KERR CENTER

Field Notes

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PHOTO CREDITS

Maura McDermott: pgs. 1, 2, 6, 7, 8, 11, 14, 15, 17, 18, 19

Andy Makovy: pgs. 3, 13

Learn From the Pros in 2011

– Maura McDermott –

Motivational speaker *and* expert soil scientist?

Ray Archuleta is that rare combination. The dynamic Archuleta will kick off the Kerr Center's two-day Healthy Soils, Healthy Livestock workshop April 8-9 at the Kerr Center in Poteau (see pg. 3).

"He is not to be missed," says Ann Wells, Kerr Center program director. "We are thrilled that he is coming to Oklahoma."

Also in April: a reprise of the center's popular hoophouse building workshop. On Saturday, April 2, and again on Saturday, April 16, participants will get some hands-on experience building a hoophouse of the innovative Hanley design (see pg. 2).

On May 26, longtime aquaculturist Kenneth Williams will lead a pond management workshop. Williams has literally "written the book" on pond management. He will cover a variety of topics and will field questions from pond owners (see pg. 13).

Kerr horticulture projects director George Kuepper will lead an evening tour of the center's Cannon Horticulture Project on August 4. On Saturday, September 17, the horticulture plots will again welcome visitors, this time for a full field day focused on heirloom vegetables (see pgs. 6-7).

Two livestock events will finish out the year. A field day for meat goat and sheep producers will take place on Saturday, September 24 (see p. 8).

The Kerr livestock team will also offer an evening tour and seminar on pastured pork on October 6 (see online events calendar). Events will be held at the Kerr Center, located five miles south of Poteau in southeast Oklahoma.

Come see us this year! Check our website (kerrcenter.com) for registration information or call the center at 918.647.9123.

The Kerr Center for Sustainable Agriculture offers progressive leadership and educational programs to all those interested in making farming and ranching environmentally friendly, socially equitable, and economically viable over the long term.

The Kerr Center is a non-profit foundation located on 4,000 acres near the southeastern Oklahoma town of Poteau. It was established in 1985.

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Visit the Kerr Center web pages for information on programs, staff, history and for extensive information on sustainable agriculture.

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Learn to Build a Low-Cost Hoop House

One of the Kerr Center's most popular educational events, the hoop house workshop, is coming to the Kerr Center near Poteau on two separate dates this spring, April 2 and April 16.

Hoop houses are greenhouses without any source of heat other than the sun. Designs vary, but the basic elements are a row of curved supports, or hoops, covered with a sheet of clear plastic.

Hoop houses are an important tool for season extension, allowing warm-season crops to be grown earlier and later in the season, and permitting some cool-season crops to thrive all winter long.

Oklahoma Producer Grant recipients Tod and Jamie Hanley, of Trebuchet Gardens in Norman, developed a design that stands up to wild Oklahoma weather better than some commercial versions, while costing considerably less. Total materials costs run around $1,000.

Workshop participants will go step by step through the process of building this 100' by 17' "Hanley-style" hoop house — from bending the hoops, to pounding stakes, to throwing the plastic over the hoops and securing it with ropes.

The Hanleys' method is quick as well as inexpensive. At previous workshops, the entire house has usually been completed in less than three hours. (Just two people can manage, but it will take longer than with a workshop-size crowd.)

One of the key cost-cutting innovations of the Hanleys' hoop house design is a homemade tool that they use to bend straight metal tubing to form the hoops, instead of paying much more for pre-formed hoops.

Plans for the bender are included in a fully illustrated guide to the Hanleys' hoop house construction methods, available free online at http://www.kerrcenter.com/publications/hoophouse/index.htm.

The $30 workshop registration fee covers all materials and refreshments. Registration is due by March 21 for the April 2 workshop, and by April 6 for the April 16 workshop. Register online at www.kerrcenter.com.

In order for folks to have a true hands-on experience, the number of participants will be limited at these workshops, so early registration is strongly encouraged.

Bring a lawn chair and wear appropriate shoes. The workshops will be held rain or shine.

GLUING THE SOIL TOGETHER:

Healthy Soils, Healthy Livestock Grazing Workshop April 8-9, 2011

– Wylie Harris

If you want to know how to solve the problems, you have to learn how the soil functions.

So says Ray Archuleta, self-styled "recovering soil destroyer," and featured speaker at the Healthy Soils, Healthy Livestock workshop, Friday and Saturday, April 8-9, at the Kerr Stewardship Ranch in Poteau.

The workshop will also bring forward a group of deeply experienced educators, veterinarians, and livestock producers to explain how ranchers can use management intensive grazing as a tool to improve their pastures as well as their bottomlines. (See agenda, p.5.)

Archuleta's passion is applying ecological principles to agricultural systems to use and improve the most amazing resource we have: the soil.

"If you don't understand the soil as an ecosystem, you're taking things out of context," he says. "Context builds understanding. The ecosystem's not part of us; we're part of it."

To illustrate this 'context' during his talks, Archuleta demonstrates what he calls the "slake test," using two clods of dirt. One clod comes from a field tilled continuously for decades; the other from one that has not been tilled in 40 years, and has had no synthetic fertilizer applications for 13.

He drops each clod into a clear container of water. The water holding the continuos-tillage clod goes instantly muddy. The other stays clear as Archuleta continues to explain.

"Why is one so clear and the other dissolving?" he asks.

The clod of untilled, unfertilized soil is full of pores, and held together by glues exuded by soil organisms: fungi, earthworms, and bacteria. "More pores mean more porosity . . . more porosity means more infiltration," he answers.

"Where do we want our rainwater to go?" he asks.

"Into the soil system. Our country doesn't have a runoff problem, it has an infiltration problem. The glues help complete the water cycle, and clean our watersheds."

"Why do we want our soils covered?" he continues.

"Yesterday's cover is tomorrow's structure. Vegetation is the conduit to feed the organisms that create the glues."

Goals and Tools

Archuleta has 25 years of experience with the Natural Resources Conservation Service, most recently as a member of the Soil Quality Team. A Certified Professional Soil Scientist with the Soil Science Society of America, he spends much of his time working to improve infiltration in croplands.

However, he says, ranchers have their part to play, too. "Not only are our cropping systems messed up, but even our grazing systems are missing the mark."

"I've known people who have heard Ray and come away planning big changes with their whole grazing and livestock operations," says Kerr Center Program Director Ann Wells, D.V.M. "He's so dynamic and makes soil science so interesting."

