Plant Science Says

Merry Christmas!

Volume 17, No. 11 The Department of Plant Sciences and Plant Pathology December, 2015

PSPP Christmas Party

The Departmental Christmas party will be on Saturday, December 12, at 5:30 p.m. at the Bozeman Senior Center. Dinner will be at ~5:45 p.m.; Santa will be showing up around 7:00 p.m. and after that you will have the opportunity to play Bingo.

Please bring a generous amount of one of the following to share: Hors d'oeuvres, a vegetable or potato dish, salad or dessert. The meat, rolls, and drinks will be provided. Please join us! Note: They do not allow alcoholic beverages as it is a city owned facility.

Crop Science Society of America Announces 2015 Award Recipient

This article is courtesy of the Crop Science Society of America

The Crop Science Society of America (CSSA) announces the following 2015 award recipient to be formally presented at the CSSA Awards Ceremony on 11-17-15 during the scientific society's International Annual Meeting, Nov. 15-18, 2015, Minneapolis, MN. The annual awards are presented for outstanding contributions to agronomy through education, national and international service, and research.

John M (Jack) Martin, Montana State University, Bozeman, MT – CSSA Fellow: Jack Martin is a Professor in the Plant Sciences and Plant Pathology Department, Montana State University, Bozeman. He received his BS degree in Agronomy and MS and PhD degrees in plant breeding from Iowa State University. Dr. Martin's highly collaborative research has focused on the action and interaction of genes that impact end product quality and agronomic traits in wheat. Specific accomplishments include determining the genetic basis of wheat grain texture and its role in milling and baking properties, the impact of polyphenol oxidase genes on Asian noodle quality, and the genetic basis for the solid stem trait which provides resistance to the wheat stem sawfly. He has co-authored 108 refereed publications. Jack teaches an undergraduate biometry course and a graduate experimental design course to wide audiences, and team teaches a plant breeding course. He also advises undergraduate and graduate students. He has been Associate Editor for Crop Science and Agronomy Journal.

Dr. Jack Martin was recently elected a Fellow of The Crop Science Society of America.

Fellow is the highest recognition bestowed by the Crop Science Society of America. Members of the Society nominate worthy colleagues based on their professional achievements and meritorious service. Up to 0.3 percent of the Society's active and emeritus members may be elected Fellow.

Congratulations Jack!

Strobel Awarded Lowell Thomas Award

This article is courtesy of the Bozeman Daily Chronicle

The Explorers Club has chosen Professor Gary Strobel, emeritus Professor at MSU, as one of the six recipients of this year's Lowell Thomas Award. He was honored in a unique category of awardees namely- "Visionaries of Conservation: Paradigm Shifts in Protecting the Planet". He was recognized on Saturday, November 7, 2015, at the Crowne Plaza Hotel in Melbourne, Florida, at a black tie event.

"I am totally surprised at being given the Lowell Thomas award", said Strobel. "I have been interested in issues involving conservation since I was a teenager growing up in an industrial town of Massillon, Ohio. In fact, I spent nearly all of my waking hours working towards the W.T. Hornaday award (for conservation) eventually given to me by the chief scout executive of the USA. It seems peculiar that I would start life thinking about matters involving conservation and finish my work in the same vein."

Forbes magazine called Strobel the "Indiana Jones" of fungi. He is considered by many to be the father of endophyte biology.

Endophytes live in the stems, leaves, fruits, flowers and roots of all plants. They contribute to the health and well- being of plants and many can benefit mankind as well as the earth and its environment. Strobel and his colleagues have carried out over 50 expeditions to every corner of the earth to find odd and peculiar endophytic microbes. Many of these organisms are new to science and Strobel along with his associates from around the world have described them. They also found novel and extremely interesting compounds made by these organisms including new anti-cancer drugs, antibiotics, antioxidants, immunosuppressive agents, antimalarial

Dr. Gary Strobel was recently awarded the Lowell Thomas Award

compounds, volatile antibiotics, anti -quorum sensing substances, and diesel -like compounds (fuels).

The Explorers Club was founded in New York City in 1904 by a group of the world's leading explorers of the time. With 3,000 members worldwide; it is a multidisciplinary, not for profit 501(c)(3) organization dedicated to scientific exploration of land, sea, air, and space by supporting research and education in the physical, natural and biological sciences. The Club's members have been responsible for an illustrious series of famous firsts: First to the North Pole, first to the South Pole, first to the summit of Mount Everest, first to the deepest point in the ocean, and first to the surface of the moon.

