

## 2020 Annual Report of Accomplishments and Results

Oregon
Oregon State University
Oregon Agricultural Experiment Station
Oregon Extension Service

### I. Report Overview

The NIFA reviewer will refer to the executive summary submitted in your Plan of Work. Use this space to provide updates to your state or institutions as needed.

<p><b>1. Executive Summary</b> (Optional)</p> <p>The College of Agricultural Sciences (CAS) at OSU completed a comprehensive planning exercise to guide research (AES) and extension (AgES) activities going forward for the next decade. This exercise centered on four thematic areas or strategic advantages that will be used to support investment of resources, planning, funding, and strategic direction. The four themes are: 1) Sustainability, Competitiveness, and Resilience of Agricultural Production; 2) Coastal Food Systems and Marine Conservation; 3) Food Innovation for Health, Markets and Access; and 4) Working and Natural Landscapes. These four focus areas also form the AES Critical Issues within the Plan of Work. Each planned program provided in this report is based on these Critical Issues.</p> <p>AES work highlighted in this report includes an overview of much of the work we have completed or are currently engaged in with plant pathogens and diseases, biological control of weeds and pests of agricultural crops, and development of new agronomic practices to reduce reliance on chemical control of weeds and pests. Additional genomic work is aiding our understanding of the relationship between plant hosts and the microbiome and how plants have developed unique symbiotic relationships with the microbiome to resist disease and insect damage. Geneticists, pathologists, and entomologists can now work together to exploit these relationships by producing new varieties that can respond to new diseases and pest infestations and to combat existing issues. New varieties of wheat, beans, ornamental plants, mint, potatoes, hazelnuts, hops, onions, barley, etc., are currently being released based on this new technology.</p> <p>Considerable effort was expended this year on issues surrounding food safety including but not limited to early detection of pathogens prior to processing, utilization of food wastes for protein production, post-harvest storage and handling protocols to reduce food waste, and sustainability criteria for the entire food production system. Wildfires this season produced notable impacts on the quality of wine grapes and development of new enology practices that can address smoke contamination and other environmental changes is ongoing. Assisting food processors to combat COVID-19 spread in food harvesting and processing activities was a key function of our Food Science and Technology</p>
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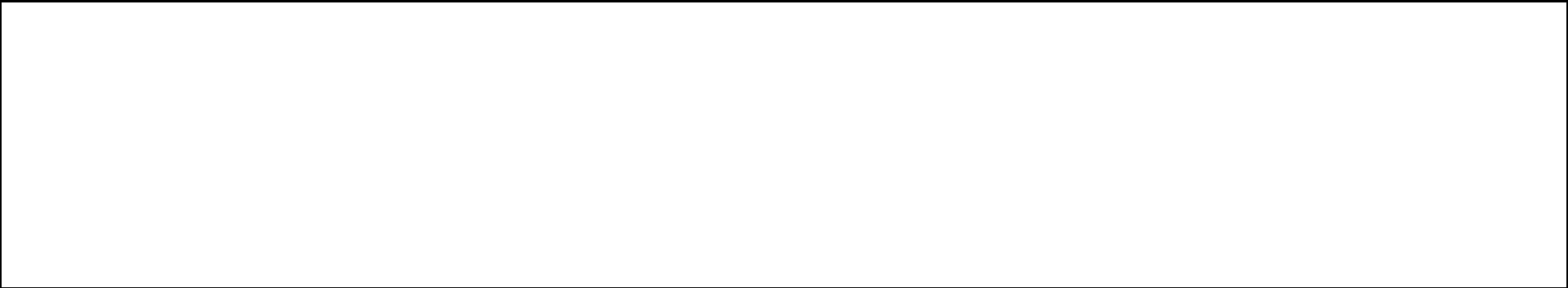
faculty as well as faculty in Animal Sciences, Crop and Soil Sciences, and Fisheries and Wildlife Sciences. We have prioritized research to enhanced AI-driven innovations in food manufacturing, from raw materials/ingredients, food quality and safety, to processing efficiency for promoting a sustainable food processing industry. This research will match large opportunities for optimizing efficiencies in food manufacturing systems and support integrative data science that leverages a multi-disciplinary approach. Finally, we have expanded research in sustainable food packaging (compostable, recyclable, and/or biodegradable packaging). Lack of sustainable food packaging has been a visible problem to the sustainable food systems even before Covid-19. Packaging is uniquely important due to its multiple functions – food safety, distribution stability and its impact on consumer purchase and post-purchase behavior.

Our laboratories in the Environmental and Molecular Toxicology Department continue to describe the health impacts of Polycyclic Aromatic Hydrocarbons (PAH) on animals and humans. The use of the Zebrafish model has shown that toxic effects of these chemicals may move across generations and can contribute not only to physical harm but behavioral changes as well. The recognition of the role of food in promoting health and reducing the risk of disease has greatly pushed the boundaries and significance of food and nutritional science. Our faculty continue identifying and evaluating bioactive and functional properties of natural foods and dietary components, especially specialty crops, seafood derived from the Pacific Northwest, and other bioactive natural products. Similarly, we aim to understand food (and other consumer products) as a route for environmental exposures to pollutants.

The College of Agricultural Sciences at Oregon State University is a global leader in research, education and outreach in a wide range of transdisciplinary sciences related to coastal food systems, sustainable seafood harvest and production, and conservation of marine natural resources. Faculty and staff in CAS have diverse and broad expertise related to the marine and coastal environments ranging from aquaculture, biology, ecology, economics and policy, ecosystem services, fisheries, genomics and seafood production and processing. CAS scientists have active projects in all five of the Earth's ocean basins and engage with policy makers at national and international levels. The importance of this work will continue to grow as global human populations increase and our coastal and marine ecosystems are subjected to multiple anthropogenic impacts and natural disasters. Marine, coastal, and aquatic sciences at OSU is bolstered by world-class facilities and infrastructural assets. The [Hatfield Marine Science Center](#) (HMSC) is OSU's coastal campus and research facility for over 300 scientists, six state and federal agencies including four satellite labs from three different National Oceanic and Atmospheric Administration (NOAA) Line Offices and labs in the United States Department of Agriculture Agricultural Research Service (USDA ARS). CAS's [Coastal Oregon Marine Experiment Station](#) (COMES) was the first marine experiment station in the nation and houses the largest group of tenure-track faculty at HMSC. HMSC includes a visitor center and outreach programs for K-12 and the public. HMSC's seawater system enables live-animal exhibits in the visitor center and marine organism research in several of the buildings on campus including the NOAA/OSU aquaculture facilities. The Gladys Valley Marine Studies Building is a state-of-the art research and teaching facility. CAS's Seafood Research and Extension Center in Astoria is the only remaining seafood research center on the West Coast.

Oregon agriculture is characterized by its diversity. With an emphasis on specialty crops, more than 220 commodities are represented, including nursery and greenhouse crops, hay, cattle and calves, milk, grass seed, wheat, and a variety of fruits, nuts and vegetables. The state's rich and varied geographic regions, growing demand for specialty crops by domestic and global consumers, and proximity to Western U.S. and Asian markets are key enablers to the success of Oregon agriculture. Contributing to the diversity of Oregon's agriculture are the forms of ownership and scale. About 96.7% of Oregon's farms and ranches are family owned and operated, according to the USDA National Agricultural Statistics Service. Research and extension activities have focused on the following key challenges: 1) need for agricultural workers and, increasingly, for a workforce skilled in the use of data-driven and technology-enabled agricultural systems; 2) Need to provide safe, fair and just working conditions for all agricultural workers. 3) Diminishing quantity and quality of water; 4) Diminishing arable land due to environmental, financial, and societal pressures such as urbanization; 5) Abiotic stresses, including those driven by climate change, such as increased temperature and precipitation variability and extremes, as well as soil degradation, salinity and smoke; 6) Biotic stresses such as diseases, pests, and weeds; 7) Increased regulation of water, crop production, livestock management, and food safety; 8) Consumer expectations about how their food is produced; 9) Market issues including costs of inputs, international competition and trade conflicts; and 10) Limited influence on national policy due to diversity and scale of Oregon's agriculture.

CAS has Branch Experiment Stations and faculty located in each agro-ecosystem across the state. This footprint provides us with a unique perspective of the different managed and natural landscapes across precipitation, elevation, and population gradients. The diversity of expertise ranges from fruit pathologists to sage grouse habitat biologists and virtually every discipline in between. The "deep bench" of facilities and personnel coupled with an outstanding reputation for objectivity across competing perspectives and positions, places us as the source for good science, provisioning of decision-making tools, and convenor of alternative approaches and ideas for problem resolution. Faculty research and extension efforts have focused on the following: 1) the science and engineering of water resources provision, quality and conservation; 2) interdisciplinary spatial and temporal work in ecological and agricultural concerns; 3) complex socioeconomic and environmental problems related to land use, regional development, environmental protection, and matters related to the interface of landscapes (e.g., suburban centers-farmland, rural communities-fire, human-wildlife conflict, etc.); 4) in soil health, plant and microbial sciences (both native and cultivated), livestock production systems, restoration ecology and conservation biology, range and wildlife ecology, water safety and sustainability; and 5) integration of multiple disciplines that support unique organizational and structural arrangements to meet the diversity of demands on working and natural landscapes.



## II. Merit and Scientific Peer Review Processes

The NIFA reviewer will refer to your Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA’s attention.

Process	Updates
<p><b>1. The <u>Merit Review Process</u></b></p>	<p>We have implemented an internal merit review process for all federal, state, and foundation grant proposals. The review is not intended to disqualify but rather provide mentoring and guidance such that all proposals going forward have been vetted with other faculty in that discipline and to ensure that quality takes precedence over quantity. For our newer faculty, we offer grant writing workshops that include specific recommendations on narrative development, budgeting, matching objectives and outcomes, and the importance of clearly defined processes and deliverables.</p>
<p><b>2. The <u>Scientific Peer Review Process</u></b></p>	<p>We have established “red teams” with the Research Office to serve as a pre-proposal peer review panel for larger grant applications. The teams are multi-disciplinary and involve scientists from other colleges to review the proposals and make suggestions for improving methods, research focus, scope of the proposal and to carefully distinguish between applied and fundamental science.</p>

### III. Stakeholder Input

The NIFA reviewer will refer to your Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA’s attention.

Stakeholder Input Aspects	Updates
<p><b>1. Actions taken to seek stakeholder input that encouraged their participation with a brief explanation</b></p>	<p>As described in the Executive Summary we have completed a two year long process of focusing CAS resources and investment in strategic opportunities. This involved several town hall exchanges to capture input and reaction to these themes. We are also completing a cattle strategic plan that has engaged with all the livestock and dairy producer groups and we will complete this process by allowing each member of each organization to provide feedback through a web survey.</p>
<p><b>2. Methods to identify individuals and groups and brief explanation.</b></p>	<p>We have expanded the use of social media to attract non-traditional interests in urban settings, for food science and technology, and organic producers and consumers.</p>
<p><b>3. Methods for collecting stakeholder input and brief explanation.</b></p>	<p>Covid-19 forced us to rethink how we provide and collect information. Through the use of Zoom and YouTube we were able to continue to offer substantive opportunities for both input and outreach. Many of our field days were provided through pre-taped presentations by scientists with Zoom used to collect feedback after the presentations.</p>
<p><b>4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.</b></p>	<p>The input has been used to formulate a plan for investment and allocation of resources for the next ten years. The theme document will also be used for budgeting, priority staffing, capital planning, and curriculum and research focus areas. Stakeholders varied in their perspectives based on what type of agricultural production they are engaged in. Organic producers favored more investment while production agriculture favored less investment in organic production. Overall, there was general agreement for the need to expand research emphases in genomics, IPM, breeding crops and animals adapted to a warming planet, and to expand on the ground extension activities at the county level.</p>

**IV. Planned Program Table of Contents**

<b>No.</b>	<b>Program Name in order of appearance</b>
1.	Sustainability, Competitiveness, and Resilience of Agricultural Production
2.	Coastal Food Systems and Marine Conservation
3.	Food Innovation for Health, Markets and Access
4.	Working and Natural Landscapes
5.	Animal Diseases
6.	Thriving youth, individuals, and families
7.	Healthy communities and economies

## V. Planned Program Activities and Accomplishments

Please provide information for activities that represent the best work of your institution(s). See Section V of the Guidance for information on what to include in the qualitative outcomes or impact statements. Add additional rows to convey additional accomplishments. You may expand each row as needed.

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program No.
1.	Gene Introgression and Gene Editing for Developing New and Improved Oregon State University Wheat Varieties	<p>Bringing genes into Oregon State University (OSU) wheat germplasm for herbicide tolerance, biotic / abiotic resistance and end-use quality can be challenging depending on the source of the gene(s). The problem is that if the genes are in genetic backgrounds that are not adapted to Oregon growing environments or are in the wrong market class of wheat, there will be many undesirable genes/traits also transferred that will need to be eliminated. To speed the transfer or introgression of the desired traits/genes it is possible to use molecular markers to advance only lines carrying the desired genes and do rapid generation cycling in the greenhouse to shorten the time it takes to develop true breeding lines. This research is focusing on: (1) development of winter wheat breeding lines of soft white (SWW), hard red (HRW), hard white (HWW) and club wheat carrying genes for improved disease resistance and low polyphenol oxidase (PPO) reaction; (2) completion of the on-going project to transfer genes for CoAXium herbicide resistance into SWW, HRW, HWW and club winter wheat; (3) completion of a two-year project to determine the feasibility of using CRISPR-Cas9 gene editing to rapidly modify OSU wheat varieties and breeding lines for improved end-use quality.</p> <p>Breeding lines carrying disease resistance genes will be screened for the molecular markers associated with the specific genes in winter/spring 2021 and three-way crosses will be evaluated in the field in spring 2021 for stripe rust resistance. First backcrossing for these groups was done in spring 2019. Initial gene introgression work will be completed winter 2021. Subsequent work on the CoAXium breeding lines will be transferred to the breeding project in summer 2021.</p>	1
2.	Field rates of Sivanto™ (flupyradifurone) and Transform®(sulfoxaflor) increase oxidative stress and induce apoptosis in honey bees ( <i>Apis mellifera</i> L.)	In a study <a href="#">published</a> in the journal PLOS ONE, honeybee researchers in OSU's College of Agricultural Sciences found detrimental effects in bees exposed to Transform and Sivanto, which are both registered for use in the United States and were developed to be more compatible with bee health.	1



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		<p>The western honeybee is the major pollinator of fruit, nut, vegetable and seed crops that depend on bee pollination for high quality and yield.</p> <p>Coupled with other stressors such varroa mites, viruses and poor nutrition, effects from these pesticides can render honeybees incapable of performing their tasks smoothly. Beekeepers and some environmental groups have raised concerns in recent years about these insecticides and potential negative effects on bees.</p> <p>According to the researchers, this is the first study to investigate “sub-lethal” effects of sulfoxaflor, the active ingredient in Transform, and flupyradifurone, the active ingredient in Sivanto. Sub-lethal effects mean that the bees don’t die immediately, but experience physiological stress resulting in shortened lifespan.</p> <p>In the case of Transform, the bees’ lives were severely shortened. A majority of the honeybees exposed to Transform died within six hours of being exposed, confirming the severe toxicity of the pesticide to bees when exposed directly to field application rates recommended on the label, the researchers said.</p>	
3.	Open Source Environmental Sensing (OPeNS) Laboratory	<p>This Hatch funded project that provides faculty and students with a “makers lab” to produce new technologies for agricultural production and environmental sensing again produced a number of breakthrough technologies: Making a low-cost, accurate dendrometer for the vineyard industry, with broad applicability; Making a gas emission detection and capture system for tracking cows; Developing an isotopic sampler for rainwater collection; Development of automated water sampler, DNA filter system for environmental tracking; Development of 3-D robotic mobilization and sensor package for greenhouse automation retrofit;; Development of a novel unlimited capacity rain gauge which measures evaporative flux; A 3-D flexible gantry system for greenhouse and field monitoring of agricultural systems; A general purpose sensor-data storage and transmission software platform; A general purpose 24-container water sampling system preserving isotopic/volatile constituents; A acoustic insect attractant to control vineyard pests; A passive dielectric sensor of soil water content activated by RFID interrogation; Develop citizen-science bluetooth stream sensor system for temperature and stage; and Optical sensor-based system to target weeds for elimination.</p>	1
4.	Effects of vaccination timing against respiratory pathogens on performance, antibody response, and health in feedlot cattle	<p>The bovine respiratory disease (BRD) complex is the most important cause of morbidity and mortality in U.S. feedlots, and management to mitigate incidence of BRD is warranted for optimal welfare and productivity of feedlot cattle. Preconditioning programs are examples of such management, in which calves generally receive vaccination against BRD pathogens at weaning and revaccination 30 d later upon feedlot arrival. However, vaccine efficacy is reduced when administered to highly stressed animals, whereas weaning and feedlot entry are major stressors to cattle. Vaccination against BRD pathogens has also been shown to impair cattle performance. For</p>	1

