Date: July 29, 2016

To: Academic Affairs

From: Frank Galey, Dean, College of Agriculture and Natural Resources

Re: Veterinary Sciences MS and PhD Graduate Program Review

I would recommend this program be continued at the University of Wyoming with the following comments.

- This program is growing and in relatively new form. The Wyoming Wildlife Livestock Health Center with the BSL 3 Laboratory is a key focus in the college and university. Fundraising and state support have very recently added one endowed professor and one endowed chair. The chair arrive in the past 2 years and has a full stable of graduate students. Further, a second endowed chair has been funded, to be filled once the expendable dollars allow.
- The program is relatively low cost. Most of the involved faculty are either heavily involved in state service through the Wyoming State Veterinary Laboratory (WSVL) yet still are able to provide a quality graduate experience via hands-on clinical and laboratory experience. A lack of graduate students would have a detrimental effects on the ability to attract and retain excellent diagnosticians to the WSVL, a key state service.
- Numbers of students are just below the minimums. The above-mentioned growth trajectory would suggest that the program is on the upswing despite recent faculty vacancies.

Thank you and please let me know if you have questions.

Academic Program Review
Report Template
University of Wyoming
Office of Academic Affairs
March 2016

Title of Program/Specialization: ANVS Veterinary Sciences
Indicate whether undergraduate or graduate program/specialization: Graduate (Master's and PhD) degree program
Department and College: Veterinary Sciences, College of Agriculture and Natural Resources
Department Head Name and contact information: William Laegreid, wlaegrei@uwyo.edu, 6-9929

Part 1 – Program Review

1. **Program Demand*:**
   The number of graduates and students enrolled in our graduate program (MS and PhD) in Veterinary Sciences is shown in the table below. While the number of graduates falls below the cutoff for "Low Demand" designation, we take exception to this designation as applied to our department. The demand for our program is rather high and in fact we discourage a number of potential students due to lack of faculty time to provide adequate mentoring for a rigorous graduate education. The lack of time derives primarily from three causes.

	Fall semester					
	2011	**2012**	**2013**	**2014**	**2015**	**Total**
MS Degrees Granted	2	1	5	2	2	**12**
MS Students Enrolled	5	7	9	5	3	**29**
PhD Degrees Granted	0	0	3	0	1	**4**
PhD Students Enrolled	8	6	3	3	8	**28**

   First, due principally to the aging demographics of our department, over the five year evaluation period we have had between 20 and 30% faculty vacancies. It follows from this that we have a high proportion of new faculty (70% of our faculty have an average of 3.3 years of time in service) and that faculty are covering diagnostic duties, classes and service responsibilities which would be covered by the vacant faculty positions. The combination of new faculty and reduced overall number of faculty is the major cause of reduced numbers of graduate degrees granted since 2011.

   A second factor in reduced graduate degrees granted derives from a collective decision of the Veterinary Sciences faculty not to accept any students for Plan B MS degrees based on the lack of actual laboratory research required for these programs. The effort required of students for a Plan B MS is significantly less than for a standard MS. Since on the record the degrees appear equivalent, our faculty felt that offering a Plan B MS was unfair to our hardest working graduate students. Obviously, this reduces the number of MS degrees conferred as well.

   Finally, this "Low Demand" metric fails to take into account differences in both the number and type of percentage effort between faculty members of various departments. It is rather

disingenuous to compare departments with vastly different faculty numbers to a set cutoff value. Furthermore, in the sciences, percent research effort is typically around 50-60%. It is this effort that contributes primarily to graduate student mentoring. In the Veterinary Sciences department, the average percent research effort is about half that, approximately 28%. This is due largely to the heavy diagnostic service load required by appointments in the Wyoming State Veterinary Laboratory. As with faculty numbers, the comparison of departments to an arbitrary set cutoff value without regard to differences in job assignment and percent effort is highly biased.

2. **Program Quality: Is the program of high quality?**

   a. Program accreditation.
   No program accreditation program available. Our diagnostic laboratory is fully accredited by the American Association of Veterinary Laboratory Diagnosticians. We have not performed an Academic Program Review (APR) in over five years. **N/A**

   b. Credentials of faculty.
   The Department of Veterinary Sciences faculty are some of the most highly trained and credentialed faculty on campus. All but one of our faculty hold both a PhD and a Doctor of Veterinary Medicine (or equivalent). In addition, a majority of our faculty have completed residency training in their area of specialization and four are board certified with one pending completion of her board exams. **See Appendix A**

   c. Program reputation.
   Not ranked. To my knowledge there is no ranking for veterinary science departments independent of colleges of veterinary medicine.

   d. *Curriculum of major or specialization*
   There is no fixed curriculum for our graduate program. The program of study is established by the student's graduate committee. An M.S. student must take a minimum of 26 credit hours of course work and four hours of PATB 5960: Thesis Research. It is desirable that a minimum of about 12 hours be selected from Veterinary and Animal Science course offerings associated with the degree title. In unique circumstances (e.g., exceptional disciplinary academic background before arriving at UW, or special targeted career objectives) the committee may allow that fewer disciplinary courses be taken at UW in lieu of other specialized coursework. Conversely, the committee may require additional hours for the degree or additional hours within the discipline, depending on the scope of the research problem and previous course work.
   All graduate students with a major professor affiliated with the department make a presentation on their research progress to the faculty and staff of the department during a noon-time seminar. This occurs on at least an annual basis.

   e. *Distance delivery of program/major* **N/A**

   f. Quality of Assessment Plan/data
   Over the past three years the faculty of the Department of Veterinary Sciences have been conducting a thorough review of our entire curriculum at both the undergraduate and graduate levels. Our goal is to close the learning objective-course delivery-

assessment loop for all individual courses and for the curriculum as a whole. The Department of Veterinary Sciences endorses continuous quality improvement in the curriculum and departmental courses offered for graduate students. The curriculum and coursework correlate with and reinforce expected student learning outcomes. The Department of Veterinary Sciences utilizes a variety of indirect and direct tools for assessing the quality of education for graduate education. These tools may include but not be limited to:

- Curriculum mapping for courses offered by departmental faculty. These courses should, to the extent possible, address the learning outcomes specified for our students. New graduate courses, as they are developed, (and/or existing courses) may incorporate problem-based learning, which should facilitate assessment of the student depth of knowledge on a particular topic.
- Formal assessment of performance on written assignments and oral presentations: These are assignments for specific courses in the curriculum and/or presentations at meetings and reports/manuscripts prepared for publication. All graduate students with a major professor in the Department of Veterinary Sciences are required to give an oral presentation to the department yearly. This allows for formal assessment of oral communication skills and scientific rigor across various academic degree programs represented among the departmental graduate students
- Annual graduate student retreat. The retreat includes a group-learning educational component with a three-year cycle of topics such as research ethics, scientific inquiry, grantsmanship, and communication skills. Due to our graduate students using various degree programs across UW this is one of the few opportunities we have to engage all students at a single time.
- Exit interviews for graduating students or those withdrawing from the program.
- Post-graduate "tracking" surveys sent-out once a year.

The information from these assessment tools is used to update and improve the quality of education in specific courses, the curriculum as a whole, and other student experiences.

g. Strategic Plan

There have been two major strategic initiatives within the department, the creation of the Wildlife-Livestock Health Center (described below) and development of a high level biocontainment facility (BSL-3) to perform research and diagnostics on some of the most dangerous and important infectious diseases in Wyoming. Driven largely by the need to address the problem of brucellosis in the Greater Yellowstone Area, this facility will also be used for work on diseases such as plague, tularemia, Q fever, highly pathogenic avian influenza and arboviral diseases, all present in Wyoming and subjects of research and diagnostic activity. When this facility is operational, it will open new areas of research and extramural funding to UW faculty and students, especially in the areas of public health and bioterrorism defense. While clearly an asset to the department and UW, the BSL-3 facility requires an enormous amount of faculty time – training, regulatory reporting/response, facility and equipment

oversight and maintenance – most of which is not captured in job descriptions and productivity metrics. However, the BSL-3 facility is a priority of the Governor's office and many diverse Wyoming stakeholders and Veterinary Sciences Department is proud to do its part in making this facility a reality for UW and the State. Both of these initiatives will provide state of the art opportunities for graduate students at UW, both within our department and in other departments and colleges.

3. **Mission Centrality: Does the program advance the mission of UW including institutional strategy?**
   a. *Describe how the program supports the mission, vision and strategic goals of UW.*
   UP4 Goal 1: Prepare University graduates to compete in a global economy.
   The ability to work within the Wyoming State Veterinary Laboratory offers perhaps one of the best experiential learning opportunities at UW, for both undergraduate and graduate students. The nexus of clinical medicine, laboratory diagnosis and bench research in the WSVL allows students to directly sense the immediacy of the problems on which they are working as well as providing access to case material, isolates and other real-world components to incorporate into their research, a great competitive advantage in an increasingly difficult research climate.
   In terms of global mission, our department hosts veterinarians, other health professionals and students from around the globe on an ongoing basis. Most of these individuals come for training and experience in diagnostic medicine while some are here for research collaboration. The opportunity to interact with these individuals is invaluable to both our graduate and undergraduate students.
   In addition, we are currently working on an exchange program with the University of Teramo (Italy) in Biotechnology, Food Safety and Veterinary Medicine. This will be a two way program where we will host some students as will U. Teramo and will also include faculty exchanges. Our department will host our first student from Teramo (Israeli) this spring and we will take a group of our students to Teramo early next summer where they will focus on agricultural production issues. Again, this will give our students an excellent opportunity to experience the differences and similarities in how problems in their specific fields are addressed in other countries. Faculty exchanges are also expected to become part of this program. Finally, one of our graduate students was recently awarded a grant to work in Tanzania on diagnostic test validation in an animal and public health setting. Our faculty have extensive experience working on international projects and are committed to ensuring that our students have the opportunity to broaden their horizons and understanding of their field in a global context.

   UP4 Goal 2: Measurable progress toward excellence in areas of distinction.
   Two of the objectives under this goal are to invest in areas of distinction and to build systems of scholarship that transcend traditional disciplinary boundaries. A key initiative in our department has been to establish and build a program focused on diseases that affect wildlife and livestock. The extensive nature of animal agriculture in Wyoming and the richness of our wildlife populations are deeply imbedded in the culture of this state. Unfortunately, these same factors increase the likelihood that diseases will either pass between domestic and wild animals or that both groups will be exposed to common sources of illness. To address these problems, we have

created the Wildlife-Livestock Health Center to address the most important diseases affecting these important animal resources (see prospectus in Appendix B). This is a multidisciplinary center with faculty interests ranging from basic molecular mechanisms to broad population ecology studies. One of a handful of initiatives identified by the UW Foundation for funding priority, the WLHC is also a major attraction for graduate student and recruiting. Several recent faculty hires, including an excellence chair in disease ecology, are actively involved in making the WLHC a go-to state, national and international resource to address diseases of wildlife and livestock, and in many cases public health as well. Furthermore, while extractive industries constitute the bulk of Wyoming's economy, as we strive to diversify it is important to note that the next largest sectors in our economy are tourism and agriculture. Wildlife, either viewing, hunting or fishing, are major factors in Wyoming's tourism and livestock constitute the majority of the state's agriculture sector so the WLHC will serve as both a guardian and driver of the number two and three segments of Wyoming's economy.