Congratulations Gary!

PSPP Celebrates Fall 2015 Graduation
By Jill Scarson

The College of Agriculture will host a graduation reception in 125 Linfield Hall from 4:00 to 6:00 p.m. on Friday, December 11, honoring the College's Fall 2015 graduates. Appetizers and refreshments will be served and all College of Agriculture faculty and staff are invited to attend. A program celebrating the graduates will begin promptly at 4:30 p.m.

Graduates from Plant Sciences and Plant Pathology will receive the following gifts:

Landscape Design and Plant Biology graduates- "The Artful Garden: Creative Inspiration for Landscape Design"; Sustainable Crop Production graduates- "Weeds of the West"; and Horticulture Science graduates- loupes (magnifying glass). All the graduates will receive a cowbell from the College of Agriculture, a coffee mug and a carabineer.

The Fall 2015 Commencement Ceremony will begin at 10:00 a.m. on Saturday, December 12, in the Brick Breeden Fieldhouse. Following are the names of all the PSPP graduates.

Congratulations to each of you and we wish you the best in all your future endeavors!

Undergraduates:

Environmental Horticulture- Horticulture Science
Caitlyn Foley
Easton Volz
Tyler Woodward

Environmental Horticulture- Landscape Design
Joshua Brewer

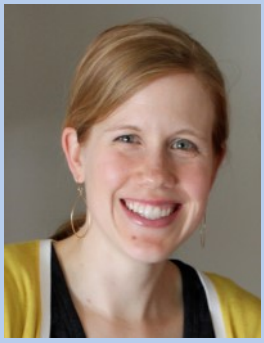
Plant Sciences- Plant Biology
Eric Freyer

Sustainable Food & Bioenergy Systems- Sustainable Crop Production
Anna Carlson
Benjamin Clark
Ben Dhiman
Erin Eisner
Madilynn Honnold
Durc Setzer

Grad Students:

Doctorate in Plant Science- Plant Genetics
Andrea Varella
Masters in Plant Science
Erin Gunnink Troth

Service-Learning Landscape Design Project at Gallatin County Fairgrounds
By Rebekah VanWieren



Senior landscape design majors in HORT 432: Advanced Landscape Design participated in a service-learning project looking at sustainable site design ideas for treating stormwater runoff before it reaches Bozeman Creek. On November 17, they presented their conceptual site design solutions at the Gallatin County Fairgrounds Board meeting. The Board decided to hold their monthly meeting at MSU for the first time, and the event drew students, faculty, and staff from a range of College of Agriculture departments and the Bozeman community.

Students helped two community partners, the Gallatin County Fairgrounds and the City of Bozeman Stormwater Program, envision site designs for an improved parking lot, fairgrounds entrance, and a stormwater treatment area on the southeast corner of the Fairgrounds property. Some overarching themes of the studio project were to design the site in a way that connects people to our watersheds and plant ecosystems, makes urban hydrology visible above ground, utilizes landscape-focused solutions to treat stormwater, and provides opportunities for education. The larger stormwater treatment area would also help reduce non-point source pollutants generated from impervious surfaces in the northeast neighborhoods south of the site. If this project moves forward, it has the potential to be one of the first few in the state, leading the region in landscape-solutions to stormwater management.

