Plant Science Says

Happy Valentine's Day!

Volume 15, No. 1 February, 2012

Jacobsen Wins Award

MSU President Waded Cruzado and Barry Jacobsen

Barry Jacobsen was selected to receive the Meritorious Technology/ Science Award for 2011. This is a prestigious award that was established to recognize an MSU faculty member who made one or more significant technological/ scientific contributions which will likely transfer or has *already* transferred to the private sector, and that have the potential to be or already are useful products or processes impacting the Montana or United States economy.

Congratulations Barry!

Meet the New Post Farm Manager

My name is David Gettel. I come from a multigenerational farm near Power, Montana. Power is a small town on Interstate 15 about 25 miles northwest of Great Falls. I started driving and running farm equipment at the age of eight. I graduated from Power High School in 1970 with ten other boys and four girls. The next fall I started college at Montana State University. I graduated with a Bachelor of Science Degree from the College of Agriculture in 1974. My option (that's what they called it in those days), was in Recreational Area Management. We studied the science and methods of building parks, golf courses, campgrounds, landscape design and land use management. My course work included plant materials, horticulture, soil science, botany, and both organic and inorganic chemistry. After college, I was a farm manager for a large farm north of Great Falls for a couple of years and for the last 36 years I've been involved with our family farm with my parents and my brother and his family. Together we farm about 6,000 acres and grow many different crops including winter and spring wheat, barley, canola, mustard, flax, peas, and lentils.

My wife, Patti, and I were married in 1982. We have been blessed with four children, three girls and a son. Lynsie, our oldest, graduated from MSU with a degree in graphic design. She now lives and works in Bozeman. Our second oldest, Rose, also graduated from MSU with a landscape design degree from the College of Agriculture. She was married this past fall and will soon be moving to Indiana. Grace, our youngest daughter, has also attended MSU and is currently living and working in Bozeman. Rudy, our youngest is currently a sophomore at Bozeman Senior High which is quite different from Power High School with only about 55 students. He is currently learning about the ups and downs of snowboarding. The past couple of years, Patti and I were looking for an opportunity to do something new and different. Patti informed me that the position of Manager of the Post Farm was available. The rest is recent history. We are excited to be here. I have many old friends from college that are still in Bozeman and I really like Bobcat Football and being associated with the

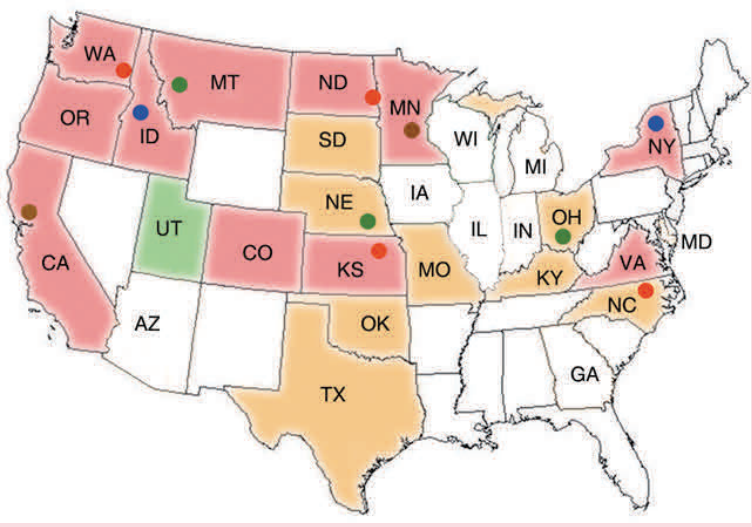
university. Patti and I enjoy the cultural activities that are available here and I also enjoy the outdoor activities, including back country skiing, hunting and fishing. Keep in mind that every hour you fish adds a day to your life. Although I am just learning my new job, I am really excited to be working with MSU and MAES and meeting the many nice people that are involved with my job. Everyone that I've met and worked with is happy and warm towards me and it really means a lot. I'd like to invite you all to come out to the Post Farm for a visit.
Sincerely, Dave Gettel (Getts)

T-CAP
The following two articles are an update on the T-CAP Project.

