



*The Kentucky  
Agricultural Experiment Station*

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**128th**

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**Annual Report**  
2015



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To His Excellency  
The Honorable Matt Bevin  
Governor of Kentucky

I herewith submit the one hundred and twenty-eighth annual report of the Kentucky Agricultural Experiment Station for the period ending December 31, 2015. This is done in accordance with an act of Congress, approved March 2, 1887, titled "An act to establish Agricultural Experiment Stations, in connection with the Agricultural Colleges established in the several states under the provisions of an act approved July 2, 1862, and under the acts supplementary thereto," and also the act of the Kentucky State Legislature, approved February 20, 1888, accepting the provisions of the act of Congress.

Very respectfully,

A handwritten signature in blue ink that reads "Rick Bennett". The signature is written in a cursive style with a long horizontal flourish extending to the right.

Rick Bennett  
Associate Dean for Research  
Director, Agricultural Experiment Station

Lexington, Kentucky  
November 30, 2016

**Experiment Station–Affiliated Departments and Centers**

Agricultural Economics  
Animal and Food Sciences  
Biosystems and Agricultural Engineering  
Community and Leadership Development  
Dietetics and Human Nutrition  
Entomology  
Family Sciences  
Forestry  
Horticulture  
Kentucky Tobacco Research and Development Center  
Landscape Architecture  
Plant and Soil Sciences  
Plant Pathology  
Regulatory Services  
Retailing and Tourism Management  
Robinson Center for Appalachian Resource Sustainability  
School of Human Environmental Sciences  
UK Ag Equine Programs  
UK Research and Education Center at Princeton  
UK Veterinary Diagnostic Laboratory  
USDA Agricultural Research Service Forage Animal Production Research Unit  
Veterinary Science

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# Purpose of the Kentucky Agricultural Experiment Station

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The University of Kentucky, the state's flagship land-grant institution, is responsible for serving the people of the Commonwealth of Kentucky. The College of Agriculture, with its research, teaching, and extension activities, has developed a structure and organization to provide the mandated land-grant services in agriculture and related areas.

As the research arm of the College of Agriculture, the Kentucky Agricultural Experiment Station has been providing research results to farmers and rural residents for more than 130 years. The continued progress of Kentucky agriculture attests to the benefits of applying new knowledge and technology. College researchers also have successfully addressed problems of agribusiness, consumers, international trade, food processing,

nutrition, community development, soil and water resources, bioenergy, and the environment.

Experiment station research spans both basic and applied sciences. The ability of Kentucky producers to be competitive in domestic and world markets requires an expanded base of knowledge in emerging areas of research applicable to agriculture, food, and natural resources. This annual report lists experiment station research projects and publications completed during 2015. The research programs of the Kentucky Agricultural Experiment Station have benefited Kentucky's agriculture over the past century, and the results of present and future research will continue to serve Kentucky's primary industry.

## Statewide Research

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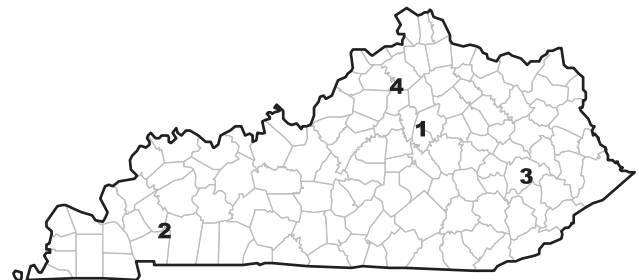
In 2015, research activities of the Kentucky Agricultural Experiment Station were conducted at Lexington, Princeton, Quicksand, and Owenton and in counties throughout the state. Efforts are constantly made to ensure that the research studies have application to the problems of all Kentucky farmers and other clientele groups. Locations of the experimental facilities provide conditions representative of most sections of the state.

### Map Position 1

- **Campus**—Laboratories and specialized equipment for all research program areas
- **Coldstream—Maine Chance—Spindletop Farms**—Dairy cattle, poultry, and horses; forages and grain crops, tobacco, hemp, and turf
- **Horticulture Research Farm**—Fruits, vegetables, and ornamentals, including organic production
- **UK Animal Research Center** (Woodford County)—Purchased in late 1991 as a location for development of state-of-the-art food animal (beef cattle, sheep, and swine) research programs

### Map Position 2

- The **Research and Education Center** facilities and the **West Kentucky Substation Farm** (Caldwell County) are devoted to research on grain crops, beef cattle, fruits, ornamentals and vegetables, forages, and tobacco.



### Map Position 3

- At Quicksand (Breathitt County), the **Robinson Center for Appalachian Resource Sustainability** is the location of research on fruits and vegetables, ornamentals, forages, grain crops, tobacco, and wood utilization. Quicksand is also the headquarters of **Robinson Forest**, which spreads over parts of Breathitt, Perry, and Knott counties and is the site of forestry and watershed management research.

### Map Position 4

- At the **Eden Shale Farm** (Owen County near Owenton), run as a public-private partnership with the Kentucky Cattleman's Association, demonstration studies are conducted on beef management.

## Kentucky Tobacco Research and Development Center

The mission of the Kentucky Tobacco Research and Development Center (KTRDC) is to utilize plant-based technologies to benefit Kentucky Agriculture. The focus is on the use of science, including molecular biology, genomics, plant genetic engineering, plant breeding/field research, and other advanced technologies to improve agriculture. The program focuses on applied research in support of Kentucky tobacco production, the enhancement of tobacco and other *Nicotiana* species as a production system for plant-based products (including pharmaceuticals and industrial materials), and for discovering new plant natural products having potential for commercialization. This also includes significant resources devoted to research on industrial hemp including variety evaluation and production research. KTRDC facilities include field plots, laboratories, greenhouses, and contained growth facilities for plant breeding, plant analysis, disease screening and genetic engineering research. The goal is to utilize these resources to preserve and strengthen agriculture in Kentucky and, in particular, tobacco agriculture.

### Research Program

The KTRDC research program is comprised of six in-house research programs and eight non-KTRDC research programs that receive some KTRDC support. Additional research funding is provided through the "Summit Grant" program. This is a competitive grants program which encourages/supports research collaborations. In 2015, twelve new research collaborations were funded. Within KTRDC, staff has expertise in plant breeding, the development of molecular markers, applied field research, plant genomics, plant genetic engineering, and tobacco analytical research. For 2015, KTRDC supported 45 research projects/programs. Progress reports and research results for each of these projects can be found in the KTRDC annual report for 2014-2015.

There has been noteworthy progress in areas ranging from the development of new molecular markers to support tobacco breeding, to the addition of new reference tobacco products as part of our cooperative agreement with the Food and Drug Administration. In 2015 this cooperative agreement received second year funding totaling \$3.3 million. With significant progress being made, a second cooperative agreement was recently awarded, bringing the total expected funding from the FDA for the program to \$15.3 million between 2014 through 2021. KTRDC research includes non-tobacco projects as well, and of particular interest are several projects focusing on industrial hemp. Much of the current research on industrial hemp at the University of Kentucky is being undertaken utilizing KTRDC facilities, equipment, and resources. Although Kentucky has grown industrial hemp in the past, the collection of seed and the evaluation of varieties and production practices is necessary for this new crop opportunity to expand. KTRDC scientists are also beginning to explore using biotechnology to make modern improvements to this old Kentucky crop. The KTRDC analytical laboratory has added expertise to conduct THC analyses; these will be required to ensure that the industrial hemp varieties

grown for research purposes meet federally mandated regulations, and also to support our industrial hemp researchers.

### Research Activities

#### KTRDC Projects

- Development of recombinant inbred lines (rils) population to identify molecular markers in marker-assisted selection (mas) for tobacco breeding.
- Production and development of high converter burley tobacco seed.
- KTRDC Analytical Laboratory: Analyzed 5,860 tobacco samples and 1,866 fescue forage and seed samples. The analytical lab analyzed samples for numerous research projects, including support for the Minimum Standards Program based on the Regional Quality Trials done at eight locations in four states. The group also participated in an international collaborative study on the determination of B[a]P in tobacco and smokeless products and an international collaborative study on the stability of smokeless reference products and methods.
- Tobacco surface chemistry: engineering of glandular trichome secretion.
- Gene discovery: Designed and implemented a program using Next Generation DNA sequencing to screen thousands of tobacco plants treated with fast neutron radiation for gene mutations. Produced a set of tobacco lines that flower very early due to the expression of FT gene homologs from rice, tomato, *Nicotiana sylvestris* and *Nicotiana benthamiana*.
- Production and development of high converter dark tobacco seed.
- The effect of several natural products on the reduction of black shank disease in tobacco greenhouse conditions.
- Cytokinin regulation of tobacco growth.
- Evaluation of three seeding methods for industrial hemp when producing hemp as a fiber crop.
- Evaluating the performance of a novel, interspecific nicotiana hybrid as a source of nectar for foraging honey bees.

#### Faculty Research Support

- Placing Transgenic Agronomic Traits under the Control of 'Gene Switch' Technology to Facilitate Phenotype Containment.
- The Potential of Tobacco Phyloplanins and Zn-Nanoparticles as Chemical Fungicide Alternatives.

#### Summit and Externally Funded Projects

- Alkaloid and TSNA Stereo Isomers in Low Converter, High Converter, Demethylase Mutants and Transgenics.
- Evaluation of NNK Extraction Methods.
- Develop a Greenhouse Screening for Resistance to Fusarium Wilt in Tobacco.
- Purification of Nicotine from Concentrated Extracts of Green Tobacco and Dried Tobacco Lamina: A Comparison.
- On Farm Production of a Purified Nicotine Concentrate from Green Tobacco.

- Determination of Optimal Storage Conditions of Reference Cigarettes.
- In vitro Antimicrobial Effects of Quercetin on Tobacco Pathogens.
- Controlling Endophyte Colonization to Reduce TSNA in Tobacco Leaves.
- Development of Tobacco Plants with Ultralow Alkaloid Content by Targeted Mutation of Structural Genes Involving Nicotine Biosynthesis.
- Establish Sample Size for Testing TSNA in Farmer Bales.
- Tobacco Response to Burndown Herbicides at Various Pre-transplant Intervals.
- Reduction of Heavy Metals in Tobacco by Genome Editing Technology.
- Evaluation and Control of Ground Sucker Formation in Burley Tobacco Varieties.
- Addition of Blue Mold Resistance to KTTII Burley Tobacco Varieties.
- Evaluation of the Efficacy of HP400 in Reducing TSNA.
- The Effects of Pre-Harvest Quercetin Application on the Accumulation of Tobacco-Specific Nitrosamines.
- Investigation of *R. glabra* (smooth sumac) as a New Agronomic Crop for Kentucky Farmers.
- The Effects of Cytokinin Application on the Accumulation of Tobacco-Specific Nitrosamines.
- Development of Gene-Specific Codominant Molecular Markers for Nic1.
- The Effect of Genetically Reduced Alkaloids on TSNA Accumulation.
- Accumulation of Benzo- $\alpha$ -Pyrene and TSNA during Fire-Curing.
- The Effect on TSNA of Stick Spacing in the Barn.
- Sample Preparation for TSNA Analysis.
- Development of Gene-Specific Codominant Molecular Markers for Nic2.
- The DNA Sequence of the Burley Tobacco Genome.
- Engineering Floricultural Crops for Resistance to Tomato Spotted Wilt Virus.
- Varieties and Production Practices to Maximize Nicotine to Be Utilized in Emerging Tobacco Products.
- Evaluation of Six Varieties of Hemp for Dual Purpose: Both Grain and Fiber Production.
- Chemical Analysis of Burley Tobacco from Cooperative Research among Universities.
- Fiber Evaluation of Industrial Hemp and Kenaf.
- Proficiency Testing Program and Certification of 1R6F Reference Cigarettes: Second year of a five year cooperative agreement awarded from the FDA related to the development of science under the FSPTCA. The second year budget of \$3.4 million completed the production and characterization of a new reference tobacco product. The pilot round of a laboratory proficiency testing program was accomplished working with statistical and bioinformatics personnel from UK's Markey Cancer Center. Hosted an FDA supported workshop as part of the Tobacco Science Research Conference in Naples, FL. This was part of the successful launch of a laboratory proficiency testing program.
- 2015 Industrial Hemp Grain Variety Trial.
- Effects of Constitutive Over-Expression of FT Gene Homologs from Diverse Angiosperm Species on Flowering in Tobacco.

## Regulatory Services

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The Division of Regulatory Services is committed to consumer protection and service to Kentucky citizens, businesses, and industries. Our regulatory programs monitor and analyze feed, fertilizer, milk and seed products, and our milk, seed and soil service programs are all administered using a cooperative, science-based approach.

The division administers four state laws pertaining to ingredients, manufacturing, processing, labeling, and marketing of feed, fertilizer, seed and raw milk. Our primary objectives are to protect consumers of these products from poor-quality, mislabeled, or misrepresented products, and to protect businesses marketing these products from unfair competition.

Feed, fertilizer, and seed are monitored from ingredients through manufacturing and retail channels for compliance. Label review and product and facility inspections as well as product sampling by our inspectors and analysis in our laboratories are important steps in this process. Raw milk is monitored during marketing to (1) ensure accurate and equitable exchange between dairy producers and processors; and (2) ensure integrity of milk from farm to processor.

Eight regulatory inspectors and one auditor cover the state collecting samples, inspecting facilities, reviewing labels, and auditing records. Audits of sales and fee payments are conducted

on feed, fertilizer, seed, and milk firms in Kentucky to verify reports, records, and fee payments. One additional inspector is dedicated to the milk program for auditing payment records and monitoring activities of sampler-weighers, handlers, lab personnel, and lab facilities.

The activities in the division are performed by a dedicated and professional staff that conduct laboratory analyses, provide administrative and computer support, process data, and compile reports in addition to various other duties necessary to carry out and administer effective programs.

### Feed Regulatory Program

The feed regulatory program provides consumer protection for livestock feed and pet food according to provisions of the Kentucky Commercial Feed Law. The program ensures safety, suitability, and quality of animal feed in producing meat, milk, and eggs for human consumption and products for companion animals. The program provides standards of quality, safety, efficacy, and labeling for feed products. A statewide inspection, sampling, and laboratory analysis program monitors feed ingredients and feed products. Feed labels are evaluated to identify purpose of feed, guaranteed composition, ingredient list, feeding directions, and the need for any warning or caution statements.



The feed program participates in food safety efforts that promote consumer confidence in the nation's food supply. We work cooperatively with the U.S. Food and Drug Administration (FDA) in assessing compliance with the ruminant-to-ruminant feeding ban to prevent any establishment or amplification of bovine spongiform encephalopathy (BSE or "mad cow disease"). We are also participating in the Animal Feed Regulatory Program Standards (AFRPS) initiative, a joint effort by the American Association of Feed Control Officials (AAFCO) and the FDA to help build a more robust integrated food safety system by concentrating on regulation of animal feed production.

### *Highlights*

- Performed 1,268 official inspections at Kentucky feed manufacturers and dealers.
- Collected 3,056 official (with guarantees) and 213 unofficial samples that resulted in 23,500 total lab analyses.
- Samples collected included 1,325 pet food samples for analysis.
- Under our contract with FDA for the 2014–2015 fiscal year, inspectors will conduct a total of 79 inspections for compliance with the ruminant-to-ruminant feed ban, including 28 inspections of medicated feed mills for compliance with current good manufacturing practices.
- At the end of 2015, there were 23,880 feed products registered for sale in Kentucky with 4,040 of these products approved in 2015.
- Analyzed and reported 48 feed samples from quality control programs.
- Used 45 different approved analytical methods in providing results.
- Income from inspection fees and product registration received during the period of July 1, 2014, to June 30, 2015, was \$1,264,130.78. Inspection fees are assessed at \$0.35/ton, and annual registration of \$50.00 is collected for products sold exclusively in 10-pound or smaller packages.

### **Fertilizer Regulatory Program**

The fertilizer regulatory program ensures Kentucky farmers and urban consumers of quality fertilizer while promoting fair and equitable competition among fertilizer manufacturers and dealers through inspection and analysis of products found in the marketplace. The division, which administers and implements the Kentucky Fertilizer Law, promotes compliance through facility inspections, sampling, and analysis of fertilizer offered for sale. The law requires proper labeling of fertilizer, including the grade and guaranteed analysis of nutrients. The division is also responsible for maintaining registration of fertilizer products.

### *Highlights*

- Conducted 1,085 visits to perform inspections and to sample agricultural, lawn, turf, and garden fertilizer at Kentucky processing, wholesale, and retail locations.
- Administered actions on 2,655 official and 13 unofficial samples of fertilizer involving more than 7,077 chemical tests.
- The official samples represented about 53,898 tons of the approximately 928,081 tons of fertilizer distributed in Kentucky during 2015, or about 5.80 percent.

- Reviewed labels and registered over 4,600 products from 474 firms and issued licenses to 198 companies that manufactured custom-blended fertilizers.
- Analyzed laboratory check sample materials from Magruder®, UAN, AFPC phosphate rock, AFPC phosphate, and AFPC specials for the fertilizer regulatory program.
- Provided support for 15 different analytical methods that yield results for 28 analytes and contaminants.
- Substantiated cash receivables from fertilizer reports. The income from registration fees, inspection fees, and licenses received from July 1, 2014, to June 30, 2015, was \$723,896. Fertilizer products are assessed an inspection fee of 50 cents/ton.

### **Milk Regulatory Program**

The mission of the milk regulatory program is to ensure that farm milk produced and marketed in Kentucky is bought and sold using accurate weights and tests. The program's primary function is to monitor milk handling systems from the time a producer's milk is sampled and weighed, through delivery and laboratory testing, until producer payments are calculated. The program provides support to the producers and processors of Kentucky's dairy industry. Industry participants are trained, licensed, and subsequently monitored to maintain compliance with the law.

In addition to regulatory functions, the milk program cooperates with other agencies in educational projects to provide a variety of services to Kentucky dairy producers, processors, and allied industries. The milk program also operates a laboratory that is available for Kentucky producer, processor, and handler service testing.

### *Highlights*

- Reviewed applications and issued licenses to 1 transfer station, 21 milk handlers, 16 laboratories, 72 technicians, and 313 sampler-weighers (milk-haulers, receivers, and samplers).
- Collaborated with Kentucky Cabinet for Health Services Milk Safety Branch to train sampler-weighers and processor receiving personnel. Trained and examined 26 new sampler-weighers and 7 new technicians.
- Conducted 8 pay-record and 9 raw milk receiving audits.
- Conducted 34 milk laboratory inspections.
- Conducted 347 sampler-weigher inspections and analyzed milk samples from 2,242 dairy herds to evaluate sampler-weigher performance and ensure accurate producer payments.
- Administered a monthly milk lab quality control check sample program through the distribution of samples to the 16 licensed laboratories and 2 other labs to ensure accurate component-analysis procedures.
- Analyzed 96 samples for university research projects pertaining to dairy cattle management and feeding practices effects on milk composition.
- Analyzed 105 samples for Kentucky small processor cheese makers.
- Analyzed milk samples from 71 cows in conjunction with cattle judging at North American International Livestock Exposition in Louisville.
- The income from fees and licenses received from July 1, 2014, to June 30, 2015, was \$170,638.60. Milk handlers and

producers are assessed at the rate of one-half cent (\$0.005) per hundredweight of milk.

### Seed Regulatory Program

The seed regulatory program ensures Kentucky farmers and urban consumers of quality seed while promoting fair and equitable competition among seed dealers and labelers through inspection and analysis of products found in the marketplace. The division, which administers and implements the Kentucky Seed Law, promotes compliance through facility inspections, sampling, and analysis of seed offered for sale. The law requires proper labeling of seed, including kind, variety, and lot designation, purity percentages, noxious weeds, origin, test date, and germination guarantee. The division is also responsible for maintaining registration of seed labelers, seed conditioners, and seed dealers in the state.

#### Highlights

- Conducted 1,120 visits to perform inspections and to sample agricultural, lawn, turf, and garden seeds at Kentucky seed processing, wholesale, and retail locations.
- Collected and tested 1,799 official seed samples.
- Issued stop-sale orders on 188 official seed samples and 255 violative seed lots at seed dealer and seed processor locations.
- Cooperated with the USDA Seed Branch regarding shipments of seed into the state that were in violation of the Federal Seed Act.
- Reviewed and issued 233 permits to label agricultural seed and 62 permits to label vegetable and flower seed.
- Registered 631 seed dealers and 35 non-certified custom seed conditioners.
- Provided training to firms on labeling requirements, retail sales procedures, stop-sale release procedures, and record keeping requirements.
- Substantiated cash receivables from seed reports. The income from fees, permits, and licenses received from July 1, 2014, to Jun 30, 2015, was \$549,664. Seed products are assessed at 8 to 24 cents per unit.

### Seed Testing Laboratory

The division maintains the only certified seed testing facility in Kentucky. This facility handles all official samples collected by inspectors and provides service testing for seed producers, dealers, retailers, research projects, and homeowners for a fee. More than 90 percent of the service samples accepted into the laboratory were submitted by Kentucky firms or individuals.

The laboratory analyzes seed for purity, identifies weed and crop seed, conducts germination, counts seed, determines test weight, performs accelerated aging, conducts fluorescence testing on ryegrass, determines moisture content, conducts tetrazolium analysis, assesses herbicide tolerance, determines presence of endophyte, and conducts many other analyses. Our analysts keep abreast of changes through participation in regional and national referee testing with the Association of Official Seed Analysts (AOSA) and the USDA Federal Seed Laboratory and by attending special scheduled and regular workshops at the AOSA annual meeting.

#### Highlights

- Analyzed 3,351 service samples.
- Collaborated with researchers to analyze 61 seed samples.
- Supported the equine and livestock pasture management programs in analyzing 174 plant samples for endophytes.
- Analyzed 39 seed samples under the provision that allows one free sample for testing each year from Kentucky residents.
- Participated in the testing of 16 referee samples in conjunction with AOSA.
- Income derived from service samples from July 1, 2014, to June 30, 2015, was \$60,590.

### Soil Testing Laboratory

Soil testing provides farmers, homeowners, greenhouse operators, and others with scientific information about the fertility status of their soils or greenhouse media. In partnership with the Cooperative Extension Service, the lab also provides lime and fertilizer recommendations based on laboratory results. We also offer analyses of animal wastes, nutrient solutions, and special research solutions. The program received \$248,000 in income for service testing during the period July 1, 2014, to June 30, 2015.

The soil test website is located at [soils.rs.uky.edu](http://soils.rs.uky.edu). The number of samples analyzed in 2015 and the percent change from 2014 is shown below.

Type	Number	% Change
Agriculture	30,968	-3
Home lawn and garden	8,361	-9
Commercial horticulture	827	1
Greenhouse media	93	111
Research	6,028	-14
Atrazine residue in soil	6	-14
Animal waste	271	-45
Nutrient solution	72	1
Soil nitrate	99	29
TOTAL	46,725	-6

## Robinson Center for Appalachian Resource Sustainability

At **Quicksand** (*Breathitt County*), the Robinson Center for Appalachian Resource Sustainability (RCARS) is the east region location for research on fruits and vegetables, ornamentals, livestock forage and grazing systems, grain crops, bio-mass crops, tobacco, and wood utilization. The Robinson Center is also the administrative headquarters of the Robinson Forest, which spreads over parts of Breathitt, Perry, and Knott counties

and is the site of forestry, wildlife, surface mine reclamation and watershed management research.

Established in 1925, the Robinson Center for Appalachian Resource Sustainability has the budgetary and physical responsibility for managing the research facilities at Quicksand, the Wood Utilization Center, and Robinson Forest. The mission of this unit is to increase the long-term value added, sustainable

income, and sustainable flow of economic, ecological, and social goods and services from the lands, natural resources, and people of Eastern Kentucky and the Appalachian Region.

## **Research Activities: Robinson Center (Quicksand)**

### *Plant and Soil Sciences*

- The RCARS is the east region location for the livestock forage variety testing program. Results from orchardgrass, tall fescue, and alfalfa trials are published annually in the Forage Variety Trial progress reports.
- Conducted beef cattle grazing and wildlife research project in conjunction with the University of Tennessee's Native Plant Center titled, Restoring Imperiled Grassland Wildlife through Grazing Innovation in the Eastern United States.

### *Plant Pathology*

- Conducted an in-furrow starter fertilizer enhancer trial. Various organic and microbial additives were tested to evaluate their effectiveness in both soybean and corn production.

### *Horticulture*

#### **Vegetable Crops**

##### ***Annual rhubarb production***

- Production of rhubarb in an annual system may be more profitable and have more consistent success as Kentucky is at the southern edge of rhubarb production. Rhubarb is often mentioned as one of the most profitable crops by growers. An annual system of rhubarb production is showing promise, but further refinement of the system is needed.

##### ***Sweet potato fertilization trial***

- A fertilizer trial for sweet potato production showed no statistical differences as the excessive rain leached out the fertilizer. There continues to be interest in sweet potato production so there will be a repeat trial again in 2017.

##### ***Fall fresh market cabbage variety trial***

- The cabbage trial in the fall was very educational in that it demonstrated that good yields of high quality cabbage can be grown that time of year. Over 4,000 pounds of cabbage from less than one-third of an acre was harvested. Twenty-five varieties of cabbage, two Chinese cabbage varieties (Emiko and Mirako), three red varieties (Azzuro, Cairo, and Primero) and 20 varieties of green (Bajonet, Bennili, Blue Lagoon, Bravo, Bronco, Capture, Caraflex, Celebrate, Charmant, Checkmate, Deuce, Early Thunder, Escazu, Expot, Gonzales, Leopold, Maddox, Quickstart, Stonehead, and Tendersweet). Unfortunately, due to wildlife pressure there was too much variation in the stand count to get consistent plot results. Stand counts ranged from 45 to 100 percent. Any varietal differences disappeared. As expected, the Chinese cabbages were most tolerant of heat at transplanting but also most susceptible to disease. Charmant was one not grown before but would highly recommend based on having the best flavor.

##### ***Green Bean Trellising Project***

- Continued to modify the green bean trellis system to increase production and profitability. Varieties grown were brown greasy selection (BG), two white greasy selections (Greasy

A and Greasy B), Volunteer Half Runner (VHR), 2 cut short selections (CSA and CSB), and a large rattlesnake bean selection. While yields of the heirloom type are shorter than for the Volunteer Half Runner, the price premium that can be received may minimize any differences. Plans are to look more closely at this trellis system in the future.

##### ***Pumpkin production***

- Over one third of an acre of mixed varieties of pumpkins were grown to demonstrate the production of pumpkins on plastic, a method not commonly used in eastern Kentucky, as well as to provide pumpkins for the UK Arboretum's Fall Pumpkin Project.

##### ***Fruit Crops***

###### ***Strawberries***

- About one thousand strawberry plugs were planted at the Quicksand Station as part of a plasticulture demonstration. This demonstration will establish the effect that bed construction can have on strawberry production because many growers think that a vegetable bedder is sufficient. The Rain-Flo, the Kenco, and the Mechanical Transplanter were utilized. The Rain-Flo is the favorite as it has frequently been used and is easy to adjust. The Kenco puts up a higher, wider bed. Two growers are doing small (250 plugs) trials of plasticulture strawberry in Fleming and Clay counties and one grower is doing high tunnel strawberries in Morgan County. The Kentucky Strawberry Association meetings are growing in attendance with more attendance from plasticulture growers than from matted row growers.

###### ***Raspberries***

- Evaluation of the primocane bearing black raspberry, Niwot, was completed. It is acceptable for floricanes production but not for primocane production as it is disease susceptible and prone to attack by the spotted wing drosophila late in the season.

###### ***Tree fruit***

- An orchard of apples, pears, and peaches is maintained at the Quicksand station. The apples and pears are used for scion wood for the extension agents in eastern Kentucky. We do not keep them for fruit production so minimal spraying is done to maintain tree health.

###### ***Other***

###### ***Filbert production***

- This is an ongoing evaluation of American-European hybrids to determine the viability and productivity of these selections in eastern Kentucky. More than six pounds of nuts were produced from the plot, but there were no kernels in the nuts. This is probably related to excessive rainfall at pollination. Based on this, an agreement with Thomas Molnar at Rutgers University was formed to expand our evaluation to include his material from his breeding work as well.

###### ***Hops production***

- Hops are one of the most rapidly expanding specialty crops in the Midwest. This trial is a continuation of one that was planted in 2011 but will be moved to a new location on the station in 2016.



### **Organic High Tunnel**

- A project funded by the Kentucky Natural Resource Conservation Service (with a cost-share component from the NGO Grow Appalachia) was conducted. The project was a demonstration of organic high tunnel production of tomato and fall greens for Eastern Kentucky climates. Included in the demonstration was rainwater catchment and solar powered irrigation utilizing ultra-low pressure drip irrigation systems.

## **Research Activities: Robinson Forest**

### **Entomology**

- Research continues on the effects of the highly invasive hemlock woolly adelgid. Permanent plots have been created to monitor the establishment and proliferation of the hemlock woolly adelgid in hemlock-dominated forests of Kentucky.
- A common garden of six hemlock species of varying geographic origin is being used to evaluate hemlock woolly adelgid behavior ecology, including potential species-specific differences in host suitability and physiological effect of adelgid colonization.
- Trapping of insects in an attempt to describe new species of brachonid wasps. In addition, as part of a larger statewide survey, specimens collected will be used to further develop methodology to determine insect biodiversity at a locality.

### **Biosystems and Engineering**

- The Guy Cove Restoration Project: Restoring a Headwater Stream on a Valley Fill. A project, in cooperation with the Kentucky Department of Fish and Wildlife, to restore a stream buried due to coal mining activities in a valley fill. Three fourths of a mile of stream was recreated and 30,000 trees planted; monitoring of hydrology, water chemistry, macroinvertebrates, and vegetation.

### **Geography**

- Study being conducted in an attempt to characterize how the soil microbial community associated with a standing tree changes over time following a tree fall.

### **Forestry**

- Evaluating the effect of canopy structure and openness on Plethodontid salamander species abundance and richness.
- Effects of mountaintop removal mining on population dynamics of stream salamander populations. Using data from 2013 to present, evaluation of population parameters such as extinction rates will provide information regarding the stability of salamander populations.
- Are elk vectors of invasive plant species? This study seeks to determine if elk through herbivory are vectors of invasive plant species.
- Restoring forest wildlife habitat on reclaimed mined lands. This project will re-establish a hardwood forest by decompacting mine spoil and removal of invasive species to improve cerulean warbler habitat.
- Spatial ecology and den use by the northern copperhead and eastern timber rattlesnake in mining associated habitat in cen-

tral Appalachia forest. Transmitters were implanted in over 20 timber rattlesnakes and a dozen northern copperheads in efforts to track their movement and understand basic spatial ecology patterns (home range).

- Effects of regeneration, opening size, and simulated crop tree release on volume yields and economic value in oak-dominated stands.
- Effect of timber harvest on invasive species colonization relative to disturbance, site, and soil conditions.
- Resource selection, survival, and cause-specific mortality of cow elk and bull elk in southeast Kentucky. Radio-collared cow and bull elk are studied to determine dominance behavior and hierarchies that may influence disease transmission. The project is now entering the analytical phase.
- Effects of timber harvest on breeding bird communities in a mixed mesophytic forest. Currently in the analytical phase of this experiment.
- Factors controlling carbon distribution on reforested mine-lands and regenerating clear cuts in Appalachia.
- Evaluating best management practices for ephemeral channel protection following forest harvest in the Cumberland Plateau. This study provides information on the effect of best management practices and harvest operations on hydrologic variables associated with surface flows in ephemeral channels.
- Effects of riparian zone width and disturbance on water quality and stream communities following forest harvest in eastern Kentucky watersheds. This study evaluates three Streamside Management Zone options and related Best Management Practices on water quality and quantity of headwater streams on the Cumberland Plateau.
- Development and deployment of a bioreactor for the removal of sulfate and manganese from circumneutral coal mine drainage. This study restored a headwater stream system located on the University of Kentucky's Robinson Forest. This project is intended to provide mitigation for headwater stream loss in eastern Kentucky, specifically in the Kentucky River watershed. The major goals of the headwater restoration project are: replace lost stream in both form and function; improve water quality; and restore watershed function.
- Evaluating reforestation success on a surface mine in eastern Kentucky.
- Evaluating the use of light detection and ranging (LiDAR) information to improve forest management decisions.
- Long-term hydrologic monitoring of Cumberland Plateau headwater streams at Robinson Forest. Water quality and hydrologic response of headwater streams at Robinson Forest are under continuous monitoring and used to establish baseline data for forested watersheds on the Cumberland Plateau in eastern Kentucky.
- The effect of size of opening and cultural treatment on reproduction in oak-hickory in Eastern Kentucky. This study provides a detailed look at group opening dynamics developed to provide practitioners with options to successfully regenerate hardwood species in the Central Hardwood Forest.
- Crop tree release of small sawtimber white oak (*Quercus alba*) on the Cumberland Plateau. This study was designed to look at the long-term development of small white oak crop trees

to crown touching release. Attributes associated with both wildlife and timber production are being assessed.

- Development of rapid assessment models for measuring stream function using the hydrogeomorphic (HGM) approach to ecosystem assessment. This project uses perennial streams within Robinson Forest in an effort to develop an ecosystem functional assessment method to apply to streams within the Appalachian region.

#### *Eastern Kentucky University*

- Morphological divergence in *Etheostoma spilotum* Gilbert (Kentucky arrow darter) along a stream gradient with known barriers, both natural and anthropogenic. This study addresses whether barriers play a role in morphological and genetic divergence through field surveys on Clemons Fork. The study compares the Kentucky arrow darter's morphology across the stream gradient of Clemons Fork, as well as between barriers in the stream. In addition, pectoral fin clips are used to identify genetic divergence.

#### *U.S. Environmental Protection Agency*

- Characterizing macroinvertebrate drift and organic matter transport in headwater streams.
- Investigating macroinvertebrate assemblages in unmined and mined streams as they relate to tributary connections where tributaries supply invertebrates to receiving streams via drift.
- Morphological divergence in *Etheostoma spilotum* Gilbert (Kentucky arrow darter) along a stream gradient with known barriers, both natural and anthropogenic.

#### *U.S. Army Corps of Engineers*

- Development of rapid assessment models for measuring stream function using the Hydrogeomorphic (HGM) approach to ecosystem assessment. This project uses perennial streams within Robinson Forest in an effort to develop an ecosystem functional assessment method to apply to streams within the Appalachian region.

#### *U.S. Fish and Wildlife*

- Population Estimation and Microhabitat Characterization of *Etheostoma spilotum* Gilbert (Kentucky arrow darter) in Clemons Fork, Breathitt County, Kentucky. This study estimates KAD's current population size and average density within Clemons Fork, and it compares current densities with historic data. In addition, population densities and habitat parameters will be compared to data from other ongoing studies in local Kentucky River streams to aid in delineation of essential habitat.

#### *Kentucky Department of Fish and Wildlife*

- A breeding orchard established in collaboration with the American Chestnut Foundation to plant BC3 hybrid chestnuts to be used in a blight resistance breeding program.
- Regional Mast Survey as an observational survey to assess hard mast producing species and the percent of their crowns bearing mast. This survey is part of a much larger regional project to assess mast production for the state.

#### *Extension Activities*

- Center for Wood and Forest Certification. The Center encompasses a network of partners necessary for achieving success in sustainable development of certified forests and wood.
- University of Kentucky's Department of Forestry at the Robinson Center partners with the Kentucky Division of Forestry in creating and maintaining a Wood Industries Directory of all the wood product companies in the state.
- UK Wood Utilization Center Entrepreneur Development Program. Entrepreneurs are currently participating in this program to develop new wood products businesses.
- Win with Wood Youth Event. October.
- Master Logger Program conducted. November.
- Military Family Early Childhood Adventure at Robinson Forest. June.
- Participated in Grow Appalachia/Grow Breathitt County. A collaborative endeavor with the Breathitt County Cooperative Extension Service and Robinson Center to encourage and teach gardening.
- Mountain Monday Series. Monthly extension programs on a variety of topics are held at RCARS the second Monday of the month.
- 4-H Natural Resource and Environmental Sciences Academy. A three-year program for seventh and eighth graders based on their academic achievements and teacher recommendations. Students study water, forestry, and wildlife resources at the Robinson Forest.
- Manage farmer's market.
- Participated in the Kentucky Wood Expo regional wood products show. The 2015 show was held in Lexington on September 17 and 18, and 3,500 visitors attended the show. UK forestry extension provided staff for eight days from September 14 through September 21 for organizing and facilitation, setup, and teardown.
- SOAR—Analysis of the forest industry's potential in Eastern Kentucky.

#### *Teaching Activities Conducted at Robinson Forest*

##### **Courses**

- NRE 320—Natural Resource and Environmental Analysis
- FOR-356—Landscape Assessment
- ENEC 698—Environmental Science Senior Capstone (UNC-Chapel Hill). Barton co-taught course, and a week-long field study trip was conducted at Robinson Forest.

##### **Events and Workshops**

- Joint conference of the American Society of Mining and Reclamation (32nd annual) and the Appalachian Regional Reforestation Initiative (9th annual) held in Lexington June 7–11. More than 200 in attendance. Included a day-long field tour of Robinson Forest and Eastern Kentucky surface mines for 110 participants.
- Council on Forest Engineering (38th annual) held in Lexington July 19–22. Included a field tour of eastern Kentucky for approximately 75 participants.

## UK Ag Equine Programs

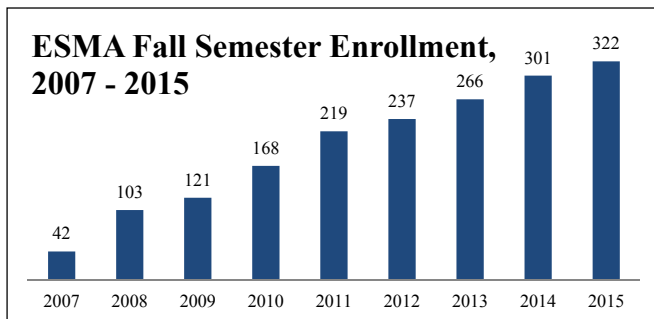
UK Ag Equine Programs is an interdisciplinary program encompassing all three areas of the land-grant mission: teaching, research, and outreach. A brief review of 2015 activities in each area follows.