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		<p>these reasons, altering the time of vaccination against BRD has been investigated as an approach to enhance vaccine efficacy, immunity to BRD, and performance in feedlot cattle.</p> <p>Results of this research provides producers with important evidence that altering the time of vaccination and revaccination against BRD to provide both doses prior to feedlot entry altered serum antibody responses to BRD pathogens and alleviated the incidence of this disease in feedlot cattle.</p>	
5.	Long-Distance Dispersal and Disease Outbreaks: Effects of Initial Prevalence, Basic Reproduction Number, and Control Tactics	<p>Empirical data and modeling studies of diseases caused by pathogens with long-distance dispersal ability will be used to: 1) Determine effects of initial disease prevalence, spatial pattern of initial disease prevalence, and pathogen reproductive capacity on disease spread; 2) Compare the efficacy of reactive ring culling, reactive ring vaccination or chemotherapeutic applications, timing and extent of reactive ring treatments, and broad-scale population protection for disease control; and 3) Determine the influence of initial disease prevalence and pathogen reproductive capacity on the efficacy of these control tactics. Modeling studies of wheat stripe rust, foot-and-mouth disease, sudden oak death, and arboviruses of animals will be conducted. Extensive comparative modeling will be conducted through factorial combinations of models and input data among the different diseases. Generalized theory and models will be developed to predict "rules-of-thumb" for the control of diseases caused by pathogens with long-distance dispersal. Data from field observations of sudden oak death and foot-and-mouth disease, and manipulative experiments with wheat stripe rust, will be used for model validation/verification. The project will determine the importance of initial disease prevalence, the spatial pattern of initial disease prevalence, and pathogen reproductive capacity on the spread of diseases caused by pathogens with "fat-tailed" dispersal kernels, and the interaction of these biological variables with control practices such as reactive culling, reactive vaccination or chemotherapeutic applications, and broad-scale protective strategies. The work is fundamental to our understanding of disease spread and is crucial to predicting the spread of epidemic invasions and designing disease control strategies. The work is potentially transformative as it will provide a rare opportunity to test such hypotheses in natural and controlled field experiments, and because the applicability of a broad diversity of plant, animal, and human pathogens with fat-tailed dispersal kernels will be rigorously evaluated via the interdisciplinary modeling efforts. Conclusions should apply over a very wide range of spatial scale due to the nature of dispersal kernels of pathogens that have the potential for long-distance dispersal.</p>	1
6.	Enhancing Professional Quality of Future Leaders in Agriculture and Natural Resources: New Strategies for Graduate Student Training	<p>With the projected global population of 9 billion people by 2050, the demand for food will require innovative solutions to increase global food production. These solutions need to be rationale and sustainable and be made by teams of well-trained multidisciplinary decision makers that involve both agriculturists and natural resource managers. These new leaders will need to have a global vision of the food and agricultural systems and have an understanding of various disciplines</p>	

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		<p>encompassing plant production, integrated pest management, plant pathology, soil science, water resources, land use, tradition and culture, and economics. At a time when the need for people with training in sustainable food and agricultural systems is increasing, the number of students interested in graduate degrees in agricultural sciences appears to be decreasing. This proposal aims at increasing the number of trained students and future leaders in Integrative Biosciences for Sustainable Food and Agricultural Systems.</p> <p>In addition to taking and completing their classes on campus, students took a class "Field and Lab Diagnostics" at the Hermiston station in summer 2018 instructed by HAREC faculty. During spring 2019, they took two additional classes at the station: (1) Foundations for Success; (2) Reading and Conference. The first class aimed to provide students with soft skills or universal competencies. The second class aimed to broaden students' knowledge about food production, agriculture, and natural resources. All students finished their classes on campus and moved to Hermiston to do field research. At the end of summer 2018, students gave presentations of their research project to industry mentors and HAREC faculty. They also did mock interviews as part of the "soft skills" training. Students worked with the OSU Experiment and Extension Station Communications to make short videos featuring their research. These videos are posted on the OSU Extension Catalog.</p>	
7.	Oregon State University Multicultural Scholars Program in Bioresource Research	<p>The overarching goal of this project, which will continue our existing MSP, is to increase participation of students from groups underrepresented in USDA mission areas and prepare them for the professional/scientific workforce. Financial support, research opportunities, and social/mentoring support have been identified as critical factors for recruiting and retaining minority students in sciences. Our first objective is to provide 6 MSP Scholars from Oregon and the Northwest with MSP scholarships and SEL internships. Our second objective is to provide Scholars with an outstanding research experience in a STEM/Agriculture/Natural Resource/Food Science field, including NIFA Challenge Areas: Agricultural and Natural Resources Science for Climate Variability and Change, Food Safety, Food Security, Sustainable Bioenergy, and Water Resources. To gain this experience, scholars will major in BRR in the College of Agricultural Sciences, and complete a 2-year mentored research project, thesis and public seminar. Our third objective is to provide MSP Scholars with effective academic and personal mentoring and professional and leadership development opportunities. We will leverage the resources and expertise of existing programs that provide academic support and mentoring. Scholars will participate in OSU MANRRS (Minorities in Agriculture, Natural Resources, and Related Sciences), providing service learning and local/national professional and leadership opportunities. Scholars will complete funded internships in industry or government agencies. We will support peer mentors, and partner with graduate programs to provide tutors. The project will graduate 6 exceptional students from underrepresented groups with research training and professional</p>	1

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		<p>experience in the food/ natural resource/ agricultural fields, with baccalaureate degrees and well prepared to join the workforce or a graduate/professional degree program.</p> <p>All 9 MSP scholars have participated in leadership opportunities via CAMP mentors, OSU SACNAS and MANRRS Chapter, with one serving as a Nationally elected MANRRS Region undergraduate student officer, STEM Leaders, CAS Ambassadors, or CAS Leadership Academy. 6 of the 2016 MSP scholars participated in SEL to Puerto Rico Spring Break 2018 providing agricultural education and rebuilding damaged school.</p> <p>2 scholars have graduated and completed comprehensive undergraduate research theses:</p> <ul style="list-style-type: none"> <li>* Analysis of boscalid resistance of isolates of Botrytis cinerea</li> <li>* Biogas inhibition of fats, oils, and greases with varying ammonia levels</li> </ul>	
8.	Genomic Tools, Genetic Resources, and Outreach to Expand Commercial U.S. Hazelnut Production	<p>Hazelnuts are a profitable, high-value, low input, sustainable crop for which steadily increasing world demand now exceeds supply and stakeholders (from producers through consumers) show a significant desire for expanded US production. However, susceptibility to eastern filbert blight (EFB) caused by the fungus <i>Anisogramma anomala</i> and the limited climatic adaptation of existing cultivars severely limit production in the eastern and Midwestern regions and threaten the sustainability of current production in Oregon. The genetic resources and knowledge to overcome these limiting factors now exist. This SREP "<b>Center of Excellence</b>" project leverages substantial resources and prior investments to develop genomic tools for hazelnut (Approach 1), study gene expression following EFB inoculation (Approach 2), map dominant R genes and study R gene Genomic tools, genetic resources, and outreach to expand commercial U.S. hazelnut production - 7 pyramids and resistance in <i>Corylus americana</i> (Approach 3), enhance <i>Corylus americana</i> germplasm collections (Approach 4), improve knowledge of the pathogen <i>A. anomala</i> (Approach 5), identify superior cultivars and pollenizers (Approach 6), and bolster and implement strategic, coordinated outreach efforts (Approach 7) to address these limiting factors in a targeted, effective, and comprehensive way with longterm goals that include: a) the expanded planting of hazelnut as a food crop, b) the development of new economic options for producers and entrepreneurs, and c) the improvement of national food security by enhancing crop, farm system, and product diversity, adaptation to climatic fluctuations, and improved disease resistance.</p> <p>We sequenced 'Jefferson' parents OSU 252.146 and OSU 414.062 with PacBio and Illumina technology. Eastern filbert blight (EFB) resistance in 'Jefferson' is on LG6. Genome sequences were generated for OSU 1026.073 and its parents (LG7 resistance), and OSU 1477.047 (LG2 resistance) and its parents. These genome assembly trios support investigation of various sources</p>	1

		<p>of EFB resistance. The finely mapped EFB resistance region in 'Jefferson' contains 23 genes, of which 14 are from its resistant parent. More than 100 SNP markers differentiate the genes from the resistant and susceptible parents. Primers for long-range PCR (73 pairs) were developed to amplify 3 target areas in the 'Gasaway' resistance region, of which 90% produced a product of the expected size. Sequence alignment revealed that several genes in the homologous target regions show great similarity, so gene-specific primers that spanning exon-exon boundaries are necessary to quantify gene expression. We evaluated EFB response in the field of 40 clonal F1 hybrid selections and a subset of their F2 progeny. The responses ranged from moderately tolerant to highly tolerant to resistant; many progenies included seedlings with less disease than either parent. F2 progeny distributions indicate quantitative (multi-genic) inheritance and major gene resistance.</p> <p>Hybrid hazelnut OSU 541.147 was released for the eastern U.S. by the Hybrid Hazelnut Consortium in April 2020 and a plant patent application submitted in August 2020. At OSU, evaluation in replicated trials of 69 F<sub>1</sub> hybrid selections continues. In collaboration with OSU, Rutgers released four cultivars ('Raritan', 'Monmouth', 'Hunterdon', and 'Somerset') with high tolerance or resistance to EFB; patent applications were filed. A licensed micropropagator and nursery will increase them. Farmers will plant orchards of these new cultivars and pollinizers in fall 2020. Rutgers identified a superior American hazelnut with high yield, large nut size for the genus, thin shell, relatively open husk, and great kernel blanching. Rutgers identified &gt;60 EFB-resistant F1 hybrid selections, clonally propagated them, and sent a subset to the University of Nebraska for evaluation.</p>	
<p>9.</p>	<p>IPMSPs: Bringing Integration to Pest Management Strategic Plans</p>	<p>We propose to connect IPM Center developed consultative processes with local IPM extension programming to achieve a more integrated research and extension system. We will develop a model for agricultural stakeholder engagement and follow-up on critical IPM challenges that combines Pest Management Strategic Planning (PMSP) and Crop Pest-Losses Impact Assessments (CPLIAs) with participatory extension education. We directly support CPPM program goals of increasing widespread adoption and implementation of IPM, and IPM Roadmap goals of reducing human health and environmental impacts. Our model infuses the PMSP with greater IPM content, and uses this to inform local, risk-management based IPM Extension programming. Annual CPLIAs provide crop loss and IPM cost data that underpin ongoing assessments of progress and impacts. The resulting education program will lead to increased IPM adoption among our collaborating stakeholder groups and will enable more effective responses to new pest management challenges. Supported by an IPM-Center developed IPM impact evaluation model, PMSPs and CPLIAs will become a centerpiece "IPMSP" program that provides an organizing principle for state IPM programs in the Pacific Northwest and Arizona. This will ensure continued progress toward nationwide IPM Roadmap goals and offers a transferrable model to enhance adoption elsewhere.</p>	<p>1</p>

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		<p>Over the last year, we have developed a model for data analysis and reporting, the first example of which is currently pending publication. Although this is based on a crop outside of this award, the work to develop this reporting format and structure will enable us to complete one of our objectives. The model for IPM strategic planning has been piloted successfully and developed and published through OSU Extension. We now have 4 completed and published IPM Strategic Plans, as well as a published how-to guide for the model. The IPM elements have been added successfully and have become important elements in the process and document. Crop Pest Losses surveys have now been conducted successfully with all four industries, with one industry (onion) having received the first biennial update. We have maintained close communication and collaboration with local, regional, and national partners including the regional IPM Centers regarding the IPMSP method and our progress and publications.</p>	
<p><b>10.</b></p>	<p>Enhancing Diversity and Scholarship in Agricultural Education</p>	<p>Our Fellowship program will support one PhD fellow in the targeted expertise shortage area of Agricultural Education in the Agricultural Social Sciences (S) discipline. We will recruit an underrepresented minority fellow and provide rigorous cross- disciplinary training in agricultural education with an emphasis in STEM preparation. Our Fellow will create a national impact as he/she takes faculty positions to train and support secondary teachers in agricultural education, exponentially increasing their ability to impact agricultural education, further support underrepresented minority students, and serve as models for the next generation of agriculturalists. Our overall project goal is to develop faculty with competencies in research, teacher education, curriculum development, educational technology, service, leadership, and scholarship.</p> <p>The following goals were accomplished on this project:</p> <ol style="list-style-type: none"> <li>1. Successfully recruit, retain, and graduate one under-represented National Needs Fellow.</li> <li>2. Provide holistic mentoring of our Fellow to include academic advising, research support, leadership development, personal development, career readiness training, and mentor pairing through the early career stages.</li> <li>3. Provide opportunities in research, teaching, course development, service, and advising to best prepare our Fellow for career success.</li> <li>4. Provide opportunities to attend and participate in discipline specific research conferences as well as leadership development activities.</li> <li>5. Graduate a Fellow who will have presented research at regional and national conferences with a successful record of publication.</li> </ol>	<p>1</p>

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		<p>In addition, our project addresses the NNF program goals to: (a) train new students to fill nationally identified TESA, (b) increase the quality and diversity of traditionally underrepresented groups, (c) build science competencies through participation in experiential learning, and both the USDA and NIFA Strategic Goals and Objectives to: (a) increase the number of underrepresented students, college graduates, and those with an integrated education component, (b) enhance the ability to create sustainable change in their homes and communities through the synthesis of technical skills and leadership concepts.</p>	
<p>11.</p>	<p>Harnessing the Voracity of the Biocontrol <i>Tyta luctuosa</i> to Improve Management of Field Bindweed During Transition to Organic and Beyond</p>	<p>The goal of this project is to develop and demonstrate integrated weed management plans for field bindweed (<i>Convolvulus arvensis</i> L.) in organic systems so that organic producers and others transitioning to organic can reduce the impact of this pernicious weed. A secondary aim is to develop attractants for the field bindweed moth <i>Tyta luctuosa</i>, a biological control agent (BCA) of field bindweed. We propose to test and demonstrate how attractants can enhance herbivory and improve the efficacy of an ecologically based weed management plan. Additionally, this project will contribute to the development of cultural practices that may replace or reduce the need of some of the allowable alternatives and substances listed for organic production, including organic herbicides that are difficult to safely apply. These goals are consistent with the goals of the ORG program because this project will improve the competitiveness of organic crop producers, particularly those that are transitioning to organic practices.</p> <p>A rearing protocol for <i>T. luctuosa</i> is now published on the e-Organic site to assist anyone wishing to rear and augmentatively release of <i>T. luctuosa</i> as a biological weed control agent. Other methods of redistribution from wild-caught populations are being discussed (collecting adults, shipping pupae, etc).</p> <p>Laboratory assays were planned for March through May 2020, in preparation for deployment summer 2020. Access to campus facilities was restricted at that time, and pupae remained in cold storage. We were, however, able to analyze data from the 2019 field season, and found some interesting interactions among the initial semiochemical attractants tested and other tactics used to attract moths. There was higher bindweed coverage by moths in plots that included benzaldehyde as part of the semiochemical bait treatment, regardless of what other factors were present (pheromone, augmented release of larvae, etc.).</p> <p>A large dataset was gathered from monitoring 3 commercial farms and 1 research farm where moths have naturalized. Parameters measured included flowering, shoot length, percent cover, and visible signs of herbivory. Analysis of that data has proven useful for developing future release plans. For example, if larvae must be contained within mesh bags to focus herbivory, a 'terminal capacity' of 5 larvae per bag seems to be consistent across observations.</p>	<p>1</p>

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		<p>One large-scale field experiment was conducted in an organic commercial blueberry plantation. The objective was to document efficacy and operational pros and cons of steam when applied by the grower's staff. The steam was effective at killing weeds, but it requires a qualified operator to ensure equipment longevity. Additional experiments were conducted on university farms to evaluate the impact of boiler temperature and steam flow rate on weed control.</p>	
<p>12.</p>	<p>Statewide Networks for Overcoming Barriers to IPM Adoption in Oregon</p>	<p>This is an EIP project that addresses the primary area "IPM Implementation in Specialty Crops" and the secondary area "IPM Training and Implementation in Schools". Our specialty crop program involves needs assessments conducted with Extension agents and stakeholders, and directly addresses eight economically important crops in Oregon and the Pacific Northwest: onions, cranberries, hazelnuts, cherries, grass seed, pears, mint, and potatoes, with impacts to many additional industries. We will compile economic data on pest losses and production costs, and conduct IPM strategic planning. We will design extension outreach that will engage agents in addressing IPM priorities, pesticide risk management, and natural enemy/pollinator protection, with agro-ecological approaches. We will lead a watershed-based, multi-stakeholder pesticide stewardship partnership involving multiple specialty crop industries to reduce pesticide contamination in surface water. We will develop new pest models, technology, and system infrastructure for our climate and weather-based decision support tools. Our School IPM program will oversee trainings for school IPM coordinators and staff, it will prepare Head Start programs to meet IPM challenges that benefit at-risk students, and it will provide IPM training for environmental health inspectors to consider IPM in inspections. We directly address CPPM program goals of improving IPM practices and economic sustainability with reduced environmental and health risks with a model for IPM implementation supported by state-of-the-science risk assessment and decision support tools developed by us in collaboration with local, regional, and national partners.</p> <p>Accomplishments include:</p> <p>An integrated pest management strategic planning (IPMSP) and crop pest losses impact assessment (CPLIA) framework: Percent completion: This objective is 85% complete                  Completed biennial revision and publication of an IPM Strategic Plan for Treasure Valley Onions: Murray, K., Jepson, P., and Reitz, S. (2019). An Integrated Pest Management Strategic Plan for Treasure Valley Onions: Oregon and Idaho. Oregon State University Extension Publication EM 9254 <a href="https://catalog.extension.oregonstate.edu/em9254">https://catalog.extension.oregonstate.edu/em9254</a></p>	<p>1</p>