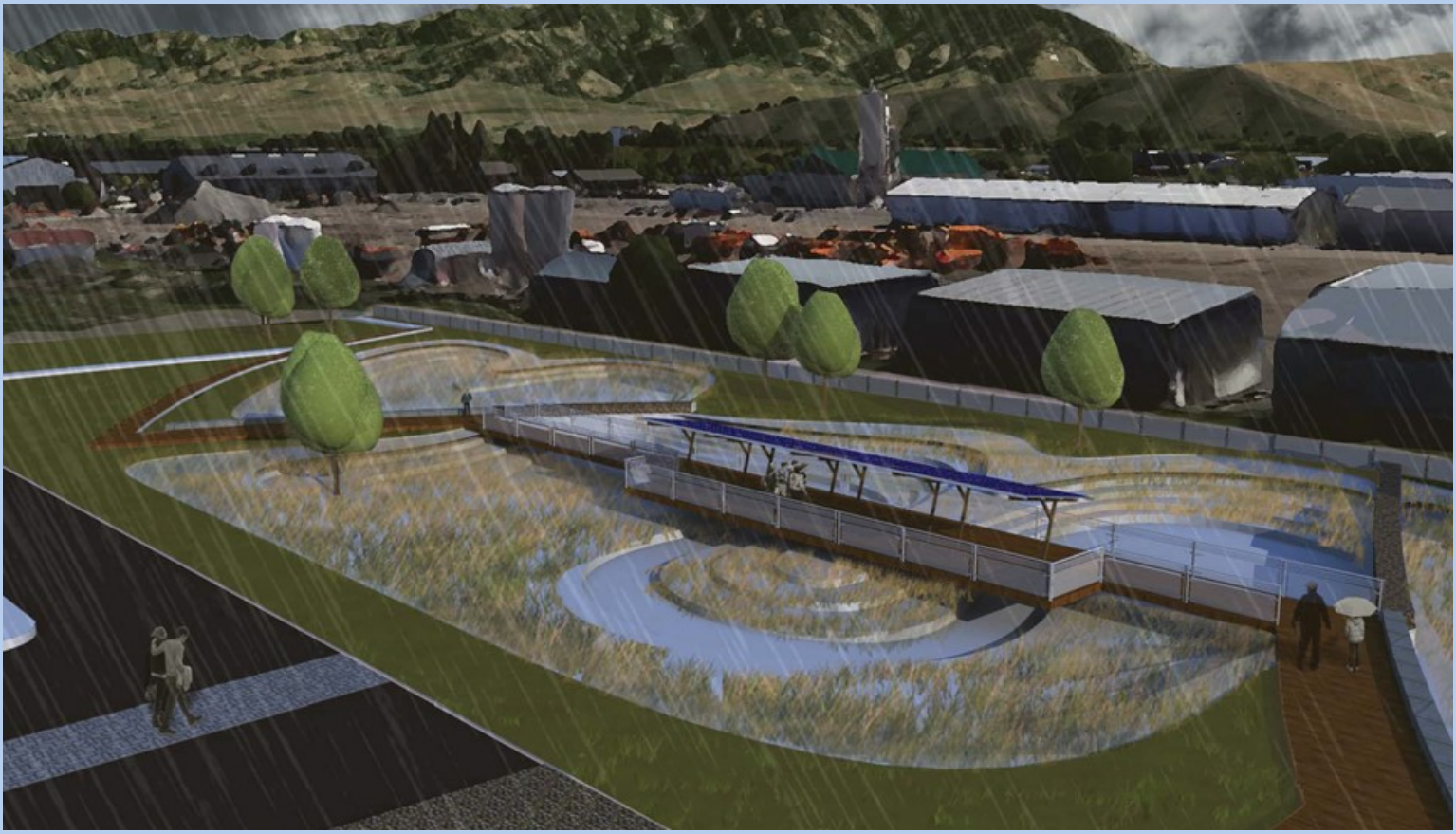
This project required students to draw on previous courses in planting design, landscape graphics, horticulture, and, especially, site engineering. One of the most rewarding aspects of teaching this studio is to see when students effectively utilize the multiple lenses and skills they've acquired in these previous courses to critically analyze a new project

HORT 432 students presenting at the Gallatin County Fairgrounds Board meeting.

