



## Fall 2012

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### Dr. Frank Arthur Receives ESA Recognition Award



Dr. Frank Arthur receiving his award from Dr. Fred Baxendale, President of ESA North Central Branch (L) and Dr. Grayson Brown, ESA National President (R).

Dr. Frank Arthur, Research Entomologist in the CGAHR's Stored Product Insect Research Unit (SPIRU), was selected to receive the 'Recognition Award in Entomology' by the Entomological Society of America and sponsored by Syngenta Crop Protection. This national award recognizes Frank for his significant contributions to entomological science and agriculture.

Congratulations, Frank!

### ADM Milling Group Visits CGAHR

A group from ADM Milling spent a day in Manhattan visiting various organizations including CGAHR. ADM Milling is one of the world's leading food processors. Their products include food and feed ingredients, animal feeds, biofuels and other items. The purpose of the visit was to update the group on research activities and recent achievements. The group toured CGAHR and met with scientists in EWERU and GQSRU. Drs. Brad Seabourn and Tom Herald (upper right photo) and Tom Pearson (lower right photo) explain their research to the group.

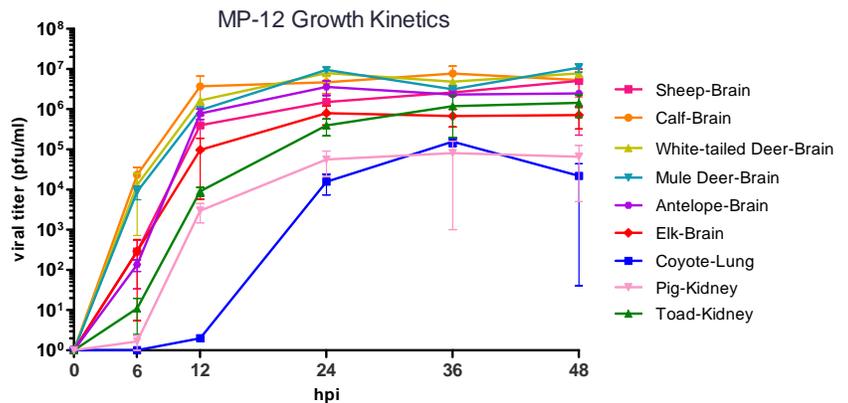


## Research Highlight

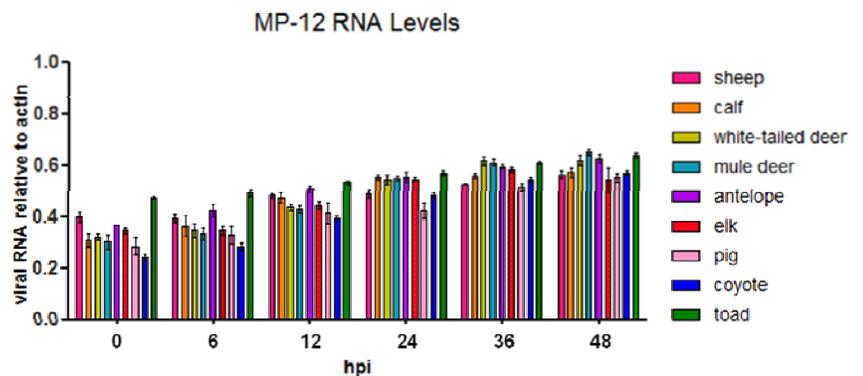
### Comparison of RVF MP-12 replication in domestic livestock and wildlife cell lines of North America

Rift Valley Fever, caused by the Rift Valley Fever virus (RVFV), is a mosquito transmitted disease found in Africa and the Middle East. It causes high mortality among livestock, and is also responsible for mild to fatal disease in humans. RVFV is endemic to Africa, but threatens other countries, including the United States, as a result of possible spread or introduction. Currently, there are no approved vaccines for use in the United States if an outbreak were to occur. Domestic goats, sheep and cattle are susceptible hosts for RVFV and several North American mosquito species have been shown to be capable of spreading the virus. In Africa, RVFV is known to cause infection in indigenous wild ruminants, though it is unknown whether native North American wildlife could act as potential amplifying hosts or reservoirs for this disease if it were introduced.