Triticeae CAP

USDA United States Department of Agriculture National Institute of Food and Agriculture

The Triticea Coordinated Agricultural Project (T-CAP) funded by USDA-NIFA has a primary goal of improving barley and wheat germplasm for changing environments. The T-CAP includes 56 participants at 28 institutions in 21 states. Both Luther Talbert and Tom Blake are participants. The T-CAP is an integrated project with the educational goal of training the next generation of plant breeders. The education team is led by Jamie Sherman.



TCAP – Significant Progress in Year 1
By Gary Muehlbauer (UMN)
As TCAP approaches the end of the first year of funding, we are providing an update of the tremendous progress that has been made on all of the original objectives: (1) Discover and deploy beneficial alleles from diverse wheat and barley germplasm; (2) Accelerate breeding through marker-assisted selection and genomic selection; (3) Implement sequence-based genotyping methodologies to discover new allelic diversity; (4) Implement web-based tools to integrate marker-assisted selection and genomic selection strategies into breeding programs. (5) Develop and implement a Plant Breeding Training Network to train the next generation of plant breeders (see Education review page 7).

Research Update
The overall research goals of the project are to phenotype and genotype diverse barley and wheat germplasm pools to discover and deploy alleles that improve yield under biotic and abiotic stresses, and to use genetic markers to rapidly deploy favorable alleles and accelerate breeding cycles.

Phenotyping
Phenotypic characterization of the barley and wheat National Small Grain Core Collections (NSGC) to various pathogens is progressing nicely. One thousand lines of the wheat NSGC collection were evaluated for stripe rust, leaf rust and stem rust. 1050 lines of the barley NSGC collection were evaluated for resistance to spot blotch and spot form of net blotch. These data will be used to identify novel genes for resistance and as sources of resistance for breeding programs.

One key aspect of the TCAP is to develop and utilize high-throughput phenotyping of climate-change related traits such as water use efficiency (WUE) and nitrogen use efficiency (NUE). To standardize WUE and NUE phenotyping we chose to use Canopy Spectral Reflectance (CSR) technology. The first drought experiments confirmed the usefulness of CSR to detect differences in drought tolerance among

wheat cultivars and isogenic lines. Near-isogenic lines for potential drought tolerance QTL were investigated in rainfed and irrigated environments. 540 wheat accessions from the NSGC were evaluated for WUE and NUE. These data will be used to map genes conferring NUE and WUE.

Nested Association Mapping Project for Spring Wheat
By Luther Talbert and Nancy Blake

An important goal of the T-CAP grant is to access genes from landrace accessions in the National Small Grains Collection to improve modern wheat varieties. The landrace accessions themselves are inferior to modern varieties for both agronomic and quality characteristics. However, there are many good genes hidden amongst the undesirable ones in these ancient varieties. The process of nested association mapping (NAM) was developed by the maize community to allow identification of favorable alleles from a diverse germplasm set (Yu et al., 2008). NAM combines the advantages of traditional linkage analysis with association mapping, providing higher resolution and power. Steps in NAM include 1) Creation of a set of inbred lines using diverse founders crossed with one common parent, 2) Dense genotyping of parental lines, 3) Less dense genotyping of progeny, 4) Phenotyping of progeny, and 5) Statistical analysis identifying marker-trait associations.

T-CAP is developing a spring wheat NAM population by crossing a genetically diverse set of 25 landraces to a common parent, named Berkut. Berkut was developed by CIMMYT for drought-stricken areas around the world. Extreme height and photoperiod sensitivity in the landraces make them difficult to phenotype in many of the target environments for the T-CAP. Among the genes that differentiate Berkut from the landraces are ones for semidwarf growth habit and photoperiod insensitivity. Thus, our strategy is to select, based on phenotype, a set of 100 F4 plants from each cross that are photoperiod insensitive and have semidwarf growth habit. Recombinant inbred lines derived from these plants will be phenotyped by T-CAP participants throughout the spring wheat region of the United States. In addition, all lines will be genotyped by the USDA Genotyping Laboratories, and linkage analysis will be conducted to identify favorable alleles from the landraces that can be incorporated into our variety development programs.