UP4 Goal 3: Expand statewide engagement to further the well-being of Wyoming citizens.

Almost all of the research and diagnostics conducted in our department is driven by and directly or indirectly impacts Wyoming citizens. From modeling chronic wasting disease dynamics to estimating seroprevalence of Brucella ovis in Wyoming sheep to discovery of novel viruses circulating in the state, our faculty and students are working to solve problems for the people of the State of Wyoming. A majority of our graduate students work on problems derived from diagnostic material or suggested/requested by Wyoming stakeholders. Often these stakeholders contribute funds directly to support this work, whether they governmental (Wyoming Dept of Agriculture, WGFD, Wyoming Livestock Board) or private individuals (animal owners, ranchers, alumni).

An excellent example of how this dynamic works in our department is the emerging disease, canine dysautonomia, the cause of which is unknown. Almost 100% rapidly fatal, an increase in the incidence and range of canine dysautonomia was recognized through diagnostic accessions in the WSVL. Through our enhanced diagnostic investigation program, we began field epidemiologic investigations of individual cases and outbreaks across a multistate region involving both faculty and graduate students. Dog owners and veterinarians were so impressed by our efforts to identify a cause for this disease that they spontaneously began a funding campaign for this important work. Though a small effort at present, it is a very clear indication of the daily engagement of our faculty and students with Wyoming stakeholders.

b. Describe how the program contributes to other programs across campus

Three of eight core Microbiology courses are PATB. In addition, 9 of 11 approved electives in the Medical Microbiology series are PATB as well. PATB courses support Animal Sciences options as well as Zoo/Phys Wildlife and Fisheries Biology and Management Major & Minor. A table illustrating these relationships is presented in Appendix C. Of the 16 course offered by the department, 11 (69%) are offered for graduate as well as undergraduate credit.

c. *Include placement data for graduates and indicate if graduates are working in the field or not.*
All (100%) of the graduate students for which we have placement data (87.5% of past 5 year graduates) are either currently working in their field or have continued on in graduate or professional school.

d. *Describe the uniqueness or duplication of this program across the UW.*
The graduate program in Veterinary Sciences is unique on the UW campus in its emphasis on disease – how disease occurs, how it may propagate through populations, risk factors for disease development (genetics, environmental factors, etc.), disease diagnostics and development and evaluation of control strategies for disease. We have funded programs in livestock, companion animal, wildlife and human disease. The broad emphasis on disease is unique on the UW campus. Furthermore, the presence of a fully accredited diagnostic laboratory offering hundreds of diagnostic tests and providing service to veterinarians and animal owners throughout Wyoming and the region, is a unique experiential learning opportunity for our students. Students (25-35 on average at any given time) work in all diagnostic sections and gain valuable insight into naturally occurring disease, its laboratory and morphologic diagnosis, state of the art testing methodologies and one on one interaction with highly skilled faculty and staff, all without leaving UW. Our faculty also provide informal instruction to graduate and undergraduate students from across campus on animal capture and handling, proper sampling techniques, euthanasia, etc. While not captured in any teaching metrics, this sort of experiential learning may be some of the most important and rewarding instruction we do in this department.

e. Other:

4. **Cost: Is the program financially viable?**
   a. *Ratio of student credit hours per FTE*

	2010	2011	2012	2013	2014	AVG
Lower	37.9	26.7	20.0	57.5	53.8	39.17
Upper	16.6	48.3	25.6	21.8	21.0	26.66
Grad	21.3	30.5	15.3	13.6	17.3	19.60
Total	75.8	105.5	60.8	93.0	92.0	85.43

   b. *Direct instructional expenditures:*
      i. Per student credit hour
      This term needs to be defined and the appropriate denominator identified.

      ii. Per total degrees awarded

	2009	2010	2011	2012	2013
per degree awarded	$ 69,766	$ 55,543	$ 69,212	$ 82,890	$ 40,275
per student FTE	$ 15,406	$ 13,817	$ 15,253	$ 9,314	$ 9,557

      iii. Non-personnel expenditures per total academic FTE

For 2014, this ratio was $12,407 based on OIA data. However, we have been unable to ascertain the origin or validity of the non-personnel expenditure figure which does not correspond to anything on our books.

c. Course enrollment

i. Number of classes falling under University minimums **0**

ii. Lower-division courses falling under University minimums **0**

d. Other instructional cost drivers, such as:

i. Section fill rates

Our course enrollment numbers and fill rates are shown below. Note that the fill rates are artificially low in a number of cases as instructors kept the number of available seats elevated to avoid any issues at registration. Courses in red are no longer being taught (PATB 1001 has been replaced by PATB 1101).

Didactic Course Enrollment (# students enrolled)

	Academic Year						
Course	**11-12**	**12-13**	**13-14**	**14-15**	**15-16**	**Total**	**Fill Rate (avg)**
PATB 1001	20	20	28	28		96	80.0%
PATB 1101					24	24	100.0%
PATB 2220	31	19	39	31	27	147	73.5%
PATB 4001/5001	18	16	20	35	23	112	70.9%
PATB 4110/5110	53	39	49	55	63	259	83.3%
PATB 4111/5111	27	17	28		10	82	60.4%
PATB 4130/5130	25	27	15	11	19	97	64.7%
PATB 4140/5140		29				29	96.7%
PATB 4150	7	14	14	14	12	61	55.8%
PATB 4170/5170	19		30		22	71	75.9%
PATB 4200	8					8	40.0%
PATB 4220/5220	15		20			35	100.0%
PATB 4240/5240					18	18	72.0%
PATB 4400/5400		36	36	36		108	100.0%
PATB 4500/5500	19	30				49	81.7%
PATB 4710/5710	50	57	49	60	60	276	92.0%
Total	292	304	328	270	278	1472	77.9%

