



Summer 2012, Issue 2

Summer Internship Program Enters Midway Point

Recently, the undergraduate students selected for the Dixon Springs Summer Internship program, sponsored by ACES Office of Research, gathered to report on their progress to faculty, extension coordinators, and stakeholders. For the first time this summer, research is being conducted at two facilities, the Dixon Springs Agricultural Center (DSAC) and the Orr Agricultural Research and Demonstration Center. After 6 weeks, just over half-way through the 11 week program, the students already had learned valuable lessons in flexibility and perseverance, where some of the research plans had to be adapted due to dry weather, time constraints, or other unexpected obstacles. The day began with Dr. Elvira de Mejia, Assistant Dean for Research, welcoming those present and thanking the advisors, mentors, and stakeholders, whose investment helps make the program a success. She talked about how the short-term goals of the program are to help the students gain experience and make scientific discoveries, whereas the long-term goal is to improve the economy of Illinois. The summer interns are studying a variety of topics this summer, including bioenergy, cattle management practices, local economic development, specialty crops, ecological conservation, and water quality.

Summer Internship Program Newsletter

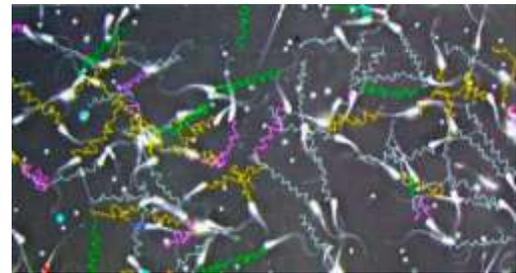


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Improving Biodiversity and Analysis of Bioenergy Crops



Summer intern Dylan Walker taking measurements of *Miscanthus* in field plots grown at Dixon Springs Agricultural Center.

The growing need for renewable energy has led University of Illinois researchers to study the perennial Asian grass *Miscanthus* as a supplier for energy production. A current limitation of *Miscanthus* is a lack of biodiversity, where only a few varieties are being studied for bioenergy applications. In order to improve biodiversity and determine the ideal genotype, **Dylan Walker** is studying in depth three varieties of *Miscanthus* grown at Dixon Springs: *M. sinensis*, *M. x giganteus*, and *M. sacchariflorus*. Using Bluetooth technology that can deliver measurements like stem diameter and plant height directly to a tablet in the field, Dylan has taken data monitoring these traits and others that might attribute to improved biomass. Due to time constraints, Dylan had to decrease the amount of varieties he was planning to analyze. In order to address this limitation, Dylan is also developing methods utilizing standard imaging techniques and analysis software in hopes of improving the accuracy and efficiency of data collection. He plans to compare his digital analysis to measurements taken in the field and ultimately correlate his results to overall yield that will be determined when the *Miscanthus* is harvested this winter.

Water Quality at Orr Research Center

Rachel stands in water as she prepares to take conductivity measurements.



The Gulf of Mexico contains a hypoxic zone, an area of low oxygen content that makes survival of aquatic wildlife difficult, that is likely the consequence of agricultural nutrient runoff from the Mississippi River Basin. This downstream outcome highlights the importance of understanding how our practices can influence the quality of water and the health of the wildlife that depends on it. This summer **Rachel Welch** is monitoring the impact, if any, the Orr Research Center has on local water quality. She is quantifying indicators of water quality, such as nitrogen and phosphorus content, by sampling several locations throughout the center, including a pond and lake on the property, a stream that runs through the center, and runoff from tiling in both pasture and cropland. Rachel is also studying the accuracy of a water quality gauge recently installed by US Geological Survey on the Illinois River near Florence, IL, as well as determining the influence a creek just north of the gauge has on registered water quality readings. She hopes her studies will be the first steps to improving the awareness and knowledge of water quality issues.



Insecticides and Cattle Fertility



Ear tag application to bull at Dixon Springs.

The cattle industry controls pests, such as flies, by treating with insecticides that can be applied either directly by pour-on treatments or with ear tags. Over the last several years, pyrethroid insecticides have grown in popularity and are used in a variety of household and livestock applications. These insecticides were thought to be relatively safe until a recent conference report suggested that pyrethroids could have detrimental effects on beef cattle reproduction. Accordingly, two summer interns are investigating the effects of pyrethroids on the fertility of bulls and the conception rates of beef cows.

Bull Fertility

To study pyrethroid effects on bulls at Dixon Springs, **Tim DelValle** is evaluating on a weekly basis semen quality and dihydrotestosterone levels in bulls left untreated, treated with the pour-on product CyLence®, the ear tag product CyLence-Ultra®, or both products combined at standard label dosages. Since the instructions suggest the same dose for any bull over 800 lbs and large bulls can weigh as much as 2,700 lbs, Tim also divided the bulls into weight classes to investigate the effect of the relatively higher dose given to smaller bulls. The semen quality was determined by a relatively new method to the beef cattle industry called Computer Assisted Semen Analysis (CASA), which can determine overall motility and progressive (single direction) motility in an objective and unbiased manner. So far, no difference in semen quality between the treatment groups has been observed.