		<p>Completed publication of an IPM Strategic Plan for Potatoes in OR, WA, and ID: Murray, K., Jepson, P., Sandlin, I., Jenson, A. (2020). An Integrated Pest Management Strategic Plan for Potatoes in Oregon, Washington, and Idaho. Oregon State University Extension Publication EM 9275.</p> <p>IPM Strategic Plan workshop for Pears in Oregon and Washington was held in March 2020 with 22 researchers, extension agents, growers, and consultants from Oregon and Washington attending; publication is now in workgroup development.</p> <p>Crop Pest Losses data report publication for Oregon mint is pending publication</p> <p>Co-funding received to conduct IPM strategic planning for Oregon and Washington brassica crops and Oregon nursery crops for FY20-21;          A pesticide stewardship partnership (PSP) program that focuses upon IPM and risk management education to limit surface water contamination;          A 5-year strategic PSP plan for the Middle Rogue watershed to increase local commitment to and efficacy of the program has been completed, and is in motion. A regional network of professionals working in functional agricultural biodiversity (FAB);</p> <p>Continuing development of multi-species spatial modeling platform known as DDRP (Degree-Days, Risk mapping and Pest event mapping), (95% complete); parameterized models for 15 invasive species.</p> <p>Combining mobile-friendly pest models with "push" text and email alerts based upon model predictions; currently beta testing these developments with the initial applications for degree-day models and several plant disease pathosystems</p> <p>Degree-day models as an app and using "push" notifications for all 130+ degree-day/phenology models at USPEST.ORG. The current version is online: <a href="https://uspest.org/dd/model_app">https://uspest.org/dd/model_app</a>; This app has been overhauled and updated over the past 18 months and is set to replace our legacy degree-day calculators.</p> <p>The "push" system is expected for release for the 2021 growing season. The app is available in the Android play store; release soon from Apple app store.</p> <p>New model developments at USPEST.ORG since May 2019: Tomato leafminer, honeydew moth, false codling moth, bronze birch borer; 6 new sweet corn CROPTIME models, developed to help growers schedule planting and harvest times.</p>	
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		<p>Model runs for insect models plus the generic degree-day calculator on our platform reached over 98,000 in 2019</p> <p>The most popular insect degree-day models currently in our system include (with approximate average number of runs per year over the past four years): generic calculator, 39,000; codling moth, 6,500; spotted wing Drosophila, 5,000; orange tortrix, 3,800; gypsy moth, 2,800; oblique-banded leafroller, 2,000; western cherry fruit fly, 2,000; peach twig borer, 1,900, san Jose scale, 1,900, and oriental fruit moth, 1,750.</p>	
<p>13.</p>	<p>Assessing Key Factors Influencing Farmers' Water Use and Irrigation Decisions on the U.S. West Coast</p>	<p>The goal of this project is to identify the key economic, biophysical, climate, and, institutional factors influencing farmers' water application rates and irrigation technology adoption on the U.S. West Coast (California, Oregon, and Washington). The specific objectives are: 1) Create a profile of water and climate variables affecting specific crops, including the timing dimensions of these variables and whether there are "upside" or "downside" risks; 2) Develop crop-specific databases on spatial and temporal variations of important climate variables affecting crop production on the West Coast; 3) Develop a database to characterize water availability, water supply institutions, irrigation technology, and water use across farms on the West Coast; 4) Develop a farm-level modeling system to understand how water availability, water supply institutions, climate, and extreme weather affect farmers' crop choice, water use and irrigation technology adoption for specialty crops, grain, and forage crops on the West Coast; 5) Use the modeling system to analyze how farmers would respond to changes in climate and water policy and to understand the barriers or disincentives to adopt efficient irrigation technologies; and 6) Communicate findings to inform policy on water resource management.</p> <p>This project, though not complete has accomplished the following:</p> <p>1) Created a profile of key water and climate variables affecting several major crops/crop types in the region by using the Cause of Loss Data (COL) collected by the Risk Management Agency of the US Department of Agriculture (USDA). The COL data are complemented by our review of the agronomic and plant science literature on risks for producing each of the five crops. The major crops/crop types covered in this project include orchard/vineyard (top crops in each of the three states), rice (important in California in term of acreage and water use), wheat (important in Oregon and Washington), potatoes (a top crop in Oregon and Washington), and forage (important in all three states). The crop-specific profiles summarize the specific climate and weather conditions critical to the health of each of the crops, including timing dimensions of these conditions (e.g., freezing risk in late spring or heat risk in June) and whether there are "upside" or "downside" risks (i.e., exposure to above or below normal conditions).</p>	<p>1</p>

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		<p>2) Developed a crop- and agricultural-land-specific database on the historical mean and standard derivation of the critical climate and weather variables identified in the profiles. These historical means and standard deviations measure, respectively, the expected weather and climate conditions and the risks of extreme climate and weather events for growing each of the crops. Extracted long-term climatological, monthly and annual county averages, for the 30-year period 1983-2012 using PRISM 800-meter daily gridded time series data. Data for each county were extracted using an agricultural land mask so that data did not include mountainous areas or other non-agricultural lands.</p> <p>3) By analyzing the most comprehensive data on agricultural water use in the US - the 2008 and 2013 Farm and Ranch Irrigation Surveys (FRIS), we provide a complete picture of the spatial and temporal variations in water availability, water supply institutions, crop choices, water use, and irrigation technology adoption across the US West Coast.</p> <p>4) Developed an empirical framework for estimating the effect of water scarcity, expected weather and climate conditions, and risks of extreme weather events on agricultural producers' decisions connected with land and water use on the US West Coast.</p>	
14.	Multicultural Scholars Program to Enhance the Diversity of the Agricultural Workforce	<p>Objectives of this MSP are to: 1) Recruit 6 URM/ first generation students who show a strong interest in careers in agricultural/renewable natural resource sciences; 2) Enroll scholars in BioResource Research (BRR), an interdisciplinary major with required research; 3) Provide academic and peer mentoring and opportunities for professional and career development, leading to their successful graduation; and 4) Incorporate experiential/service learning, including a faculty-led tropical agriculture/hurricane recovery trip to Puerto Rico. The BRR interdisciplinary major in OSU's College of Agricultural Sciences integrates high-value educational practices and has documented effectiveness in graduating underrepresented (URM) and MSP students. To recruit, we will partner with OSU organizations with a strong record of recruitment/ retention of URM students. Scholars will be selected using cognitive and non-cognitive criteria, including leadership and interest in a career in agriculture. Scholars will be matched with trained Peer Mentors funded by Cost of Education. Scholars will benefit from culturally- appropriate academic/personal mentoring programs (CAMP, TRiO), and join MANRRS or SACNAS for service learning, professional development, and leadership. They will complete a 2-year authentic mentored research project in a USDA-NIFA area of emphasis, culminating in a thesis and seminar. A Puerto Rico tour will provide exposure to tropical agriculture and service to Puerto Rico's agricultural education infrastructure. MSP scholars will be evaluated twice a year; data will be used for programmatic assessment/ improvement. This MSP will provide underrepresented and first-</p>	1

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		<p>generation students with strong preparation for careers and graduate programs in agriculture and renewable natural resources.</p> <p>Of the 8 MSP scholars, all have completed BRR 100 – Great Experiments in Bioresource Research and BRR 200 – Developing a Research Proposal: Theory and Practice courses. 5 MSP scholars have identified research projects and mentors and have started their comprehensive research experiences and have enrolled in BRR 401 – Research credits.</p> <p>6 MSP scholars attended the National SACNAS Conference in Honolulu, HI. networking with USDA career professionals, attending professional development workshops, learning about graduate opportunities, and finding summer internships.</p> <p>Professional Development, mentoring and service opportunities through the OSU MANRRS Chapter have included: Interview Skills, Resume Building, Elevator Speeches, science outreach to youth, team building, fund raising and grant writing, networking with career and industry professionals. Students prepared for travel for SEL planned for Spring Break 2020, however, 2 days before leaving, the university banned all student travel which also impacted the Spring term planned National MANRRS Conference which was cancelled. Another student received a National Lab internship for summer 2020 at PNNL which was also cancelled.</p> <p>2 MSP scholars participated in Leadership Academy, and 2 more served as CAS Ambassadors. One served as a CAMP mentor, and another CSI leadership intern.</p>	
15.	Northern Vegetable Improvement Collaborative (NOVIC) 3	<p>The overall long-term goal of NOVIC3 is to increase the proportion of US agriculture that is managed organically. To achieve this goal, we seek to provide organic growers with greater access to improved vegetable cultivars that are adapted to organic systems. Such cultivars should be productive, robust (stable across environments), relevant (meet growers' market needs), high quality and nutritious. Increasing the number of cultivars that are produced as certified organic seed will facilitate the end of the untreated, conventional seed exemption under NOP§ 205.204 for certified organic seed. The project will conduct variety trials to identify existing cultivars that are adapted to organic production and have the taste, flavor and quality traits that consumers expect from organic produce. Where gaps in suitable cultivars exist, breeding programs will be conducted for a selected set of crops.</p> <p>Research Objective - To breed the following vegetables for specific traits targeted to organic systems: 1) Late blight resistant, productive and tasty tomatoes for field production in cooler climates. 2) Early maturing, flavorful, disease and blossom end rot resistant tomatoes adapted to high tunnel production. 3) High quality, cold tolerant, open - pollinated, red and green storage cabbage. 4) Long storing, productive, high quality, powdery mildew resistant winter squash. 5) Early, good tasting, high - yielding blocky red bell pepper. 6) High quality, early maturity "everlasting OP" sugary-enhanced sweet corn. 7) Savory (green vegetable) corn adapted to</p>	1

		<p>organic production. 8) Fertile gynocious cucumbers where maintenance is based on genetic control rather than synthetic hormones.</p> <p>The primary outreach objectives include, 1) expansion of regional plant breeding workshops, 2) delivery of webinars and an online toolkit on on-farm organic plant breeding fundamentals, 3) delivery of seed production education through the USDA Plant Genetics Resource Unit (PGRU), 4) farmer-driven variety trials that address regional priorities in organic vegetables, and 5) participation of farmers in variety development including on-station evaluation of early populations and advanced varieties as well as deployment of breeding populations for farmer-managed on-farm breeding projects.</p> <p>Accomplishments to date:</p> <p>Vegetable variety trials were grown by NOVIC participants in five states. A mother-daughter trial design was used whereby replicated trials were grown at research stations and single rep trials on several organic farms in each region. The trials were evaluated for productivity, earliness, disease resistance and flavor. The crops trialed and region in ( ) were: cabbage (WA), Carrot (NY, WA &amp; WI), cucumber (NY), dry bean (NY), dry/flour corn (WA) lettuce (CO), melon (OR, WI), onion (WI), mild-hot peppers (CO, OR, WI), purple sprouting broccoli (WA), Spinach (WA), storage onions (WA), sweet peppers (CO, OR, NY, WA, WI), sweet corn (OR &amp; WI), red and gold table beets (WA) tomato (CO, OR, WI, WA), and winter squash (NY, WI, OR, CO). Trials in WI were conducted at two hub locations in Madison and Spooner. Daughter trials were conducted on 13 farms in WA and 7 in OR.</p> <p>Several projects involving sweet corn are underway. Also in WI, we evaluated tomato breeding lines and parents in organic conditions to develop extra early populations for recurrent selection in high tunnel environments adapted to the upper Midwest. In WA, work on the "Olympic Sweet" corn breeding project continued with 200 plots of full-sib families planted and evaluated at OSA research farm. Ear to row selections were also planted at the Organic Farm School on Whidbey Island. Cabbage Breeding in WA continued with selections planted at Nash's Organic Farm for overwintering and spring head selection and seed production in 2020. Butternut squash breeding continued in NY. Approximately 50 advanced breeding lines were grown and evaluated for yield, quality and disease resistance. A powdery mildew resistance molecular marker developed as part of the USDA-NIFA CucCAP was used to select lines. A pole dry bean breeding project was initiated because of grower requests for disease resistant bean seed that can be grown in the Northeast. Also in NY, the most promising pepper lines from NOVIC II are being evaluated in 2019. In CO, we conducted an assessment of the metabolite profile from the NOVIC peppers using rapid evaporative ionization mass spectrometry (REIMS) and solid phase micro extraction gas chromatography mass spectrometry (SPME-GC-MS). Our goal was to characterize the volatile components contributing to flavor in NOVIC bell and roasting peppers using mass spectrometry. In</p>	
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		addition, we will be using direct application real time (DART) mass spectrometry (September-October 2019) to assess the metabolite profile of peppers without an extraction step, so that genotypes can be screened for flavor components with minimal sample preparation.	
16.	Management Techniques to Optimize Soil pH and Nutrient Availability in Organic Highbush Blueberry Grown East of the Cascade Range	<p>The long-term goal of this project is to develop improved horticultural management strategies for soil pH and organic matter within the unique conditions in eastern Oregon and Washington. This will ensure the short- and long-term success of the robust organic blueberry industry in eastern Washington and Oregon. This goal is essential to supporting the primary organic blueberry production region in the US, as well as creating more opportunity for regional expansion. Outcomes from the project also will be applicable to other production regions which face similar challenges. Project priorities have been developed collaboratively with stakeholders and will focus on developing methods to economically modify and maintain soil pH and organic matter, both of which are industry bottlenecks imperative for existing and future production success. Currently, there is no research-generated information to guide organic growers with naturally high pH soils on best practices to manage soil pH and organic matter. Based on our previous work and preliminary studies, we are proposing to evaluate modified horticultural practices, such as the use of pelleted and micronized sulfur for rapid and long-term soil acidification and the use of acidified grape pomace and alternative biochar feedstocks as improved sources of organic matter within these naturally alkaline soils.</p> <p>All experimental design work, soil preparation, plantings, and data collection work are complete. Initial results will be available this year (2021) with project completion in 2024.</p>	1
17.	RNAi mediated disease resistance: Efficacy, stability, and non-target/off-target impacts	<p>RNA interference (RNAi) directed against pests and pathogens, often called host induced gene silencing (HIGS), is a new approach for engineering resistant plant varieties. HIGS is expected to produce highly specific forms of resistance compared to pesticides and most other resistant varieties; however, this prediction has not been rigorously tested. A better understanding of the specificity of HIGS will inform the development of regulatory standards for non-target organism studies. We propose to use the Populus trichocarpa model system to study HIGS. Populus is genetically transformable, has a well characterized microbiome, and has excellent genomic resources. We will focus on the Sphaerulina canker and leaf spot, the most economically important disease of poplar trees. Our proposed study will use a combination of field and greenhouse experiments to evaluate the ecological impact of HIGS based disease resistance on the Populus</p>	1

		<p>microbiome. We have already created HIGS constructs that are effective against the Sphaerulina pathogens. These constructs are currently being transformed into Populus. We will test these transgenic lines in randomized greenhouse and field trials to assess disease resistance and non-target effects of HIGS on the Populus microbiome.</p> <p>We have confirmed successful transformation of Populus using, PCR, qPCR, and northern blotting to detect the presence of the insert and expression of the RNAi in the transgenic plant. These confirmed transgenic lines are currently being propagated for the initial disease resistance screening assay which will be conducted in magenta boxes to reduce the total number of transgenic lines used in Objective 2. We anticipate conducting the magenta box screening in early winter 2021. The data from this initial screen will be analyzed and a reduced number of transgenic events, with the greatest levels of disease resistance, will be used in the greenhouse experiment.</p> <p>The purpose of Objective 2 is to test HIGS transgenic lines selected for disease resistance in the magenta box screening for greenhouse testing. Currently, all transgenic lines are being propagated and once the results from the magenta box screening have been analyzed we will select lines for the greenhouse screening assay.</p>	
<p><b>18.</b></p>	<p>Integrated and Cooperative Russian Thistle (Salsola Tragus) Management In The Semi-Arid Pacific Northwest</p>	<p>The most common cropping system in the semi-arid region of the Pacific Northwest (PNW), where low annual precipitation prevents alternative crops, is winter wheat followed by one year of fallow. To save water during the fallow period, weeds must be controlled with herbicides or tillage. One significant challenge to these cropping systems is Russian thistle (Salsola tragus). Russian thistle is a continuous problem probably because seeds are reintroduced to a field from roadsides, ditches, and neighboring fields by plants tumbling with the wind. The goals of this project are: 1) Determine the biological and ecological factors that make Russian thistle a recurrent problem, 2) Demonstrate that reducing Russian thistle problems is possible by integrating practices that prevent Russian thistle plants from tumbling, and 3) Prove that Russian thistle infestations can be decreased more efficiently with a cooperative control effort. To achieve these goals, the particular objectives we propose are: 1) Investigate aspects of Russian thistle ecology and biology to improve its control in dryland cropping systems, 2) Investigate harvest and post-harvest strategies to improve integrated Russian thistle management in no-till dryland cropping systems, 3) Evaluate the potential of cooperative efforts to improve Russian thistle control, and 4) Document and communicate results to growers, their advisors, other stakeholders, and the scientific community. By improving integrated Russian thistle management practices, the project seeks to enhance the economic and environmental sustainability of dryland cropping systems in the PNW and similar semi-arid regions.</p>	<p>1</p>

		<p>Due to the pandemic, this project has been delayed but all field plots have been identified and preliminary results obtained on RT seed germination rates and soil temperature and moisture content for germination. Fencing to capture tumbling RT plants are in place as are control fields for both planted and fallow wheat fields.</p>	
<p><b>19.</b></p>	<p>Climate resilient and sustainable forage-based livestock production systems for Oregon</p>	<p>The overall goal of this project is to systematically evaluate forage production, livestock management and ecosystem services from natural and cultivated grasslands and develop adaptive management strategies for sustainable forage/livestock farming across Oregon.</p> <p>A temperate climate and favorable agroecological conditions for forage growth together with strong forage seed and hay industries make Oregon a highly conducive place for forage-based livestock farming. However, the forage and livestock production in Oregon is specifically challenged by erratic rainfall, poor forage management and utilization, competition among public land management interests, limited and scarce land and water resources, and other social-economic issues such as climate change and rural community culture. Therefore, the utilization and management of forages need to be improved in order to achieve high production efficiency and to cope with climate change and unstable market conditions.</p> <p>In order to improve Oregon livestock production efficiency, we need to systematically study all the land resources including forested rangeland, shrubland, valley bottom irrigated pastures and hay land. Furthermore, we need to focus on the interactions between livestock production and wildlife habitat preservation, water availability and quality, and soil health. Novel grazing systems such as sequential grazing, grazing cover crops to extend the grazing season, and use of forages with bioactive compounds to reduce GHG emissions can be studied to help increase livestock production, health, profitability and sustainability.</p> <p>Current project findings are identified below:</p> <p><u><i>Agrivoltaics production system:</i></u> We conducted a 2-year grazing study where we compared herbage and lamb production from agrivoltaics and traditional open pastures. This was the first ever study reporting livestock production in an agrivoltaics system. Our findings suggest that the land productivity could be greatly increased through combining sheep grazing and solar energy production on the same land. The profits from our grazing efforts show that grazing in combination with solar energy leasing could increase revenues by 46% compared with solar alone. This was part of Honor thesis work of Alyssa Andrew who was supervised by Dr. Ates. Our manuscript is under review in <i>Frontiers in Sustainable Food Systems</i>.</p> <p><u><i>Forb-based pasture systems:</i></u> We performed a large grazing study where we compared the effects of grazing Jersey dairy cows on grass, forb (&gt;60% DM of chicory and plantain), and legume-based pasture mixtures on milk yield, milk components, N partitioning, and CH<sub>4</sub> yields (Wilson et al., 2020). The data clearly indicated an increase in animal performance, particularly increased in milk yield and yield of milk solids and reduction of urinary N outputs and CH<sub>4</sub> emissions per kg DM eaten by cows when grazed on forb pastures compared to the traditional white clover-ryegrass pasture (Wilson et al., 2020). A feature of the results was that the cows grazed on Forb also had</p>	