Non-didactic Course Enrollment (# students enrolled)

	Academic Year					
Course	**11-12**	**12-13**	**13-14**	**14-15**	**15-16**	**Total**
PATB 4050	4	12	21	28	9	74
PATB 5505		3	1			4
PATB 5515	11	1	6	5	4	27
PATB 5900	2	4	6	4	1	17
PATB 5960	8	14	15	9	6	52
PATB 5980	14	10	9	13	9	55
Total	39	44	58	59	29	229

ii. *Course completion rates*
We have no comprehensive data available on completion rates.

iii. *Curricular complexity*
It is precisely because of the incredible diversity of interests within our department that we do not have a set curriculum for our graduate students. Each student's program of study is tailored to their field and to their individual research questions.

iv. *Faculty course load.*
Our average teaching appointment is 17%. Our average didactic course load is 1.15 didactic courses/year. This is exclusive of the extensive hours spent on non-didactic instruction, WWAMI instruction, externship training and continuing education performed by our faculty.

e. *Research expenditures per tenured/tenure-track FTE (and other academic personnel, where appropriate)*

	2011	2012	2013	2014	2015
FTE	12	13	11	11	10
Research Expenditures	$1,542,039	$1,555,116	$1,727,358	$1,515,564	$1,355,944
RE/FTE	$128,503	$119,624	$157,033	$137,779	$135,594

f. *Compare your data to national benchmarks (Delaware data)*
This data set was unavailable on request.

g. Other:

Appendix A. Credentials of faculty.

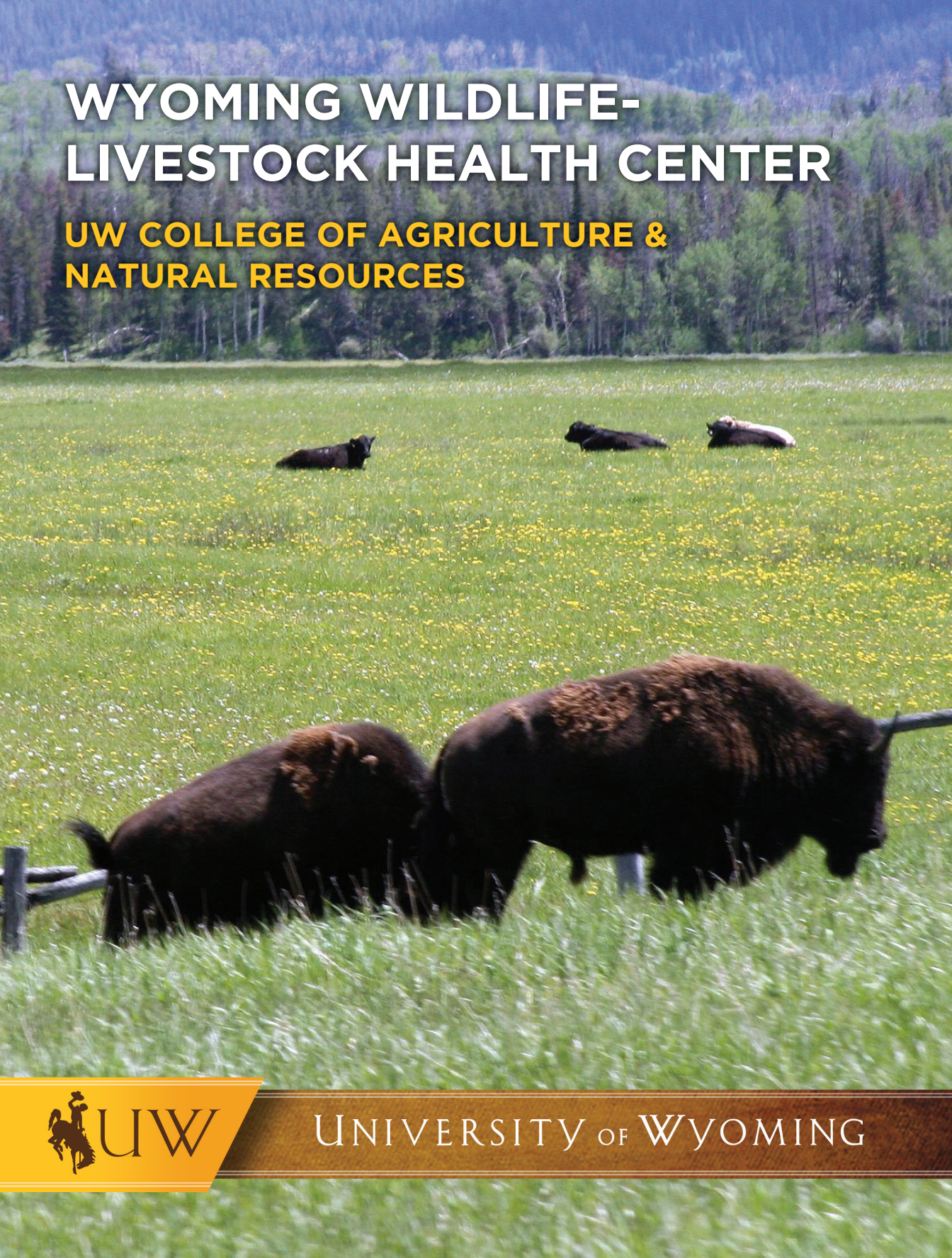
The following table summarizes the credentials of the Veterinary Sciences Department faculty. Positions in red are slated to be eliminated in the current budget reductions.