In this study, a variety of cell lines from animals found throughout the United States were tested for their ability to support replication of a model RVFV strain, MP-12. Cultures derived from brain, lung or kidney tissues of nine domestic livestock and native North American wildlife were evaluated and compared. Virus growth kinetics (Fig. 1) were determined by collecting infected cell cultures at designated time points and performing plaque assays, the standard method to quantify infectious virus titer. In addition, viral genomic levels were assessed by quantitative RT-PCR (Fig. 2). Differences in viral growth kinetics were observed between cell lines; most markedly between ruminant (calf, sheep, deer, elk, antelope) brain and non-ruminant (pig, coyote, toad) lung and kidney cultures (Fig. 1). It is possible that this variance is related to tissue type and not necessarily host specific, and is being addressed by ongoing work. Viral RNA levels generally correlated with the infectious viral growth kinetics, increasing over time and plateauing after 24 hours post infection (hpi); however, consistently higher viral RNA levels observed in the toad cell line did not correlate with higher infectious titers or faster viral growth kinetics (Fig. 2). This demonstrates that the level of viral genome does not always coincide with infectious virus titer. RVFV may infect a wide range of animals, but a high infectious viral titer is necessary to achieve transmissible levels of virus. Results from this study suggest that RVFV may be capable of replicating to high titers not only in North American domestic livestock, but native deer species, antelope, and elk (Fig. 1). Wild ruminants in North America, such as deer, have high risk potential given their abundance, wide distribution, and territories that overlap with livestock farms and human populated areas. This work serves as a model system to direct and support future investigations with wild type RVFV and *in vivo* studies.



**Fig. 1. Growth kinetics of RVFV MP-12 in various cell lines.** Infectious viral titers were determined by plaque assay on Vero cells and are graphed as log increase from initial time of infection.



**Fig. 2. MP-12 viral RNA levels.** Specific primers and probe directed toward the MP-12 genome were used to detect viral RNA levels at the indicated hours post infection (hpi). Beta-actin was used as a reference to calculate relative amounts of viral genome.

For more information contact: Drs. Natasha Gaudreault (785) 537-5563, [Natasha.Gaudreault@ars.usda.gov](mailto:Natasha.Gaudreault@ars.usda.gov) ; and William Wilson (785) 537-5570, [William.Wilson@ars.usda.gov](mailto:William.Wilson@ars.usda.gov).

## Meetings/Conferences

**Barbara Drolet, William Wilson, and Natasha Gaudreault** attended the 31<sup>st</sup> Annual Meeting of the American Society for Virology, 21-25 Jul. and gave the following presentations: "Development and Evaluation of One-Step rRT-PCR and Immunohistochemical Methods for Detection of Rift Valley Fever Virus in Biosafety Level 2 Diagnostic Laboratories" (Drolet); "Evaluation of Lamb and Calf Responses to Rift Valley Fever MP-12 Vaccination" (Wilson); and "Comparison of RVF MP-12 Replication in Domestic Livestock and North American Wildlife Cell Lines" (Gaudreault).

**William Wilson** traveled to Milan, Italy, from 19-26 Aug. to participate in a conference on "Early Actions to Reduce Climate Sensitive Disease Risks."

**Lee Cohnstaedt** participated in the 24<sup>th</sup> International Congress of Entomology in Daegu, South Korea, 19-25 Aug. He moderated the session Medical Entomology: Surveillance & Ecology and a presented "Entomological surveillance on a continental scale: A new application of social networking."

**Mark Ruder** traveled to Rehovot, Israel, 9-15 Sep. to present research and meet with prospective collaborators. His presentations "Pathobiology and epidemiology of orbiviral hemorrhagic disease in North America" and "Evaluation of the susceptibility of potential North American ruminant and vector hosts to epizootic hemorrhagic disease virus serotype 7", were given at the Kimron Veterinary Institute and the Koret School of Veterinary Medicine (Hebrew University of Jerusalem).

**Scott McVey, Barbara Drolet, and William Wilson**, traveled to Ames, IA, to participate in a workshop on Vaccines and Diagnostics for Transboundary Animal Diseases, 17-19 Sep.

**Lee Cohnstaedt** traveled to St. Augustine, FL, to present at the Society for Vector Ecology meeting 23-27 Sep., and meet with collaborators.

**Lee Cohnstaedt** traveled to French Polynesia, 3-15 Oct. to present on the control of biting midges at a planning workshop organized by the Institut Louis Malardé.

**Barbara Drolet** completed a series of six training sessions with the Leadership Kansas program, a diverse statewide program emphasizing leadership skills and development. The final session was held in Topeka, KS, 24-26 Oct.