### Leadership and Organization

A draft five-year strategic plan was completed by the end of 2015. The organization will be enhancing the five main goals and publishing a final version during the spring of 2016.

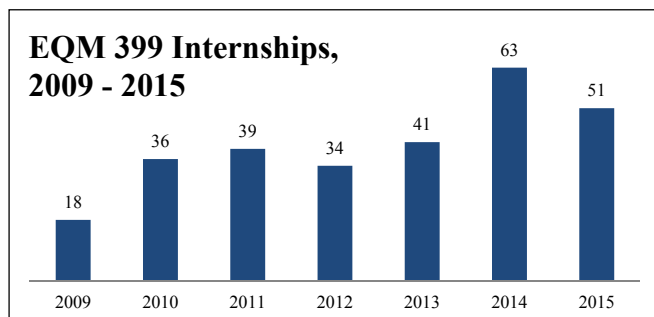
### Teaching

The Equine Science and Management (ESMA) undergraduate degree was officially instituted in 2009, but even before that, 42 students were enrolled in "Individualized Studies," pending official approval of the program. In fall 2015, enrollment had climbed to 322 students. About 26 percent of these students are in-state. Out-of-state students are represented by 39 different states and the District of Columbia, and seven international students are enrolled. Females account for 87 percent of students currently enrolled. The following graph shows the continued rapid growth in enrollment:



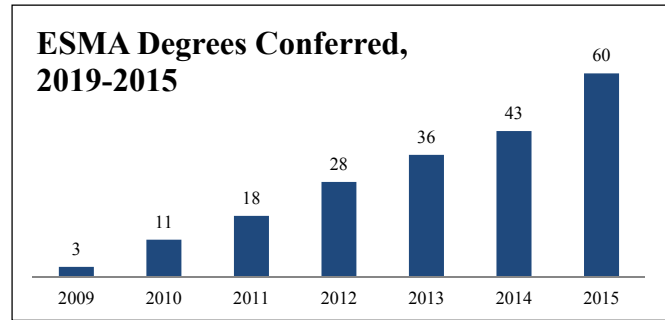
### Internship Program

ESMA students completed 51 internships in 2015. Of the 2015 internships, 43 were in Kentucky, 6 were out-of-state, and 1 was international (Peru).



### Alumni

The ESMA program has conferred degrees to 199 graduates to date. Number of degrees conferred by calendar year is illustrated in the following chart:



In exit surveys conducted with these graduates, 70 percent of respondents indicated that they were currently employed in equine industry, 20 percent were pursuing further training, and 10 percent were employed outside industry. The response rate was 77 percent.

### Research

Currently, 20 EP affiliates, along with their approximately 40 graduate students, are involved in equine-related research within the UK Ag Equine Programs. Areas of research represented within the UK Ag Equine Programs include:

- Economics
- Entomology
- Environmental stewardship
- Genetics and genomics
- Horse-human connection
- Immunology
- Infectious diseases
- Musculoskeletal science
- Nutrition
- Parasitology
- Pasture management
- Reproductive health

### Outreach

UK Ag Equine Programs offers a rich set of outreach programs, including both adult and youth extension programming as well as a variety of other programs.

#### Adult Extension Programs

- Horse College attracted 95 participants from 15 counties across the state.
- Farm and Facilities Expo in Fayette County attracted about 220 participants.
- Asbury Draft Horse Field Day, held in partnership with Asbury University and in conjunction with the U.S. Draft Horse Plowing Contest; attracted about 250 participants

#### Youth Extension Programs

The Kentucky 4-H Horse Program delivers educational programs to youth and adult leaders and volunteers across the state. There are 5,000 total youth registered in the Kentucky 4-H Horse Program. Some of the activities include:

- State 4-H Horse Show attracted 750 youth.
- State 4-H Horse Program Contest attracted more than 350 youth.
- Leader Certification Program certified 65 leaders in 2015.

In addition to extension programming, UK's Ag Equine Programs offers a variety of other outreach programs, including:



- Diagnostic Services. UK's Veterinary Diagnostic Laboratory (VDL) performed nearly 13,000 EVA tests, almost 19,000 EIA tests, and nearly 1,500 necropsies. The VDL offers testing and consulting in the following fields:
  - Microbiology
  - Molecular biology
  - Histopathology
  - Clinical pathology
  - Serology/immunology
  - Toxicology
  - Virology
  - Epidemiology
- Department of Veterinary Science Equine Diagnostic and Research Seminar Series consists of monthly seminars attracting internal and external participants; recorded by *The Horse* and made available internationally.
- Horse Pasture Evaluation Program conducted 15 evaluations on 1,300 acres and 3,300 farm acres in seven counties.
- Pastures Please was held in Fayette County and attracted about 130 participants.
- UK Equine Research Showcase and UK Breeders' Short Course attracted about 135 total participants from five states.

### Budget

The Equine Programs operated on \$50,000 in-state funds. These funds support communications, the internship program, academic programs activities, office overhead, the office intern, and director and associate director travel. Those funds are supplemented by \$9,500 in federal funds and \$4,000 TIIF funds. The college contributed over \$250,000 to salaries of EP faculty and staff in 2015.

### Development

The EP budget is supplemented by cash and in-kind gifts. Much of these gifts directly support research efforts. In FY 2015, EP cash gifts totaled \$1,099,636.64. Due to a university-level change in the way that in-kind gifts are reported, the amount of in-kind gifts to EP is unavailable at this time.

### Communications

A dozen equine-related news releases were produced by EP Communications or the College of Agriculture, Food and Environment. In addition, communications support was provided to the 18 EP hosted or attended events.

The program's printed and display materials were updated and a new website was launched. In addition the program remains active on Facebook (pages include Equine Programs, ESMA alumni, horse pasture evaluation and Gluck) and Twitter (Equine Programs and Gluck). UK Ag Equine Programs also has a LinkedIn account it hasn't yet utilized but is exploring.

Two monthly online newsletters are produced within the Equine Programs office, including the *Bluegrass Equine Digest*, with nearly 30,000 subscribers from 50 states and 110 countries and click-through/open rates around 35 percent, consistently the highest of *The Horse's* e-newsletters. The *Bluegrass Equine Digest* was also recognized locally through the Public Relations Society of America Lexington chapter. The *Wildcat Canter*, a student- and program-based e-newsletter, continues to grow and also won awards through the local PRSA chapter. Other equine-related newsletters in the college include *Equine Disease Quarterly*, *Equine Research and Service Report*, and *Board Bits* from the Gluck Center.

An ad was placed in the Kentucky Thoroughbred Farm Managers' Club annual directory.

### Clubs and Teams

Equine clubs and teams continue to be popular. In addition to the Dressage and Eventing Team, UK's Ag Equine Programs offers Equestrian Team (western and hunt seat), Horse Racing Club, Polo Team, Research in Equine and Agricultural Disciplines Club, Rodeo Team (which is now a member of the National Intercollegiate Rodeo Association), and Saddle Seat Team.

## UK Research and Education Center at Princeton

The University of Kentucky Research and Education Center (UKREC) is an integral part of the Kentucky Agricultural Experiment Station and the Kentucky Cooperative Extension Service. The faculty and staff of the UKREC are dedicated to sustaining the long heritage of meaningful impact and achievement by addressing the rapidly changing issues and challenges associated with Kentucky agriculture and rural communities. The center's vision is to be recognized at the local, state, and national level for excellence in agricultural research, education, leadership, and service to the Commonwealth.

Established in 1925, the West Kentucky Substation at Princeton has functioned as a center of agricultural activities in western Kentucky. Great advancements have been made in Kentucky's leading industry—agriculture—with considerable progress being made in improving use and conservation of resources, increasing yields of crops and livestock, better management of capital and labor, expanding markets, and finding solutions for problems facing rural people and communities. Increased returns to Kentucky farmers and livestock producers total mil-

lions of dollars annually just from the use of new production technologies resulting from research findings and educational programs of the College of Agriculture.

The University of Kentucky Research and Education Center is fundamentally interdisciplinary, applying the biological and social sciences to challenges in agricultural, food, and environmental systems. Our scholarship encompasses human and natural resources and their interaction.

As part of the University of Kentucky, the center:

- Facilitates life-long learning, informed by scholarship and research.
- Expands knowledge through creative research and discovery.
- Serves Kentucky communities by disseminating, sharing, and applying knowledge.

The UKREC is the headquarters for more than 50 faculty and staff members representing seven academic departments (Agricultural Economics, Animal and Food Sciences, Biosystems and Agricultural Engineering, Entomology, Horticulture, Plant and Soil Sciences, and Plant Pathology) and three units (Ag

Communications Services, Research and Education Center, and Regulatory Services) in the college. Its faculty and staff conduct research, provide diagnostic testing services, and develop educational programs on topics of concern to Kentucky farmers, livestock producers, agribusinesses, and families.

The UKREC Experiment Station Farm consists of almost 1,300 acres, including soils of both sandstone and limestone origins that are characteristic of soil types throughout the state. Researchers conduct approximately 100 different research/demonstration projects each year at the experiment station farm or on farms in Western Kentucky. Information derived from these projects or research conducted elsewhere is delivered to farmers, livestock producers, and the general public through county offices of the Cooperative Extension Service. Extension specialists located at the center have expertise in a wide variety of food and agriculture topics.

Crops such as corn, wheat, soybeans, tobacco, fruit, vegetables, and ornamentals are studied for ways to increase yields, disease resistance, and profitability and to improve handling and storage, protect the environment, and address other problems farmers may have. Research, demonstrations, and educational programs are also conducted in the areas of beef and swine production. Agricultural engineering specialists conduct research and educational programs related to both crop and livestock production.

Service laboratories located at the center provide information needed to make management decisions in the following areas:

- Soil testing enables farmers to develop nutrient management plans for growing crops.
- The plant disease diagnostic laboratory helps identify plant health problems and provides recommendations for disease prevention and control. Once insect and plant pests are identified, specialists can give advice on integrated pest management strategies to control them.

The following additional learning opportunities and resources are provided through the UKREC:

- The Rottering-Kuegel Agricultural Research and Extension Building is available to large and small groups for classes and meetings in agriculture, home economics, and 4-H. It is also used for a wide variety of meetings by government agencies, industry, and the general public. Each year there are approximately 450 different meetings held in this building, attended by about 14,000 people, many from other states and countries.
- Commodity-specific and joint commodity field days showcase the work of the UKREC and attract about 3,000 people annually. Visitors observe research, educational displays, and demonstrations representing work conducted at the center and throughout the state.
- Individuals and small groups are welcome to visit throughout the year to observe specific projects and talk with specialists.

## Activities

### *Agricultural Economics*

- Completed 2014 Farm Bill education to help farmers with their ARC vs. PLC decision.
- Provided market situation and outlook to help farmers understand market conditions.

- Improved understanding of crop insurance and price risk management tools.

### *Animal and Food Sciences—Beef Cattle*

- Form of selenium on progesterone levels in cycling cows.
- Long-term effects of form of selenium on multigenerational physiological capacity.
- Regulation of controllers of EAAC1 to enable efficient nutrient metabolism.
- Year-round mineral intake in beef cattle.
- Performance of Wagyu or Angus steers in the feedlot.

### *Biosystems and Agricultural Engineering*

- Improving energy efficiency on Kentucky farms.
- Evaluation of a wood pellet heating system for broiler houses.
- Energy assessments for grain and livestock farms.
- Energy assessments for solar PV installations.
- Nationwide study on packing factors for six different grains.
- Providing food security in Nigeria by reducing post-harvest grain losses during storage at the farm and small-holder (warehouse) level.
- Assessment of needed research and extension programs in Ghana to reduce post-harvest grain losses along the value chain.
- Revising the *Midwest Plan Service Handbook on Grain Drying, Handling and Storage*.

### *Entomology*

- Spotted wing drosophila survey in small fruit.
- Survey of exotic insects in soybean, wheat, orchards, and vineyards.
- Using insect pheromone traps to predict outbreaks.

### *Forages*

- Alfalfa variety test.
- Red clover variety test.
- Tall fescue variety test.
- Orchardgrass variety test.

### *Grain Crops*

- Agronomic field trials of soybean lines with a novel gene which increases oil content.
- Applying late-season nitrogen to soybean with pivot irrigation systems in Western Kentucky.
- Barley variety trial.
- Cereal rye variety trial.
- Double-crop soybean trial.
- Evaluating the effect of controlled drainage on soybean yields in Western Kentucky.
- Evaluation of Palisade® plant growth regulator and nitrogen rates on wheat growth and yield.
- Hulled barley variety trial.
- Installation of lateral irrigation systems for grain crops research.
- Oat variety trial.
- Soybean seed company tour.
- Soybean variety trials.



- Triticale variety trial.
- Corn: Product evaluation protocol—The next big thing in corn production.
- Soybean: Product evaluation protocol—The next big thing in soybean production.
- Wheat: Product evaluation protocol—The next big thing in wheat production.
- Evaluation and selection of early generation wheat breeding material.
- Wheat variety trial.
- Wheat variety response to Metribuzin trial.
- Wheat vernalization and plant development trial.
- No-till wheat management.
- Corn variety trial.
- Testing of wheat breeding lines.
- Wheat fusarium head blight nursery.
- Canola variety trial.

### *Horticulture*

#### **Sustainable Nursery/Landscape Research**

- Integrated pest management (IPM) monitoring.
- Drone nursery plant health and pest monitoring.
- Moisture sensor irrigation controller design and evaluation.
- Maintaining water quality and efficient irrigation of nursery crops.
- Landscape plant evaluations.
- Landscape plant establishment based on production container.
- Plant container evaluation for sustainable production.
- Efficient fertilization of nursery crops.
- Kentucky native plant evaluation, production protocols, and use.
- Development and maintenance of Kentucky provenance stock plants.
- Container nursery runoff remediation.

#### **Fruit**

- NC-140 rootstock trials: apple and peach.
- Cultivar trials: peach and blackberry.
- Sweet cherry rootstock observation and UFO training system demonstration trial.
- Small fruit demonstration plots.
- Pecan variety demonstration.
- Blueberry fruit production in aboveground containers with moisture sensor irrigation and fertility monitoring and control.

#### **Vegetables**

- Cole crop vegetable production variety trials: cauliflower and Brussels sprouts.

#### **Manure Management and Use**

- Evaluation of an automated “compost-a-matic” system for composting manure from a swine wean-to-finish operation.
- Evaluation of composting of separated swine manure solids with wood chips.
- Evaluation of an under-slat scrapper system for removing solid manure from a swine wean-to-finish facility.

- The use of gypsum and/or poultry litter to increase rooting depths in fragipan soils.
- Poultry litter, biosolids, and composted swine manure used for winter wheat and corn production (cooperative study with ARS-AWMRU).
- Poultry litter use for corn and soybean production.
- Investigation of the potential of poultry litter to contain viable weed seed.

### *Plant Pathology*

- Soybean fungicide efficacy testing.
- Corn fungicide efficacy testing.
- Wheat fungicide efficacy testing.
- Monitoring for diseases of grain crops.
- Effect of poultry litter on soybean cyst nematode populations.

### *Soil Science*

- Remediation of the fragipan to increase soil productivity: Greenhouse trials with ryegrass + soybean rotation; wheat + soybean rotation; ryegrass + sodium fluoride; ryegrass variety evaluation; ryegrass + KCl; ryegrass + KCl + NaCl; ryegrass + NaNO<sub>3</sub>; ryegrass + corn rotation; ryegrass + humate.
- Remediation of the fragipan to increase soil productivity: Field trials with chicken litter; fly ash; gypsum; calcium carbonate lime; calcium silicate lime; sodium nitrate; calcium nitrate; potassium nitrate; ryegrass cover crop; ryegrass + sodium fluoride; wheat; humate with and without ryegrass.

### *Tobacco*

- Tobacco transplant production—plastic tray evaluation.
- Dark fire-cured commercial variety test.
- Dark air-cured commercial variety test.
- Burley commercial variety test.
- Burley regional quality trial.
- Insecticide performance for tobacco hornworm, budworm, flea beetle, and aphid control.
- Evaluation of C10 fatty alcohols and application methods for burley tobacco sucker control.
- Comparison of potassium sulfate and potassium chloride sources for dark air-cured tobacco.
- Evaluation of pre-harvest yeast application for TSNA reduction in dark air-cured tobacco.
- Dynamics of benzo- $\alpha$ -pyrene and nitrosamine accumulation during fire-curing.
- Dark fire-cured and dark air-cured tobacco pesticide residue tests.
- Effect of crop maturity on nitrosamine production in dark-fired tobacco.
- Effect of plant population and dark tobacco variety on crop canopy development.
- Effect of streptomycin application timing on angular leafspot in Wisconsin cigar binder tobacco.
- Effect of maleic hydrazide/acephate tank mixtures on shed burn in Wisconsin cigar binder tobacco.
- Evaluation of plant-back intervals for dark tobacco following 2,4-D and saflufenacil applications.
- Evaluation of cover crop blends in no-till tobacco production.

## Weed Science

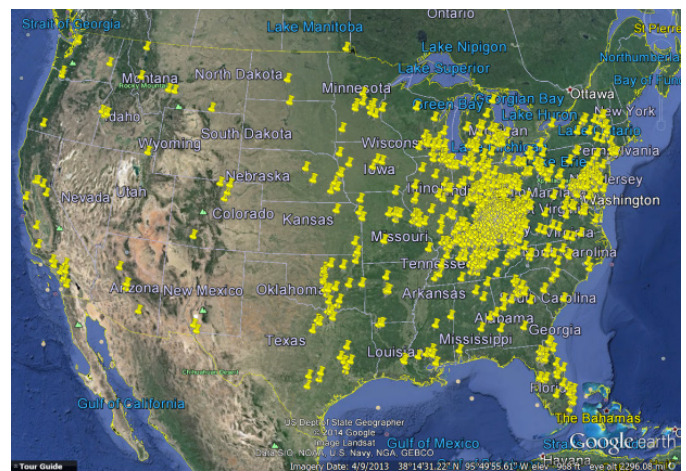
- Marestalk control in Roundup-Ready 2 Xtend systems.
- Marestalk control using Enlist Soybean technology.
- Weed management using delayed pre-emergence treatments of Cheetah and Cheetah Max applied alone or in combination with Dual in Liberty Link soybean.
- Weed management programs in soybean utilizing Bolt technology.
- Pre-emergence and post-emergence weed control using Authority MTZ, Fierce Prefix, Valor, Reflex, Warrant, and Warrant Ultra.
- Weed management in soybean with Envive, Canopy, and Trivence.
- Soybean response to pre-plant applications of dicamba, 2,4-D LV4 ester, and Spitfire.
- Ryegrass control in wheat using Anthem Flex, Axiom, Axial XL, and Power Flex HL.
- Ryegrass control with pre-emergence and post-emergence herbicide treatments (year 4).
- Henbit control in wheat with spring applications of Quelex.
- Wheat response and volunteer corn control with Select Max, Gramoxone Inteon, and Finesse.

## UK Veterinary Diagnostic Laboratory

The University of Kentucky Veterinary Diagnostic Laboratory (UKVDL) strives to be one of the premier veterinary diagnostic laboratories in the United States, providing timely and accurate services in support of the practicing veterinary profession, Kentucky animal agriculture, the signature equine industries, companion animals, and public health. As the state's flagship veterinary diagnostic laboratory, the University of Kentucky Veterinary Diagnostic Laboratory's primary goal is to develop, apply, and utilize state-of-the-art veterinary diagnostic testing methods and scientific knowledge to improve animal health and marketability, preserve the human-animal bond, and help protect and improve public health through the early and accurate identification of zoonotic diseases. The UKVDL laboratory is fully accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD), and is a member of the USDA National Animal Health Laboratory Network (NAHLN) and the FDA Veterinary Laboratory Investigation Response Network (Vet-LIRN).

In addition to its clinical diagnostic role, the UKVDL provides surveillance and regulatory testing for emerging and endemic diseases such as equine infectious anemia (EIA), equine viral arteritis, equine piroplasmiasis, West Nile virus, chronic wasting disease of deer, contagious equine metritis, bovine spongiform encephalitis (Mad Cow Disease), John's disease, bovine leukosis, avian influenza, rabies, and many other diseases of agricultural, public health, and companion animal importance. Furthermore, the laboratory continually monitors for the emergence of foreign animal diseases (FADs) such as foot and mouth disease and classical swine fever. As part of the NAHLN, the UKVDL conducts ongoing proficiency testing (PT) to be prepared for any outbreak of a FAD in Kentucky and to assist other states as needed. Finally, UKVDL hosts a rich continuing education and outreach program for our clients and the public every year. The laboratory is composed of fifteen distinct sections as depicted in the following organizational chart.

Farmers and animal owners use the UKVDL's services primarily through their practicing veterinarians. These professionals have expertise in selecting, preparing, shipping, and submitting the proper specimens for testing when needed to assist in making a clinical diagnosis. Laboratory findings are reported back to the submitting veterinarian who then consults with his or her clients to implement a treatment protocol or a



Locations of clients submitting accessions to UKVDL, 2010–2015.

prevention/management solution to disease problems on the farm. A state-of-the-art Laboratory Information Management System (LIMS) is utilized which enables UKVDL to provide the most professional, accurate, and timely accessioning, order entry, results capture, and clinical case reporting for our clients.

UKVDL faculty, scientists, and technical staff are specialists in several diagnostic medical disciplines directly related to animal health, including bacteriology, clinical pathology, epidemiology, extension, molecular biology, pathology, serology, toxicology, virology, and informatics. Funding to add metagenomics testing is being pursued to improve diagnostics in the future. The laboratory is also exploring the potential of supporting the Kentucky aquaculture industries, food safety, stem cell therapy, and other emerging animal health technologies. As part of the cooperative agreement with the Lincoln Memorial University College of Veterinary Medicine, the Center for Animal Health in Appalachia (CAHA) was launched in 2015. Director Dr. Craig Carter, is serving on the advisory board.

Disease diagnostic efforts are coordinated and handled by specialists in the appropriate disciplines. Complex clinical cases involving multiple sections are monitored by trained case coordinators. During surge testing periods and disease outbreaks, cross-trained technicians are redistributed across sections to assure that the surge in workload can be managed in a timely and accurate fashion.

The UKVDL received 13,493 clinical diagnostic cases (+4%) and 31,534 regulatory cases (+12%) in calendar year 2015. Regulatory cases are down about 10 percent from 2013. The increasing trend in regulatory cases is due primarily to gaining three large poultry clients. The clinical diagnostic and necropsy caseloads have increased by approximately 4 percent each in calendar year 2015. The diagnostic and necropsy accession loads fluctuate based on seasonal and natural epidemiologic conditions and events. Total tests run in each laboratory section are listed in the individual section reports.

## Vision

The Veterinary Diagnostic Laboratory strives to be one of the premier veterinary diagnostic laboratories in the United States, providing the very best and most timely services in support of the practicing veterinary profession, Kentucky animal agriculture, the signature equine industries, companion animals, and public health.

The Veterinary Diagnostic Laboratory (UKVDL) is a full-service laboratory and an administrative unit in the College of Agriculture, Food and the Environment (CAFE) at the University of Kentucky. The UKVDL was established in 1970 by the State Legislature of Kentucky and charged with the responsibility of providing diagnostic assistance to veterinary practitioners, owners of animals in Kentucky, wildlife conservationists, scientists utilizing animals in their research throughout the university, and state-federal regulatory officials. The laboratory assists with safeguarding the health of animal agriculture in Kentucky via diagnostic testing and disease identification.

The UKVDL confirms infectious and parasitic diseases, chemical and other toxic contaminants that may harm animals or humans, nutritional diseases, and regulatory diseases and provides the means to meet export sales and movement requirements as well as an early warning system for impending epidemics. Emphasis is placed on quality assurance and control for all diagnostic and regulatory testing including new testing methods. Each employee of the UKVDL focuses on performance of all tasks according to protocol with total commitment to quality.

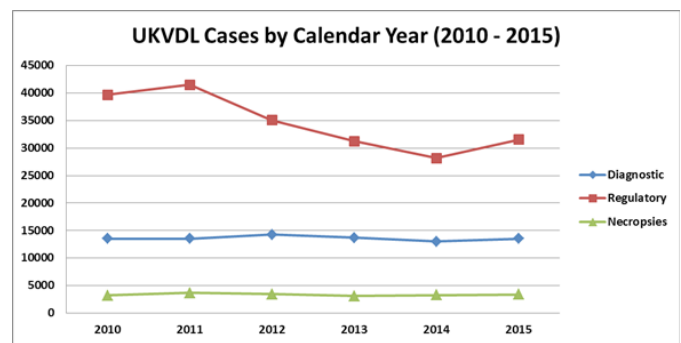
## Mission

The UK Veterinary Diagnostic Laboratory's primary goal is to develop, apply and utilize state-of-the-art technology and scientific knowledge to improve animal health and marketability, preserve the human-animal bond, and help protect the public health.

## Quality Philosophy and Objectives

Every employee of the UKVDL is committed to quality, integrity, and excellence in all work completed. In order to meet our mission and achieve our vision, we must:

- Ensure client satisfaction by consistently meeting or exceeding customer requirements.
- Demonstrate competence in accordance with AAVLD essential requirements through the performance of high-quality diagnostic testing in accordance with ISO 17025 standards and guidelines.



Year	Diagnostic		Regulatory		Necropsies	
	Number	Change	Number	Change	Number	Change
2010	13487		39705		3172	
2011	13491	0.03%	41538	4.62%	3645	14.91%
2012	14227	5.46%	35093	-15.52%	3398	-6.78%
2013	13655	-4.02%	31251	-10.95%	3100	-8.77%
2014	12976	-4.97%	28142	-9.95%	3227	4.10%
2015	13493	3.98%	31534	12.05%	3343	3.59%

- Continuously improve diagnostic information and dissemination processes.
- Integrate contemporary laboratory practices throughout the laboratories.
- Ensure employee health and safety.
- Provide employees with training and tools to facilitate our quality effort.

The laboratory's success is measured by customer satisfaction, meeting professional standards, meeting the essential American Association of Veterinary Laboratory Diagnosticians (AAVLD) Accreditation requirements, and our response to service demands. These quality objectives are reviewed for continuing compliance on a recurring basis.

## Outreach

The UKVDL continues to build and enhance outreach programs around Kentucky. The Kentucky VetLabNet listserv continues to distribute animal health bulletins and has grown to a list to more than 2,000 UKVDL clients, scientists, farmers, and stakeholders. The UKVDL director and other faculty continue to contribute articles quarterly to the KVMA journal and the Kentucky Cattleman Association *Cow Country News*.

The UKVDL director, faculty and staff continue to deliver lectures at scientific and lay meetings and participate in the monthly Equine Diagnostic-Research Seminar Series at the UKVDL since 2006. These seminars are filmed by *The Horse* magazine, edited, and made available as webinars. These seminars have been viewed in more than sixty countries. The University of Kentucky Diagnostic Research Lecture Series offers up-to-date horse health research and information from leading academic experts. Most presentations are 45 minutes to an hour long.

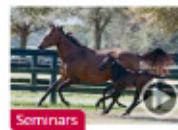


### Other Outreach Events (select)

- Food Animal Practitioner Conference with approximately 50 veterinarians and other guests in attendance, February 26.
- Food Animal Practitioner Conference with approximately 50 veterinarians and other guests in attendance, August 13.
- The director and six UKVDL employees attended the AAVLD meeting in Providence, RI, for continuing education and delivering scientific presentations.
- Dr. Craig Carter, Executive Director of the World Association of Veterinary Laboratory Diagnosticians, oversaw planning for the biennial meeting in Saskatoon, Saskatchewan, Canada.
- Public Health Contributions of Veterinary Diagnostic Laboratories first annual meeting of the Center for Animal Health in Appalachia, Lincoln Memorial University College of Veterinary Medicine, Ewing, VA, October.
- Continuous Animal Activity Monitoring System for Early Detection of Health Problems in Cattle, 32nd World Veterinary Congress, Istanbul, Turkey, September.
- High Path Avian Influenza Diagnostic Laboratory Response, presented to the HPAI Kentucky Poultry Federation Planning Forum, Elizabethtown Tourism and Convention Bureau, Elizabethtown, KY, September 9.
- Overview of the DVM Training Programs by the University of Kentucky in support of the Lincoln Memorial University (LMU) College of Veterinary Medicine. Presented to the LMU Dean, faculty, and staff, July 28.
- See the Ruminant Extension Veterinarian and Epidemiologist's reports below for additional outreach activities.

### Disease Diagnoses and Outbreak Responses (select)

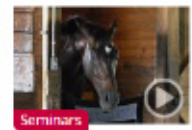
- UKVDL placed on standby by the National Animal Health Laboratory Network to assist in control of the 2015 High Path Avian Influenza outbreak, H5N2.
- Severe necrotizing bronchopneumonia and pleuritis, *M. haemolytica*, *Mycoplasma* sp., and *P. multocida*, BRSV.
- EHV-1, leptospiral, and other etiologies in equine abortion cases.
- Confirmation of selenium/copper deficiencies in cattle.
- Confirmed diagnoses of botulism in cattle.
- Centrilobular hepatocyte necrosis in a bovine.
- Bovine viral diarrhea and deaths in multiple outbreaks.
- Confirmed diagnosis of blackleg (*Clostridium chauvoei*) in cattle.
- Confirmed canine herpesvirus infection in a litter of Labrador puppies.
- Vegetative endocarditis in cattle.
- Diffuse interstitial pneumonia in cattle.
- Coccidiosis and epicarditis in chickens.
- Mild segmental enterocolitis in cattle.
- Multifocal nonsuppurative interstitial nephritis in cattle.
- Myocardial degeneration and necrosis in cattle.
- Anaplasmosis in cattle.
- Histomoniasis, mycotic myocarditis, pneumonia, and sacculitis in chickens.
- Ulcerative stomatitis in Alpacas.



Seminars  
Sport Horse Reproduction: Challenges and Solutions



Seminars  
Emergent and Re-Emergent Equine Disease



Seminars  
Equine Enteric Coronavirus



Seminars  
Equine Gastric Ulcers



Seminars  
Objective Determination of Lameness in the Horse



Seminars  
Advances in Joint Disease Treatment



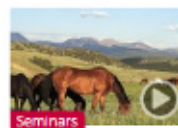
Seminars  
Pain Management in Horses



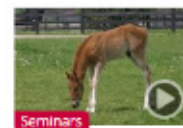
Seminars  
Performance Horse Nutrition: What Role Do Supplements Play?



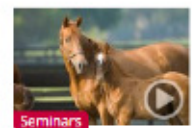
Seminars  
The Ergot Alkaloid Enigma



Seminars  
Developing Practical Pasture and Forage Diagnostic Tools



Seminars  
Parasite and Growth Rates in Foals, and More



Seminars  
Surgical Intervention to Improve Mare Fertility

- Necrotizing enteritis, coronavirus, and rotavirus infection in cattle.
- Intestinal cryptosporidiosis in cattle.
- Abomasal obstruction in cattle.
- *Mycoplasma bovis* pneumonia and pulmonary abscesses in cattle.
- Parasitic meningoencephalomyelitis, verminous pneumonia in goats.
- Leptospiral infection in cattle.
- Lymphoproliferative disease in chickens.
- Necrotizing enterocolitis in sheep.
- Chronic fibrosing and eosinophilic portal hepatitis in pigs.
- Capillariasis (severe ingluvitis and mucosal nematodes) in quail.
- Aspiration pneumonia in an alpaca.
- Poison hemlock toxicosis in cattle.
- Botulism in horses.
- Carbofuran poisoning in a dog.
- Lead poisoning in calves.
- Taxus poisoning in cattle.
- Anticoagulant rodenticide poisoning in a dog.
- Sodium intoxication and water deprivation in cattle.
- Ivermectin toxicosis in dogs.
- Nitrate poisoning in cattle.
- Ethylene glycol toxicosis in a dog.

## Notable Achievements or Advancements

- Maintained American Association of Veterinary Laboratory Diagnosticians (AAVLD) national accreditation, accredited by the USDA National Animal Health Laboratory Network (NAHLN), FDA Veterinary Laboratory Investigation and Response Network (VetLIRN) certified member, National Poultry Improvement Program (NPIP) laboratory certification through the oversight of proficiency testing and quality control programs, faculty and staff continuing medical education initiatives, and participation in outbreak response and emergency exercises.
- Provided leadership and guidance for faculty and staff to enhance the UKVDL outreach programs through one-day symposia and seminars such as food animal (Dr. Michelle Arnold), equine (all faculty), poultry (Meg Steinman and Dr. Lynne Cassone), toxicology (Dr. Cindy Gaskill). The Equine Diagnostic Research Seminars reach a global audience through our partnership with *The Horse* magazine.
- Supported and guided Mr. Ryan Redimarker, helped to provide a clear vision and oversight for a UKVDL strategic and marketing plan to improve client services, enhance testing and collection of fees, and purchase high value instrumentation to modernize our laboratory sections.
- Served as key liaison with Lincoln Memorial University leaders to enter a cooperative agreement to provide training for veterinary medical students in exchange for significant funds that can be used to improve UKVDL services and research capability in support of Kentucky animal agriculture.
- Continue to oversee the operation of a real-time animal disease cluster detection system for Kentucky.
- Continue to provide support for faculty and staff to host professional exhibits for display at local, state, and national meetings.
- Supported and guided Dr. Jackie Smith in fostering the growth of KY-VetLabNet listserv from 600 to 1,949 subscribed clients to maintain a high level of situational awareness for veterinarians and farmers through alerts and bulletins.
- Continue to oversee epidemiological field investigations/research studies for clients as requested/needed.
- Regular articles in the Kentucky Veterinary Medical Association (since 2005) and the Kentucky Cattleman Association (since 2009) magazines.
- Implemented a visiting foreign scientist program at the UKVDL. One scientist from Turkey recruited in 2015 to arrive in 2016.
- Supported and guided Dr. Laura Kennedy as PI in the furtherance of the Kentucky Horse Racing Necropsy Program funded by the Kentucky Horse Racing Commission and the Equine Drug Research Council.
- Supported and guided Dr. Erdal Erol in the development of several problem-based diagnostic testing panels that assist veterinarians in obtaining the earliest definitive diagnosis on clinical cases.
- Supported and guided Dr. Erdal Erol in the implementation of Matrix Assisted Laser Desorption-Ionization Time of Flight (MALDI-TOF) mass spectrometric identification of pathogenic bacteria and fungi. This new technology has accelerated

the time from receipt of samples to pathogen identification by up to 24 hours.

- Supported and guided Dr. Erdal Erol in his role as a member of the Joint National VS-AAVLD Antimicrobial Resistance Working Group.
- Supported and guided Dr. Michelle Arnold in her role as a co-PI on the Southeast Quality Milk Initiative to improve milk quality in the southeast.
- Supported and guided Dr. Jennifer Janes in her role as PI on an internally funded project to identify genetic determinants in Wobbler Syndrome in horses.
- Supported and guided Drs. Cindy Gaskill and Lori Smith in the modernization of instrumentation and staffing in the toxicology laboratory to include the purchase of new ICP-MS and HPLC instrumentation to improve the development of toxicological methods and enhance throughput of cobalt, mycotoxin, and ergovaline testing.
- Supported and guided Dr. Alan Loynachan as a co-PI on the development of a genetically defined live attenuated equine herpesvirus-1 vaccine for the horse.
- Supported and guided Dr. Jackie Smith in the production and dissemination of the weekly Reportable Disease alerts distributed to the Office of the Kentucky State Veterinarian's office.
- Supported and guided James Mason and Derrick Miles in the total overhaul and upgrade of the UKVDL file servers and networking software to greatly improve the performance and efficiency of our centralized Laboratory Information System internally and for UKVDL clients.

## Initiatives and Programs

- Equine leptospirosis awareness and vaccine initiative: Served on the Zoetis Equine Leptospirosis Advisory Committee and as PI on the national sero-epidemiological survey that helped convince Zoetis to pursue a research and development project to create a vaccine for the horse. In October 2015, the Lep-toEQ Innovator equine leptospirosis vaccine was announced by Zoetis as the first ever licensed vaccine for the horse to protect against abortion and recurrent uveitis.
- Metagenomics diagnostic laboratory section for UKVDL: Met with the University of Tennessee, University of Illinois, Columbia University, Texas A&M University, and Neogen Corporation to discuss the formation of a consortium of university and industry partners to explore metagenomics as an initiative for furthering veterinary diagnostic medicine. Helped convince the Gluck Equine Research Center to hire a bioinformatics faculty member to assist in the formation of a metagenomics research effort within the Department of Veterinary Science.
- Pursuit of laboratory testing data integration with veterinary practice management software: Hosted several meetings and demonstrations with AAVLD laboratory directors and representatives of VetData corporation toward LIMS data integration with practice management software at client hospitals/clinics.
- Established an agreement with VetAura, a commercial veterinary laboratory in Lexington, to refer selected case material to UKVDL for testing.

## Bacteriology/Mycology

Dr. Erdal Erol, Section Head; Mr. Steve Locke, Section Supervisor

The bacteriology/mycology section of the UKVDL receives specimens to culture for the isolation and identification of potentially pathogenic bacteria and fungi from livestock as well as companion and other animals. The section performs susceptibility testing on isolates for the treatment of specific pathogens to safeguard the health of animals in Kentucky and beyond. This section performs cultures for *Taylorella equigenitalis* and *T. asinigenitalis* for the federal/state CEM regulatory program in equines. Other specialized cultures and testing techniques include anaerobic culture, mycoplasma culture, mastitis culture, and fluorescent antibody testing for leptospire and clostridia (blackleg). This section also performs cultures for the National Poultry Improvement Plan (NPIP). In addition, the bacteriology/mycology section participates in annual proficiency testing for AAVLD, NPIP *Salmonella*, FDA Vet-LIRN *Salmonella*, and *Listeria*.