Tim centrifuges samples and collects fluid for analysis.

Cow Conception Rates

Ashley Kloth is conducting a similar study at the Orr Agricultural Center in Perry, IL. However, her study focuses on the conception rate of female cows. Utilizing similar insecticide treatment groups, cows were monitored for reproductive health with ultrasound prior to hormone synchronization and artificial insemination. Afterwards the cows were monitored for progesterone levels and checked for successful pregnancy at day 35 and 60. The two combined will help Ashley not only determine the rate of successful pregnancies, but also the ability of cows to maintain pregnancy when treated with insecticides.



Ashley finishes collecting a blood sample to be analyzed for progesterone levels.

Significance

The results of these studies are important to cattle farmers, like Todd Slykhuis who is a stakeholder on the project. DSAC mentor Frank Ireland talked about how reproductive issues have only been observed in cattle exposed to doses much higher than the recommended levels. Despite this many have suggested changes in fly treatment strategies without any direct evidence for problems with treatment at normal dosages. These studies will help clear up the controversy in the area.

Cattle Nutrition

Two studies this summer are investigating methods of improving feed efficiency in cattle in order to reduce costs with improved outcomes for grazing cattle, as well as pregnant cows and their offspring.



Eileen collecting blood samples



The GrowSafe System

Co-product Supplementation

Co-product feeds, such as Distiller's Grains with Solubles (DDGS) and soybean hulls, are cost effective nutritional supplements for cattle that are by-products of ethanol and soybean oil production, respectively. Dixon Springs is conducting an 8 year study on the effect of co-product supplements on fetal development and performance. Last summer the project was initiated by summer intern **Ashley Kloth**, who fed pregnant cows various levels of supplements during their third trimester. This summer **Eileen Sul** will be continuing the project by studying the progeny of last summer's treatment groups. The progeny will be monitored for desirable characteristics, such as average daily weight gain and time to puberty. Additionally, Dixon Springs just received a GrowSafe system, one of 25 in the world that allows continuous tracking of food intake. Each animal has a unique ear tag transmitter that is detected by a sensor in the feed bunk. Once activated, the system measures and records by scale the total weight consumed during each feeding. This technology allows very accurate determination of feed efficiency, or the amount of food eaten per amount of weight gained. Eileen hopes to correlate feed efficiency to the amount of supplement intake, as well as identify important genetic factors involved.

Forage Optimization

Tall fescue is a popular forage for grazing cattle in Illinois and across the United States. However, the majority of fescue is infected with an endophytic (internal) fungus. Although the fungus provides benefits to the plant, such as drought and pest resistance, the cattle grazing on it develop fescue toxicosis, which due to poor thermal regulation leads to a significant loss in daily weight gain and consequently can have a large economic impact on beef producers. Utilizing rotational grazing to maximize forage quality, **Madeline Milnamow** is comparing two forages this summer: the commonly used toxic endophyte infected fescue and a novel endophyte infected fescue that contains a nontoxic form of the fungus. She will also determine the compensatory benefit of switching cattle suffering from fescue toxicity to the novel, nontoxic fescue. Throughout the study, she plans to monitor the cattle for indicators of fescue toxicosis, such as average daily weight gain, respiration rates, prolactin levels, and grazing behavior. Although insufficient rain caused her to eliminate one of the forages she was originally planning to study, she has observed, as expected, that cattle grazing on novel endophyte infected fescue gain weight faster than those eating the toxic form of the plant.



Madeline runs the tractor in the pastureland at Dixon Springs.



Ecological Impact of Invasive Plants



Japanese stiltgrass (*Microstegium vimineum*) is an invasive plant species first introduced in Tennessee in the early 1900s. Due to its ability to adapt to disparate environments, Japanese stiltgrass is located across the eastern United States and now covers areas of both Dixon Springs State Park and Shawnee National Forest. The invasion in these areas has not been managed and little is known about the ecological impact. Two interns this summer are addressing this knowledge gap by studying how the presence of Japanese stiltgrass affects songbird populations and prescribed forest burns.

Songbird Populations

Passerines, perching birds, include more than half of bird species, most of which are songbirds. Their reliance on ground cover for building nests and finding food suggests that changes in their behaviors might be a good indicator for ecological stress. Therefore, **Scott Cinel** is investigating the reproductive success of songbirds in areas with and without stiltgrass invasion, where 20% or more coverage is classified as an invaded zone. In order to find nests, Scott must first listen to and identify bird calls, which helps to narrow his search to their preferred nest location either near the forest floor or high in trees. Once Scott identifies a nest, he maps it by GPS and returns every 3 days to determine survival, predation, and parasitism rates. So far, he has found 22 of his desired 40 nests. However, extreme heat and dry weather can decrease bird breeding, which might make identifying additional nests difficult.



Right: Scott identifies and analyzes a Northern Cardinal nest.

Left: Sean collects the litter and duff layers to score fire potential.



