Annual Report
2016

WSU

Center for Sustaining Agriculture & Natural Resources

Letter from the DIRECTOR

In the University environment, Centers play an important role in enabling flexible and adaptive responses to new opportunities. The incredible opportunity we have to work in so many diverse areas, including organic agriculture, climate change, small farms and food systems is exhilarating. One important challenge this creates is that Centers like CSANR can feel like they are in a constant state of evolution and staff turnover as projects are completed and programs transition while new programs and projects are initiated. It is a testament to the quality and dedication of the faculty, staff, and students involved in CSANR that efforts on numerous projects have over time combined to make substantial contributions to long-term sustainability in the region.

In 2016, CSANR's longest running initiative, the Small Farms Program, began the transition to a newly revitalized programmatic initiative under the banner of the WSU Farm & Food Systems Team (FFST). Many faculty, staff and partners contributed to the revitalization process that was described in last year's annual report. After nearly 16 years, Marcy Ostrom has transitioned from the WSU Small Farms program leadership role into a new role focused on building teaching, outreach and research programs in her passion-area of Food Systems.

The successes of Marcy and the Small Farms Team's efforts to build community capacity in the region – through beginning and immigrant farmer education, farmers market capacity development, and other efforts – have dramatically changed the state and regional landscape of community efforts in supporting small farms and the emergence of community-based food systems. Under the interim leadership of Doug Collins during 2016, a dedicated team of WSU faculty and staff serving as the Steering Committee for the FFST have been hard at work articulating plans for the next decade of investment and activity in support of small farms and community food systems. A new Program Coordinator, Nicole Witham, was hired to support this team and permanent faculty leadership will be identified by summer 2017.

The Center also maintains several important efforts that support work across the Center's topic areas. In 2016, we awarded eight new BIOAg grants to initiate research inquiries in new areas and to provide educational training to Washington farmers and ranchers. These grants provided funding to 9 faculty members from 7 different WSU units. This brings our total number of affiliated faculty for the past decade to 154, representing 19 different units. Through the diverse efforts of our affiliated faculty and students, more than $4 million in new extramural grants and contracts were secured and more than 41 new research papers and 7 formal Extension publications were completed 2016.

If I've learned anything in the 9 years I've had the privilege of leading CSANR, it's that change and transition are constants. I fully expect CSANR will look different again by the end of 2017. Some of the change will be expected, and some will be a surprise. But the one thing that is clear is that we'll be doing important work that advances the sustainability of Washington's agriculture and food system. There is literally no better place in the world for the work we do with our community partners.

Chad Kruger
Director

Photo Credits - Cover (top left to right): Field Day at Honcoop Farms courtesy of Brooke Saari, Skagit Valley tulip farm courtesy of Brooke Saari, CSANR adivisory committee summer meeting 2015 courtesy of Tara Zimmerman, Cherries at Vashon Island farmer market courtesy of Flickr CC 2.0. Cover (botton left to right): Pivot courtesy of Scott Butner Flickr CC 2.0, Agriculture in a Changing Climate workshop courtesy of Brooke Saari, Chocolate brown swiss cows in Skagit Valley courtesy of Dana Flickr CC 2.0, Farm Tour at Cliffside Organic Orchard courtesy of Brooke Saari.

Citizen ADVISORY COMMITTEE

Jim Baird, Baird Orchards & Cloudview Ecofarm

Trudy Bialic, PCC Natural Markets

Joe Casola, UW Climate Impacts Group

Dan Coyne, Washington State Department of Agriculture

Kevin Corliss, Ste. Michelle Wine Estates

Tim Crosby, Cascadia Foodshed Financing Project

Laurie Davies, Washington Department of Ecology

Nichole Embertson, Whatcom Conservation District

Dale Gies, Gies Farms

Russell Lehman, Washington Sustainable Food and Farming Network

Alec McErlich, Earthbound Farms

Leslie Michel, Okanogan Conservation District

Warren Morgan, Morgan Orchards/Double Diamond Fruit

Doug Poole, Poole Farms

Maurice Robinette, Lazy R Ranch

Rick Roeder, Washington State Department of Natural Resources

Derek Sandison, Washington State Department of Agriculture

Anne Schwartz, Blue Heron Farm

Jill Smith, Pure Eire Dairy

Bill Warren, Warren Orchards

Rachel Wieme, WSU Graduate Student Representative

Andy Wilcox, Wilcox Farms

2016 BIOAg Funded Projects

PI: Beverly Gerdeman

Integrating manure-based amendments with pest control: Potential of predatory flies (Scathophagidae) as a secondary benefit of manure amendments, for early season control of spotted wing drosophila in red raspberry