In April, the bacteriology section put a MALDI-TOF biotyper, a cutting edge instrument used for the quick identification of microorganisms, into service. This equipment has already significantly decreased our turn-around time on the identification of many bacteria. We are confident that this new technology will increase client satisfaction with our microbiology service offerings.

### Highlights

- 8,862 aerobic cultures were performed on samples submitted to the UKVDL; significant bacterial pathogens were found in these samples, such as Nocardioform bacteria, coliforms, Beta-hemolytic streptococci, *Salmonella*, *Pasteurella*, *Mannheimia*, *Arcanobacterium*, *Mycoplasma* and *Staphylococci*.
- 6,869 CEM cultures were performed for the CEM regulatory screening program.
- 3,022 antimicrobial susceptibilities were performed to determine the antimicrobials that could be used for their treatment in exposed animals (MIC broth microdilution method).
- 1,385 specimens were tested for leptospire by fluorescent antibody testing.
- 687 specimens were cultured for NPIP *Salmonella* testing. Our participation in NPIP helps poultry industry improve infectious disease control and eradication programs.
- 373 anaerobic cultures were performed. *Clostridium perfringens* and *C. difficile* screening was the predominant focus.
- 204 ruminant mastitis cultures were performed. Often collaborate with extension veterinarian Dr. M. Arnold for communication of treatment options to client.
- 155 specimens were tested for fungal pathogens.
- 132 *Clostridium chauvoei* (blackleg) and *Clostridium septicum* fluorescent antibody tests were performed.

## Virology

Dr. Erdal Erol, Section Head; Sharon K. Ray, Section Supervisor

The virology section aids veterinarians and animal owners to diagnose viral infections and to treat and protect their animals. Our section also works closely with UKVDL pathology section to test for evidence of viral infections in necropsy specimens. In

addition, virology performs a high volume of regulatory tests for national sales, and for both the national and international movement of animals. The virology section provides information to the field veterinarians and animal owners regarding sample selection, preservation, shipping procedures, and interpretation of results.

### Highlights

Virology conducted numerous virus neutralizations, virus isolations, ELISAs, and fluorescent antibody (FA) tests in support of animal agriculture not only in Kentucky but across the country. The table below provides an overview.

## Molecular Diagnostics

Dr. Erdal Erol, Section Head

The primary mission of the molecular diagnostic section at the UKVDL is to provide molecular testing on the clinical specimens submitted by animal owners, veterinarians, and pathologists. A number of molecular assays in the formats of gel-based PCR, real-time PCR, multiplex gel-based PCR, and multiplex real-time PCR are being utilized because of their speed, specificity, and sensitivity. This section also analyzes specimens received from the virology and bacteriology sections to obtain a confirmatory diagnosis. In addition, Dr. Erol provides consultations to Kentucky veterinarians and animal owners on the areas of appropriate sample collection and submission, therapeutic advice, interpretation of test results, determination of appropriate tests, and differential diagnosis. The molecular biology section personnel consist of Dr. Erdal Erol, two full-time technicians, and one half-time technician.

### Highlights

- The molecular diagnostics section successfully demonstrated its ability to provide accurate, rapid, high-volume testing. This section also became an accredited member of the USDA's National Animal Laboratory Health Network and passed several federal proficiency tests such as foot and mouth disease, classical swine fever, avian influenza, and exotic Newcastle disease. The membership enables this unit to participate in national veterinary disease surveillance and provide rapid coordinated diagnostic response in the event of future outbreaks within the veterinary industry.
- Dr. Erol performed independent and collaborative research with other scientists. The results were presented at World Veterinary Medical Association Congress.

## Pathology

Dr. David Bolin, Section Head

The UKVDL pathology section is composed of seven faculty pathologists, a staff laboratory animal pathologist, one post-doctoral scholar (pathology residents), four histology technicians, four full-time necropsy technicians, and three part-time necropsy student workers. The pathologists perform complete necropsy examinations on animals, histopathology on necropsy cases, surgical biopsies, and cytological examinations, all submitted by veterinarians, producers, and pet owners. The pathologists are fully supported by the other laboratory sections in the necropsy investigations.



As part of the comprehensive necropsy examination, additional laboratory tests are ordered by the pathologist to aid in confirming a diagnosis. The abnormal findings on necropsy are correlated with other laboratory tests, including microscopic examination of the tissues, and a comprehensive report is prepared for every pathology case. Utilizing the abundant cases submitted to the VDL and the faculty expertise, the post-doctoral scholar (DVM) is trained in veterinary anatomic pathology in a three-year program. However, with the upcoming cooperative agreement to train Lincoln Memorial University DVM students, the post-doctoral residency program is being discontinued. Visiting senior veterinary students have extern rotations, and surgical residents visit to fulfill the pathology requirement for the American College of Veterinary Surgeons.

### Highlights

#### Necropsy Examinations

Postmortem examinations (necropsies) are conducted on animals submitted to the VDL to identify any pathologic changes in the tissues that would indicate disease, injury, toxicosis, or any other abnormal process resulting in illness.

#### Biopsies

Tissue lesions are often removed surgically or portions biopsied from live animals and sent to the laboratory for determination of the type of process, recommended treatment, and potential prognosis. These tissue specimens are processed and microscopic slides prepared for the pathologists to examine by microscopy. Tissue specimens representing 3,149 cases were processed and examined. A report with diagnosis was produced for each case. Typical turn-around on these cases is 24 to 48 hours.

#### Cytologies

Preparations of cells harvested and/or aspirated from abnormal lesions or abnormal fluids are placed on microscopic slides and stained for examination under the microscope by the pathologists. Cytopathological examinations were performed, diagnoses made, and reports generated for 483 cases.

Virology tests, 2015		
Disease	Test	Number
Bovine corona virus	FA	47
Bovine respiratory syncytial virus	FA	97
	VN	31
Bovine rotavirus	FA	32
Bovine viral diarrhea	ELISA	5712
	FA	750
Bovine viral diarrhea 1	VN	60
Bovine viral diarrhea 2	VN	60
Canine adenovirus	FA	21
Canine corona virus	FA	20
Canine distemper virus	FA	75
Canine herpesvirus	FA	43
Canine parainfluenza 2	FA	27
Canine parvovirus	FA	93
	FA	93
Equine herpesvirus 1	FA	779
	VN	235
Equine influenza A1	HI	142
Equine influenza A2	HI	142
Equine viral arteritis	VN	12999
Feline herpesvirus	FA	31
Feline Infectious peritonitis	FA	49
Feline panleukopenia	FA	49
Infectious bovine rhinotracheitis	FA	266
	VN	82
Parainfluenza-3 virus	FA	71
Potomac horse fever	IFA	392
Vesicular stomatitis IN	VN	1722
Vesicular stomatitis NJ	VN	1722
Virus isolation	VI	544
West Nile IgM capture	ELISA	113
<b>Total</b>		<b>26,406</b>

Major molecular tests, 2015	
Type	Number
Avian influenza	250
Calf diarrhea panel (corona virus, rotavirus, <i>E. coli</i> , <i>Salmonella</i> and <i>Cryptosporidium</i> )	212
Bovine respiratory disease viral panel (viral diarrhea virus, corona virus, respiratory syncytial virus and herpes virus)	143
Bovine respiratory disease bacterial panel ( <i>Mannheimia haemolytica</i> , <i>Pasteurella multocida</i> , <i>Histophilus somni</i> and <i>Mycoplasma bovis</i> )	70
Clostridium perfringens toxin typing	80
Nocardioform actinomycetes ( <i>Amycolatopsis</i> spp and <i>Crossiella equi</i> )	62
Equine arteritis virus	42
Equine herpesvirus 1	291
Equine herpesvirus 2	99
Equine herpesvirus 3	17
Equine herpesvirus 4	121
Equine herpesvirus 5	64
Equine influenza	221
Equine protozoal myeloencephalitis	14
<i>Lawsonia intracellularis</i>	158
<i>Leptospira</i>	62
<i>Mycobacterium paratuberculosis</i>	87
<i>Mycoplasma gallisepticum</i>	99
Potomac horse fever	449
<i>Salmonella</i>	872
<i>Streptococcus equi</i>	669
<i>Tritrichomonas foetus</i>	145
<b>Total</b>	<b>4,227</b>

Post-mortem examinations, 2015	
Species	Number
Avian	115
Bovine	1,111
Caprine	80
Equine	1,480
Ovine	68
Porcine	30
Small animal	429
Miscellaneous	40
Laboratory animal	60
<b>Total</b>	<b>3,413</b>

Necropsies, 2015			
Species		Number	
<b>Equine adult</b>			
Donkey		4	
Equine		538	
<b>Equine fetus/foal</b>			
Donkey		2	
Equine		750	
<b>Equine placenta</b>			
Equine		240	
<b>Food animal/adult</b>			
Bovine		319	
Caprine		38	
Equine		1	
Ovine		29	
<b>Food animal/fetus/neonate</b>			
Bovine		710	
Caprine		45	
Equine		3	
Ovine		37	
Porcine		33	
Rabbit		1	
<b>Poultry (up to 3 birds)</b>			
Chicken		128	
Quail		24	
<b>Small animal/exotic animal</b>			
African grey parrot		1	
Alpaca		131	
Antilopine kangaroo		2	
Canine		242	
Chinchilla		3	
Deer		6	
Elk		3	
Emu		1	
Feline		37	
Ferret		3	
Guinea pig		1	
Hedgehog		1	
Lion		1	
Llama		6	
Mouse		432	
Pigeon		2	
Quail		2	
Rabbit		4	
Raccoon		1	
Rat		18	
Ringnecked parakeet		1	
<b>Total</b>		<b>3,800</b>	

## Pathology, Research Animal (DLAR)

*Kathryn (Casey) Coyle*

The research animal pathology service sees mostly small rodents and a variety of other species (see below), non-human primates, and pigs. There were 101 submissions from research animals including clinical pathology samples, biopsies, and necropsies. In addition to research animal work, Dr. Coyle is handling the diagnostic pathology case load for the agricultural research animals housed at the various UK farms.

Pathology, 2015	
DLAR cases	Number
Cynomolgus monkey	1
Equine	1
Hamster	2
Mouse	46
Pigeon	1
Porcine	1
Quail	7
Rat	24
Salamander	2
Water	16
<b>Total</b>	<b>101</b>

## Clinical Pathology Section

*Bonnie L. Decker*

The primary mission of the clinical pathology section is to provide chemistry, hematology, endocrine, urinalysis, fluid analysis, fecal parasite exams, and other testing to animal owners, veterinarians, and the agriculture community. The section also provides support and testing to UKVDL's pathologists and testing related to necropsy. They also support University of Kentucky equine and animal science researchers who can submit specimens to clinical pathology for monitoring various chemistry, hematology, and endocrine levels in their research animals. Clinical pathology hosts two to three Morehead State University veterinary technician students every year to help them complete their practicum.

The clinical pathology section completes its testing the same day as receipt with a few exceptions to get information to the submitting veterinarian as soon as possible to aid in the treatment of their clients' animals. A section chief with a BS MT (ASCP) and 40 years of experience in veterinary and human diagnostic laboratory testing works full time. A part time veterinary technician with 21 years of experience occupies the half-time position in the section. Other qualified UKVDL personnel are available for backup and consultation as needed.

Clinical pathology is dedicated to meeting the current and future needs of the agriculture community, the companion animal community, and veterinarians.

## Quality Control/Quality Assurance

*Mary Harbour*

The goal of the quality management system (QMS) is to ensure quality of all test results and continuous improvement of all services to clients. Our design of the QMS and quality assurance program is based on American Association of Veterinary Diagnostic Laboratory (AAVLD) requirements, International Standards Organization (ISO) guidelines, and Organization of International Epizootics (OIE). In addition to meeting these requirements, the UKVDL QMS helps fulfill the university's mission of improving service delivery while achieving excellent

Testing performed by clinical pathology section, 2015			
Test	Number	Test	Number
Bovine panel	358	ACTH	18
Canine panel	194	K-9 TLI	6
Caprine panel	20	T4	286
Chemistry panel	61	K-9 TSH	17
Equine panel	244	Cortisol	150
Feline panel	54	Cryptosporidia	63
Hepatic panel	0	Fecal exam	918
Porcine panel	0	Fibrinogen	115
Renal panel	4	Giardia antigen	16
Electrolyte panel	6	Parasite ID	0
Eye fluid panel	156	Phenobarbital	202
Fluid exam	88	Progesterone	352
Urinalysis	88	Reticulocyte count	1
CBC	496	Stone analysis	234
CBC no diff	4	T3	70
Differential only	5	<b>Total</b>	<b>4226</b>

human relations (internally and externally), sound leadership, and effective communications.

The quality assurance section now consists of two employees, a quality assurance manager, and a full-time quality assistant. The requirements for maintaining the QMS are continuously being updated. The assistant position was created to meet the increasingly more stringent AAVLD requirements, OIE, NAHLN, and federal mandates.

Since 2010 UKVDL has been a part of the National Animal Health Laboratory Network (NAHLN). QA maintains UKVDL information on the NAHLN portal. This portal provides information to NAHLN about the capacity of national laboratories in the event of a food animal disease outbreak. The section continues to prepare quarterly reports to the NAHLN and maintains the NAHLN policies and procedures.

To maintain conformance to all requirements, the QA manager attended the quality assurance committee meeting at the annual AAVLD meeting and also attended AAVLD auditor training. The QA manager and assistant attended a four-day seminar at the USDA/NVSL facility about the quality management system.

The quality assurance section has implemented new quality system software. This software has improved document control, equipment inventory, competency and training assessments, and corrective action investigations and has streamlined internal audits. Quality assurance will continue to monitor and update policies and procedures to meet the AAVLD requirements. Two members of the AAVLD accreditation team are scheduled to revisit UKVDL in 2016 to assure compliance with all non-conformance findings from the 2014 full accreditation team visit.

## Ruminant Extension

*Dr. L. Michelle Arnold*

The ruminant extension veterinarian works closely with the College of Agriculture, Food and Environment (CAFE) faculty, UKVDL faculty and clients, county extension agents, producer organizations, state livestock commodity specialists, and state



and federal regulatory agencies regarding all veterinary ruminant health issues. Perhaps most important is outreach to food animal veterinarians through regular continuing education programs, newsletters, and animal health bulletins. In addition, by developing this close working relationship between practicing veterinarians and UKVDL faculty, better diagnostic work-ups on challenging diagnostic cases and complex investigations result in more definitive answers for the producers of Kentucky.

The entire network of industry stakeholders are considered partners with the ruminant veterinary in lowering morbidity and mortality rates, attaining higher rates of production, and adding more pounds sold to return profits throughout the agricultural community. Dr. Arnold continues to be involved in collaborative research projects within the university with the dairy, beef, and small ruminant industries, especially those involving diagnostic veterinary medicine.

The livestock disease risk and occurrence and its diagnosis, treatment, prevention, and control form the core of the information disseminated by the ruminant extension veterinarian. New university research, governmental directives, and other stakeholder concerns are also communicated broadly for discussion and action to benefit producers throughout Kentucky.

### Highlights

- Updated and presented the herd health portion of Master Cattleman in 11 regions and 2 Master Grazer sessions. These programs directly affected many farming enterprises representing significant numbers of Kentucky cattle.
- Hosted two well-attended food animal veterinary continuing education meetings at the diagnostic laboratory (UKVDL) and one at the Breathitt Veterinary Center (BVC). A total of 24 hours of continuing education was made available to food animal veterinarians at no cost to them. Outside sponsors covered the costs of the events. The winter CE meeting at the UKVDL was sponsored by Zoetis Animal Health. Fifty-seven food animal veterinarians attended the winter meeting. A summer meeting was held in August at the UKVDL sponsored by Boehringer Ingelheim Animal Health. Seventy-nine attended. The final CE meeting was held at Breathitt Veterinary Center in November. Bayer Animal Health sponsored the event, which was attended by 39 food animal veterinarians primarily from the western portion of the state.
- Pasture to Plate is a new demonstration/educational effort to increase the knowledge base of producers on all aspects of cattle production from genetics to consumers. The overall goal of this program is for cattlemen to learn and experience all phases of feeder calf growth from feeder through the eating experience. Topics covered in the program included receiving programs, feeding to finish programs, nutrient management, live animal evaluation, carcass evaluation, taste panel evaluation, consumer preferences, and healthfulness of beef. Dr. Arnold developed and presented the health modules for six sessions.
- Continued to work with the extension dairy specialist Dr. Jeffrey Bewley, teaching the Cow Signals training course for dairy producers. This program originated in the Netherlands and teaches how to read the body language of cows to improve management techniques.
- Dr. Arnold continued to teach the health portion of the undergraduate classes in beef and dairy science and a veterinary lecture to the careers class.
- Continued development of the new extension program Improving Reproductive Efficiency in Beef Cattle in Northern Kentucky with Drs. Les Anderson, Jeff Lehmkuhler, and Darrh Bullock. These meetings are very specific and target one topic with extensive question and answer periods. This year the program expanded into Eastern Kentucky. The herd health portion is an in-depth examination of vaccination protocols, abortion diagnostics, and pre- and post-calving problems. This is a unique program of classroom sessions, field day demonstrations, and on-farm case studies.
- Dr. Arnold published several fact sheets on Forage Related Cattle Disorders. These include: Stagers (Tremorgenic Syndrome) (Vet-35), Acute or Atypical Interstitial Pneumonia (AIP) with Dr. Jeff Lehmkuhler (Animal Science) (ID-231), and Slaframine Toxicosis or "Slobbers" in cattle and horses with Dr. Ray Smith (Animal Science) (ID-230).
- Joined the BVD Task Force at the request of the Kentucky state veterinarian (Dr. Stout) to discuss BVD PI testing and the new law regarding the movement of positive calves as well as to brainstorm long-term solutions.
- Participated in numerous field days, producer meetings, and farm visits throughout the state to educate producers in best management practices, to identify existing problems, and to promote prevention through realistic on-farm changes.
- Dr. Arnold writes a monthly health article for *Cow Country News*, the newsletter of the Kentucky Cattlemen's Association. In addition, Dr. Arnold is a regular contributor to the KVMA newsletter, *Off the Hoof* (UK Beef electronic newsletter), and *Kentucky Dairy Notes* (UK dairy electronic newsletter).
- Dr. Arnold educated producers, extension personnel, and veterinarians about the new veterinary feed directive. This new government strategy, scheduled to begin January 2017, will affect the way antibiotics administered through the feed or water are sold to the public and will change the labeled indications for these products.
- Continued to serve as the attending IACUC veterinarian for the UK Swine Unit and the attending veterinarian on several research projects. Dr. Arnold also serves on two graduate committees for Ph.D. candidates.
- Continued to expand the database of food animal veterinarians with email addresses and cell phone numbers to enhance the speed of communication and decrease postal expenses. The list currently has approximately 400 veterinarians and 288 veterinary clinics.
- Participated in producer meetings, conference calls, and program development with faculty from 6 southeastern land grant institutions funded by the Southeast Quality Milk Initiative (SQMI) grant. This is a multi-state grant for \$3M over a 5 year funding period that began in February 2013. Dr. Arnold spoke and helped coordinate the two-day SQMI Annual Meeting held in Russellville, Kentucky. The University of Kentucky prints and distributes the *SQMI Quarterly Newsletter* to veterinarians throughout the Southeast identified as active in dairy practice.

- Managed cases at the UK Veterinary Diagnostic Laboratory including recording in-depth histories, determining necessary tests, participating in complex disease investigations, and interpretation and communication of results to veterinarians and producers.
- Kentucky veterinarians, extension agents, producers, government entities, and the university benefit from a strong livestock sector; and health is a major component. In 2015, this position served to reach each of these stakeholders for the overall improvement of livestock health and sustainability of the food animal veterinary profession.

## Serology

Meg Steinman, Section Head

The mission of the serology section is to provide accurate and timely results for both diagnostic and regulatory testing. The results generated provide veterinarians and regulatory personnel with data upon which to base their decisions. This section offers a wide variety of tests by various types of methodologies; the tests and numbers listed below are just a sampling.

### Poultry

This section participates in annual USDA audits to maintain status as an NPIP approved laboratory. Personnel from this section have attended National Poultry Improvement Plan (NPIP) approved training courses. In 2015 the serology laboratory tested 11,482 samples for antibody to avian influenza, 21,876 samples for antibody to *Salmonella pullorum*, 30,615 samples for antibody to *Mycoplasma gallisepticum*, and 30,615 samples for *Mycoplasma synoviae*.

### Equines

This section successfully passed USDA-APHIS audits and proficiency tests to continue to offer equine infectious anemia (EIA) antibody testing and piroplasmosis testing. In 2015, we ran 15,327 ELISA and 408 AGID EIA tests. The serology section continues to monitor equines moving through the state stockyards for EIA antibody and tested 3,221 specimens. All employees of this section passed the required NVSL proficiency testing for piroplasmosis testing *Babesia caballi* (391 samples) and *Theileria equi* (391 samples). We tested 1,145 serum samples for antibody to contagious equine metritis (CEM-CF). Serology performs antibody screening tests for *Leptospira* in equines for diagnostic and regulatory purposes. In 2015, we tested approximately 5,100 serums.

### Bovines

The serology section offers a variety of antibody tests performed on serum from bovines and other ruminant species. In 2015 we began to offer a serum test on ruminants to determine pregnancy status and tested 1,397 samples. Other testing done included 524 specimens for antibodies to *Anaplasma marginale*, 99 specimens for antibody to bluetongue virus, 127 samples for EHD antibody, 377 specimens for antibodies to the bovine leukemia virus, 1,625 serums for Johne's (*Mycobacterium paratuberculosis*) antibodies, approximately 500 samples for *Leptospira* antibodies, and 359 specimens for antibody to *Neospora caninum*. This lab is also active in regulatory screening

for antibodies to *Brucella abortus*, testing approximately 1,100 samples.

### Small ruminants

The serology section runs testing on small ruminants, including *Brucella melitensis* (50) and small lentivirus virus antibody (279).

### Canine and feline

This section offers a variety of tests that can be run on dogs and cats. In 2015 the lab was requested to offer a rapid test to determine pregnancy. We began offering a rapid test to determine pregnancy and hope to begin getting requests. A few examples of the testing done in 2015 include 123 for antibodies to histoplasmosis and blastomyces. Serology also offers *Brucella canis* testing, an important test for breeding, and tested 99 samples. We also are running tests for lyme disease, canine heartworm, ehrlichia and anaplasma, testing 31 samples. Feline testing offered includes FIP testing (35 tests), FeLV (40), FIV (38) and toxoplasmosis (135 tests). This is just a sampling of the tests we run for these species.

### Porcine

This section also offers regulatory testing for swine. In 2015 we tested 125 samples for pseudorabies and brucella antibodies.

### Additional Activities

- Meg Steinman serves on a National Animal Health Laboratory Network Exercises and Drills Working Group. The purpose of this group is to develop exercises to help prepare for a disease outbreak in the food animal. This year the committee developed a training exercise to determine a laboratory's ability to implement a response plan to keep the food supply safe. Findings from the exercises will help determine the strengths and weaknesses of the individual laboratory and identify what needs to be in place to help respond.
- Meg Steinman is a member of the Poultry Health Advisory Board for Kentucky. Meetings this year centered around the outbreak of avian influenza and plans for managing should an outbreak hit Kentucky.

## Toxicology

Dr. Cynthia L. Gaskill, Section Head

The primary mission of the UKVDL toxicology section is to provide toxicological diagnostic testing capabilities and consultations to Kentucky veterinarians, UKVDL pathologists, county extension agents, livestock producers, pet owners, state officials, and others. A large variety of toxicological tests are available, including analyses for metals and minerals; organic compounds including a multitude of pesticides, drugs, and other chemicals; biological toxicants such as plant, insect, bacterial, and fungal toxins; and numerous other toxicants. Tests are performed in tissues, gastrointestinal contents, biological fluids, baits, feeds, forages, water, soil, and many other substances.

Consultation services include assistance with therapeutic advice, differential diagnoses, residue considerations, toxicological risk assessments, determination of appropriate tests, appropriate sample collection and submission recommendations,

interpretation of analytical results, and other general toxicological information. Alerts, updates, and toxicological information regarding cases of poisoning or contaminated animal feeds are also provided to the state veterinarian's office.

The toxicology section personnel consist of Cynthia Gaskill (DVM PhD ABVT), clinical veterinary toxicologist and section head; Lori Smith (PhD) senior analytical chemist; Michelle Helm (BSc), technician; Kyle Francis (MSc), research analyst; Joseph Johnson (BSc), research analyst; Boying Liang (PhD), post-doctoral scholar, and student interns.

### Highlights

- The toxicology section handled a number of herd food animal poisoning cases involving toxicants such as arsenic, lead, and organochlorine pesticides. We worked in cooperation with state and federal agencies for these cases. We provided analyses of blood, tissues, and feeds to evaluate herd animals for evidence of exposure, and source and tissue residue information to assist the state veterinarian with quarantine/withholding time decisions. The section also provided toxicological information related to toxicokinetics, environmental considerations, treatments, and other considerations. This work helped prevent contamination of the human food supply.
- The most common causes of poisoning diagnosed at the UKVDL included:
  - Cattle, sheep, goats: yew (*Taxus*), nitrate, arsenic, botulism, sodium, lead, organochlorine pesticides, copper, cyanide, poison hemlock, sulfur, ionophores, buckeye.
  - Horses: botulism, yew (*Taxus*).
  - Dogs and cats: anticoagulant rodenticides, bromethalin, ivermectin, carbofuran, ethylene glycol, lead.
- We received continued funding from several federal and other grants, totaling over \$150,000 for this calendar year (total funding of \$675,000 over several years). This funding provides support for instrumentation, personnel, and supplies to develop analytical methods and complete interlaboratory validations studies, to investigate poison cases involving drugs and feeds, and to develop methods to detect fescue-associated toxicants in biological samples. Our FDA grants involve collaboration with several veterinary diagnostic laboratories including the Davis California Animal Health and Food Safety laboratory, Iowa State University Veterinary Diagnostic laboratory, the Washington Animal Disease Diagnostic Laboratory, and others.
- We hired two additional full-time analysts (Kyle Francis and Joseph Johnson) using grant funding.
- We provided serum and plasma cobalt analyses for several horse racing jurisdictions and performed over 4,500 cobalt analyses.
- New ICP-MS and UPLC instrumentation was installed which will increase our analytical capabilities, shorten analytical test run times, and free up instrument time for method development.
- Several new methods were developed and validated including an anticoagulant rodenticide screen in liver tissue and fumonisins B1 and B2 in feeds.
- We hosted student interns from the forensic science internship program at Eastern Kentucky University and a post-doctoral scholar.

Toxicology tests performed, 2015	Number
Anticoagulant rodenticide panel–liver. Panel includes analyses for 8 ACR compounds. LC-MS/MS method	104
Arsenic–whole blood. ICP-MS method	180
Bromide–serum. IC method	139
Clostridium botulinum–sent to referral lab. PCR method	16
Cobalt–serum, plasma, blood. ICP-MS method	4,547
Ergovaline–UPLC method	291
Ethylene glycol/glycolic acid panel–GC/FID method	8
GC/MS organic compound screen	68
Lead–whole blood. ICP-MS and anodic stripping voltammetry methods	70
Metal panels–liver and kidney tissue, blood, feeds, water, environmental samples. Panel includes analyses for 14 different inorganic elements. ICP-MS method	2,548
Trace mineral panels–liver and serum. Panel includes analyses for 7 trace elements. ICP-MS method	2,758
Moisture contents–forages	48
Mycotoxin panel–feeds. Panel includes analyses for 6 mycotoxins. HPLC and GC methods	24
Nitrate/nitrite panel–ocular fluid, serum, water, forages, other. IC and colorimetric methods	394
pH–forage, rumen contents, other samples. pH meter	29
Plant ID	6
Selenium–serum, blood. ICP-MS method	122
Sodium–brain. ICP-MS method	8
Strontium–serum. ICP-MS method	150
Other tests (misc. tests including those with < 4 requests each). Various methods	87
<b>Total</b>	<b>11,597</b>

- Our post-doctoral scholar, Dr. Boying Liang, won an American Association of Veterinary Laboratory Diagnosticians (AAVLD) trainee travel award to present her work at the 2015 AAVLD conference in Rhode Island.
- We continued providing forage ergovaline analyses for the University of Kentucky pasture evaluation program and for producers and UK extension agents.
- We participate in numerous proficiency programs to ensure quality results and revised and reviewed a number of toxicology standard operating procedures.

The UKVDL toxicology section participated in several additional research projects directly applicable to improvements in diagnostic offerings. Funding from these projects helped support instrumentation and personnel also used for diagnostic purposes. Projects included:

- Completion of a study investigating moxidectin concentrations in brain tissue and serum in horses post-therapeutic dosing to help with diagnostic interpretation.
- Evaluation of Kentucky barn owls for evidence of chemical contaminations.
- Strontium concentrations in serum samples post-dosing in horses.
- Serum bromide concentrations in Idaho cattle exposed to forages contaminated with methyl bromide.
- Liver metal concentrations in Kentucky racehorse breakdown cases.



## Epidemiology

*Dr. Jacqueline L. Smith, Section Head*

The UKVDL epidemiology section plans and conducts veterinary epidemiological research experiments that lead to the earliest detection of animal disease outbreaks, with our primary mission being to provide animal disease surveillance and assist veterinarians in the investigation of serious and unusual disease problems. Daily monitoring of finalized necropsy and lab testing data streams provide near real-time disease cluster analysis.

The section also conducts data acquisition and statistical analysis in support of the office of the state veterinarian and the USDA, and to provide animal health situational awareness for industry stakeholders. Many of these studies lead to publication in peer-reviewed journals and lay publications. Disease reporting to the state veterinarian (reportable infectious diseases, disease of interest, emergency disease notification) is performed weekly for the typical endemic diseases, while unusual or emergency disease situations are reported immediately.

In-depth field investigations to better characterize disease outbreaks for identifying causative etiology through the collection of diagnostic specimens and recommending diagnostic testing are provided free of charge to any farm/producer in the state of Kentucky at the request of a local client with the approval of the UKVDL administration.

### Highlights

- Conducted 261 telephone consults regarding suggestions, recommendations, and information related to animal health issues.
- Statistical requests (from UKVDL faculty, UK faculty, state and federal officials, local veterinarians): 197 requests (1-10 hrs each)
- Graphics requests: 173 (2-10 hrs each)
- Reportable disease reports: 52 weekly reports (approximately 1 hr each week)

# Department Reports

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## Agricultural Economics

### Executive Summary

The department filled its remaining research/teaching faculty vacancies, and now contains nine assistant professors and is poised for growth in the quantity and quality of refereed publications and in external grants that support graduate students. The Ph.D. program suffers from uncompetitive assistantship levels, delays in beginning research outside of coursework, and slow time to graduation. These challenges are being addressed. On the positive side, graduate students are actively presenting and publishing research, getting teaching experience, seeking and receiving funding for projects, leading meaningful international projects, and performing well in the job market.

### Research Programs

The department contained approximately 11 faculty who were actively involved in research. Areas of specialization include production economics (2), marketing and trade (4), environmental and resource economics (2), economic development (2), and equine economics (1). Research is also performed by the Community Economic Development Initiative of Kentucky (CEDIK), which is housed in the agricultural economics department, and by extension faculty engaged in farm management, livestock marketing, and horticultural marketing. Relative to peer institutions, we now have a comparative strength in farm management and production economics, with strong collaborations among research faculty, extension faculty, our ten Kentucky farm business management specialists, and researchers in other departments within the college.

### Graduate Degree Programs

The department administers M.S. and Ph.D. programs in Agricultural Economics, with approximately 25 students in each program. The recent filling of vacant faculty positions with highly skilled junior faculty will elevate the graduate program and generate more grant-funded assistantship support. The graduate students themselves are well-organized and seek ways to develop their competitiveness through journal authorship, conference presentations, teaching experience, and special projects in locations such as Haiti, the Netherlands, China, East African countries, and Benin. Challenges include uncompetitive assistantship levels, few funding opportunities for M.S. students, delays in getting started on research outside of coursework, and slow time to graduation.

### Significant Achievements

One of our Ph.D. students won both our national association's and the UK Provost's awards for outstanding teaching. Wuyang Hu won the college's award for service to graduate students. Three Ph.D. students spent the fall 2015 semester as visiting research assistants at the University of California–Berkeley.

## Animal and Food Sciences

The Department of Animal and Food Sciences is a vital part of the College of Agriculture, Food and Environment, providing significant contributions to the research and graduate studies missions of the Kentucky Agricultural Experiment Station. The department's faculty and professional staff uses a multidisciplinary approach to address important research areas from the cellular level to production systems, with the ultimate goal of enhancing animal production efficiency, improving health and well-being of animals and people, improving quality of life

in society, and providing consumers with a healthy, safe food supply. Lab and animal space in W.P. Garrigus Building and state-of-the-art beef cattle, sheep, and swine facilities at C. Oran Little Research Center, dairy and poultry facilities at Coldstream Farm, equine facilities at Maine Chance Farm, and beef cattle facilities at the Research and Education Center are utilized by faculty and staff for conducting cutting-edge research and training of graduate students. On-campus laboratories are equipped with instrumentation that allows trace mineral, vitamin, lipid, amino acid, hormone, enzyme, and stable and radioactive isotope analyses. Facilities for meat and food processing are also available and support research and graduate student training.

Disciplines of research in animal and food sciences include human, ruminant, non-ruminant, and equine nutrition; nutritional and anaerobic microbiology, physiology, genetics and animal breeding, and food science. Faculty and professional staff are involved in collaborative efforts with other scientists in the College of Agriculture, Food and Environment and other colleges within the University of Kentucky as well as with investigators from other research facilities across the U.S. and the world. These kinds of collaborative efforts allow research efforts to focus on developing solutions to complex problems.

Animal and Food Sciences faculty and staff play a key role in the University of Kentucky's Superfund Research Center, which conducts biomedical and environmental research with the goal of minimizing the negative health and environmental impacts of organic chemicals found in hazardous waste sites. Other departmental personnel are leading efforts for the Food Systems Innovation Center, a multidisciplinary program involving collaborations between Animal and Food Sciences, Agricultural Economics, Dietetics and Human Nutrition, and Biosystems and Agricultural Engineering, whose programs and activities help answer important questions for entrepreneurs involved in the local foods industry. Equine researchers in the department are an integral part of the college's UKAg Equine Program efforts and provide cutting-edge nutrition research for one of Kentucky's signature industries.

Animal and Food Sciences provides opportunities for students to pursue doctorate (Ph.D.) and masters (M.S.) degrees in animal sciences. Graduate research work in the broad areas of nutrition, management, animal care and well-being, and reproductive physiology may be conducted with beef cattle, dairy cattle, horses, poultry, sheep, swine, and companion animal species. Students with interests in foods may specialize in meats, dairy products, food microbiology, muscle biology, or food chemistry.

Faculty and graduate students in animal and food sciences received numerous acknowledgements of excellence. Faculty were recipients of two international, eight national, and two regional awards from professional associations. Two faculty also received state-level award winners for their efforts from commodity groups. Graduate students in the department received one international, five national, one regional, and one college-level award. In addition, one graduate was elected 2015-2016 National ADSA-SAD Second Vice President.

## Biosystems and Agricultural Engineering

The Department of Biosystems and Agricultural Engineering at the University of Kentucky began its professional engineering curriculum in the fall of 1957. Through May 2016, the program has granted more than 520 bachelor of science degrees. The department currently has 14 full-time tenured or tenure-track faculty members, more than 200 undergraduate students, and 35 graduate students. The degrees offered by the Department of Biosystems and Agricultural Engineering are:

- Bachelor of science in biosystems engineering (BSBN)
- Master of science in biosystems and agricultural engineering (MSBAE)
- Doctor of philosophy (Ph.D.)

The areas of specialization offered for undergraduate students are: bioenvironmental engineering, food and bioprocess engineering, machinery systems automation engineering, controlled environmental systems, pre-biomedical engineering, and pre-veterinary medicine. Research and extension programs are active in bioenvironmental engineering, food and bioprocess engineering, machine systems automation engineering, and controlled environmental systems.

### Highlights

- Undergraduate biosystems engineering enrollment increased 67 percent from 121 in 2013 to 203 in 2015.
- Highest retention percentage for first-year students in the College of Engineering for the 2014–2015 school year with 95 percent of the students retained.
- Incoming freshman class had the highest high school GPA of any department in the College of Engineering.
- Karin Pekarchik was the recipient of Fulbright International Education Administrators (IEA) grant, a competitive program that brings education administrators from the U.S. to Germany to learn about the German higher education system. She spent two weeks in Germany and visited in Berlin, Cologne, Frankfurt, and Strasbourg, France.
- Department awarded over \$40,000 in teaching-related grants including eLii Teaching Innovations Grants, NASA Kentucky Space Grant Consortium, CAFÉ TIIF award, and the Barnhart Fund for Excellence.
- Carmen Agouridis won the 2014 ASABE Young Educator Award (National competition for professors under the age of 40) and the 2015 Master Teacher Award Recipient, Gamma Sigma Delta.
- The ¼ Scale Tractor Team took first place in the 2014 and 2015 ASABE Student Design Tractor Competition.
- The graduate program ranked 12th in *U.S. News & World Report* (May 2014); tied with Penn State, ranked higher than Ohio State.
- Dr. Sama is central to one of the two NSF RII Track-2 EPSCoR proposals funded in 2015: Unmanned Aircraft System for Atmospheric Physics. \$1.4M for UK; \$305,359 for Dr. Sama's scope (collaborating with Oklahoma State University).
- Sama, Montross, Dvorak, McNeill, Mark. Development of a CAN-Based Data Management and Decision Support System

- for Optimal Equipment and Harvest Timing from Grain Harvest to Storage. USDA-NIFA-AFRI. \$500K for three years (2016-2019). Dr. Bode Adedeji received an equipment grant from USDA-NIFA-AFRI to purchase an extruder (\$149,713).
- USDA Postdoctoral Fellowship. Joshua Jackson (Dr. Montross Advisor). Forage and Resource Management Tool for Beef Producers Implementing Rotational Grazing. \$149,950.
- Larry Wells selected as ASABE fellow.
- 2015 Superior paper award by Sama and Stombaugh: Performance Evaluation of a Tracking Total Station as a Position Reference for Dynamic GNSS Accuracy Testing.
- Don Colliver is the director for the Kentucky Industrial Assessment Center funded by the U.S. Department of Energy. The IAC has performed assessments resulting in an average annual energy costs savings percentage of 17.7 percent plant energy usage.