At the present time, we are growing F3 plants from over 30 crosses of landraces by Berkut, as well as about a dozen crosses involving local varieties and drought-tolerant lines from other sources. We began the inbreeding process with about 800 F2 plants per cross, and are selecting in the F2 and F3 generations for lines we think are either homozygous or heterozygous for the gene conferring semidwarf habit. Our goal is to test approximately 400 F4 plants per cross under 12-hour days in growth chambers in spring 2012 to identify 100+ recombinant inbred lines that are both photoperiod insensitive and semidwarf. The Dubcovsky lab also has population development underway with lines that have shown potential in California, all crossed to the common parent Berkut. The number of final populations to be tested may be revised based on results from parental genotyping.

Our goal for the Berkut NAM populations is to have the genotyping completed for all lines by 2013 and to have sufficient seed available for phenotyping in the field in 2014 and 2015. In addition to the crosses with Berkut, we are also crossing each of the landraces with the variety Clear White. Clear White is a variety from California that has shown good performance in several places, including Montana. Following the procedure proposed by Pumphrey et al. (2007), and modified by Blake et al. (2011), we will use these populations to develop near-isogenic lines to confirm any important QTL identified in the Berkut populations.

The final stage of the project will be to cross the beneficial genes identified from the landraces into elite breeding material for incorporation into new varieties for spring wheat producers.

References
Blake NK, Stougaard RN, Weaver DK, Sherman JD, Lanning SP, Naruoka Y, Xue Q, Martin JM, Talbert LE (2011) Identification of a quantitative trait locus for resistance to *Sitodiplosis mosellana* (*Gehin*), the orange wheat blossom midge in spring wheat. Plant Breeding 130:25-30

Pumphrey MO, Bernardo R, Anderson JA (2007) Validating the *Fhb1* QTL for Fusarium Head Blight Resistance in Near- Isogenic Wheat Lines Developed from Breeding Populations. Crop Sci. 47: 200-206.

Yu J, JB Holland, MD McMullen, Buckler, ES. 2008. Genetic design and statistical power of nested associate ion mapping in maize. Genetics 178:539-551.

Kenya and Striga
By David Sands

Try, if you will, to understand the dire dilemma of 55 women in Maseno Kenya, 2005. Their husbands are gone (a combination of HIV, malaria etc.), and they are left holding a small farm. They needed to grow corn, and they haven't a hoe. *Striga hermontheca*, a parasitic weed that attacks and sucks the energy out of corn, millet and sorghum, limits their yield as much as 30-90% (see table). Then Florence Oyosi, an agronomist, leads them in a community based organization (CBO). They are instructed to use compost, good seed, fertilizer (manure and/or diammonium phosphate), and to weed out the striga. At that point in time (2007) we entered the picture, finding a striga pathogen, *(Fusarium oxysporum* fsp *strigae) and* tested it in community plots maintained by Florence's farmers. They determined how and why to plant with the fungus. Yields have gone up, and the farmers have transferred the technology to their farms. They used an easy way to transfer the fungus (on a toothpick with fungus on it, tossed into a pot of boiled rice, and left it at room temperature for three days). They measured the results and scientists with the Kenyan government took notice and are helping them register the fungus. This project empowers them to produce a reliable crop and to start on the road to self sustainability.

Table 1. Sub-Saharan African countries with the highest food production losses to Striga (Gressel et al. 2004)

Country	Yield loss (%)*	Yield loss ('000 tons)
Burkina Faso	35-40	710-820
Ghana	35	170
Kenya	35-40	50-60
Mali	40	580
Niger	40-50	930-1,160
Nigeria	35	3,750
Sudan	30	1,230
Tanzania	up to 90	550
Africa	**39-45**	**8,110-8,520**

White Bran Verses Red Bran
By Petrea Hofer

Thanks to all who helped evaluate four bread formulations during the first week of January. The reason for the study was to test whether consumers could detect taste differences between whole wheat breads made using either white or red bran. We were able to conduct this study because Jamie Sherman created red and white bran isolines in the varieties Choteau (MSU Spring wheat

variety) and Hank (Westbred Spring wheat variety) and also because the Montana Board of Research and Commercialization Technology funded Luther Talbert's proposal on the topic. The major point of the funded research was to test for quality advantages of white over red wheat and to develop white seeded versions of some popular varieties.