		<p>lower milk somatic cell counts (SCC) compared to cows grazed on grass, which is indicative of a healthier mammary gland. This finding has led to new project ideas and funding acquisition for further studies. Our paper was featured at Journal of Animal Science.</p> <p><u><i>Spent hemp biomass as livestock feed:</i></u> An experiment was carried out at Oregon State University to investigate the use of spent hemp biomass inclusion in the diet of finishing lambs. The primary objective of that study was to determine and quantify the presence of cannabinoid residuals in lean and adipose (fat) tissues and effect on performance and health of lambs. Our data support the safe use of spent hemp biomass to feed lambs. Besides not being detrimental to the performance or health of lambs, feeding spent hemp biomass resulted in increased feed intake in the long run. The higher feed intake induced by the spent hemp biomass could be due to an effect on the rumen or could be a systemic effect. Currently, we are working on meat quality parameters.</p> <p>Another collaborative project, led by David Hannaway, is developing an “Oregon Forages” website (<a href="https://forages.oregonstate.edu/oregon">https://forages.oregonstate.edu/oregon</a>). This website, primarily focused on Oregon, will include comprehensive content of forage and livestock topics and segments devoted to the interrelationships among soil, water, plant, animal, and human health and the economic and social implications of developing sustainable agricultural systems. This site will simplify the search for information by county agents and specialists, farmers and ranchers, and agricultural agency personnel and build stronger linkages among research, outreach, and classroom and eCampus teaching efforts. Progress to date includes developing the organizational outline of 19 topic areas, numerous sub-topics, and content authors. Initial drafts have been completed for many of the sections and a review process is being developed. This review process is necessary for ensuring “scholarly accomplishments” credit for authors.</p>	
20.	A Defeated Effector Leads to the Convergence of Plant Disease Resistance and Susceptibility	<p>Genes that confer plant disease resistance are commonly employed to prevent plant disease in a cost-effective, environmentally benign way. Studies of a disease called Victoria blight, have indicated that a plant disease resistance gene can confer plant disease susceptibility. Victoria blight is caused by the fungus <i>Cochliobolus victoriae</i>, which is pathogenic dependent on its production of a peptide called victorin. Plant sensitivity to victorin and susceptibility to the fungus is conditioned by a single dominant gene that encodes a resistance protein. Victorin has been demonstrated to activate the resistance protein by binding to a thioredoxin that is apparently guarded by the resistance protein. The work outlined in this proposal is directed at trying to further characterize this phenomenon and is composed of three objectives: Objective 1, Genetic characterization of victorin sensitivity in diverse, sensitive species; objective 2, Mapping and cloning of a gene that impacts developmental (ontogenic) resistance (victorin sensitivity); and objective 3, Identification of Victorin-like effectors from other pathogens. Completion of these objectives will determine if the mechanism of victorin sensitivity is conserved across a diversity of plant species and characterize developmental control of this response. In addition, pathogens will be examined to determine if they produce virulence effectors that function similar to victorin. The work is directed toward understanding why some resistance genes can be exploited by pathogens</p>	1

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		<p>and lead to serious disease outbreaks. In addition to conducting and analyzing experiments, other expected outputs are training and mentoring particularly of undergraduate students; attendance at conferences and publication of data in peer-reviewed manuscripts.</p> <p>For <i>Brachypodium distachyon</i>, during production of a mapping population from a cross of Bd21 X ABR6, we initiated a collaboration with Dr. Matthew Moscou at the Sainsbury Laboratory as his group had already developed a mapping population from this cross. Using this population, we mapped victorin sensitivity to chromosome 3 at the locus, Bradi3g58937. Interestingly, this locus encodes a fusion protein of an NB-LRR with a thioredoxin. This strongly suggests a functional equivalency to what we had previously observed in <i>Arabidopsis</i>. That is, an NB-LRR "guarding" a thioredoxin target for victorin, except that in <i>Brachypodium</i>, these two genes have been fused. Thus, these results implicate a prototypical "decoy" system. Additionally, this gene is immediately adjacent to another NB-LRR, which is transcribed in the opposite direction, Bradi3g58951. Guided by findings conducted with other NB-LRR fusion proteins, we expressed these two genes in <i>Nicotiana benthamiana</i>, and found evidence that this second gene very likely encodes a signaling partner for Bradi3g58937. These results are very exciting both for their implications for understanding the evolution of defense decoys and for demonstrating a conservation of mechanism for victorin sensitivity across diverse species.</p>	
21.	Resistance Genes that Confer Plant Disease Susceptibility and Their Activation	<p>Our investigations of <i>Arabidopsis</i> have revealed that an NB-LRR encoding gene called "LOV" confers both victorin sensitivity and susceptibility to <i>C. victoriae</i>. Although LOV confers susceptibility, it appears to be a typical resistance (R) gene whose product, shares the same structural and functional requirements as other R proteins and is activated by a mechanism identical to the guard model of R-protein activation. Furthermore, in the absence of LOV, victorin enhances the virulence of biotrophic pathogens. Thus, victorin apparently functions as a biotrophic effector that is recognized as an avirulence determinant by an R gene. In other words, <i>C. victoriae</i> is activating the resistance response (&amp; HR) for disease susceptibility. These results are entirely consistent with Vb and Pc2 in oats occurring as one and the same gene and support that an R gene can confer disease susceptibility.</p> <p>The discovery of victorin sensitivity in <i>Arabidopsis</i>, a species considerably divergent from oats, led us to investigate other plant species with an eye toward further understanding victorin's mode-of-action and ultimately identifying Vb/Pc2 in oats. We identified sensitivity in common bean, barley, <i>Brachypodium</i> and rice. Mapping data indicated that in all species, sensitivity is conferred by R-like genes (i.e. genes encoding NB-LRRs). Because these genes recognize victorin, they share recognition specificity with Vb in oats. Further, if Vb and Pc2 are identical, then, by definition, Vb/Pc2 confers shared recognition of both victorin and AvrPc2 from <i>P. coronata</i>. Thus, we</p>	1

		<p>hypothesize that genes conferring victorin sensitivity from these other species may also confer rust resistance in oats.</p> <p>In addition to expanding current, growing knowledge of biotrophic effector targets and defense activation, completion of the proposed work promises to clarify the nature of the type of biotrophic effectors that can be exploited by necrotrophs to cause disease, an important, understudied, recently-emerging paradigm for plant-microbe interactions. Further, the proposed efforts will provide insight into the identification and use of nonhost, R-like genes that can be exploited for defense against important pathogens, such as rusts. Additionally, we will finally and unequivocally determine if a true, known R gene can indeed confer plant disease susceptibility, a hypothesis awaiting over 70 years for confirmation. Other expected outputs are training and mentoring particularly of undergraduate students; attendance at conferences and publication of data in peer reviewed manuscripts.</p> <p>Based on the identification of ecotypes with a victorin sensitivity phenotype intermediate between that conferred by LOV and SSEN, we hypothesized that there may be an additional NB-LRR(s) (other than LOV and SSEN) that confers victorin sensitivity in Arabidopsis. This hypothesis was also supported by the Arabidopsis 1001 ecotypes sequencing project because sequence information indicated that some of the ecotypes with an intermediate phenotype had the non-functional Col-0 lov allele. We have completed genetic evaluation of all of these previously identified ecotypes and found that in all cases, sensitivity is due to LOV. Resequencing of purported lov alleles revealed sequencing errors in the Arabidopsis 1001 ecotypes database, and that these ecotypes actually retain a functional LOV allele. Thus, these data do not support the hypothesis and have revealed that genetic background effects on LOV function can be more significant than we had originally anticipated. These data suggest that evaluation of LOV or SSEN function in Arabidopsis could be an excellent tool for examining QTL that impact NB-LRR function.</p>	
<p><b>22.</b></p>	<p>Characterizing Competitiveness and Persistence Of Agrobacteria In The Crown Gall Disease Niche</p>	<p>The goal of this project is to advance the understanding of competition between members of bacterial communities (microbiome) for resources and their effects on plant health, specifically in regard to Agrobacterium-induced crown gall disease. Agrobacterium spp. carrying a Ti plasmid induce crown gall formation by transferring a segment of DNA (T-DNA) from the Ti plasmid into the plant cell. The T-DNA is able to integrate into the plant genome. The T-DNA contains genes encoding for auxin and cytokinin biosynthesis, which when expressed by the plant causes dysregulation of hormones and results in uncontrolled tissue growth and the formation of galls. Research on crown gall has primarily focused on the mechanisms that mediate the interactions between pathogen and host. Less is known about the bacterial community inhabiting these galls, the interactions between its members, and the effects on plants health. This gap will be addressed by studying the evolutionary ecology of agrobacteria. It is often difficult to culture pathogenic</p>	<p>1</p>

		<p>agrobacterium from some crown galls, as once a gall is established the original bacterial pathogen is not required to maintain growth. It is hypothesized that <i>Agrobacterium</i> is outcompeted by other opine-utilizing bacteria in the gall. This hypothesis is grounded in preliminary data that showed that gall communities are rich and <i>Agrobacterium</i> is not even the most abundant species in the gall, despite the presumed fitness advantage provided by the availability of plant-produced opines (uncommon nutrients able to be catabolized by agrobacteria carrying a Ti-plasmid). This goal will be met using microbiome sequencing, metabolite profiling, and synthetic bacterial communities to 1) quantify the abundance of agrobacteria within microbial communities in crown galls collected from various agricultural systems, and 2) measure the effects of competition for plant-produced opines on the ability of agrobacteria to persist in crown galls inoculated from synthetic communities of representative bacteria from galls in the natural environment. Because there are many species of broad host range, pathogenic agrobacteria, crown gall disease is widespread in the orchard and nursery industries. Current methods of control are reactive and involve destruction of infected plant tissue, resulting in millions of dollars of losses each year. The proposed work will inform on diagnostics and has the potential in addressing long-term goals of using biocontrol methods to deter the spread of <i>Agrobacterium</i>. Successful completion of this proposed work will provide a direct measure of the interactions taking place in a plant disease niche and contribute to our understanding of bacterial competition in the agricultural ecosystem.</p> <p>The bacterial pathogen <i>Agrobacterium tumefaciens</i> causes crown gall disease on a diverse variety of plant host species and is a major problem in the nursery and orchard industries. It is often difficult to isolate pathogenic agrobacteria from crown galls, particularly from woody plant hosts, making fast and accurate diagnosis difficult. Microbiome analysis was performed on 92 diseased gall and healthy plant tissue samples from nurseries and orchards across Oregon and the Pacific Northwest. These represent 14 plant host species from nurseries in 4 states and 2 countries. Most were from woody plants such as apple, raspberry, blueberry, and rose. This work revealed that total microbial abundance inside crown galls is low, and most microbes are likely to be surface associated. This has implications for diagnostics and testing as standard protocol for diagnostic labs includes sterilization and removal of the surface of sample tissue.</p> <p>Despite the low overall microbial presence, gall communities were found to be rich in microbial diversity. Surprisingly, we found that <i>Agrobacterium</i> are not the most abundant taxa in most sampled galls and often don't even represent a plurality of bacteria in a gall. These data suggest that other bacteria are often outcompeting <i>Agrobacterium</i> in the gall. Future experiments will explore whether the gall itself is the true reservoir of pathogenic agrobacteria.</p> <p>The genome sequences of strains isolated in the course of this study, combined with genomes of strains selected from culture collections, were analyzed to determine the evolutionary history of agrobacteria and the Ti plasmids. New methods for genomic epidemiology were also developed using this analysis as a framework. These methods enable the identification of transmission patterns both within and between nurseries and grow sites. This work was recently accepted for</p>	
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		<p>publication and is also expected to promote advances in the optimization of <i>Agrobacterium</i> for genetic engineering.</p>	
<p>23.</p>	<p>Integrating grower-maintained and publicly held data for improved management of potato early dying in the Pacific Northwest</p>	<p>This project addresses potato early dying (PED), a disease that impacts potato production in all major production regions of the US by reducing crop growth and tuber yield. Potatoes grown in the Pacific Northwest (PNW), Oregon, Washington, and Idaho, account for approximately 57% of the total US potato production making it an extremely important production region. The primary causal organism of PED, <i>Verticillium dahliae</i>, is ubiquitous in the PNW and across all US production regions. In any given year, <i>V. dahliae</i>, is estimated to reduce crop yields by 10-15%, but losses can be as high as 50% if environmental conditions promote disease. The black dot pathogen <i>C. coccodes</i> may also be involved in the PED complex and can reportedly reduce yields by up to 30%. Importantly, potato growers must either manage the PED using soil fumigation, which is expensive, or endure yield loss each year due to PED.</p> <p>This project seeks to improve the management of PED by increasing our understanding of the mechanisms that may be leading to reduced efficacy of soil fumigants, enhancing our abilities to estimate yield losses due to soil-borne pathogens by developing reliable sampling methods and accurate action thresholds, and by evaluating currently available and new environmentally compatible strategies, new bio-rational pesticides, for PED management. To do this we will be combining data from multiple sources generated in both the private and public sectors and from a combination of experimental and survey studies. We have worked closely with grower cooperators to generate some of the data sets that will be used for validation of our methodologies. Some large data sets, previously generated, will also be used to refine sample strategies for soil borne pathogens and improve field-level estimates soil born pathogen inoculum. These outcomes will allow potato growers to select crop rotations that result in reduced pathogen persistence in the soil and subsequent disease severity and enhance management by allowing for more accurately estimation of inoculum density and need for fumigation. If effective, bio-rational products can be quickly adopted by growers using optimized best management practices.</p> <p>We compared the CDL data with grower crop histories for a little over 1200 field-year combinations occurring in the Columbia Basin and found a 92% agreement between the two data sets. We conducted a soil microbiome analysis and determined that soil microbial communities differed as a function of cropping history and soil classification. Soil microbiomes originating from fields with different cropping histories also appeared to differ in their response to metam sodium perturbation. However, metam sodium appeared to reduce the overall microbial diversity (i.e. bacterial) over the duration we made measurements in our studies. Preliminary data suggest metam sodium treatment did reduce <i>V. dahliae</i> inoculum, but that reduction did not vary as a function of field or history of metam sodium application.</p>	<p>1</p>

		<p>The NASS CDL can be used to assess cropping history with ~ 90% accuracy for fields in the semi-arid Columbia Basin production region. Some crops are regularly mis-classified, and those crops tend to be herbaceous perennial crops (i.e. mint, etc.) and grasses. Microbial response to metam sodium perturbation varied as a function of a fields cropping history. Broad landscape scale effects of crop rotation on soil microbial communities or pesticide resistance development could be determined using the CDL data. To date, we have not observed evidence of fumigant biodegradation or pathogen resistance.</p> <p>Incidence and severity of stem colonization by <i>V. dahliae</i> and <i>C. coccodes</i> did not differ among biorational treatments, the non-treated control or the non-infested/non-treated control. Disease symptoms did not differ among biorational treatments on any assessment date or when aggregated over the seasons. Yields averaged 30.8 tons per acre which is typical for the area. Biorational pesticide applications did not significantly affect total potato yields and there were no treatment differences in yields within size categories of potato. No biorational products that we have evaluated have significantly suppressed plant colonization or disease caused by the early dying pathogens.</p>	
<p><b>24.</b></p>	<p>Optimizing ground and surface water resources for agricultural production, drinking water quality and ecosystem health in the Umatilla Basin, OR Phase I</p>	<p>In 1985, the Oregon Water Resources Department declared four Critical Groundwater Areas (155,400 ha) in Lower Umatilla Basin (LUB) because groundwater-level declined to 160 m, leading to restricted surface appropriations for irrigation. Furthermore, in 1990, the Oregon Department of Environmental Quality's (DEQ) declared the LUB a Groundwater Management Area (GWMA) (LUBGWMA, 1,425 km<sup>2</sup>) because groundwater (well) nitrate concentrations exceeded Federal safe drinking water standard (10 mg L<sup>-1</sup>). Water shortage and nitrate pollution in the groundwater of the LUB is mostly attributed to irrigated agriculture. Additionally, to ensure agricultural productivity remains high in the LUB, challenges related to soil health need to be addressed. Specifically managing soil acidity to resist nutrient losses, and to optimize fertilizer usage is an ever-growing issue. Soil acidity can have a negative impact on crop yields, food production, and food security worldwide. Low soil pH can severely reduce fertilizer-use efficiency, plant nutrient availability, crop yields and thus, overall farm profitability.</p> <p>Our long-term goals are to restore 12,300 ha-m of water supply, reduce nitrate in groundwater to &lt; 10 mg L<sup>-1</sup>, and optimize cropping management recommendations in the LUB. We have created a Collaborative Project utilizing Hatch and state matching funds, as well as competitive research funding to support OSU CAS scientists, and students dedicated to solving water, food, and natural resources problems in Umatilla Basin to reach these goals. Through integrated research,</p>	<p>1</p>