PI: Tarah Sullivan

Building soil quality, enhancing soil microbial function, and alleviating chlorosis in Concord grapes with inter-row cover crops

PI: Doug Collins

Strip tillage and cover cropping for enhanced water use efficiency in western Washington organic vegetable farms

PI: Pius Ndegwa

Rapid sensing of dairy manure nutrients for precision applications in agricultural production

PI: Debra Inglis

Impact of fungal root endophytes on Verticillium wilt using cucurbits as model hosts

PI: David Brown

Precision application of organic amendments for improved soil quality in replant orchards

PI: Andy McGuire

Combined soils and high residue farming workshop and summary publication

PI: Arron Carter

Rapid evaluation of winter wheat residue decomposition potential

SOIL HEALTH Progress Update

In January 2014, the producers and professionals of the CSANR Advisory Committee (AC) gathered in a workshop to identify specific priority areas that could benefit work to understand and improve soil quality.

The top two priorities identified at the workshop were: 1) identifying the economic value of soil quality; and 2) understanding the relationship between soil biological activity and disease pressure (see http://bit.ly/2kVarn4). Additional priority topics included soil-water relations, soil organic matter, indicators of soil quality, the relationship between soil and nutrient density in food, and soil physical attributes.

Afterwards, a Task Force of faculty and a representative of the AC developed specific recommendations for how CSANR could most effectively and efficiently invest in research, extension and teaching capacities in soil quality. Those recommendations can be found here: _http://bit.ly/2kI74V7.

Now, three years since the Advisory Committee helped formulate the priorities and the Task Force made its recommendations, we'd like to share the investments we've made in soil quality work through the BIOAg grant program. More detail for these projects is available through the links provided, with new progress and final reports posted as projects progress.

Economic costs and benefits of soil improvement practices. Andy McGuire
http://bit.ly/2lCB4B4
This project aggregated and synthesized data to estimate the benefits and costs of three soil improvement practices in the irrigated Columbia Basin: adding soil amendments; using cover crops/green manures; and high residue farming and reduced tillage. The team collected producer information, conducted a literature search and made field measurements. Partial budgets were also constructed, and showed that all three practices generated positive changes in profit. Positive economic impacts were mostly due to savings in replant costs or reduced fumigation costs.

Soil quality network 2014. Don McMoran
http://bit.ly/2miopQU
WSU Skagit County Extension hosted the Soil Quality Network 2014, third in a series of annual soil quality workshops. The workshop provided training about the many facets of soil quality on the farm, including: understanding soil quality on the farm, soil biology and plant health, cover crops, compost, and hands-on assessment of soil quality.

Bi-functional crops. Fall-sown cool season grain legumes provide cover crop attributes. Stephen Guy
http://bit.ly/2m4Aa1l
Spring and fall sown cool season food legumes (CSFL) harvested as seed are important rotational crops in the Palouse region of WA and ID and western WA as they provide fixed nitrogen to subsequent crops and break weed and disease cycles. In organic and other systems, fall-sown CSFL can serve as cover crops to reduce soil erosion, improve soil health, provide nitrogen, and reduce the need for phosphorus from manure or compost. This project identified pea and fava breeding lines and germplasm with desirable cover crop/green manure attributes: good overwintering, high biomass production, and early spring N fixation.

Photo Credits - Page 3, Healthy soil courtesy of USDA NRCS Flickr CC; Page 4 (Top) Lake Chelan courtesy of Flickr CC, (Bottom) Examining a soil sample courtesy of USDA Flickr CC.