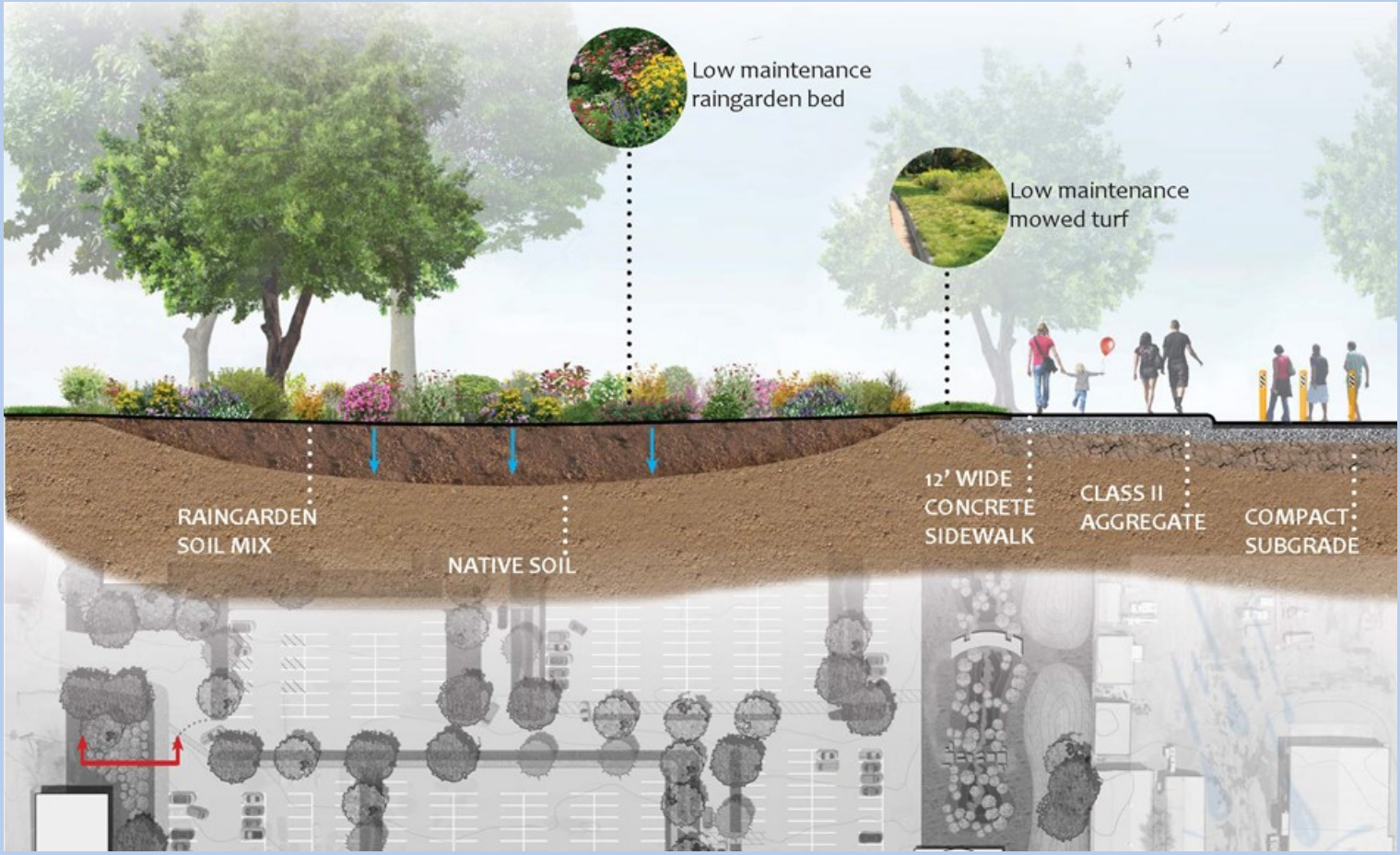
context. In addition, this semester, the City of Bozeman Engineering, Utilities, and GIS departments helped the students navigate some more complex land cover and civil engineering computations.

As part of this semester-long project, students have had the opportunity to practice their design processes in a real-work context while helping our local community. Not only do students learn and apply new knowledge in master planning and site design-scale projects, they build skills in verbal and written communications, project timelines, meeting facilitation, professional presentations, and strategies in meeting multiple client goals. I was particularly impressed with students' self-motivation in identifying and contacting project stakeholders and product manufacturers to gather information for a successful project.

Following the public presentation, students have now been working on a conceptual cost estimate and a written letter to the project partners addressing how operations, maintenance, and stewardship are essential for the project's long-term success. The student's completed design work will be posted in the landscape design studio hallway and all are welcome to come take a look – we are located in the basement of Linfield Hall, off the loading dock along 11th Street! Finally, a big thank you to all those who attended the student presentations in November, and to the project partners.



Stormwater treatment amenity representation, Kyle Anderson, senior landscape design major



Gateway rain garden representation, Josh Brewer, senior landscape design major

Montana Seed Potato Seminar
By Susie Siemsen

From the first Montana Seed Potato Seminar in Deer Lodge in 1965, to celebrating the 50th seminar on Nov. 4 & 5, 2015 in Missoula, families of Montana seed potato growers, seed buyers, and industry representatives gathered together to acquire information, conduct business, mingle at a trade show, and have a good time. Bill Cottom, Herb Koenig, Don Lake, and Roy Lake, with their families, were privileged to have attended the 1st seminar as well as this 50th seminar. A book entitled "A History of Montana Potato Farms" recounts times past and present for 20 farms. Montana growers acknowledged the Washington state growers for their role in keeping Montana seed a viable industry.

Starting off with industry news, Nina Zidack, Director, discussed the growth and harvest of the 2015 seed potatoes. Dan Lake, the 2015 National Potato Council President, updated the attendees with national issues. Dan was able to host the summer meeting of the NPC in Kalispell, as well as provide a tour of his farm in Ronan, complete with pitch fork fondue.