## Community and Leadership Development

Our mission is to strengthen the capacities of individuals, organizations, and communities to act on their shared visions and challenges. We do this by basing our instructional and outreach programs on science-based research. The department was formed in 2002 and brought together faculty from rural sociology, agricultural education, agricultural communication, and program and staff development. Forming a new department necessitated changes and new approaches in how faculty approached their research endeavors as well as restructuring curricula at both the undergraduate and graduate levels. Undergraduate programs that were previously instruction-based (community communication and agricultural education, for example) now contain active and successful research components. Revisions in the graduate program led to a strengthening of the foundation between social science theory and research methods. Our overall focus is moving beyond the disciplinary approach of the past to a process stressing cross-disciplinary and collaborative partnerships in all aspects of our research, instructional, and outreach programs.

### Research Programs and Faculty Expertise

All faculty in community and leadership development have Ph.D.s in their respective disciplines. They have strong training from major research universities in such fields as communication, education, and rural sociology. Collaboration among our departmental faculty is very strong and extends to other units in the College of Agriculture, Food and Environment and other colleges on the UK campus including College of Arts and Sciences, College of Medicine, College of Education, and College of Communications. Our diverse faculty have varied research interests, including:

- Communications in a community context, including issues relating to online journalism, citizen journalism, role of communication in community development and community-based public health campaigns.
- Agricultural education including the role of STEM, school scheduling impact on education, teacher efficacy and job satisfaction, and youth and adult partnerships.

- Issues relating to community health, obesity, and supporting the health of SNAP-Ed.
- Topics relating to beginning farmers, family farms and social relationships, sustainability, the role of marketing projects in Appalachia, and community food projects.
- Environment and land use, labor of agrodiversity, and land and the role of politics and migration.
- Land grant universities and knowledge in the Black Belt South.
- Encouraging innovations and entrepreneurship locally, nationally, and internationally, including utilization of a community innovation lab to understand community engagement.
- Understanding communities and community development and the role of 4-H youth development in communities.

### Graduate Degree Program

The master of science degree in community and leadership development at the University of Kentucky is a unique multidisciplinary program that prepares students for a broad range of careers or for pursuing a Ph.D. in several different disciplines (agricultural education, agricultural leadership and development, communications, rural sociology). The curriculum integrates a solid foundation in social science theory and research methods. Students are challenged to understand and then apply both theory and methods in diverse contexts as both independent and collaborative scholar/professionals. Graduate students are expected to be engaged professionals participating in scholarly organizations, social change initiatives, community development associations, or community media campaigns. They should demonstrate the depth and breadth of their knowledge and skills through applied service or research projects. Finally, students are expected to contribute their expertise as academic, organizational, and community leaders. Many of our faculty and students collaborate on research, teaching, or outreach projects. Their work often involves a partnership with citizen groups, community-based organizations, and/or state/local governmental units in order to address a particular set of social issues.

### Significant Research Achievements, Honors, and Awards

- P. Dyk: National Association of Community Development Extension Professionals Southern Region Winner for Excellence in Teamwork for “Sustaining Civic Capacity in the Rural South.”
- R. Harris: Faculty Mentor of the Year Award. The Compact for Faculty Diversity. Presented by Southern Regional Educational Board.
- S. Nah: Editor’s recognition as a top reviewer out of 358 ad-hoc reviewers. Journalism and Mass Communication Quarterly.
- K. Rignall: “The labor of agrodiversity in a Moroccan oasis.” Journal of Peasant Studies. Selected as one of the 40 most important journal articles from the journal’s 40 year history on environmental themes in critical agrarian studies.
- S. Vincent: Intervention evaluation winner. Presented by National Institute for Occupational Safety and Health.
- J. Zimmerman: Recipient of the C. Milton Coughenour Rural Sociology Professorship at the University of Kentucky.



## **Dietetics and Human Nutrition**

The Department of Dietetics and Human Nutrition (DHN) is committed to being FIRST a student-centered department and, with the assistance of many community-based partners, offers a wide range of academic, research, and community development opportunities. Two undergraduate programs—dietetics, and human nutrition (450 students)—are offered, as well as a graduate program for a master of science degree in nutrition and food systems. The bachelor of science in human nutrition offers appropriate preparation for further study or professional careers in nutrition and food systems management and other health related fields, particularly medicine, dentistry, pharmacy, physician assistant, physical therapy, public health, food policy, and nutrition research. The bachelor of science degree in dietetics prepares individuals to be experts in the field of food and nutrition. Graduates are prepared to apply for an accredited supervised practice/dietetic internship program to become eligible to sit for the Commission on Dietetic Registration's national registry exam to earn the credential of registered dietitian nutritionist (RDN). An additional pathway to the bachelor in dietetics is acceptance into the Coordinated Program in Dietetics, which includes the academic programing plus the supervised practice program. All students in the department participate in research projects. Our core values are designed to support learning, discovery, and engagement and include:

- Focus on the contributions to excellence in learning, discovery, and engagement.
- Innovation in ideas will contribute to evidence-based best practices in the profession.
- Respect for others will allow service to others to be our highest priority.
- Success is reached by empowering all individuals to reach their full potential.
- Teamwork fosters partnerships between students, faculty, alumni, and community.

### *Research Programs and Faculty Expertise*

DHN addresses community dietary-related issues through undergraduate and graduate education, research, and outreach/extension. Faculty are dedicated to finding innovative solutions to real-world problems facing the state of Kentucky, our nation at large, and the world beyond. The long-term goal is to reduce the risks of food insecurity, obesity, and chronic diseases and to contribute to evidence-based best practices in the profession of dietetics and human nutrition.

DHN has state-of-the art facilities for educational and research purposes, including food preparation and food development laboratories and a BOD POD used for standard body composition assessment. Faculty have expertise in food systems, food insecurity, nutrition and chronic disease, entrepreneurship, environmental contaminants, and weight loss management. Recent funding was awarded through national competitive processes from the National Institute of Environmental Health Sciences, the U.S. Department of Agriculture, the National Heart, Lung and Blood Institute; Cooperative State Research, Education and Extension; the National Institute of Food and

Agriculture; the Centers for Disease Control; the Robert Wood Johnson Foundation; and the American Livestock Breeds Conservancy.

### *Graduate Degree Program*

The Department of Dietetics and Human Nutrition offers a master of science in nutrition and food systems and seeks to educate students using a multidisciplinary approach in order to emphasize the impacts of food systems and diet on human health while exploring strategies to reduce the risk of chronic disease among individuals and communities. Our goal is to provide students with an expertise in nutrition and food systems, learning to apply practical and critical thinking skills to nutrition-related problems in an evolving global society.

### *Significant Achievements*

DHN success has been accomplished by empowering students, faculty, community partners, and clients to reach their full potential in determining their own health through education, research, and outreach/extension. DHN is known for such programs as Food Insecurity and Accessibility; Plate It Up Kentucky Proud; Homebased Microprocessors; Lemon Tree Cafe; Superfund Nutrition Outreach; Children, Youth and Families at Risk; and Behavioral Mindful-based Weight Management.

## **Entomology**

The members of the Department of Entomology are committed to providing high quality programs. We recognize that we must continually look for new opportunities and adjust current programs to enhance our ability to meet the changing needs of society. Our strengths are in graduate education, research, teaching, and extension. Faculty are actively involved in a number of undergraduate degree programs, including agricultural biotechnology (ABT), sustainable agriculture, and an individualized program in entomology within the bachelor of science program in agriculture. Faculty teach undergraduate courses that are required for several majors within the College of Agriculture (forestry, horticulture, and plant and soil sciences) and the College of Arts and Sciences (biology). Each semester for the past 15 years the department has taught a course (ENT 110) that fulfills a natural sciences requirement in the current university studies program (USP) at the University of Kentucky. Faculty in entomology are dedicated instructors who take pride in their graduate and undergraduate teaching responsibilities. Within the department, we strive for a creative synergy between fundamental and applied entomological research, developing long-term solutions to entomological problems while providing answers that address immediate short-term problems. Our strong integration of research and extension efforts enhances our visibility and effectiveness. We also integrate the graduate education program with our research and extension strengths. The department's approach to the MRLS (mare reproductive loss syndrome) crisis in Kentucky and our response to the more recent worldwide outbreak of bed bugs and the Zika virus demonstrate how we respond to critical needs of the citizens of the Commonwealth of Kentucky, the nation, and the world.

Behavioral and ecological questions in forest ecosystems are addressed in the context of herbivore-plant relations, feeding guild interactions, and interactions among plant stressors. Current research emphasis focuses on the highly invasive hemlock woolly adelgid, which is threatening the sustainability of eastern Kentucky's hemlock forests, and a globally invasive gall wasp, which impacts nut production and threatens the feasibility of forest restoration efforts (Rieske-Kinney). A variety of post-genomics technologies including RNA interference, microarray real-time PCR, and a model insect pest, the red flour beetle (*Tribolium castaneum*) were used to study the function of gene products that play key roles in hormonal regulation of development, reproduction, and insecticide resistance (Palli). Bacterial endosymbionts are common among insects and affect many aspects of the ecology, evolution, and behavior of their hosts. Jen White is investigating bacterial endosymbionts in agricultural pests. The invasive mosquito *Aedes albopictus* (the Asian tiger mosquito) is a significant biting pest throughout much of the United States, including Kentucky. Dobson is utilizing novel insect marking technologies to track their dispersal, population size and survivorship. A developing research program is combining the power of genomic, proteomic, and bioinformatics research tools with the biological disciplines of toxicology, physiology, and sociobiology to address biological questions with practical implications (Zhou). Insect behavior and chemical ecology program investigates fundamental questions concerning how insects communicate using chemical signals. We have a long-term interest in the evolution of multi-component pheromones in moths, with a focus on a model species, *Trichoplusia ni* (Haynes). Faculty and students from the department published 60 refereed journal articles and six other publications.

## Family Sciences

Family Sciences is a strong unit that makes significant contributions to the College of Agriculture, Food and Environment and the University of Kentucky. The department generates some of the highest student credit hours in the college, our majors contribute to the university's compelling interest in diversity, and our research productivity (controlling for research distribution of effort) is one of the highest in the college. Our research profile is enhanced by the two faculty members who edit respected journals in our field. The department includes two active research labs: the Adolescent Development Lab directed by Alexander Vazsonyi and the Family Interaction Research Lab directed by Ronald Werner-Wilson, which are supported by endowments.

Our graduate program has continued to grow, and we have recruited more diverse students, including international students as well as students from traditionally underrepresented groups. We successfully mentor these graduate students by providing them opportunities to publish with faculty members. (The majority of publications and presentations include graduate student co-authors.) After graduation they are able to successfully compete for positions. It is notable that faculty mentoring is occurring throughout the department as more faculty members are supervising theses and dissertations.

We have systematically investigated appropriate online course delivery and have received approval to teach several

courses online. We identified a handful of courses that seemed appropriate to this delivery strategy and identified tactics to ensure rigor and minimize academic misconduct (for example, requiring Proctor U for all online courses offered by our department), which can plague this approach to teaching. We have also become more active in providing study abroad opportunities to students, including experiences in Greece and Korea.

## Forestry

The Department of Forestry (UK Forestry) is one of 14 academic departments within the College of Agriculture, Food and Environment at the University of Kentucky. It is one of only a few professionally accredited degree programs in the college and the only accredited forestry program in the state. As such, the department is responsible for servicing all demand for forestry undergraduate and graduate programs, the majority of research, and all forestry-related Cooperative Extension programming in the Commonwealth of Kentucky. Approximately 47 percent of Kentucky is forested, and there are nearly 470,000 woodland owners in the state. According to the latest estimates, the state supports a forest products industry with cumulative impacts nearing \$13 billion. Forestry-related industries employ around 30,000 workers, not including supporting industries. Kentucky is typically one of the top three hardwood-producing states in the country. The stated mission of the department is to enhance the ecological, economic, and social benefits of forests and related natural resources to elevate the quality of life for Kentuckians and beyond.

Although its primary undergraduate teaching mission is the bachelor of science in forestry, UK Forestry has also been the leading contributor to the interdisciplinary Natural Resources and Environmental Sciences (NRES) bachelor of science for many years, having been foundational in beginning the program for the College of Agriculture back in 1991. Our faculty not only teach many of the classes in the program but continue to serve in key leadership positions.

The department supports UK's mission through its teaching, research, and extension activities. Nearly one-half (~12 million acres) of Kentucky supports commercially and ecologically valuable forestland, providing ample evidence for the importance of UK Forestry and its tripartite purpose of teaching the future generation of forest, wildlife, and natural resource managers; conducting research to improve management and conservation; and outreach to share the findings of relevant research being conducted not only in Kentucky but from around the country. UK Forestry and the College of Agriculture, Food and Environment strive to promote the integration of research, instruction, and extension to discover new knowledge as well as to address issues of importance to the Commonwealth, the nation, and the world.

Graduate instruction is offered through the Master of Science in Forestry program. Although UK Forestry does not currently have a Ph.D. program, individual faculty members maintain adjunct appointments in other departments (plant and soil sciences, animal sciences, biology), which enables them to recruit and offer Ph.D. programs to graduate students. Several UK Forestry faculty also participate in the interdisciplinary Inte-



grated Plant and Soil Sciences (IPSS) Ph.D. program. Graduate instruction is offered through the Master of Science in Forestry program. Although UK Forestry does not currently have a Ph.D. program, individual faculty members maintain adjunct appointments in other departments (Plant and Soil Sciences, Animal Sciences, Biology), which enables them to recruit and offer Ph.D. programs to graduate students.

A new major research initiative within the Department of Forestry is the Forest Health Research and Education Center (FHREC), a collaborative effort between UK Forestry, the USDA Forest Service Southern Research Station (SRS), and the Kentucky Division of Forestry. The stated mission of the FHREC is to advance the conservation of forested ecosystems by integrating genetics-based biological research, social science, and education on factors affecting tree health and forest restoration.

Using a collaborative research and education approach, the FHREC is developing programs and facilitating discussions to fight forest health threats and ensure the resilience of eastern U.S. forest systems. The FHREC is comprised of three collaborative teams working together to fight forest health threats and improve sustainability.

The biological sciences team conducts research collaboratively with researchers around the world to better understand tree resistance to stress, pests, and pathogens.

- The social sciences team collaborates with scientists around the country to improve understanding of the economic and cultural impacts/impressions of forest threats.
- The education and outreach team is comprised of Cooperative Extension personnel around the region to develop and deliver educational programming to improve understanding of forest health threats and the tools to fight them.

## Horticulture

The Department of Horticulture continues to move toward a position of national leadership in organic and sustainable horticultural production practices and continues as a major player in the College of Agriculture, Food and Environment for the undergraduate programs in sustainable agriculture, horticulture plant and soil sciences, and agriculture biotechnology. The department has basic and applied research programs with national and international reputations particularly in the area of biofuels, plant microbiomes, cellulose metabolism, life-cycle analyses, agroecology, seed biology, and basic plant physiology and biochemistry. Our most productive young faculty members are taking active roles throughout the college and university and are shaping the future of the department.

The department has had a significant increase in the number of competitive grant dollars and research publications per FTE in research, as well as an increase in the quality of publications over the past two years. The department's research farm is home to a 30-acre Organic Farming Unit and the community supported agriculture program. Horticulture graduate faculty actively participate in the Integrated Plant and Soil Science graduate program by teaching in graduate level courses and mentoring graduate students. A significant research paper published in the journal *Frontiers in Plant Science* 10 July 2015, Characterization of culturable bacterial endophytes and their

capacity to promote plant growth from plants grown using organic or conventional practices by Dr. Seth DeBolt and Dr. Mark Williams has had 2,320 combined downloads and views. Horticulture faculty and staff have received numerous awards and recognition, including:

- Dr. Seth DeBolt received the Thomas Poe Cooper Research Award.
- Dr. Mark A. Williams received the Provost's Award for Outstanding Teaching.
- Dr. Winston Dunwell received a fellow award from the Eastern Region International Plant Propagators' Society.
- Dr. A. Bruce Downie was selected by the Indian National Science Academy (INSA) for the Dr. B.P. Pal Distinguished Chair Award.
- Dr. John G. Strang was awarded the inaugural Dr. John Strang Award from the Kentucky State Horticultural Society.
- Ms. Ruth Scott's floral sculptures were on display for Earth Day by the Cultural Arts Committee of the Student Activities Board.
- Ms. Shari Dutton received the CAFE Outstanding Staff award.

Departmental faculty were also instrumental in the development and implementation of two new interdisciplinary programs; the Distillation, Wine and Brewing Undergraduate Certificate Program, and the University Scholars Program between the College of Medicine and the Agriculture Biotechnology Program.

## Landscape Architecture

The primary mission of the Department of Landscape Architecture is the undergraduate program in landscape architecture, which prepares students for entry into the profession of landscape architecture. Research in the department is largely in the areas of design thinking and metacognition, geospatial analysis, stream morphology and change, and cultural landscape preservation. The department also engages in an active program of community design assistance, led by an extension faculty member, Jayoung Koo, who collaborates with the college's Community Economic Development Initiative of Kentucky.

## Plant and Soil Sciences

An overarching goal in the Department of Plant and Soil Sciences is to improve, through scholarly research, the understanding of plant and soil systems as sustainable resources for human use while preserving and enhancing environmental quality. We address a broad subject matter including the chemistry, physics, and biology of plant, soil, and environmental systems, ranging from the molecular to the whole plant to the ecosystem scale. This diverse research portfolio underlays our participation in the Integrated Plant and Soil Sciences graduate program. The department includes 43 full-time faculty members and nearly 60 graduate students and 70 staff employees. Our distribution of faculty effort is approximately 60 percent research with the remainder divided between extension and instruction. Over the past five years the department has averaged \$4,360,000/year in extramural funding, and in 2014–2015 received \$183,000 in grant funding per full-time researcher.

While many of our students are enrolled for master's and doctoral degrees in the recently created Integrated Plant and Soil Sciences program, students are still also receiving degrees from several legacy programs. In 2014-2015 the following degrees were granted: Crop Science – 2 M.S.s, 3 Ph.D.s; Plant Physiology – 4 Ph.D.s; Soil Science – 1 Ph.D.; Plant and Soil Sciences – 2 M.S.s; Integrated Plant and Soil Sciences – 6 M.S.s, 1 Ph.D.

### Highlights

- Our forage breeding program released two new varieties: 'Kenfest', a cross between ryegrass and meadow fescue, and 'Lacefield MaxQII', a novel endophyte tall fescue.
- Researchers are participating in a major regional project: Using precision technology: On-farm field trials to enable data-intensive fertilizer management.
- The industrial hemp agronomic research program grew significantly with major projects on genomics of oil quantity/quality, natural fiber production, field-scale cannabinoid production, techniques for genetic modification, and three standard variety trials evaluating entries for grain/seed production, dual purpose (grain and fiber production), and fiber-only production.
- Working with Keeneland, the soil physics program helped to identify a race track material which would drain quickly, provide a stable base for races, and sustain the health of horses.
- Cooperative research occurs with people from China, Japan, Sri Lanka, Taiwan, and the United States related to the ecology, biogeography, and evolution of seed dormancy and germination.
- A project to improve fragipan agriculture has shown promising results. Annual ryegrass looks promising at breaking down the fragipan. Not only does ryegrass have a deep root system that can penetrate the pan, but it also releases chemicals that can help break it apart.
- A new area of emphasis in agroclimatology and ag-systems modeling will project outcomes and responses of crop production to climate change of increased temperatures and altered precipitation patterns.
- The department initiated an irrigation research project at the West Kentucky Research and Education Center, receiving significant funding from the Kentucky Soybean Promotion Board, the Kentucky Corn Growers, and the Kentucky Small Grain Growers Association.
- In molecular biology research, a major project began: Flavonoid Isolation from Intact Plants: A Nanoparticle-Based Approach. Research continued on messenger RNA modification with NSF funded projects: CPSF30 at the convergence of cellular signaling and RNA Processing and Alternative polyadenylation and non-stop mRNAs in Arabidopsis. These projects helped develop versatile and inexpensive methods for the production of RNA-Seq libraries which were then adopted by many laboratories in the United States and the world.

### Plant Pathology

The mission of the Department of Plant Pathology is to improve understanding of plant disease through research and to utilize this knowledge to educate students and Kentucky

residents about plant diseases. By these means, the department promotes plant health throughout the Commonwealth and encourages the use of economical, science-based disease management practices intended also to minimize negative environmental impacts. Traditional research strengths of the department have been physiology of plant disease and resistance, plant virology, and plant mycology. Published research of the department programs has addressed replication and evolution of plant viruses, biochemistry and genetics of plant disease resistance, whole genome analysis of plant-pathogenic and plant-symbiotic fungi, and methods to detect, distinguish and control plant pathogens.

The department maintains two plant disease diagnosis laboratories—one on the Lexington campus and the other at UKREC in Princeton, Kentucky. Together, these laboratories conduct more than 4,000 diagnoses annually. These laboratories provide up-to-date diagnostic records and integrate them with the Southern and National Plant Diagnostic Networks, which is essential for timely and effective Cooperative Extension programs for growers and other stakeholders to manage plant diseases.

The department also plays a key role in bioinformatic and genomic education in the Commonwealth. Department faculty managed the genome sequencing core and conducted a week-long regional course in genomics and bioinformatics. Other department faculty continued to direct the Plant Imaging core facility, which provides confocal microscopy, a state-of-the-art technology.

This department offers a dissertation-based doctor of philosophy degree and a thesis-based master of science degree. In both programs, students take approximately two years of coursework that has been designed by the faculty to enhance knowledge of plant physiology, microbiology, genetics, molecular biology, biochemistry, and plant pathology, and they learn skills, standards, and ethics in scientific philosophy, research techniques, and writing and oral communication. Graduate student research projects are generally relevant to the betterment of Kentucky agriculture and biotechnology.

The department launched a dual degree program with the Departamento de Fitopatologia at the Universidade Federal de Viçosa (UFV) in Brazil. This program will allow Ph.D. students in UFV to complete the requirements for a Ph.D. in Plant Pathology at the University of Kentucky, and vice versa. Students enrolled in this program will gain valuable international experience and connections that will make them highly competitive for a wide range of jobs, such as with major agribusiness corporations or with academic departments with emphasis on international agriculture.

Plant pathology Cooperative Extension faculty received several awards, including the Friend of the Wheat Industry Award (Bradley) from the Illinois Wheat Association, the Outstanding New Extension Faculty Award (Gauthier) from the Kentucky Association of State Extension Professionals (KASEP), and the Blue Ribbon Extension Communication Award (Gauthier) from the Southern Region American Society of Horticulture Science. Also, Paul Vincelli was elected 2015–2018 councilor at large for the American Phytopathological Society.

## Retailing and Tourism Management

The Department of Retailing and Tourism Management (RTM) consists of two major programs: Merchandising Apparel and Textiles and the Hospitality Management and Tourism. The department has two lecturers, three assistant professors, five associates, and two full professors. The goal of the department is to enhance the teaching and research of all faculty and to improve the employability of our students. To improve the teaching and research of faculty we have increased the number of collaborations among faculty and focus more on publications than conference presentations. To improve student employability, we have developed a professional development team for students. So far, we have utilized our advisory board to raise funds for scholarships for domestic and international travel. We are also utilizing the advisory board and Amanda Saha for on-site mock interviews, resume writing, and professional communications. Our intern coordinator spends a great deal of time seeking quality internships for our students. We have also developed a curriculum committee that has reviewed and revised our course offerings to create opportunities for students from both programs to learn together and to understand how we are similar.

As we move forward, our goal is to increase grant writing and continue to enhance student experiential learning by building relationships with the industry. We hope to build our graduate program by completing our online master's degree program in the next two years.

We are working with Tennessee State University to develop an articulation agreement at the undergraduate and graduate level. We hope to be able to create a joint program with them where students can take courses at UK and complete a master's degree with our courses and their degree.

### Research Programs and Faculty Expertise

- Brown, D.: Tourism in developing countries, specifically poverty alleviation, small business skills development and employability, and building capacity for small and medium size tourism enterprises (SME's) in rural areas and developing countries.
- Cavendar, R.: The brand management of luxury fashion goods.
- Easter, E.: ALM: Quality Control Laboratory, Provides a test piece service for the Association for Linen Management.
- Easter, E.: The Clothes Care Research Center™ (CCRC) is a cooperative effort among Cotton Incorporated, GE Consumer & Industrial, and Procter & Gamble. The University of Kentucky's Textile Testing Laboratory provides unbiased oversight to design and conduct CCRC's research projects to help consumers save time and money by identifying the best in-home cleaning and maintenance techniques to extend the life and performance of fabrics.
- Jackson, V.: Perceived importance of soft skills between retailing and tourism management students, faculty and businesses.
- Lee, MinYoung: Consumer emotion and experience in retail environment and social responsibility issues.
- Lu, Tracy: Service management and consumer behaviors in service settings, particularly on the topics of customer

engagement, loyalty, and interactive experiences in local communities and travel destinations.

- Spillman, K.: Expression of the self through dress, Public, Private and Secret Self (PPSS model), and developing ways to assist women in Ghana.
- Swanson, J.: Investigating challenges involving public policy related to tourism, motivations associated with education abroad travel, and transformational travel, investigating how travelers may change their psychological understanding of themselves based on their travel experiences.
- Wesley, S.: Local retail development, tourist retailing and shopping, and education abroad.

### Graduate Degree Programs

RTM offers a Master of Science in Retailing and Tourism Management degree with two formal options—Merchandising, Apparel and Textiles (MAT) and Hospitality Management and Tourism (HMT)—with a single set of core requirements and individual support selections for both options.

In preparation for our proposed online degree, all courses in the program have been revised and approved as online courses and are ready for implementation as soon as the program has been approved and we work out other details.

## Veterinary Science

The Department of Veterinary Science supports the Commonwealth's animal industry by providing a comprehensive range of research, service, and teaching activities. All three primary divisions of the department, namely the Maxwell H. Gluck Equine Research Center, the Animal Genetics Testing and Research Laboratory, and the Veterinary Diagnostic Laboratory, have gained national and international recognition for the quality of their respective programs. Research activities within the department encompass the various disciplines of equine research. The overall goal of these activities is to improve the health and wellbeing of the horse through the generation and application of new knowledge. As such, our program emphasizes novel investigations into the causes and mechanisms of diseases which affect the economy of production and the performance of horses. The dissemination of this information to our stakeholders throughout Kentucky is of paramount importance.

Research programs within the department encompass the various disciplines of equine research, including infectious disease, immunology, parasitology, reproduction, musculoskeletal diseases, genetics, and pharmacology/toxicology. The infectious disease group focuses on ways to improve the diagnosis, treatment, and prevention of important pathogens of the horse, including arteritis (P. Timoney, Balasuriya), herpes (Balasuriya, Chambers), equine infectious anemia (Issel, Cook), and equine influenza viruses (Chambers), as well as those bacterial infections caused by *Streptococcus equi* (J. Timoney), *Leptospira*, and *Rhodococcus equi* (Horohov). The immunology program has continued its emphasis on immune function and dysfunction in both foals (Horohov) and aged horses (Adams). Parasitology research focuses on ways to reduce the impact of parasitic infections through improved diagnostic and treatment strategies



against intestinal worms (Nielsen, Lyons) and *Sarcocystis neurona* (Howe). This research includes the development of a novel technology for determining parasite burdens in horses (Nielsen, Howe). The reproduction group works on causes of infertility in both mares and stallions with recent emphasis on equine placentitis (Ball, Troedsson, Squires) and testicular development (Ball). The musculoskeletal group continues to work on the molecular regulation of chondrocytes (MacLeod) as well as the underlying genetic basis for equine stenotic myelopathy (Janes). The genetics group contributes to our overall understanding of the equine genome and its role in various diseases of the horse (Bailey), as well as providing genetic testing services (Graves, Lear). A recent emphasis of the pharmacology program has the issue of environmental contamination in racehorse blood samples (Tobin).

The veterinary science graduate degree program provides opportunities for our students to develop the skills necessary to become competent scientists who are creative and critical thinkers with the contemporary skills and knowledge to perform

independent research and to effectively communicate their results. There are currently 16 Ph.D. and 7 M.S. students in our department. These students are distributed through each of the research disciplines in our program.

The prior year has seen the implementation of several new initiatives in our program. The musculoskeletal group (MacLeod, Janes, Kennedy) has developed the Equine Sports Science Initiative, which involves faculty from the Gluck Center and the Diagnostic Laboratory as well as local practitioners. The focus of this effort is on the reduction of injuries in equine athletes. As noted above, the parasitology program (Nielsen), through an innovative collaboration with a private company, has developed a novel technology which will permit stall-side determination of fecal eggs counts for intestinal parasites in horses and other species. The application of this technology should result in improved use of anthelmintic therapies to offset the emergence of drug resistance in these parasites.

## Kentucky Agricultural Experiment Station Projects

*Hatch, McIntire-Stemis, and Animal Health projects for calendar year 2015, as reported in the USDA Current Research Information System (CRIS) database, follow.*

### Agricultural Economics

- A Comprehensive Study of Kentucky's Equine Industry—*Stowe, C.; Rossano, M.; Coleman, R.; Davis, A.*
- Agricultural and Rural Finance Markets in Transition (NC1014, NC221, NCT-194)—*Freshwater, D.*
- Assessing the Consumer Behavior, Market Coordination, and Performance of the Consumer-oriented Fruit and Vegetable Sector—*Woods, T.A.*
- Benefits and Costs of Natural Resources Policies Affecting Ecosystem Services on Public and Private Lands—*Schieffer, J.*
- Economic Effects of Adaptive Behavior with Precision Agriculture Technology—*Dillon, C.*
- Family Firms and Policy in Times of Disruption (NC1030)—*Robbins, L. W.*
- Food Safety Incidents and the Food Supply Chain: The Impacts on Consumers and Producers and the Strategic Response of Supply Chain Managers and Food Industry Leaders—*Saghaian, S.H.*
- The Impact of Enhancing Community Capitals on Rural Economic Development—*Davis, A.*
- The Importance of U.S. Food and Agricultural Trade in a New Global Market Environment—*Reed, M.*
- Modeling and Testing Kentucky Farmers' Use of Climate and Weather Forecasts—*Kusunose, Y.*
- Nanotechnology and Biosensors—*Hu, W.*
- Whole Farm Dairy and Beef Systems: Gaseous Emissions, P Management, Organic Production, and Pasture Based Production—*Kusunose, Y.*

### Animal and Food Sciences

- Construction of Active Protein Membranes for the Formation of Functional Oil-in-Water Food Emulsions—*Xiong, Y.*

- Development of Methodology for the Analyses of Intrinsic Free Radicals in Foods—*Boatwright, W.*
- Enhancing the Competitiveness and Value of U.S. Beef—*Suman, S.*
- Enteric Diseases of Food Animals: Enhanced Prevention, Control and Food Safety—*Newman, M.*
- Environmental Pollutants, Nutrition and Vascular Endothelial Cell Function—*Hemig, B.*
- Factors Affecting Phosphorus Concentrations and Phosphorus Digestibility in Pasture Herbage Consumed by Grazing Animals—*Lawrence, L.*
- Integrated Approach to Enhance Efficiency of Feed Utilization in Beef Production Systems—*Matthews, J.C.*
- Limitations in Small Intestinal Carbohydrate Assimilation in Beef Cattle—*Harmon, D.*
- Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises (NC-119)—*Bewley, J.*
- Mastitis Resistance to Enhance Dairy Food Safety—*Bewley, J.M.*
- Metabolic Relationships in Supply of Nutrients for Lactating Cows—*McLeod, K.R.*
- Methods to Increase Reproductive Efficiency in Cattle—*Silvia, W.J.*
- National Animal Nutrition Program—*Cromwell, G.L.*
- Nutritional Systems for Swine to Increase Reproductive Efficiency—*Lindemann, M.*
- Ovarian Influences on Embryonic Survival in Ruminants—*Bridges, P.J.*
- Poultry Production Systems and Well-being: Sustainability for Tomorrow—*Adedokun, S.*
- Rapid Assay Probe Technologies and Media for Monitoring Flora in Foodstuffs—*Hicks, C.L.*
- Regulating the Signaling Pathways that Determine Skeletal Muscle Mass—*Urschel, K.*
- Species-specificity in Carboxymyoglobin Redox Stability—*Suman, S.P.*

- Use of a Carbohydrate-based Toxin Adsorbent Supplement Provided through a Mineral Carrier to Alleviate Endophyte Toxicosis in Beef Cows and Calves Grazing Tall Fescue—*Ely, D.*

### Biosystems and Agricultural Engineering

- Agricultural Safety and Health Research and Extension—*Purschwitz, M.A.*
- Animal Production Systems: Synthesis of Methods to Determine Triple Bottom Line Sustainability from Findings of Reductionist Research—*Taraba, J.*
- Development of a Distributed Control and Data Acquisition System for Variable-Rate Applications in Precision Agriculture—*Sama, M.*
- Development of an Algae-based System for CO<sub>2</sub> Mitigation—*Crocheck, C.L.; Montross, M.D.*
- Development of Stream Assessment Tools and Riparian Corridor Techniques for Enhancing Water Quality in Karst Watersheds in Central Kentucky—*Agouridis, C. T.; Warner, R. C.*
- Engineering for Food Safety and Quality—*Payne, F. A.; Adedeji, A.*
- Integrated Systems Research and Development in Automation and Sensors for Sustainability of Specialty Crops—*Dvorak, J.*
- Marketing and Delivery of Quality Grains and BioProcess Coproducts—*Montross, M. D.; McNeill, S. G.*
- Quantification of Best Management Practice Effectiveness for Water Quality Protection at the Watershed Scale—*Edwards, D.*
- The Science and Engineering for a Biobased Industry and Economy—*Nokes, S.E.; Lee, C.; Crocheck, C.; Montross, M.*

### Community and Leadership Development

- A Framework for Secondary Schools Agriscience Education Programs that Emphasizes the STEM Content in Agriculture—*Epps, R.*

Agricultural Education Research—*Hains, B.*  
Interactions of Individual, Family, Community,  
and Policy Contexts on the Mental and  
Physical Health of Diverse Rural Low-Income  
Families—*Dyk, P.*  
Renewing an Agriculture of the Middle:  
Value Chain Design, Policy Approaches,  
Environmental and Social Impacts—*Tanaka, K.*

## Entomology

A Sustainable Approach for Protecting Our  
Forests from Emerald Ash Borer, with  
Applications to Other Exotic Wood-boring  
Invaders—*Rieske-Kimney, L.*  
Bacterial Symbionts and Defensive Traits in  
Insects—*White, J.*  
Biological Control in Pest Management Systems  
of Plants—*Harwood, J. D.*  
Biological Control of Arthropod Pests and  
Weeds—*Yeagan, K.V.*  
Biological Improvement of Chestnut through  
Technologies that Address Management of  
the Species, Its Pathogens and Pests—*Rieske-  
Kimney, L. K.*  
Biology and Management of Insects Attacking  
Turf and Woody Landscape Plants—*Potter,  
D.A.; Redmond, C.T.*  
Biology, Ecology and Management of Emerging  
Disease Vectors—*Dobson, S.L.*  
Biology, Impact, and Management of Soybean  
Insect Pests in Soybean Production Systems—  
*Yeagan, K.*  
Colony Collapse in Termites—RNA Interference-  
Mediated Genetic Manipulation—*Zhou, X.*  
Comparative Ecological and Phonological  
Studies of Predatory Lady Beetles (Coleoptera:  
Coccinellidae)—*Obrzycki, J.*  
Defining and Utilizing Selected Molecular  
Features of Insect Viruses—*Webb, B.A.*  
Delineation of Structural Complexity in Above  
and Belowground Forest Food Webs—  
*Harwood, J. D.*  
Ecology and Management of European Corn  
Borer and Other Lepidopteran Pests of Corn—  
*White, J.A.*  
Identifying Weak Links in Bed Bug Biology—  
*Haynes, K.*  
Improving Management of Insects of Public  
Health Significance in Kentucky—*Brown, G.C.*  
Inbreeding Depression in Mating Biology  
Following Population Bottlenecks in a Storage  
Pest—*Fox, C.W.*  
Management of Pests and Conservation of  
Beneficial Insects in Urban Landscape—*Potter,  
D.*  
Molecular Analysis of Insecticide Resistance—  
*Palli, S.R.*  
Quantifying the Effect of Habitat Structure on  
Biological Control—*Harwood, J. D.*  
Spatiotemporal Relationships in Forest-Floor  
Food Webs—*Harwood, J.*  
Systematics, Taxonomy, Biodiversity, and Food  
Web Interactions of Ichneumonidae (Insecta:  
Hymenoptera)—*Sharkey, M.; Chapman, E.*

## Forestry

Autecology and Population Dynamics of  
Reintroduced Elk in a Denatured Landscape of  
Appalachia: Implications for Management of  
Kentucky's Mixed-Mesophytic Forest—*Cox, J.*  
Evaluating the Use of Light Detection and  
Ranging (LIDAR) Information to Improve  
Forest Management Decisions—*Contreras, M.*  
Forest Management and Foraging Habitat of Bats  
Vulnerable to White-nose Syndrome—*Lacki,  
M.J.*