		<p>education, extension, and outreach activities, the project addresses systemic challenges to improving water quality and access to water for food production, ecosystem health, and cropping system soil health. In this phase, we will characterize basin hydrology and ecosystem health, determine source and extent of nitrate pollution, and evaluate soil health to support the sustainability and viability of agriculture and ecosystem health in the LUB.</p> <p>The characterization of the LUB aquifer is ongoing with data compilations led by J.R. Cook (NOWA), the Port of Morrow, and OSU (S. Lukas). Aquifer data has been presented to the Oregon State legislature identifying hydraulically disconnected regions of the LUB. This is a significant step to de-designating sections of the region which are disconnected from others and not affected by nitrate contamination in the groundwater. Funding to support one post-doctoral researcher to create a harmonized groundwater model is underway, with matching funds already provided for 3-years by regional landowners. This post-doctoral position will be filled in 2021.</p> <p>Research is underway to understand nitrogen dynamics in the LUB. Field soil core sampling was initiated in 2020 and will continue for 1 year. Samples were be processed in winter 2020 to identify soil physical properties as they relate to water and nitrogen leaching. A post-doctoral researcher Dr. Nouri is leading this effort under PI S. Lukas. This research is also evaluating the potential to conserve water by utilizing re-used water from regional industrial parks. The potential irrigation water savings for this resource is approximately 2.4 billion gallons annually.</p> <p>Research is underway to optimize water and nutrient use efficiency through irrigation practices and modifications of soil and production practices in Onion, Hemp, Watermelon, and Blueberry crops. Protocols have been developed to use sub-surface drip irrigation techniques and biochar amendments to improve production and environmental stewardship. Funding has been acquired, and two postdoctoral researchers have been hired to focus on understanding soil physical properties (Dr. Nouri) and the interaction with nitrogen movement and water and nutrient retention using biochar products (Dr. Singh). Funding has been secured to support two Master of science graduate students (Alex Gregory and Andrea Retano) to focus soil, water, and carbon interactions to improve nutrient efficiency.</p> <p>Research conducted in two field locations (Moro, OR and Pendleton, OR) and one greenhouse location have produced preliminary data of the effect of Lime on glyphosate to control <i>Bromus tectorum</i> (downy brome). In the field, it was observed that in Pendleton, the glyphosate killed the downy brome faster in the areas with higher pH, however we did not see that effect in Moro. In the greenhouse trial, soil from the Pendleton study reinforced the effect we had seen in the field but there was not enough effect to be statistically significant. When the downy brome was inoculated with a pathogen, the effect of the Lime on the glyphosate was more pronounced but still not significant. When we used soil coming from Moro in the greenhouse, we did not observe effect of the Lime on the glyphosate performance to control downy brome as happened in the field.</p>	
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<p><b>25.</b></p>	<p>Microirrigation: A Sustainable Technology for Crop Intensification and Improved Crop Productivity</p>	<p>This project will focus on water conservation, which is widely accepted as one of the primary worldwide challenges in irrigated agricultural systems. Although there was a great expansion of irrigated lands in the 20th century, most experts agree that such additional great expansion in the 21st century will not be possible. The agricultural community must not only increase the food supply, but it must also conserve water and protect water quality to meet the population demands and environmental constraints.</p> <p>Irrigating coarse soil can be challenging to optimize water resources. Native soils in the Lower Umatilla Basin (LUB) of Oregon are primarily sandy loam, which contributes to high levels of water and nutrient movement through the soil profile due to poor nutrient water and nutrient holding capacity. Farmers in this area are highly dependent on center pivot irrigation systems for applying water and top-dressing fertilizer as a fundamental grower standard. Ideally, the goal of irrigation and fertilization is to provide the appropriate amount of nitrogen for the crop to maximize growth and just enough water in the soil to keep excess nitrogen from moving away from the root zone and into the water table, but this is difficult to achieve using the current methods of production. Applied research and extension activities will address new technologies in water delivery, as well as methods to measure soil moisture and automate large-scale irrigation systems. Soil characteristic information will be applied to methods to reduce water losses due to infiltration. The end result of this project aims to promote sustainable water use practices and technology adoption to irrigated crop producers.</p> <p>Current research efforts have focused on introducing Sub-Surface Drip (SSD) irrigation as an alternative to center pivot irrigation methods. SSD has been studied in the coarse soils of the LUB in onion and hemp cropping systems. For onion in the LUB, SSD results in 15% less water used and 20% greater crop yield compared to center pivot systems. Additional benefits include targeted fertilization which reduces cost and environmental contamination, as well as decreased incidence of plant disease, such as Iris Yellow Spot Virus. Hemp research is in progress with one year of data to identify the optimal water balance of SSD irrigation based on a range of irrigation volumes. One site of the hemp water research is conducted at OSU's Hermiston Agricultural Research and Extension Center (HAREC), with four replicate sites in Oregon and California.</p> <p>Research and extension efforts are in the year three, focusing on evaluating in-field and remote sensing technology to automate irrigation systems. Data has been generated to determine crop-specific volumetric and soil tension parameters that are used to automatically irrigate crops as needed, based on soil and root hydraulic conditions. Sensor type and system controls are being evaluated to determine the best tools for producers to use. Soil physical properties are being identified to model regional croplands through on ground soil core sampling and GIS satellite data. Soil core samples are transect collected to produce a calibrated model that will be used to extrapolate satellite land data to better predict water infiltration and holding capacity throughout the LUB.</p>	<p>1</p>
<p><b>26.</b></p>	<p>Citizen Science – the Master Melittologist</p>	<p>Oregon is the first state in the nation to form a Master Melittologists program of trained community scientists dedicated to preserving and cataloguing bees that are native to the state.</p>	



		<p>Like OSU Extension Master Gardeners, the <a href="#">Master Melittologist</a> program intensively trains volunteers on the meticulous work of locating and cataloging the bees that no one has seen before. While Oregon is known for honey bees that pollinate much of the food we eat, the state is also home to about 600 native bees, many that are pollinators, too. The Master Melittologists program works with the Oregon Bee Atlas, which is responsible for surveying the state's native bee population in partnership with OSU Extension Service, OSU colleges of agriculture and forestry, and the Oregon Department of Agriculture.</p> <p>Although the Master Melittologist program just started this year, volunteers have been the driving force in the Oregon Bee Atlas since 2018. Over the past three years these volunteers have contributed 70,000 new bee records from every county in the state. These include some rare species, including a new metallic sweat bee from the Alvord Desert, a wool carder bee that was found nesting in the sand dunes around Newport and, in Ashland, the first recording in the state of a squash bee.</p> <p>To become a Master Melittologist, volunteers go through a rigorous year of training that includes six online, self-paced modules covering everything from bee biology, preparing bee collections and planning a bee survey trip. Participants also get a day in the field and a day on microscopes with instructors. Once they complete all the training, they become an apprentice level Master Melittologist, the first level of the three-level program. After more intensive study of different bee groups, participants can move up if they want to dive even more into the world of bees.</p>	
27.	Biological Control in Pest Management Systems of Plants	<p>Herbivores that are introduced for biological control of weeds are tested for their host specificity and tolerance of climatic conditions in the target area. However, the potential for rapid evolution in traits related to climate or host specificity makes introductions of biological control agents less predictable and raises concerns about safety and effectiveness of biological control practices. The goals of this project are to better understand, predict, and manage the process of rapid adaptation of a biological control organism encountering new climates and host plants. Overall, our research will (1) improve understanding, prediction and management of biological control systems, (2) improve practical procedures currently used to project climatic, host, and geographic ranges of organisms, (3) inform biological control policy and increase public participation in science.</p> <p>Our specific objectives are: (1) to screen for differences in relevant phenotypic traits (rates of growth, development, survival, reproduction, and projected rates of population growth and range expansion; plus consumer oviposition preference, food consumption, and conversion of ingested food to growth) within and between geographic populations of the cinnabar moth, a biological control agent of tansy ragwort, (2) identify the genetic architecture of ecologically relevant traits, and the causal links between variation in traits, performance and reproductive success, (3) scan the transcriptome to identify specific candidate</p>	1

		<p>genes associated with climate and host plant adaptation, (4) run regional (North America) and international surveys (plus New Zealand and Europe) spanning latitudinal and altitudinal gradients to compare patterns of genome variation with our local findings, (5) convene a panel of experts and a scientific symposium to apply knowledge gained by this research to biological control policies and procedures, (6) use our project to conduct public outreach and provide opportunities for students and citizens interested in science.</p> <p>This research is part of Multistate Research Project W4185 and preliminary results will be reported next year.</p>	
<p><b>28.</b></p>	<p>Nutrient-Energy-Water Nexus: Emerging Regional and Global Challenges</p>	<p>The scientific community has realized that understanding and enhancing resilience especially at the nexus of NEW systems is important to address emerging societal challenges. In the context of this proposal, resiliency is defined as "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" (Walker, 2004). A Stockholm Resilience Centre report indicates that the resiliency of a system can be enhanced through diversification and redundancy, managing connectivity and flexibility among others (SRS, 2017).</p> <p>Applying these resilience principles to agriculture systems indicates that diversifying the agriculture systems through combination of photovoltaic systems and agriculture may increase resiliency to economic and climatic factors. Crop yields are determined as a combined effect of all the variations during the growth season and provide a revenue stream at the end of the season that is subject to various disturbances in the economic sector. On the other hand, a photovoltaic system produces electricity in a reasonably consistent manner throughout the year and the revenues are generated throughout the year and are relatively less effected by day to day weather variations. Additionally, there are synergies that can be exploited by combining the photovoltaic systems with agriculture as the partial shading from the solar panels can reduce excess solar energy particularly during mid-day resulting in potentially higher crop productivities. Preliminary measurements by PI Higgins showed a 90% increase in above ground biomass of dryland pasture below solar panels relative to the control in the Willamette Valley. The efficiency of the solar panels depends on the solar panel temperature. Higher temperatures leads to decreased energy outputs. Thus, lower temperatures under the solar panels due to the latent heat exchange of growing vegetation may increase the solar panel efficiency, resulting in more renewable electricity. Preliminary measurements by PI Higgins indicate that solar panel efficiency increased from 11% to 12% when the air temperature dropped from 35°C to 20°C. Therefore, the proposed agri-voltaic systems can increase resilience of the system to economic and climatic factors through diversification of revenues, managing connectivity with the water-energy usages between photovoltaic and agriculture systems, and increasing flexibility of the farmer due to increased revenues.</p> <p>A new facility is being constructed at the North Willamette Research and Extension Center and due to additional funding received in 2020. Results will be presented early next year.</p>	<p>1</p>

<p><b>29.</b></p>	<p>Identifying plant genes associated with beneficial foliar yeasts in <i>Populus trichocarpa</i></p>	<p>Managing crop microbiomes for enhanced productivity and disease resistance is a major challenge given their taxonomic and functional complexity. On the other hand, managing a discrete component of the microbiome may be a more realistic goal if we can selectively breed for plant genotypes that are enriched in a taxonomic group that is beneficial to plants, or manipulate plant genomes to promote particular beneficial plant-fungal symbioses. The proposed study will advance sustainable disease management in agricultural systems by contributing to the development of plant genetic improvement targets that facilitate plant disease suppression by epiphytic yeasts. We will do this by leveraging plant genomic resources in the model tree, <i>Populus trichocarpa</i>, to identify plant SNPs/genes associated with the abundance of epiphytic yeast species and their antagonism of a leaf rust pathogen. We will additionally explore yeast-pathogen antagonism in the context of a synthetic community, asking whether yeast arrival order into the community impacts disease suppression. We expect that results of our project will reveal the potential for plant genetic improvement optimizing both epiphytic yeast colonization and yeast priority effects for robust disease control. This novel approach to disease management has the potential to be both safer and more sustainable than the use of conventional pesticides. Outcomes of the proposed research address two key USDA AFRI program areas: plant health and production, and bioenergy, natural resources and the environment.</p> <p>The goal of the proposed research is to identify plant allelic variation associated with the abundance of epiphytic yeasts that antagonize a leaf rust pathogen, resulting in reduced rust disease. We expect to find that both yeast abundance and the level of rust antagonism are influenced by host genes associated with the physical leaf environment (e.g., cuticle composition), and genes associated with the host innate immune system. A long-term goal of this research is to develop plant genetic improvement tools that favor these beneficial yeasts in phylloplane (i.e., leaf surface) communities, thereby reducing plant disease severity. Because many disease antagonizing foliar yeasts are widespread, generalist species, managing plant-microbiome interactions to promote yeast colonization and persistence on the leaf surface may represent a tractable, though untested, practice for promoting beneficial symbiosis for enhanced disease control.</p> <p>This project was initiated in late 2020.</p>	<p>1</p>
<p><b>30.</b></p>	<p>Exploring factors affecting foraging success and nontarget impacts of a newly introduced biological control agent</p>	<p>Insects used in biological control against pests are often tested in highly artificial conditions to determine their risk to nontarget species. Most of these tests ignore important natural components which affect a biological control agents ability to establish, locate, and effectively control the pest. This project focuses on the role of more complex natural components on the foraging and success of a newly introduced biological control agent, <i>Trissolcus japonicus</i> (Tj)</p>	<p>1</p>

		<p>which parasitizes eggs of the invasive brown marmorated stink bug (BMSB). In order to make effective releases, we need a better understanding of the foraging behavior, dispersal ability, and nontarget risk from Tj. Since Tj is not yet present in much of North America, research on the impact of more natural conditions is key to predicting the outcomes of Tj spread and make effective releases for biological control. The specific aims of this project are to 1) determine the how foraging behaviors and host distribution affect the ability of Tj to control BMSB and 2) identify biological and environmental conditions contributing to risk of nontarget impacts by Tj.</p> <p>Understanding the ecological interactions of introduced natural enemies can lead to better predictions on the impacts following new introductions and improve efficacy in augmentative releases for established natural enemies. My work will explore ecological behaviors of the recently introduced <i>Trissolcus japonicus</i>, an important exotic egg parasitoid of the invasive brown marmorated stink bug (BMSB), <i>Halyomorpha halys</i>. Current research on biological control agents ignores the key behaviors and role of ecological interactions in determining the outcome of biological control releases. This project with Tj will serve as a model for considering natural enemy ecology in biological control testing. Tj has not expanded to much of North America, but adventive populations in Oregon provide the opportunity to perform ecological testing to predict outcomes of its spread.</p> <p>This project was initiated in late 2020.</p>	
31.	Investigating the genetic basis of <i>Pseudomonas syringae</i> attachment to host plant surfaces	<p>Plant products are the foundation of most modern food, fuel, and industrial output. Agricultural plants are vulnerable to a wide variety of diseases caused by bacteria and other microorganisms, which may lead to major losses in crop health and productivity. In addition to direct economic hardship for growers and rural communities, plant disease can have far-reaching effects on global food security and international relations. Understanding the infection biology of bacteria and other microorganisms that cause disease on agricultural plants is key to maintaining a thriving agricultural economy, as well as reducing our reliance on hazardous chemicals to mitigate plant disease.</p> <p>Many conventional approaches to bacterial plant disease management rely on the application of broad-spectrum antimicrobial compounds. These nonspecific strategies vary in their efficacy of limiting pathogen growth, as well as their risk of off-target effects on beneficial microbiota and environmental health. The effort to produce robust, non-hazardous measures of disease management that specifically target pathogenic microorganisms is thus critical to the development of sustainable agricultural systems. This project focuses on the pathogenesis of <i>Pseudomonas syringae</i>, a bacterial plant pathogen of diverse agricultural plants. In previous studies, we have observed that <i>P. syringae</i> surface attachment is coordinately regulated with the expression of known virulence-associated genes. Attachment of <i>P. syringae</i> to plant host cell surfaces, while likely required for virulence, has not been elucidated on a molecular level. We aim to characterize</p>	1

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		<p>the genetic basis of <i>P. syringae</i> attachment to host cell surfaces during plant infection. These efforts will identify candidate targets for future plant disease management strategies that aim to mitigate <i>P. syringae</i> disease by blocking bacterial attachment to host cells.</p> <p>This project will foster insight into the genetic basis of <i>P. syringae</i> surface attachment, and the role of attachment in host infection and virulence. In addition to advancing overall understanding of this model pathosystem, these results will highlight potential targets for novel strategies of bacterial plant disease control. By extension, completion of this study will promote the development of sustainable, pathogen-targeted disease management practices.</p> <p>This project was initiated in 2020 with preliminary results available in 2021.</p>	
32.	Chromosome-level assembly and genomic data science to reveal insights about cone development, disease resistance, and the evolution of hop	<p>Hop (<i>Humulus lupulus</i>) is known for the unique array of bioactive compounds that it produces. It has a long history of use in traditional medicine. Hop produces xanthohumol, which has anticancer activity, and bitter acids, which impart flavor in brewing and possess antimicrobial activity. Hop is also susceptible to diseases including powdery mildew (PM), which reduces the quality and quantity of hop cone yield. The genome of hop is large and complex, challenging early assembly efforts. Because of advances in sequencing and assembly, we now have a chromosome-level assembly that we can analyze for gene content and other genomic features. With a comprehensive annotation of genes, we can investigate evolutionary patterns in hop and extensively analyze gene expression and function.</p> <p>The results of this study will have an impact on improving hop health and production. My goal is to uncover genes that both show variable expression during development and contribute to the presentation of desired traits, including disease resistance and synthesis of bioactive compounds. Mapping similarities between the genomes of hop and closely related species will improve our understanding about the evolutionary history of hop. It will also provide insight about whether genes involved in traits of interest are conserved between species or show evidence of selective pressure and duplication. The results of this study will inform the development of disease-resistant hop cultivars containing a desired profile of bioactive compounds through improved genomics-assisted breeding strategies. Taken together, the chromosome-level assembly of hop will transform hop genomics.</p> <p>This project was initiated in 2020 and preliminary results will be available in 2021.</p>	1
33.	Impacts of Stress Factors on Performance, Health, and Well-Being of Farm Animals	<p>Weaning is probably one of the most stressful moments in the life of the calf. It is a complex behavioral and physiological event that involves separation from the dam, exposure to a new environment, and also comingling with other calves. Therefore, in order to better understand the calf physiology related to weaning, several research projects will be conducted. The main objective of these research projects is to improve calf welfare at this moment and further in life, and therefore reduce stress and the negatives impacts associated with it. To accomplish these goals, different</p>	1

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		<p>strategies will be tested in different research projects, including but not limited to nutritional strategies before weaning and management strategies applied at weaning. The final goal of these research projects is to establish nutritional and management guidelines for beef cattle producers in order to improve calf welfare and to reduce stress.</p> <p>Cattle welfare/wellbeing and stress are often studied in the animal sciences field. It is expected that the outcome of these research projects will lead to change in knowledge of the current subject. Additionally, changes in the current management practices could also be expected for applied projects that are presented to stakeholders.</p> <p>This research is associated with a Hatch Multi-State project and research was initiated in 2020. Preliminary results will be available in 2021.</p>	
34.	Robotic Pruning in Modern Orchards	<p>Pruning - a critical perennial operation required to maintain tree health and produce high yields of quality fruit - is one of the most labor-intensive orchard activities in the production of high-value tree fruit crops. As the fresh market tree fruit industry continues to face the challenge of an uncertain labor force, the development of robotic technologies that are able to perform labor-intensive field operations - like pruning - will play a crucial role in its long-term sustainability. Automating selective pruning is a complex problem requiring high-resolution sensing, complex manipulation, and advanced decision making on determining which branches to prune. The specific research objective of this project is to develop a robotic system for autonomous, dormant pruning of fruit trees. To accomplish our objective, we have formed an experienced, interdisciplinary project team with expertise in horticulture, agricultural mechanization, computer graphics, and robotics.</p> <p>The output of the proposed project will be a robotic system for fruit tree pruning. The system will include a virtual training option and interface that allows a human expert to train the robotic machine to gain increasing capability of identifying pruning points. This work also provides a framework for training a robot to perform interactive orchard tasks that could be extended to other operations such as harvesting, tree training, and fruit/flower thinning. We expect that companies/manufacturers will be able to use the knowledge and prototype machine to develop and evaluate full-scale prototypes and eventually commercialize the technology. An expected long-term outcome is the reduction of manual labor and thus a decrease in cost and increase in sustainability of the tree fruit industry.</p> <p>This project was initiated in 2020 and preliminary results will be available in 2021.</p>	1
35.	Developing the Organic Medicinal Herb Industry	<p>Fresh market and processed vegetable organic producers in the Western US are facing steep challenges to maintaining profitable production. Labor costs, increased food safety measures, and low prices from import competition are cutting farm profits, as much 25% in the last 5 years. This</p>	1

