

Down To Earth: Reports from the Field

Innovative Small Farmers' Outreach Program (ISFOP)



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Feral Swine: Are They on Your Land?

By Stephen "Randy" Garrett and David Middleton,
Farm Outreach Workers



Feral swine on farmer's field.

If you notice patches of trampled and uprooted plants in your fields, you might have feral swine on your land. Finding wallowed-in grain fields, pastures, woodlots and damaged plant roots would also be signs of the presence of feral swine (or wild pigs). These initial problems can lead to worse situations in that holes and ruts caused by feral swine can damage farm equipment and endanger the safety of operators. Feral swine also pose a potential hazard to cattle.

Landowners might not realize that wild pigs have been on their property until they see a pig or notice widespread damage. The earlier the presence of wild pigs is detected and the control measures are initiated, the easier it is to

handle the problem. There are some obvious signs that wild pigs are on your property. These pigs root around in pursuit of various foods, such as roots, acorns and earthworms. When doing so, they plow the soil to depths of 2 to 8 inches. If several pigs are involved, these rooted areas can stretch over many acres. If you see a spot that looks like it has been tilled, it is likely that feral swine were the cause. Other signs of hog damage include muddy pits called "wallows" or rubbings found low on trees (Missouri Department of Conservation 2016).

Wild pigs are omnivores (eating plants and meat), and they



Crop field tilled by feral swine.

eat what they can find. They consume mostly plant matter and invertebrate (without a spine) animals, such as worms, insects and insect larvae (early stage of an insect). Wild pigs will eat small mammals and the young of larger mammals. They also eat young ground-nesting birds and reptiles as well as bird and reptile eggs. In addition, they are attracted to livestock feed. Many farmers have spotted feral swine eating feed out of creep feeders.

Besides damage to livestock, agricultural fields, forests and the environment, wild pigs threaten native wildlife. They spread diseases such as leptospirosis, swine brucellosis, tuberculosis and pseudorabies to livestock (Davis 2016).

(continued on page 2)

Inside This Issue:

Feral Swine: Are They on Your Land? 1 - 2

Quinoa: An Alternate Cash Crop for Marginal Farmers
in the Midwestern States 3 - 5

Which Watershed is Mine? And Why Should I Care?..... 4 - 5

Preventing Damping-Off Diseases: Tips for a Good Start..... 6 - 7

Farewell from Shon Bishop 7

Feral Swine (continued from page 1)

Wild pigs compete for food and space with native wildlife species. This is especially true of game animals, such as deer and turkey. In the southeastern U.S., competition for food between wild pigs and native game species is highest during the late summer and fall. At these times, persimmons and acorns become available. The wild pigs rub on trees, destroying their bark. Rooting by feral swine damages plant roots (Mississippi State University Extension 2015).

Wild pigs come in a variety of colors and sizes. The most common color is black or dark brown, but wild pigs can be nearly any color or combination of colors (Mississippi State University Extension 2015).

Some feral swine can sexually mature at six months of age. Their litter size is three to eight piglets. Feral swine give birth twice each year. Wild pigs reproduce rapidly, giving them a high reproductive potential. The rate is so high that more than 70 percent of feral swine population must be removed annually to be effective in lowering numbers.

Feral swine can live almost anywhere. This is because they are highly adaptable and can endure diverse climates. Alan Leary leads the Missouri Department of Conservation's (MDC) feral swine eradication efforts. He believes strongly that hunting is an effective tool for managing wildlife populations. However, feral swine are not wildlife. Therefore, MDC does not manage them. The MDC's goal is to eradicate these pigs. Leary states that killing feral swine for sport hinders efforts to wipe them out. "Some hunters intentionally

release feral swine into new areas to establish populations to hunt," Leary said. "And hunters usually only shoot one or two pigs out of a group. Then, the rest scatter across the landscape and become more difficult to catch." Leary also cautions that the entire group (or "sounder") "must be removed at the same time for eradication efforts to be successful." This is because they reproduce so quickly. Leary adds that trapping is the best method for eliminating feral swine due to this year's first-quarter results. During this quarter, most swine were trapped in southern Missouri because this is where the highest density of feral swine occurs. "We have also trapped pigs in other parts of the state, which unfortunately means people are still intentionally releasing feral hogs for hunting," Leary said. "It's vital we continue our efforts and get the hog population under control before it spreads any further."