Soil health and pasture productivity under mob grazing and fertility management. Tipton Hudson
http://bit.ly/2m8JoGE
This study assesses the soil health and productivity of a certified organic ranch pasture under a variety of grazing and fertility treatments. Two different strategies of planned grazing management are used: a sustainable low-density stocking rate, and a very high density but brief stocking approach (mob grazing). To address pre-existing fertility limitations, these two grazing strategies are overlaid with four soil fertility treatments: organic phosphorus and sulfur, supplemental manure, compost tea, and none (control).

Precision application of organic amendments for improved soil quality in replant orchards. David Brown
http://bit.ly/2lCTcuT
During apple orchard renewal, Apple Replant Disease (ARD) and soil degradation can lead to inconsistent infill vigor and uneven fruit production. This project investigates spatial predictors of ARD and whether site-specific application of organic soil amendments can be used to suppress ARD, improve general soil health, and promote uniform tree growth. The PIs are intensively mapping soil fertility and texture for an organic orchard block hosting new plantings, applying uniform vs. targeted rates of organic amendments, and monitoring soil microbial and fertility response in addition to tree root and canopy development.

Strip tillage and cover cropping for enhanced water use efficiency in western Washington organic vegetable farms. Doug Collins
http://bit.ly/2m4zOry
Tillage is an important tool in organic systems for weed control, residue management, seedbed preparation, and regulation of spring soil temperature. However, excessive tillage wastes energy and degrades soil quality. Soil water also evaporates more quickly from bare, tilled soils, potentially increasing irrigation demand. This integrated research and extension project compares the field water use efficiency of strip tillage and full tillage for organic winter squash production following a rye cover crop.

Building soil quality, enhancing soil microbial function, and alleviating chlorosis in Concord grapes with inter-row cover crops. Tarah Sullivan
http://bit.ly/2lCUVQO
Leaf yellowing, or chlorosis, occurs on more than 50% of the Concord vineyards in central WA, resulting in significant reductions in vine size, uniformity, productivity, and sometimes vine death. The yellowing of the leaves resembles classic iron-deficiency chlorosis, but many previous studies have attempted without success to determine the precise cause and effective treatment of this type of chlorosis. An earlier pilot study revealed a significant correlation between rooting zone bacterial community composition and Concord leaf tissue iron content. This study expands on previous work, comparing four different cover crops to a bare-soil control, in terms of their capacity to enhance soil quality, build soil organic matter, and enhance biological activity as a means of decreasing vine chlorosis severity.

Soils and high residue farming workshop and summary publication. Andy McGuire
http://bit.ly/2lCKhJC
This effort builds on previous successful workshops covering high residue farming and Building Soils for Better Crops, both of which stress soil quality. The project hosted a one-day workshop focusing on both soils and high residue farming. The team recorded video of the presentations, but instead of posting the long videos (low viewership), they will review them to extract the take-home messages and visuals from each presentation and include those in an on-line publication that can be quickly scanned.

FEATURED BIOAg Projects

Potential for early season control of spotted wing drosophila by predatory flies (Scathophagidae) as a secondary benefit of manure amendments in red raspberry

Principal Investigator: Beverly Gerdeman

Spotted wing drosophila (SWD), *Drosophila suzukii*, is considered the most important pest of soft fruit in Washington State. Current control methods require weekly insecticide applications, which are unsustainable. So far however, no effective biological controls have been identified. Large numbers of yellow dung flies were observed in a Whatcom County red raspberry field following an early spring manure application. This prompted an investigation into the potential of yellow dung flies to impact SWD populations by feeding on overwintering females returning to berry fields early spring.

In 2016, CSANR's BIOAg program awarded a grant to Dr. Gerdeman to investigate the potential of yellow dung flies as a biological control for SWD. Overlapping with a USDA NCRS-funded project that examined the impacts of a variety of manure-based amendments in berry production, this study investigated the attraction of dung flies to two types of soil amendments in raspberry: by-products of anaerobic digestion (AD) and liquid manure. Results indicated dung flies were only attracted to fresh raw manure and not to the AD by-products. Dissections and cage studies confirmed dung flies would capture and feed on SWD. Molecular tests detected presence of SWD DNA in dung flies prior to the cage studies, suggesting they had fed on SWD prior to collection.