With Archuleta as keynote speaker, she adds, "This is more than just a grazing conference."

"Cattle are fantastic tools, just misunderstood," says Archuleta. "Management practices are tools,

continued on page four

they're not the goal. I do not talk about tools — I talk about understanding."

Hands on the Animals

On Friday, David Sparks, D.V.M., of the Oklahoma Cooperative Extension Service (OCES), will lead sessions on hands-on animal assessment (covering body condition scoring, frame size, and reproductive efficiency), and animal health.

Sparks has worked as a food-animal veterinarian for over 30 years in Arizona, Kansas, and Oklahoma. He is active in research on multi-species grazing, and assists his wife Linda with the management of their own meat goat operation.

Brian Freking, LeFlore County Extension Agriculture Educator, will discuss fencing for "management intensive grazing 101." Freking maintains his own registered Angus & Chiangus cattle operation.

Together with Kerr Center herdsman and technician Andy Makovy, Freking will also lead a session on water systems. Makovy, who has years of experience using management intensive grazing with his own herds, will also present an introduction to that subject.

Wells and Mary Penick, Kerr livestock manager, will contribute their own expertise. Penick will share insights on genetics for grazing, with an emphasis on the Kerr Center's experience with heritage breed Pineywoods Cattle.

In addition to her veterinary practice, Wells has more than 25 years of experience in livestock production, including producing and selling natural lamb and now grass finished beef.

She will package that experience in sessions on "cowboy arithmetic and pasture allocation" as they pertain to the layout and design of grazing systems.

Sessions will be divided between an indoor classroom setting, and pastures on the Kerr Ranch for hands-on experience. Breaks, as well as a Saturday evening session, will also offer ample opportunity for informal discussions with presenters.

Days Inn & Suites in Poteau is offering a special workshop discount of $77 per night. Call direct at 918.647.3510 by March 25 and mention the Kerr Grazing Workshop.

VISIT WWW.KERRCENTER.COM FOR MORE INFORMATION ON THE WORKSHOP PROGRAM AND PRESENTERS.

Registration is available online or also by mail using the form below.

REGISTRATION FORM :: **SOIL/LIVESTOCK HEALTH WORKSHOP**

NAME(S): _____

ADDRESS: _____

PHONE: _____ EMAIL: _____

NUMBER ATTENDING _____

- Registration fee is $60 per person; $50 for each additional person from the same family or farm.
- Registration includes all materials, and lunch and refreshments on both days. (Saturday's supper will be as a group, but pay-on-your-own.)
- Refunds available if cancellation is made by April 4.
- Enclose check made out to *Kerr Center,* and mail to:
  Kerr Center for Sustainable Agriculture,
  P.O. Box 588, Poteau, OK 74953.

Management Intensive Grazing Workshop Agenda

FRIDAY, APRIL 8, 2011

8:00 am to 8:30 am	Registration and Coffee
8:30 am to 8:45 am	Welcome & Introductions
8:45 am to 10:15 am	Soil health and how it relates to healthy cattle—Ray Archuleta
10:15 am to 10:30 am	Break
10:30 am to 11:00 am	Goal Setting—Mary Penick
11:00 am to 11:20 am	My experience with Management-Intensive Grazing—Andy Makovy
11:20 am to 12:00 pm	Animal Assessment—Dr. Dave Sparks: Body Condition Scoring, Frame size, Reproductive efficiency
12:00 pm to 1:00 pm	Lunch provided by Kerr Center—Pineywoods grassfed beef
1:00 pm to 1:30 pm	Cowboy Arithmetic & Pasture Allocation—Dr. Ann Wells
1:30 pm to 3:00 pm	Outside Classrooms: Fencing for MIG 101—Brian Freking & Andy Makovy Hands-on Animal Assessment—Dr. Dave Sparks Pasture ID—Mary Penick and Ann Wells Soil Health—Ray Archuleta
3:00 pm to 3:15 pm	Break
3:15 pm to 4:45 pm	Pasture Allocation Exercise using Kerr Cattle and Pastures
4:45 pm to 5:30 pm	Discussion of Days Events & Questions—Panel
6:30 pm- 8:00 pm	Informal Discussion of Multi-Species Grazing— Dr. Dave Sparks and Kerr Center Staff Western Sizzling—pay-on-your-own dinner

SATURDAY, APRIL 9, 2011

8:00 am to 8:30 am	Review of Yesterday
8:30 am to 9:30 am	Layout & Design of Grazing Systems—Dr. Ann Wells
9:30 am to 10:00 am	Water Systems—Brian Freking & Andy Makovy
10:00 am to 10:15 am	Break
10:15 am to 11:15 am	Genetics for Grazing—Mary Penick-
11:15 am to 12:00 pm	Animal Health—Dr. Dave Sparks
12:00 pm to 1:00 pm	Lunch provided by Kerr Center
1:00 pm to 3:00 pm	Outside Classroom: Review of Pasture Allocation Exercise Water Systems What to do when you get home?
3:00pm	End

The past few seasons of the horticulture and organics program at the Kerr Center have been productive both crop- and information-wise. Two events later this year will give visitors a taste after 2011's season has been added to the mix.

A TASTE OF THINGS TO COME:

Summer and Fall Horticulture Events

ON AUGUST 4, an evening garden tour will give visitors a chance to observe crops in-season while still avoiding the worst of the summer heat.

Visitors will take a guided tour of the Kerr Center's horticultural demonstration plots, which include trials of heirloom tomatoes, sweet potatoes, flour corn, and pumpkins.

The tour will highlight organic management, including crop rotation, cover crops, and mulching. *(For more on the Center's latest publication on these topics, see p. 10.)* In addition, discussions will include composting, compost tea, foliar fertilization, and biochar. *(For more on biochar, see p. 14.)*

ON SEPTEMBER 17, the horticulture plots will again welcome visitors, this time for a full field day focused on heirloom vegetables.

Participants will learn about Kerr Center's MORE ›››

Grafted Tomato Trials

"Grafted Heirloom Tomatoes: Our Experience in 2010" is available free at www.kerrcenter.com. Here is an excerpt from the report:

Grafting is an old horticultural technique. It typically involves marrying a plant with desirable aboveground characteristics (called a scion) to one with desirable underground characteristics (the rootstock). In the U.S., grafting is especially common with woody plants such as fruit trees. It is far less common with vegetables, though the practice is quite popular in southeast Asia and other regions where intensive agriculture is common.