## Visitors

Dr. Lisa Durso, Agroecosystem Management Research Unit in Lincoln, NE, and her technician visited ABADRU and SPIRU (see photo in SPIRU section) in Aug. Dr. Durso presented a seminar entitled "*Microbial community analysis of cattle and their environment.*"

Melinda Hadi from Vestergaard-Frandsen visited ABADRU and SPIRU (see photo in SPIRU section) to discuss future projects, learn *Culicoides* rearing techniques, and get an update on the insecticide treated materials testing on *Culicoides*. Melinda presented a review of the Vestergaard projects and discussed her facilities in Ghana for raising mosquitoes. She also introduced IR Mapper, a program by Vestergaard to map insecticide resistance reports.

A group of animal infectious disease experts from China Huazhong Agricultural University visited Manhattan from 22-24 Jul. The visitors included Drs. Huanchun Chen, Meilin Jin, Aizhen Guo, Rui Zhou, Shengbo Cao, and Junni Tan.



## Meeting/Conferences

**Tom Pearson** and **Dan Brabec**, traveled to Brookings, SD, to discuss and do wheat sorting research at South Dakota State University, 31 Jul. – 2 Aug.

**Larry Wagner**, **John Tatarko**, and technicians and students assigned to the Soil Resources and Air Quality in-house project traveled to Yakima, WA, 3-17 Aug. The group collected field data at the U.S. Military Training Center as part of a \$2.8 million grant from the Strategic Environmental Research and Development Program to assess fugitive dust emissions from Department of Defense activities.

**Tom Pearson** traveled to St. Louis, MO, 17-20 Sept., to do sorting research with the Monsanto Company.

**John Tatarko** participated in the 16<sup>th</sup> annual Kansas State University Agronomy Kids Field Day, 6 and 13 Sept. The event brought more than 560 4<sup>th</sup> grade students from area schools where they learned about various components of agriculture and the science behind the food they eat. John discussed the problem of wind erosion, its extent, and control using photographs and maps on a poster display followed by a demonstration of wind erosion processes and control principles using the EWERU portable wind tunnel. A video about this event is available at: <http://www.youtube.com/watch?v=yMWzDc-Lrac> The wind tunnel can be seen beginning at about the 2:20 mark.

## Visitors

Dr. Yaqin Ji (photo at right) from the College of Environmental Science and Engineering, Nankai University, China, visited EWERU 24 Sept. – 20 Oct. Dr. Ji worked with Jiaqiong Zhang on her blowing residue study, received training on WEPS, and visited with the wind erosion scientists about writing a book on wind erosion.

Joel Poore from USDA Natural Resources Conservation Service visited EWERU 24-28 Sept. to receive training on WEPS.



## Research Highlight

### Nitrogen fertilization and cropping system effects on sorghum grain characteristics

Sorghum ranks 5<sup>th</sup> worldwide for production and area among all cereal grains. Sorghum is tolerant to heat and drought conditions, and is commonly grown under non-irrigated conditions in semi-arid parts of the United States such as Kansas, Oklahoma, and Texas. The practice of no-till farming (Fig. 1) has become an increasingly popular cropping system due to increased water and soil conservation. Producers are estimated to be utilizing no-till farming on nearly 35% of the more than 5.2 million sorghum acres planted. Cover cropping has recently been added to the no-till system, although cover crops do not produce a marketable product for the producer, they provide many benefits such as; increasing organic matter content, providing residue cover, preventing or reducing soil erosion, cycling nutrients, reducing nitrate leaching, suppressing weeds, and adding diversity to crop sequences.



Fig. 1. Sorghum no-till planted into a field without a cover crop.

## Research Highlight cont.

Working with colleagues at Kansas State University, this study investigated different levels of nitrogen on a no-tilled soil with differing preceding cover crops (Sunn hemp and soybean) grown on specific plots (Fig. 2). The nitrogen fertilization and cover cropping systems appeared to enhance the soil by increasing both total soil nitrogen and soil organic carbon. Results also indicate cover crop systems provided an increase in the agronomic effect as well as overall sustainability of the production system without causing negative effects on end product quality. The treatments also increased the amount of protein in the grain from 8.2% protein with no cover crop to 9.2% protein with a soybean cover crop without reducing digestibility, thus allowing for greater digestible protein yield. The physical characteristics, e.g. hardness and size, were also greatly influenced by the cover crop and fertilization treatments. Since, cover cropping appears to provide both agronomic and end product quality benefits, increased utilization of this cropping system could be useful as another tool for the producer interested in sustainable agriculture.

