



To: Provost Mokwa
Dean Bajwa
Dean Ogilvie
Vice Provost Eitle
Dr. Hatfield

From: Dr. Eric Belasco, Dr. Diane Debinski, Dr. Jeff Heys, and Dr. Robert Collier
Re: Animal and Range Sciences department review
Date: December 3, 2020

A comprehensive review of the Department of Animal and Range Sciences was conducted during October of 2020. The review team prepared this report based on a self-study document prepared by the department and two days of meetings (Oct. 26 and 27, 2020) with individuals associated with the department. Below is a summary of our findings for the specific focus questions you requested followed by a more detailed and comprehensive review of the department.

SUMMARY

- Since the last department review in 2013, the department has improved in many measurable ways. The undergraduate academic programs appear to be of high quality, and they have assessment and improvement processes in place. The graduate programs are improving and also have rigorous assessment processes in place.
- The department has identified valuable opportunities for updating and expanding their course offerings, and we encourage the department to pursue these changes.
- Our review of the current graduate programs indicated that there is interest from students to pursue professional graduate degrees. The department is encouraged to consider changes to graduate programs that could simplify the pursuit of graduate degrees by self-funded students. However, we recognize that there are costs in faculty and staff time required to run a professional M.S. program.
- The current PhD program is small and there are opportunities for growth and enhanced diversity. The department should consider admitting PhD students without a Masters degree, and the department should commit to increasing the number of PhD students supported on research grants and fellowships. A team of faculty should be encouraged to strategically target higher education grants (NIFA, NSF or NIH) to improve opportunities for student funding and to focus on under-served communities such as Native Americans.
- The department has excellent research and teaching facilities and MAES support for research. With the newly recruited faculty, it is expected that research productivity and dissemination will show an upward trajectory in the coming years. However, the department head should continue to promote a culture of high levels of research productivity and dissemination among all faculty.
- Overall, the review committee was encouraged by the improvements in the department over the 7-year review period. The department has excellent leadership, engaged faculty, a strong record of hiring high quality new faculty, well-prepared graduates, and extensive facilities. While there are areas that need to be improved, including peer-reviewed publications, the department appears capable of making those improvements.

RESEARCH

The research program in Animal and Range Science currently has a total of 7.5 tenure track faculty FTE's engaged in applied and basic research programs spread across 15 tenure track faculty members with an average research appointment of 50%. Several of the faculty are in the early stages of their career and a total of 10 new faculty have been hired between 2010 and 2020. They have received 195 grants over the period of 2012 to 2019 and average 30 to 60 grants per year. The department is well-positioned with several research facilities, good start-up packages and large numbers of animals to carry out their research programs. Thus, facilities, support, animals and research faculty are not limiting to the overall research productivity of the department. Faculty FTEs dedicated to research publish on average 4.3 peer-reviewed papers per research FTE. A recent Self-Review identified publications, grants and number of graduate students per research FTE as below average for peer institutions. The current review team would agree that these areas are opportunities for growth. Additionally, high living costs in the Bozeman area and relatively low salaries have contributed to high turnover in both faculty and staff.

Strengths

- A strong core of new faculty
- Good start-up packages
- Good research facilities
- Adequate animal availability
- A strong core of non-tenure track faculty to assist in teaching

Weaknesses

- Low graduate student numbers relative to peer institutions
- Low participation of undergraduates in research
- Lower than expected grant success and low numbers of Federal Grants in particular
- Lower than expected publication rates
- High turnover in Directors/Managers at the research centers

Opportunities

- Increase graduate student recruitment, especially students from underrepresented groups.
- Increase undergraduate participation in research to foster development of new graduate students
- Increase Development Programs to seek endowments and funding for graduate student assistantships
- Develop cross-disciplinary teams to compete for large NIFA, NSF or NIH grants
- Conduct salary analysis to compare salaries with peer institutions as basis for salary increases
- Return portion of indirect cost funds from grants to faculty PI's to provide some flexible research support

Threats

- Salary disparities with peer institutions will lead to continued turnover of faculty and staff
- Research facility upkeep at Red Bluff and Fort Ellis
- Turnover of Livestock Operations Managers may impact long-term research capability

Summary

The research program in Animal and Range Sciences is well-positioned to capitalize on a relatively young and enthusiastic faculty to improve grant funding, publications and graduate student recruitment. The department needs to build strong interdisciplinary teams to compete for large grants, increase their

development program to fund endowments including endowed professorships and develop a strong culture of publications and grantsmanship.

GRADUATE PROGRAM

The Department of Animal and Range Sciences grants M.S. and Ph.D. degrees in Animal and Range Science and a Ph.D. in Ecology and Environmental Sciences. Graduate enrollment numbers average 15.6 MS students and 7.8 PhD students per year, but there is a high variance around these means. The Ph.D. enrollment in the interdepartmental Ecology and Environmental Sciences degree has progressively increased since the Department joined the program in 2015 and provides opportunities for expanded cross-campus collaboration. The graduate program has prioritized high-impact practices, including seminars, writing-intensive courses, collaborative assignments, and service and community-based learning.