In this country, grafting tomatoes has gained attention, particularly for greenhouse culture. Using rootstocks resistant to fusarium and other problematic soil diseases, tomato growers are able to continue using popular and productive varieties that are otherwise susceptible.

This interest extends to heirloom tomato production, whether grown in the field or in the greenhouse. Heirlooms are prized for flavor, color, and other qualities that are often lost from modern varieties as breeders pursue high yields, mechanical harvest, and shipping characteristics.

Heirloom cultivars, however, often lack disease resistance and stress tolerance, and may have low productivity. If grafting remedies any of these concerns, heirloom tomatoes may become a much better option for the region's small market growers.

Market growers, who sell in farmers markets or similar venues, are in an especially good position to take advantage of the benefits grafting might provide, since a small yield increase in high dollar heirloom tomato fruit would add quickly to profit.

We chose to grow Cherokee Purple and Brandywine varieties. Both heirlooms are

experiences with sweet potatoes as part of a specialty crops research project. Topics will include varieties, planting and harvesting methods, irrigation, and pest management.

Kerr staff will discuss growing heirloom tomato varieties in-season under various high-tunnel covers to evaluate effects on sunscald, pollination, early blight, and insect pests. Cover types include 1) plastic, 2) plastic + shade cloth, 3) shade cloth only, and 4) no cover

Featured speakers will include Dr. Warren Roberts from the Lane Agricultural Center, and Gary Schaum from Duck Creek Farms in Mounds, Oklahoma — the source for most of the heirloom sweet potato varieties in the Kerr Center trials.

Advance registration for the September 17 field day is required. For more information, visit www.kerrcenter.com or call the center at 918.647.9123. Both events will be held rain or shine; wear shoes appropriate for walking in potentially muddy fields.

Sweet Potato Trials

The 2010 sweet potato trial included seventeen varieties, though its primary focus was on production practices. "Heirloom Sweet Potato Varieties: A Preliminary Look in 2010" is available free at www.kerrcenter.com. Here is an excerpt from the report:

The varieties of sweet potato familiar to most U.S. gardeners and consumers have moist, orange flesh, with red or orange skins. However, there are also dry-fleshed varieties, and flesh and skin colors can vary widely. Yellow, white, purple, and red are among the common colors.

In 2010 the Kerr Center received a Specialty Crop Grant from the USDA Agricultural Marketing Service (AMS) for a three-year project investigating and demonstrating small-scale heirloom sweet potato growing. Our goals include identifying appropriate-sized equipment, small tools, varieties, and organic growing practices suitable for the region's market farmers and gardeners.

Our main objective for 2010 was to identify the more critical production practices we would use in the next two years for demonstration and variety trials. We also planted a small variety trial, to gain familiarity with the range of sweet potato types and cultivars. Because this was a preliminary trial, we have not reported measured yields. Instead, we provided general observations only where we feel confident in them.

popular at farm markets and occasionally requested by name. Cherokee Purple is considered well adapted to Oklahoma, Brandywine, less so.

Neither had performed especially well in our 2009 heirloom tomato trial. We therefore reasoned that improved performance would not only be readily detected, if it occurred, but especially welcome on varieties that were so marketable. The 2010 trial featured grafted and non-grafted plants from both varieties.

We found no clear yield advantage to grafting in either Cherokee Purple or Brandywine. This is not entirely surprising. This land had been in pasture for decades and had little chance to develop populations of root knot nematodes, fusarium, and other soil pathogens that tomato grafting is intended to circumvent. If grafting had been beneficial to either variety, it should have appeared as a generalized increase in vigor. Unfortunately, that was not evident.

There was, perhaps, a slightly higher marketing percentage for fruit from grafted plants. This advantage was not great, however, and a more exacting trial would be needed to determine whether this advantage truly exists.

We again confirmed that Cherokee Purple — whether grafted or not — is far better adapted than Brandywine, to the challenging growing conditions of Eastern Oklahoma. Cherokee Purple's yields were between 3 and 4 times as great. The extreme heat of summer 2010 probably accentuated the difference between varieties more than would normally be seen.

BUCK UP!

Oklahoma Forage Based Buck Test Rolls into 2011

– Wylie Harris

Grand Champion by Average Daily Gain,
David and Debra Johnson, Windy Hill Farms, Jackson, TN

With its fourth successful year completed in 2010, the Oklahoma Forage Based Buck Test is now taking nominations for 2011.

The Kerr Center buck test is unique in the nation for its emphasis on pasture conditions. Most other tests either take the form of outdoor feed trials, or seed paddocks with forages intended specifically for goats.

"This test is giving a more realistic expression of the bucks' genetic potential because they're on pastures that are already there," says Kerr Center Program Director Ann Wells, D.V.M.

"Goats naturally want to eat brush, but most people don't know how to manage brush. It's very difficult," Wells explains.

However, "improved forages — grasses, legumes, and so on — may not fully meet the goats' nutritional requirements," she adds. Because of that, the Kerr Center test does include supplementation, but as little as possible to ensure good gains — an approach that also makes economic sense for producers.

"Most people raising goats are raising them on pasture because they don't have enough browse," Wells says. "With the results from this test, people can know how well they're going to do in a pasture setting, which is where most commercial goats are being raised."

"I think the buck test is serving a very useful purpose," agrees test manager Mary Penick. "It has changed somewhat over the years, and will make a big change in 2011."

Part of that change includes a shorter test period. "We've noticed that the bucks go into rut during the last thirty days or so of the test," Penick explains. "The highest gains come right about the third week of September; then they drop as the bucks start to spend all their time fighting each other."

This year, Penick says, "We had one buck that dropped four pounds in rut season. He was a strong contender and then decided to just continuously fight. We don't want to punish those."

This year, the test will conclude in late September, instead of running through October.

Numbers Game

With four years of accumulated data from the buck test, some general patterns are beginning to emerge (see table). One that stands out is the large influence of rainfall on the bucks' performance, since parasites are much more abundant during wetter summers.

"The thing that's really good about our test is that we run the gamut of weather," says test manager Mary Penick. "We're going to test your bucks. We get everything from hurricanes to droughts."

Regardless of weather, individual bucks vary widely from one another in their average daily gains and parasite loads. That variation provides the genetic basis for parasite resistance that can be used for breeding improved

Fall Field Day

Goat and sheep producers will learn about parasite management, forage management and general animal health during a field day at the Kerr Ranch on September 24. Winners of both the 2011 Oklahoma Commercial Meat Goat Forage Performance Test (Buck Test) and the 2011 Oklahoma Commercial Meat Sheep Performance Test (Ram Test) will be honored in an awards ceremony.

resistance.