Raw manure treatments to fresh market crops remain restricted because of potential food-borne illnesses. However if AD by-products could be tweaked to attract dung flies, they could replace risky manure applications while attracting these predators to the fields when overwintering SWD return. Dung flies feeding on these founder females could significantly impact SWD field populations during the fruit harvest period. For more information on this BIOAg project please visit, http://bit.ly/Gerdeman.

Spatial and temporal dynamics of attracting green lacewings to synthetic lures in apple orchards for pest suppression

Principal Investigators: Vincent P. Jones and Conor O'Leary (graduate student)

This BIOAg funded project focused on critical knowledge gaps in the use of plant volatiles as attractants for two different beneficial lacewing species (*Chrysopa nigricornis*, and *Chrysoperla plorabunda*). The purpose was to investigate whether it was possible to manipulate the spatial distribution of natural enemies in agricultural systems to augment biological control in areas with large pest populations of woolly apple aphid (WAA).

Results found spatial effects of the lures increased the activity 8-10 fold compared to control areas, but the effects were limited to less than 3.3 meters from the source tree. Flight activity around the lures was highest at dawn and dusk, and relatively low throughout the rest of the day. In addition, the lures did not result in lacewings spending significant time on the lures, which would disrupt their population growth and suppression of pest populations. Evaluation of WAA population growth between trees with lures and control trees showed that the lures suppressed colony establishment and growth compared to the control trees, but to date they have not been tested for the ability to reduce high populations. This demonstrates the feasibility of using this approach to attract lacewings to orchards for biological control and justifies further experiments to evaluate the operational factors necessary for commercial adoption.

Funds were leveraged for an additional research grant from the Washington Tree Fruit Research Commission to further research this pest management possibility. For more information into Dr. Jones' project findings please visit http://bit.ly/VJones. For more information on pest management, visit the WSU Orchard Pest Management Online site at http://bit.ly/tfrecOPM.

Photo Credits - Page 5 (top left from the top): Female spotted wing drosophila courtesy of Betsy Beers, Raspberries courtesy of Flickr CC 2.0, Female spotted wing drosophila on fruit courtesy of Betsy Beers; (bottom right from the top): Green lacewing courtesy of Callie Baker, Apple Tree courtesy of Washington State University, Wolly apple aphid on apple courtesy of Callie Baker. Page 6 (bottom left): Sunrise Area at Mt. Rainier, © Homini, CC BY 2.0.

REGIONAL NITROGEN ANALYSIS

Using the BioEarth Modeling Framework to Understand the Sources, Transport and Fate of Atmospheric Nitrogen in the Pacific Northwest

Researchers: Serena Chung, John Harrison, Brian Lamb, and Tsengel Nergui

Widespread use of synthetic nitrogen fertilizers and fossil fuel combustion have led to significant increases in reactive nitrogen emissions and deposition globally. Emissions are any transfer of nitrogen compounds from the Earth's surface to the atmosphere, while deposition describes transfer from the atmosphere back to the surface. Excess nitrogen is a serious environmental concern for many reasons including causing eutrophication of terrestrial and aquatic systems and contributing to global climate change. Within the Northwest, there are pressing questions about the degree to which agricultural practices contribute to excess nitrogen and its associated environmental consequences.