The Potato Industry Leadership representative from Montana, Bridgett Cheff, thanked the growers for electing her to participate in the program, where future leaders are trained and educated with tours of farms, processing plants, storage and fresh pack facilities with new technologies, and finally with public policy meetings in Washington D.C. with Montana representatives. Blaire Richardson of the United States Potato Promotions Board, as well as Mike Telford of the United Potato Growers of America, discussed the supply and demand for potatoes and consumer trends. Various chemical technologies and equipment were presented in the afternoon. The keynote speaker, Jolene Brown, is a "true Farmer Brown". As a co-owner and

active partner of an Eastern Iowa corn and soybean farm, she humorously presented "The Positives of Passing It On", as well as the "Wrinkles of Wit and Wisdom". Between laughing at farm humor involving spouses going to town to pick up parts, and driving big equipment with modified gas pedals or brakes, Jolene emphasized the serious side of running a business with family and passing the farm on. Mike Sun, retired Director, recalled the prominence of past certification staff, first generation growers in Montana, and veterans from the industry or research professions who were instrumental in developing Montana's excellent seed potato industry. Nina Zidack; Mel Martin of Martin Potato Consulting in Moses Lake, Washington; Rich Novy of USDA-Agricultural Research Service in Aberdeen, Idaho; Robert Thornton, Professor Emeritus at Washington State University in Pullman; Mark Pavek, Washington State University at Pullman; Walt Stevenson, Emeritus Professor at University of Wisconsin-Madison and Amy Charkowski, Wisconsin Seed Potato Certification administrator at University of Wisconsin-Madison presented past and future perspectives in facing the new challenges in the industry involving certification, potato varieties and breeding, history of improvements, problem solving in the past, research to improve industry, as well as how to keep on top of plant diseases. The overall take home message was that production and disease problems in the past couldn't have been solved without growers working hand in hand with land grant universities, crop improvement associations, research stations, certification agencies, and chemical and innovative equipment technologies. The entire agriculture industry, which accounts for only 1% of the population, is feeding the world. While extremely efficient, this small group of voices must continue to work to uphold their successful accomplishments.

2016 MSU Crop and Pest Management School
By Kevin Wanner

Enrollment is limited; register now for the Crop and Pest Management School (CPMS) held at Montana State University January 5-7, 2016. The two and a half day workshop will focus on Forage and Pulse Crops. MSU Extension Specialist Dr. Emily Glunk has organized a day of forage crop topics, a new and exciting addition to the topics covered by the CPMS. This schedule has three guest speakers. Dr. Earl Creech, Assistant Professor of Agronomy at Utah State University will provide two lectures on forage crop management and Dr. Pierce Paul, Associate Professor of Cereal Pathology from Ohio State University will join us to provide two lectures on disease epidemiology and management. Dr. Kevin McPhee, the Pulse Crop Breeder at NDSU, will also be speaking. A hands-on practical session will feature beneficial insect identification from samples collected from alfalfa crops during the 2015 growing season. Topics in plant breeding and weed, disease, insect, and nutrient management will be covered by ten MSU staff from the Bozeman campus, as well as the Superintendent of the MSU Central Ag Research Center.

A registration fee of $195 provides workshop supplies, morning and afternoon refreshments, parking and the traditional pizza dinner at Colombos. Crop consulting, private pesticide applicator and commercial/ government pesticide applicator credits will be available. The schedule that includes instructions for registration can be found online at: http://plantsciences.montana.edu/producersandfarmers/CPMSbrochure2016.pdf.

For more information contact Kevin Wanner, kwanner@montana.edu

Durc Setzer Receives Scholarship

Congratulations to Durc Setzer, a senior majoring ins Sustainable Food and Bioenergy Systems, for recently receiving the Clyde and Helen Erskine Excellence in Agriculture Scholarship. This scholarship is for an undergraduate enrolled in Plant Sciences and Plant Pathology or Land Resources and Environmental Sciences.

Durc says, "I am most grateful and would like to extend my very sincere thank you to your organization. The acknowledgement and help from your scholarship means a lot to me, and will help me to pursue my agricultural career. As a child, I participated in 4-H and have always been interested in agriculture, but it wasn't until my adult life that I came to dream about being an agriculturist. After graduation, I hope to work for University Extension and to also secure a Farm Service Agency loan in order to operate a sustainable farm."