Earlier this year, MDC partnered with other conservation and agriculture groups as well as the Missouri Conservation Heritage Foundation. This partnership provided the state's feral swine strike team with more trapping equipment to be used by MDC for trapping efforts on private and public land. It also funded public education efforts on the dangers of feral swine. Leary encourages all landowners to report feral swine sightings or damage by calling (573) 522-4115 (ext. 3296) or by visiting <http://nature.mdc.mo.gov/discover-nature/report-wildlife-sightings/feral-hog-sighting-and-damage-report>.

Note: In collaboration with Tuskegee University, Tuskegee,

Alabama, the Lincoln University Cooperative Extension (LUCE) Innovative Small Farmers' Outreach Program (ISFOP) has received a grant from the United States Department of Agriculture (USDA)-Animal and Plant Health Inspection Service (APHIS) to raise awareness among landowners in Missouri about feral swine. Besides educating landowners about wild pig problems, the ISFOP will also address proper control and removal methods and other related issues. These goals will be met by organizing three workshops as well as demonstrations in southern Missouri.



Trapped feral swine.

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- Mississippi State University Extension. "Wild Pig Info." Last modified Oct. 26, 2015. <http://wildpiginfo.msstate.edu/>.
- Missouri Department of Conservation. "Feral Hogs in Missouri." Accessed March 31, 2016. <https://mdc.mo.gov/your-property/problem-plants-and-animals/invasive-animals/feral-hogs-missouri>.
- The assistance and information provided by Alan Leary, Wildlife Management Coordinator, and Candace Davis, Media Specialist, both with the Missouri Department of Conservation (MDC), and Bill Hamrick, Wildlife Biologist with the Mississippi State University Extension Service, is gratefully acknowledged. ■

Quinoa: An Alternate Cash Crop for Marginal Farmers in the Midwestern States

By Dr. Safiullah Pathan, Assistant Professor of Crop Science, Lincoln University

Quinoa (pronounced “kin-wa” or “kin-o-wa”) is an outstanding nutritional crop that is similar to beets or spinach. For thousands of years, quinoa has been grown in South America. It was mainly grown in the areas where Bolivia, Peru, Chile and Argentina are now located. Between 3,000 and 5,000 years ago, prehistoric people living in the Andes Mountains, began planting quinoa as a food crop. They valued it for its unique nutritional qualities as well as its agronomic (related to cultivation) properties. Elsewhere in the world, this crop was overlooked for thousands of years. Only a few people were aware of it until about 50 years ago. Recently, quinoa has regained its reputation as a nutrient-rich, popular food grain. This is true in the U.S., Canada, Europe, China and Japan, where it is not grown. Considering its importance, the United Nations (UN) General Assembly declared 2013 to be the “International Year of Quinoa.”

Quinoa is not a cereal; it is a small grain. It is consumed in ways similar to rice. It is the only food comparable to rice, corn and wheat that contains all their amino acids, trace elements and vitamins. It is also gluten-free. Quinoa contains higher amounts of important minerals, proteins and monosaturated fatty acids than common cereal grains (Table 1). The nutrient-rich young plants and green leaves are also eaten as vegetables. The Food and Agriculture Organization (FAO) of the UN reports that quinoa can be grown under diverse conditions.

It can be grown at sea level and up to an altitude of 13,000 feet and at temperatures from 27°F to 100°F. Quinoa is a drought-resistant crop. It needs about 50 percent less water than corn and wheat; 75 percent less than rice. It is also resistant to salinity (salt level). The FAO calls quinoa a super crop because it can resist drought and grow in poor soil without irrigation and fertilizer. It can be raised with only 4 to 8 inches of rain during the growing season.



Harvesting mature quinoa crops.

The yield of quinoa is low, only about 1,000 to 2,000 pounds per acre. Still, farmers can earn a profit because of its higher prices. Small farmers living in drought-prone areas might be able to grow it with only a small investment. This increases the chance of gaining a profit. Today, quinoa is seen as a new crop that is perfectly suited to grow under the changing climatic conditions. Best of all, quinoa could be an ideal crop to combat hunger and malnutrition in developing countries.

Both the demand and the price of quinoa have risen manyfold in the last 10 years. The current export price of quinoa is around \$3,000 per ton. The U.S. imports more than 25,000 tons of quinoa yearly. It comes from South America, mainly from Bolivia and Peru. Yellow, red and black versions of this grain can be found in most grocery stores. The price ranges from \$2 to \$4 per pound. Organic quinoa costs even more.