			Appointment % Effort																	
Pos#	Name	Faculty Rank	Teaching	Advising	Research	Professional Service	Service	Extension	Admin	Total	Instr FTE		Postgraduate degrees	Board Certification	Gender	Ethnicity	Grants Awarded	Publications	Presentations	Courses Taught	Awards
0931	Andrews	Associate	34	10	31		5		20	100	44		PhD		M	Caucasian	17	31	54	PATB 2220, PATB 4150, PATB 4220/5220, WWAMI I&D	Department of the Army, Surgeon General's "A" Proficiency Designator in Microbiology, 2002, Order of Military Medical Merit, 2001
1161	Cornish	Associate	5	5	15	50			25	100	10		DVM, PhD	ACVP	M	Caucasian	4	33	212	PATB 1001, PATB 1101, PATB 4170/5170	Wildlife Disease Association Terry Amundson Award 1999, American College of Veterinary Pathologists Resident Scholarship Award 1999, Morris Animal Foundation Award of Appreciation for Service 2006, Journal of Veterinary Diagnostic Investigations Best Manuscript Award 2007, The Wildlife Society Professional Wildlifer of the Year 2007, Wildlife Disease Association Award of Merit for Student Mentorship 2008, United States Fish and Wildlife Service Certificate of Merit 2009
4543	Ernest	Full	20	5	65		5	5		100	25		DVM, PhD		F	Caucasian	24	48	>75	PATB 4240/5240	
1202	Fox	Associate	14	1	30	50	5			100	15		BVSc, PhD	ACVP	M	Caucasian	2	28		NEUR 5715, PATB 5160, WWAMI Blood & Cancer, WWAMI Pathology	
2561	Laegreid	Full	4	1	10	20		5	60	100	5		DVM, PhD		M	Caucasian		95	>200	PATB 4130/5130, WWAMI Virology	USDA-ARS Administrator's Special Award 2003; DTRA Training Excellence Award, 2010; Roy Schultz Lecture, 2013
2244	Miller	Assistant	20	5	25	47	3			100	25		DVM, PhD		F	Caucasian	17	32		PATB 4710, WWAMI Virology	
1156	Munoz-Gutierrez	Assistant	20	5	20	50	5			100	25		DVM, PhD	ACVP	M	Hispanic	1	5	18	PATB 4130/5130	
1112	O'Toole	Full	19	1	20	55	5			100	20		MVB, PhD	ACVP	M	Caucasian	0	51		PATB 4110/5110, PATB 4111/5111	Distinguished Career Service Award, 2014, American Association of Veterinary Laboratory Diagnosticians (AAVLD)
1824	Schumaker	Assistant	18	2	40	35	5			100	20		DVM, PhD		M	Caucasian	18	16	84	PATB 4001/5001, PATB 5515	
0647	Sondgeroth	Assistant	20	5	30	40	5			100	25		DVM, PhD		F	Caucasian		9		PATB 2220	
0236	Vacant																			PATB 4400/5400	
0710	Vacant																			PATB 4140/5140	
1154	Vacant - recruited																			PATB 4360/5360	

Appendix B. Prospectus for the Wildlife-Livestock Health Center.

WYOMING WILDLIFE-LIVESTOCK HEALTH CENTER

UW COLLEGE OF AGRICULTURE & NATURAL RESOURCES



UW

UNIVERSITY OF WYOMING

Center personnel have just concluded two landmark studies that document chronic wasting disease's significant and long-term negative effects on mule deer and white-tailed deer populations.

INTRODUCTION

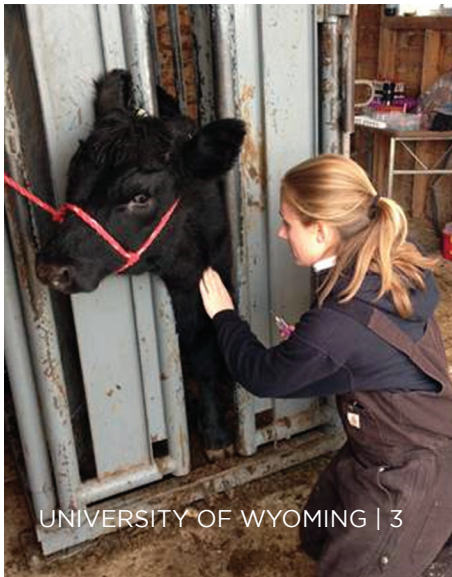
A TIMELY CATALYST IN THE FIGHT AGAINST LIVESTOCK AND WILDLIFE DISEASES

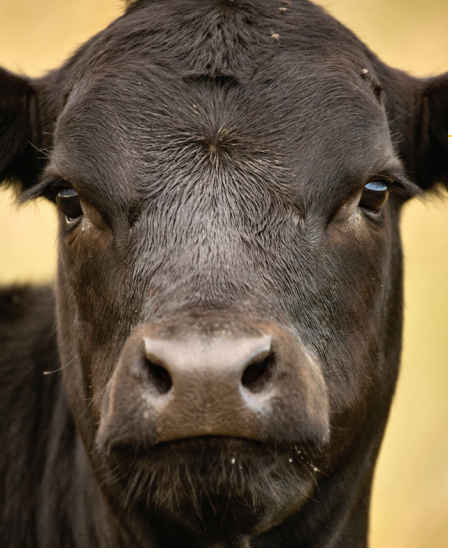
Brucellosis, chronic wasting disease, sheep pneumonia, hemorrhagic disease, and plague can have a significant impact on livestock and wildlife in Wyoming and the West. Two of Wyoming's most important economic industries—tourism and livestock production—depend on maintaining and preserving these healthy animal populations.

That's why these disruptive diseases have been the focus of visionary faculty members at the University of Wyoming College of Agriculture and Natural Resources for more than a decade.

During that time, the Wyoming Wildlife-Livestock Health Center was developed with a critical mass of expertise—nationally renowned faculty members well-established in their fields. The center has laid the groundwork and put in place the necessary infrastructure—laboratories, facilities, and human capital—and ongoing research in this area. These projects, when competing against top universities and veterinary schools, have won more than $9 million in research grant funding. On the horizon are promising wildlife and livestock health partnerships with sister institutions such as the University of California, Davis and Colorado State University.