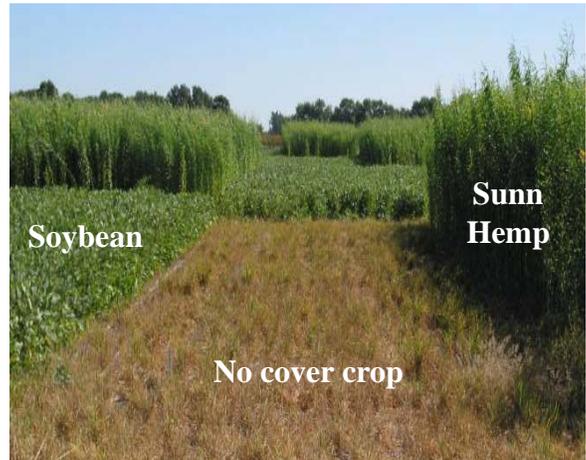


Fig. 2. Cover crop plots in late summer following wheat harvest.

For more information, contact: Dr. Jeff Wilson (785) 776-2763, [Jeff.D.Wilson@ars.usda.gov](mailto:Jeff.D.Wilson@ars.usda.gov)

## Meeting/Conferences

**Tom Herald** was interviewed on Celiac Radio on 7 Aug.

**Scott Bean, Deidre Blackwell, Prini Gadgil, Tom Herald, Rhett Kaufman** and **Jeff Wilson** attended the Great Plains Sorghum Conference/Sorghum Research and Utilization Conference held at Kansas State University 28-30 Aug.

**Mike Tilley** attended the Tortilla Industry Association Convention & Exposition in Las Vegas, NV, 10-11 Sep.

**Mike Tilley, Margo Caley** and **Richard Chen** attended the annual AACCC International meeting in Hollywood, FL, 30 Sep. – 3 Oct.

## Grants

**Jeff Wilson** was awarded an ARS-funded post-doctoral award to investigate the “Impact of plant-soil interactions on sorghum grain quality.”

## Visitors

Kerui Zhu, Ye Wang, and Yong Wang from COFCO Beijing, China, toured and discussed wheat evaluation methods with members of the unit on 6 Jul. A representative from U.S. Wheat Associates, four members of the Columbian Trade Team and Kansas Wheat Commission Team toured and discussed wheat quality with members of the Unit on 9 Jul. Richard Chen presented Crop Quality Survey Data. Kevin Clarke, Food Corp Milling, South Africa discussed grain quality, evaluation and toured the Unit on 16 July. Dr. Guorong Zhang, Kansas State University Wheat Breeder in Hays, KS, toured the facility and discuss potential research collaborations. Ms. Nkhensani Tshabalala and Mr. Gerhard Haitembu USDA Cochrane Fellows from South Africa visited and toured the Unit on 1 Oct. Kenji Nakamura, Takaya Marume, Yasuyuki Nishitsuzi and Noritaka Tusge of Nisshin Flour Milling Group, Japan, visited and toured the Unit on 4 Oct. Ivan Baxter from the ARS Plant Genetics Research Unit, Columbia MO, visited and toured on 4 Oct. Don Sullins, Dave Green, Nick Weigel, Brook Carson, and Erin VanCamp from ADM Milling visited and toured on 15 Oct. Trikoesoemaningtyas and Desta Wirnas from Bogor University in Indonesia visited and toured on 18 Oct.



## Research Highlight

### Wheat Breeding Taps Next Generation Sequencing

With year-end funding support from the USDA-ARS Northern Plains Area Office in Ft. Collins, CO, Dr. Guihua Bai's USDA-ARS Genotyping Lab in Manhattan, KS recently purchased a next generation bench top sequencer for discovery and implementation of high throughput markers in wheat breeding and genomics research. Next-gen sequencers have enormous capacity and were designed to be able to sequence the entire human genome in about a day for \$1,000. There are several different Next-gen sequencing systems available, but this particular system uses a special chip for high-throughput sequencing. The chip is based on semiconductor technology similar to that found in digital cameras, but instead of capturing light, the chip "sees" chemistry as it happens in real time. Digital data are translated directly into DNA sequence data. In a 4 hour run, the sequencer can provide up to 80 million sequence reads at up to 200 bases per read.



Ion Proton Sequencer

The wheat genome is about five times the size of the human genome and has the largest genome size among crop species. Unlike most other important crop species, the complete assembled wheat genome sequence is not yet available, thus limited DNA markers are currently available for wheat breeding. Next-gen sequencing technology provides a new opportunity for marker discovery. Using a new technique called genotyping-by-sequencing, we can simultaneously discover tens of thousands of markers and analyze them in a breeding population in one step. Dr. Bai's lab will use the sequencer to perform genotyping-by-sequencing for mapping wheat genes and for genotyping breeding lines for wheat breeding programs. The data production rate will be many orders of magnitude faster than the previous generation technologies. With all this new speed, it seems like wheat breeding is engaging the warp drive engines!