Andrea Varella Receives Scholarship

Congratulations to Andrea Varella for recently receiving the Robert F. Eslick Memorial Scholarship. Andrea is a PhD candidate in Plant Sciences with a Plant Genetics option. This scholarship is for a graduate student majoring in Plant Sciences and Plant Pathology or Land Resources and Environmental Sciences.

Andrea says, "I am a Brazilian student who came to MSU in 2012 to pursue my dream of becoming an expert in plant breeding and plant genetics. As an international student, I was initially very nervous and excited to start my PhD in the the PSPP Dept. Now, three years later, I am very happy with the choices I have made. My research on plant breeding is helping wheat breeders to develop insect resistant varieties; my involvement within the international student community has given me many friends, and my work as a volunteer at the Bozeman Community Café has given me the opportunity to give back to the people in Bozeman who have received me with open arms. My sincerest thanks for your generous financial support toward my education."

Course Focus
PSPP 516 Research Design and Analysis
By Jack Martin

This is a 3 credit course offered Fall semester. The pre-requisite is STAT 401. That pre-requisite is that students have some knowledge of basic statistics before entering. This course emphasizes the corner stones of experimental design. These are randomization, replication, and local control as outlined by R. A. Fisher. Common experimental designs are considered with examples from each. These include completely random, randomized block, and Latin square along with special cases for each. Examples of special cases include subsampling and missing data. The assumptions underlying the analysis of variance and the distinction between fixed and random effects and their implications for inference are considered. Methods for determining power of a test and for determining the number of replications required to meet a set of specified conditions are covered. Considerable emphasis is given to planned comparisons among means using linear combinations of means rather than the host of multiple comparison procedures. Factorial treatment structure is included with emphasis on interpreting main effects and interactions. Final topics include experiments with different sizes of experimental units. These are known in text books as split plot experiments and repeated measures experiments when the subplots occur in time rather than in space. Hand calculation cannot be avoided, but students do problems outside of class using R software.

New Employees
Kristel Slifer – Assistant Manager of the Plant Growth Center and Horticulture Farm

I am really excited to be a part of the Montana State University College of Agriculture once again! I graduated from MSU with a B.S. in Environmental Horticulture in 2013 after studying abroad in Australia and working at an organic farm in the San Juan Islands. After obtaining my diploma, I worked in various jobs in the industry including landscaping, greenhouses, and residential gardening.

My fiancé and I moved here from my home town of Boise, Idaho seven years ago for school and skiing. I enjoy hiking, crocheting, running, and growing all types of plants.

New Graduate Students
Whitney Harchenko - Jessica Rupp

Hi, my name is Whitney Harchenko and I will be joining the PSPP Department in January as a new Ph.D. candidate. Under the supervision of Dr. Jessica Rupp, the Extension Potato, Sugarbeet, and Pulse Pathologist, I will be working on a precision genome editing project to promote disease resistance to a major potato pathogen that is of great economic concern to today's potato industry.

I received my undergrad degrees in Horticulture and Psychology and my Master's degree with a focus on plant breeding from North Dakota State University. During my undergraduate years, I was a goaltender for the NDSU's Women's Ice Hockey Team.

I am thrilled to be back in an academic atmosphere and excited to dive deep into potato genetics and pathology. Thank you to Jessica and MSU for giving me the opportunity to chase my dream of earning a Ph.D. in Plant Sciences. My Bernese Mountain Dog puppy, Chloe, will be joining me on this move from flat Fargo to the mountains. I am looking forward to hiking new trails with new friends.

MAES Seminars

Tracy Dougher - Friday, Dec. 4 at 9:00 a.m. in 138 ABB, "Commercializing production of native Montana species"

Mac Burgess - Monday, Dec. 7 at 1:00 in 108 PBB, "Production Practices for Small Acreage Specialty Crop Growers"

Luther Talbert – Jacobsen, Martin, Wichman Tuesday, Dec. 8 at 1:00 in 108 PBB "Spring wheat breeding and genetics"

Mike Giroux - Hatfield, Fischer, Weaver Wednesday, Dec. 9 at 9:00 a.m. in 108 PBB "Small grain quality and molecular biology"

Invited Talks

Li Huang, "Inactivating rust resistance suppressors to unlock multiple defense responses in wheat." NSF annual meeting, Washington D.C.

Rebekah VanWieren, "Initiating Integration: Partnering with MSU's Landscape Design Program". Montana Trails, Recreation, and Park Association & Idaho Recreation and Park Association Annual Conference. October 28, 2015. Bozeman, Montana.