Multiscale Approaches to Investigate the Effects  
of Various Anthropogenic Disturbances on  
Stream-inhabiting Amphibians and Reptiles—  
*Price, S.*  
Participation of Kentucky Woodland Owners in  
the Woody Biomass Market—*Stainback, G.A.*  
Silvicultural Approaches to Enhance the  
Resiliency of Oak-dominated Forests to  
Disturbance—*Lhotka, J.*  
Using Remotely-sensed Data to Evaluate Post-fire  
Vegetation and Fuel Dynamics in Central and  
Appalachian Hardwood Forests—*Arthur, M.A.*  
Water Resources in a Changing World:  
How Changes in Climate and Land-use  
Influence Water Quality and Quantity in the  
Cumberland Plateau Region of Kentucky—  
*Barton, C.*

## Horticulture

Arthropod Resistance of *Lycopersicon hirsutum*  
LA2329, a Wild Relative of Tomato—*Snyder,  
J.C.*  
Defining the Role(s) of Plant Sorbitol  
Dyhydrogenase—*Archbold, D.*  
Developing Optimized Organic Production  
Systems for Cucurbits and Apples—*Williams,  
M.*  
Environmental and Genetic Determinants of  
Seed Quality and Performance (from W1168)—  
*Downie, A.B.; Geneve, R.L.; Perry, S.; Baskin, C.*  
Identification and Predicting LEA Protein  
Interacting Proteins—*Downie, A.B.*  
Identifying the Biophysical, Biochemical,  
Environmental, and Genetic Factors  
Associated with Seed Development, Dormancy,  
Germination, and Establishment of Eastern  
Gamagrass—*Geneve, R.L.*  
Improving Economic and Environmental  
Sustainability in Tree-Fruit Production through  
Changes in Rootstock Use—*Archbold, D.*  
Microbial Based Herbicide Discovery Focused on  
Cellulose Biosynthesis Inhibitors—*DeBolt, S.*  
Multi-State Evaluation of Wine Grape Cultivars  
and Clones—*Archbold, D.*  
Quantifying the Linkages among Soil Health,  
Organic Farming, and Food—*Jacobsen, K.*  
Sustainable Practices, Economic Contributions,  
Consumer Behavior, and Labor Management  
in the U.S. Environmental Horticulture  
Industry—*Ingram, D. L.*  
Water Management and Quality for Ornamental  
Crop Production and Health—*Dunwell, W.*

## Human Environmental Sciences

EFNEP Related Research, Program Evaluation  
and Outreach—*Forsythe, H.E.*  
The Influence of Social Media on Attendee  
Behavior—*Lu, Y.*

## Plant and Soil Sciences

A Comparison of Soil Seed Bank Dynamics  
of Herbicide Resistant and Nonresistant  
Amaranthus Species—*Baskin, C.*  
Breeding and Genetics of Forage Crops to  
Improve Productivity, Quality, and Industrial  
Uses—*Phillips, T.D.*  
Complementary Approaches to Developing Scab  
Resistant Wheat Varieties—*Van Sanford, D.A.*  
Cooperative Variety Testing Programs—*Van  
Sanford, D.A.*  
Design, Assessment, and Management of Onsite  
Wastewater Treatment Systems: Addressing the  
Challenges of Climate Change—*Karathanasis,  
A.D.*  
Determining Potential Interactions of Genetics  
and Management in Maize—*Lee, C.*

Development of External Regulation of  
Transgenic Traits in Crop Plants—*Davies, H.*  
Ecophysiological Aspects of Forage  
Management—*McCulley, R.L.*  
Enhancing Nitrogen Utilization in Corn Based  
Cropping Systems to Increase Yield, Improve  
Profitability and Minimize Environmental  
Impacts—*Grove, J.*  
Evaluating the Physical and Biological Availability  
of Pesticides and Contaminants in Agricultural  
Ecosystems (from W1082)—*D'Angelo, E.M.*  
Functional Metagenomic Analysis of Soil-  
dwelling and Plant-associated Microbial  
Communities—*Moe, L.A.*  
Genetic Control of Pod Shattering in Soybeans—  
*Zhu, H.*  
Influence of Tall Fescue Cultivar and Endophyte  
Genotype Combinations on Root System  
Architecture, Exudate Composition, and Soil  
Biogeochemical Processes—*McNear, D.*  
Management and Environmental Factors  
Affecting Nitrogen Cycling and Use Efficiency  
in Forage-based Livestock Production  
Systems—*Goff, B.*  
Messenger RNA 3' End Formation in Plants—  
*Hunt, A.*  
Molecular Genetic Analysis of a Novel Feedback  
Inhibition Mechanism in the Cytokinin  
Response Pathway—*Smalle, J.S.*  
Nitrate-Dependent Iron (II) Oxidation in Soils—  
*Matocha, C.*  
Nitrifier Community Ecology Influences on  
Trace Gas Evolution From Agricultural Soil—  
*Coyne, M.*  
Onsite Wastewater Treatment Systems:  
Assessing the Impact of Climate Variability and  
Climate Change—*Lee, B.*  
Plant Genetic Resources Conservation and  
Utilization—*Phillips, T.D.*  
Reduction of Tobacco-specific N-nitrosamines  
(TSNA) in Dark Tobaccos—*Bailey, W.A.*  
Regulation of Gene Expression during Plant  
Embryogenesis—*Perry, S.E.*  
Soil, Water, and Environmental Physics across  
Scales—*Wendroth, O.*  
The Chemical and Physical Nature of Particulate  
Matter Affecting Air, Water and Soil Quality—  
*Karathanasis, A.*  
Tobacco Breeding and Genetics—*Miller, R.*  
Turfgrass and the Environment—*Barrett, M.*  
Turfgrass Management Practices in Kentucky—  
*Williams, D.W.; Powell, A.J.*

## Plant Pathology

Characterization of Emerging Viruses—*Goodin,  
M.*  
Characterization of Resistance Gene-mediated  
Signaling and Role of Oleic Acid and Glycerol  
3-Phosphate in Plant Defense—*Kachroo, P.*  
Dissecting Defense Signaling Pathways in  
Soybean and Arabidopsis—*Kachroo, A.*  
Elucidating and Manipulating Alkaloid  
Biosynthesis Pathways in the Plant-symbiotic  
*Epichloe* and *Neotyphodium* Species of Fungi—  
*Schardl, C.*  
Inhibition of Tombusvirus Replication by  
Exploiting Novel Host Factors—*Nagy, P.*  
Locoweed and its Fungal Endophyte: Impact,  
Ecology, and Management—*Schardl, C.*  
Molecular Biology of the Interaction Between  
Corn and Corn Stalk Rot Fungi—*Vaillancourt,  
L.J.*  
Mycotoxins: Biosecurity, Food Safety and  
Biofuels Byproducts (NC129, NC1025)—  
*Vaillancourt, L.J.*

New Strategies to Induce Resistance Against  
Tombusviruses Based on Host Factors—*Nagy, P.*  
Population Dynamics and Fitness Roles of Host  
Specificity Genes in the Fungus *Magnaporthe*  
*oryzae*—*Farman, M.L.*

### Veterinary Science

A Novel Dimorphic Fungus as an Emerging  
Cause of Reproductive Losses in Mares and  
Other Livestock—*Swercek, T.W.*  
Control of Equine Gastrointestinal Parasites:  
Immunology, Host Genetics, and Drug  
Resistance—*Nielsen, M.*  
Control, Transmission, and Prevalence of Natural  
Infections of Internal Parasites of Equids and  
Ruminants—*Lyons, E. T.*

Developmental Progenitor Cells of Articular  
Cartilage—*Macleod, J.*  
Equine Infectious Anemia Virtue Detection and  
Control in Equid Populations—*Issel, C.J.; Cook,*  
*R.F.; Cook, S.J.*  
Genetic Basis of Attenuation of the T953 Strain  
of EHV-1 and Development of a Genetically  
Defined Live Attenuated Equine Herpesvirus-1  
Vaccine—*Balauriya, U.*  
Interactions of Equine Viral Pathogens with the  
Equine Innate Immune System—*Chambers,*  
*T.M.; Horohov, D.W.*  
Investigation of *Sarcocystis neurona*  
Genes Involved in Parasite Survival and  
Pathogenesis—*Howe, D.K.*

National Animal Genome Research Program—  
*Bailey, E.*  
Reference Standards, Internal Standards and  
Critical Reagents/Regulatory Analytes for  
Analytical/Toxicological Approaches to  
Problems in Equine Medicine—*Tobin, T.*  
Studies on Regulation of Reproduction in the  
Horse—*Ball, B.*  
The Immunological Basis for *Rhodococcus equi*  
Susceptibility in the Foal—*Horohov, D.W.*  
Vasomodulatory Effects of Endophyte Infected  
Tall Fescue in Horses—*McDowell, K.;*  
*Lawrence, L.; Bush, L.*

## Collegewide Extramural Funding

*This information, generated from the Office of Sponsored Projects Administration database, includes any award with a start date within the reporting period (January 1, 2015–December 31, 2015) and any budgetary addition or reduction to existing projects processed within the reporting period. Grants are listed under the departments of the principal investigators.\**

### Agricultural Economics

Total—\$446,447

A Regional Program for Production of Multiple  
Agricultural Feedstocks and Processing to  
Biofuels and Biobased Chemicals, Louisiana  
State University, \$15,205—*Mark, T.*  
AMS Grant Writing Workshops, Pennsylvania  
State University, \$4,987—*Davis, A.; Meyer, A.*  
Appalachian Health Career Scholarships, New  
York Community Trust, \$70,000—*Davis, A.*  
CAPE Western Kentucky Barometer  
Community, Michigan State University,  
\$91,847—*Davis, A.*  
Community Business Resilience Program, Rural  
Development, \$50,000—*Davis, A.*  
Examining How Consumers Respond to Price  
Changes in Groceries Versus Restaurants: A  
Natural Experiment from Food Tax Exemption,  
Economic Research Service, \$30,000—*Zheng, Y.*  
Governors Minority Student College Preparation  
Program, Kentucky Council on Postsecondary  
Education, \$54,370—*Tyler, Q.*  
Implement Plan of Work for the Southern  
Region Sustainable Agriculture Research and  
Education (SARE) Professional Development  
Program (PDP) Plan of Work, University of  
Georgia, \$30,979—*Meyer, A.*  
Revitalizing the American Private Enterprise  
System (APES) Program, The Kentucky Youth  
Seminar, CHS Foundation, \$11,250—*Tyler, Q.*  
SBIR: CEDIK ORB Technologies' Phase I, ORB  
Technologies LLC, \$5,000—*Davis, A.*  
Specialty Crop: Market-ready Training for  
Specialty Crop Growers, Kentucky Department  
of Agriculture, \$32,811—*Woods, T.*  
Training Kentucky Crop Farmers to Develop an  
Integrated Farm Program, Insurance, and Price  
Risk Management Safety-Net, University of  
Arkansas, \$49,998—*Davis, T.; Halich, G.*

### Agricultural Programs

Total—\$418,002

EDEN Strengthening Community Agrosecurity  
Preparedness (S-CAP) Workshop Update,  
Purdue University, \$7,000—*Higdon, A.; Dwyer,*  
*R.; Newman, M.*  
Kentucky AgrAbility, National Institute of Food  
and Agriculture, \$189,000—*Hancock, J.*

Nutrient Management Planner, Kentucky Energy  
and Environment Cabinet, \$75,000—*Gumbert,*  
*A.*  
University of Kentucky Cooperative Extension  
Service (UK-CES) Liaison, Kentucky Energy and  
Environment Cabinet, \$54,000—*Gumbert, A.*  
Using Sustainable Agriculture to Address Food  
Security Before, During, and After a Disaster,  
National Institute of Food and Agriculture,  
\$93,002—*Higdon, A.; Mullins, J.; Newman, M.;*  
*Saha, S.*

### Animal and Food Sciences

Total—\$3,960,280

Analysis of Insulin Concentrations, Alltech  
Biotechnology Inc, \$5,204—*Lawrence, L.*  
Characterizing Myoglobin Phosphorylation  
and Its Relationship with Beef Color Stability,  
National Institute of Food and Agriculture,  
\$149,999—*Suman, S.; Rentfrow, G.*  
Economics of Automated Body Condition  
Scoring, DeLaval International AB, \$13,975—  
*Bewley, J.*  
Economics of Automated Estrus Detection  
Systems in New Zealand, DairyNZ, \$14,000—  
*Bewley, J.; Mark, T.*  
Effect of a Titrated Dose Response to  $\beta$ 1,3  
Glucanase (CMG 3453) Inclusion in Corn-  
soybean Meal Diet Containing a Constant  
Level of DDGS on Growth Performance of  
Individually Housed Grower Pigs, Elanco  
Animal Health, \$42,000—*Lindemann, M.*  
Effects of Supplementing Rations Differing in  
Forage Level with Live Yeast Culture, Alltech  
Biotechnology Inc, \$30,240—*Bewley, J.*  
Enzyme Effects on Fibrous Feed Ingredients in  
Cannulated Pigs, DuPont, \$65,000—*Adedokun, S.*  
Factors Influencing Phosphorus Excretion,  
Waltham Centre for Pet Nutrition, \$19,800—  
*Lawrence, L.*  
Fighting with Food: Battling Chemical Toxicity  
with Good Nutrition, Miami University,  
\$31,843—*Hennig, B.; Gaetke, L.*  
Genomic Selection for Improved Fertility of  
Dairy Cows with Emphasis on Cyclicity and  
Pregnancy, Texas A&M University, \$18,788—  
*Amaral-Phillips, D.*  
Improving Fertility of Dairy Cattle Using  
Translational Genomics, Washington State  
University, \$33,894—*Amaral-Phillips, D.*

Improving Pork Meat Color with Total  
Mineral Replacement Technology, Alltech  
Biotechnology Inc, \$34,800—*Lindemann, M.;*  
*Suman, S.; Xiong, Y.*  
In Vitro Evaluation of an Equine Feed Additive,  
Probiotech International Incorporated,  
\$9,591—*Lawrence, L.*  
Intramammary Infusion for Hastened Evolution,  
Amelgo LLC, \$11,861—*Bewley, J.*  
Kentucky Beef Network VIII Master Education  
Series, Kentucky Beef Network, \$232,836—  
*Lehmkuhler, J.; Amaral-Phillips, D.; Anderson,*  
*L.; Bullock, K.; Burdine, K.; Burris, W.; Halich,*  
*G.; Smith, S.*  
Nutrition and Superfund Chemical Toxicity,  
National Institute of Environmental Health  
Sciences, \$2,447,381—*Hennig, B.; Gaetke, L.*  
Plant Protein Off-note Research Program, Campbell  
Soup Company, \$195,347—*Boatright, W.*  
Program Income: Regulation of EAAC1  
Controllers to Enable Efficient Nutrient  
Metabolism, National Institute of Food and  
Agriculture, \$11,646—*Matthews, J.; Burris, W.;*  
*Lindemann, M.*  
SBIR: Diphenhydramine Leads to Dry-off  
Acceleration and Mastitis Prevention, Amelgo  
LLC, \$62,697—*Bewley, J.*  
Southeast Quality Milk Initiative: Implementing  
Science-based Recommendations to Control  
Mastitis and Improve Milk Quality in the  
Southeast, University of Tennessee, \$130,871—  
*Bewley, J.; Arnold, L.; Garkovich, L.*  
Student Sponsorship Agreement for Amanda  
Pesqueira, Alltech Biotechnology Inc,  
\$36,092—*Harmon, D.*  
Student Sponsorship Fisher, Alltech  
Biotechnology Inc, \$18,900—*Pescatore, A.*  
The Alltech-UK Animal Nutrigenomics Alliance,  
Alltech Biotechnology Inc, \$135,028—  
*Matthews, J.*  
Use of In Vitro Fermentation as a Comparative  
Measure of Ionophore Function, Zoetis LLC,  
\$208,487—*Harmon, D.*

### Associate Dean/Academic Programs

Total—\$3,300

KY-NRCS Internship Program, Natural Resources  
Conservation Service, \$3,300—*Saha, A.*



## Associate Directors

\$1,063,862

- 2014-15 Acquisition of Goods and Services for the USDA Offices in Ag North—Lab and Field Work, Agricultural Research Service, \$29,175—*Bennett, A.; Cox, N.*
- 2014-15 Acquisition of Goods and Services for the USDA Offices in Ag North—Lab and Field Work, Agricultural Research Service, \$9,334—*Cox, N.*
- 2014-15 Acquisition of Goods and Services for the USDA Offices in Ag North—O&M, Agricultural Research Service, \$9,999—*Cox, N.*
- 2015-16 Acquisition of Goods and Services for the USDA Offices in Ag North, Agricultural Research Service, \$11,055—*Bennett, A.*
- FAPRU SCA, Agricultural Research Service, \$809,341—*Bennett, A.; Workman, S.*
- Kentucky Equine Medical Director, Kentucky Horse Racing Commission, \$194,958—*Oliver, L.*

## Biosystems and Agricultural Engineering

Total—\$918,893

- A Cost-Effective Mechanized System to Benefit the Sustainability of Local Organic Vegetable Production, University of Georgia, \$14,906—*Wilhoit, J.*
- Appalachian Research Initiative for Environmental Science (ARIES), Virginia Polytechnic Institute and State University, \$50,000—*Warner, R.; Agouridis, C.; Barton, C.; Uhrine, J.*
- Application of Hyperspectral Imaging System for Detection of Adulterants in Foods, Burroughs Wellcome Fund, \$6,760—*Adediji, A.*
- Development of a Can-based Data Management and Decision Support System for Optimal Equipment and Harvest Timing from Grain Harvest to Storage, National Institute of Food and Agriculture, \$500,000—*Sama, M.; Dvorak, J.; Mark, T.; McNeill, S.; Montross, M.*
- Ensuring Restoration Success and Management Effectiveness for the Imperiled Blackside Dace at Cumberland Gap National Historical Park: Sediment Acquisition and Modeling of Davis Branch, U.S. Geological Survey, \$25,300—*Warner, R.; Agouridis, C.*
- Evaluation of Crop Logistics, Case New Holland America LLC, \$20,000—*Montross, M.; Dvorak, J.; Sama, M.*
- Factors that Affect Packing During Storage, Ohio State University, \$24,547—*Montross, M.; McNeill, S.*
- Kentucky Energy Education and Outreach Project, Kentucky Energy and Environment Cabinet, \$100,000—*Fehr, R.*
- Phosphorus Runoff Potential and Nitrogen Flux Emissions from Compost Generated in Compost Bedded Dairy Pack Barns, Natural Resources Conservation Service, \$75,000—*Taraba, J.; Edwards, D.; Lee, B.; Sama, M.*
- Pollinator Habitat Installations, Natural Resources Conservation Service, \$2,500—*Higgins, S.*
- Radon Education Training, Kentucky Department for Public Health, \$12,720—*Fehr, R.*
- Reducing Aflatoxin Contamination of Corn in On-farm Bin Drying and Storage Systems, University of Arkansas, \$5,010—*McNeill, S.*
- Support of the French Tobacco Sector in Utilization of a Recently Developed High Capacity Market Preparation System for Air-cured Burley Tobacco and Reducing Cost

Associated with High-capacity Mechanical Harvesting by Reducing Cost of Curing Structures, Arvalis Institut du Vegetal, \$14,980—*Wells, L.*

Technical Assistance for Energy Audits and Renewable Energy Projects in Rural Kentucky, Rural Development, \$67,170—*McNeill, S.; Montross, M.; Overhults, D.*

## Community and Leadership Development

Total—\$160,004

- 2015 Technical Upgrade Training: All About the Horse: Equine Management and Industry, Kentucky Department of Education, \$3,500—*Vincent, S.; Coleman, R.*
- Communities Preventing Childhood Obesity Coaching, Kansas State University, \$29,293—*Kahl, D.*
- Impacts of Value-based Supply Chains on Small and Medium-sized Farms, Kansas State University, \$74,211—*Tanaka, K.*
- Impacts of Value-based Supply Chains on Small and Medium-sized Farms, University of Minnesota, \$50,000—*Tanaka, K.*
- University of Kentucky Professional Development Perkins Leadership Project 2015-2016, Kentucky Education and Workforce Development Cabinet, \$1,500—*Epps, R.; Vincent, S.*
- University of Kentucky Professional Development Perkins Leadership Project 2015-2016, Kentucky Education and Workforce Development Cabinet, \$1,500—*Vincent, S.; Epps, R.*

## e-Extension

Total—\$351,763

- Continuation of eXtension—Issues, Innovations and Impact, eXtension Foundation, \$39,921—*Wood, C.*
- i-Three Rapid Solutions, eXtension Foundation, \$306,714—*Wood, C.*
- Military Families Learning Network—DoD/Extension Military Partnership, University of Illinois, \$5,128—*Denev, I.*

## Entomology

Total—\$1,045,766

- 2015 IR-4 Biopesticide Project, University of Florida, \$25,500—*Dobson, S.*
- 2015-2016 Private Pesticide Applicator, Kentucky Department of Agriculture, \$27,500—*Townsend, L.*
- Apple Commodity Survey, Animal and Plant Health Inspection Service, \$15,510—*Lensing, J.*
- Assessing Bee Attractiveness of Woody Landscape Plants and Mitigating Potential Bee Hazard from Neonicotinoid Insecticides, Horticultural Research Institute, \$26,000—*Potter, D.*
- Biodiversity and the Development of Natural Pest Control, Washington State University, \$50,000—*Harwood, J.*
- CAPS 2016—Forest Pests Survey, Animal and Plant Health Inspection Service, \$5,212—*Lensing, J.*
- CAPS 2016—Infrastructure, Animal and Plant Health Inspection Service, \$10,319—*Lensing, J.*
- CAPS 2016—Nursery Survey, Animal and Plant Health Inspection Service, \$4,456—*Lensing, J.*
- Development of Artificial Blood for Mosquitoes, Bill and Melinda Gates Foundation, \$100,064—*Dobson, S.*
- Development of RNAi in Woody Plants for Broad Scale Management of Tree Pests, Forest

Service, \$50,000—*Rieske-Kimney, L.; Abbott, A.; Palli, S.*

- FY 15-16 UK Mosquito Surveillance, Kentucky Department for Public Health, \$10,000—*Brown, G.*
- Grape Commodity Survey, Animal and Plant Health Inspection Service, \$19,520—*Lensing, J.*
- Gypsy Moth Survey, Animal and Plant Health Inspection Service, \$252,600—*Lensing, J.; Harper, C.*
- Imported Fire Ant Survey, Animal and Plant Health Inspection Service, \$3,758—*Lensing, J.*
- Integrating Biological and Chemical Control to Save Our Ash, Kentucky Division of Forestry, \$149,500—*Rieske-Kimney, L.; Townsend, L.*
- Invasive Pest Outreach in Kentucky, Animal and Plant Health Inspection Service, \$44,077—*Lensing, J.*
- Kentucky Contact for the Southern Region Regulatory Information Network, North Carolina State University, \$7,000—*Lucas, P.*
- Kentucky Cooperative Agricultural Pest Surveys (CAPS), Animal and Plant Health Inspection Service, \$101,460—*Lensing, J.*
- Kentucky IPM Extension and Implementation Program: 2014–2017, National Institute of Food and Agriculture, \$65,000—*Bessin, R.; Dunwell, W.; Gauthier, N.; Knott, C.; Lucas, P.; Saha, S.*
- Monitor Gypsy Moth Populations for Slow the Spread Program, Slow the Spread Foundation, \$44,000—*Harper, C.*
- Mosquito Mass Production and Tool Development, MosquitoMate Inc, \$13,000—*Dobson, S.*
- Pine Shoot Beetle Survey, Animal and Plant Health Inspection Service, \$11,290—*Lensing, J.*
- Scale Efficacy in Container: 15-006, University of Florida, \$10,000—*Potter, D.*

## Family and Consumer Sciences

Total—\$3,681,981

- 2015 DoD Camp Grant, Kansas State University, \$50,000—*Ashurst, K.*
- 2015 Kentucky Military Teen Adventure Camp, Purdue University, \$545,830—*Ashurst, K.*
- Collaborative Environment Approaches to Reduce Obesity Disparities in Kentucky, Center for Disease Control and Prevention, \$786,056—*Vail, A.; Bastin, S.; Brewer, D.; Davis, A.; Gustafson, A.; Kurzynske, J.; Mullins, J.; Stephenson, T.; Webber, K.*
- Measuring Communities: Mapping Progress for Military and Veteran Families, Purdue University, \$12,000—*Ashurst, K.; Lianekhammy, J.*
- Reaching Rural Veterans: Engaging Faith-based Food Pantries in Serving Low-income, Homeless, and At-risk Veterans in Rural Areas, Purdue University, \$33,935—*Ashurst, K.*
- UK Supplemental Nutrition Assistance Program Education (SNAP-Ed), Kentucky Cabinet for Health and Family Services, \$2,094,160—*Vail, A.; Mullins, J.*
- University of Kentucky National Nutrition Education and Obesity Prevention Coordination Center of Excellence, National Institute of Food and Agriculture, \$160,000—*Vail, A.; Brewer, D.; Kurzynske, J.; Mullins, J.*

## Family Studies

Total—\$56,636

- Managing for Today and Tomorrow: Risk Management Education for Kentucky Farm Families, University of Arkansas, \$49,136—*Hunter, J.; Isaacs, S.*

Retiring Poor in New Jersey: The Projected Expenditures of State Government, Rutgers University, \$7,500—*Kim, H.*

## Forestry

Total—\$1,150,643

Abiotic Stress and Adaptive Phenology in Fruit and Forest Trees, National Institute of Food and Agriculture, \$425,220—*Abbott, A.*  
Daniel Boone National Forest and Triplett Creek Landscape Restoration Partnership, Forest Service, \$45,000—*Arthur, M.*  
Designing a Revised McIntire-Stennis Strategic Plan, National Institute of Food and Agriculture, \$30,000—*Baker, T.*  
Effect of Grading Technique on Forest Productivity of High-value Tree Species in Reforested Surface Mine Lands, Department of the Interior, \$174,765—*Lhotka, J.; Barton, C.; Stringer, J.*  
Evaluation of Acidic Atmospheric Deposition and Its Influence on Soil Solution Composition in the Daniel Boone National Forest, Forest Service, \$7,840—*Barton, C.; Karathanasis, A.*  
Forest Health and Research Education Center, Forest Service, \$20,000—*Baker, T.*  
Forestry Stewardship PA, Publicity and Training, Kentucky Division of Forestry, \$10,000—*Stringer, J.*  
Kentucky Woodlands Magazine Issue—Cultivating a Healthy Woodland, Kentucky Division of Forestry, \$16,000—*Stringer, J.; Thomas, W.*  
KSEF RDE: Dispersal Congruency and Population Structure within Imperiled Host-parasite Systems, Kentucky Science and Technology Co Inc, \$30,000—*Price, S.*  
Rapid Tree Breed: A Revolutionary Tree Breeding Concept, National Institute of Food and Agriculture, \$99,734—*Abbott, A.*  
Restoring Native Forests and Wildlife Habitat on Coal Mined Lands in the Cumberland Plateau, National Fish and Wildlife Foundation, \$149,384—*Barton, C.*  
Support for the 38th Meeting of the Council on Forest Engineering, Kentucky Energy and Environment Cabinet, \$2,500—*Contreras, M.*  
Survival, Cause-specific Mortality, and Natality of White-tailed Deer in Southeastern Kentucky, Kentucky Department of Fish and Wildlife, \$140,200—*Cox, J.*

## Horticulture

Total—\$1,635,791

Best Management Practices for a Sustainable Urban Forest, Kentucky Energy and Environment Cabinet, \$35,000—*Fountain, W.*  
Characterization of the Functional Microbiome of Tobacco, Council for Burley Tobacco, \$10,000—*DeBolt, S.*  
Clean Water3—Reduce, Remediate, Recycle: Informed Decision-making to Facilitate Use of Alternative Water Resources and Promote Sustainable Specialty Crop Production, Clemson University, \$84,179—*Ingram, D.*  
Hard Cider and Sparkling Wine Production in Kentucky, Kentucky Department of Agriculture, \$50,000—*Wheeler, J.; Wilson, P.*  
Kentucky Horticulture Council Grant VII, Kentucky Horticulture Council, \$1,085,000—*Ingram, D.; Woods, T.*  
Managing Anthracnose of Watermelon Using Host Resistant Pollenizer Varieties, Purdue University, \$4,750—*Saha, S.*  
Optimizing Plant Growth and Water Use by Modifying Cyclic Irrigation Timing in Container Nursery Production, Horticultural Research Institute, \$15,000—*Geneve, R.*  
Organic Tomato Breeding for Arthropod Resistance with a Focus on Protected Cultivation: A Planning Proposal, National Institute of Food and Agriculture, \$50,000—*Snyder, J.; Bessin, R.*  
Reinventing Sustainable Protection Systems for Cucurbit Production, Iowa State University, \$79,053—*Williams, M.; Bessin, R.; Harwood, J.; Woods, T.*  
Triploid Watermelon Variety Evaluation, Monsanto Co, \$1,680—*Saha, S.*  
Viticulture and Enology Extension and Research Program, Kentucky Governor's Office of Agricultural Policy, \$221,129—*DeBolt, S.; Houtz, R.*

## International Programs

Total—\$129,553

Borlaug LEAP Fellowship for Abdel Lawani, University of California Davis, \$19,998—*Reed, M.*  
Haiti Policy Analysis Matrix, Foreign Agricultural Service, \$109,555—*Reed, M.; Hanley, C.*

## Kentucky Small Business Development Center

Total—\$2,249,724

Kentucky Procurement and Assistance Match Support CED, Kentucky Economic Development Cabinet, \$100,000—*Naugle, L.*  
Kentucky PTAC, Defense Logistics Agency, \$241,175—*Naugle, L.*  
Kentucky Small Business Development Center, Small Business Administration, \$1,788,589—*Naugle, L.*  
Kentucky Small Business Development Center Lease, Commerce Lexington Inc, \$13,500—*Naugle, L.*  
Louisville SBDC Local Support, Louisville Metro Government, \$30,000—*Naugle, L.*  
Metro Louisville Funding for SBDC, Louisville Metro Government, \$30,000—*Naugle, L.*  
Ongoing SBDC Program Income Account—Louisville, Small Business Administration, \$8,813—*Naugle, L.*  
Ongoing SBDC Program Income Account, Small Business Administration, \$12,647—*Naugle, L.*  
Procurement and Technical Assistance Cash Match Support, Kentucky Community and Technical College System/University of Kentucky, \$25,000—*Naugle, L.*

## Kentucky Tobacco Research and Development Center

Total—\$1,141,316

Altria NNK Research, Altria Corporate Services Inc, \$77,000—*Ji, H.; Bush, L.*  
Development and Distribution of a Certified Reference Cigarette Suitable for Research Applications and Establishing a Proficiency Testing Program at the University of Kentucky Reference Cigarette Program, Food and Drug Administration, \$998,933—*Chambers, O.; Ji, H.; Yuan, L.*  
Identification of Topping- and Suckercide-Responsive Genes in Tobacco by Next-Generation Gene Sequencing, Council for Burley Tobacco, \$20,000—*Yuan, L.*  
KSEF RDE: Developing a Tissue Culture and Gene Transformation Platform for Industrial

Hemp, Kentucky Science and Technology Co Inc, \$30,000—*Yuan, L.; Williams, D.*  
Varieties and Production Practices to Maximize Nicotine to be Utilized in Emerging Tobacco Products, Council for Burley Tobacco, \$15,000—*Mundell, R.; Jack, A.; Ji, H.*

## Veterinary Diagnostic Laboratory

Total—\$378,987

Animal Health Monitoring Field Testing, National Institute for Hometown Security, \$175,000—*Carter, C.; Vanzant, E.*  
Avian Influenza Surveillance, Kentucky Department of Agriculture, \$11,687—*Carter, C.*  
Bovine Spongiform Encephalopathy Testing and Related Services, Kentucky Department of Agriculture, \$16,800—*Carter, C.*  
Diagnostic Laboratory Support of NAHLN, Animal and Plant Health Inspection Service, \$55,000—*Carter, C.*  
FDA Vet-LRN Veterinary Diagnostic Laboratory Cooperative Agreement Program Funding, Food and Drug Administration, \$21,500—*Gaskill, C.; Carter, C.; Erol, E.*  
Validation of LC-MS/MS Analysis of Animal Tissue and Feed Matrices for Toxicants, Food and Drug Administration, \$99,000—*Gaskill, C.; Smith, L.*

## Merchandising, Apparel and Textiles

Total—\$39,859

Quality Control Lab for NAILM, Association for Linen Management, \$39,859—*Easter, E.*

## Nutrition and Food Science

Total—\$395,000

Feeding the Future in Rural Ghana: Opportunities for Women Smallholders, Legumes and Maize for School Feeding Programs, Foreign Agricultural Service, \$40,000—*Mullins, J.; Reed, M.; Williams, M.*  
KY CYFAR PD&TA Program, University of Minnesota, \$25,000—*Kurzynske, J.; Ashurst, K.; Stivers, W.*  
Specialty Crop: Plate It Up! Kentucky Proud Recipe Development and Evaluation for Consumers and Producers Using Healthy Specialty Cooking Techniques with an Emphasis on Grilling, Kentucky Department of Agriculture, \$50,000—*Stephenson, T.; Vail, A.*  
Strong Dads, Resilient Families, National Institute of Food and Agriculture, \$145,000—*Kurzynske, J.; Ashurst, K.; Jones, K.*  
The YMCA, UK and KSU: Yes (Youth Engagement and Support) Jefferson County!, National Institute of Food and Agriculture, \$135,000—*Kurzynske, J.; Ashurst, K.; Jones, K.*

## Plant and Soil Sciences

Total—\$2,818,586

2015 Soybean Foliar (SO14), Monsanto Co, \$6,300—*Lee, C.*  
2015-SOYB\_OPS LCM USA SO16, Monsanto Co, \$3,780—*Lee, C.*  
2015-SOYB-370 (SO15), Monsanto Co, \$3,780—*Lee, C.*  
Accelerating the Development of FHB-resistant Soft Red Winter Wheat Varieties, Agricultural Research Service, \$61,171—*Van Sanford, D.*  
Addition of Blue Mold Resistance to KTTII Burley Tobacco Varieties, Council for Burley Tobacco, \$20,000—*Miller, R.*