About 50 years ago, quinoa had been cultivated in only half a dozen countries in South America. Now it is grown in

Table 1. Nutrients in grain: quinoa, corn, wheat and rice per 100 gm

		Quinoa	Corn	Wheat	Rice
Minerals	Unit				
Calcium	mg	47	7	29	11
Iron	mg	4.6	2.7	3.2	1.6
Magnesium	mg	197	127	126	23
Phosphorus	mg	457	210	288	71
Potassium	mg	563	287	363	77
Sodium	mg	5	35	2	7
Zinc	mg	3.1	2.2	2.65	1.2
Vitamins					
Thiamin B1	mg	0.36	0.39	0.39	0.18
Riboflavin B2	mg	0.32	0.2	0.11	0.06
Niacin B3	mg	1.52	3.63	4.38	2.15
Vitamin B6	mg	0.49	0.62	0.37	0.11
Folate B9	µg	184	0	38	7
Vitamin A	IU	14	0	9	0
Vitamin E	mg	2	0	1	0
Others					
Protein	g	14.1	9.4	6.8	11.3
Oil	g	5.6	1.2	2.5	0.3
Monosaturated fatty acid	mg	1.6	1.3	0.2	0.2
Dietary fiber	g	7	7.3	2.8	12.2

Source: Krivonos 2013

(continued on page 5)

Which Watershed is Mine? And Why Should I Care?

By Susan Jaster, Farm Outreach Worker, and Bob Broz, State Water Quality Specialist, University of Missouri Extension

A watershed is an area of land where water drains to a common place. This might be a lake, river or wetland. In Missouri, watersheds are important. There are small watersheds that are part of larger watersheds. Each has a national identification number code, called a hydrologic unit code (HUC). Many watersheds are given an HUC of twelve numbers. The larger the number, the smaller the watershed. To determine watershed boundaries, Missouri focuses on watersheds that have an eight-digit HUC. Missouri has 66 of these eight-digit watersheds. The Missouri Department of Natural Resources (DNR) has a web page devoted to “Our Missouri Waters” (<http://dnr.mo.gov/omw/>). A great deal of information about watersheds can be found on the site. You can find your watershed and the name of the coordinator for your region. If you live in the St. Louis region, your two-digit watershed begins in Montana. It is known

benefits include safe drinking water and good water quality for humans, livestock, crops, wildlife and aquatic organisms. One aspect of a healthy watershed is healthy soils. Healthy soils filter and pre-clean the water that moves over and through it. If we do our best to prevent pollution, especially soil pollution, the cost of drinking water treatment is reduced. You can use some best management practices (BMPs) at your farm and home. Below is list of BMPs located on their website: <http://dnr.mo.gov/env/hwp/es-crap/docs/bmps-hhsmorg.pdf>

- Create a buffer zone by planting vegetation along a stream on your property. This reduces stormwater runoff, allowing it to enter the ground before it can reach the stream. Do not farm or build next to a stream.
- Have your soil tested. Then, scout for insect pests to reduce the amount of fertilizer and pesticide

used.

- When you plant, use native species. This will not only enhance beauty, but it creates habitat for wildlife and pollinators. Native plants need less water, fertilizers and pesticides.

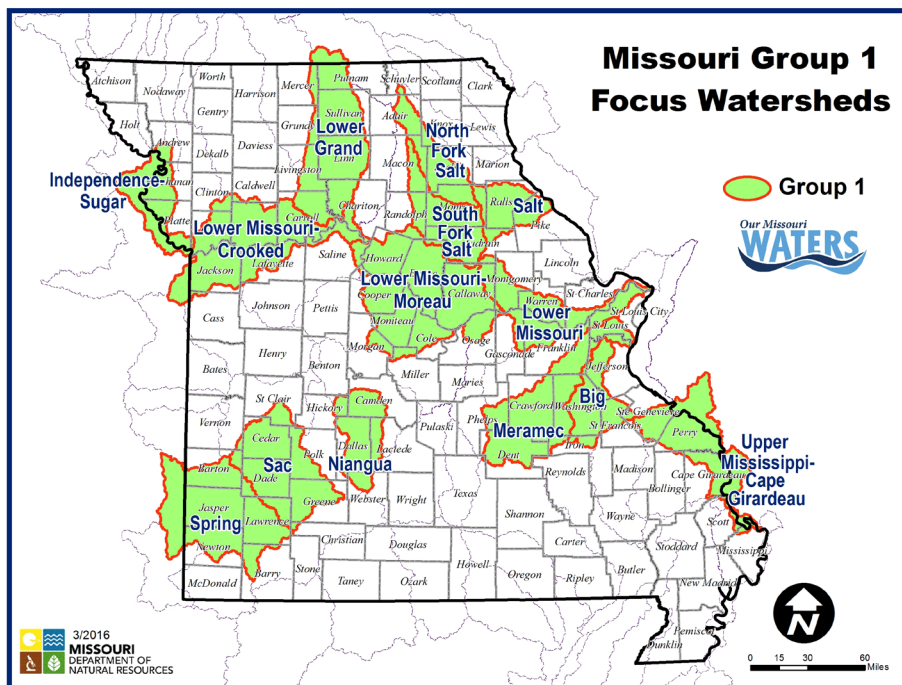
- Be sure that your car is properly maintained. This reduces oil, grease, etc. that would otherwise leak onto roads and into the environment.