It has long been supposed that white seeded wheat tastes better than red seeded wheat but without isolines that really is just speculation. The seed color in wheat is controlled by the R loci. When all three R loci are in recessive condition the seed color is white. Most wheat varieties grown in the Northern Great Plains are red. White flour may have some advantages to millers in allowing them to more easily produce a light colored product (like WonderBread). Also, when you buy whole meal flour that is from a red or white seeded variety you typically may be buying low protein white wheat (not from Montana) and high protein white wheat (maybe from Montana). Protein and starch have distinct flavors of course and so increasing protein content would likely impart a stronger (more wheat-like) flavor. I often try to include whole wheat flour in things that I bake and have found that whole wheat white flour imparts a sweeter taste, but that also might be just speculation. Setting up a taste test study was not totally trivial in that we needed to do all baking in the Nutrition Lab in Herrick Hall and obtain approval from the MSU Institutional Review Board. It turns out eating wholesome foods without additives are exempt from review, which is good news or our Friday morning coffee and goodies might have required a weekly review.

So, to test whether you all could detect white vs. red bran taste differences we started with Jamie's isolines and chose red and white isolines of Choteau and Hank that were relatively identical in protein content. The red and white wheats were milled and the straight grade flours (no bran) were mixed for Choteau and Hank and the bran fractions were kept separate. So, there were four bread samples for each of you to taste test.

1. Choteau – composite flour with red bran.
2. Choteau – composite flour with white bran.
3. Hank – composite flour with red bran.
4. Hank – composite flour with white bran.

Panelists were asked to rate the bread samples for sweetness, bitterness, moisture, and graininess and evaluated replicate bread samples on two different days. We were mainly interested in knowing if red and white imparted a flavor difference but were also kind of interested to know whether Choteau tastes better than Hank.

So…. the results (all of you) say that whole wheat breads made using white bran were significantly sweeter and less bitter than those made with red bran and that result was true for both Hank and Choteau. (Kind of surprising given that with the lights on, most people would not detect a significant difference between any of the samples.) There were no consistent differences between Hank and Choteau in terms of taste or preference. Given that we all have such different preferences, some like sweet and others bitter, there were no rank differences based upon bran color. The end product quality of red versus white flour will be further documented from bread and Asian noodle evaluations later this spring.

Again, thanks for participating and we would be glad to have you take part in future taste test studies. Now that we have the kitchen and dark room details worked out, future trials don't seem too daunting.

Photo Contest
By Mina Talajoor, Jay Kalous, and Duke Pauli

The barley and spring wheat breeding programs purchased Ocean Optics

spectrophotometers with funds through the TCAP this past summer. The spectrophotometers were used to measure canopy reflectance in hopes of providing a high throughput method for phenotyping plants in order to improve nitrogen use efficiency and drought tolerance.

Ocean Optics sponsors a global photo and video contest each year. Users can share how they use Ocean Optics instruments in their research, and winners will have their photos featured on the company's website as well as in future catalogs and advertisements.

This past summer, we spent an afternoon taking some photos of us using the equipment. We submitted them to the contest and were lucky enough to win! Following is the description we submitted along with the photo: "Agricultural production of food crops are not increasing at a rate fast enough to keep pace with the increase in population, so scientists must look for ways to create new 'Green Revolutions'."

Duke Pauli and Jay Kalous in winning photo

One of the ways to achieve this is to increase the resource efficiency of current crop varieties. Previous scientific work has demonstrated that the amount of light reflected off a plant is related to the amount of nitrogen and water it contains. In this photo we are taking measurements of the amount of light reflected off the canopies of the plants. By better understanding this relationship we can look to identify plants that are better able to use their resources. By using these plants in subsequent breeding projects, we are able to improve the overall capabilities of wheat and barley crops. This is an ambitious project, but we hope that stable food production systems can be put in place to help combat world hunger."