Identifying the bucks that carry those genetics is one of the primary reasons for the buck test, so the project thus far has been a success.

"There was a big question as to whether this would even work, and as to whether people could actually breed goats that would do well on pasture," Penick says.

The buck test is enabling new developments in meat goat research, with scientists at several regional academic institutions putting test data to work.

At Auburn University, animal geneticist Dr. Nadra Nadarajah has revealed a statistical correlation behind the commonsense hypothesis that high fecal egg counts translate into lower average daily gains.

Nadarajah has also begun developing expected progeny differentials (EPDs), estimates of an animal's genetic value as a parent, for goat bucks based on the results from Kerr's buck test, along with others. According to Penick, to the extent that EPDs exist for goats at all, to date they have been developed only in a show-ring setting.

The buck test makes a measurable effect in the economic sphere, too. "We've noticed that the bucks that place well in the test are commanding higher prices," Penick observes.

2011 Oklahoma Forage-Based Buck Test for Meat Goats

The Kerr Center is calling for entries in the 2011 Oklahoma Forage-Based Buck Test. This will be the buck test's fifth consecutive year.

Goat producers wishing to test their bucks' performance on forage are invited to enter bucks in the test, which will run from mid-July until late September.

All breeds of meat goat are welcome. In past years, participating breeds have included Boer, Kiko, Texas Genemaster, and Kiko/Boer and Kiko/Boer Spanish crosses.

The entry fee is $120 per buck, and nominations are due by June 24, 2011.

For complete information on this year's test, and the entry form, visit the Kerr Center website at www.kerrcenter.com/stewardship/goats.html, or call the center.

Reports on tests for individual years from 2007-2010 are also online, or available by calling the Kerr Center. Those interested can follow progress on the 2011 test via the online test blog at www.kerrosubucktest.blogspot.com.

For more information, contact Mary Penick by calling the Kerr Center, or email mpenick@kerrcenter.com.

Year	*Rainfall (inches)*	*Average Daily Gain (pounds)*	*Fecal Egg Count (eggs/gram)*	*Number of Bucks Disqualified*
2007	14.9	0.26 - -0.10	150 - 4,400	5
2008	20.2	0.19 - -0.02	50 - 14,600	23
2009	32.56	0.25 - -0.13	163 - 3,600	25
2010	9.53	0.38 - -0.02	216 - 2,208	2

2010 Oklahoma Forage-Based Buck Test Results

Sixty bucks from 13 farms in six different states competed in the 2010 test. Overall, the bucks gained an average of 0.22 pounds per day of the test.

GRAND CHAMPION
Breed: Kiko
Average Daily Gain: 0.38 lb.
Owner: David Johnson, Windy Hill Farm,
Jackson, Tennessee

RESERVE GRAND CHAMPION
Breed: Kiko
Average Daily Gain: 0.34 lb.
Owner: Wes Pinneo, B Bar W Kikos
Kincaid, Kansas

TOP HERDSMAN by Fecal Egg Count
Sky Shivers, Blu Sky Kikos,
Prague, Oklahoma
(average FEC: 258 eggs per gram)

GRAND CHAMPION FEC
Average Ending Fecal Egg Count
Breed: Kiko
Ending FEC: 216
Owner: Sky Shivers, Blu Sky Kikos
Prague, Oklahoma

TOP HERDSMAN by Average Daily Gain
David Johnson, Windy Hill Farm,
Jackson, Tennessee
(ADG: 0.31 lbs)

New this Year: Ram Test!

For the first time, the Kerr Center will be offering meat sheep producers a chance to test their rams' mettle.

The ram test will run during the same period as the buck test, and following the same general rules.

The fee is $120 per ram, and nominations are due by June 24, 2011.

For complete ram test rules and regulations, see www.kerrcenter.com/event_links/ram_test.htm.

BEATING BACK BERMUDA:

Summer Cover Crops that Weed and Feed the Soil

At the Kerr Center, our goal is to identify and test sustainable production systems.

Well-designed organic systems are among the most sustainable. They are resilient due to many factors including higher soil organic levels, greater above- and below-ground biodiversity, and reduced dependence on off-farm inputs.

Organic production is not new at the Kerr Center. For much of its 15-year history, the original 20-acre horticultural farm was certified organic through the Oklahoma Department of Agriculture, Food, and Forestry.

Program Assistant Seth Stallings in the sorghum-sudan patch

The staff experimented with cover crops, compost, and crop rotations to build soil fertility. These are old techniques that are often undervalued, yet they work extremely well.

In 2008, the Kerr Center began converting about ten acres of pasture to certified organic status. This Cannon Horticulture site is the main demonstration and research area, including about two acres under organic management. Application for certification will be made early in 2011.

The site features a long-term soil-building rotation based on cover crops, green manures, and modest inputs of compost. There is a greenhouse and a compost area, with two hoophouses planned for construction in 2011.

Following are excerpts from the recent report: *Cover Crops, Rotations and Green Fallow on the Cannon Horticulture Project: A 2010 Update* by George Kuepper and Seth Stallings

Background

Cover crops play a number of important roles at the Cannon Horticulture Project. The most obvious are demonstrated by our winter cover crops.

Fall plantings of grain rye accompanied by legumes like crimson clover, vetch, or winter peas protect the soil from erosion, capture soil nutrients, and fix nitrogen for subsequent vegetable crops.

Less obvious but no less important are the contributions of summer cover crops.

Feeding the Soil

The organic management plan for the Cannon Horticulture Project is built upon a 3-year rotation in which about one-third of the land is planted to a season-long summer cover crop each year.

We commonly use sorghum-sudangrass or sudangrass for this purpose. Both grasses produce large amounts of biomass that can be plowed back into the soil to build fertility.

This is a traditional organic management strategy in which one "feeds the soil" so it has the capacity to grow crops.

We have several reasons for preferring sorghum-sudan and sudan grasses, aside from the amount of organic matter they produce. Both are drought tolerant; when mowed they re-grow and produce even more biomass. This is not true with either buckwheat or purple-hull peas, which are also summer cover crops that we use.

We do grow purple hull peas in fairly large blocks within our plots. Purple hull peas are a type of southern pea or "cowpea." Southern peas are legumes and can fix quite a bit of nitrogen. It has a shorter growing season, however, and does not re-grow well after mowing, unless cut high.

