the significant amount of funding Rick has helped to attract over the past 3 years (>\$700,000). Aquatic toxicology and microbiology / genomics are currently important areas of research with significant amounts of funding support. The loss of this capacity would hurt AWRI's reputation and negatively affect its ability to provide a critical service to the state of Michigan. It would likely also have negative financial impacts, as toxicological and microbial analyses performed on a contract basis can be an effective way of supplementing research grants. Dr. Rediske's research and teaching has clearly benefitted the Chemistry and Cellular & Molecular Biology Departments; they might be engaged in justifying replacement of this position. **It is crucial that this faculty position be replaced by a full-time faculty member.**

The SAB recommends that AWRI be intentional about increasing diversity when considering new hires for any position. We understand that all searches at GVSU require a certified "inclusion advocate" who is trained in implicit bias and other human resources considerations. Additional strategies include: 1) Active recruitment (rather than only advertising); 2) Highlighting a diversity priority in the job description.

Summary

Strengths:

- Strong institute leadership
- A strong, well-designed outreach and education program
- Active faculty highly engaged in research, teaching, and service
- Good integration of students into faculty research programs
- Robust external funding with diverse mix of local, state, and national awards
- Good internal collaboration among AWRI faculty, resulting in multi-disciplinary research
- Good collaboration with other GVSU faculty and other Great Lakes researchers
- Excellent community service of faculty through collaboration with state and local agencies
- Well maintained and operated fleet
- National-class facilities in the Robert B. Annis Field Station
- National recognition of faculty expertise

- Low turnover and high competence of technical and support staff
- Muskegon renaissance

Challenges:

- Anticipated director transition
- Replacement of Dr. Rediske
- Changing leadership of the University
- Aging local donor pool
- Role of AWRI in undergraduate teaching
- Integrating lifelong learners
- Graduate student support levels
- Graduate students are somewhat insulated from other GVSU departments
- Lack of diversity

Recommended Actions:

- **Director:** Begin active planning for future replacement of Director Steinman's position.
- **Faculty Vacancies:** Aggressively pursue replacement of Dr. Rediske's position, engaging other appropriate GVSU departments as allies.
- **Water Resource Policy:** Develop a plan for implementing Water Resource Policy M.S. program, including administration and faculty resources.
- **Education and Outreach:** Expand Education and Outreach offerings to senior learners.
- **Buoy:** Identify funds to continue operation of the Muskegon Lake buoy.
- **Teaching:** Ensure that Provost and senior administrators understand AWRI's substantial contributions to teaching.
- **Grant Funding:** Pursue large grants from agencies such as Sea Grant and NSF, and include graduate student support in these grants.
- **Potential New Revenue Sources:** Pursue new revenue sources, including lab services (e.g. toxicology, genomics) and workshops, but conduct a market analysis before considering online workshop options.
- **Graduate Student Recruitment and Careers:** Augment GVSU's graduate student website with a website that provides AWRI-specific information for graduate students, and include a link from the Biology M.S. web page to AWRI. Develop or provide more information and support for post-graduate careers.
- **Graduate Student Support:** Examine options for providing more graduate student financial support, including strengthening the expectation that faculty should build funding for graduate assistantships into their grant proposals.
- **Increasing Diversity:** Pursue opportunities to increase student and faculty diversity (see text).
- **Assistant Director:** Appoint an Assistant Director.
- **Human Resources:** Develop a more intentional and structured onboarding for new employees and graduate students (including those who newly transition from student to technician).
- **Working with Senior Administration:** As Senior leadership positions turnover, it is incumbent upon those who know AWRI well to share their understanding of AWRI's unique position within the university and the excellent reputation it has earned in the community, the region, and the state.
- **Retention of Indirect Funds:** We continue to encourage further consideration of this recommendation made in 2017, especially if budgetary constraints worsen.

Appendix 1. Courses taught by faculty with primary appointments in AWRI (does not include faculty with primary appointments in Biology). BIO = Biology, CHM = Chemistry, CMB = Cellular & Molecular Biology, ENS = Environmental Studies, GPY = Geography, NRM = Natural Resource Management, WAT = Water

Bopi Bidanda	BIO 370 Marine Biology (3 cr) BIO 532/WAT 532 Advanced Aquatic Ecology (3 cr)
James McNair	BIO 480/580 Special Topics - Techniques for Modeling Biological Systems BIO 580 Special Topics - R Programming for Scientific Computing NRM 552 Fisheries Management (with Carl Ruetz) (3 cr)
Charlyn Partridge	BIO 120 General Biology I and lab (4 cr) BIO 210 Evolutionary Biology (3 cr) BIO 376 Genetics Lab (1 cr) BIO 485/585 CMB 485/585 Molecular Ecology and lab (3 cr)
Rick Rediske	CHM 111 Intro to Green Chemistry (3 cr) CHM 380 Special Topics - Contemporary Toxicology NRM 452 Watershed & Wetland Mgmt. (4 cr)
Carl Ruetz	BIO 362 Fisheries Biology and lab (4 cr) NRM 552 Fisheries Management (with James McNair) (3 cr)
Al Steinman	BIO 651 Emerging Issues in Water Resources (2 cr)
Kevin Strychar	BIO 105 Environmental Science (3 cr) BIO 532/WAT 532 Advanced Aquatic Ecology (3 cr)
Janet Vail	ENS 183 Sustainability as a Lifestyle (1 cr)
Sean Woznicki	GPY 100 Physical and Environmental Geography (fall and winter) GPY 407 Advanced GIS (4 cr)