Proposed Position in Biometry and Applied Statistics

I. Background

Excellent data quality is essential to the missions of science-based organizations such as the Division of Plant Sciences (DPS). Interpretation and production of quality data depend on appropriate experiment design, careful data collection, and data analyses that fit research objectives. Attention to data quality enhances the ability of researchers to create new information and build upon information from past experiments. More importantly, high quality data are the foundation upon which researchers develop future experiments.

The discipline of statistics is comprised of several sub-disciplines including, but not limited to, field plot technique, simple regression, multivariate analyses, population dynamics, and bioinformatics. DPS Sciences encompasses many disciplines and individual scientists and their research programs differ in their statistics needs. Most of these needs are rooted in an understanding and correct application of fundamental statistics.

Colleges of agriculture have had a long relationship with statistics departments in universities across the US. In fact, many of the models and statistics used to interpret data were developed using experiments in plant and animal sciences. At MU, CAFNR has supported several faculty positions in the Department of Statistics. But, the DPS and the Department of Statistics have different missions. DPS scientists use statistics as a tool to assess their data; whereas, faculty members in Statistics often focus on theory. For this reason, the current situation in which DPS scientists are dependent on Statistics faculty members for assistance and graduate student education meets the needs of neither party. A more appropriate model would be for DPS to develop and fill at least one position with expertise in applied statistics.

Several plant focused departments within colleges of agriculture in other universities have successfully incorporated applied statistics into faculty positions. An example is the Department of Crop Sciences at the University of Illinois. That department has developed core expertise called “Biometry and Bioinformatics” (for more information see the following link http://cropsci.illinois.edu/academics/grad/biometry.cfm). The success of that program is grounded in being mission oriented and focusing on the application of statistics to biological sciences.

II. Crop and Pest Management Needs

Statistical needs identified by Crop and Pest Management focused on graduate education. The use of correct statistical models/procedures is essential to successful completion of requirements for both MS and PhD degrees and is crucial to the successful careers of all DPS graduates. Two graduate courses in applied statistics is the minimum need. These courses should focus on experiment design, simple and multivariate, SAS programming, and the latest statistical models. The ability to consult with a statistician on experiments other than those used by graduate students for degree requirements was also identified as a need.

III. Proposed Position Description

A. Research

Research should be the majority portion of the position, perhaps 60 to 75%. Description of research responsibilities should be left fairly broad within plant sciences to attract applications. Persons with the training and inclination necessary to be successful in this position exist, but they are not plentiful and may be educated in a broad range of biological sciences. While collaboration with colleagues is essential, ability to document essential roles in interdisciplinary teams will also be required. An independent research program will be helpful for promotion and will complement

the mission of this position. Research strengths within DPS should be highlighted listed in the position description so applicants understand that they will be part of a team and will have many potential collaborators.

B. Teaching

Graduate courses are an important need, but teaching should be less than 50% of the position responsibilities, perhaps 25 to 40%. Not all course needs can be met by one position, but a two-course sequence in applied statistics with one course offered each semester will benefit all students. These courses should build on and not replace undergraduate courses taught in the Department of Statistics.

C. Consultancy

Arguably, every current faculty member and graduate student would benefit from consulting from a statistician dedicated to plant sciences. Due to this overwhelming demand, consulting could become a time consideration for a new hire and become an obstacle for successful promotion. We suggest this be addressed in the position description, and potential hires should be able to establish comfortable consulting hours. DPS and CAFNR should provide salary support for post docs or doctoral graduate students to assist with consulting needs of DPS.

DRAFT
Forage Physiologist

I. Background

Missouri's forage-livestock industry is the state's largest agricultural endeavor. Forage producers use 13 million acres of private lands for grazing, hay production, and conservation; forages are the major land cover for protecting the environment. Forage-livestock enterprises contribute more than $12 billion annually to Missouri's economy and provide direct income for more than 200,000 citizens. Nationally, Missouri has the third largest cow-calf herd (more than 4 million cows and calves), the second largest number of beef producers, the seventh largest number of dairy farms, and is the second largest producer of grass hay. Eighty percent of all feed units for these livestock come from forage crops. No other agricultural enterprise covers more acres, generates more real income or engages as many citizens.

A greater understanding the physiology of forage plants provides the scientific basis for the development of innovative technologies needed by Missouri's forage-livestock industry. For instance, scientific basis for Missouri's Grazing Schools and its Pasture-based Dairy program rely on our understanding of how forage plants behave under various utilization scenarios.

At present, a small core-group of faculty work exclusively in the forage area. However, a number of CAFNR faculty work on some aspect of forage crops. A forage physiologist would be a key faculty member in connecting these diverse efforts. Additionally, we do not have a faculty member to teach our undergraduate course in forage crops, nor to contribute to new courses such as the Pasture-based Dairy course offered collaboratively with the Division of Animal Sciences.

II. Proposed Position Description

Forage Physiologist
Assistant Professor

Division of Plant Sciences, College of Agriculture, Food, and Natural Resources, University of Missouri

Position Description

The Division of Plant Sciences, University of Missouri, invites applications for a tenure-track position in forage physiology. The position is for an Assistant Professor with a 12-month appointment - 60% research, 40% teaching.

Responsibilities

The successful candidate will be expected to establish an innovative, extramurally funded research program on the biology, development, and physiology of forage plants. Research should focus on the physiology of both cool and warm-season forage crops used for pasture and/or stored feed in the Midwestern USA. Emphasis should be placed understanding the critical physiological components that lead to improved forage-livestock production systems. The University of Missouri has a long history of collaboration within the Division of Plant Sciences and with other teams of scientists across campus. The candidate will be expected to explore collaborative opportunities with the Interdisciplinary Plant Group, the Forage-Livestock group, and teams of scientists working pasture-based dairies, and the forage-based

beef industry. Accessible to the candidate are excellent laboratory and field research facilities (both on and off- campus research centers) within the Missouri Agricultural Experiment station network.