Buckwheat, another cover, also has a shorter growing season and does not re-grow after mowing. We like to use it on ground that will be tilled mid-summer for fall vegetables.

Bermuda grass

Both buckwheat and purple hull peas are excellent habitat for beneficial insects.

However, the most compelling reason for using sorghum-sudangrass and sudangrass is their incredible ability to outgrow and smother summer weeds, especially bermudagrass.

Weeding the Soil

Organic gardeners in the region blanch when they hear that we established our organic demonstration plots in the middle of a bermudagrass pasture.

Conventional wisdom argues that bermudagrass can only be managed by using heavy plastic

Lessons from Pennsylvania

The management model for the Cannon Horticulture Project utilizing rotation and season-long cover crops to sustain fertility and control weeds is not unique.

Anne and Eric Nordell of Trout Run, Pennsylvania, have developed an exceptionally sustainable market farm operation utilizing these methods. They use the term bio-extensive to describe their system which substitutes fallowed/cover-cropped land for the time and labor mostly spent cultivating or hand-weeding, and for off-farm fertility inputs.

The Nordells have been farming this way commercially since 1983, which challenges the conventional notion that growers cannot afford to leave that much land out of annual production.

The Nordells have done an excellent job of documenting and reporting on their system. A copy of the 6-page article "Weed the Soil, Not the Crop" is available at www.newenglandvfc.org/pdf_proceedings/ weedthesoil.pdf

Their DVD with the same title is available for $15.00 by writing Anne & Eric Nordell, 3410 Rt. 184, Trout Run, PA 17771.

Additional information and photos of their farm can be found at www.neon.cornell.edu/focalfarms/photogal/bchgrove.html and newfarm.rodaleinstitute.org/features/1204/nordell/index.shtml.

Sorghum-sudan grass border

mulches, soil solarization, repeated digging, or spraying Round-up and waiting three years for organic certification.

Annual smother crops provide another alternative to such draconian measures.

Bermudagrass does not tolerate shading and it is readily smothered under the dense canopy produced by either sorghum-sudangrass or sudangrass. In fact, most summer weeds compete poorly.

We find few serious weed problems when our vegetables are grown on a plot that was previously in one of these two grasses. Very little time is spent cultivating or hand-weeding. We are effectively weeding, as well as feeding, the soil.

Our initial choice of annual sorghums as smother crops is predicated on earlier work at the Kerr Center by Alan Ware and Simon Billy. During the 1990s, they evaluated a number of summer cover crops for their ability to suppress weeds, especially bermudagrass.

Their observations are summarized in the ATTRA publication *Tree Fruits: Organic Production Overview.*

We try to plant annual sorghums between May 1 and June 15 to get a good stand. Because our plots are small, we choose to broadcast seed at 30-40 lbs per acre onto freshly disked ground and follow with shallow incorporation. (A somewhat lighter rate can be used if the seed is drilled.) To date, this has worked well for us.

We mow the smother crop just as seed heads begin to emerge, taking care not to cut it too short. This is especially important if weather is hot and dry. The crop will have difficulty re-growing well under such conditions.

A rotary bushhog mower, therefore, usually works better than a sicklebar. Unless conditions are exceptionally dry, there will be several feet of re-growth by late August, which continues to smother late-summer weeds.

By late August, we like to begin preparing the ground for a winter cover crop. In 2009, though, fall rains prevented that. The sorghum-sudangrass remained in the field and was killed by frost, leaving us a bit nitrogen-poor in spring, but the soil was well-covered all winter.

A few words of caution: First of all, this rotation will suppress bermudagrass, it will not eradicate it. Some viable seed will remain in the soil ensuring some recovery from seedlings.

However, the greatest threat of bermudagrass is re-establishment from the field edges, where bermudagrass stolons snake out into the vegetable planting as soon as you turn around. If not careful, tillage can re-plant stolons even further into the field.

For this reason, it is important to rotate back to a smother crop every few years to help keep the planting bed as clean as possible.

It is also important to realize that all weeds are not vulnerable to smothering by this rotation. A prime example is johnsongrass. Johnsongrass is a perennial sorghum that can out-compete its annual relatives while being almost indistinguishable during the growing season. Other weeds that seem to survive our smother crops include yellow nutsedge and horse nettle.

For the complete report and more information on Kerr Center's organic projects visit www.kerrcenter.com.

COVER CROPS DEFINED: A crop growing close to the ground for the chief purpose of protecting the soil from erosion and also for the improvement of its productivity, between periods of regular production of the main crops, or between trees and vines in orchards and vineyards.

Getting the Most FROM YOUR POND

It is hard to beat a spring morning spent on the banks of a pond, your line in the water, waiting for a nibble.

But whether or not there are any fish to catch depends to a large degree on how well you have managed your pond.

Thousands of ponds dot the Oklahoma landscape, and a pond is a valuable asset on any farm or farmette. Many ponds were originally constructed to water livestock, but a well-managed pond can provide many other economic and recreational benefits. These include home fish production, commercial aquaculture, hunting and fishing leases, irrigation, wildlife habitat, swimming, and even sports fishing.

All of these uses can be "enhanced and sustained," with a bit of management, says Kenneth Williams, the man who literally "wrote the book" on pond management in Oklahoma. Williams will talk about getting the most from your pond, Thursday evening, May 26, from 5:30-7:30 at the Kerr Center.

"I will cover vegetation control, leaks in ponds, water quality, clearing muddy ponds, and fish population management," he says.

"I will also be happy to discuss individual pond owner's concerns," he adds. "I can identify aquatic vegetation if a sample is brought in."

Williams has worked in the fields of pond management and aquaculture for 26 years. He retired from Langston University a year ago. He built the Langston University aquaculture and fisheries web pages and wrote many of the articles on those pages. He has also worked as a science illustrator.

Participants will receive a CD containing Williams' book, which is a compilation of his many articles.

Space is limited, so sign up early. Registration fee is just $15 per person and includes the CD. To register via Paypal, visit the calendar of events at www.kerrcenter.com. Or call the Kerr Center for more information. Registration must be paid by deadline of May 16.

Hot off the Presses, New on the Web

Recent additions to the shelves of Kerr Center publications include the 2010 buck test report (p. 8), 2010 variety trial reports for sweet potatoes and grafted tomatoes (p. 6), and a report on work with summer cover crops (p. 10).