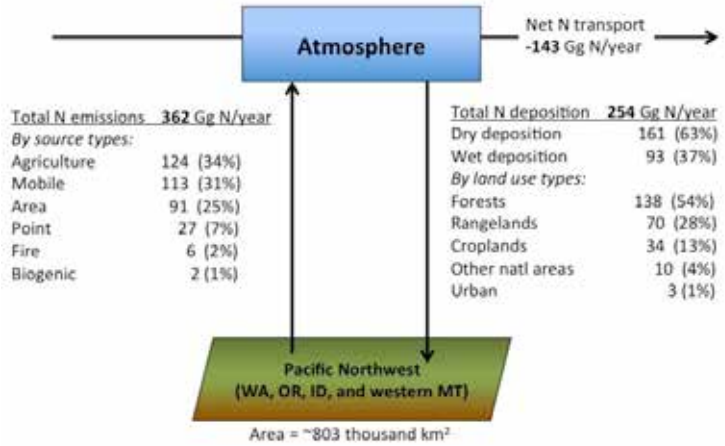
WSU researchers at the Department of Civil and Environmental Engineering's Laboratory for Atmospheric Research, the School of the Environment, and the School of Biological Sciences are working together to quantify nitrogen sources, fluxes, and fates—in other words, defining a nitrogen budget for the Pacific Northwest. This work is part of the BioEarth project, funded by a 5-year $3 million grant from the USDA National Institute of Food and Agriculture (NIFA), which has supported researchers in modeling regional nitrogen emissions and deposition under changing climate patterns. Having an understanding of major nitrogen sources and sinks in the region is a prerequisite for being able to compare nitrogen fluxes in the Northwest with other regions and designing effective nitrogen management policies. This research is vitally important because it supports "true cost accounting", enabling decision-makers to assess the various costs and benefits of nitrogen in the environment—including the crop yield benefits derived from fertilizers and negative effects of nitrogen deposition in sensitive natural environments.

Transport of atmospheric nitrogen is controlled in part by natural inter-annual climate variability caused by the El Niño-Southern Oscillation (ENSO). In the ENSO cycle, El Niño years are characterized by warmer than average winters and springs, while La Niña years typically are cooler and wetter than average. As part of the regional nitrogen budget effort, researchers used meteorological and chemical transport models to simulate atmospheric physical and chemical processes in the Northwest during the 1997/98 El Niño and the 1998/99 La Niña events.

Tsengel Nergui is a graduate student working with Brian Lamb and Serena Chung in the Laboratory for Atmospheric Research.

Her dissertation research has focused on understanding the effect of climate variability on atmospheric nitrogen dynamics in the Northwest. The frequency of extreme El Niño events, such as the one that occurred during the time period that Nergui focused on for her research, is projected to double in the 21st century. Understanding nitrogen deposition patterns in recent history helps modelers make projections about the transport and fate of nitrogen in the future.

The figure below shows an approximate annual nitrogen budget for the Pacific Northwest in the year 2000. The combination of nitrogen emissions from transportation, urban, industrial, and agricultural sources accounted for 97% of total regional emissions. Total annual nitrogen emissions from the Northwest were estimated at 362 gigagrams, or nearly 400,000 tons. Regional nitrogen deposition is less than total emissions. For the study period, over half of all deposition occurred in forests, with substantial nitrogen deposition in grasslands and croplands as well. Regional deposition tends to follow the seasonal patterns in agricultural nitrogen emissions.



Approximate Pacific Northwest total nitrogen emissions and deposition for the year 2000.

This research advances understanding of atmospheric nitrogen sources, sinks, and net transport over the Northwest using an integrated modeling approach. Also, it reveals how natural climate variability can alter atmospheric transport and nitrogen deposition. Looking toward future research goals, ongoing measurements and modeling studies are needed to further examine the effects of climate variability and change on nitrogen dynamics in the atmosphere. There is also a great need to investigate the potential for new management practices and technologies that reduce nitrogen emissions.

A recent webinar featuring WSU graduate student researchers Tsengel Nergui and Will Forney explores regional nitrogen budget research in greater detail. That webinar can be found here: http://bit.ly/2kMklqv.

FARMER-TO-FARMER Case Studies

PI: Georgine Yorgey
Collaborators: Kristy Borrelli, Kate Painter, Andy McGuire, Chad Kruger, Sonia Hall, and others from across University of Idaho, Washington State University, Oregon State University, and USDA- Agricultural Research Service

Successful farmers are skilled at coping with risk, from weather to markets, and a variety of other factors. So to answer the question, "what practices might best help our region's farmers adapt to climate change?" we went straight to the source. Our region is home to many accomplished farmers who are pioneering a range of new farming practices that improve sustainability, enhance resilience, and are likely to be helpful in adapting to climate change. Their farming practices include reducing and eliminating tillage; diversifying crop rotations; integrating livestock and cover cropping into dryland wheat rotations; and working with partners in their communities to address water related issues.