For more information, contact Dr. Robert Bowden (785) 532-2368, [Robert.Bowden@ars.usda.gov](mailto:Robert.Bowden@ars.usda.gov)

## Meeting/Conferences

**Guihua Bai** travelled to China and presented research on wheat genetics, fusarium head blight qtl mapping and genomics work being conducted in the HWWGRU; attended the 4<sup>th</sup> International symposium on fusarium head blight in Nanjing,; and the 13<sup>th</sup> International cereal rust and powdery mildew conference in Beijing from 16 Aug. – 2 Sep.

**Guihua Bai** was invited to give a seminar titled "Wheat genetic improvement, from DNA marker to gene, QTL and traits," Brookings, SD, 30 Sep.– 2 Oct.

**Guihua Bai** attended the annual Tri-Society meetings in Cincinnati, OH, 20-25 Oct., and was awarded the 2012 Tengtou Agricultural Science Award by American Society of Agronomy.

**Robert Bowden** attended the annual 2012 American Phytopathological Society Meeting, Providence, RI, 1- Aug.

**John Fellers** and **Jesse Poland** also attended the annual Tri-Society meetings in Cincinnati, OH, 20-25 Oct.

**Jaime Mitchell** attended the annual Northern Plains Area Council of Office Professionals meeting in Fort Collins, CO, 15-19 Oct.

## Grants

**Jesse Poland** was awarded an ARS-funded post-doctoral award to investigate the "Genomic selection for increased yield in winter wheat."

## Visitors

Jared Bell from Washington State University visited 6-10 Aug. Jared came to learn genotyping-by-sequencing techniques. Jingping Su from Tianjing Academy of Agricultural Sciences, China, visited the Genotyping Lab 19-20 Sep., to learn high-throughput marker analysis. Dr. Faouzi Bekkaoui from the Wheat Improvement Flagship Program, Canada, visited Jesse Poland's lab to see wheat research activities.

## Research Highlight

### Phytosanitary measures to overcome biological barriers to trade

Dr. Guy Hallman (right) was moved to SPIRU in June 2012 from the ARS lab in Weslaco, TX, where he was working on phytosanitary issues. He is completing that previous work as he transitions to working on stored-product entomology. Two major components of this continuing effort are development of generic phytosanitary treatments using ionizing irradiation and development of proactive phytosanitary treatments against invasive tephritid fruit flies. The first is part of a 5-year, 12-nation cooperative effort sponsored by the U.N. Food and Agriculture Organization and the International Atomic Energy Agency (FAO/IAEA). The U.S. is a major user of phytosanitary irradiation technology (see Fig. 1). The second major effort emerged from a routine visit to FAO/IAEA laboratories in Seibersdorf, Austria, where tephritid colonies are maintained for sterile insect technique work. For some time, the USDA had been trying to organize phytosanitary research with a new highly invasive tephritid, *Bactrocera invadens*, in Africa, and Dr. Hallman found that there was a lab colony of the pest at Seibersdorf. Arrangements were made to work with it and other species of tephritids (Fig. 2) there, so now critical phytosanitary research is being done in Seibersdorf with tephritids that threaten U.S. horticulture and international trade. Exotic tephritids are frequently trapped in the U.S., and proactive phytosanitary measures can prevent them from inhibiting exports.



Fig. 1. Irradiated mangoes from Mexico entering the U.S. These mangoes are better tasting than hot water treated ones and avoid problems with contamination, such as *Salmonella* which recently caused numerous sicknesses in the U.S. Photo credit Guy Hallman, ARS.



Fig. 2. Inset shows Asian fruit fly *Bactrocera invadens*. Photo credit: nda.agric.za. Background photo shows Mediterranean fruit fly. Photo credit Scott Bauer, ARS.

For more information, contact: Dr. Guy Hallman (785) 776-2705, [Guy.Hallman@ars.usda.gov](mailto:Guy.Hallman@ars.usda.gov)

## Meeting/Conferences

**Jim Throne** and **Jim Campbell** attended the XXIV International Congress of Entomology in Daegu, South Korea, 15-26 Aug. Dr. Throne presented the invited talk "Recent Advances in Stored-Product Psocid Research in North America" and organized the Stored-Product Entomology symposium. Dr. Campbell presented the invited talk "Evaluating Fumigation Efficacy in Rice Mills."