Kalous and Pauli Attend Plant and Animal Genome Conference

Jay Kalous: Recently I attended the 20th session of the Plant and Animal Genome (PAG) conference in sunny, San Diego, CA. One talk I found interesting was given by Dr. Jianming Yu, at Kansas State University. Dr. Yu presented some of the work that his lab was doing on the *Tan1* locus, which controls tannin production in sorghum and also may provide cold tolerance to sorghum seedlings. Dr. Yu talked about meta-QTL analysis for narrowing down the location of the *Tan1* locus. This analysis basically involved combining multiple bi-parental populations segregating for the trait of interest. I walked away scratching my head somewhat with respect to how the phenotypic data were combined if there were no parents in common between the populations.

Of course the trip wasn't all about work; in addition to the talks I was able to find my way to the beach in La Jolla. I'm 25 years old and this was my first time walking on the beach and looking out across the ocean. It was quite an experience, definitely something I will never forget.

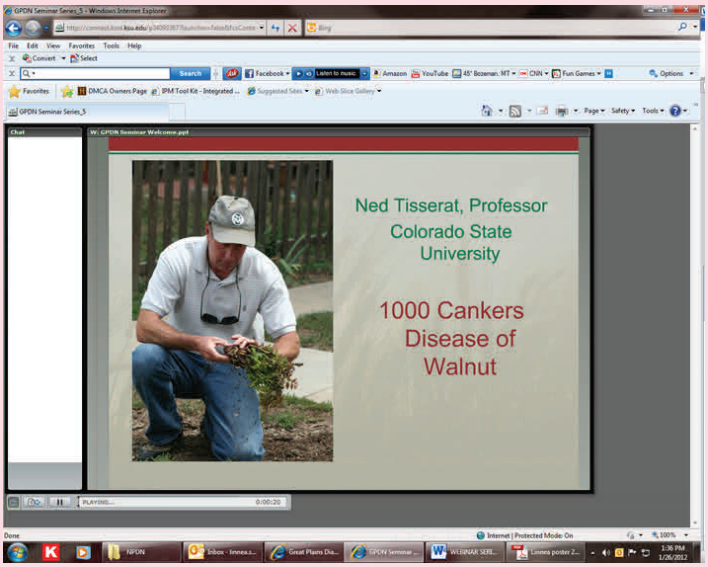
Duke Pauli: This past January I was fortunate enough to get to travel to sunny San Diego in order to attend the 20th annual Plant and Animal Genome Conference. Jay Kalous and I are part of the TCAP grant which also holds its annual meeting during this conference in order to take care of business and plan the upcoming year. It was extremely interesting to get to watch large collaborative science in action and to see how projects of this magnitude are managed. The more enjoyable part though was getting to attend the PAG meeting itself since there is so much diversity in what is offered in terms of talks. I tried to attend as

many talks on genomic selection as I could in order to better grasp this newly emerging technique and was able to meet some of the "pioneers" in the field. This was immensely beneficial and probably the most important part of the trip for me. It wasn't all work though; I got to see my best friend who lives down there and even got to further my skill on surfboard which I am sure was entertaining to watch.

Come Attend the 2012 Diagnostics Webinar Series
Linnea Skoglund

Each Spring Semester the Schutter Diagnostic Lab sponsors a webinar series in collaboration with the Great Plains Diagnostic Network. This year the series will start on February 22 and will run through April 18th. We invite everyone to attend. We will connect to the webinar in Rm 108 of Plant BioSciences Bldg. Webinars take place at 9:00 a.m. and run about 50 minutes. This year we have presentations on diseases, insects and some general topics of interest.

We start out the series with a presentation on evaluating the impact of our research projects. Dr. Marty Draper, National Program Leader for NIFA, will tell us what reviewers expect as documentation of outcomes of research projects. On Leap Day (February 29th), Dr. Howard Schwartz will discuss the accomplishments of the Onion ipmPIPE and the fate of PIPEs in general. Don't know what a PIPE is? Then come to the webinar. Later in the series, you can learn something about Spotted wing drosophila, a newly introduced pest that threatens fruit and berry crops in Montana. As part of our final webinar on bacterial diseases, Dr. Ned Tisserat promises to include some information on "Drippy Nuts" disease, first found in Boulder, CO. You won't want to miss this. Don't worry if you miss a webinar of interest or want to see it again. They are recorded and posted on the GPDN website (www.gpdn.org). Contact Linnea if you want to join the webinars from a different location.