- Find out how to dispose of used oil and household chemicals. Hazardous chemicals and oil should never be disposed of by dumping onto the ground.

- Dispose of medicines responsibly. Never flush them down the toilet, where they could end up in downstream waters. Watch for drop-off events to get rid of expired or unused medicine.

- Employ erosion control measures on construction sites (e.g., silt fences).

- Use best management practices when farming so as to decrease soil erosion and reduce runoff from fertilizers and pesticides. Create filter strips at the edges of fields, test your soil, plant cover crops and never mix chemicals near wells. Rotational grazing can be used to slow erosion, limit the need for reseeding and maintain cleaner water for farm



as the Missouri River Basin. A small section of that two-digit watershed is also the eight-digit watershed located around Kansas City, called the Crooked Watershed. A million people live in the Crooked Watershed. No matter which watershed you live in, it is up to each person to help keep it clean and healthy.

You should care about your watershed because when it is clean and healthy, there are many benefits. These

animals while also protecting waterways. For more information, contact your local Extension agent.

- Never use a storm drain to dump any material. Material in storm drains can eventually find its way to a local stream or lake.
- Use mulch or hay in gardens or landscaping to reduce erosion.
- Create a rain garden on your property.
- Support those developers who include sustainable spaces, such as stormwater retention basins, rain gardens and green areas.
- Maintain your septic tank by pumping it every two or three years.

Currently, the DNR is focusing on the Lower Grand River, Meramec Basin, Missouri River Corridor, Nian-gua, Sac, Salt Basin, Spring River and Upper Mississippi-Cape Girardeau watersheds. Over a five-year period, all 66 eight-digit watersheds will be evaluated. The DNR would like to have your help and hear your ideas about keeping our waters clean. You can attend meetings that will plan for how best to preserve water resources. Or, you can join a watershed advisory committee. Some local wastewater treatment plants need to be upgraded and modernized for population capacity. Please be sure to vote when these issues are on the ballot. Join the Missouri Stream Team (<http://www.mostreamteam.org/>). There are over 4,000 groups in Missouri. As a member, you can learn to monitor water quality, pick up trash and debris from stream banks and advocate for clean water. See the website for more activities near you. For more information about your watershed, please contact your regional coordinator:

Northeast Region Watershed Coordinator: Mary Culler, mary.culler@dnr.mo.gov, (660) 385-8000.

Kansas City Region Watershed Coordinator: Crew Schuster, crew.schuster@dnr.mo.gov, (816) 251-0798.

St. Louis Region Watershed Coordinator: Tracy Haag, tracy.haag@dnr.mo.gov, (314) 416-2960.

Southeast Region Watershed Coordinator: Susan Mathis, susan.mathis@dnr.mo.gov, (573) 840-4853.

Southwest Region Watershed Coordinator: Gwenda Bassett, gwenda.bassett@dnr.mo.gov, (417) 891-4300. ■

Quinoa (continued from page 3)



Fully grown quinoa plant.

more than 60 countries worldwide. In the U.S., it is grown on small acreages in Colorado, New Mexico, Wyoming and Washington.

Lincoln University of Missouri has recently begun research to find quinoa varieties that can be grown in the Midwest. Also being studied are ways to fit the crop into current cropping systems, chiefly for small, marginal farmers. Visitors are welcome to see the quinoa fields during Lincoln University's George Washington Carver Farm Field Day in August or at other times by appointment. (Call Dr. Pathan at 573- 681-5963).

Photo source: Food and Agriculture Organization of the United Nations, 2015, D. Bazile, D. Bertero, and C. Nieto, eds., *State of the Art Report of Quinoa in the World in 2013*. <http://www.fao.org/3/contents/ca682370-10f8-40c2-b084-95a8f704f44d/i4042e00.htm>. Reproduced with permission.