**Frank Arthur** attended the meeting of the Food Protection Committee of the International Association of Operative Millers held in Nisswa, MN, 4-6 Sep. to share new ARS research results and to learn about industry research needs.

**Brenda Oppert** attended the International Symposium on Proteinases, Inhibitors and Biological Control in Portorov, Slovenia, 20-28 Sep. She presented the invited paper "Peptidase Gene Expression in Tenebrionids."

**Jim Campbell** attended the National Food Safety Meeting hosted by Nestle Purina PetCare in Denver, CO, 24-27 Sep. He presented the invited talk "Understanding pheromones and strategies for using pheromones in pest management programs."

**Jim Campbell** attended the Pest Management and Food Safety Seminar in Teaneck, NJ, 3-5 Oct. He presented the invited talk "Use of pheromones in stored product insect pest management programs."

**Guy Hallman** attended the Research Coordination Meeting for the Cooperative Research Project on Generic Phytosanitary Irradiation Treatments in Buenos Aires, Argentina, 13-20 Oct. He presented "Advances in phytosanitary irradiation research and technology transfer in the US."



## Grants

**Frank Arthur** will be receiving \$16,650 from Central Sciences International as part of a Trust Agreement to evaluate the grain protectant methoprene (Diacon II®) for residual efficacy on different grains (wheat, rough rice, brown rice, and corn).



## Visitors

**Dr. Lisa Durso** (photo #1 with Jim Throne) of the USDA-ARS Agroecosystem Management Research Unit in Lincoln, NE, visited CGHAR for two weeks at the end of July to work on SPIRU's ION Torrent Sequencer to complete some 16S amplicon sequencing and whole community metagenomic sequencing. Dr. Durso worked with Dr. Brenda Oppert of SPIRU and Drs. Bill Wilson and Natasha Gaudreault of ABADRU.



**Ms. Melinda Hadi** (photo #2 with Jim Throne) from Vestergaard Frandsen in Ghana visited with scientists in SPIRU on 27 July. The company is headquartered in Switzerland, and they specialize in the manufacture and marketing of disease control textiles. These products are being used in various parts of Africa for mosquito control, and the company is interested in adapting these textiles to control insects in stored bulk grains and in food products.



**Dave Mueller**, President of Insects Limited in Westfield, IN, and **Ethan Estabrook**, (photo #3 with Jim Throne) also with Insects Limited, visited with SPIRU scientists on 7 Aug. to learn about recent research in the unit.



Two stored-product entomologists from Greece, **Dr. Christos Athanassiou**, from the University of Thessaly in Volos, and **Dr. Nickolas Kavallieratos**, (photo #4) from the Benaki Phytopathological Institute in Athens – this is similar to a USDA lab and the only one in Greece, visited SPIRU 10-30 Sep. Both have visited SPIRU several times in the past and are familiar faces. They conducted research in Jim Throne's and Frank Arthur's labs during their visit.



# Center News

## Personnel News

### Arrivals:

**Sherry Adrianos** joined GQSRU as a Bio Science Lab Technician.

**Ryne Hensley** joined Location Support as a Clerk.

### Departures:

**Erin Mark** and **Jose Leal**, Biological Science Technicians in GQSRU.

**Ryne Hensley**, Clerk, Location Support Staff.

**Ryan Cloyd**, Bio Science Aide in HWWGRU.

**Elizabeth Elmore**, Bio Science Lab Technician, HWWGRU

**Nathan Goetzinger**, Bio Science Aide, EWERU



### Feds Feed Families Food Drive:

CGAHR employees collected more than 12,000 lbs of food for the local Flint Hills Breadbasket food bank as part of the annual Feds Feed Families Food Drive. Included in this was 9600 lbs of pre-packaged meals from the charity Planting Hope International, via Kids Against Hunger programs in Lincoln and Omaha, NE, and Cherokee, OK, and Numana in El Dorado, KS. These meals were left from much larger shipments that CGAHR employees helped pack and send to a refugee camp serving the Horn of Africa, and to an orphanage in Zimbabwe this past year. This is the fourth year that CGAHR employees have been collecting food through the Feds Feed Families program and donating it to the Flint Hills Breadbasket. The Flint Hills Breadbasket serves Riley County, Kansas and provided food for more than 16,000 families in 2011. The photos at right show part of the food collected including the pre-packaged meals under the tarp on the trailer.



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