- An Integrated Approach to Understand the Agronomic Responses to Poultry Litter Use and Soybean and Corn Production Systems, Kentucky Corn Growers Association, \$35,000—*Ritchey, E.; Hershman, D.; Martin, J.*
- An Integrated Approach to Understanding the Dynamics of Poultry Litter Use in Corn-soybean Production Systems, Kentucky Soybean Promotion Board, \$35,000—*Ritchey, E.; Haramoto, E.; Hershman, D.*
- Applied and Basic Irrigation Research Projects Proposed for UKREC, Princeton, Kentucky Soybean Promotion Board, \$32,000—*Knott, C.*
- Bayer Soybean, Bayer CropScience GmbH, \$10,000—*Slack, C.; Lawson, S.*
- Burley Tobacco Breeding and Genetics, Philip Morris International Management SA, \$325,000—*Miller, R.*
- Can Wheat Yield and Grain Fill Duration Be Increased by Decreasing Wheat Canopy Temperature, Kentucky Small Grain Growers Association, \$27,346—*Knott, C.*
- Climate Change Impacts on Soil-water Availability Under Different Land Management: Forest and Grasslands in MLRA 120, Natural Resources Conservation Service, \$3,998—*Lee, B.*
- Controlling Endophyte Colonization to Reduce TSNA in Tobacco Leaves, Council for Burley Tobacco, \$5,000—*Yang, S.; Li, D.; Miller, R.*
- Corn Fragipan, Kentucky Corn Growers Association, \$25,000—*Murdock, L.; Grove, J.; Matocha, C.*
- Determining the Effect of Additional Fertilizer Nitrogen on Irrigated Soybean Yield, Kentucky Soybean Promotion Board, \$6,000—*Lee, C.; Knott, C.; McGrath, J.; Ritchey, E.*
- Development of Chia, *Salvia hispanica* L., as a Sustainable Oil Source for Renewable Chemical Applications, Cono SA, \$7,890—*Hildebrand, D.; Phillips, T.*
- Development of Effective Educational Programs to Manage and Mitigate Herbicide Resistant Weeds, Purdue University, \$30,000—*Martin, J.*
- Development of Molecular Markers for Selection Against a Soybean Gene that Restricts Nodulation by the Highly Efficient Nitrogen-fixing Strain USDA 110, Kentucky Soybean Promotion Board, \$40,000—*Zhu, H.*
- Development of User-friendly Markers for Disease Resistance to Potato Virus Y (PVY) and Black Root Rot (BRR) in Burley Tobacco, Council for Burley Tobacco, \$15,000—*Yang, S.; Li, D.; Miller, R.*
- Effect of Chloride-containing Potassium Fertilizer Application on Dark Air-cured Tobacco, American Snuff Company, \$9,800—*Bailey, W.*
- Effect of Preharvest *Debaryomyces hansenii* Application on Nitrite and TSNA in Dark Tobacco, American Snuff Company, \$5,600—*Bailey, W.*
- Enhanced Efficiency Nitrogen Fertilizers on the Production and Nutritive Value of Bermudagrass Pastures, Koch Agronomic Services LLC, \$5,042—*Goff, B.*
- Enhancing Burley Tobacco Production Labor Efficiency, Council for Burley Tobacco, \$20,000—*Pearce, R.; Snell, W.; Swetnam, L.*
- Equipment Proposal: Support of Plot Combine, Kentucky Soybean Promotion Board, \$264,900—*Ritchey, E.*
- Evaluation and Control of Ground Sucker Formation in Burley Tobacco Varieties, Council for Burley Tobacco, \$15,000—*Miller, R.*
- Evaluation of MON 63479 Preemergence and Postemergence in Soybeans (SO18), Monsanto Co, \$7,000—*Martin, J.*
- Flavonoid Isolation from Intact Plants: A Nanoparticle-based Approach, National Institute of Food and Agriculture, \$450,000—*Smalle, J.*
- Fragipan Remediation Small Grains, Kentucky Small Grain Growers Association, \$25,000—*Murdock, L.*
- Genomic Selection in Soft Red Winter Wheat, Kentucky Small Grain Growers Association, \$10,000—*Van Sanford, D.*
- Improving Barley and Wheat Germplasm for Changing Environments, University of California Davis, \$64,615—*Van Sanford, D.*
- Improving Soybean Yields with Crop Rotation, Kentucky Soybean Promotion Board, \$39,852—*Knott, C.; Grove, J.*
- Introducing New Technologies for Managing Herbicide Resistant Weeds, Kentucky Soybean Promotion Board, \$13,109—*Green, J.; Martin, J.*
- Irrigating the Soil to Maximize the Crop—An Approach for Corn to Efficient and Environmentally Sustainable Irrigation Water Management in Kentucky, Kentucky Corn Growers Association, \$23,319—*Wendroth, O.; Lee, C.*
- Irrigating the Soil to Maximize the Crop—An Approach for Soybean, Kentucky Soybean Promotion Board, \$11,660—*Wendroth, O.; Lee, C.*
- Irrigating the Soil to Maximize the Crop: An Approach for Wheat to Efficient and Environmentally Sustainable Irrigation Water Management in Kentucky, Kentucky Small Grain Growers Association, \$11,660—*Wendroth, O.; Lee, C.*
- KSEF RDE: Increasing the Market Value of Industrial Hemp Seed, Kentucky Science and Technology Co Inc, \$28,576—*Hildebrand, D.; Williams, D.*
- Low Alkaloid Burley Yield Test: Conservation Tillage, Altria Corporate Services Inc, \$19,166—*Pearce, R.; Fisher, C.*
- Management Tools to Improve Forage Quality and Persistence of Alfalfa, Cornell University, \$26,862—*Smith, S.*
- Mon 24-01-SO'19, Monsanto Co, \$7,000—*Slack, C.; Lawson, S.*
- Monsanto 24-04 Service Order 13, Monsanto Co, \$7,000—*Slack, C.; Lawson, S.*
- Monsanto SO'20, Monsanto Co, \$2,100—*Slack, C.; Lawson, S.*
- NanoFARM (Fate and Effects of Agriculturally Relevant Materials), National Science Foundation, \$257,097—*Umrine, J.; Tsyusko-Umrine, O.*
- PEP-NBT: Product Evaluation Protocol and the Next Big Thing in Corn Production, Kentucky Corn Growers Association, \$30,000—*Grove, J.*
- PEP-NBT: Product Evaluation Protocol and the Next Big Thing in Soybean Production, Kentucky Soybean Promotion Board, \$35,000—*Grove, J.; Venard, C.*
- Performance of Small Grain Varieties in Kentucky, Kentucky Small Grain Growers Association, \$20,000—*Bruening, W.*
- Planning/Evaluation for UK-REC Wheat Field School, Kentucky Small Grain Growers Association, \$5,735—*Ritchey, E.*
- Raising Soybean Yield Potential in Dry Seasons: Increased Rooting Depth and Greater Soil Water Extraction with Deeper Depth to the Fragipan, Kentucky Soybean Promotion Board, \$15,000—*Grove, J.; Ritchey, E.*
- Regional Biomass Feedstock Partnership, South Dakota State University, \$20,000—*Williams, D.*
- Renewal Center for the Environmental Implications of Nanotechnology, Duke University, \$150,000—*Umrine, J.; Tsyusko-Umrine, O.*
- Rye and Barley Management Study, Kentucky Small Grain Growers Association, \$10,000—*Lee, C.; Knott, C.*
- SAM Initiative: Achieving Subsurface Application of Manures in the Chesapeake Bay Basin, National Fish and Wildlife Foundation, \$257,621—*McGrath, J.*
- SBIR: Leaf-Specific Herbicide Application in the Presence of Crops, Concurrent Solutions LLC, \$25,000—*Haramoto, E.; Martin, J.*
- SO17: Maretail Control in RR2 Xtend System-Midwest, Monsanto Co, \$10,500—*Martin, J.*
- Soft Red Winter Wheat Breeding and Variety Development for Kentucky, Kentucky Small Grain Growers Association, \$55,000—*Van Sanford, D.*
- Soil Morphology, Kentucky Department for Public Health, \$20,000—*Karathanasis, A.*
- Synchrotron X-ray Microprobe and Microspectroscopy Research at Low Temperature Geochemistry, University of Chicago, \$8,332—*Umrine, J.*
- Synchrotron X-ray Microprobe and Microspectroscopy Research in Low Temperature Geochemistry, University of Chicago, \$50,846—*Umrine, J.*
- Topping Height of High Leaf Potential Varieties, Council for Burley Tobacco, \$10,000—*Fisher, C.; Pearce, R.*
- Triple Mutant Dark Hybrid Evaluations, Altria Corporate Services Inc, \$42,000—*Bailey, W.*
- Triple Mutant Dark Hybrid Stress Test, Altria Corporate Services Inc, \$28,000—*Bailey, W.*
- TSNA Accumulation in Controlled Curing Environment, Council for Burley Tobacco, \$5,000—*Fisher, C.; Jack, A.; Ji, H.*
- U.S. Wheat and Barley Scab Initiative's Networking and Facilitation Office and Website, Agricultural Research Service, \$3,927—*Van Sanford, D.*

## Plant Pathology

Total—\$1,500,081

- Applied Management of Fusarium Head Blight in Kentucky, Agricultural Research Service, \$53,787—*Bradley, C.*
- Bet Hedging as a Mechanism of Pathogenic Variation in the Rice Blast Fungus, National Science Foundation, \$100,814—*Farman, M.*
- Broadening Host Specificity in Soybean-rhizobia Symbiosis, Kentucky Soybean Promotion Board, \$66,049—*Kachroo, A.*
- Characterization of the SF9-rhabdovirus in Plants, Takeda Pharmaceuticals North America Inc, \$260,743—*Goodin, M.*
- Compile Estimates of Soybean Yield Suppression by Diseases in the U.S. during 2015, United Soybean Board, \$17,000—*Bradley, C.*
- Examining the Importance of Dynamic Trafficking in Systemic Acquired Resistance, National Science Foundation, \$696,000—*Kachroo, A.; Kachroo, P.*
- Exploiting Potential Bio-control Agents to Manage Seedling Diseases of Soybean (year 2), Southern Illinois University, \$30,666—*Bradley, C.*
- Glycerol Metabolism and Its Role in Biotrophy Versus Necrotrophy in an Arabidopsis/Fungal Hemibiotroph Model System, National Science Foundation, \$6,000—*Kachroo, P.; Kachroo, A.; Vaillancourt, L.*
- KSEF RDE: Remodeling Alkaloid Architecture in Forage Grass Endophytes, Kentucky Science and Technology Co Inc, \$30,000—*Schardl, C.*

Molecular, Genetic, and Biochemical Characterization of Oleate-regulated Defense Gene Expression in Plants, National Science Foundation, \$6,000—*Kachroo, P.; Kachroo, A.*

Novel Strategies for Managing Blast Diseases on Rice and Wheat, Kansas State University, \$99,084—*Farman, M.*

Research and Outreach for Fungicide Management of Fusarium Head Blight or Small Grain Crops, Kentucky Small Grain Growers Association, \$9,898—*Bradley, C.*

SARE Sustainable Ag Training Program (MSP)—Program Assistant, University of Georgia Agriculture Experiment Station, \$22,222—*Vincelli, P.*

SARE Sustainable Ag Training Program (MSP), University of Georgia, \$11,111—*Vincelli, P.*

Southern Plant Diagnostic Network, Kentucky Component, University of Florida, \$25,000—*Vincelli, P.*

Testing the Response of Commercial Sweet Sorghum Germplasm to *Colletotrichum sublineola*, Chromatin Inc, \$60,483—*Vaillancourt, L.*

Transgenic Approaches in Managing Sudden Death Syndrome, Iowa State University, \$5,224—*Bradley, C.*

### Plant Pathology—RCTF

Total—\$812,509

Blocking RNA Virus Replication Through the Antiviral Functions of Cellular Helicases, National Institute of Allergy and Infectious Diseases, \$175,000—*Nagy, P.; Kovalev, N.*

Key Role of The Multifunctional Translation Elongation Factor in Virus Replication, National Science Foundation, \$207,509—*Nagy, P.*

KSEF RDE: Allosteric Inhibitors of Cellular Hsp70 to Inhibit Virus Replication, Kentucky Science and Technology Co Inc, \$30,000—*Nagy, P.; Chuang, C.*

Mechanism of Inhibition of RNA Virus Replication by Host WW-domain Proteins, National Institute of Allergy and Infectious Diseases, \$210,000—*Nagy, P.; Chuang, C.*

The Cellular Actin Network and Virus Replication, National Science Foundation, \$190,000—*Nagy, P.*

### Regulatory Services

Total—\$62,561

BSE Rule and Medicated Feed Inspections, Food and Drug Administration, \$62,561—*Harrison, G.; Green, K.*

### School of HES Administration

Total—\$2,500,000

Child Poverty Nutrition Center, U.S. Department of Agriculture, \$2,500,000—*Vail, A.; Davis, A.; Kahl, D.; Kim, H.; Kurzynske, J.; Lianekhammy, J.; Vazsonyi, A.*

### Tracy Farmer Center for Sustainability and the Environment

Total—\$149,939

STEM PRIDE: Partnering with Research and Industry to Develop STEM Educators for College and Career Readiness, Kentucky Council on Postsecondary Education, \$149,939—*Hanley, C.; Moe, L.*

### Veterinary Science

Total—\$1,417,574

Determination of Amino Acids at Loci 78 and 159 of p to 50 Equine Flu Isolates Collected from 2010–2015, Zoetis LLC, \$6,420—*Chambers, T.*

Do Horses with Equine Metabolic Syndrome (EMS) Have Reduced Immune Responses to Vaccination?, American Quarter Horse Foundation, \$19,121—*Adams, A.; Horohov, D.*

Dual Antigen ELISA to Distinguish Vaccine from Infection Antibody Responses, Zoetis LLC, \$7,487—*Timoney, J.; Velineni, S.*

Effect of Alltech Algae Derived FA Supplementation on Inflammation and Metabolic Parameters of the EMS Horse, Alltech Biotechnology Inc, \$14,000—*Adams, A.*

Equine Interferon-Lambda, American Quarter Horse Foundation, \$44,957—*Chambers, T.; Bailey, E.; Horohov, D.*

Evaluation of Drug Efficacy with Combination Deworming and the Long Term Consequences, Zoetis LLC, \$39,596—*Nielsen, M.*

Identification of Genetic Factors Responsible for Establishment of Equine Arteritis Virus Carrier State in Stallions, National Institute of Food and Agriculture, \$594,046—*Balasuriya, U.; Bailey, E.; Cook, R.; Horohov, D.; MacLeod, J.; Squires, E.; Timoney, P.; Troedsson, M.*

Inhibition of Type-1 Interferon Response by EHV-1, Grayson Jockey Club Research Foundation Inc, \$66,068—*Chambers, T.; Balasuriya, U.; Horohov, D.*

Larvicidal Efficacy of Moxidectin or Fenbendazole Against Equine Cyathostomins: Quantitative and Qualitative Influence of the Interval Post-treatment, Zoetis LLC, \$28,407—*Nielsen, M.*

NAHMS National Equine Anthelmintic Resistance Survey, U.S. Department of Agriculture, \$144,000—*Nielsen, M.*

SBIR: Development of a Simple and Rapid On-site Veterinary Fecal Egg Count Test, MEP Equine Solutions LLC, \$25,011—*Nielsen, M.*

Student Sponsorship by Alltech for Sarah Elzinga, Alltech Biotechnology Inc, \$37,092—*Adams, A.*

Tube-ovarian Ligation via Colpotomy as a Method for Sterilization in Mares, Bureau of Land Management, \$391,369—*Ball, B.*

### Multidisciplinary Grants Led by Other Colleges\*

A Microalgae-based Platform for the Beneficial Reuse of CO<sub>2</sub> Emissions from Power Plants, Department of Energy, \$505,693—*Crofcheck, C.*

Appalachia Community Cancer Network, National Cancer Institute, \$596,049—*Webber, K.*

Appalachians Together Restoring the Eating Environment (APPAL-TREE), National Institute on Minority Health and Health Disparities, \$334,076—*Gustafson, A.; Mullins, J.*

Central Appalachian Regional Education Research Center, National Institute of Occupational Safety and Health, \$1,014,022—*Purschwitz, M.*

Enveloped Porous Nanoparticles for RNA Delivery to Insects, Iowa State University, \$130,000—*Webb, B.*

FEEDER: Foundations for Engineering Education for Distributed Energy Resources, University of Central Florida, \$38,724—*Colliver, D.*

Genotype Phenotype Correlations in KCNH2 variants from 31,000 Whole Exome Sequences Identified in a Biobank Cohort, American Heart Association, \$159,999—*Farman, M.*

Kentucky Industrial Assessment Center (KIAC): Developing the Next Generation Energy Assessment Engineering Workforce, Department of Energy, \$150,000—*Colliver, D.*

Kentucky Research Consortium for Energy and Environment, Department of Energy, \$430,223—*Price, S.*

KSEF RDE: Forest Modeling Using Airborne LiDAR Information, Kentucky Science and Technology Co Inc, \$30,000—*Contreras, M.*

KY IDeA Network of Biological Excellence, University of Louisville, \$289,500—*Farman, M.*

Mechanisms of Atherogenic Effects of Bisphenol A, National Institute of Environmental Health Sciences, \$187,969—*Hemmig, B.*

Mechanisms of Oxacycle- and Olefin-installing Iron/20(oxo)glutarate oxygenases, Pennsylvania State University, \$63,706—*Schardl, C.*

Microalgae-based Carbon Dioxide Capture and Recycle for the Production of Fuels and Plastics, Kentucky Energy and Environment Cabinet, \$125,000—*Crofcheck, C.*

NSF EPSCoR: Powering the Kentucky Bioeconomy for a Sustainable Future, National Science Foundation, \$8,000,000—*Crofcheck, C.; DeBolt, S.*

NSF EPSCoR: RII Track-2 FEC: Unmanned Aircraft System for Atmospheric Physics, Oklahoma State University, \$700,000—*Sama, M.*

Ovulation and Luteal Formation in Rodents, Monkeys, and Women, National Institute of Child Health and Human Development, \$1,244,388—*Bridges, P.*

Peer Support Network, Kentucky Council on Developmental Disabilities, \$295,798—*Davis, A.*

Peer Support Network FY 2015, Kentucky Council on Developmental Disabilities, \$38,451—*Davis, A.*

Project-based Investigations on Improving Water Quality in the Kentucky River, Kentucky Council on Postsecondary Education, \$130,000—*Hanley, C.*

Reconciling Nanoceria's Jekyll and Hyde Reputation Toward Safer Nanotherapy, National Institute of General Medical Sciences, \$348,156—*Umrine, J.*

Southeast Center for Agricultural Health and Injury Prevention: Admin Core, National Institute of Occupational Safety and Health, \$1,217,411—*Purschwitz, M.; Vincent, S.*

State Water Institute Fiscal Year 2011-2016, U.S. Geological Survey, \$92,335—*Agouridis, C.; Barton, C.; Knott, C.*

University of Kentucky—Summer Academy—GEAR UP KY 3.0 Yr4, Kentucky Council on Postsecondary Education, \$150,000—*Grabau, L.; Vincent, S.*

\*Only College of Agriculture co-investigators are listed.



# Intellectual Property

## GenBank Register

### Entomology

- Saeed, A., and J.A. White. Partial mitochondrial cytochrome oxidase subunit I (COI) gene sequences for bees (various species). Accessions: KT123206-KT123242.
- Saeed, A., and J.A. White. Partial wsp gene sequences from *Wolbachia* bacterial symbionts of bees (various species). Accessions: KT153630-KT153643.
- Saeed, A., and J.A. White. Sequence read archive accession of partial 16S rRNA sequences from bacterial associates of bees (various species). Accession: PRJNA283198.
- White, J.A., and N. Desneux. Partial 16S rRNA sequences from bacterial symbionts of aphids (various species). Accessions: KT336569 - KT336597.

### Horticulture

- Downie, A.B. Plasmid Purpose: Protein interaction with yeast two hybrid assay of PIF1 (PIL5) in yeast, *Saccharomyces cerevisiae*. Accession ABD821.
- Downie, A.B. Plasmid Purpose: Protein interaction with yeast two hybrid assay of CTG10 in yeast, *Saccharomyces cerevisiae*. Accession ABD823.
- Downie, A.B. Plasmid Purpose: Protein interaction with yeast two hybrid assay of truncated PIF1 (PIL5) in yeast, *Saccharomyces cerevisiae*. Accession ABD870.
- Downie, A.B. Plasmid Purpose: Protein interaction with yeast two hybrid assay of truncated PIF1 (PIL5) in yeast, *Saccharomyces cerevisiae*. Accession ABD871.
- Downie, A.B. Plasmid Purpose: Protein interaction with yeast two hybrid assay of truncated PIF1 (PIL5) in yeast, *Saccharomyces cerevisiae*. Accession ABD872.

*Bruce Downie had an additional 13 AddGene submissions.*

### Plant and Soil Sciences

- Pattanaik, S., and L. Yuan. *Catharanthus roseus* novel interactor of JAZ mRNA, complete cds. Accession KR703663.

### Plant Pathology

- Farman, M.L. *Homo sapiens* ATP binding cassette subfamily C member 9 (ABCC9), transcript variant SUR2A, mRNA. Accession NM\_005691.
- Farman, M.L. *Homo sapiens* ATP binding cassette subfamily C member 9 (ABCC9), transcript variant SUR2B, mRNA. Accession NM\_020297.
- Farman, M.L. *Homo sapiens* SLC8A1 antisense RNA 1 (SLC8A1-AS1), long non-coding RNA. Accession NR\_038441 XR\_109974.
- Goodin, M.M. Coffee ringspot virus isolate BE-13 ORF1 gene, partial cds. Accession KT202827.
- Goodin, M.M. Coffee ringspot virus isolate BE-11 ORF1 gene, partial cds. Accession KT202825.
- Goodin, M.M. Coffee ringspot virus isolate BE-8 ORF1 gene, partial cds. Accession KT202822.
- Goodin, M.M. Coffee ringspot virus isolate BE-7 ORF1 gene, partial cds. Accession KT202821.
- Goodin, M.M. Potato yellow dwarf virus, complete genome. Accession NC\_016136.

*Michael Goodin had 22 additional accessions.*

- Kachroo, A.P. *Glycine max* non-race specific disease resistance 1b (NDR1b), mRNA. Accession NM\_001248138.
- Kachroo, A.P. *Glycine max* RIN4d protein (RIN4d), mRNA. Accession NM\_001248323.
- Kachroo, A.P. *Glycine max* RIN4c protein (RIN4c), mRNA. Accession NM\_001248306.
- Kachroo, A.P. *Glycine max* RIN4a protein (RIN4a), mRNA. Accession NM\_001248292.
- Kachroo, A.P. *Glycine max* heat shock protein 90-1 (HSP90-1), mRNA. Accession NM\_001249683.

*Aardra Kachroo had four additional accessions.*

- Schardl, C.L. *Epichloe festucae* E2368 unplaced genomic scaffold scaffold000001, whole genome shotgun sequence. Accession JH379045.
- Schardl, C.L. *Epichloe festucae* Epichloe festucae E2368 unplaced genomic scaffold scaffold000002, whole genome shotgun sequence. Accession JH379046.
- Schardl, C.L. *Epichloe festucae* E2368 unplaced genomic scaffold scaffold000003, whole genome shotgun sequence. Accession JH379047.

- Schardl, C.L. *Epichloe festucae* E2368 unplaced genomic scaffold scaffold000004, whole genome shotgun sequence. Accession JH379048.
- Schardl, C.L. *Epichloe festucae* E2368 unplaced genomic scaffold scaffold000005, whole genome shotgun sequence. Accession JH379049.

*Christopher Schardl had 2,029 additional accessions.*

### Veterinary Science

- Balasuriya, U.B.R. EHV-1 T953 P135 strain full-length genome. Accession KR021354.
- Balasuriya, U.B.R. EHV-1 T953 P210 strain full-length genome. Accession KR047045.
- Balasuriya, U.B.R. ncpBVDV KY-HP-RK-13 strain full-length genome. Accession KT355592.
- Balasuriya, U.B.R. DENV-2/KBPV-VR-29 strain full-length genome. Accession KP406804.
- Balasuriya, U.B.R. DENV-3/KBPV-VR-30 strain full-length genome. Accession KP406805.
- Balasuriya, U.B.R. DENV-4/KBPV-VR-31 strain full-length genome. Accession KP406806.
- Balasuriya, U.B.R. DenKor-01 strain full-length genome. Accession KP406801.
- Balasuriya, U.B.R. DenKor-02 strain full-length genome. Accession KP406802.
- Balasuriya, U.B.R. DenKor-07 strain full-length genome. Accession KP406803.
- Mondal, S.P., R.F. Cook, R.L. Chelvarajan, P.J. Henney, P.J. Timoney, and U.B. Balasuriya. Cloning vector pEAV sVBSmCherry, complete sequence. Accession KT175701.

### Gene Expression Omnibus

#### Animal and Food Sciences

- Cerny, K.L., and P.J. Bridges. Estrogen receptor alpha (ESR1)-dependent regulation of the mouse oviduct. Accession GSE72614.

### Patents Issued

#### Veterinary Science

- Nielsen, M., U. Andersen, and D.K. Howe. Diagnosis of *Strongylus vulgaris*. Patent 08951741.

## Publications

*All publication dates are 2015 unless otherwise noted.*

### Annual Report

*One Hundred and Twenty-eighth Annual Report of the Kentucky Agricultural Experiment Station for 2015.* College of Agriculture, Food and Environment, University of Kentucky, Rick Bennett, Director. June.

### Books and Book Chapters

#### Agricultural Economics

Dillon, C.R., J.M. Shockley, and J.D. Luck. Spatial economics decision-making guide for conservation reserve program. Chapter 14,

- pp. 245-257. IN: T. Mueller and G. Sassenrath, ed. *GIS Applications in Agriculture, Volume 4: Conservation Planning*. CRC Press, Boca Raton, FL.
- Garcilazo, E., D. Freshwater, and C. Icaza-Lara. 2014. *OECD Rural Policy Reviews: Chile*. OECD Publishing, Paris.
- Mueller, T.G., D. Zourarakis, G.F. Sassenrath, B. Mijatovic, C. Dillon, E. Gianello, R. Barbieri, M. Rodrigues, E.A. Rienzi, and G.D. Faleiros. Soil surveys, vegetation indices, and topographic analysis for conservation planning. Chapter 2, pp. 11-36. IN: T. Mueller and G. Sassenrath, ed. *GIS Applications in Agriculture, Volume 4:*

- Conservation Planning*. CRC Press, Boca Raton, FL.
- Trapasso, R., D. Freshwater, and E. Garcilazo. *New Rural Policy: Linking up for Growth*. OECD Publishing, Paris.
- C.J. Stowe contributed to one book chapter in Animal and Food Sciences.*

#### Animal and Food Sciences

Coleman, R.J., M.G. Rossano, C.J. Stowe, S. Johnson, A.F. Davis, J.E. Allen, A.E. Jarrett, G. Grulke, L. Brown, and S. Clark. The 2012 Kentucky Equine Survey: Importance and

impact of the equine industry in Kentucky. pp. 45-54. IN: C. Vial and R. Evans, ed. *The New Equine Economy in the 21st Century*. EAAP publication no 139. Wageningen Academic Publishers, Wageningen, The Netherlands.

### Biosystems and Agricultural Engineering

Agouridis, C.T. Reconnecting through stream restoration. IN: B.D. Lee, A. Jones, D. Carey, and J. Burch, ed. *Shaped by Water: Kentucky's Watersheds, Landscapes, and People*. University Press of Kentucky, Lexington.

### Community and Leadership Development

Hustedde, R. Seven theories for seven community developers. pp. 22-44. IN: R. Phillips and R.H. Pittman, ed. *An Introduction to Community Development*. Routledge, New York City.

Zimmerman, J.N. I could tell stories 'til the cows come home: Individual biography meets collective biography. pp. 35-62. IN: J.I. Bakker, ed. *Rural Sociologists at Work: Candid Accounts of Theory, Methods and Practice*. Routledge, New York City.

### Dietetics and Human Nutrition

Stephenson, T.J., and W.J. Schiff. *Human Nutrition: Science for Healthy Living*. McGraw-Hill Publishing.

### Family Sciences

Hans, J. D. Family Relations. IN: C. Shehan, ed. *The Encyclopedia of Family Studies*. Wiley-Blackwell.

Hans, J. D. Family science: History, status, and practice. pp. 3-8. IN: M.J. Walcheski and J.S. Reinke, ed. *Family Life Education: The Practice of Family Science*, 3rd ed. National Council on Family Relations: Minneapolis, MN.

Harris, C., A. Ksinan, and A.T. Vazsonyi. Introduction: Schools, achievement, work, and careers. pp. vii-xiv. IN: A.T. Vazsonyi, ed. *Adolescence*, vol. 3. Sage Publications, London.

Ksinan, A., and A.T. Vazsonyi. Introduction: Biological processes, puberty, and brain development. pp. xxix-xxvi. IN: A.T. Vazsonyi, ed. *Adolescence*, vol. 1. Sage Publications, London.

Ksinan, A., and A.T. Vazsonyi. Introduction: Health, health-risk, and problem behaviors. pp. xxix-xxxvi. IN: A.T. Vazsonyi, ed. *Adolescence*, vol. 5. Sage Publications, London.

Ksinan, A., and A.T. Vazsonyi. Introduction: Proximal developmental contexts—the family and peer group. pp. vii-xvi. IN: A.T. Vazsonyi, ed. *Adolescence*, vol. 2. Sage Publications, London.

Ksinan, A., C. Harris, and A.T. Vazsonyi. Introduction: Distal developmental contexts—neighborhoods, school, and culture. pp. vii-xvi. IN: A.T. Vazsonyi, ed. *Adolescence*, vol. 4. Sage Publications, London.

Vazsonyi, A.T. *Adolescence*. Five volumes. Major Works Series. Sage Publications, London.

Vazsonyi, A.T., J. Mikuska, and A. Ksinan. Big five and well-being: A study across six cultures. pp. 89-108. IN: M. Blatny, ed. *Well-being in a Lifespan Perspective*. Routledge, Taylor and Francis Group.

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*C.T. Agouridis contributed to one publication in Forestry.*  
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*David Van Sanford contributed to one article in Plant Pathology.*
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Watson, J.R., A. Leber, S. Velineni, J.F. Timoney, and M.I. Ardura. Recurrent *Streptococcus equi* subsp. *zoepidemicus* bacteremia in an infant. *Journal of Clinical Microbiology* 53(9):3096-3099.

Woodward, E.M., and M.H.T. Troedsson. Inflammatory mechanisms of endometritis. *Equine Veterinary Journal* 47(4):384-389.

Yeagan, M., I.D. Rocha, J. Morrow, A. Graves, S.M. Reed, and D.K. Howe. A new trivalent SnSAG surface antigen chimera for efficient detection of antibodies against sarcocystis neurona and diagnosis of equine protozoal myeloencephalitis. *Journal of Veterinary Diagnostic Investigation* 27(3):377-381.

## Other Research Publications

### Agricultural Economics

Davis, A.F., J. Allen IV, M. Childress, J. Talbert, and R. Maurer. An evaluation of ARC health projects, 2006-2010. Report to the Appalachian Regional Commission, Washington, DC.

Davis, A.F., R. Maurer, J. Mansfield, C. Purdom, K. Fawcett, and J. Allen IV. An evaluation of Agricultural Development Board investments in Kentucky agriculture 2007-2014: KADF Projects, Programs, and the Kentucky Agricultural Finance Corporation. Executive Summary, Report to the Kentucky Agricultural Development Board, Frankfort.

Schieffer, J., and M. Vassalos. Risk and the use of contracts by vegetable growers. *Choices* 30(3):1-4.

### Animal and Food Sciences

Burkey, T.E., and M.D. Lindemann. An overview of the 2015 Digestive Physiology of Pigs Meeting. pp. 49-53. Proceedings, 15th Annual Midwest Swine Nutrition Conference, Indianapolis, IN.

Desai, M.A., V. Jackson, S.P. Suman, M.N. Nair, C.M. Beach, and M.W. Schilling. Proteome basis of pale, soft, and exudative (PSE) condition in broiler meat from a commercial processing plant. Paper 4.23. Proceedings, 61st International Congress of Meat Science and Technology, Clermont-Ferrand, France. August 23-28.

Lehmkuhler, J.W. Production of quality beef for market needs from holstein dairy production. *Chinese Journal of Animal Science* 6:116-120.

Meng, Q., H.P.S. Makkar, J. McKinnon, P. Beck, D. Gibb, W. Yang, S.J. Bartles, J. Madsen, J.W. Lehmkuhler, D. Rethorst, et al. The First Symposium on the Applied Techniques and Industry Economics in Chinese Beef Cattle Production. *Viandes and Produits Carnes* 31:3-6.

Poore, M.H., and J.W. Lehmkuhler. Forages and Pastures Symposium: Use of marginal lands and fibrous byproducts in efficient beef and dairy production systems. *Journal of Animal Science* 93:2607-2608.

Scaglia, G., P. Beck, M.H. Poore, and J. Lehmkuhler. Tall fescue toxicosis update. Bill E. Kunkle Interdisciplinary Beef Symposium: *Journal of Animal Science* 93:5485-5486.

### Biosystems and Agricultural Engineering

Agouridis, C.T. Rotational vs. continuous stocking comparisons: Environmental and wildlife responses. Technical note, USDA-NRCS Conservation Assessment Project, CEAP Conservation Insight.

### Community and Leadership Development

Bronkema, D., M. Fortunato, M. Redlin, D. Kahl, R. Hustedde, M. Rios, and M. Emery. Mobilizing theory, practice and research to create sustainable futures: Challenges and innovations in community development educational programming. Presentation, Community Development Society, Lexington, July.

Chung, D., S. Nah, and M. Yamamoto. Predicting citizen journalism complexity: An analysis of U.S.-based editors' definitions of citizen journalism. Participatory Journalism Interest Group. Association for Education in Journalism and Mass Communication. San Francisco. August.

Dyk, P. Barriers to health in rural communities: Perspectives from rural mothers. Presentation, Southern Rural Sociological Society. Atlanta. February.

Dyk, P. Barriers and enablers to good health experienced by low-income rural mothers. Poster, National Council on Family Relations annual meeting. Vancouver, BC. November.

Dyk, P. Theory Construction and Research Methodology pre-conference. Presentation, National Council on Family Relations annual meeting. Vancouver, BC. November.

Dyk, P. Health barriers in rural communities: Perspectives from rural mothers. Presentation, Rural Sociological Society, Madison, WI. August.

Dyk, P. Leading with cultural intelligence: Growth through experiential education. Presentation, International Leadership Association. Barcelona, Spain. October.

Garkovich, L. The practice of community development. National webinar, USDA Rural Development. July.

Garkovich, L. Managing conflict and principles of effective boards. State webinars, Community Farm Alliance. July and October.

Garkovich, L. Organized panel on conflict and community land use issues. American Bar Association section on local government. October.

Hains, B.J., K.G. Ricketts, and D. Beck. International synergy: An international exchange focusing on complex community dynamics. Presentation, Community Development Society. Lexington. July.

Harris, R., and H. Hyden. Land grant institutions and contested knowledge within the Black Belt South. Presentation, Southeastern Division of the Association of American Geographers. Pensacola. November.

Hustedde, R. Public conflict analysis and resolution. Presentation, Midwest Community Development Institute. Moline, IL. August.

Hustedde, R., M. Denham, and M. Geneve. E-Discovery challenges you. Presentation, Community Development Society. Lexington. July.

Kahl, D. Understanding community power dynamics. National webinar, Southern Regional Development Center. Starkville, MS. January.

Kusunose, Y., and K. Rignall. Labor migration, poverty and the long-term development of international migration. Presentation, Agricultural and Applied Economics Association and the Western Agricultural Economics Association joint meeting. San Francisco. July.

Nah, S. Citizen journalism scholarship: Theory, research, and practice. Media Innovation Lab, Department of Communication, University of Vienna. Vienna, Austria. May.

Namkoong, K. An integrated marketing project for farmers' markets in the Appalachian region. Presentation, Sharing Work in Appalachia in Progress. UK Appalachian Center, Lexington. April.

Namkoong, K. Social capital in an online health community: Network features and impact on breast cancer patients. Presentation, research seminar. Korean Bioscientists Association. Lexington. March.

Namkoong, K., S. Nah, S.K. Van Stee, and R. Record. Diffusion of social media campaign effects: Moderating roles of social capital in anti-smoking campaign communications. Presentation, Association for Education in Journalism and Mass Communication. Montreal, Canada. August.

- Rignall, K. Socio-economic dynamics of household mobility through time and space in Dades-Mgoun. Final report of NSF-funded post-doctoral research results disseminated to local government, civil society groups, research participants and Moroccan academics. Tinghir, Morocco.
- Rignall, K., and H. Hyden. Agrarian questions of labor: A roundtable discussion on political ecology and agrarian labor issues: Agrarian questions of labor in Kentucky. Presentation, Dimensions of Political Ecology Conference. Lexington. February.
- Rignall, K. Elusive traditions: Women, collective land tenure and the legacy of the French colonial project. Presentation, British Middle East Studies Association. London. June.
- Rignall, K. Environmental change as uneven development: Land use and the struggle over narrative in Morocco's Saharan periphery. Department of Geography, University of Kentucky. October.
- Rignall, K., and H. Hyden. Extension agents, institutions, and the possibilities of social justice. Presentation, Community Development Society. Lexington. July.
- Rignall, K. Land and the politics of value in unconventional gas: Political ecologies of extraction. Saleh Kamel Symposium on An Energy Revolution? The Political Ecologies of Shale Oil in the Middle East, U.S. and China. Center for Contemporary Arab Studies, Georgetown University, Washington DC. February.
- Rignall, K. Results of a household survey in the province of Tinghir. Research colloquium for survey participants, civil society activists and local government officials. Rabat, Morocco, March.
- Rignall, K. Materialism and the uses of immaterial labor in Southern Morocco. Presentation, Conference on Critical Geography, University of Kentucky. Lexington. October.
- Shelton, B.M., B.J. Hains, and K. Ricketts. Contemporary cultural dynamics: An international community comparison. Presentation, Community Development Society. Lexington. July.
- Stansfield, J., B. Peterson, and R. Hustedde. The status quo and future of community development in colleges and universities. Presentation, Community Development Society. Lexington. July.
- Tanaka, K. Beginning farmers in upper southeast. Presentation, Agricultural Marketing Research Group of the Graduate Faculty of Agricultural Economics, Kyoto University. Kyoto, Japan. April.
- Tanaka, K. Beginning farmers in upper southeast. Agrifood systems in transition, supporting new farmers: A comparison of knowledge dynamics in America and Japan. Presentation, Third Seminar of the Lifeworlds of Sustainable Food Consumption. Research Institute for Humanity and Nature. Kyoto, Japan. April.
- Tanaka, K. Building the capacity for community food work: The role of the USDA community food project competitive grant program. Presentation, graduate seminar. International Political Economy of Agriculture, Graduate School of Economics, Kyoto University. Kyoto, Japan. April.
- Tanaka, K. Farming as an assemblage. Presentation, Political economy research group of the Graduate School of Economics, Kyoto University. Kyoto, Japan. April.
- Tanaka, K. Field based sociology: Some lessons and reflections in Kentucky. Presentation, Rural Sociological Society. Madison, WI. August.
- Tanaka, K., L. Brislen, and K. Jacobsen. First land: Creating a farm for the future. Presentation, RC-40 Session on Land as an Asset Class: The Future of Food and Farming. 18th World Congress of Sociology. Yokohama, Japan. April.
- Tanaka, K. Keeping agricultural cooperatives relevant in Japan: The struggle of the National Federation of Agricultural Cooperative Employees. Presentation, Rural Sociological Society. Madison, WI. August.
- Tanaka, K., L. Brislen, and K. Jacobsen. Knowing sustainability, practicing sustainability: Three cases of beginning farms in Kentucky. Presentation, Rural Sociological Society. Madison, WI. August.
- Tanaka, K. 日米農村開発比較: "resilience" と "sustainability" の視点から Rural community development in Japan and the United States: Concepts of resilience and sustainability. Presentation, Akita Seminar on Thinking about Sustainable Agriculture and Farming Communities, Akita Prefectural University Environmental Sociology Research Group. Akita, Japan. April.
- Vail, A., C.K. Smith, J.N. Zimmerman, M. Harris, and R. Manseau. Building strong families for Kentucky 2016. School of Human and Environmental Sciences, Family and Consumer Sciences, University of Kentucky. Published online: <http://hes.uky.edu/StrongFamilies>.
- Wright, K.M., and S.K. Vincent. Agricultural education for all: Expansion techniques at the secondary level. Presentation, North Central Association for Agricultural Education Research Conference. Morgantown, WV. October.
- Yamamoto, M., and S. Nah. A multilevel analysis of individual- and community-level sources of local newspaper credibility in the United States. Mass Communication and Society Division; Association for Education in Journalism and Mass Communication. San Francisco. August.
- Yamamoto, M., S. Nah, and D. Chung. Newspaper editors' perceptions of social media as news sources. Newspaper and Online News Division; Association for Education in Journalism and Mass Communication. San Francisco. August.
- Zabawa, R., and R. Harris. A renewed vision for the 1890 land grant universities: Training the engaged scholar to transform the Black Belt South. Presentation, Southern Rural Sociological Association. Atlanta.
- Zimmerman, J. N. Author meets critics: Planning democracy: Agrarian intellectuals and the intended New Deal. Rural Sociological Society Annual Meeting. Madison, WI. August.
- Zimmerman, J. N. Development (rural) sociology: 100 years of scholarship at Cornell. Keynote for Centennial Celebration. Ithaca, NY. September.
- Zimmerman, J.N. Rural sociology begins. Poster, Rural Sociological Society annual meeting. Madison, WI. August.
- Zimmerman, J.N. When is your 100th? 100 years of rural sociology at the University of Kentucky. Poster, Rural Sociological Society annual meeting. Madison, WI. August.
- Entomology**
- Graziosi, I., and L.K. Rieske. Semiochemicals offer hope for managing the granulate ambrosia beetle, *Xylosandrus crassiuscullus*, an invasive pest of chestnut. The Nutshell. Northern Nut Growers Association annual report.
- Tucker, E.M., E.G. Chapman, and M.J. Sharkey. Interactive key, DELTA data matrix, images, and other files to species descriptions for a revision of the New World species of *Cremnops Förster* (Hymenoptera: Braconidae: Agathidinae). Published online: doi:10.13140/2.1.1322.0649. Dataset published in Zootaxa 3916(1):001-083.
- Potter, M.F., K.F. Haynes, and J. Fredrickson. Bed bugs across America: The 2015 national bed bug survey. *PestWorld* Nov/Dec:4-14.
- Penn, J., W. Hu, and M.F. Potter. Economic impact of bed bugs on the hotel industry. *Pest Control Technology* 43(11):24-26, 28, 30, 32.
- Crawley, S.E., M.F. Potter, and K.F. Haynes. Think like a bed bug. *Pest Control Technology* 43(12):96-112.
- Potter, M.F. Bed bugs: Understanding, prevention and control, 3rd ed. *Pest Control Technology* 43(9).
- Family Sciences**
- Armes, S., K. Tippett, and R.J. Werner-Wilson. Marital satisfaction and PTSD development post-deployment. American Association for Marriage and Family Therapy. Austin, Texas. September.
- Carlson, M.W., and J.D. Hans. A grounded theory of household labor division among dual-earner couples. Presentation, National Council on Family Relations Annual Conference. Vancouver, BC, Canada. November.
- Cui, G., A.T. Vazsonyi, C. Harris, and J.M. Bolland. Reciprocal relationships among explosive anger, deviance, and violent behaviors: An examination of a poor, inner-city African American youth. Biennial Meetings of the Society for Research in Child Development. Philadelphia. March.
- Cui, G., N.G. Karaman, and A.T. Vazsonyi. The effect of low self-control on sexual aggression: A test of three mediators of rape myth, date rape attitudes, and sexual norms. The Biennial Meetings of the Society for Research in Child Development. Philadelphia. March.
- Hans, J.D. Directors of graduate study focus group. The National Council on Family Relations Annual Conference. Vancouver, BC, Canada. November.
- Hans, J.D., and I. Okhotnikov. Attitudes toward posthumous reproduction among Christians. The National Council on Family Relations Annual Conference. Vancouver, BC, Canada. November.
- Harris, C., A.T. Vazsonyi, and J. Bolland. A comparison of self-reported and official data in predicting future offending behaviors. The 74th Annual Meetings of the American Society of Criminology, Washington, DC. November.
- Hosier, A.F. Keys to Embracing Aging: How to Stay Healthy throughout the Life Course. 16th State Conference for Kentucky Women in Agriculture. Lexington. November.
- Hosier, A.F., and L.S. Traywick. Keys to Embracing Aging. Southern Gerontological Society 36th Annual Meeting. Williamsburg, VA. April.
- Hunter, J.L. Preparing future faculty through undergraduate student service learning. The Family Science Association Conference. June.