The foundation has been laid for major breakthroughs, and additional funding is the catalyst that will generate new discoveries and advances and provide seed money for even larger federal grants that lead to vaccines and other essential developments in fighting these diseases.





ONE OF A KIND

The center is intensely focused on the health and ecology of wildlife and domestic animals, and basic research is intricately tied with applied research in the field. No other program does this, making UW number one worldwide in practicality and expertise.

The center is dedicated to protecting and enhancing two of Wyoming's greatest resources: wildlife and domestic animals. The center addresses important questions via both science and stakeholder needs, with timely dissemination of information resulting in informed decisions that improve wildlife and livestock management. Health threats to humans, companion animals, and the environment are also addressed.

The center is one of the nation's premier research and outreach programs in its field. The UW program is unique in its focus on the niche of diseases important to large wild herbivores (elk, deer, and sheep) and large domestic livestock (cattle, sheep, and horses), as well as their relationship to humans.

The College of Agriculture and Natural Resources has over twelve researchers and numerous graduate students working on a broad range of disease problems of domestic animals and wildlife, including insect-borne diseases like West Nile virus and hemorrhagic disease, parasitic diseases like arterial worm in sheep and moose, bacterial diseases like brucellosis, chronic wasting disease, and pneumonia in bighorn and domestic sheep. Scientists seek solutions through laboratory and fieldwork, modeling of impacts and management practices, and improved diagnostic tests, treatment, and vaccine development, and they also tackle the economic impacts of disease and management stratetegies.

We recently completed a pilot study on risk factors for transmission of hemorrhagic disease to domestic sheep and wildlife, such as deer and pronghorn sheep. A larger definitive study is planned.

A study that determines best practices for tackling brucellosis in wildlife has been completed and we are working on similar studies in cattle.

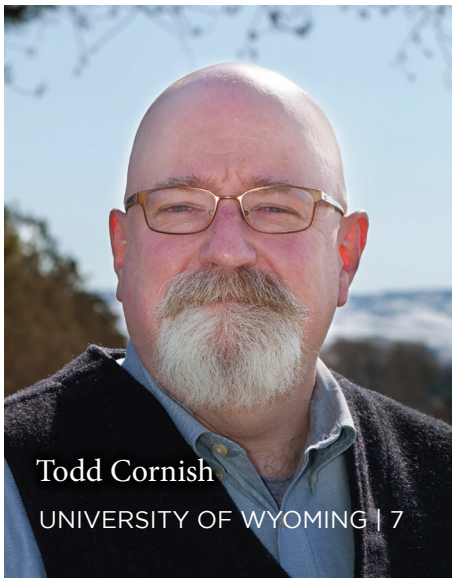
THE PEOPLE

A core team of faculty, staff, graduate students, and undergraduates in the Department of Veterinary Sciences research diseases affecting wildlife and livestock. This research is in partnership with essential collaborators from other UW departments and colleges and with local, state, regional, national, and international partners from other academic institutions, wildlife and livestock agencies, public health agencies, and non-governmental organizations.

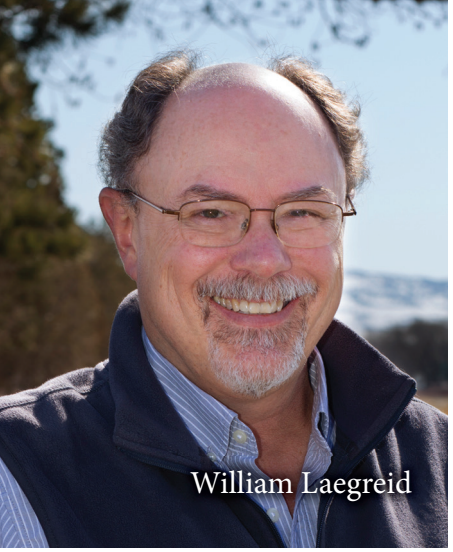
An integral part of the center's mission is to recruit and train world-class graduate students and postdoctoral research associates in disease ecology, epidemiology, pathology, microbiology, and toxicology. Students train on research projects with real-world objectives using the latest tools and technologies and are prepared for careers working regionally, nationally, and internationally on health problems across species boundaries. The center has a record number of funded externships, in which third- or fourth-year veterinary students from across the U.S. come to UW for up to 12 weeks of exposure to diagnostic veterinary medicine.

The Wyoming Wildlife-Livestock Health Center includes these world-class researchers.

Todd Cornish, *director of the Wyoming Wildlife-Livestock Health Center, associate professor and veterinary pathologist in the Department of Veterinary Sciences* – Dr. Cornish's research interests include infectious diseases of livestock and wildlife including chronic wasting disease, vesicular stomatitis, bovine viral diarrhea virus, pestiviruses of wildlife, West Nile virus, brucellosis, and others. His particular interest is in diseases of free-ranging wildlife species native to Wyoming. Dr. Cornish also spends much of every day working as a diagnostic pathologist at the Wyoming State Veterinary Lab, teaching undergraduate and graduate students, and mentoring graduate students.



Todd Cornish


William Laegreid

William Laegreid, *department head and professor in the Department of Veterinary Sciences, director of the Wyoming State Veterinary Laboratory* – Dr. Laegreid's research interests include the pathogenesis and control of animal diseases, especially high consequence infections of livestock. He utilizes molecular, cellular, and animal- and population-based studies to investigate mechanisms of injury and susceptibility to viral and bacterial disease. His recent work is directed toward understanding how genomic variation of hosts and pathogens interacts to influence the expression of disease at the population level.