In addition, 2010 student intern Seth Stallings has added a brief introduction to the topic, called "A Few Facts about Biochar," excerpted below. (Stallings' first publication on biochar, a bibliography titled "Exploring Biochar," was featured in the Fall 2010 issue of *Field Notes.* Both publications are available free from www.kerrcenter.com.)

Biochar is a term applied to any organic material or "biomass" that has been burned or charred with limited oxygen, as is done when making commercial charcoal for fuel. Biochar has promise as a soil amendment and a means of stabilizing and sequestering carbon.

Biochar in soils can help increase moisture holding capacity, improve fertilizer efficiency, increase organic matter, and improve habitat for beneficial soil microbes. These benefits are among the main reasons for the growing interest in making and using biochar.

Biochar is created by a chemical process called pyrolysis, in which material is heated in the presence of limited oxygen. There are various styles and designs of retorts for producing biochar, from small cooking stoves that produce biochar as a by-product, to large industrial models capable of producing biochar, bio-oils, and fuel gases, as well as electricity and heat.

A simple and low-cost retort suitable for gardeners and small farmers is the two-barrel nested retort of the sort tested at the Kerr Center.

Another reason for popular interest in biochar is its potential to sequester carbon. The carbon in biochar is remarkably stable and long lasting. Some advocates argue that it is one of the few good technologies available to reduce atmospheric carbon levels.

If prepared incorrectly, applied at improper rates, or made from contaminated feedstock, biochar can cause radical increases in soil pH, introduce toxins, and bind minerals that would otherwise be available to plants.

To help mitigate these hazards, clean feedstock should be used at the outset. When finished, biochar should be composted with manure and other organic materials before applying to the soil. Composting "charges" the biochar with nutrients, water, and beneficial microbes, so that it does not compete for these with crop plants when added to the soil.

George Kuepper and Seth Stallings making biochar, summer 2010

Kerr Center Updates, Virtually

The Kerr Center website is also blossoming with new content as programs continue to develop and add information. The horticulture and organics program pages have recently undergone a complete renovation to keep abreast of new work in those areas.

On the old theory that a picture is worth a thousand words, the newest features on the website are slideshows, allowing visitors to get a visual idea of current projects. The main horticulture/organics page, and the organic system design page both feature new slideshows.*

Would you like to receive *Field Notes* in your inbox instead of your mailbox? Visit www.kerrcenter.com to sign up to receive *Field Notes,* along with periodic updates about Kerr Center programs and notices about upcoming events, via email.

If *Field Notes* just doesn't come often enough to satisfy your craving for the latest information in sustainable agriculture and goings-on at the Kerr Center, drop by the Kerr Center's Facebook page*.

* Kerr Center Links:

■ ***HORTICULTURE/ORGANICS SLIDESHOW:***
http://www.kerrcenter.com/stewardship/horticulture.html

■ ***ORGANIC SYSTEM DESIGN SLIDESHOW:***
http://www.kerrcenter.com/stewardship/organic-system-design.htm

■ ***KERR CENTER on FACEBOOK:***
http://www.facebook.com/pages/Kerr-Center-for-Sustainable-Agriculture/179959438245

The Mysterious Pear

THE SECRETS OF THIS UNDERAPPRECIATED FRUIT ARE WORTH DISCOVERING

– Maura McDermott –

If you drive down an Oklahoma country road in the early spring when the first fuzz of green is spreading across the pastures, you may notice, here and there, a tall tree ablaze with white flowers.

If you look closer you might discover that it stands next to a falling-down barn or the foundation stones of a forgotten home. Later in the season, if you were to walk over to the tree, you would find it loaded with fruit.

These stately beauties are pears. These hardy, adaptable trees can bear fruit for 50, even 100 years, and along with jonquils and day lilies, often mark the site of old farmsteads.

We have such a tree on our farm near Checotah. It has been going strong since the mid-1960s, planted by the family patriarch, Luther Wood. In good years, the 25-foot tall tree produces 15-20 bushels of fruit and has never been sprayed or fertilized.

The fruit can be eaten fresh — both hard like an apple or after ripening in a paper sack for a week, where it softens and develops the sweet, distinctive taste of a pear. From late September until frost, family, neighbors and friends come to pick or pick up fallen fruit.

I ate my first fresh pear from that tree after we moved back to the farm in 1982. And like Eve, after her fateful bite of the apple, my world was changed (if not so dramatically). I wanted to know more about pears, the good and the bad. And I wanted to plant my own pear tree. Problem was, no one could recall the variety of the family pear.

continued on page sixteen

POSITIVES

Long lived

Productive

Can tolerate clay soils

Can be grown organically

Drought tolerant

Fire blight resistant cultivars available

Big, though semi-dwarf cultivars exist

Beautiful

NEGATIVES

Fireblight, which can devastate a tree

Vulnerability to late freezes

Messy

Can attract raccoons and other fruit loving animals

Pear trees with "high" fireblight resistance for Oklahoma

European
Comice
Harrow Delight
Magness
Moonglow
Seckel
Warren

Oriental Hybrids
Kieffer
Orient

Asian
Shinko

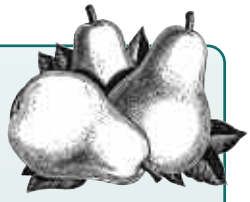
SOURCE:
OKLAHOMA COOPERATIVE EXTENSION SERVICE

So I began searching books and catalogs. In the process I learned a lot about the natural history of the pear, which some call the most glorious of fall fruits.

An ancient and venerable fruit

The pear is one of the two-dozen plants known to have been cultivated over 4,000 years. Dried pears have been found in Ice Age cave dwellings in Europe. In China, records show cultivation stretches back 3,000 years. In the *Odyssey* of Homer (9th century B.C. Greece), pears and apples grow in a magical orchard, and are ripe year-round.

The Romans too were crazy about pears, preferring them stewed with honey. King Charlemagne (900 AD) went so far as to command his orchardists to grow varieties of pears for fresh eating, cooking, and storage. Both Shakespeare and Leonardo Da Vinci wrote about them (though Shakespeare was disparaging).



Pear Fun Facts

- Pear leaves were smoked in Europe before tobacco was introduced
- In Spain, Esto *es la pera* (This is the pear!) describes a particularly wonderful experience.
- Apples, when placed carefully in water, will float; pears will sink.
- Pears are high in vitamin C and fiber and have a mild laxative effect. Hence the name Lightning given to one variety.
- Some perry pears (varieties used in making perry — hard pear cider or sparkling wine) are known for their picturesque names — example, Merrylegs and Mumblehead.
- Lizzie Borden, the accused axe murderess of Fall River, Massachusetts, used pears as an alibi. At the critical time when her father was being murdered she testified that she was in the barn eating three pears from her backyard tree. She was acquitted.
- Perry pear trees can live to a great age, and can be fully productive for 250 years.
- The largest pear tree recorded, in England in 1790, reportedly covered three quarters of an acre and yielded 5-7 tons.
- In Japan, it is a tradition to plant pear trees at each corner of a dwelling to ward off evil spirits.