Since the last review in 2013, two required courses were either updated or created to support students in their graduate program. ARNR 507 Research Methods (1 cr), a course that had been on the books, now focuses on the needs of beginning graduate students and includes preparation of formal written research proposals, research posters, oral presentations, and research manuscripts. A new required course, ARNR 594 Research Seminar (1 cr) associated with the Bair Ranch Foundation Seminar series, was recently created. This seminar is targeted to continuing students and is led by national and regional animal science and range science researchers. The combination of these two required courses is helpful in creating community among the graduate student.

Below are summary points for the strengths, weaknesses, opportunities, and threats as described by the self-study, the groups that our review team met with, as well as our own assessment.

Strengths

- Learning outcomes for graduate students are assessed and linked to specific courses as well as the completion of thesis or dissertation.
- Faculty report good success rates on the measured indices associated with Program Assessment.
- Recent graduate students are well-placed in positions associated with their training such as university professors and state and federal natural resource agencies. Faculty commented that there was no shortage of jobs for graduates.
- The survey of graduate students provided high levels of satisfaction with regard to faculty knowledge and support.

Weaknesses

- Current Graduate School data show that time to degree is lengthy, as reported in the department self-study. Some of these data may not accurately reflect time to degree due to inclusion of students who opted out or obtained an alternative degree. Obtaining more accurate data on actual time to degree for M.S. and Ph.D. students would allow the department to determine the significance of this issue.
- The survey of graduate students highlighted a need for additional courses.
- The survey of graduate students highlighted a need for additional guidance by major professors.

Opportunities

- The program could grow in numbers of graduate students and there are a variety of options to accomplish this:
 - Place a higher emphasis on recruiting PhD students.

- Eliminate the requirement for students to have an earned MS degree before entering the PhD program.
- Consider a self-funded M.S. or a professional M.S. degree. However, the committee acknowledges that developing a professional M.S. program could negatively impact undergraduate teaching, research, or the current graduate program if additional resources were not provided.
- A variety of potential new courses could be added, both in techniques-focused and physiological and behavioral topics.
- Graduate students who are interested could be encouraged to integrate extension into their research experience. Given the faculty expertise in extension there are some good opportunities for mentorship. However, some graduate students would see this as an additional requirement that would create a time challenge. As such, making it optional would be best.
- The recent influx of new Assistant Professors is expected to help in growing the graduate program.
- It would be valuable to re-emphasize expectations of faculty in mentoring graduate students. Some students did not know the full set of expectations required of them and mentioned the need for more guidance. There is a graduate student policy manual, but it may not be extensive enough as currently written.

Threats

- The doctoral prioritization process identified the PhD program of the Department of Animal and Range Sciences as 'needing improvement', predominantly due to the numbers of students and degrees conferred.
- There is very little diversity, beyond gender diversity, within the graduate student ranks. There should be an emphasis on recruiting a broader diversity of underrepresented students. A team of faculty could be encouraged to strategically target higher education grants (NIFA, NSF or NIH) to improve opportunities for student funding and to focus on under-served communities such as Native Americans.
- The self-study report showed a relatively low annual allocation and a high interannual variation in TA support provided to the department. In order to provide better TA support to the department and to the students, there needs to be a more predictable TA funding allocation on an annual basis. Currently TAs are often split among students to maximize the benefits. Additional TA funding would allow for recruitment of more graduate students.

Undergraduate Programs

Animal and Range Science has three undergraduate degree programs: (1) Animal Science, (2) Natural Resources and Rangeland Ecology, and (3) a new program in Ranching Systems. The Animal Science degree program includes options in Livestock Management and Industry, Equine Science, and Science. The NRRE degree includes options in Wildlife Habitat Ecology and Management and Rangeland Ecology and Management. Enrollment in the various programs has been relatively flat over the review period with an average annual undergraduate enrollment of approximately 350 students and an average of roughly 70 BS degrees per year. However, enrollments have declined at peer institutions with similar programs. All programs have appropriate learning objectives and these objectives are assessed regularly with approximately 80% to 90% of students achieving an acceptable rating on the various outcomes (http://animalrange.montana.edu/program_assessment.html). The faculty are commended for the quality of the assessments that were communicated in the report.

Strengths

- Student survey results, interviews of current students, and interviews of external employers were consistent – graduates of the programs are generally highly regarded. Graduates are knowledgeable, hardworking, and employable. The faculty and staff in the department should be proud of their graduates.
- The department's internship program was frequently cited as a strength. In fact, the department reports regularly receiving more requests for interns than they have students.
- The department has demonstrated the ability to regularly update its programs so that they remain relevant and attractive to students (e.g., renaming the 'Range Science' B.S. to a B.S. in Natural Resources and Rangeland Ecology).
- The NRRE program was accredited by the Society for Range Management in 2016.
- The department has established a new degree program in Ranching Systems in 2019, and the program already has students enrolled and new courses have been proposed for the program.