The successful candidate is expected to participate in the undergraduate and graduate teaching and service missions of the Division of Plant Sciences. Teaching responsibilities include an undergraduate forage crops class, as well as contributing to a new course in pasture-based dairy systems. Future teaching opportunities could include self or team-taught graduate courses in the candidate's area of expertise.

Qualifications

The applicant must have a Ph.D. degree in Crop Science, Agronomy, Plant Sciences, or related field. Effective oral and written communications skills are required. Training in the development, degradation, biochemistry, or physiology of forage plants as it relates to the food-animal industries is desirable. Post-doctoral experience is also desirable.

Applications

Application materials should be sent to Christa Smith, ESA, Division of Plant Sciences, 1-41 Agriculture Bldg., University of Missouri, Columbia, MO 65211. Questions regarding this position should be directed to xxxxx by email (preferred) xxxxxxxx@missouri.edu or by phone at 573-882-3001.

Weed and Invasive Plant Ecologist

Currently, the weed science extension, research, and teaching program within the Division of Plant Sciences (DPS) at the University of Missouri consists of 3 faculty members. In comparison to many other weed science programs at peer institutions, all of the weed-related needs of students and clientele are not currently being met at MU. According to a recent study published in the journal *Weed Technology* (April-June 2011 issue), the situation at MU appears to be similar, if not even more dire, than those observed at many universities across the U.S. In this study, the authors found that compared to weed scientists, there were more than four times as many entomologists and three times as many plant pathologists at the 76 universities studied. There were five times as many undergraduate entomology courses and two-and-a-half times as many plant pathology courses at these universities compared to courses in weed science. This disparity is growing despite the fact that issues related to herbicide resistance and invasive species management are expanding areas of importance. The weed science program at MU currently has a total of 10 graduate students being advised by 2 faculty members. The current core of faculty members with weed-related responsibilities in the DPS is insufficient to meet the growing needs and demands that are occurring within the field of weed science.

Currently, the weed science program at MU has no faculty member with research or teaching responsibilities in the area of weed ecology. Weed ecology is the study of the adaptive mechanisms that enables weeds to thrive in natural and managed systems, and therefore provides a basic understanding of the distribution and abundance of weeds in a variety of settings. Weed ecology should be a foundational component of any university weed science program. By the very nature of this research, weed ecology lends itself also to the study of invasive weeds. **The area of invasive weed management is an increasing area of importance in the U.S. For example, one study conducted in** 2005 estimated a $34 billion economic impact from invasive plant species in the U.S. alone.

We propose that a Weed and Invasive Plant Ecologist tenure-track position would contribute to and build on the strengths within the current weed science program area in the DPS. Research should be the majority portion of the position, perhaps 60%, with the remainder of the position rooted in the teaching of graduate and undergraduate courses. The incumbent would be expected to develop a primarily laboratory-based research program related to factors contributing to the success of weeds in agricultural crop and non-crop areas. Collaborations with existing faculty would be encouraged for any relevant aspect of research related to weed biology, physiology and ecology, ultimately leading to the development of integrated weed control methods. Although a description of specific research responsibilities should be left fairly broad in order to attract the best applicants, research interests and projects could include, but are not limited to: spatial distribution and dynamics of non-native populations and how to detect and model these populations in agricultural or natural systems, the specific processes of invasive plant dispersal and how dispersal impacts management of these species, and research to address the processes and variables that influence the invasive potential of various plant species. The incumbent's research should also place some emphasis on the adoption of methods that integrate cultural techniques, herbicides, and biocontrol agents for the control of those weeds which severely restrict the agricultural, recreational, and/or industrial uses of public or private lands throughout the state of Missouri and beyond.

The candidate would also be expected to develop an undergraduate plant ecology course that teaches students about the interactions that occur between crops and weeds as well as the impact of non-native plants. A graduate lecture/laboratory course on weed ecology would build on principles developed in the undergraduate course and include specific research techniques for understanding the interference of weeds in various habitats. The faculty member will actively seek contract and grant funding to support his/her program. The faculty member will be expected to serve on undergraduate and graduate committees, supervise thesis and dissertation research, mentor students in undergraduate research, and publish in peer-reviewed journals.

GENERAL DESCRIPTION: Extension Medical Entomologist.

Using modern approaches to understanding the biology and management of medically important arthropods.

JUSTIFICATION:

A large industry and many government agencies are associated with the management of medically important arthropods. There are considerable amounts of grant dollars available annually for research associated with arthropods of medical importance and the diseases they vector. Requests for information about medically important arthropods from the public and county extension offices are numerous and are consistently within the top 20 most-requested guides from MU Extension. MU Extension has not had a medical entomologist responding to these requests, delivering web-based information, or conducting Pesticide Applicator training sessions during the past ten years, despite the enormous demand for information and training. The response to these needs by other entomologists requires significant adjustments.

RESPONSIBILITIES:

A) EXTENSION: Conduct outreach activities that include: responding to questions from county extension faculty, government agencies, and the general public regarding management of medically important arthropods; coordinate conferences and other training workshops; provide Pesticide Applicator Training for certification and re-certification; use modern innovative and successful communication methods including delivery of web-based knowledge about medically important arthropods

B) RESEARCH: Obtain external funding, supervise graduate students, and conduct field and/or laboratory studies. Studies may include: host-vector-pathogen relationships, transmission biology, vector behavior, vector population genetics, innovative vector population management strategies, genetics of insecticide resistance, environmental toxicology, invasive species dynamics, etc