Holly Ernest

Holly Ernest, *Wyoming Excellence Chair in Disease Ecology and professor in the Department of Veterinary Sciences* – Dr. Ernest's focus is applied research on questions and problems of importance to the health of wildlife and livestock populations in the Rocky Mountain West and includes disease issues at the wildlife-livestock interface. She employs genomic, population biology, and disease ecology sciences and has a program that includes undergraduate and graduate education, as well as service and outreach to the public.


Brant Schumaker

Brant Schumaker, *assistant professor and epidemiologist in the Department of Veterinary Sciences* – Dr. Schumaker investigates the population-level effects of wildlife-livestock diseases, especially brucellosis, chronic wasting disease, arterial worm infections of sheep and cervids, hemorrhagic viral diseases, and respiratory disease complex of bighorn sheep. He focuses on developing diagnostic tests for these diseases and evaluating strategies to limit their impacts. Dr. Schumaker also mentors many undergraduate and graduate students working on applied research projects.

The Wildlife-Livestock Health Center has its origins in the seminal work of the late Dr. Beth Williams and her husband Dr. Tom Thorne. The pair performed much of the original research on brucellosis, chronic wasting disease, and sheep pneumonia.

Gerry Andrews, *associate professor in the Department of Veterinary Sciences and director of the University of Wyoming's undergraduate Microbiology Program* – Dr. Andrews research interests include a variety of wildlife-livestock infectious diseases, including brucellosis, plague, tularemia, mycoplasmosis, and pasteurellosis. He instructs and mentors undergraduate and graduate students in microbiology courses and laboratory research projects including molecular mechanisms of pathogenesis of zoonotic bacterial pathogens as they apply to the development of novel vaccines and rapid diagnostics.


Gerry Andrews

Myrna Miller, *assistant professor in the Department of Veterinary Sciences and diagnostic virologist at the Wyoming State Veterinary Laboratory* – Dr. Miller's research interests include viruses affecting livestock and wildlife that are transmitted by insects, such as bluetongue virus and epizootic hemorrhagic disease virus. Dr. Miller also teaches undergraduate and graduate students and mentors graduate students working on a wide range of applied research projects including vaccine efficacy and an economic cost-benefit analysis of vaccine strategies, geospatial features related to risk of infection, transmission dynamics, and a phylogeographic analysis of bluetongue virus and epizootic hemorrhagic disease virus in Wyoming.


Myrna Miller

Kerry Sondgeroth, *assistant professor in Department of Veterinary Sciences and diagnostic bacteriologist for the Wyoming State Veterinary Laboratory* – Dr. Sondgeroth's research interests include host-pathogen interaction utilizing *Babesia bovis* infection in cattle and identifying bacterial diseases that are important at the interface of wildlife and livestock. Dr. Sondgeroth teaches undergraduate students in microbiology and currently is mentoring graduate and undergraduate students on research projects including the detection and seroprevalence of *Brucella ovis* in Wyoming domestic sheep.


Kerry Sondgeroth

Frank Galey

The center has a record number of funded externships, in which third- or fourth-year veterinary students from across the U.S. come to UW for up to 12 weeks of exposure to diagnostic veterinary medicine.

Frank Galey, *dean of the College of Agriculture and Natural Resources* – Dr. Galey holds specialty certification in toxicology, and his research and clinical service interests include diagnostic and forensic medicine, plant and other natural product poisonings, and analytical pharmacology and toxicology. Research and service milestones include development of interpretable analytical screens for plants containing potentially toxic alkaloids and cardiac glycosides, as well as for pharmaceutical residues in dairy animals and race horses. His latest research involves seeking a reliable assay for botulism in affected animals and humans.

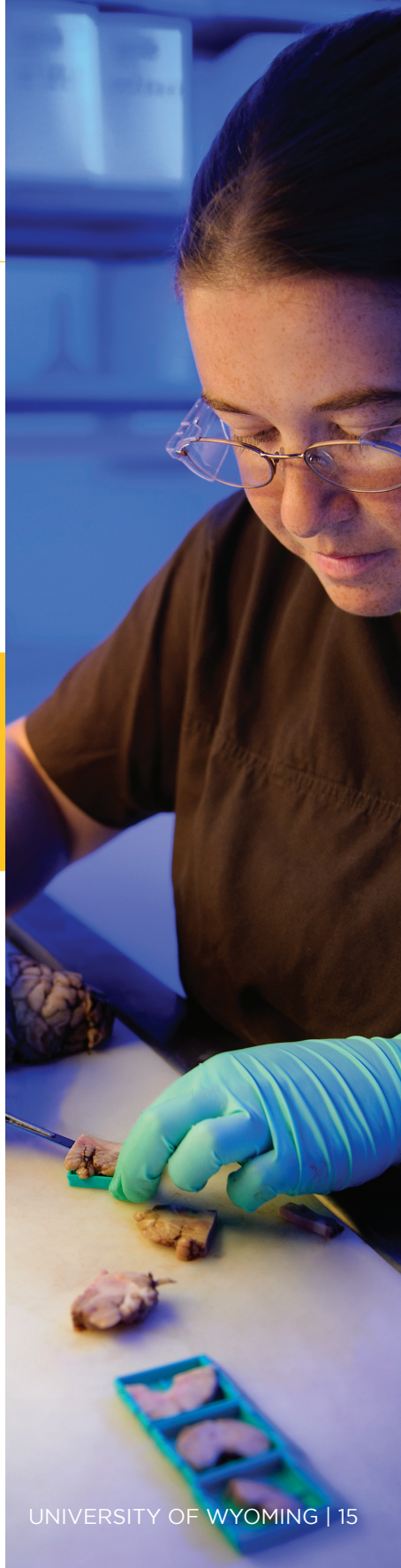
In addition to research, an integral part of the center's mission is to recruit and train world-class graduate students and postdoctoral research associates in disease ecology, epidemiology, pathology, microbiology, and toxicology.