Grants

Bill Dyer, David Baumbauer, Mac Burgess, and Chaz Holt (PSPP); Kara Landolfi, and Alison Harmon (HHD). 2015. "Infrastructure Improvement at the MAES Horticulture Farm and Towne's Harvest Garden." MAES.

Bill Dyer, Erin Burns, and Barbara Keith. 2015-2016. "Do herbicide safeners play a role in multiple herbicide resistance?" Bayer CropScience.

Bill Dyer and David Weaver. 2015. "Ecological implications of an altered spectrum of volatile compounds from multiple herbicide-resistant Avena fatua (wild oat) accessions." MAES Research Innovation Grant Proposal.

Bill Dyer, Barbara Keith, and Erin Burns. 2015-2016. "Controlling multiple herbicide-resistant (MHR) wild oats." Montana Wheat and Barley Committee.

Bill Dyer, Fabiàn D. Menalled, and Barbara Keith. 2016-2018. "The physiological mechanisms and management of herbicide-resistant Avena fatua." USDA/NIFA/AFRI.

Cripps, C.L. Parks. Canada (PARCAN). 10/29/15. Application and Knowledge Transfer of ECM Fungi Inoculum—Waterton Lakes National Park.

Publications

Cripps, C.L., Liimatainen, K., Niskanen, T., Dima, B., Bishop, R.F., and J.F. Ammirati. 2015. Intercontinental distributions of species of Cortinarius, subgenus Phlegmacium, associated with Populus in western North America, 2015, Botany 93: 711-721.

The Burgess lab's work on season extension of vegetable crops utilizing mobile high tunnels was featured in the December issue of "The Furrow", John Deere's monthly agriculture magazine.

A section of the article appears at the end of this newsletter with the permission of John Deere's "The Furrow" magazine. Copyright (C) 2015 Deere & Company. All worldwide rights reserved.

Cinnamon

By Toby Day, Extension Horticulturist

There were many discussions about recipes and food at our house over Thanksgiving. Some of the questions that came up were about cinnamon. "Where does it come from?", one guest asked. Another talked about the benefits of cinnamon they had recently read about; others just enjoyed the desserts that were made with the spice. Many of the questions I couldn't answer – other than that it came from a plant. But which plant? And how is it harvested? And are all the benefits scientifically proven? So here is what I found:

Cinnamon "bark" that is dried and made into cinnamon sticks.

Cinnamon Tree

First, I found that not all cinnamons are the same – yes there is more than one! There are dozens of types of cinnamon from the trees that belong to the genus *Cinnamomum*. Most of the trees grow and are harvested in Sri Lanka, but they also grow in China, Vietnam and Burma. The most common cinnamon and the one that we are used to seeing in the grocery store is called Cassia (*Cinnamomum cassia*). This is the cinnamon that is used in recipes and oatmeal. The only other cinnamon that is found in the U.S. is called Ceylon (*Cinnamomum verum*). This is a less common cinnamon that is touted as "real cinnamon" and is pushed because it is thought to have better health benefits. Cinnamon is harvested by cutting the branches of 3-6 year old trees (1.5" to 2" diameter) to the ground and letting them grow back again. They then remove the outer and inner bark to reveal the "cinnamon." Then the layers are dried in what can only be described as a kiln oven.

When it dries it naturally rolls into what we call cinnamon sticks. The sticks that don't hold up well are then milled into finely ground cinnamon. Here is a great video on YouTube If you want to see how it is harvested and prepared: https://www.youtube.com/watch?v=4GO-rxNl6M0

As for the health benefits, well that is where I am skeptical. You can find several online sites that write about the health benefits of cinnamon – including better heart health, blood sugar regulation, diabetes protection, better brain function, Parkinson's protection and dozens more benefits. Apparently, according to all the hype and a little of my sarcasm, the only thing that should be stalked on the pharmacy shelf is cinnamon. Most of the information is anecdotal. While I believe there are some health benefits, very few have been scientifically proven. The website WebMD put it best when they wrote this about health benefits to humans, "For now, studies have been mixed, and it's unclear what role cinnamon may play in improving health." However, there are little to no side effects to using "normal" amounts of cinnamon. So, mix it in your pies and oatmeal, your hot ciders and sticky buns, and of course your rolls. It might just be good for you too.

Recipe of the Month
Balsamic Bruschetta - a great appetizer!