		<p>project will help identify new crops and barriers to adoption to direct future research for high value crop rotation option with Asian herb crops that have potential to keep farms profitable.</p> <p>While medicinal herb production is currently limited in the US and in Oregon, and there are more than 5,000 medicinal plants grown in China alone, researchers (Kraker and Giblette 2002) and farmers (HerbPharm and Pacific Botanicals) have identified a much shorter list of crops with very strong northern US production potential.</p> <p>Herbs currently grown in Oregon (farms with greater than 1 acre) include astragalus root, burdock root/seed, ginkgo leaf, bacopa and gotu kola. Other potential herbs with large market potential include ginseng root, reishi fruiting body, schisandra berry and licorice root. Herbs that are also suited to local production but with smaller yet consistent demand include: andrographis, Artemisia annua, chrysanthemum, codonopsis, eclipta, red sage, rhubarb (<i>rheum palmatum</i>), and Baikal skullcap.</p> <p>The goal of this project is to provide a roadmap to industry research needs sufficient to organize and coordinate future grant proposals that will provide support to the developing organic herb industry. To foster growth in production of these crops in Oregon and Washington, this project will:</p> <ol style="list-style-type: none"> <li>1. Convene an industry stakeholder group.</li> <li>2. Identify promising crops for production, as well as any obstacles to their widespread adoption</li> <li>3. Identify obstacles to widespread adoption and describe research needs for a short list of promising crops.</li> </ol> <p>This project was initiated in 2020 and preliminary results will be available in 2021.</p>	
<p><b>36.</b></p>	<p>A Systems Approach for Managing Bacterial Blight of Carrot</p>	<p>Carrots (<i>Daucus carota</i> subsp. <i>sativus</i>) are one of the United States' leading root crops. The 2018 farm-gate value of carrots in the U.S. was \$731,504,000 and average per capita consumption of fresh carrots in the U.S. is 12.4 lb. per person. Carrot seed production is limited to only a few regions of the world where suitable climatic conditions exist for hybrid seed production of this biennial species. In fact, over 50% of the world's hybrid carrot seed is produced in central Oregon, central Washington, southern Idaho, and northern California of the U.S. Pacific Northwest region. Stakeholders have consistently identified bacterial blight caused by <i>Xanthomonas hortorum</i> pv. <i>carotae</i> (Xhc) as the most significant threat to the sustainability and economic viability of US carrot seed production. However, because Xhc is seed-borne, it is not only a major concern for the hybrid carrot seed industry in the U.S. but also to regions that import carrot seed for fresh or processed carrot production. Xhc can survive and reproduce epiphytically on the leaves, flowers, and stems of host and non-host plants without causing disease symptoms. When weather conditions are sufficiently warm and humid, Xhc can incite disease, which can lead to defoliation and significant yield losses. In the case of bacterial blight, symptoms are often not observed on carrots until a relatively high population is attained (<math>&gt; 10^4</math> Xhc/g leaf tissue). One reason why Xhc is so</p>	<p>1</p>

		<p>problematic in carrot and carrot seed production is that the process by which the pathogen infects plants and infests seeds is largely unknown. Critical needs associated with bacterial blight in carrot and carrot seed include: i) improving disease control in the field and post-harvest; ii) learning how Xhc spreads in seed production systems; iii) determining if carrot seed becomes infested externally, infected internally, or both; iv) identifying sources of Xhc in production systems and quantifying the extent of inoculum dissemination via propagative materials; and v) quantifying the impact of bacterial blight on yield and/or quality of carrot seed, as well as the costs associated with mitigation of these effects.</p> <p>Expected outcomes include:</p> <p><b>Short-term</b></p> <ul style="list-style-type: none"> <li>• An improved systems approach for IPM of Xhc</li> <li>• Models that explain Xhc spread, deposition, and aerobiology at field scales</li> <li>• Increased knowledge of seed-borne and epiphytic life stages of Xhc</li> <li>• A better understanding Xhc spread at state, national, and international scales</li> <li>• Greater awareness and desire for IPM approaches for bacterial blight</li> </ul> <p><b>Medium-term</b></p> <ul style="list-style-type: none"> <li>• Adoption of systems-based IPM approaches for bacterial blight control</li> <li>• Improved efficacy of preventive bactericides and biocontrols</li> <li>• Improved post-harvest treatments</li> <li>• Reduced seed-borne dispersal of Xhc</li> <li>• Reduction in copper- based bactericide inputs</li> </ul> <p><b>Long-term</b></p> <ul style="list-style-type: none"> <li>• Reduced Xhc in carrot fields and seed lots</li> <li>• Improved carrot and carrot seed yield and quality</li> <li>• Greater marketability of carrot seed</li> <li>• Reduced environmental impacts</li> <li>• Reduced risk of copper-resistance development</li> <li>• Increased sustainability</li> <li>• Improved rural economies</li> </ul> <p>This project was initiated in 2020 and preliminary results will be available in 2021.</p>	
37.	Developing Non-Chemical Weed Control In Hazelnut - Comparing Saturated Steam And Electric Weed Control	<p>We propose to evaluate the efficacy of saturated steam and electric weed control as components of a non-chemical weed management program. These novel technologies can fundamentally change weed management in hazelnut to mitigate herbicide resistance. Herbicide resistance is the greatest weed management challenge identified in multiple commodities. In Oregon hazelnut orchards, there are confirmed cases of resistance and multiple-resistances to all post-emergence herbicides, jeopardizing herbicide mixtures and rotations as a management tool. The use of non-chemical weed controls like tillage is limited in hazelnut because the nuts are harvested from the orchard floor, requiring a litter-free and</p>	1



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		<p>firm soil surface. Our approach includes field research in collaboration with growers and on University farms. Neither saturated steam nor electric weed control disturbs the soil, making them compatible with hazelnut. Our objective is to evaluate the effectiveness and crop safety of the novel tools as they compare to mowing or herbicides. We propose to test tools in orchard middles and within tree rows, an area of the orchard often managed exclusively with herbicides. Experiments will determine safe rates for steam and electricity applications while optimizing weed control. This project will help identify effective non-chemical weed management tools compatible with tree nut production. The expected outcomes include a reduction in herbicide reliance, mitigation of herbicide resistance costs, and reduced human exposure to chemicals. Our findings will have applications to a wide range of other woody perennial crops.</p> <p>This project was initiated in 2020 and preliminary results will be available in 2021.</p>	
<p><b>38.</b></p>	<p>Water Management and Quality for Specialty Crop Production and Health</p>	<p>Most field producers of nursery stock use irrigation at some point during the growing season. Many field producers use low-volume irrigation and some use such systems to deliver soluble fertilizers. While supplemental irrigation is beneficial in field production, frequent (most often daily) irrigation is essential for container production both in nurseries and greenhouses. Container substrates need to be well drained and container volume limits the amount of available water, resulting in frequent irrigation and high water use. For example, in Florida, container nurseries annually apply 56 to 120 inches per year in addition to the 40 to 50 inches of average annual rainfall. Over 75% of nursery crops in 17 of the major nursery producing states were grown in containers (USDA, 2007) and thus require irrigation. Almost all greenhouse crops are produced in containers. Frequent irrigation along with high fertilizer and pesticide use can lead to significant movement of agricultural chemicals and pathogens in runoff water that transports them to containment ponds and/or off-site into groundwater or surface water. Irrigation water management is a key component in the nutrient management of ornamental crop production and in reducing the impact of runoff water on local water systems. Emerging constraints on water use and quality means that the green industries need to find ways to manage water without detracting from production schedules and crop quality. Precision water management and resource efficiency were rated at the top of the issue/need/concern list developed at the joint USDA, ARS, NASA and NSF workshop Engineering Solutions for Specialty Crop Challenges (USDA, 2007). Furthermore, the United States Environmental Protection Agency (EPA) is enforcing federal legislation requiring states to implement Total Maximum Daily Load (TMDL) programs for watersheds.</p> <p>During the next 5 years, this project will address management strategies for anticipated decreasing availability and quality of water for irrigation use in the green industries. Water conservation methods, improved nutrient management practices will be used to reduce the amount of water used and potential contamination. The project will also investigate methods to reduce or remediate production impacts on water quality in order to safely reuse water in production or return water to the surrounding water systems with respect to agrichemicals, abiotic and biotic, substrate and nutrient management environmental, economic and social benefits. In addition, we plan to target urban environmental situations, specifically building on green roof stormwater runoff models, using</p>	<p>1</p>

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		<p>a wireless sensing technology developed by the SCRI team (Lea-Cox et al., 2013).</p> <p>This research is associated with a Hatch Multi-State project and research was initiated in 2020. Preliminary results will be available in 2021.</p>	
39.	Enhancing the Competitiveness and Value of U.S. Beef	<p>This research strives to increase quality of beef for the consumer and the overall profitability to the producer. These goals will be achieved by conducting laboratory experiments related to beef tenderness, juiciness, flavor, color and cutability. Information regarding the research will be disseminated through informal and formal teaching of students, other academics, producers, and consumers.</p> <p>Expected outcomes include Identify ongoing market risk associated with domestic livestock protocols to the U.S. beef industry. Improve quality, safety, and domestic and international marketability of U.S. beef products by examining palatability attributes, developing and applying novel food safety interventions, exploring metagenomics to investigate food safety and antimicrobial resistance, increasing shelf life, developing novel products from variety meat items, and developing innovative carcass fabrication techniques.</p> <p>This research is associated with a Hatch Multi-State project and research was initiated in 2020. Preliminary results will be available in 2021.</p>	1
40.	Bacillus metabolites target the Achilles heel of phytopathogenic Agrobacterium	<p>Agrobacterium is an economically important pathogen that causes millions of dollars of damage to US crops. This pathogen is able to infect a wide range of plants and once a plant is infected, the only form of control is to destroy the infected plants. In addition, there is currently only one commercially available preventative and it has limited uses. The goal of this project is to develop new control products that are efficacious in controlling against genetically diverse Agrobacterium pathogens. We have identified strains of bacteria from the Bacillus group that exhibit toxic activities against Agrobacterium grown in culture. We have further demonstrated extracts from Bacillus are toxic against Agrobacterium and protect plants from disease. The specific goals of this project are to: 1) determine the identity of the compounds in the extract, 2) understand how this extract works, 3) understand why Agrobacterium is sensitive to it, 4) determine whether genetically different lineages of Agrobacterium are sensitive to the extract, and 5) develop a sprayable form of the extract that can be used by farmers and growers.</p> <p>The overall goals of this project are to characterize the mechanisms by which two lipopeptides of <i>Bacillus</i> inhibit members of the <i>Agrobacterium</i> group and to advance extracts from <i>Bacillus</i> into a sprayable treatment for use in managed ornamental plant production systems. Formulation of Bacillus extracts into a spray efficacious in controlling Agrobacterium has potential to change management practices in US nurseries.</p> <p>This project was initiated in 2020 and preliminary results are expected in 2021.</p>	1

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<p><b>41.</b></p>	<p>Improving honey bee nutrition by understanding nutritional composition of pollens and micronutrient requirements of honey bees</p>	<p>Poor nutrition has been cited as one of the major factors involved in both honey bee and native bee declines reported over the last decade. Nutrition plays a vital role in mitigating effects of biotic and abiotic stressors on bees. Since reports of significant bee declines began, much effort has been dedicated to researching the causes of such declines, but only a few studies have addressed the underlying, fundamental problems, particularly with regard to nutrition. As honey bee nutrition plays a vital role in mitigating the effects of biotic and abiotic stressors on bees, efforts to improve bee nutrition are critical. The long-term goal of this proposal is to improve bee nutrition by building a database of the pollen nutritional compositions (especially phytosterols), understanding phytosterol requirements and their impact on colony health and performance, and investigating impacts of sterol biosynthesis inhibitor fungicides on plant pollen sterol availability and bee health.</p> <p>The pollen nutritional composition database generated from our findings will serve as robust tool for stakeholders (beekeepers, conservation groups, growers) in selecting plants for habitat developments in a scientific way rather based on just attractiveness of a plant species to bees. This database will be the first of its kind for bee forage plants in North America. Understanding the phytosterol profiles (especially 24-methylenecholesterol) of pollens available to bees will help improve bee nutrition as specific plant species could be grown as supplemental forage near honey bee-pollinated crops or high-quality pollens could be collected for use as substitutes during pollen dearth for feeding colonies. Further, understanding the effects of SBI fungicides on sterol biochemistry of pollen and sterol availability to bees will assist in formulating best management practices to promote bee health.</p> <p>This project was initiated in 2020 and preliminary results are expected in 2021.</p>	<p>1</p>
<p><b>42.</b></p>	<p>Feeding spent hemp biomass to cattle: cannabinoid residuals, animal health, and product quality</p>	<p>Our long-term goal is to implement the safe use of hemp byproducts in livestock diets and take full advantage of their nutritional and potential medicinal properties to improve animal health and the quality of animal products. In Oregon, hemp is primarily grown for cannabidiol production. This process yields a high amount of extracted biomass, a byproduct of high nutritive value; however, hemp byproducts are not yet FDA approved to be used in livestock diets. Therefore, we expect to generate data essential for FDA approval and to develop an Extension program on feeding hemp byproducts to livestock. Our primary objective is to generate fundamental data to allow for the legalization of hemp byproducts to be used to feed livestock and to use the research to create an Extension program to connect producers with the hemp industry.</p> <p>Expected outcomes will aid us to understand if extracted hemp biomass can be safely fed to cattle, to have produced data to assist the FDA in approval of the use of hemp byproducts to feed livestock that will enter the food chain, and to have increased knowledge on societal acceptability of using hemp byproducts to feed livestock and increase the awareness of the livestock producers about the hemp industry and the opportunities offered by the feeding of byproducts.</p> <p>This project was initiated in 2020 and preliminary results are expected in 2021.</p>	<p>1</p>

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<p>43.</p>	<p>An integrated field and laboratory approach to studying long-distance dispersal in <i>Drosophila suzukii</i></p>	<p><i>Drosophila suzukii</i> (spotted-wing drosophila) is an invasive agricultural pest that infests and ruins crops worldwide. Effectively managing the species requires both knowing how flies disperse at a landscape scale and understanding the factors that modulate this dispersal. Recent laboratory studies suggest fruit flies have an underappreciated capacity for extended straight-line navigation. How these findings apply in field conditions, and to <i>D. suzukii</i>, is unknown.</p> <p>Our findings will address crucial, unanswered questions about the behavior and physiology of a potent agricultural pest, responsible for ~750 million dollars of yearly damage. Our work will enable more precise application of pesticides and biocontrols, more effective synthetic attractants, as well as an understanding of the potential spread of transgenic populations. More broadly, our findings will provide a generalizable framework to study animal movement and its agricultural consequences, with relevance to beneficial species, pests, and disease vectors.</p> <p>This project was initiated in 2020 and preliminary results are expected in 2021.</p>	<p>1</p>
<p>44.</p>	<p>Development and Evaluation of Broccoli Adapted to the Eastern US</p>	<p>Most broccoli bred in the U.S. is targeted to the California Salinas and Imperial Valley production areas and is not be adapted to the environments of other production regions. Such is certainly true for production along the Eastern Seaboard with production slots ranging from Maine to Florida. Western Oregon represents another unique production environment in which we have had an established broccoli breeding program dating back more than 40 years. Germplasm from this region can contribute to breeding efforts taking place in the eastern U.S. We will provide hybrids produced from OSU inbreds for trialing in eastern regional trials. We will also provide inbreds to breeding programs that may be used for crossing as well as hybrid production with regionally bred inbreds. Data from regional trials will be utilized to evaluate the usefulness of these materials for eastern broccoli production.</p> <p>The main output of this project will be the development of broccoli germplasm. Both inbreds and hybrids derived from those inbreds will become available.</p> <p>This research is associated with a Hatch Multi-State project and research was initiated in 2020. Preliminary results will be available in 2021.</p>	<p></p>
<p>45.</p>	<p>Plant breeding collaborative project</p>	<p>Peppermint and spearmint are important regional crops in the U.S. Pacific Northwest. The most important traits to the mint industry are oil quality and resistance to the fungal disease <i>Verticillium</i> wilt. The OSU mint breeding program employs genome sequencing and bioinformatics to identify genes to target for molecular marker development and marker-assisted selection. The lab collaborates closely with the USDA National Clonal Germplasm Repository in Corvallis, using the <i>Mentha</i> germplasm maintained there and helping to confirm true genetic identity of mint accessions.</p> <p>We completed an analysis of gene expression in <i>Verticillium</i> wilt resistant and susceptible accessions of <i>M. longifolia</i> that provided insight into mechanisms of disease resistance in mint. A</p>	<p>1</p>