SCHEDULE

February 22
Evaluating Our Impact - *Marty Draper*
National Program Leader,Plant Pathology - NIFA

February 29
Onion ipmPIPE - *Howard Schwartz*
Professor and Extension Specialist, Plant Pathology – Colorado State University

March 7
Zebra Chip - *Phil Nolte*
Extension Seed Potato Specialist – University of Idaho

March 14
Spring Break - none

March 21
First Detector Training - *Amanda Hodges*
Extension Specialist and Entomologist – University of Florida

March 28
IPM Retrospective - *Barry Jacobsen*
Professor, Plant Pathology – Montana State University

April 4
Spotted wing drosophila - *Amy Dreves*
Research and Extension Specialist-IPM Entomologist – Oregon State University

April 11
Rust Alternate Hosts - *Tim Murray*Professor, Plant Pathology – Washington State University

April 18

Bacterial Diseases: Xanthomonas translucens and Drippy Nuts - *Ned Tisserat*
Professor and Extension Specialist, Plant Pathology – Colorado State University

Class Focus
Andreas Fischer - New Class: BIOO 437 – Plant Development

After several years of 'absence' (some of you may remember that Rich Stout taught this topic when he was still with the department), 'Plant Development' is back! I am offering the class this spring, and will teach it every other year (alternating with BIOO 460, 'Plant Metabolism').
There has been incredible progress in our functional understanding of plant developmental processes over the last 10-15 years. Accordingly, I will focus on topics such as plant signaling pathways (including plant hormone receptors and hormone signaling), development of apical-basal and radial patterns during embryonic development, meristem maintenance and function, functional details of floral transition and the development of flowers. For a plant's reproductive (and evolutionary) success, it is critical to identify the optimal time point for the initiation of flowers. Accordingly, the mechanisms controlling this 'decision' have attracted a lot of attention, and finally (after a decades-long search… quite a fascinating story) led to the identification of 'florigen' during the last decade. As it is becoming clear that, at least in annuals, the regulation of flowering and senescence (my favorite subject) are linked, I will emphasize the progress which has been made with the identification of molecular, genetic and epigenetic controls of floral induction. Unsurprisingly (for those who know me), I will then also spend quite some time on the regulation of the plant's last developmental phase, senescence. The goal of the class is to provide students with a thorough understanding of basic plant development, and with an understanding of the most important molecular principles governing it.

As only four students have enrolled this spring, I hope that everybody will help to spread the word that this class, which covers central aspects of modern plant biology, is now available again.

Publications
Kalinina, E. B., L. Lee, B.K. Keith, and W.E. Dyer. 2011. Salt and osmotic stress-induced choline monooxygenase expression in Kochia scoparia is ABA-independent. (In press, Biologia Plantarum).

Keith, B.K., E.B. Kalinina, and W.E. Dyer. 2011. Differentially expressed genes in dicamba-resistant and susceptible biotypes of Kochia scoparia. (In press, Weed Biology and Management).

Al-Niemi, T., N.F. Weeden, B.H. McCown and W.A. Hoch. 2012. Genetic analysis of an interspecific cross in ornamental viburnum (Viburnum). J. Hered. 103:2-12.

W.A. Hoch and T.A.O. Dougher. Student Perceptions of Hybrid vs Traditional Courses: a Case Study in Plant Identification. North American Colleges and Teachers of Agriculture Journal. 55(4):8-13.

Invited Talks
Gary Strobel is shown here giving the

Keynote address at the British Society of Plant Pathology meeting held in Cambridge England on Dec 15 and 16th. Strobel discussed the value and importance of small molecules in plant microbe associations and how some of these substances have direct applications

to human activity and plant protection. He mentioned the discovery of such molecules, in his lab, as cryptocin (an antifungal agent), pestacin (an antioxidant), and ambuic acid (a potent quorum sensing inhibitor in bacteria). The main focus of his talk dealt with the discovery of volatile molecules made by *Muscodor* sp that have potent antibiotic effects and have potential uses in agriculture, medicine and industry.