Weaknesses

- Both current students and external employers expressed concern about the communication skills of some graduates. While it is clear that both oral and written communication is taught throughout the curriculum, it is not clear that the faculty have a clear, comprehensive plan for teaching all aspects of communication across the curriculum. We recommend that faculty meet regularly to discuss where in the curriculum various communication skills are taught and reinforced to ensure that students have all the necessary skills when they graduate. Higher quality feedback to students on their communication may also be necessary. It should be noted that students in the NRRE program have a strong record of success in the extemporaneous public speaking contests at the Society for Range Management meetings.
- Similar to communication skills, some external employers and department faculty identified the lack of sufficient instruction in interpersonal skills such as conflict resolution and personnel management. While it may ultimately be necessary to develop a specific course that addresses these topics, it may also be possible to partner with other departments to help deliver the necessary instruction on these topics.
- A current student and an external employer expressed concern about the critical thinking skills of students. The assessment report also indicated that only 75% of students in NRRE were rated acceptable for their critical thinking skills during the most recent assessment in 2017. Instructors may want to consider asking more open-ended problems (if they fit with the course content) to assess and provide feedback to students on critical thinking.
- Student gender diversity in the department does not appear to be an area of concern, but there is little diversity beyond that. The department is encouraged to develop strategies for recruiting and retaining students of diversity, especially tribal students since there have been a very small number of tribal students in the past.

Opportunities

- The department faculty are cognizant of curriculum changes that will be important over the next 5 to 10 years. In Animal Science, these changes include courses on companion animals, large animal anatomy and physiology, and courses on new, emerging technologies. The department is encouraged to develop courses in these new areas and may want to continuously evaluate the need for existing specialty courses on a course-by-course basis.
- The department is housed in the modern Animal Biosciences building and the department manages separate farm and ranch facilities (e.g., BART farm, Red Bluff ranch). These facilities

were widely recognized by students and faculty as excellent. The department is currently pursuing donations to update the equestrian arena complex, which was originally built in 1968.

Threats

- Low pay and lack of stability is creating discomfort and some unhappiness among a few NTT faculty. These concerns are obviously increased by COVID and are not unique to NTT faculty in the ARS department. Clear communication and continued effort to increase compensation are encouraged.

EXTENSION

The Department of Animal and Range Science has a long history of exceptional contributions in extension, outreach, and engagement and is expected to include 5.64 FTEs devoted to extension once their suspended search for a Forage specialist concludes. This amount of faculty effort indicates a high degree of dedication to disseminating important information to stakeholders across the state. The active participation of representatives from key stakeholder groups in departmental activities, including the advisory committee and the Dan Scott Ranch Management program, illustrates the established relationships and engagement with the department. From 2014-2019, Extension faculty in this department averaged 35 non-academic instructional events and 1,600 participants per 1.0 Extension FTE per year. This amount of engagement and extension is well above the department's stated productivity standards and provides public goods for the College of Agriculture and Montana State University in terms of financial and public support, as well as support in achieving objectives with the strategic plans for the university and college.

Strengths

- Faculty have established a strong record of extension services across the state.
- The department possesses a strong network of stakeholders and engagement with the inclusion of these members on their advisory committee and other committees.
- There is strong support for the department/college/university from stakeholders because of past extension efforts and established networks.
- Applied research within the department provides a natural integration linkage between research, teaching, and extension.
- Existing extension faculty devote substantial travel time to meet with key stakeholder groups all over the state.

Weaknesses

- Insufficient web presence of extension materials.
- Extension activities seem to be concentrated on few faculty members.
- High turnover in some critical extension positions.
- High cost (in terms of time and money) of delivery for face-to-face extension and engagement programs in a state as large as Montana.

Opportunities

- Newly developed Dan Scott Ranch Management Programs provides opportunities to expand extension network through workshops, internships, and alumni.
- Continue to establish networks with non-traditional stakeholder groups, including tribal representatives, organic associations, and other groups focused on animal and natural resource management.

- Emphasis of PhD program on applied research and extension provides additional opportunities for integration of research, teaching, and extension programs.
- Providing opportunities for new faculty hires with extension and stakeholder engagement, while allowing sufficient times for those hires to be successful in research and teaching, can deconcentrate those efforts across the department.
- Drawing on collaborative group extension efforts that demonstrate the diversity of expertise with the department may assist in spreading out the extension efforts (particularly to new faculty hires) and provide more value to stakeholders.

Threats

- Increased competition from private consultants, salespersons, and other service providers.
- Difficulty in hiring and retaining extension faculty in traditional areas of need that also maintain an active research program.

Additional Comments:

- The staff appear to work well together and have a collegial working environment.
- A high level of stress/anxiety was communicated by both the livestock operations staff and some of the NTT's. The stress was caused by: (1) complex work with many different responsibilities, and (2) low pay relative to the cost of living in Bozeman.
- NTT faculty, as in many departments, face challenges of job security and low wages relative to their training and the cost of living in Bozeman. They are highly committed to the department and to their teaching mission.
- Dr. Hatfield is highly regarded by faculty and staff as a committed and effective Department Head.