- Javakhishvili, M., and A.T. Vazsonyi. Problem behaviors in ethnic minority versus majority youth in the Republic of Georgia. 5th Annual Children at Risk Conference, University of Kentucky, Lexington. April.
- Jiskrova G., A.T. Vazsonyi, A. Ksinan, and M. Javakhishvili. Sleep functioning and cyberbullying perpetration: Indirect effects by low self-control. 14th European Congress of Psychology. Milan, Italy. July.
- Jiskrova, G., A.T. Vazsonyi, and A. Ksinan. Does the discrepancy between sensation seeking and impulse control mediate the sleep functioning-deviance link? 71st Biennial Meetings of the Society for Research in Child Development. Philadelphia. March.
- Jiskrova, G., and A.T. Vazsonyi. Change in sleep problems and self-control from third to sixth grade. 5th Annual Children at Risk Conference, University of Kentucky, Lexington. April.
- Kelley, E.L., and A.T. Vazsonyi. Trouble with the law: "Big Five" versus low self-control in the explanation of adolescent authority contact. 5th Annual Children at Risk Conference, University of Kentucky, Lexington. April.
- Kelley, E.L., M. Javakhishvili, and A.T. Vazsonyi. Aufseherinnen at Camp Majdanek: Violence as daily routines by female SS guards. Invited book review of *Female SS Guards and Workaday Violence: The Majdanek Concentration Camp, 1942-1944* by Elissa Mailänder. International Criminal Justice Review. Published online: doi:10.1177/10575677115615189.
- Kelley, E.L., M. Javakhishvili, and A.T. Vazsonyi. Invited book review of *Critical Youth Studies Reader* by Awad Ibrahim and Shirley R. Steinberg (invited book review). Teacher's College Record, Number 18023.
- Ksinan, A., A.T. Vazsonyi, and G. Jiskrova. Narcissism and online behavior: A study of two tales. 14th European Congress of Psychology, Milan, Italy. July.
- Ksinan, A., A.T. Vazsonyi, G. Jiskrova and M. Javakhishvili. A test of the dual systems model: Developmental similarities/differences in male and female adolescents. 71st Biennial Meetings of the Society for Research in Child Development. Philadelphia. March.
- Mikuska, J., A.T. Vazsonyi, E. Kelley, G. Torrente-Hernandez, J.-C. Sheu, and L. Huang. Testing self-control theory in Chinese, Czech, Slovene, Spanish, Taiwanese, and Turkish youth. 74th Annual Meetings of the American Society of Criminology, Washington, DC. November.
- Mikuska, J., A.T. Vazsonyi, G. Cui, and E. Kelley. Self-control and deviance: A decade of research. 5th Annual Children at Risk Conference, University of Kentucky, Lexington. April.
- Okhotnikov, I., and J.D. Hans. Religious denomination and attitude toward posthumous reproduction among Christian in the United States. Society for the Scientific Study of Religion Annual Meeting. Newport, CA. October.
- Raley, K., J.D. Hans, and L.B. Blume. How to prepare manuscripts for NCFR journals. National Council on Family Relations Annual Conference. Vancouver, BC, Canada. November.
- Rowles, G.D., A.F. Hosier, L.S. Traywick, and E. Marshall. Explorations in gerontological literacy II: Strategies for change. 31st Association for Gerontology in Higher Education annual meeting. Nashville. February.
- Scarpate, M.J., and A.T. Vazsonyi. On the development of self-control: Maturational versus socialization effects over time. 74th Annual Meetings of the European Society of Criminology. Porto, Portugal.
- Vazsonyi, A.T., J. Mikuska, and E. Kelley. It's time: Revisiting the empirical status of Gottfredson and Hirschi's General Theory of Crime (2000-2010). 74th Annual Meetings of the American Society of Criminology. Washington, DC. November.
- Vazsonyi, A.T., J. Mikuska, and E. Kelley. It's time: Revisiting the empirical status of Gottfredson and Hirschi's general theory of crime after 25 years. 74th Annual Meetings of the European Society of Criminology. Porto, Portugal.
- ### Forestry
- Adams, M.B., P. Angel, C. Barton, and J. Slavicek. American elm in mine land reforestation. Reclamation Matters Fall 2015:34-38.
- Agha, M., B. Augustine, and S.J. Price. Gap-based forest harvesting and the thermal ecology of eastern box turtles. Kentucky Woodlands Magazine 10:20-21.
- Agha, M., B. Augustine, J.E. Lovich, D. Delaney, B. Sinervo, M.O. Murphy, J.R. Ennen, J.R. Briggs, and S.J. Price. Using motion-sensor camera technology to infer seasonal activity and thermal niche of the desert tortoise (*Gopherus agassizii*). Society for Freshwater Science annual meeting. Milwaukee WI. May 17-21.
- Agha, M., J.E. Lovich, J.R. Ennen, B. Augustine, T.R. Arundel, and S.J. Price. Exploring the spatial dynamics of tortoise burrow placement in an industrial landscape. Association of Southeastern Biologists Annual Meeting. Chattanooga, TN. April 1-5.
- Baker, T.T., J. Stringer, A. Stainback, A.G. Abbott, and C.D. Nelson. Kentucky Forest Industries Association Annual Meeting. Forest Health Research and Education Center. Lexington, KY. March 25.
- Bartlett, B.D., J.H. Roberds, K.C. Showmaker, D.G. Peterson, and C.D. Nelson. Draft genome sequence of *Mycosphaerella dearnessii* from two isolates in flexing longleaf pine. 33rd Southern Forest Tree Improvement Conference. Hot Springs, AR. June 8-11.
- Barton, C.D. From Butcher Holler to Monkey Broke Creek: Restoring forests on surface coal mines. Invited keynote presentation, Cleanup 15. Melbourne, Australia. September 13-16.
- Barton, C.D. From Butcher Holler to Monkey Broke Creek: Restoring forests on surface coal mines. Invited presentation, University of Newcastle workshop. Newcastle, Australia. September 18.
- Barton, C.D. From Butcher Holler to Monkey Broke Creek: Restoring forests on surface coal mines. Invited keynote presentation, 38th Council on Forest Engineering. Lexington. July 19-22.
- Barton, C.D. T.R. Littlefield, C. Hoy, and C. Agouridis. Hydrologic characterization of three headwater wetlands in southeastern Kentucky, USA. Invited presentation, ASABE Annual International Meeting. New Orleans. July 26-29.
- Blackburn-Lynch, W., C. Agouridis, C. Barton, and R. Warner. Impacts of flooding on forested headwater streams. ASABE Annual International Meeting. New Orleans. July 26-29.
- Blackburn-Lynch, W., C. Agouridis, C. Barton, R. Warner, and R. Maupin. Hydrologic Assessment of a Stream Created on Mined Land. Joint conference of the 32nd annual American Society of Mining and Reclamation and the 9th annual Appalachian Regional Reforestation Initiative. Lexington. June 7-11.
- Bradley, J.C., R.E. Will, J.F. Stewart, C.D. Nelson. Fire kills shortleaf x loblolly pine hybrid seedlings. Poster, Eighteenth Biennial Southern Silviculture Research Conference. Knoxville, TN.
- Brandeis, T.J., C. Oswalt, J. Stringer, and S. Zarnoch. Are observed trends in hardwood tree grade due to resource changes or data anomalies? Presentation, Forest Inventory and Analysis (FIA) Science Symposium. Portland, OR. December 10.
- Brandeis, T.J., C. Oswalt, J. Stringer, and S. Zarnoch. Are observed trends in hardwood tree grade due to resource changes or data anomalies? Proceedings, Sharon M. Stanton and Glenn A. Christensen, comps. *Pushing boundaries: New directions in inventory techniques and applications: Forest Inventory and Analysis (FIA) symposium 2015 December 8-10; Portland, OR.* 384 p. Gen. Tech. Rep. PNW-GTR-931. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- Burdine, C.S., K.E. Smith, B.D. Bartlett, J.M. Davis and C.D. Nelson. Single genotype isolates of the fusiform rust fungus: Process and progress. Poster, 33rd Southern Forest Tree Improvement Conference. Hot Springs, AR. June 8-11.
- Butnor, J., K.H. Johnsen, C.D. Nelson. Changes in soil chemistry following prescribed fire in a longleaf pine plantation in Mississippi. Poster, Eighteenth Biennial Southern Silviculture Research Conference. Knoxville, TN. March 2-5.
- Conrad, A.O., E.V. Crocker, X. Li, A.G. Abbott, G.A. Stainback, J.W. Stringer, C.D. Nelson, and T.T. Baker. An interdisciplinary approach to address current and emerging threats to forest health. Society of American Forester Meeting. Baton Rouge, LA.
- Contreras, M., ed. Proceedings, 38th Annual Meeting of the Council on Forest Engineering: Engineering Solution for Non-Industrial Private Forest Operations. 377 pp. Lexington. July 19-22.
- Cox, J.J., and C. Spence. Evermore (common raven study). The Magazine: University of Kentucky College of Agriculture. Winter. Published online: <http://www2.ca.uky.edu/agcomm/Magazine/2015/Winter2015/index.html>.
- Cox, J.J., writer, director, producer. Kentucky forests: A world of wildlife. 25 minutes. Shown at Kentucky Wood Expo and other extension venues. Released August 15.
- Cram, D., and T.T. Baker. Using broadcast fire to manage mixed conifer forests. Poster, 6th International Fire Ecology and Management Congress: Advancing Ecology in Fire Management. San Antonio, TX. November 16-20.
- Cram, D., T.T. Baker, A. Fernald, A. Cibils, and D. VanLeeuwen. Longitudinal response of fuel and vegetation following fire in treated vs. untreated forests. Poster, SAF National Convention. Baton Rouge. November 3-7.
- Cram, D., T.T. Baker, G. Mason, and R. Lucas. Ax, match, cow: Aldo Leopold's natural resource management tools. Poster, 15th Annual Research and Creative Activities Fair: All About Discovery. Las Cruces Convention Center, October 2.
- Crocker, E.V. Decline of our forests and trees: Can modern genetics provide a solution? Kentucky Woodlands Magazine 10(1). Published online: <http://www2.ca.uky.edu/>



- KYWoodlandsmagazine/Vol10\_No1/GMOS.pdf.
- Crocker, E.V. Plant health: Anthracnose. UK Urban Forest Initiative Tree Talk Series, Summer 2015. Published online: <https://ukntrees.ca.uky.edu/treetalk/planthealth-anthracnose>.
- Crocker, E.V. There's a fungus among us. UK Urban Forest Initiative Tree Talk Series, Fall 2015. Published online: <https://ukntrees.ca.uky.edu/treetalk/fungus-among-us>.
- Crocker, E.V., A.O. Conrad, X. Li, A.G. Abbott, G.A. Stainback, J.W. Stringer, T.T. Baker, and C.D. Nelson. An interdisciplinary approach to address current and emerging threats to forest health. Posters, Society of Foresters Annual Meeting, Baton Rouge, LA. October.
- Crowley, K.F., G.M. Lovett, M.A. Arthur, and K.C. Weathers. Invasive pests alter long-term carbon and nitrogen dynamics in northeastern U.S. forests. Ecological Society of America. August.
- Crowley, K.F., G.M. Lovett, M.A. Arthur, and K.C. Weathers. Invasive pests alter long-term carbon and nitrogen dynamics in northeastern U.S. forests. Northeastern Ecosystem Research Cooperative. Saratoga Springs, NY. March 24-25.
- Dodd, L.E., and M.J. Lacki. Discussing the relationships between fire management and the quality of habitat for bats: A workshop for scientists and land managers. Consortium of Appalachian Fire Managers and Scientists, JFSP Fire Science Exchange Network. April 30, 2014. Published online: [www.appalachianfire.org/past-events-webinars/](http://www.appalachianfire.org/past-events-webinars/).
- Dodd, L.E., M.J. Lacki, N.S. Skowronski, M.B. Dickinson, and L.K. Rieske. Long-term impacts of prescribed fire on bat and insect activity at Mammoth Cave National Park. Proceedings, 5th Fire in Eastern Oak Forests Conference. Tuscaloosa, AL.
- Dreaden, T.J. Influence of soil community on American chestnut (*Castanea dentata*) field survival: Proposed research. USDA FS SRS All Researches Meeting. Asheville, NC. November 17-19.
- Dreaden, T.J., A. Campbell, R.C. Plotz, and J.A. Smith. Assessing the pathogenicity of *Raffaelea* spp. isolated from *Xyleborus glabratus* to swamp bay, *Persea palustris*. American Phytopathological Society Annual Meeting, Pasadena, CA. August 1-5.
- Dreaden, T.J., and J.A. Smith. Assessing the pathogenicity of *Raffaelea* spp. isolated from *Xyleborus glabratus* to swamp bay, *Persea palustris*. 14th Biennial Meeting of the Florida Phytopathological Society. Gainesville, FL. May 4-6.
- Dreaden, T.J., and J.A. Smith. Assessing the pathogenicity of *Raffaelea* spp. isolated from *Xyleborus glabratus* to swamp bay, *Persea palustris*. Southern Appalachian Forest Entomologist/Pathologist Seminar. Newland, NC. March 5-6.
- Dreaden, T.J., and J.A. Smith. Development of a detection method for the survey of the oak pathogens *Diplodia corticola* and *D. quercivora* in Florida. American Phytopathological Society Annual Meeting. Pasadena, CA. August 1-5.
- Dreaden, T.J., and J.A. Smith. Development of a PCR-RFLP based detection method for the oak pathogens *Diplodia corticola* and *D. quercivora*. American Phytopathological Society Southern Division Meeting. Atlanta. February 1-2.
- Freitas, R., L. Ribeiro, M Contreras, J. Stringer, C. Osborne, and R. Reeves. Evaluating the feasibility of using a security camera system for time and motion studies of timber harvesting equipment. Poster, Council of Forest Engineering (COFE) 38th Annual Meeting. Lexington. July 19-22.
- French, M., C. Barton, B. McCarthy, C. Keiffer, J. Skousen, C. Zipper, and P. Angel. Re-establishing American chestnut on mined lands in the Appalachian coalfields. Forest Reclamation Advisory Number 12, U.S. Office of Surface Mining. Published online: <http://arri.osmre.gov/fra.htm>.
- Guldin, J.M., J.F. Rosson Jr., and C.D. Nelson. Restoration of longleaf pine: The status of our knowledge. Eighteenth Biennial Southern Silviculture Research Conference. Knoxville, TN. March 2-5.
- Hamilton, S., J.J. Cox, A. Drayer, J.M. Richards, and J.J. Treanor. An investigation of chytrid fungus infection in plethodontid salamander communities of logged, surface mined and intact forests of eastern Kentucky. The Annual Water Resources Symposium, Lexington, KY. March 9.
- Hanna, A., C.D. Barton, M. French, and P.N. Angel. Engaging the public in mine land reforestation: Volunteer tree planting events in Appalachia. Joint conference of the 32nd annual American Society of Mining and Reclamation and the 9th annual Appalachian Regional Reforestation Initiative. Lexington. June 7-11.
- Hansen, E., C. Barton, and A. Drayer. Challenges for native forest establishment on surface mines in a time of climate change. Reclamation Matters Spring 2015:36-39.
- Hansen, E., C.D. Barton, and A. Drayer. Climate change and native forest establishment: A case study from Eastern Kentucky. Joint conference of the 32nd annual American Society of Mining and Reclamation and the 9th annual Appalachian Regional Reforestation Initiative. Lexington. June 7-11.
- Haymes, C., J. McDermott, J.T. Hast, G. Jenkins, W. Bowling, and J.J. Cox. Immobilization of wild white-tailed deer with BAM. Kentucky Chapter of The Wildlife Society 22nd Annual Conference. Natural Bridge State Park. Slade, KY.
- Haymes, C., J. McDermott, J.T. Hast, G. Jenkins, W. Bowling, and J.J. Cox. Immobilization of wild white-tailed deer with BAM. The Wildlife Society 22nd Annual Conference. Winnipeg, Canada. October 17-20.
- Hime P.M., S.D. Unger, A.M. McMillan, M. Freake, S.O. Nunziata, A.R. Lemmon, E.M. Lemmon, S.J. Price, R.N. Williams, and D.W. Weisrock. Genome-scale resolution of species boundaries and demography in *Cryptobranchius*. Seventh Hellbender Symposium. Saint Louis, MO. June 14-17.
- Islam, M.H., C. Casola, N. Islam-Faridi, T.D. Byram, and C.D. Nelson. Application of laser capture micro-dissection (LCM) microscopy in forest tree genomics. Poster, 33rd Southern Forest Tree Improvement Conference. Hot Springs, AR. June 8-11.
- Islam-Faridi, N., M.A. Majid, T. Zhebentyayeva, L.L. Georgi, N. Cannon, M.E. Staton, F.V. Hebard, P.H. Sisco, J.E. Carlson, and C.D. Nelson. Genome Organization and Cytomolecular map of chestnut. 33rd Southern Forest Tree Improvement Conference. Hot Springs, AR. June 8-11.
- Lhotka, J.M. Advanced woodland management practices. University of Kentucky Forestry Extension, Woodland Owners Short Course. Versailles, KY. August 15.
- Lhotka, J.M. Forest edge effects on oak regeneration in gap-based silvicultural systems. Eastern Kentucky University Department of Biology Seminar Series. Richmond, KY. February 13.
- Lhotka, J.M. Formulating an expanding-gap silvicultural system to address oak regeneration issues in the central hardwood forest region. Advanced Silviculture Seminar (SEFS 526) via video conference. University of Washington School of Environmental and Forest Sciences. Seattle, WA. April 2.
- Lovett, G.M., M.A. Arthur, and K.Crowley. Does de-acidification affect forest floor carbon dynamics? Ecological Society of America. August.
- Lu, M., C.D. Nelson, K. Krutovsky, and C. Loopstra. Phenotyping environmental adaptation and stress mitigation traits in the clonal loblolly pine ADEPT2 population. PineMap Annual Meeting. Athens, GA. June.
- Murphy, M.O., M. Agha, T.A. Maigret, M.E. Dorcas, and S.J. Price. The effects of urbanization on body size of larval stream salamanders. Association of Southeastern Biologists Annual Meeting. Chattanooga, TN. April 1-5.
- Murphy, M.O., S.J. Price, W. Haag, and D. Weisrock. Assessing congruency of population structure and gene flow between freshwater mussels and their hosts: A genomic approach. Society for Freshwater Science annual meeting, Milwaukee, WI. May 17-21.
- Murphy, S.M., J.J. Cox, J.T. Hast, B. Augustine, J. Plaxico, and S. Dobej. Demographic and genetic characteristics of a reintroduced black bear population in the Big South Fork area of Kentucky and Tennessee. Kentucky Chapter of The Wildlife Society Annual Meeting. Natural Bridge State Park. Slade, KY.
- Nelson, C. Dana. QTL mapping in chestnut. Shatz Tree Genetics Colloquium: Integrating Genomics Tools in American Chestnut Restoration. State College, PA. October 23-24.
- Nelson, C.D., A.G. Abbott, A. Stainback, J. Stringer, and T.T. Baker. Forest Health Research and Education Center, Kentucky Farm Bureau Forestry Conference. Louisville. December 4.
- Nelson, C.D., A.O. Conrad, E.V. Crocker, and A.G. Abbott. Towards a forest health paradigm based on host genetics and participatory breeding. 33rd Southern Forest Tree Improvement Conference. Hot Springs, AR. June 8-11.
- Picullell, B.J., C.D. Nelson, J.H. Roberds, and J.D. Hoeksema. Effects of interaction with mycorrhizal fungi on correlations between traits in loblolly pine. Zobel Award winner for best graduate student presentation. 33rd Southern Forest Tree Improvement Conference. Hot Springs, AR. June 8-11.
- Picullell, B.J., C.D. Nelson, J.H. Roberds, L.G. Eckhardt, and J.D. Hoeksema. Examining the evolutionary interactions of loblolly pine with both beneficial and pathogenic fungi. Ecological Society of America Annual Meeting. Baltimore. August 9-14.
- Price, S.J. Quantifying the effects of habitat disturbance on amphibian populations in the southeastern United States. Middle Tennessee State University. Murfreesboro, TN. October 8.
- Price, S.J. Snake fungal disease in Kentucky. Department of Forestry, University of Kentucky. Lexington. November 30.
- Price, S.J., B. Muncy, S. Bonner, C. Barton, and A. Drayer. Impacts of mountaintop removal

- mining and valley fills on stream salamander occupancy, abundance and species richness. Society for Freshwater Science annual meeting. Milwaukee, WI. May 17-21.
- Price, S.J., B.L. Muncy, and C.D. Barton. Effects of mountaintop removal and valley fill on stream salamander populations. Biology Department, Davidson College. Davidson, NC. November 18.
- Price, S.J., B.L. Muncy, B.L., and C.D. Barton. Mountaintop removal and valley fills reduces stream salamander occupancy, abundances, and richness in eastern Kentucky. Department of Biology and Chemistry, Morehead State University. Morehead, KY. March 24.
- Schmidtling, R., V. Chhatre, C.D. Nelson. Salt tolerance of barrier island slash pine. Poster, 33rd Southern Forest Tree Improvement Conference. Hot Springs, AR. June 8-11.
- Slabach, B., J.T. Hast, C. Barton, and J.J. Cox. A matter of taste? Geophagic behavior of free-ranging ungulates on a human altered landscape. The Wildlife Society 22nd Annual Conference. Winnipeg, Canada. October 17-20.
- Slusher, A., J. Johnson, M. Lacki, and J. Treanor. Altitude- and sex-specific variation in roosting behavior and thermoregulation of *Myotis lucifugus* in Yellowstone National Park. 45th Annual Symposium of the North American Society for Bat Research. Monterey, CA.
- Smallidge, S.T., H.J. Halbritter, T.T. Baker, N.K. Ashcroft, D.S. Cram, and J.M. Fowler. RITF Report 82. Elk and livestock in New Mexico: Issues and conflicts on private and public lands. Published online: [http://aces.nmsu.edu/pubs/\\_ritf/RITF82.pdf](http://aces.nmsu.edu/pubs/_ritf/RITF82.pdf).
- Staats, W., and M. Contreras. Elevation error of LiDAR-derived DEM in the complex terrain and vegetation condition of eastern deciduous forests. Presentation, Council of Forest Engineering (COFE) 38th Annual Meeting. Lexington. July 19-22.
- Staats, W., M. Contreras, D. Price. LiDAR derived forest canopy metrics and their influence on the spatial distribution of Plethodontid salamanders. Poster, University of Kentucky Graduate Day at the Capitol. Frankfort. February 27.
- Stewart, J.F., B.S. Crane, R.E. Will, C.D. Nelson. Some shortleaf pine (*Pinus echinata* Mill.) seed orchard clones are hybrids with loblolly pine. Third Biennial Shortleaf Pine Conference, Knoxville, TN. September 22-24.
- Stewart, J.F., R.E. Will, K.M. Robertson, C.D. Nelson. Frequent fire and the reduction of loblolly pine × shortleaf pine introgression. 33rd Southern Forest Tree Improvement Conference. Hot Springs, AR. June 8-11.
- Stringer, J. Understanding the certified supply chain, Part 2: Tracking certified wood, making certified wood products legitimate. Kentucky Woodlands Magazine 9(2):20-22.
- Stringer, J. Economic Impact of the Closing of the Verso Pulp and Paper Facility in Wickliffe, KY. 1 pp.
- Stringer, J. Hardwood timber products and tree value. Kentucky Woodlands Magazine 9(2):6-9.
- Stringer, J. Kentucky's woodland owners and logging best management practices. Kentucky Woodlands Magazine 10(1):1-2.
- Stringer, J. Logging and BMP use associated with the proposed rule for the Kentucky arrow darter. White paper. 3 pp.
- Stringer, J. SOAR—analysis of the forest industry's potential in Eastern Kentucky. White paper. 5pp.
- Stringer, J. SOAR—Next steps for job growth: Unlocking the forest industry potential. White paper. 1 pp.
- Stringer, J. Understanding the certified supply chain, Part 3: Controlled wood and fiber sourced wood. Kentucky Woodlands Magazine 10(1):4-5.
- Stringer, J. Woodland owners and the northern long-eared Bat. Kentucky Woodlands Magazine 10(1):11-13.
- T. Heim, C.D. Barton, M. French, and P.N. Angel. The Appalachian forest renewal initiative: Demonstrations of legacy mine land reforestation across Appalachia. Joint conference of the 32nd annual American Society of Mining and Reclamation and the 9th annual Appalachian Regional Reforestation Initiative. Lexington. June 7-11.
- Thalken, M., M. Lacki, R. Toomey, and S. Thomas. Roosting behavior of *Myotis septentrionalis* during spring emergence in Mammoth Cave National Park. 45th Annual Symposium of the North American Society for Bat Research. Monterey, CA.
- Upadhaya, S., M. Arthur, M. Contreras, C. Cotton, D. Taylor. Assessment of burn severity and response of non-native invasive species in an eastern deciduous forest using Landsat imagery. Poster, University of Kentucky Graduate Day at the Capitol. Frankfort. February 27.
- Westbrook, J.W., V.E. Chhatre, L.-S. Wu, S. Chamala, L.G. Neves, P. Muñoz, P.J. Martinez-García, D.B. Neale, M. Kirst, K. Mockaitis, et al. An annotated consensus genetic map for *Pinus taeda* and extent of linkage disequilibrium in three genotype-phenotype discovery populations. Poster, 33rd Southern Forest Tree Improvement Conference. Hot Springs, AR. June 8-11.
- Wilent, S., D. Cram, and T.T. Baker. Research matters: Does fuels management work? Study says yes. Forestry Source 20:11.
- Will, R.E., J.F. Stewart, C.D. Nelson, and B.S. Crane. Fire exclusion is causing an increase in hybrids between shortleaf and loblolly pine. Third Biennial Shortleaf Pine Conference. Knoxville, TN. September 22-24.
- Yang, J. Joint Sino-U.S. workshop on forest, soil, and landscape modeling. Changchun, China. June 22.
- Yang, J. USDA Forest Service Eastern Forest Environmental Threat Assessment Center (EFETAC). Asheville, NC. August 17.
- Yang, J. USDA Forest Service Southern Research Station (SRS) forest inventory and analysis (FIA) research work unit. Knoxville, TN. August 6.
- Yang, J., J. Wang, F. Zhao. Mine reclamation schematic design based on ecosystem services and landscape ecology: A case study in Liaoning province, China. Presentation, Integration of Landscape Ecology into Ecosystem Service Assessment for Sustainability of Coupled Human-Environment Systems. 9th IALE (International Association of Landscape Ecology) World Congress. Portland, OR. July 7.
- Yang, J., P. Weisberg, and T. Dilts. Integration of climatic water deficit and fine-scale physiography in process-based modeling of forest landscape dynamics. Presentation, Modeling Forest Landscapes in a Changing Climate: Theory and Application. 9th IALE (International Association of Landscape Ecology) World Congress. Portland, OR. July 8.
- Yates, W.T., M. Agha, J.R. Ennen, J.E. Lovich, C.H. Ernst, E.M. Ernst, and S.J. Price. Delayed emergence dynamics in Emydid neonate turtles of North America. Association of Southeastern Biologists Annual Meeting. Chattanooga, TN. April 1-5.
- Zhebentyayeva, T., M.T. Perkins, S. Jeffers, J. James, P. Sisco, F. Hebard, L. Georgi, M. Staton, C.D. Nelson, and A.G. Abbott. Mapping of resistance to *Phytophthora* root rot (caused by *P. cinnamomi*) in interspecific American/Chinese and American/Japanese chestnut hybrid families. 33rd Southern Forest Tree Improvement Conference. Hot Springs, AR. June 8-11.

## Horticulture

- Hall, C.R., and D.L. Ingram. Costs and carbon footprint associated with selected nursery production systems. Proceedings, Southern Nurseryman Association Research Conference 60:65-67.
- Ingram, D.L., and C.R. Hall. Using life cycle assessment (LCA) to determine the carbon footprint of trees during production, distribution and useful life as the basis for market differentiation. Proceedings, 1st International Symposium on Horticulture Economics, Marketing and Consumer Research. Acta Horticulturae 1090:35-38.
- Nambuthiri, S., A. Fulcher, E. Hagen, and R.L. Geneve. Using light integrals and vapor pressure deficit to simulate irrigation scheduling for container nursery production. Paper 2143968. American Society of Agricultural and Biological Engineers Symposium on Emerging Technologies for Sustainable Irrigation.
- Nambuthiri, S., A. Fulcher, R. Geneve, G. Niu, C. Cochran, S. Verlinden, and R. Conneway. Alternative containers for the green industry. South Carolina Nurseryman May/June:14-15.
- Nambuthiri, S., A. Fulcher, R. Geneve, G. Niu, C. Cochran, S. Verlinden, and R. Conneway. Pick your pot. Nursery Management 31(3):10-14.

## Plant and Soil Sciences

- Cabrera, A., J. Isidro, E. Olson, B. Brisco, F. Kolb, E.A. Brucker, A. Krill, M.P. Arruda, M. Sorrells, D. Van Sanford, et al. Utilizing genomic selection to accelerate the pace of developing resistant varieties. Proceedings, 2015 National Fusarium Head Blight Forum, U.S. Wheat and Barley Scab Initiative. St. Louis, MO. December 6-8.
- Coyne, M.S., and R. Mikkelsen. Soil microorganisms contribute to plant nutrition and root health. Better Crops 99(1):18-20.
- Grove, J.H., and E.M. Pena-Yewtukhiw. Soil management determines sampling density/spatial dependence of dynamic soil properties. Precision Agriculture '15. Proceedings, 10th European Conference on Precision Agriculture, Wageningen Academic Publishers. Tel Aviv, Israel. July 12-16.
- Knott, C.A., E.L. Ritchey, and L.W. Murdock. Reductions of wheat yield and yield components and nitrogen loss following frozen soil nitrogen applications. Plant and Soil Science Research Reports 4(1).
- Malla, S., C. Griffey, J.P. Murphy, E. Milus, A. Clark, D. Van Sanford, J. Costa, N. McMaster, D. Schmale III, S. Chao, and G. Brown-Guedira. Characterization of FHB resistance QTL in SRW wheat cultivar tribute. Proceedings, 2015 National Fusarium Head Blight Forum, U.S. Wheat and Barley Scab Initiative. St. Louis, MO. December 6-8.



Pena-Yewtukhiw, E.M., and J.H. Grove. NDVI measurements as a predictor of miscanthus x giganteus biomass. *Precision Agriculture '15. Proceedings, 10th European Conference on Precision Agriculture*. Wageningen Academic Publishers. Tel Aviv, Israel. July 12-16.

Ritchey, E.L., and J.L. Gray. Nitrogen contribution from different manure sources. *Proceedings, North Central Extension-Industry Soil Fertility Conference*. Des Moines, IA. November 4-5.

### Plant Pathology

Salgado, J.D., K. Ames, G. Bergstrom, C., Bradley, E. Byamukama, J. Cummings, V. Chapara, M. Chilvers, R. Dill-Macky, A. Friskop, et al. Robust management programs to minimize losses due to FHB and DON: A multi-state coordinated project. pp. 24-26. *Proceedings, National Fusarium Head Blight Forum*. St. Louis, MO. December 6-8.

Schardl, C.L. Introduction to the Toxins special issue on ergot alkaloids. *Toxins (Basel)* 7:4232-4237. Published online: doi: 10.3390/toxins7104232.

Vincelli, P. Trichoderma ear rot of corn. *Mid-America Farmer* 35(6):12.

### Retailing and Tourism Management

Brown, D.O. and J. Wani. Sudan tourism. IN: J. Jafari and H. Xiao, ed. *Encyclopedia of Tourism*. Springer. Published online: doi:10.1007/978-3-319-01669-6\_1-1.

Brown, D.O. (2015). Sierra Leone tourism. IN: J. Jafari and H. Xiao, ed. *Encyclopedia of Tourism*. Springer. Published online: doi:10.1007/978-3-319-01669-6\_1-1.

Swanson, J.R. Future, tourism. IN: J. Jafari and H. Xiao, ed. *Encyclopedia of Tourism*. Springer. Published online: doi:10.1007/978-3-319-01669-6\_365-1.

### UK Veterinary Diagnostic Laboratory

Arnold, L.M. Beware of "Dr. Google": Grass tetany myths debunked. *Cow Country News*. March.

Arnold, L.M. Can you guess the effect of pi cattle on health and performance outcomes? *Off the Hoof*. September.

Arnold, L.M. Can you guess the effect of pi cattle on health and performance outcomes? *Cow Country News*. September.

Arnold, L.M. Dealing with anaplasmosis in your herd. *Cow Country News*. November.

Arnold, L.M. Dealing with anaplasmosis in your herd. *Off the Hoof*. October.

Arnold, L.M. Developing quality replacement heifers: Vaccine requirements weaning to breeding. *Cow Country News*. October.

Arnold, L.M. Emergency calf management after dystocia. *Off the Hoof*. January.

Arnold, L.M. Emergency calf management considerations after dystocia (difficult birth). *Cow Country News*. January.

Arnold, L.M. Extended therapy for mastitis: When should you? *The Progressive Dairyman* 7.

Arnold, L.M. Preventing neonatal calf diarrhea or "calf scours." *Off the Hoof*. December.

Arnold, L.M. The veterinary feed directive, part II: Clarifications in the final rule. *Cow Country News*. August.

Arnold, L.M. The veterinary feed directive, part II: Clarifications to the final rule. *Off the Hoof*. August.

Arnold, L.M. Vaccinations for the fall calving herd: Do them now! *Cow Country News*. December.

Arnold, L.M. When to intervene in delivery of a calf. *Cow Country News*. February.

Arnold, L.M. When to intervene in delivery of the calf. *Off the Hoof*. February.

Arnold, L.M. Developing quality replacement heifers: Vaccine requirements weaning to breeding. *Off the Hoof*. November.

Arnold, L.M., and Darrell Johnson. The veterinary feed directive: Changing the way producers obtain medicated feeds. *Off the Hoof*. May.

Arnold, L.M., and Darrell Johnson. The veterinary feed directive: Changing the way producers obtain medicated feeds. *Cow Country News*. June.

Arnold, L.M., and J.D. Green. Be aware of poison hemlock. *Cow Country News*. July.