Domesticated pears can be divided into two main groups: European (*Pyrus communis communis*) and Asian (*Pyrus pyrifolia, serotina, ussierensis*). What most people think of as a pear is the European pear, which is pear-shaped or pyriform. It ripens only after harvest and is best when the flesh is soft.

The Asian pear, which is round, ripens on the tree. It is crisp like an apple, hence its nickname of apple-pear.

A third type of pear, the Oriental hybrid, is a cross between the Asian and European. It is a more recent development and combines characteristics of both.

Both the European and the Asian types have been cultivated from ancient times and in countries across the northern temperate zone from England to Japan. Pear cuttings were brought to the American colonies from Europe in the 1700s. While many acres of Asian pears have been planted in the last few decades, most pears grown in the US are the European type, and some writers refer to these as "true pears."

In 1867, one French writer identified 900 varieties in Europe, with 3,000 names. The Bartlett, perhaps the most famous pear in North America, is a good example of a pear with more than one name. It was actually originally called the Stairs pear. The variety was discovered in England in 1765 by a school teacher named Stair.

Then a horticulturist named Williams promoted the variety and it became the Williams pear. For reasons now obscure, *bon Chrétien* (meaning "good Christian") was tacked onto this name, making the pear *Williams bon Chrétien.*

At the very end of the 1700s, the *Williams* trees were imported into the US and planted on a farm in Roxbury, Massachusetts. The farm was eventually purchased by a man named Enoch Bartlett who, not knowing that the pears already had a name, promoted the variety under his own name. Only in 1828, when a fresh batch of *Williams* trees arrived from England, was it realized that the pears already had a name, but by then *Bartlett* had stuck in North America.

Today, several thousand varieties of pear exist, though like many modern fruits, only a tiny fraction of these are grown commercially. European varieties such as *Bartlett, Bosc, Anjou,* and *Comice* and Asian varieties such as *20th Century* and *Chojuro* are commonly found in stores. Many others are available to the home gardener.

Kieffer pears turn yellow when ripened on the kitchen counter or in a sack.

The problem with pears

You would think with this lengthy and distinguished history, pears would be more popular than they are. Today the worldwide production of pears at 20 million tons is only ¼ that of its cousin the apple. The United States in #3 in pear production (after China and Italy) but here too the pear takes a backseat to the apple. In any given year, only half the people in the country eat pears, and when they do, it's just one or two.

Why is the pear out of fashion? In one survey people expressed confusion over just what to do with a pear. European-type pears must be picked at the right time and ripened after harvest, under the right conditions, to produce the perfect proportion of texture and flavor. In an age of instant gratification, pears are losers.

This is too bad, because pears are worth the patience it takes to fully appreciate them. Pears can be eaten fresh, made into pies and added to cakes, simmered into butter, pickled, poached in wine, baked with cloves, canned in sugar syrup, steeped in Southern Comfort, fermented into cider and sliced, simply, on a spinach salad, with blue cheese.

Those who have experienced the taste of a dead-ripe pear use adjectives like "luscious, honeyed, succulent, glorious."

Seems pears can make you gush.

Kieffer: it's a keeper

In Oklahoma peaches, strawberries and wine grapes have harvest festivals, but not pears. The lonesome trees on the abandoned home places stand unpicked, unheralded and unnamed.

Which brings us back to our mystery pear tree.

After leafing through catalogs I finally found a description of a variety that seemed to match Luther Wood's mysterious tree: "An old fashioned variety. Big. Hard. Gold with red blush. Tough skin. Flesh granular, coarse, yellow-white. Gritty. Juicy. Very hardy and disease resistant.

Kieffer. That's got to be it, I thought. I ordered a tree and planted it in the backyard.

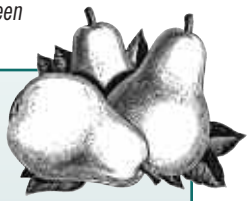
That was 25 years ago. After about ten years, the tree came into its own and we've been swamped with pears ever since.

The *Kieffer* is a survivor. In the mid 19th century, fireblight disease was introduced into North America, probably from imported ornamental pears. The disease, which makes the leaves look like they have been burned with a blowtorch, thrives in humid climates and devastated orchards east of the Rockies.

Around that time, Peter Kieffer, a nurseryman from the Philadelphia area, grew and sold a variety of Asian pear, the *Sand.* He also grew the *Bartlett.*

Among chance seedlings in his garden, Kieffer

continued on page eighteen



Check the Neck

European-type pears need to ripen after harvest. Tree-ripened pears mature from the inside out and get mealy or mushy before the outside is "done." Plus, the full flavor of pears develops through ripening off the tree.

As pears mature, they're easy to detach from the tree. Pick them when they snap off the tree when twisted upward. If you have to tug to pick a pear, it's probably not ready to harvest.

Store pears in a refrigerator or cold cellar at just above freezing. To ripen for eating, allow them to sit at room temperature for several days. Check by pressing the stem end, or neck, of a likely pear. When it yields readily, take a big bite and enjoy.

Fireblight can turn pear leaves black. Resistant trees can survive infection and bear fruit.

observed one that seemed to be resistant (though not not immune) to fireblight. This tree bore fruit in 1863 and the rest was fruit history. The *Kieffer* pear could be grown where other pears had succumbed to fireblight, and it quickly became popular across most of the United States. It was particularly suited to the South, where its early blooms were not so likely to be killed by frosts.

These pears grew to be at the heart of a . . . "pear culture peculiar to the South," notes one commentator, supporting here and there, off and on, for over 100 years, an industry of canning and preserving. Its unique flavor and texture, I learned, is part of the food heritage of the South.

The *Kieffer* pear came to Oklahoma with the first settlers. One hundred years ago, most farms had a family orchard, and pears such as *Kieffer* were a favorite because of how well they grew, how heavily they bore, and how easy they were to take care of. Their very survival so many years later attests to their toughness. Many old timers remember fondly those "big hard pears."