8 roma (plum) tomatoes, diced
1/3 cup chopped fresh basil
1/4 cup shredded Parmesan cheese
2 cloves garlic, minced
1 tablespoon balsamic vinegar
1 teaspoon olive oil
1/4 teaspoon kosher salt
1/4 teaspoon freshly ground black pepper
1 loaf French bread, toasted and sliced

In a bowl, toss together the tomatoes, basil, Parmesan cheese, and garlic. Mix in the balsamic vinegar, olive oil, kosher salt, and pepper. Serve on toasted bread slices.

December Birthdays

Bill Grey	4
Nancy Blake	6
Cheryl Moore Gough	23
Sue Brumfield	26
Amy Dolan	29

January Birthdays
(No newsletter in Jan.)

Alice Pilgeram	2
Bridget Westfall	4
Alanna Oiestad	5
Don Mathre	5
Dara Palmer	25
Hongtao Zhang	26
Kevin Wanner	28
Erin Burns	28
Tamara Parnell	29

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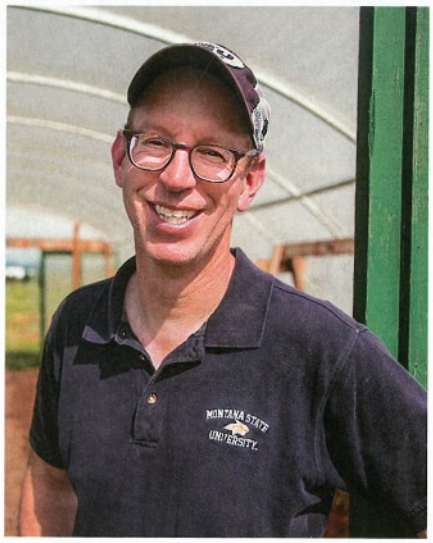
Once again, we have really enjoyed working for all of you this year.

We wish each of you a very Merry Christmas and a Happy New Year!



►**Above:** Mobile high tunnels at MSU are moved off spring crops once established and used to give summer crops an early start, protect them from wind and hail, and control moisture the rest of the season. ►**Left:** David Baumbauer is working to perfect mobile high tunnel systems.

sified vegetable grower in the valley. Now I can't tell you how many there are," Matt says. As a result, the farm now competes for CSA, farmer's market, restaurant, and retail customers.

"When we got our first mobile tunnel, we wanted to make better use of our growing space through season extension and to make a year-round living on vegetable production," he says.

Gaining time. One of Matt's tunnels has three footprints during the growing season, producing multiple crops. As summer crops come to a close around September, they plant the next two footprints to spinach. Once summer crops are done, the tunnel is moved onto one of the spinach footprints, which is harvested from November through late February. The tunnel is moved to the third position where the next spinach crop waits, idle but alive, under the snow.

"It starts growing again as soon as the tunnel is over it," Matt explains. Harvest finishes the end of March, and they then seed a mix of spring vegetables under the high tunnel. Once they're growing strongly and are cold hardy, the tunnel is moved to start warm season crops such as cucumbers, peppers, and tomatoes.

Holding customers. This system delivers fresh carrots, beets, and other cool season crops several weeks earlier than the competition, and it allows for fresh greens longer. "Our mobile high tunnels allow us to do salad greens for our winter CSA through January," Matt says. "Few others are offering anything picked fresh the day before you ate it in winter here. We can somewhat set our own value, which helps offset the cost of mobile tunnels. It also keeps our names front of mind for restaurants and CSA members. It used to be hard to reconnect in the spring after four months of not having anything for sale."

The Rothschillers funded part of their second mobile greenhouse through an EQIP grant, which David Baumbauer, manager of the Montana State University horticulture farm, thinks has contributed to an uptick in the use of high tunnels in Montana.

"It's anecdotal, but we've had 30-plus positive responses to surveys on high tunnel use. Several indicated they raise wheat and cattle in addition to high tunnel crops. They may be using high tunnels to diversify," he says.

Baumbauer is researching species that thrive in high-tunnels in the region as a result of growing interest. Developing rotations and identifying species that make sense for farmers in the northern Rockies is Baumbauer's focus. He sees mobile high tunnels as a way to add unique offerings to CSA customers and restaurants, such as salad turnips—a small sweet tuber—and allow for management techniques such as cover crops on idle footprints. "We want to give farmers flexibility to address other markets profitably. The salad turnips, for example, grow fast in cold weather, and have relatively high market value," Baumbauer says.

Mobility does cost more, but it's an investment that does the job of three or more high tunnels per season. ■