Scott and Sean prepare to measure Japanese stiltgrass invasion.



Prescribed Forest Burns

Controlled forest fire burns are an important method of limiting fuel load, while improving tree health. The Shawnee National Forest plans to prescribe forest burns for the 2012-2013 season; however, the effect of Japanese stiltgrass invasion on fire characteristics is unknown. Summer intern **Sean Hill** has identified potential areas for prescribed burns, with the help of fire specialist Scott Crist, and defined 20 pairs of plots to compare invaded versus nearby non-invaded areas. After establishing the center point, the plot is divided using three transects, each 17 meters long in order to thoroughly score the fire potential for each area. Sean also collects and determines the dry weight of the litter layer, top layer with intact organic matter, and the duff layer, decomposed layer beneath, from various locations within the plot. Ultimately, these results will inform the forest rangers of the necessary precautions to take before burning areas containing high stiltgrass invasion.

Illinois Farm to School Program



Amanda visits a local specialty crop producer Flamm Orchard for her project.

The Farm to School Program seeks to provide nutritious meals to students while boosting the local economy. In 2009, Illinois state legislators mandated that 10 percent of food purchased by schools should come from Illinois farms by 2020. This summer **Amanda Rosendale** is investigating ways to improve the Farm to School program in the southern 16 counties of Illinois. These counties are known to struggle economically and have yet to establish any farm to school programs. Amanda will be conducting surveys through Zip Surveys™ to 58 school district superintendents and in person or by phone to 35 specialty crop producers in the area. Amanda identified farms using Market Maker, a website developed by the University of Illinois in order to connect consumers to local farmers. She hopes to identify methods to reduce barriers between schools and local farms in order to bridge the gap and hopefully boost the local economy. So far, Amanda has met with local superintendents that were excited about her project and interested to find ways to incorporate local foods into their menus.

Nutrient Density in Fruits



Raspberries

Mike Fornaris is studying eight raspberry cultivars (*Polka, Autumn, Joan-Irene, Caroline, Polana, Joan-J, Josephine, and Nantahala*) that are grown in either open-fields or high tunnels, which are unheated greenhouses that can extend the growing season. Mike will be measuring size, yield, pH, acidity, degrees brix (sugar content), antioxidant capacity, and phenolic content in the laboratory space at Dixon Springs. Antioxidant capacity indicates the ability to neutralize harmful free radicals that are associated with cancer and other diseases, whereas phenolic content relates to qualities important in consumption, such as taste and mouth feel. The hope is to identify alternative raspberry varieties with higher nutrient content that would be beneficial to consumers and give a competitive advantage to the farmers that grow them.

Fruits and vegetables are known to have high nutrient density, or the number of vitamins, minerals and other beneficial nutrients per total associated calories. Dixon Springs grows a variety of these nutrient rich foods on site in order to study methods to extend the Illinois growing season, handle pests, and improve genetic characteristics. Two interns this summer are studying in depth the nutrients present in several varieties, called cultivars, of raspberries and strawberries. They will compare nutrient density and productivity between cultivars, as well as the effect of the growing environment on the level of nutrients present.



Mike places raspberry pulp into vials in preparation for analysis.

Strawberries

Sui (Vivian) Lau is using the same tests on five varieties of strawberries grown in open-fields or in vertical stacks hydroponically, including *Chandler*, *Camarosa*, *Sweet Charlie*, *Radiance*, and *Monterey*. Vertical stacking provides the advantage of allowing more plants to grow in a smaller area. In addition to comparing the nutrient density between varieties, Vivian is comparing the effect of different hydroponic food sources, including Perlite, Perlite and coconut coir, and the standard Perlite and Vermiculite. Vivian plans to determine the impact of environment, cultivar selection, and growth media on plant characteristics, such as nutritional content and yield.



Vivian measures the titratable acidity of strawberries.



Outreach

In their spare time, Mike and Vivian have been participating in nutrition-related extension activities. Specifically, they have been involved with educating local consumers, some with limited budgets, on healthy food choices through the Supplemental Nutrition Assistance Program-Education (SNAP-Ed) classes given in nearby Jackson County. For a recent lesson on the benefits of whole grains, they provided muffins to those attending. Hopefully, by the end of the summer Mike and Vivian will be able to tell local consumers about the best varieties of raspberries and strawberries.

Companion Animal Initiative



The recent economic hardships have left many companion animals homeless as owners were unable to afford their care. The need to abandon pets was even more apparent in areas that already struggle economically like Southern Illinois, where nearby Pope County is the poorest county in the state. Due to their love of animals, **Eileen Sul** (right) and **Madeline Milnamow** (left) took it upon themselves to start a Companion Animal Initiative in Southern Illinois. In addition to volunteering their time at a local animal shelter, they have met with local veterinarians and identified the needs for these abandoned animals, such as spay/neuter services, microchipping, and transportation to sites where they might be adopted. Now Eileen and Madeline are hoping to find ways to address these needs by organizing a spay-neuter day and getting others involved.



Contributors

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Thank You!

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