A HISTORY OF PUBLIC AND PRIVATE INVESTMENT

The Wyoming Wildlife-Livestock Health Center was launched in 2001. It was the vision of Dr. Beth Williams working with Vice President for Research and Economic Development Bill Gern, College of Agriculture and Natural Resources Dean Frank Galey, and Dr. Tom Thorne from the Wyoming Game and Fish Department. Research performed in the then-proposed center was funded by the Wyoming Legislature through the Wyoming Wildlife-Livestock Disease Research Partnership Fund, as well as an Excellence Chair in Wildlife-Livestock Health.

Recently, the generous gift of the River Bend Ranch resulted in an $8 million endowment to support a second chair in wildlife-livestock health, as well as support for the program.

Since its founding, the program has grown exponentially, and additional funding has come from state and private sources. The state provided approximately $25 million for a new Biosafety Level 3 Laboratory and an addition to the current laboratory facility. Private support is also growing. The Williams Professor is endowed at nearly $900,000, and the laboratory benefits from over $500,000 for veterinary externships, internships, and graduate students, including the Kurt Swanson Bucholz Vet Training Fund, the Richard and Barbara Powell Wildlife-Livestock Disease Training Fund, and the Beth Williams and Tom Thorne Wildlife Disease Training Fund. The generous gift of the River Bend Ranch resulted in an $8 million endowment to support a second chair in wildlife-livestock health, as well as support for the program. Last but not least, center researchers have attracted over $9 million in external grant funding.



NEW OPPORTUNITIES

The following are the priorities of the Wyoming Wildlife-Livestock Health Center.

1. Three endowed professorships. Each professorship will support a senior UW scientist who is an associate of the Wyoming Wildlife-Livestock Health Center for three to five years in a specific discipline. Funds will support partial salary, research, postdoctoral scientists, and graduate students. This funding will attract and retain top faculty and provide seed funding for fundamental research that provides the basis for large governmental grant funding.

   Approximately $60,000/year x 3 = $180,000 annually, which is an endowment of approximately $4,800,000

2. Four endowed research programs. Each program will support one research project for two to five years for an affiliate of the Wyoming Wildlife-Livestock Health Center. Affiliates may be senior UW scientists or collaborators from other institutions, including faculty and state agency personnel. Projects selected are those with the highest likelihood of success in achieving significant and impactful results.

   Approximately $48,000/year x 4 = $192,000 annually, which is an endowment of approximately $5,200,000

3. Renovation of the Round Building. The center has a provisional new home in the old Wyoming State Veterinary Laboratory Round Building directly adjacent to the current Wyoming State Veterinary Laboratory and Department of Veterinary Sciences building; however, operations and growth of the center and renovation and remodeling of the currently inoperable Round Building necessitate further fundraising efforts.

The center benefits tremendously from being housed with the Wyoming State Veterinary Laboratory. Wildlife and livestock cases submitted to Wyoming State Veterinary Laboratory provide teaching material for undergraduate, graduate, and professional students and help drive new avenues of scientific inquiry.


AGRICULTURE

There may be overlap between the first and second priorities, and it's possible the same researcher may receive funding from both sources. Target disciplines may include population health, immunology and pathogenesis, and emerging conditions.

Operational and research fundraising will continue to be pursued not only through private donors but also through competitive research grant funding that directly supports scientific investigation and training of postdoctoral research associates and graduate students.

THAT EXTRA MARGIN

Now is a critical time in the fight against the animal diseases like brucellosis, chronic wasting disease, pneumonia, and plague that affect Wyoming's traditions, culture, and economically valuable wildlife and livestock. Private funding for the Wyoming Wildlife-Livestock Health Center will provide the "venture capital" necessary to develop vaccinations and treatments for these diseases. The center not only will extend current research; it will allow new areas of investigative innovation. It not only will fund ongoing research; it will provide the basis for attracting large governmental grants. It not only will fund the vital research of our current experts; it will attract top faculty researchers from other institutions. In short, the center will provide that extra margin—that extra energy and creative space—vital to meet these challenges.

It not only will extend current research; it will allow new areas of investigative innovation.

Wyoming Wildlife-Livestock Health Center
College of Agriculture and Natural Resources | Department of Veterinary Sciences

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Appendix C. Relationship of Pathobiology courses to requirements in other majors at the University of Wyoming.

	Course Requirement	
Course	**Major**	**Minor/Elective**
PATB 2220	Microbiology	
		Microbiology - Medical
PATB 4001		Microbiology
PATB 4001		Professional Pharmacy program
PATB 4110	Ag Business Biology of Livestock	
PATB 4110	ANVS Production Option	
PATB 4110	ANVS Range Livestock Option	
PATB 4110	ANVS Meat Science Option	
PATB 4110	ANVS Business Option	
PATB 4110	ANVS Communication Option	
PATB 4110	Agriculture Education with ANVS Major	
		Microbiology - Medical
PATB 4110		Microbiology
PATB 4111	ANVS Equine Science Option	
		Microbiology - Medical
PATB 4120		Microbiology
		Microbiology - Medical
PATB 4130		Microbiology
PATB 4130		Zoo/Phys WFBM
		Microbiology - Medical
PATB 4140		Microbiology
PATB 4140	Criminal Justice Forensic Science Concentration	
PATB 4150	Microbiology	
PATB 4170		Zoo/Phys WFBM
		Microbiology - Medical
PATB 4360		Microbiology
PATB 4400	ANVS Animal Biology Option	
PATB 4400	Microbiology	
PATB 4400	Molecular Biology Preprofessional Option	
PATB 4710	Microbiology	
PATB 4710	Molecular Biology Preprofessional Option	
PATB 5001	IBMS Program	