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		<p>slate of candidate genes has been selected for molecular marker development, and markers that are confirmed to be correlated with wilt resistance will be shared with industry sponsors. Three manuscripts are in preparation: 1) Mint genome update; 2) Mint gene expression study; 3) Mint molecular marker study.</p>	
46.	<p>Comprehensive Development of Strawberry Fresh Market Production Systems</p>	<p>Oregon is the fourth largest strawberry producer in the U.S., with fruit grown primarily for processing. Despite crop growth at the national level, total acreage and production are declining in state, and the producers' needs have changed. The strawberry industry needs continued assistance in research and extension to support new priorities set up by the Oregon Strawberry Commission, such as fresh market production. The program started by determining the state of the strawberry industry in Oregon and identifying the primary needs and challenges of growers. In 2018-2019, conducted in-person interviews, and both qualitative and quantitative data were collected and analyzed. Growers surveyed included organic and conventional, fresh market and processing, and large and small.</p> <p>The needs assessment confirmed the need for innovative research for a changing industry. It will prioritize extension programming and support needed for the sustainability and future of strawberry production in Oregon. Nutrient management and technical approaches to production for small farmers and season extension to expand existing markets determined projects that address the industry's critical needs. Multiple growers have already begun to address nutrient management issues and implement recommended practices for increased efficiencies. Twelve growers that implemented low tunnels in their farm reported more prolonged harvest with increased yields and disease and pests reduction. Many collaborators have signed up for continuing research projects, and we hope to engage in additional extension activities in the coming years.</p>	1
47.	<p>Apple Sunburn Prevention</p>	<p>Apples in the Walla Walla Valley and elsewhere are subject to discoloration of the fruit skin when exposed to intense light and high temperatures. This is thought to be caused by UVb and excessive temperatures. Several measures have been implemented over the last two decades to reduce this problem. These include sunburn protection products and reflectants such as Raynox® and Surround®. Also overhead cooling of fruit using evaporative sprays is also widely utilized in the Valley. Overhead cooling is wasteful of water and sets up potential disease problems as well as adversely affecting soil quality.</p> <ul style="list-style-type: none"> <li>•Hydrophobic organic biofilms have been formulated in conjunction with Mark Christensen in the Pharmacy Department and organic UV protectants added to them for testing in a commercial orchard situation.</li> <li>•Subsequent postharvest exposure of physiologically mature fruit of 'Golden Delicious', 'Fuji' and 'Granny Smith' picked from the inside of trees to intense UV at different temperatures has revealed that there is a time temperature relationship needed for sunburn to occur and that mature fruit are not that susceptible to sunburn.</li> </ul>	

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		<p>Growers have changed their sunburn protection practices and begin applications when temperatures exceed 85°F. In some years, this may be as early as May.</p> <p>•It is envisaged that the Biofilm may generate about \$5 million dollars in local market sales per year. OSU will be paid a royalty of 5% each year for 20 years.</p>	
48.	<p>Beef Quality Assurance program ensures quality beef and improves profits</p>	<p>Beef Quality Assurance (BQA) is a national program that raises consumer confidence through offering proper management techniques &amp; a commitment to quality within every segment of the beef industry. Major US Packing Plants are starting to require that beef producers who supply animals to them be BQA certified. Oregon's BQA Team, trained by the National BQA trainers, taught BQA classes to producers in western Oregon. During the COVID restrictions we encouraged the use of the National BQA website for online certification. Thirty-six producers were trained in Jackson (24) and Lincoln (12) counties. Learning outcomes include methods of proper animal handling, the importance of proper facility/equipment maintenance, and recordkeeping/Best Management Practices to keep track of problems, methods, and progress of practices. There is a test producers must pass administered at the end of the training. The producers are now qualified to supply cattle to mainstream packing plants and feedlots that want BQA certification by their suppliers. Producers return to their ranches where they incorporate methods learned from the BQA program. Third-party assessment as well as self-assessments help determine progress on incorporating BQA principles.</p>	1
49.	<p>Oregon State Extension assists Oregon Department of Agriculture with monitoring efforts to detect invasive gypsy moth</p>	<p>In mid-June 2020, Jake Bodart, Insect Pest Prevention and Management Program (IPPM) manager at Oregon Department of Agriculture (ODA), reached out to Dean of College of Natural Resources Alan Sams for assistance with monitoring for the gypsy moth. The gypsy moth is an invasive pest that is defoliating and causing high levels of damage to various trees in the eastern and central U.S., but is not yet established in Oregon.</p> <p>Like many other agriculture and natural resources agencies impacted by COVID-19, IPPM was in a pickle: on their plate were 9,000 gypsy moth monitoring traps that needed to be placed around the state of Oregon by July 24. But due to COVID-19 impacts, their seasonal crew of 22 could not be hired. What were they going to do? How were they going to get all of these traps out?</p> <p>IPPM requested help from Oregon State University Extension Service to assist with their efforts to place these sticky, bright green triangular-shaped traps in trees in specific areas in Clatsop, Tillamook, Lincoln, Curry, Jackson, and Josephine counties.</p> <p>OSU Extension mobilized FNR Extension Agents and volunteers from the Master Woodland Manager (MWM) and Oregon Master Naturalist (OMN) Programs, to assist IPPM with the placement and collection of gypsy moth monitoring traps in their respective service areas. On July 9, collaborators met virtually to review gypsy moth monitoring protocols and to finalize plans for trap distribution. On July 13, traps from ODA were delivered to FNR Extension Agents in their</p>	1

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		<p>respective service areas.</p> <p>Volunteers were trained by Zoom on trap placement protocols and assigned areas to place traps. Since this all took place during COVID-19, all volunteers had to take a COVID-19 training before they could participate (some Master Gardeners and Master Naturalists had previously taken the training). Traps and maps were distributed to volunteers who then placed the traps. Volunteers filled out information cards for each trap that included date and trap location, and mailed them to ODA. All traps were placed by the end of July.</p> <p>An OSU Extension volunteer squad comprised of 60 Master Woodland Managers, Master Gardeners, Oregon Master Naturalists, County Extension staff, and FNR Extension Agents, deployed and collected over 340 traps across western Oregon for the Oregon Department of Agriculture Insect Pest Prevention and Management Program.</p> <p>OSU Extension volunteer efforts contributed to a total of 4, 826 traps placed by other volunteers that also assisted ODA with invasive pest monitoring, out of a total of 21,463 traps placed in the 2020 season.</p> <p>Only two gypsy moths were detected, one European gypsy moth in Columbia County and one Asian gypsy moth in Multnomah County.</p> <p>Suffice it to say, OSU Extension is a trusted, reliable partner that produces high-quality work in a timely manner, commits to finding solutions, and delivers meaningful results.</p> <p>"This was a great opportunity for the Master Gardener volunteers and now we are working with an Urban Forester to have Master Gardener volunteers trained to help the city conduct an urban tree inventory." Sara Runkel, Josephine County Master Gardener Coordinato</p>	
<p><b>50.</b></p>	<p>Zinc Nutrition in Wheat</p>	<p>Wheat producers are anxious to reach “the new yield plateau,” and some believe zinc fertilization (a practice rarely if ever used in the past) is a way to do so. Zinc is essential for plant growth, but there is debate about soil reserves and whether or not these reserves, after 100 years of farming, can adequately support modern-day wheat production. The cost of supplemental zinc fertilization ranges from \$2 to \$7/acre.</p> <p>On-going field research is designed to evaluate the efficacy of zinc application in eastern Oregon. Results from this work will be also applicable to food-producers (and 850,000 acres) in south-central and east-central Washington.</p> <p>Preliminary, first-year results from two randomized and replicated experiments and several large-scale, on-farm demonstrations indicate no advantage from the application of zinc fertilizer. If this trend “holds true” during the second and third year of research, then recommendations to avoid</p>	

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		<p>this practice will result in a significant cost savings for farmers who produce grain consumed by people all over the world. The average, regional financial gain (cost savings) has an estimated value (assuming a conservative 35% rate of adoption) of \$1.3M. Stay tuned for future updates.</p>	
51.	Fungicide for Stripe Rust Disease in Wheat	<p>Late-season rainfall in Morrow County (and elsewhere in Eastern Oregon) increased the yield potential of soft white winter wheat. It also increased stripe rust symptomology on the leaves of susceptible cultivars. This kind of leaf damage is significant because it reduces photosynthesis. An outcome of reduced photosynthesis is a less-than-optimum grain yield. The average grain yield loss, from the stripe rust pathogen in Morrow County, is about 7 bushels per acre for untreated susceptible cultivars.</p> <p>Recommended application of a fungicide for control of stripe rust observed on susceptible cultivars of wheat being grown on about 15,000 acres. Recommended “no application” on less susceptible “lines” growing in an area equal to about 5,000 acres.</p> <p>The 15,000 acre recommendation resulted in a prevented (and estimated) yield loss (7 bushels per acre) equal to \$577,500. Cost savings from the 5,000 acre recommendation (not to apply) was approximately \$35,000.</p>	1
52.	Developing an OSU Organic Extension Program	<p>Oregon Tilth, Oregon Organic Coalition, Friends of Family Farmers (FoFF), and Organic Valley worked with the Oregon State Legislature to build support for an Oregon Organic Extension service. FoFF secured a grant from Organic Valley to support their advocacy work, and Oregon Tilth, FoFF and Organic Valley organized an Organic Day at the state capitol in Salem to promote the industry and an OSU Organic Extension program.</p> <p>In 2019, OSU faculty formed the OSU Organic Extension Working Group, to foster inter-disciplinary collaboration related to organic agriculture, and aggregate information about organic agriculture projects at OSU. Nick Andrews coordinates this working group.</p> <p>In June, 2019 the Oregon Legislature approved \$375,000 in new funding for OSU Extension, for development of a new Organic Extension program that is now housed at the OSU Center for Small Farms and Community Food Systems. In January, 2020 Nick Andrews accepted the first Organic Extension position focusing on vegetable production. In November, Garry Stephenson and Lauren Gwin formed a selection committee for the new Organic Pasture and Forages position.</p> <p>The OSU Organic Extension Working Group hosted our first Organic Extension Summit in April, 2019 to facilitate inter-disciplinary collaboration at OSU, and is developing a client facing OSU Organic Extension web site. Oregon Tilth has committed to continue their annual donations through 2022, with a new goal of creating an organic grains and pulses position.</p>	1



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<p>53.</p>	<p>Online Small Farm School expands to statewide audience</p>	<p>Small-scale farms and local food businesses in Clackamas, Multnomah and Washington counties and throughout Oregon are growing, but need access to networking opportunities and research-based information. Many of these farms are managed by people without formal training or experience in agriculture or food production. They need access to practical research-based information to manage their small farm investments and businesses well, and to steward natural resources. Many farmers and food system leaders in the Metro area and state are white and looking to support and promote a more equitable food system.</p> <p>In partnership with Clackamas Soil and Water Conservation District, Clackamas Community College, Rogue Farm Corps, Friends of Family Farmers, and local companies, we have developed online Small Farm School as a key educational event for farmers in the Metro area and throughout the state.</p> <p>We offered 18 sessions in a Zoom webinar platform, sessions were recorded and posted on the Small Farm School Website.</p> <p>Michelle Week, an Indigenous farmer, of Good Rain Farm helped organize two sessions on equitable food access in partnership with Friends of Family InFARMation. These sessions provided an opportunity for the farming community at large to listen to experiences from the BIPOC farmer community.</p> <p>Small Farm School had 270 registered participants from 20 Oregon counties and 15 states. There was an average of 70 participants per session compared to an average of 26 participants per session for the 2019 in-person Small Farm School. The two Equitable Food Access sessions organized by Michelle Week of Good Rain Farm and in partnership with Friends of Family InFARMation had the greatest attendance with over 140 participants each evening. Recorded sessions have been viewed over 300 times and provided access to participants to view at their convenience if they were unable to attend the in person sessions.</p> <p>The overall program had a rating of 4.3 (very good) on a scale of 1-5. The average session rating was 4.6 (very good/excellent) on a scale of 1-5. 97% of participants plan on implementing ideas from sessions they attended.</p> <p>70.3% of participants prefer an online format and the 29.7% prefer in-person Small Farm School. We have work to do in online offerings as 83.8% of participants indicated the online format met their expectations.</p> <p>Comments from participants: All the shared resources were awesome. Facilitators really helped get questions answered. Instructors seemed very knowledgeable and followed up after the class. Good experience. Thank You!</p> <p>This was fantastic! Really glad I committed the time. I attended a lot of sessions and feel like I got</p>	<p>1</p>
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		<p>a lot out of it. The sessions on racial justice in agriculture, developing brand identity, and the record keeping for farming session were especially helpful/interesting for me.</p> <p>Participants appreciated the flexibility of online programming and recorded sessions. Comments included: "My wife and i were able to 'attend' nearly all the classes together and discuss them. The ones we missed we were able to see later." and "We can watch from the comfort and safety of home after finishing farm chores and eat dinner. We can sit at our table and take notes. The sessions were spread out so we could attend all."</p> <p>Participants missed the networking opportunities of in-person programming and the opportunity to meet others interested in similar endeavors. Many prefer the option of both in-person and virtual programming for future Small Farm Schools.</p>	
<p><b>54.</b></p>	<p>Evaluation of agronomic, disease, and quality attributes of wheat and barley varieties for Oregon</p>	<p>Wheat is Oregon's second largest crop, after alfalfa, valued at \$239 million in 2017, with major production regions spread across many climates. While barley production is substantially lower than wheat production (\$6.5 million in 2017), it is considered to be an important rotation crop in many parts of the state. Currently, at least five universities, seven private companies, and the USDA have rights to wheat and barley varieties that may have a future in Oregon. While this leads to an abundance of options for growers in the state, it can be difficult for growers to directly compare variety performance in the field. In areas and market classes that are not represented by this variety testing program, this has led to planting decisions being made on the basis of marketing, rather than data. This can lead to growers planting varieties with sub-optimal yields, disease, and quality.</p> <p>In order to provide grower with the information needed to select the best wheat and barley varieties available, we conduct a set of variety trials in seventeen locations in Oregon, three locations in Washington, and one location in California (trials growing regions spanning state borders are often conducted in collaboration with our counterparts in neighboring states). These locations are chosen to cover the wheat and barley growing regions of Oregon, so that variety recommendations can be made based on performance in the target growing conditions. In addition to released varieties, this trial includes advanced experimental lines from public and private breeding programs, to accumulate performance data in the event of a line's release. Trial results are released to growers and seed dealers after harvest through multiple channels, so that they can be used for fall planting decisions.</p> <p>Results from the variety trial have been received extremely well by growers and stakeholders. Growers regularly express to me how much stock they put in the variety trial results. Mid-Columbia Producers, one of the leading seed dealers in Oregon, features a link to the results at the head of the list of varieties they offer. Similarly, Northwest Grain Growers relies heavily on these results when deciding which varieties to carry, and when recommending varieties to growers.</p> <p>In addition to helping with planting decisions, the data we collect on experimental lines provides important feedback to plant breeding groups, which helps them to decide which lines to release</p>	

		<p>and market in Oregon, as well as which lines to use as parents for future breeding efforts.</p> <p>Because leading wheat varieties often differ in yield by 10%, a conservative estimate of the cumulative effect of this program's impact is a 1% increase in yield of wheat and barley (including assisting growers in planting decisions, and influencing which varieties are released and marketed in Oregon). In 2018, this translates to approximately 516,000 bushels of wheat (at a price of \$6 per bushel) and approximately 570 tons of barley (at a price of \$150 per ton), totaling \$3,181,500.</p>	
<p><b>55.</b></p>	<p>Development Of Bio-Enabled Nano-Plasmonic Sensing Technology For Rapid Detection Of Histamine And Aquaculture Drugs In Seafood</p>	<p>The aim of this project is to develop a cost-effective, high performance biosensing technology for rapid detection of histamine and unapproved aquaculture drugs in seafood to enhance food safety. Different than existing expensive and bulky laboratory analytical equipment, our on-chip biosensors will be made from nature created biological materials --- diatom biosilica. The research objectives are: 1) Synthesis of high density diatom thin film with silver nanoparticles that can simultaneously perform on-chip separation and sensing; 2) Quantitative detection of trace level of histamine and unapproved aquaculture drugs in seafood; and 3) Demonstration of the biosensing technology for in-situ seafood safety through collaboration with local seafood industry.</p> <p>We have demonstrated a multiscale SERS substrate by synergistically combining naturally occurring photonic crystal-like diatom frustules and Au NPs with a mesoporous silica shell and used this substrate for the detection of explosive vapor. Utilizing a custom va or chamber and the model analyte pyrene, we verified the contributions from each component of the multiscale substrate. The sensitive and rapid detection results achieved by this multiscale SERS substrate clearly illustrate its capabilities for vapor phase explosives detection and its potential for future land mine and other vapor-phase SERS detections.</p> <p>We proposed for the first time a quaternion-based parallel feature extraction method that enables quantitative analysis using well established TLC-SERS techniques, which suffer poor quantification accuracy. By collecting SERS spectral data from three deterministic points at each measurement, the multi-spectra were holistically expressed as a pure quaternion matrix to preserve the spatial and coupling information of the TLC-SERS data.</p> <p>3) We synthesized multiscale, hierarchical photonic crystal-enhanced plasmonic mesocapsules made of diatom photonic biosilica decorated with in-situ growth Ag NPs to achieve ultrasensitive optofluidic-SERS sensing with more than 100× higher EFs and at least 1000× improvement in detection limit compared with traditional colloidal Ag NPs. We expect that optofluidic-SERS sensors using diatom photonic crystal-enhanced plasmonic mesocapsules can potentially play pivotal roles in a broad array of sensing applications including water quality monitoring, environmental protection, food sensing, forensic analysis, and drug abuse detection.</p>	<p>2</p>