In Oklahoma, pears used to be grown as a cash crop. According to research done by the Kerr Center a few years ago, in 1930, pears were grown commercially on almost 30,000 (14%) of the farms in the state. By 1959, the number had plummeted to only about 3,000 farms. In 2002 it was down to about 150.

Pears were not the only crop to suffer such declines. As the numbers of family farms have declined, so has pear production. Many of the diversified farms of yesteryear, which often grew several cash crops and a little bit of everything for family consumption, morphed into farms specializing in one or two crops.

These days, Oklahomans don't grow many pears and they don't eat many either. Seventy percent of what we do eat is grown outside the state.

Pears for the pickin'

Most commercial pear production is in the dry valleys of Washington and Oregon, alongside apples, and demand has not risen over the last ten years.

That said, perhaps pears are overdue for a comeback. Pear production (at least on the home scale) has become more possible with the development of more fireblight resistant varieties. And with the advent of the Slow Food and Local Food movements, more folks may be tempted to sample fresh pears and learn how to handle them.

For budding orchardists, OSU Extension's bulletin: "Growing and Producing Pears in Oklahoma" lists ten varieties with high resistance to fireblight and covers the basics, including site selection, planting, pruning, thinning and other cultivation tips.

Experts advise would-be growers to be cautious, however, since demand is still low, fireblight has not disappeared, and European varieties, in particular, require such careful handling.

Despite these negatives, ATTRA, the national sustainable agriculture information service says, "In most of the U.S. pears may be the easiest of the tree fruits to produce organically or with minimal spraying. Pears' fertility requirements are not high, they are adapted to a wide range of climates and soils, and they have fewer pest problems than other tree fruits."

My experience bears this out. While our tree has had two bouts with fireblight over the twenty-five years, in each case, the disease remained confined to just a few limbs and didn't impact the overall health of the tree. Otherwise, the tree has been pest free. Occasional late freezes have been our worst problem, and can completely wipe out that year's crop.

While reading up on pears for this article, I noticed that my tree, the old-reliable *Kieffer* has been bumped from the top of the list of desirable trees by up-and-coming varieties. These newer fireblight resistant cultivars are also considered to be of "fine dessert quality," i.e. very good to eat fresh. Those who have an opinion say that *Kieffers* are better for canning and cooking, and are a little below par for the discerning modern pear eater. As one writer put it, the *Kieffer* does not attain the "melting flesh" of dessert-quality pears.

Maybe so. Still I find a ripe *Kieffer* pear melts pretty fast in my mouth.

Pears of any type, in my book, are worth a try. As one admirer, De Sires, the father of French agriculture, wrote in 1608 —

> *"There is no tree among all those planted which abounds so much in kinds of fruits as the pear tree, whose different sorts are innumerable and their different qualities wonderful . . .*
>
> *Pears are found round, long 'goderonnees' pointed, blunt, small, and large. Gold, silver, vermilion, and satin green are found among the pears. Sugar, honey, cinnamon, clove, flavor them. They smell of musk, amber, and chive. In short, so excellent are the fruits that an orchard would not be worthwhile in a place where pear trees do not thrive."*

My sentiments, exactly.

Resources

- ***For the true pear geek:*** www.facebook.com/USApears
- ***Growing:***

  Spring and fall are pear planting seasons. Check your local nursery for trees or search online.

  "Growing and Producing Pears in Oklahoma," Oklahoma Cooperative Extension Service, HLA-6257, available online or from county extension offices.

  "Organic Pear Production," National Sustainable Agriculture Information Service, http://www.attra.ncat.org, 800.346.9140

- ***For astonishing recipes,*** including celebrity pear faves: http://www.usapears.com/Recipes%20And%20Lifestyle/Now%20Serving/Recipes.aspx
- ***Enthusiasts:*** The North American Fruit Explorers, Southern Pear Interest Group, www.nafex.org/index.htm
- ***Fun Reads:***

  "Pear Harvest" by Dooly Barlow, Noble Foundation, www.noble.org/Ag/Horticulture/PearHarvest/index.html

  "The Pear in History, Literature, Popular Culture, and Art" by Jules Janick, Purdue University www.hort.purdue.edu/newcrop/pearinhistory.pdf

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Calendar: Spring/Summer Events

WORKSHOP: Hoop Houses

April 2 (register by March 21);
April 16 (register by April 6) – Poteau

Learn about hoop houses, and get some hands on experience building a low-cost version. Participants will go step by step through the process of building a 100' by 17' hoop house — from bending the hoops, to pounding stakes, to throwing the plastic over the hoops and securing it with ropes. (See p. 2.)

WORKSHOP: Healthy Soils, Healthy Livestock

April 8-9 (register by March 29) - Poteau

Ray Archuleta will lead off this two-day workshop with a discussion of soil and pasture assessment and soil health. Ray's passion is applying ecological principles to agricultural systems to use and improve the most amazing resource we have: the soil. The workshop will show ranchers how to use management intensive grazing as a tool to improve the health of both their soil and their animals.

Archuleta has over 25 years of experience with the NRCS, most recently as a member of the Soil Quality Team. He is a Certified Professional Soil Scientist with the Soil Science Society of America. He will be joined by Dr. David Sparks, D.V.M., and Brian Freking, both with the Oklahoma Cooperative Extension Service, along with Andy Makovy, Mary Penick, and Dr. Ann Wells, D.V.M., from the Kerr Center.

Specific topics to be covered include soil health concepts, goal setting, introduction to management intensive grazing, hands-on animal assessment, cowboy arithmetic and pasture allocation, layout and design of grazing systems, water systems, and genetics for grazing (with an emphasis on Pineywoods Cattle). Material will be presented both in an indoor classroom setting and outdoors in pastures on the Kerr Ranch. (See p. 3.)

Would you like to receive *Field Notes* in your inbox instead of your mailbox?

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WORKSHOP: Pond Management

May 26 (register by May 16) – Poteau

This workshop will cover management and use of recreational ponds, along with fish stocking. (See p. 13.)

DEADLINE: Nominations for Meat Goat and Hair Sheep Forage Performance Tests

June 24

Nomination forms are due on this date from goat producers wishing to test their bucks' performance on forage in the "buck test" conducted by the Kerr Center and the OSU Cooperative Extension Service. For the first time, this year hair sheep producers are also invited to enter their rams in a separate but concurrent test. (See p. 8.)

For a preview of some late summer and fall events at the Kerr Center, see p. 6, and visit the online events calendar at www.kerrcenter.com.