By preparing multi-media case studies of the practices these farmers are using, we hope to provide information useful to other farmers in the region who are considering similar changes. Funding for the case studies project came from USDA National Institute of Food and Agriculture, the Laird Norton Family Foundation, and Western SARE. Based on the interests of these funders, the bulk of the case studies profile dryland and irrigated crop producers, along with one dairy and one cow-calf producer.

Map of case study profile locations.

Each case study includes a short (5-7 minute) video, and a more detailed written profile. The written profile includes details from growers explaining their successful adoption of innovative practices, their perspectives on benefits and challenges, and their thoughts on risk and climate change. These case studies are still in development, with thirteen currently planned. Completed videos and written profiles can be found at www.casestudies.reacchpna.org.

While focusing on telling the grower's story, case studies also bring in relevant scientific information through short sidebars that complement the main case study. Initial reaction to the case studies has been quite positive. The videos have been shared at conferences across the region and the written case studies have had significant online readership.

Dale Gies grows a mustard-arugula cover crop (shown here with his son Mike) that biofumigates his soil when it is tilled in. This allows him to avoid use of chemical fumigants, intensify his potato production, and add organic matter to his soils. Photo courtesy of Dale Gies.

Eric Williamson uses a combination of strip tillage, cover cropping, livestock integration, and amendment with manure to reduce soil erosion and improve soil health. Photo courtesy of Darrell Kilgore.

A stripper header "strips" grain from the stalk, leaving tall standing stubble in the field. Ron and Andy Juris use this to shade the soil and reduce wind speeds near wheat seedlings, conserving water in their dry conditions. Photo courtesy of Andy Juris.

Drew Leitch has been experimenting with cover crops in the wetter part of the dryland area. He grazes spring-seeded cover crops in place, as well as swathing a portion of the cover crops. This has improved his existing cattle grazing operation, without negative impacts on the subsequent wheat crop. Photo courtesy of Darrell Kilgore.

GRADUATE STUDENT Profiles

Rachel Wieme comes from Sartell, Minnesota and is a Ph.D. candidate in the Department of Crop and Soil Sciences as well as a NSPIRE (Nitrogen Systems: Policy-oriented Integrated Research and Education) fellow. NSPIRE is a program for interdisciplinary research focused on nitrogen cycle science and public policy. The NSPIRE program is what brought Rachel to WSU because it matched her interest in integrating environmental research and training with the communication of that research for real-world application. She chose the field of sustainable agriculture because of the large impact that agriculture has on the well-being of human lives-both in its relationship with the environment and ecosystem services, and its primary purpose of enriching lives by providing nourishment and livelihoods.

Rachel earned her undergraduate degree at St. Olaf College with a double major in Biology and Spanish. While doing ecology research and living on an organic farm in Costa Rica, her interest in the connections between ecology, environment, and sustainable agriculture were developed. That ultimately led her to other agriculture-based research projects, and to working with an inspiring farmer and environmental advocate in Minnesota.

Rachel's current WSU research project is studying organic crop rotations with quinoa in the Palouse region. She is studying the effects that quinoa has on soil and therefore the impacts it can have in rotations with other common crops in the region. She is investigating which rotations perform best agronomically, economically, and environmentally, and hopes to share this information with interested producers.

For more information on her project go to: http://bit.ly/Wieme. Rachel's future goals are still fluid but she hopes to continue working in the area of sustainable agriculture research and/or communicating scientific research to influence public policy.