Florence Dunkel

Florence was invited to speak at the following conference in Rome, Italy: Assessing the Potential of Insects as Food and Feed in Assuring Food Security. The conference was sponsored by the United Nations Food and Agricultural Organization. The title of her talk was "The use of insects as human and other animal food as a means of securing a sustainable source of protein for the human over-population of the Earth" .

Grants

William E. Dyer, Fabian Menalled, Eric Lenhoff, Barbara Keith, Bruce Maxwell, and Bob Peterson. USDA/NIFA/AFRI. 2012-2015. "Molecular, physiological, and ecological characterization of multiple herbicide resistance in Avena fatua." $500,000,

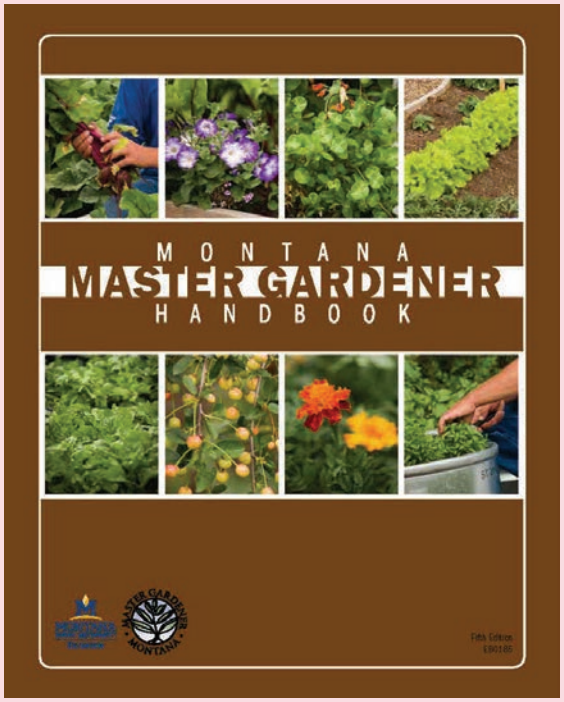
New Graduate Student
Afaf Nasser (Luther Talbert)

Debo Chiolero, Office of International Programs and Afaf Naseer at a Rotary Dinner

Hi, I'm Afaf Nasseer. I was born and grew up in Baghdad, Iraq. I received a master's degree from the College of Agriculture at Baghdad University on Biometrics in 2006. I worked in the State Board for Agricultural Research at the Ministry of Agriculture in Baghdad as a manager of the Sorghum section and a manager for the Genetic Bank for more than three years. Now I have a scholarship from my government to get my PhD. on Wheat at the Plant Science and Plant Pathology Department at MSU under my supervision, Dr. Luther Talbert.

New Montana Master Gardener Handbook
By Toby Day, Extension Horticulture Associate Specialist

The 5th edition of the Montana Master Gardener handbook is now available through MSU Extension Publications. The new and improved handbook, originally written by Dr. Bob Gough and later edited and revised by Cheryl Moore-Gough, was updated, edited and rewritten in 2011 so that it better followed the Master Gardener curriculum taught throughout Montana. The new edition of the handbook contains additional information on subjects including soils, nutrients, fertilizers, botany, vegetables, herbs, herbaceous ornamentals, tree and shrub identification and care, turfgrass management, growing fruit, composting, plant diseases, and entomology. The updated handbook also has a new and extensive glossary and Index. I am proud of and thankful for the help from Dara Palmer, Assistant Master Gardener Coordinator, Master Gardener Donna Knudson-Duff, the staff at Extension Publications and the PSPP faculty and staff that helped review many of the chapters.



With their help, the Master Gardener Handbook is more organized and comprehensive than previous editions. The Montana Master Gardener Handbook is available for $50 from Extension Publications at orderpubs@montana.edu or by calling 994-3273. Five dollars from each book sold will go to the Robert E. Gough "Dr. Bob" Endowment, benefitting horticulture students through scholarships.