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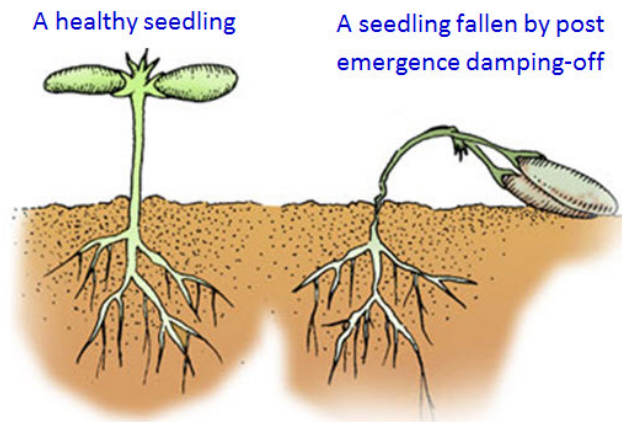
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Preventing Damping-off Diseases: Tips for a Good Start

By Dr. Zelalem Mersha, State Extension Specialist – Plant Pathology

Damping-off is a condition that affects the seeds, seedlings and root systems of plants. There are two groups of pathogens (agents that cause disease) that are common in Missouri and known to cause damping-off: soilborne fungi (e.g., *Fusarium* and *Rhizoctonia*) and water molds (e.g., *Pythium* and *Phytophthora*). Sometimes, fungi from the genus *Sclerotinia* or *Botrytis* can also cause damping-off. Poor stands or stand loss means that seedlings fall over. This might occur in home gardens, greenhouses or farms due to damping-off. Seeds or seedlings can be infected by the aforementioned pathogens before, at or during germination and emergence. Damping-off diseases are broadly grouped into two stages: preemergence and postemergence. Preemergence damping-off results in seeds that rot. Postemergence damping-off occurs when seedlings collapse after they emerge.



What conditions lead to damping-off?

Two important conditions that favor damping-off are wet soils (due to poor drainage or overwatering) and cool-to-moderate air and soil temperatures. Also, excess nitrogen either applied directly as a fertilizer or by fertigation (when fertilizer is injected through an irrigation system) worsens the problem. Using the same land to grow the same crop for more than one year can increase the chance of damping-off. Similarly, anything that delays germination poses a problem. This might be compaction (compression of soil), soil crusting and cracking, deep planting or poor seed quality. The disease can easily spread through contaminated soil, water (runoff from irrigation or rain) or infected

plants. Depending on the pathogen causing the disease, damping-off can overwinter in soils and cause more problems if the same soil is used year after year.

How can you identify damping-off?

With most preemergence damping-offs, seeds become soft, mushy and rotten. They fail to germinate. If the infection occurs after germination, the stems will often be visibly water-soaked and discolored at or below the point of the infection or the soil line. The basal part of the seedling will continue to soften. It will then discolor to a reddish-brown or black. Then, the seedling will grow much thinner, causing it to fall over, wilt and die. There are three postemergence symptoms. The first is that plants turn from red to brown. Second, there are sunken stem lesions near the soil line. Third, seedlings have wiry stems.

What are the disease management options for damping-off?

Prevention is the key to dealing with damping-off diseases. Use all available best management practices that enhance fast and vigorous seedling growth. At the same time, avoid any condition that favors the occurrence and spread of pathogens.

1. Improve soil drainage, and do not overwater. Keep seedling containers elevated. Be sure that pots have holes at the bottom to allow any excess water and moisture to drain easily. Raised beds and mulches will improve drainage. Hence, they reduce damping-off. Good air circulation improves evapotranspiration (evaporation of water from the soil and from the plant). This helps to avoid stagnant water around plant roots.
2. Plant after the soil has warmed. Choose the right time to plant—when the soil is warm. The exact time can differ based on the hardiness zone. Missouri lies between zones 5b and 7b (see <http://planthardiness.ars.usda.gov/PHZMWeb/>). Commercial farms use various seedbed heaters in nurseries. Using row covers and low tunnels will also help to create a warmer microclimate for seedlings.

(continued on page 7)

Preventing Damping-off Diseases (continued from page 6)

3. Start clean and stay clean. Get your seeds from a reliable source. Using seeds treated with conventional fungicides or organic biofungicides can make a difference. Make sure to follow all the safety precautions if using treated seeds. Be sure that any soil or potting mix is clean and is not contaminated. Disinfect tools, potting containers and workbenches used to raise and/or transport seedlings.