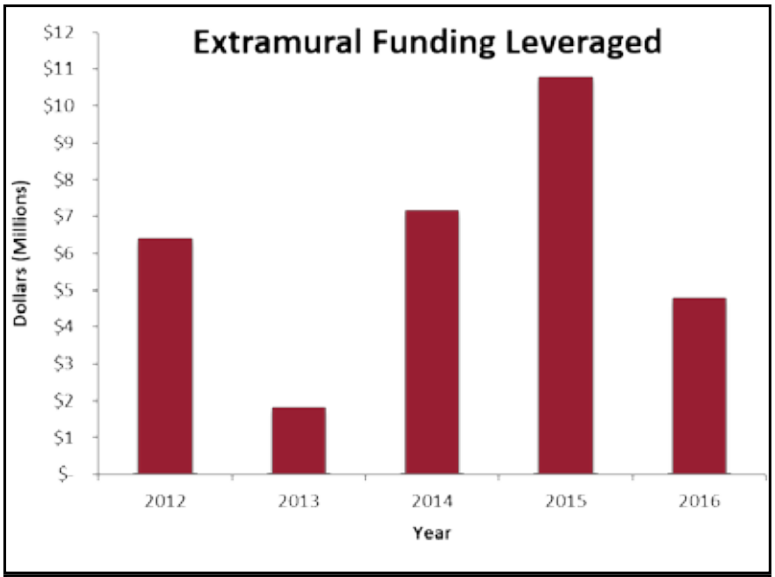
Julian Reyes is originally from Renton, WA and is a first-generation college graduate as both his parents immigrated to the US from the Philippines. With a full undergraduate Distinguished Regents Scholarship to Washington State University, Julian obtained his B.S. in Civil Engineering with minors in German and mathematics in 2010. After graduation, he stayed on to work with Jenny Adam as a PhD student in the Civil Engineering graduate program.

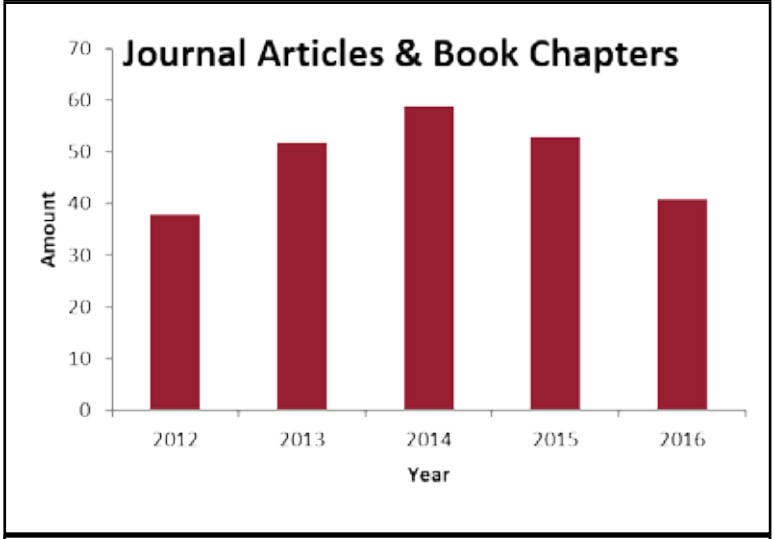
Julian left for a year to conduct research in Bonn, Germany on a Fulbright Grant doing work related to nitrogen in grasslands. Upon returning to WSU, Julian was part of the NSPIRE IGERT program linking nitrogen science and policy, which allowed him to do a science policy fellowship at the US Global Change Research Program in Washington, DC. Through these experiences and current work with the BioEarth research project, Julian was able to craft an interdisciplinary research project involving stakeholder engagement and decision-relevant science.

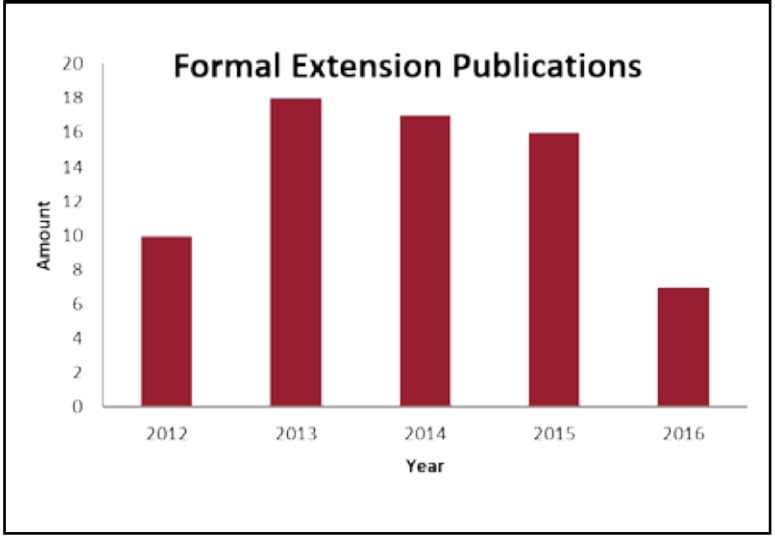
His research looks at the impacts of climate and management in rangeland ecosystems using an eco-hydrologic model. Julian has focused on improving specific aspects of the ecosystem model to better simulate how grasses grow, and how grazing management strategies affect grass growth. In addition, Julian is looking at how combinations of grazing intensity and de-stocking/stocking dates affect the resilience of grasses after a certain period of time. The goal is to examine how future climate conditions interact with management strategies and affect forage production. Julian is now working as a Fellow with the USDA Climate Hubs program. After graduation Julian will continue working in science communication and outreach to help link stakeholders with the information they need to manage their lands effectively and sustainably.