USA Hardiness Zone MAPS (see last page for current zone map)
By Toby Day
The new USDA hardiness zone maps have recently been released. Now you can find your USDA hardiness zone by Zip Code at http://planthardiness.ars.usda.gov/PHZMWeb/

The 2012 USDA Plant Hardiness Zone Map is the standard by which gardeners and growers can determine which plants are most likely to thrive at a location. The map is based on the average annual minimum winter temperature, divided into 10-degree F zones.

For the first time, the map is available as an interactive GIS-based map, for which a broadband Internet connection is recommended, and as static images for those with slower Internet access. Users may also simply type in a ZIP Code and find the hardiness zone for that area.
No posters of the USDA Plant Hardiness Zone Map have been printed. But state, regional, and national images of the map can be downloaded and printed in a variety of sizes and resolutions.

Reducing the Size of a PDF
By Chris Leonti
You may want to reduce the size of your PDF. These steps don't work with every document and are just for Acrobat Pro X though there is a way to reduce the size in older versions.

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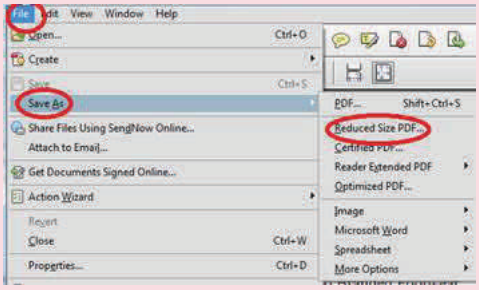
Click the FILE menu.
Highlight SAVE AS on the menu.
Click REDUCED SIZE PDF on the new menu.



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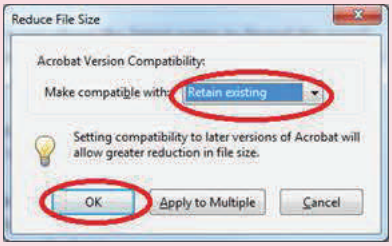

Choose a location and name for the reduced size file and click the SAVE button.
NOTE: You likely do not want to replace the original PDF unless you can easily recreate it in case the size reduction reduces the quality in a way you are not comfortable with.

Recipe of the Month
Popcorn Hearts

Measure out 8 cups of popped popcorn and set aside. Place the butter and marshmallow into a heavy saucepan; cook over medium heat, stirring continuously, until mixture is melted and smooth. Pour in the popcorn and stir until it is evenly coated with the marshmallow mixture. Press mixture firmly intoa butter 9x13 pan until it is pread out evenly; allow to cool completely.

Using a heart-shaped cookie cutter, cut the hearts out of the popcorn mixture. Place them on a piece of wax paper. If cookie cutter gets tickly while cutting out hearts, rinse it off under hot water, dry if off, and fnish cutting.
After the hearts are all cut out, melt the almond bark. Place it in the microwave and cook for one minute intervals, removing each time to stir.

Continue to cook at one minute intervals until the almond bark is completely melted. Once melted, begin dipping each of the hearts into the almond bark until they are covered completely then place the coated heart on wax paper . If cookie cutter gets sticky while cutting out hearts, rinse it off under hot water, dry it off, and finish cutting.

After the hearts are all cut out, melt the almond bark. Place it in the microwave and cook for one minute intervals, removing each time to stir.

Continue to cook at one minute intervals until the almond bark is completely melted. Once melted, begin dipping each of the hearts into the almond bark until they are covered completely; then place the coated heart on wax paper. Decorate the hearts as desired. You can use red string licorice and colored sugar as shown or some or sprinkles and cherry chips.

Note: To assure that the decorations stick to the hearts, you will want to add them before the almond bark completely sets up. You may want to coat 10 or 12 hearts and then decorate them, coating and decorating in batches. If the melted almond bark starts to thicken, just microwave it again for about 30 seconds.

February Birthdays

Jeffrey Johnston	2
Linnea Skoglund	10
Norm Weeden	12
Alan Dyer	15
Phil Bruckner	17
Zhaohui Hu	22
Pam Border	23

Lyrin Elizabeth Johnston

Jeff and Rachel Johnston are the proud parents of Lyrin Elizabeth. Lyrin was born on December 13, 2011, and weighed 6 lb 5 oz. She joins big brother Xander, 23 months.