4. Rotate crops. This is a useful practice not only to prevent damping-off but for a number of other benefits. If rotating with cover crops (crops planted in rows to prevent erosion, etc.) is an option, use those plants with an allelopathic (when one species chemically inhibits another) effect (e.g., rye). This could help to kill weed seeds as well as the pathogen that causes damping-off.

5. Soil solarization. You can also use the sun's radiation and heat to kill pathogens. A moist soil that is covered with a clear plastic bag and exposed to full sunlight for a long period of time can kill soilborne pathogens. In areas like Missouri, however, achieving a four-to-six-week span of sunshine can be a problem. Thus, this option might not be practical.

6. Biologically based products and microbes. There are biologically based products on the market (e.g.,

containing the beneficial fungus, *Trichoderma* spp.). Some of these products are known to improve germination. Others even help seedlings to grow faster. Encourage beneficial microbes to flourish on your farm to sustainably manage damping-off diseases. ■



Photo: LUCE, Z. Mersha

During cool season, seedlings can get warmth and be protected from damping-off by using a low tunnel.

Farewell from Nahshon "Shon" Bishop



For the past 18 months, I have worked as a Small Farm Specialist for the Lincoln University Cooperative Extension (LUCE) Innovative Small Farmers' Outreach Program (ISFOP), covering the southwestern corner of the state. I decided to step down from my full-time position as of March 1, 2016, so I could spend more time with my family. It was a difficult decision to make because the position I am leaving was truly my dream job. It provided me with many opportunities to assist small farmers in six Missouri counties. I was able to improve the quality of life for the socially disadvantaged, limited-resource farmers and ranchers in Southwest Missouri. I was fortunate to be able to work with some of the finest professionals as my colleagues.

They have dedicated their lives to helping the less fortunate. Until the position is filled, I will be involved with ISFOP a few hours per week to maintain continuity. ■

About Our Program...ISFOP

If you are a small farmer and need information, please contact an ISFOP Farm Outreach Worker (FOW). FOWs live and work in your community. They can provide information on ways to better manage your resources, reduce expense and increase income. They can also provide information on other programs and resources that may increase your income and the overall quality of life for you and for your family.

You are eligible to participate if you meet the following requirements:

- Your family lives on a farm, rural or urban.
- Farm products or income from the farm are necessary for you to live where you do.
- Your family provides the management and most of the labor for your farm.
- Your total annual family income is less than \$50,000.

East Central Region:

- **Miranda Duschack**
Small Farm Specialist
St. Louis County and City
DuschackM@LincolnU.edu
(314) 604-3403
- **Janet Hurst**
Farm Outreach Worker
Franklin and Warren County
HurstJ@LincolnU.edu
(660) 216-1749
- **Joyce Rainwater**
Farm Outreach Worker
Jefferson and Washington County
RainwaterJ@LincolnU.edu
(314) 800-4076
- **Reneesha Auboug**
Farm Outreach Worker
Lincoln and St. Charles County
AubougR@LincolnU.edu
(314) 838-4088

West Central Region:

- **Position Vacant**
Small Farm Specialist
Jackson County
- **Phillip Boydston**
Farm Outreach Worker
Cass and Johnson County
BoydstonP@LincolnU.edu
(816) 726-7720
- **Susan Jaster**
Farm Outreach Worker
Lafayette and Ray County
JasterS@LincolnU.edu
(816) 589-4725
- **Jim Pierce**
Farm Outreach Worker
Clay and Platte County
PierceJ@LincolnU.edu
(660) 232-1096

Southwest Region:

- **Position Vacant**
Small Farm Specialist
Barry and McDonald County
BishopN@LincolnU.edu
(417) 846-3948
- **Stephen "Randy" Garrett**
Farm Outreach Worker
Newton and Jasper County
GarrettS@LincolnU.edu
(417) 850-9391
- **David Middleton**
Farm Outreach Worker
Lawrence and Greene County
MiddletonD@LincolnU.edu
(417) 466-8056



Box 29, Jefferson City, MO 65102-0029
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ISFOP Office Staff:

- **Dr. K.B. Paul, ISFOP Director**
PaulK@LincolnU.edu
(573) 681-5584
- **Erin Brindisi, Secretary**
BrindisiE@LincolnU.edu
(573) 681-5312

For general information, call the LUCE ISFOP office at (573) 681-5312.

ISFOP Regional Map