For more information on Julian and his work read his blog post at: http://bit.ly/JulianReyes. You can also watch a recent webinar on his work at: http://bit.ly/2mmW0JG.

CSANR Highlights







2016 List of Funders

King County Conservation District
National Science Foundation
Tree Fruit Research Commission
USDA IR4
USDA National Institutes of Food & Agriculture
USDA Natural Resource Conservation Service
USDA Risk Management Agency
Washington State Department of Agriculture
Washington State Department of Ecology
USDA Western SARE

Affiliated Faculty and Staff

8 faculty were awarded BIOAg grants in the 2016 solicitation, representing Biological Systems Engineering (3), Crop & Soil Science (3), Entomology (1), Horticulture (1), Plant Pathology (1), Mount Vernon REC (2)*, Wenatchee REC (1)* Total affiliated faculty who have received CSANR seed grants is now 155 representing 19 different WSU units.
*Duplicate

CSANR People

Leadership Team

Chris Benedict, Whatcom County Extension

Ian Burke, Crop and Soil Sciences

Jeremy Cowan, Spokane County Extension

Lindsey du Toit, Plant Pathology

Kate Evans, Horticulture

Jim Jensen, Energy Program

Steve Jones, Crop and Soil Sciences

Laura Lewis, Jefferson County Extension

Vicki McCracken, Economic Sciences

Kevin Murphy, Crop and Soil Sciences

Bill Snyder, Entomology

Claudio Stöckle, Biological Systems Engineering

Kris Johnson, Animal Sciences

Faculty & Staff

Chad Kruger, Director

Georgine Yorgey, Assistant Director

Doug Collins, Farm and Food Systems

David Granatstein, Sustainable Agriculture Specialist

Andy McGuire, Irrigated Cropping Systems Agronomist

Marcy Ostrom, Farm and Food Systems

Liz Allen, Associate in Research

Cindy Armstrong, Finance/Budget Manager

Tim Ewing, Research Engineer

Sonia Hall, Associate in Research

Elizabeth Kirby, Associate in Research

Nicholas Potter, Associate in Research

Kirti Rajagopalan, Associate in Research

Brooke Saari, Extension Coordinator

Kate Smith, Extension Educator - Small and Latino Farms

Nicole Witham, Extension Coordinator - Farm & Food Systems

Tara Zimmerman, Associate in Research

Center for
Sustaining Agriculture
& Natural Resources
WASHINGTON STATE UNIVERSITY

Science In Action to Improve the Sustainability of Agriculture, Natural Resources & Food Systems




To support the mission and continued impact of CSANR, please consider contributing in the following ways:

Contribute:
bit.ly/1AGsja6

Spread the Word:
Like us on Facebook (/CSANR) & follow us on Twitter (@wsuCSANR)

Subscribe to our blog:
csanr.wsu.edu/category/blog/

Photo Credits -Left to Right: Wobbly Cart farm tour courtesy of Angela Anegon, CSANR advisory meeting 2015 photo courtesy of Tara Zimmerman, Direct Seed Field Day courtesy of CSANR, Green Bow farm tour chicken coup courtesy of Brooke Saari.