Arnold, L.M., and J.D. Green. Be aware of poison hemlock. *Off the Hoof*. July.

Arnold, L.M., and Ray Smith. Wrapping your hay this spring? Poor fermentation may lead to big health risks. *Cow Country News*. May.

Arnold, L.M. Beef Reproduction Efficiency for Eastern Kentucky. *Kickoff Herd Health*. April 23.

Arnold, L.M. Discussion of the VFD. Dr. Ryan Wonderlich's field day. Bardstown, KY. October 3.

Arnold, L.M. Dystocia management. Garrard County Reproductive Meeting. Lancaster, KY. March 3.

Arnold, L.M. Fall 2015: The VFD: What resources are available to understand the new regulations? *Kentucky Veterinary News*.

Arnold, L.M. Master Cattlemen Herd Health Sessions at Princeton (3/17), Owingsville (3/17), Vanceburg (3/24), Winchester (4/9), Carrollton (4/21), Monticello (9/14), Brandenburg (10/22), West Liberty (11/10), Fayette (11/16), and MC Field Day in Versailles (10/13).

Arnold, L.M. Master Grazer: Forage disorders. Woodford County Extension Office, Versailles, KY. May 20 and October 6.

Arnold, L.M. Mastitis treatment and dry cow management. Southeast Quality Milk Initiative Annual Meeting. Russellville, KY. November 3.

Arnold, L.M. Mastitis treatment options. 2015 Young Dairy Producer Conference. Bowling Green, KY. February 24.

Arnold, L.M. Pasture to Plate Health Considerations at Princeton (5/26 and 9/29), Eden Shale (5/27 and 9/30), and Morgan County (10/1).

Arnold, L.M. Perilla mint and other toxicities in the field. Pasture walk at Brann's farm. Adolphus, KY. October 16.

Arnold, L.M. Physical examination of dairy cattle. Dairy agent training at Coldstream. Lexington, KY. April 14.

Arnold, L.M. Preparing for the Veterinary Feed Directive. Appalachian Cow-Calf Conference. Morehead, KY (11/7) and Morehead Cattle Producers Meeting (12/17) at Dickerson Agricultural Complex, MSU.

Arnold, L.M. Preparing livestock for winter. Farm School for Women. Fleming County Extension. December 1.

Arnold, L.M. Prevention of pinkeye. McLean County Field Day. Calhoun, KY. August 14.

Arnold, L.M. Reproductive emergencies. Kenton County Reproductive Meeting. Covington, KY. February 2.

Arnold, L.M. Small ruminant wasting diseases. Barren County Sheep and Goat Producers. October 20.

Arnold, L.M. Spring 2015: Can you guess the effect of PI cattle on health and performance outcomes? *Kentucky Veterinary News*.

Arnold, L.M. Vaccinations for the cow-calf herd. Garrard County Cattlemen's Meeting. Lancaster, KY. February 2.

Arnold, L.M. Veterinary Feed Directive update and cold weather calving. *Kentucky Beef Conference*. Fayette County Extension. October 29.

Arnold, L.M. Veterinary Feed Directive. Anderson County Cattlemen's Association, Lawrenceburg, KY (4/27) and Harrison County Cattlemen's Meeting, Cynthiana, KY. (9/28).

Arnold, L.M. Winter 2015: Chronic pneumonia in stocker calves due to *Mycoplasma bovis*. *Kentucky Veterinary News*.

Arnold, L.M. Cow signals. Barren County (1/6) and Adair County (1/29) dairy meetings.

Carter, C.N. Equine Leptospirosis: We now have a vaccine! Presentation, 7th Annual Kentucky Breeders Short Course, Fayette County Extension Office, Lexington, KY. January 20.

Carter, C.N. High path avian influenza diagnostic laboratory response. Presentation, HPAI Kentucky Poultry Federation Planning Forum. Elizabethtown Tourism and Convention Bureau, Elizabethtown, KY. September 9.

Carter, C.N. Overview of the DVM training programs by the University of Kentucky in support of the Lincoln Memorial University (LMU) College of Veterinary Medicine. Presentation, LMU Dean, faculty and staff. July 28.

Carter, C.N. Public health contributions of veterinary diagnostic laboratories. 1st annual meeting of the Center for Animal Health in Appalachia. Lincoln Memorial University College of Veterinary Medicine, Ewing, VA. October.

Carter, C.N. ed. Diagnostic laboratory rounds. Column, *Kentucky Veterinary News*. Spring, summer, fall, and winter editions.

Gaskill C.L., K. Lea, L. Smith, R. Coleman, and R.S. Smith. Tall fescue ergovaline concentration based on sample handling and storage method. Presentation, AOAC International Midwest meeting. Bozeman, MT. June.

Gaskill, C.L. Introduction to the UKVDL and veterinary toxicology. Presentation, Franklin County 4-H Livestock Club and FFA. UKVDL. May.

Gaskill, C.L. Poisonous pasture plants and horses. Presentation, UK Cooperative Extension Service Pastures Please program. Lexington. February.

Gaskill, C.L. Update on moxidectin poisoning in horses. Presentation, 4th Annual UK Equine Showcase. Lexington KY. January.

Gaskill, C.L. Update on the illicit use of cobalt in racehorses. Presentation, 4th Annual UK Equine Showcase. Lexington. January.

Gaskill, C.L. Veterinary diagnostic toxicology: CSI in the veterinary realm. Presentation, Department of Veterinary Science Seminar series. Lexington. December.

Jackson, C. Zika virus update. Kentucky One Health Meeting. Kentucky Horse Park, Lexington. August 20.

Janes, J.G. Where are we going with wobbler syndrome? *Equine Disease Quarterly* 24(1):3.

Loynachan, A.T. Responsible interpretation of polymerase chain reaction assays. *Equine Disease Quarterly* 24(1):3.

Loynachan, A.T. Concurrent equine herpesvirus 1 and *Clostridium piliforme* hepatitis in a



foal. 58th Annual AAVLD/USAHA Meeting. Providence, RI.

Maples, D., and L.M. Arnold. Submitting a sample to the veterinary diagnostic laboratory? Here is what you need to know. Cow Country News. April.

Smith, J.L. Equine Tyzzer's disease update: January 1993-April 2015. April Equine Disease Quarterly 24(3).

### **Veterinary Science**

Bailey, E. Horse genomics. Equine Disease Quarterly 24(1):1.

Bailey, E. Genetics after twilight. Journal of Equine Veterinary Science 35(5):361-366.

Chambers, T.M. Anonymous: OIE expert surveillance panel on equine influenza vaccine composition: Conclusions and recommendations. OIE Bulletin 2015-2:53-55.

Dixon, M., and R. Dwyer. Commentary. Lloyds Equine Disease Quarterly 24(3):1.

Fenger, C., S. Barker, K. Soring, L. Shalgos, and T. Tobin. Trace environmental substances showing up as post-race positives. Horsemen's Journal 62(4):34-38.

Lyons, E.T., and S.C. Tolliver. Veterinary Science: Strongyles in horses: Update 2015. Bulletin SR 109.

Morales, A., A. Mendez, K. Brewer, and T. Tobin. Sudden death in highly competitive horses. Pathological aspects and clinical case series review. Revista Equinus 41:48-62.

Morales, A., A. Mendez, K. Brewer, and T. Tobin. Sudden death in Thoroughbred horses. Gaceta Hipico 149(3):23.

Nielsen, M.K. Dewormer's effect on scratches. The Horse 32(5):48.

Nielsen, M.K., and C. Barakat. The future of parasite control. Equus 456:44-53.

Page, A.E., H.F. Stills, and D.W. Horohov. The effect of passively acquired antibodies on *Lawsonia intracellularis* infection and immunity in the horse. Equine Veterinary Journal 47(6):655-661.

Timoney, P.J. Re-emergent diseases. Equine Disease Quarterly 24(2):3-4.

# Graduate Degrees

Degrees listed are from the 2015 spring semester, 2015 second summer session, and 2015 fall semester.

## Ph.D. Dissertations

### Animal and Food Sciences

*Cerny, Kathryn L.* Steroid-dependent regulation of the oviduct: A cross-species transcriptomal analysis.

*Cetin-Karaca, Hayriye.* Antimicrobial efficacy of natural bioactive compounds and high pressure processing against potential pathogens in infant foods.

*Harlow, Brittany Elizabeth Davis.* Impact of starch source on equine hindgut microbial ecology.

*Hung, I-Fen.* The effect of dietary nucleotides in sow and nursery piglet diets on reproduction, growth, and immune response.

### Biosystems and Agricultural Engineering

*Blackburn-Lynch, Whitney.* Development of techniques for assessing and restoring streams on surface mined lands.

*Jackson, Joshua.* Optimal uses of biomass resources in distributed applications.

### Entomology

*Tucker, Erica.* A revision of the new world and select old world species of *Cremnops forster* (Hymenoptera: Braconidae: Agathidinae).

*Sun, Qian (Karen).* A comprehensive understanding of corpse management in termites.

*Tian, Li (Lee).* New insights into the function and development of the soldier caste in termites.

### Family Sciences

*Frey, L.* Mental health among suicide attempt survivors: The roles of stigma, self-disclosure, and family reactions.

*Harris, C.* Understanding the pathways to youth involvement in the juvenile justice system: A longitudinal investigation of poor, inner-city African American adolescents.

*Hawks, J.* Exploring the therapeutic alliance with adolescents and their caregivers: A qualitative approach.

*Keys, D.F.* Parent development and wellbeing during the launching stage of parenthood.

*Yelland, E.L.* Sex, dementia, and long-term care: Public perspectives.

### Plant Pathology

*Buiate, Ester A.S.* Establishment of biotrophy by the maize anthracnose pathogen *Colletotrichum graminicola*: Use of bioinformatics and transcriptomics to address the potential roles of secretion, stress response, and secreted proteins.

### Plant and Soil Sciences

#### Crop Science

*Cropper, Kenneth.* Investigations into the home lawn carbon balance and improving the efficacy of t-phylloplanins for combating turfgrass diseases.

*Orlowski, John.* Evaluation of input-intensive soybean management systems and the effect of lactofen application on soybean physiology.

### Soil Science

*Szoboszlay, Márton.* Studies on the effects of plant variety and root exudate compounds on the soil microbial community.

*Zou, Congming.* Soil management and nitrogen dynamics in burley tobacco rotations.

### Plant Physiology

*Jiang, Zuodong.* Engineering triterpene metabolism in tobacco.

*Nair, Meera.* Understanding the role of membrane localized UGT80B1 encoding for UDP-glucose: Sterol glucosyltransferase in plant development.

*Radkov, Atanas.* Unveiling novel aspects of D-amino acid metabolism in the model bacterium *Pseudomonas putida* KT2440.

*Tang, Fang.* Genetic and functional analysis of host genes involved in pathogenic and symbiotic legume microbe interactions.

### Veterinary Science

*Zhu, W.* Glucocorticoid-induced chondrocyte cytotoxicity at doses recommended for intra-articular therapy in horses.

## M.S. Theses

### Agricultural Economics

*Adekunle, Omotoyosi Opeyemi.* A conjoint analysis study of preferences and purchasing behavior of potential adopters of the bureau of land management wild horses.

*Liang, Jiayi.* Wine company analysis in "the New World" and "the Old World."

*McLaughlin, Andrew James.* Water quality trading from the point source perspective: Willingness to pay for abatement credits and preferences for water quality trading market mechanism.

*Owusu-Amankwah, Georgette.* The effects of household socio-demographics on restaurant threshold prices.

*In addition, three non-thesis master's degrees were awarded in calendar year 2015.*

### Animal and Food Sciences

*Altman, Alexander W.* Impact of endophyte-infected tall fescue seed on the acute phase and metabolic responses of cattle during an immunological challenge.

*Borchers, Matthew Richard.* An evaluation of precision dairy farming technology adoption, perception, effectiveness, and use.

*Bruno, Kelsey.* Relationships between behavioral measures and productivity in growing beef cattle.

*Dolecheck, Karmella Ann.* Assessment of the technical and economic potential of automated estrus detection technologies for dairy cattle.

*Eckelkamp, Elizabeth A.* Compost bedded pack barns for dairy cattle: Bedding performance and mastitis as compared to sand freestalls.

*Lim, Jina.* Evaluation of L-Methionine bioavailability in nursery pigs.

*Mañón, Alfredo.* Interaction of dietary supplements of organic trace minerals and phytase on growth performance and mineral metabolism of replacement pullets.

*Mayo, Lauren M.* Assessing the efficacy of automated detection of estrus in dairy cattle.

*Mok, Chan Hee.* Using the indicator amino acid oxidation technique to study threonine requirements in horses fed different feed compositions.

*Norcross, Rebecca G.* Impact of algae supplemented diets combined with antioxidants on the nutritional profile, quality attributes, and storage stability of chicken breast meat.

*Paul, Marquisha A.* Effects of post-hatch holding time and early nutrition strategies on growth performance, carcass and skeletal characteristics of young chickens.

*Weatherly, Maegan E.* Algae or yeast supplementation for lactating dairy cows.

### Biosystems and Agricultural Engineering

*Hagan, Michael.* Life cycle assessment of biomass harvesting for on-farm biofuel production.

*Evans, John.* Development of a method for in-situ testing of oxygen concentrations in compost bedded pack barns.

*Scott, Derek.* Evaluation of the performance of flocculation to enhance sediment trap efficiency.

*Koeninger, Nicole.* Determining soil erosion with varying corn stover cover factors.

*Hickman, Amanda.* The effects of inoculum size, airflow rates, bulk density and particle size on the scale-up of *Phanerochaete chrysosporium* pretreatment.

*Rodrigues, Carla.* Evaluation of different sources of hydroxyl on biomass pretreatment and hydrolysis.

*Griffith, David.* Characterization of two biochars derived from horse muck and their ability to reduce pathogen transport in soil.

*Carey, Bobby.* Field implementation of *Phanerochaete chrysosporium* biomass pretreatment: Fungal identification and inoculation techniques.

*Zhang, Yue.* Low cost flow sensing for field sprayers.

### Community Leadership and Development

*Davis, Dale H.* Campus storytelling networks and student retention intent.

*McClintic, Tara Aleece.* Conceptualizing university education abroad programs using a mutualistic process: A community perspective.

*Shobe, Amber R.* Insights into perspectives on environmental sustainability.

*Tubbs, Jonathan Alexander.* The role of culture in agricultural education: A synthesis of research.

*In addition, three non-thesis master's degrees were awarded in 2015.*

### Dietetics and Human Nutrition

*Asher, Whitney, J.* Food security factors affect growth in young children in an Ecuadorian indigenous community.

*Bronner, Elizabeth A.* Nutritional assessment of preschool children in an urban Ecuadorian community.

*Gamboa, Luisyana, D.A.* The perceptions, knowledge, benefits and barriers of hispanics regarding the dietary guidelines for Americans.

*Goderwis, Lindsey M.* The effect of training and nutrition on the body composition of college football players.

*Ludwig, Emily.* Fruit and vegetable consumption of Division I collegiate football and volleyball players pre- and post-deregulation of snacks by the NCAA.

*Majors, Matthew, R.* Dietary habits and knowledge of college age students.

*Murray, Brittan M.* The role and impact of cooperative extension in diabetes self-management education.

*Paterson, Stacey.* Student perceptions of organic food in relation to health, environment and pricing.

*Rupp, John R.* The relationships among BMI, waist circumference, weight loss and health indicators.

*Saulnier, Matthew, J.* Linking the home and neighborhood food environments regarding dietary intake among rural adolescents.

*Shroff, Siddhi, L.* Impact of the Healthy Hunger-free Kids Act on changes in the phytochemical content of school lunch menus and implications of science-based nutrition education on promoting student identification of foods high in phytochemicals.

*Tincher, Laura, E.* ServSafe exam student's memory retention two years later.

## Entomology

*Dobson (Reale), Rachelyn.* Mechanical exclusion and biological control strategies for the invasive brown marmorated stink bug, *Halyomorpha halys* (Hemiptera: Pentatomidae).

*Leavengood, John.* Taxonomic and molecular studies in cleridae and hemipteran.

*Miller, Diana.* Evaluating a novel endophytic grass for its potential to reduce invertebrate populations and associated bird strike risk at airports.

*McCord, Joshua.* A comparative study of eastern and western North American populations of *Hippodamia convergens* (Coleoptera: Coccinellidae).

*Kowles, Katelyn.* Spatial and temporal dynamics of predator-prey interactions in winter wheat.

*William C. Davidson.* Developing a sustainable approach to emerald ash borer management.

## Family Sciences

*Aiello, E.* How do perceived gender roles effect the number of attempted medical interventions of infertile couples?

*Jenkins, T.* Husband's response to infidelity.

*Jury, K.H.* Ambiguous loss in adult adoptees.

*Kusisto, L.* The impact of video chatting on idealization and disillusionment for long distance dating couples.

*Pendleton, K.* Client's experience of their therapist crying in therapy: A qualitative study.

*In addition, one non-thesis master's degree was awarded in calendar year 2015.*

## Forestry

*Mickey Agha, Mirza.* A long-term investigation of the federally threatened desert tortoise (*Gopherus agassizii*) at a winder energy facility in Southern California.

*Clark, Chase.* The impacts of logging with current and modified best management practices on watershed characteristics in eastern Kentucky.

*Cunningham, Russell.* Effects of regeneration opening size and simulated crop tree release on volume yields and economic value in oak-dominated stands.

*Hamilton, Sarah.* An investigation into the occurrence of *Batrachochytrium dendrobatidis* in plethodontid communities of Robinson Forest.

## Horticulture

*Nair, Meera.* The molecular role of phyosteryl glycosides in plants.

*Wang, Zheng.* The influence of production practices, tillage applications, and endophytic bacteria on bell pepper productivity and physiology under different irrigation regimes.

## Plant Pathology

*Munir, Misbakhul.* Characterization of *Colletotrichum* species causing bitter rot of apples in Kentucky orchards.

## Plant and Soil Sciences

### Integrated Plant and Soil Sciences

*Billman, Eric.* Examining vegetative growth of cool-season forage grasses for dairy cattle preference.

*Gregg, Gary.* Evaluation of early and late season stress on soybean yield.

*Hitz, Katlyn.* Breeding for nitrogen use efficiency in soft red winter wheat.

*Hammond, Leslie.* Nutrient availability and dynamics of compost bedded pack dairy barn waste.

*Burke, Tara.* Selection and basis for tolerance to 2,4-D in red clover (*Trifolium pratense*).

*Shelton, Rebecca.* Conservation agriculture in Kentucky: Investigating nitrogen loss and dynamics in corn systems following wheat and hairy vetch cover crops.

*Timberlake, Caitlin.* Urea formulations on the productivity of bermudagrass and bermudagrass-white clover pastures.

### Crop Science

*Battaglia, Martin.* Corn (*Zea mays* L.) yield response to defoliation at different row widths.

### Retailing and Tourism Management

*Hackett, Tara.* A comparative life cycle assessment of denim jeans and a cotton t-shirt: The production of fast fashion essential items from cradle to gate.

*In addition, three non-thesis master's degrees were awarded in calendar year 2015.*

## Veterinary Sciences

*Monteiro Davolli, G.* Reversible downregulation of hypothalamic-pituitary-gonadal axis in the stallion with a third-generation GnRH antagonist, acyline.

## Graduate Enrollment

*Note: Graduate enrollment data are from the UK Office of Institutional Research <http://www.uky.edu/iraa/studentdata/enrollment>.*

	2014	2015	net change
<b>Agricultural Economics</b>			
Master's	23	22	-1
Doctorate	27	27	0
Major Total	50	49	-1
<b>Animal and Food Sciences</b>			
Master's	32	28	-4
Doctorate	18	23	0
Major Total	50	51	-4
<b>Biosystems and Agricultural Engineering</b>			
Master's	22	14	-8
Doctorate	10	10	0
Major Total	32	24	-8
<b>Entomology</b>			
Master's	11	14	3
Doctorate	20	18	-2
Major Total	31	32	1
<b>Family Sciences</b>			
Master's	21	20	-1
Doctorate	24	22	-2
Major Total	45	42	-3
<b>Forestry</b>			
Master's	18	20	2
Doctorate*			0
Major Total	18	20	2
<b>Retailing &amp; Tourism Management</b>			
Master's	7	10	3
Doctorate*			0
Major Total	7	10	3
<b>Dietetics and Human Nutrition</b>			
Master's	22	23	1
Doctorate*			0
Major Total	22	23	1
<b>Plant Pathology</b>			
Master's	2	0	-2
Doctorate	14	13	-1
Major Total	16	13	-3
<b>Plant and Soil Sciences/Horticulture</b>			
Master's	28	25	-3
Doctorate	43	40	-3
Major Total	71	65	-6
<b>Rural Sociology/Career, Technology and Leadership Education</b>			
Master's	37	39	2
Doctorate	6	9	3
Major Total	43	48	5
<b>Veterinary Science</b>			
Master's	6	8	2
Doctorate	18	17	-1
Major Total	24	25	1
<b>Grand Total</b>	<b>409</b>	<b>402</b>	<b>-12</b>

\*Degree type not offered.



# Financial Statement

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## Statement of Federal Formula Funds

*Fiscal Year 2015*

### Income

<b>Federal Funds</b>	
Hatch	5,424,487
Hatch Multi-State	1,413,917
McIntire-Stennis	560,806
Animal Health	47,228
Total Federal Funds	7,446,438
<b>State Funds</b>	
Total State Funds	29,168,984
<b>Total Funds</b>	<b>36,615,422</b>

### Expenditures

	<b>Federal</b>	<b>State</b>	<b>Total</b>
Personal Services	5,388,735	23,158,472	28,547,207
Travel	113,289	465,338	578,627
Other Operating Expenses	1,657,876	5,056,120	6,713,997
Equipment	286,538	489,054	775,592
<b>Total Expenditures</b>	<b>7,446,438</b>	<b>29,168,984</b>	<b>36,615,422</b>

# Staff

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Robert Brashear, Assistant Dean for Facilities Management

# Departments

Following are departmental faculty and leadership lists for calendar year 2015. (R) denotes Experiment Station appointment. Departments marked with an asterisk comprise the School of Human and Environmental Sciences.

## Agricultural Communications

*Skillman, L.M.*, Director

## Agricultural Economics

*Maynard, L.J.*, Professor and Chair (R)  
*Batte, M.T.*, Research Professor  
*Brown, R.*, Senior Lecturer  
*Buck, S.*, Assistant Professor (R)  
*Burdine, K.H.*, Assistant Extension Professor  
*Dasgupta, S.*, Adjunct Assistant Professor  
*Davis, A.*, Associate Extension Professor  
*Davis, T.D.*, Assistant Extension Professor  
*Dillon, C.*, Professor (R)  
*Freshwater, D.*, Professor (R)  
*Gorton, W.T.*, Adjunct Assistant Professor  
*Halich, G.*, Assistant Extension Professor  
*Hu, W.*, Professor (R)  
*Isaacs, S.*, Extension Professor  
*Katchova, A.*, Associate Professor (R)  
*Kusunose, Y.*, Assistant Professor (R)  
*Mark, T.*, Assistant Professor (R)  
*Meyer, A.L.*, Post-Retire Extension Professor  
*Reed, M.R.*, Professor (R)  
*Robbins, L.R.*, Professor (R)  
*Saghaian, S.*, Associate Professor (R)  
*Schieffer, J.K.*, Assistant Professor (R)  
*Shockley, J.*, Assistant Extension Professor  
*Simon, M.F.*, Adjunct Assistant Professor  
*Skees, J.R.*, Professor (R)  
*Snell, W.M.*, Extension Professor  
*Stowe, C.J.*, Associate Professor (R)  
*Woods, T.A.*, Extension Professor  
*Zheng, Y.*, Assistant Professor (R)

## Animal and Food Sciences

*Coffey, R.D.*, Chair and Extension Professor  
*Aaron, D.K.*, Professor (R)  
*Adedokun, S.A.*, Assistant Professor (R)  
*Aiken, G.E.*, Adjunct Associate Professor  
*Amaral-Phillips, D.M.*, Extension Professor  
*Anderson, L.H.*, Extension Professor  
*Andries, K.M.*, Adjunct Assistant Professor  
*Ao, T.*, Adjunct Assistant Professor  
*Bewley, J.M.*, Associate Extension Professor  
*Boatright, W.L.*, Professor (R)  
*Brennan, K.M.*, Adjunct Assistant Professor  
*Bridges, P.J.*, Assistant Professor (R)  
*Bullock, K.D.*, Extension Professor  
*Burris, R.*, Extension Professor  
*Cantor, A.H.*, Post-Retire Associate Professor (R)  
*Camargo, F.C.*, Associate Extension Professor  
*Coleman, R.J.*, Associate Extension Professor  
*Cox, N.M.*, Dean, College of Agriculture  
*Cromwell, G.L.*, Post-Retire Professor (R)  
*Dawson, K.A.*, Adjunct Professor  
*Ely, D.G.*, Professor (R)  
*Flythe, M.D.*, Adjunct Assistant Professor  
*Harmon, D.L.*, Professor (R)  
*Harmon, R.J.*, Professor (R)  
*Heersche, Jr., G.*, Extension Professor  
*Hennig, B.*, Professor (R)  
*Hicks, C.L.*, Professor (R)  
*Klotz, J.L.*, Adjunct Assistant Professor

*LaBonty, E.A.*, Lecturer  
*Lawrence, L.M.*, Professor (R)  
*Lehmkuhler, J.W.*, Associate Extension Professor  
*Lindemann, M.D.*, Professor (R)  
*Matthews, J.C.*, Professor (R)  
*McLeod, K.R.*, Associate Professor (R)  
*Newman, M.C.*, Associate Professor (R)  
*O'Leary, J.*, Post-Retire Extension Associate Professor  
*Pescatore, A.J.*, Extension Professor  
*Pierce, J.L.*, Adjunct Assistant Professor  
*Rentfrow, G.K.*, Associate Extension Professor  
*Rossano, M.G.*, Associate Professor (R)  
*Silvia, W.J.*, Professor (R)  
*Strickland, J.R.*, Adjunct Associate Professor  
*Strobel, H.J.*, Adjunct Associate Professor  
*Suman, S.P.*, Associate Professor (R)  
*Tidwell, J.*, Adjunct Assistant Professor  
*Tricarico, J.M.*, Adjunct Assistant Professor  
*Urschel, K.L.*, Associate Professor (R)  
*Vanzant, E.S.*, Associate Professor (R)  
*Vijayakumar, P.P.*, Assistant Extension Professor  
*Wang, C.*, Adjunct Assistant Professor  
*Webster, C.D.*, Adjunct Assistant Professor  
*Xiong, Y.*, Professor (R)

## Biosystems and Agricultural Engineering

*Nokes, S.E.*, Professor and Chair (R)  
*Adedoji, A.A.*, Assistant Professor (R)  
*Agouridis, C.T.*, Associate Professor (R)  
*Colliver, D.G.*, Professor (R)  
*Crofcheck, C.L.*, Associate Professor (R)  
*Dvorak, J.S.*, Assistant Professor (R)  
*Edwards, D.R.*, Professor (R)  
*McNeill, S.G.*, Associate Extension Professor  
*Montross, M.D.*, Professor (R)  
*Overhults, D.G.*, Extension Professor  
*Purschwitz, M.A.*, Extension Professor  
*Sarna, M.P.*, Assistant Professor (R)  
*Shi, J.*, Assistant Professor (R)  
*Stombaugh, T.D.*, Extension Professor (R)  
*Taraba, J.L.*, Extension Professor  
*Warner, R.C.*, Extension Professor

## Community and Leadership Development

*Jones, L.*, Extension Professor Emeritus and Interim Chair  
*Dyk, P.*, Associate Professor (R)  
*Epps, R.*, Assistant Professor (R)  
*Garkovich, L.*, Extension Professor  
*Hains, B.*, Associate Professor (R)  
*Harris, R.*, Associate Professor (R)  
*Hustedde, R.*, Extension Professor  
*Jackman, J.*, Adjunct Assistant Professor  
*Kahl, D.*, Assistant Extension Professor  
*Jones, K.*, Associate Extension Professor  
*Maurer, R.*, Extension Professor Emeritus  
*Nah, S.*, Associate Professor (R)  
*Namkoong, K.*, Assistant Professor (R)  
*Ricketts, K.*, Associate Extension Professor  
*Ringall, K.*, Assistant Professor (R)  
*Rossi, A.*, Lecturer  
*Strode, D.*, Senior Extension Specialist, Adjunct

*Tanaka, K.*, Associate Professor (R)  
*Vincent, S.*, Assistant Professor (R)  
*Weckman, R.*, Associate Professor Emeritus  
*Zimmerman, J.*, Extension Professor

## Dietetics and Human Nutrition\*

*Bastin, S.S.*, Chair and Extension Professor  
*Adams, I.K.*, Associate Extension Professor  
*Brewer, D.P.*, Assistant Professor (R)  
*Combs, E.L.*, Lecturer  
*Forsythe, H.W.*, Associate Professor (R)  
*Gustafson, A.A.*, Assistant Professor (R)  
*Kurzynske, J.S.*, Extension Professor  
*Mullins, J.T.*, Extension Professor  
*Schwartz, A.K.*, Lecturer  
*Stephenson, T.J.*, Assistant Professor  
*Webber, K.H.*, Associate Professor (R)  
*Williams, A.W.*, Lecturer

## Entomology

*Palli, S.R.*, Chair and Professor (R)  
*Bessin, R.T.*, Extension Professor  
*Brown, G.C.*, Professor (R)  
*Dobson, S.L.*, Professor (R)  
*Fox, C.W.*, Professor (R)  
*Harwood, J.D.*, Associate Professor (R)  
*Haynes, K.E.*, Professor (R)  
*Johnson, D.W.*, Extension Professor  
*Obrycki, J.J.*, Professor (R)  
*Potter, D.A.*, Professor (R)  
*Potter, M.F.*, Extension Professor  
*Rieske-Kinney, L.K.*, Professor (R)  
*Rittschof, C.C.*, Assistant Professor (R)  
*Sedlacek, J.D.*, Adjunct Assistant Professor  
*Sharkey, M.J.*, Professor (R)  
*Teets, N.*, Assistant Professor (R)  
*Townsend, L.H.*, Extension Professor  
*Villanueva, R.T.*, Assistant Extension Professor  
*Webb, B.A.*, Professor (R)  
*Webster, T.C.*, Adjunct Assistant Professor  
*White, J.A.*, Associate Professor (R)  
*Yeagan, K.V.*, Professor (R)  
*Xuguo, Z.*, Associate Professor (R)

## Family Sciences\*

*Werner-Wilson, R.J.*, Endowed Professor and Chair (R)  
*Brock, G.W.*, Professor Emeritus  
*Culp, III, K.*, Adjunct Associate Professor  
*Flashman, R.*, Extension Professor  
*Haleman, D.*, Lecturer  
*Hans, J.*, Professor  
*Heath, C.J.*, Professor (R)  
*Hosier, A.*, Associate Extension Professor  
*Hunter, J.L.*, Associate Extension Professor  
*Kim, H.*, Associate Professor (R)  
*Parker, T.S.*, Assistant Professor  
*Smith, D.R.*, Associate Professor (R)  
*Vail, A.*, Professor, Director of the School of Human Environmental Sciences and Assistant Director of Family and Consumer Sciences Extension  
*Vazsonyi, A. T.*, Endowed Professor (R)



Werner-Wilson, T.A., Lecturer, Director of the University of Kentucky Family Center  
Wood, N., Associate Professor (R)

### Forestry

Baker, T.T., Chair and Professor  
Arthur, M.A., Professor (R)  
Barton, C., Professor (R)  
Conners, T.E., Associate Extension Professor  
Contreras, M.A., Assistant Professor (R)  
Cox, J.J., Assistant Professor (R)  
Lacki, M.J., Professor (R)  
Lhotka, J.M., Associate Professor (R)  
Price, S.J., Assistant Professor (R)  
Ringe, J.M., Professor  
Springer, M.T., Assistant Professor  
Stringer, J.W., Extension Professor  
Wagner, D.B., Associate Professor  
Yang, J., Assistant Professor (R)

### Horticulture

Houtz, R.L., Professor and Chair (R)  
Antonious, G.F., Adjunct Professor  
Archbold, D.D., Professor (R)  
DeBolt, S., Professor (R)  
Downie, A.B., Associate Professor (R)  
Dunwell, W.C., Extension Professor  
Durham, R.E., Extension Professor  
Fountain, W.M., Extension Professor  
Geneve, R.L., Professor (R)  
Ingram, D.L., Extension Professor  
Jacobsen, K.L., Assistant Professor (R)  
Pomper, K., Adjunct Associate Professor  
Rowell, A.B., Adjunct Professor  
Saha, S.K., Assistant Extension Professor  
Scott, R., Lecturer  
Snyder, J.C., Associate Professor (R)  
Strang, J.G., Extension Professor  
Williams, M.A., Associate Professor (R)  
Wright, S., Extension Specialist

### Kentucky Tobacco Research and Development Center

Chambers, O., Managing Director  
Yuan, L., Research Director  
Gao, M., Scientist I  
Jack, A., Research Specialist  
Ji, H., Scientist II  
Kroumova, A., Research Associate  
Maiti, I., Scientist III  
Mundell, R., Scientist II  
Patra, B., Scientist I  
Pattanaik, S., Scientist II  
Yuan, L., Professor  
Zaitlin, D., Scientist III

### Landscape Architecture

Crankshaw, N.M., Professor and Chair  
Hargrove, R.A., Associate Professor  
Koo, J., Assistant Extension Professor  
Lee, B.D., Associate Professor  
Nieman, T.J., Professor  
Sass, C.K., Assistant Professor  
Segura, A.C., Lecturer

### Plant and Soil Sciences

Pfeiffer, T., Chair and Professor  
Aiken, G., Adjunct Professor  
Bailey, W.A., Extension Professor  
Barrett, M., Professor (R)  
Baskin, C.C., Professor (R)  
Bertsch, P., Professor (R)  
Bush, L.P., Professor Emeritus  
Coyne, M.S., Professor (R)  
D'Angelo, E., Associate Professor (R)  
Davies, H., Professor (R)  
Dinkins, R., Adjunct Associate Professor  
Ditsch, D., Extension Professor  
Egli, D., Professor (R)  
Goff, B., Assistant Professor (R)  
Green, J.D., Extension Professor  
Grove, J., Professor (R)  
Haramoto, E., Assistant Professor (R)  
Hildebrand, D., Professor (R)  
Hunt, A., Professor (R)  
Kagan, I., Adjunct Assistant Professor  
Karathanasis, A.D., Professor (R)  
Knott, C., Assistant Extension Professor  
Lacefield, G., Professor Emeritus  
Lee, C., Extension Professor  
Lee, B., Associate Extension Professor  
Maiti, I., Adjunct Assistant Professor  
Martin, J., Extension Professor  
Matocha, C., Associate Professor (R)  
McCulley, R., Associate Professor (R)  
McGrath, J., Associate Extension Professor  
McNear, D., Associate Professor (R)  
Miller, R., Professor (R)  
Moe, L., Associate Professor (R)  
Munshaw, G., Assistant Extension Professor  
Murdock, L.W., Professor Emeritus  
Pearce, R., Associate Extension Professor  
Perry, S., Associate Professor (R)  
Phillips, T., Associate Professor (R)  
Ren W., Assistant Professor (R)  
Ritchey, E., Assistant Extension Professor  
Sikora, E., Adjunct Associate Professor  
Sistani, K., Adjunct Professor  
Smalle, J., Associate Professor (R)  
Smith, M.S., Professor (R)  
Smith, S.R., Extension Professor  
Tsyusko, O.V., Assistant Research Professor  
Uhrine, J.M., Assistant Professor (R)  
Van Sanford, D.A., Professor (R)  
Wagner, G., Professor Emeritus  
Walker, E., Assistant Extension Professor  
Weintraub, M., Adjunct Assistant Professor  
Wendroth, O., Professor (R)  
Williams, D., Professor (R)  
Yuan, L., Professor  
Zhu, H., Professor (R)  
Zourarakis, D., Adjunct Assistant Professor

### Plant Pathology

Schardl, C.L., Professor and Chair (R)  
Bradley, C.A., Extension Professor  
Farman, M.L., Professor (R)  
Gauthier, N.A., Assistant Extension Professor  
Goodin, M.M., Associate Professor (R)  
Hershman, D.E., Extension Professor  
Kachroo, A.P., Associate Professor (R)  
Kachroo P., Professor (R)  
Nagy, P.D., Professor (R)  
Pfeuffer, E.E., Assistant Extension Professor

Vaillancourt, L.J., Professor (R)  
Vincelli, P., Extension Professor

### Regulatory Services

Johnson, D. D., Executive Director  
Barrow, M.C., Inspector  
Counts, R., Auditor  
Flood, J.S., Inspector  
Green, K.M., Tag Registration Specialist  
Harrison, G.A., Feed/Milk Director  
Hickerson, R.R., Inspector  
Johnston, C.B., Inspector  
Keith, N., Inspector  
Kariuki, Solomon, Laboratory Manager  
Mason, D.W., Inspector  
McMurry, S.W., Fertilizer/Seed Director  
Pinkston, W.W., Inspector  
Prather, T.G., Inspector  
Sikora, F.J., Soil Testing/Lab Director and Associate Professor  
True, J.A., Inspection Coordinator  
Webb, S.F., QA/QC Director  
Young, B., Inspector

### Retailing and Tourism Management\*

Jackson, V., Professor and Chair  
Brown, D., Associate Professor  
Cavendar, R., Assistant Professor  
Easter, E., Professor  
Lee, M., Associate Professor  
Lu, T., Assistant Professor  
Meuret, S., Lecturer  
Pryor, M., Lecturer  
Spillman, K., Associate Professor  
Swanson, J., Assistant Professor  
Wesley, S., Associate Professor

### Robinson Center for Appalachian Resources and Sustainability

Ditsch, D.W., Director

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