<p>56.</p>	<p>Continuing Olive Orchard Production and Establishment</p>	<p>Olives are a high value specialty crop cultivated to a limited extent in Oregon, mainly due to climatic and environmental conditions that directly affect field establishment and plant survival. The principal limitations to growing olives in Oregon are low winter temperatures that affect tree development at planting (with a lack of known tolerance to winter injury in available cultivars) and a relatively short season to ripen fruit in addition to a lack of research based knowledge of best production practices for the region. Cultivars that are sufficiently resistant and produce quality fruit in Oregon’s shorter ripening season must be identified and growing techniques refined to adapt the crop to these conditions and assist with orchard survival. An additional goal is to reduce the cost of orchard establishment by providing information on propagation to facilitate local availability of adapted cultivars and for growers to be able to propagate their own plants, as well as implement best management practices that improve tree survival at planting. Unfortunately, as most olives are produced in milder climates, comprehensive, peer reviewed and replicated relevant information on the resistance to winter damage of the hundreds of olive cultivars does not exist for our region where temperatures are lower. Our project will address this by obtaining multiple cultivars from U.S. and foreign sources (Universities, repositories, private collections and commercial sources) as cuttings or plants, rooting them, propagating them to experimental numbers, and evaluating them in a replicated, multi-year field evaluation in Aurora, OR (USDA hardiness zone 8b). A separate collaborative effort will address yearly data and observations made by growers that larger, more mature olive plants are more resistant to freeze damage than younger plants. This will also include a replicated field trial at NWREC where nursery plants of commercial age of four cultivars currently grown in Oregon orchards will be planted directly in the field, and also kept winter protected in 3 and 5-gallon pots (different age as they develop) to assess their respective susceptibility to freeze injury. To address the need for information on propagation techniques for local conditions, cuttings will be rooted in various substrates and collected/rooted at different developmental stages for comparison. Once all project data has been collected and analyzed, results will be shared with industry and the public through web-based and printed publications and media, as well as field days and presentations hosted in collaboration with the olive growers in Oregon. The industry has continued to grow and expand as we are learning and sharing our experience with growers.</p> <p>Olive propagation. The second year of propagation trials involved the replication of the 2018 hormone trial and completing the substrate trial. Our first collaborator has increased his rooting success following our techniques and has expanded his propagation operation. High rooting success encouraged our second collaborator to build an open window structure against a building which is south facing. A third grower asked to be added to our propagation trial, to evaluate and improve their current protocols for larger scale production. Following our guide for larger trays they have achieved high rooting success and automation of the system with minimum supervision in the fall.</p> <p>Cold hardiness of olive cultivars. A total of 152 accessions were planted for use in 2020 for the cold hardiness evaluation. The effort to document cold injury to olive cultivars at grower sites includes 5 collaborator farms in the Willamette Valley and one in the Umpqua Valley.</p>	<p>1</p>
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		<p>Temperature data will be collected from these sites throughout the winter season and correlated to evaluations of cold injury to cultivars undertaken in late spring 2019. Transplanting and up-potting practices.</p> <p>We received over 200 trees from the nursery supplying research plants. We planted 240 trees in our four different fields (NWREC and Woodhall.) In the fall, we up-potted 240 trees and moved them to a winter greenhouse with heat for nights with temperatures below threshold. We did not lose trees in the winter, and are continuing to reduce losses in summer and at the time of transplant. Multiple growers have learned and applied our techniques and and learning and sharing with us all their experiences and challenges.</p> <p>Outreach. At our advisory council meeting, input was obtained and discussed, to improve research at grower sites and unanimous support was given for future research efforts. We participated in various meetings including: ASHS, Durant Olive Fall Festival, Olive Master Class, Small Farm Conference and others. We hosted an Olive Field Tour at NWREC with record attendance by growers. All the opportunities to share information on the results of the project were considered very valuable and continue to show the strong industry support for our research and extension efforts that are already improving practices at small farms and making the crop more viable in the state.</p>	
57.	2020 Dry Farming Project adapts with virtual programming amidst global pandemic	<p>The Dry Farming Project expanded so significantly in 2019 that we were preparing to hire student workers for the 2020 field season for 5 research projects, when the pandemic hit. As guidelines and restrictions rolled out from the university and the state, we adapted daily to changes dictated by administration. It became apparent early in the year that in-person programming was outside institutional expectations; any programming would have to be virtual and require equipment and skills we didn't yet have.</p> <p>The OSU Dry Farming Project research team navigated the hiring process and restrictions to bring three student workers on board for the 2020 growing season starting in May. In exploring what was possible, the Small Farms Educational Program Assistant procured video cameras, a tripod, and video-editing software to enable us to begin capturing videos throughout the growing season. After a few trial runs, we committed to hosting the first-ever Dry Farming Project Virtual Field Tour Series.</p> <p>The OSU Dry Farming Project hosted its first virtual field tour series in August/September year with 137 participants from throughout Oregon, other states and other countries. Nine tours addressed these dry farming topics: Site Suitability, Soil Management, Potato Variety Trials, Tomato Management &amp; Variety Trials, Bean &amp; Squash Variety Trials, Corn Breeding and a Harvest Showcase.</p> <p>Fifty-three percent of participants were commercial farmers and of those, 51% did not have access to irrigation. The participants not farming commercially self-identified as homesteaders, aspiring</p>	1

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		<p>farmers, and NRCS and non-profit staff. A majority of virtual field tour participants (64%) had not yet tried dry farming, although the remaining 36% had 1 to 5 years of experience. This is significant because in 2015 at the first dry farming field day, less than 5% of the ~100 participants reported having dry farming experience, so there has been a 30% increase in the past six years and a growing community of practice with the DFC FaceBook group membership increasing by 18% in the past year (817 to 998).</p> <p>When Dry Farming Virtual Field Tour participants were asked, <i>Why are you interested in dry farming?</i>, some of the following responses were given by farmers:          Interest in low-input techniques. Simplicity, cost and time saving          Reduce use of limited resources. Reduce weed pressure. Reduce labor.          Resiliency, adaptation to climate change, reduction of expense/complexity.          To conserve water and become more efficient while still producing flavorful, nutrient dense foods. Although we do have water rights, the cost of irrigation infrastructure has been prohibitive.</p> <p>In a follow-up survey 55 of the 137 participants provided feedback and of those respondents, 100% reported skills or knowledge improved 68% plan to apply something they learned (e.g. techniques and varieties highlighted in virtual field tours)          One participant commented in the survey, <i>"I am so happy for the virtual platform, I have been wanting to attend for years, but could not take the time off of work to travel to the in-person classes. Thank you!"</i></p> <p>2020 Dry Farming Virtual Field Tours were recorded and archived and have enjoyed 239 views as of 1/8/21.</p>	
<p><b>58.</b></p>	<p>OSG distribution of seabird bycatch prevention devices saves birds and benefits fishermen</p>	<p>Seabird bycatch prevention efforts on U.S. West Coast (Washington, Oregon, California) have focused primarily on reducing the risk of interactions between longline fisheries and the endangered short-tailed albatross. In addition, chronic mortality of black-footed albatross and other seabird species occur in U.S. West Coast groundfish fisheries, with estimated annual takes between 51 and 215 for the 2010-13 period (Jannot et al., 2016). Streamer lines, a device used to scare seabirds away from baited hooks, protect longline fishing gear from seabird attacks, save bait, reduce incidental seabird mortality and are the most commonly prescribed seabird bycatch mitigation measure worldwide. Therefore, designing and promoting effective seabird bycatch mitigation using streamer lines has far-reaching conservation benefits for many seabirds in the Northeast Pacific Ocean.</p> <p>New regulations requiring streamer line use for vessels under 55' were implemented by NOAA Fisheries in January 2020. However, West Coast fishing vessels had limited avenues to access streamer lines since few marine suppliers manufacture them or carry them for sale.</p> <p>OSU Extension professionals worked with LFS Inc., a marine supplier based in Seattle, to custom order and secure 90 streamer lines for distribution from Central California to Southern Washington. I worked closely with NOAA fisheries to get information about the availability of free streamer lines included in regulatory bulletins and mailings sent to the fleet, and set up an online inquiry form to</p>	

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		<p>collect a list of fishermen interested in receiving free streamer lines. OSU Extension coordinated a distribution network to get streamer lines to fishermen from Moss Landing, CA to Westport, WA by working with local marine suppliers, port authorities, and others. OSU Extension conducted an outreach trip to central California in from February 19 - 22, 2020 to distribute streamer lines to 30 vessels and ensure that they had the tools and knowledge to deploy them effectively on their vessels. A second phase of outreach trips was planned for Northern California and Oregon in March, but COVID-19 travel restrictions made that impossible to carry out. Despite the change in plans, my coordination with marine supply stores ensured that streamer lines were available in Fort Bragg, Eureka, and Crescent City, CA, Brookings, Port Orford, Coos Bay, Newport, Tillamook, and Astoria, Oregon as well as Ilwaco and Westport, WA.</p> <p>As a result, in 90 U.S. West Coast longline vessels having both the tools and knowledge of how to prevent seabird bycatch in their fishery. With streamer lines preventing over 90% of unnecessary seabird deaths in fisheries, these actions have the potential to save thousands of albatross lives over the 5-7 year usable life of the streamer line mitigation devices as well as save fishermen lost bait and valuable fishing time.</p>	
<p><b>59.</b></p>	<p>Partnership Engages Landowners and Stops Pesticide Contamination in the Middle Rogue</p>	<p>Agriculture has a range of impacts on water quality. Pesticide contamination of surface water is of particular concern because of the inherent biological toxicity of those materials and the sensitivity of aquatic ecosystem to disruptions. In 2014, a group of state and local stakeholders, the Middle Rogue Pesticide Stewardship Partnership, began monitoring tributaries of Bear Creek for pesticide contamination. In one such tributary, Jackson Creek, the herbicide oxyfluorfen, which is labeled as toxic/highly toxic to aquatic organisms, was detected in 23-100% of water samples each year between 2014 and 2019 with several detections at or above the EPA's aquatic life benchmark.</p> <p>In early 2019, OSU Extension professionals worked with the Partnership to develop a targeted reconnaissance sampling plan for the Jackson Creek basin in an attempt to identify the land use or portion of the drainage responsible for the oxyfluorfen contamination. This included monitoring five additional sites through early 2019. That sampling indicated that the contamination was likely originating in one section of the watershed. OSU Extension reached out to proximate landowners and initiated discussions with a land manager in that area who routinely used oxyfluorfen but was unaware of any off-target movement of that material. We reviewed the granular monitoring results and explored potential best management practices which could reduce the surface water contamination.</p> <p>After measuring oxyfluorfen in Jackson Creek every year from 2014 to 2019 with a 23-100% detection frequency, our monitoring detected <u>no</u> oxyfluorfen in any of the samples collected in 2020.</p>	<p>1</p>
<p><b>60.</b></p>	<p>Mormon Cricket Coordinated Monitoring and Control</p>	<p>In the spring of 2017, north Gilliam County landowners began noticing large numbers of Mormon crickets in the vicinity of the Columbia River from Blalock Canyon to Arlington, Oregon. The Mormon crickets had been previously detected in this area the past five years, but the 2017</p>	<p>1</p>

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		<p>outbreak was of a significantly larger scale in terms of the insect population and geographic distribution.</p> <p>Building on 2017, 2018 and 2019 experience with Mormon crickets, continued to implement strategic plan in 2020 for large area control efforts. Worked with the Gilliam County Court to include an annual budget line item of \$105,000 to offset the cost of insect growth regulator &amp; its aerial application for Mormon cricket control. Worked with large area landowners to facilitate coordination across ownership boundaries to save time and money in control efforts. Worked with ODA-supervised volunteer field scouts to survey areas of north Gilliam County for Mormon cricket concentrations, using reported data to create a Google Earth map of infestation concentrations, and e-mailing the map to area landowners on a weekly basis during the survey periods. Used the ODA survey information to identify contiguous geographic areas with high Mormon cricket concentrations, sending the Google Earth maps to landowners in May. Landowners in turned used the maps to make integrated pest management decisions for insect monitoring and mitigation. Worked with ODA on post-control surveying of treated acres.</p> <p>A total of 9,789 acres were treated with insect growth regulator, 175 acres with bait applied by broadcast spreader in sensitive locations next to right-of-ways and agricultural homesteads, and 40 acres were left untreated. According to Oregon Dept. of Agriculture pre- and post-treatment survey sampling sites the Mormon cricket population densities of 20-200 per square yard were reduced to zero.</p>	
61.	Southern Oregon Hemp Forum Grows New Audience and Builds Knowledge	<p>Following the explosion of interest in hemp and registration of 64,000 acres for hemp production in Oregon during 2019, constituents from every angle requested that the Extension Service increase education to hemp growers. Being a newly legal crop, little research and few educational resources were available. After a direct request from the Jackson County Commissioners, OSU Extension professionals developed the Southern Oregon Hemp Growers for the 2020 season.</p> <p>A series of hemp growers forums was held monthly from April to November 2020. This program was quickly moved to a virtual Zoom format following the COVID-19 restrictions announced in March. Over the 8 sessions, more than 25 presentations were given by OSU Faculty, representatives from state and local government, and industry members. Topics included crop production practices, rules and regulations, and post-harvest processing and marketing.</p> <p>The Southern Oregon Hemp Growers Forum connected OSU Extension to a new audience and increased their knowledge of hemp topics. Of the more than 200 live attendees to the forums, about 55% reported that the Hemp Forum was their first program with OSU Extension, and registrants attended virtually from 8 states plus Canada and Ecuador. In addition to the real-time participants, recordings of the sessions have received more than 330 views.</p> <p>All survey respondents indicated they gained knowledge and/or resources which were valuable to their success this season with 31% indicating they gained a lot in terms of knowledge or resources. 93% of respondents indicated they improved their knowledge of agricultural practices, 100%</p>	1



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		<p>indicated they improved their knowledge of regulations related to hemp, and 90% indicated they improved their knowledge of post-harvest activities and markets for hemp. All together the program registrants indicated they managed 1400 acres of hemp this season and several individuals reached out to appreciate the science-based information provided at the Forum in the otherwise "Wild West" of hemp information sources. One participant wrote: "I just wanted to say that I have been to a ton of hemp seminars, and forums, and that was by far the best, most informative, well organized, educational, thought provoking, (etc.)! By leaps and bounds! Thank You."</p>	
<p><b>62.</b></p>	<p>OWIC assists with market development of Indian sugar palm wood</p>	<p>Plyboo, a San Francisco-based company, has been working to develop material from sugar palm trees (with the trade name Durapalm) in rural India. The goal is to put the material to higher value use as well as provide employment to local communities. Marketing the material has been difficult however given that information on the mechanical and physical properties of sugar palm wood was not available.</p> <p>We conducted extensive testing of the properties of sugar palm wood and provided the company with a report as well as a refereed journal article on the durability of the material.</p> <p>On their website, the company stated that our assistance with determining the mechanical and physical properties of their new Durapalm product "...assured everyone on the project that the Indian sugar palm lumber possessed both the hardness and durability, as well as the weather- and rot-resistance needed for the application." The application referenced is a Sugar Palm Suspension Bridge in Mendocino County, CA. <a href="https://www.durapalm.com/press-releases/sugar-palm-suspension-bridge-rises-in-mendocino-county/">https://www.durapalm.com/press-releases/sugar-palm-suspension-bridge-rises-in-mendocino-county/</a></p>	
<p><b>63.</b></p>	<p>Agricultural Hazardous Waste Disposal</p>	<p>Agricultural producers are limited in the ways that they can properly dispose of agricultural waste, including insecticides, herbicides, fertilizer, and other additives used in applying farm chemicals.</p> <p>OSU Extension advertised agricultural hazardous waste collection events in monthly email, newsletter, and the Mid-Columbia Farmers Newsletter. OSU Extension professionals serve on the Tri-County Hazardous Waste &amp; Recycling Program Steering Committee to provide guidance over the collection of agricultural hazardous waste at multiple collection events in Hood River, Wasco, and Sherman Counties.</p> <p>Producers in Wasco and Sherman counties turned in 750 lbs of pesticide solids, 1,850 lbs of oxidizing fertilizers and soil conditioners, and 2,400 lbs of poisons with some flammability. These collected materials were removed without causing damages to human health and natural resources. In addition, farmers saved money by disposing of these chemicals through the collection events.</p> <p>The first-year data were collected from Hermiston, OR. Currently, we are analyzing the data and will present them in the 2021 ASA-CSSA-SSSA meeting or other appropriate regional meetings. The output of this project will enhance economic profit as well as the sustainability of alfalfa-based</p>	<p>1</p>

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		forage production systems in the western region.	
64.	Increasing yield, quality, and economy of alfalfa hay through grass species selection and planting configuration	<p>Alfalfa is a very important crop in the US. The inclusion of grasses in alfalfa production systems provides additional ecosystem services. Grasses may increase soil organic carbon, reduce weed pressure, soil erosion, and reduce weevil densities. However, the effect was not consistent or with all species of grass, so further research in alfalfa-grass intercropping is needed.</p> <p>Field observation and measurements were conducted in the Hermiston field trial site. Due to the limited choice of herbicide, the weed infestation was very serious during the initial period. As a result, all the plants (alfalfa, grass, and weeds) were mowed two times. Afterwards, the weeds were suppressed by the alfalfa and grass, so continuously there were four harvestings conducted. The growth and the yield of the alfalfa and grass under different treatments were collected.</p>	
65.	Machine harvesting for fresh market blueberries	<p>The rising production cost, especially cost and availability of labor, is a serious concern for harvesting fresh blueberries to meet market demand, particularly for the late-season fresh blueberry market in the Pacific Northwest (PNW). With blueberry production and acreage expanding in the PNW, growers have been trying to pick fresh blueberries with over-the-row (OTR) mechanical harvesters with limited success. Machine harvested fruit has a significantly reduced shelf life and results in a large amount of fruit being lost on the ground. Consequently, almost all fruits destined for the fresh market are currently picked by hand in the PNW, especially fruits exported to foreign markets. Better methods to improve mechanical harvesting for fresh market blueberries need to be developed to keep the Northwest blueberry industry competitive.</p> <p>Teaming up with USDA and the University of Georgia, we first evaluated the soft fabric-based catch systems with hand-held pneumatic shakers. We found that soft catching surfaces reduced impact force and internal bruise damage (IBD) of berries. Working with OTR harvester manufacture OXBO International, several versions of the OTR harvester were modified to replace the hard-plastic catch surface with various soft catch surfaces. The modified OTR harvester was tested in commercial fields in California, Oregon, and Washington for several harvest seasons. Harvested fruits were processed and packed in commercial packing plants equipped with the latest sorting equipment. Packed fruits were evaluated for their firmness, IBD, and shelf life. The effect of various machine settings on fruit quality was also evaluated. All experiments included comparisons of fruits harvested by the modified OXBO harvester, handpick, and a regular OXBO harvester.</p> <p>The development of a new harvesting catch surface for machine harvesting fresh quality blueberries has the potential to revolutionize the blueberry industry in North America. The newly available fresh blueberry harvester can reduce the needs for harvesting labor and mitigate the rising labor cost for harvesting fresh-market quality blueberries. This will save more than 75% of harvesting labor costs (calculated based on \$0.60/lb handpick cost and \$0.15/lb machine pick cost) and have an annual economic impact of \$10 million (estimate based on 25 million lbs of fresh fruit harvested by machine) in Oregon alone. The machine harvesting research has caught</p>	1

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		national media attention since 2016 with some notable news releases (e.g. Good Fruit Grower and American Fruit Grower) and an invited paper from Agronomy Journal. Recently, two Oregon companies purchased the first three available commercial models of OXBO 7440 equipped with soft catch systems.	
66.	Increasing New Rotational Crops to the Lower Columbia Basin	<p>In the irrigated lands, potatoes and onion are the major high-value crops, while other rotational crops especially cereal crops have quite low profit. To increase the growers' profit, the following efforts are needed such as improving water/nutrient use efficiency, increasing crop yield and quality, exploring more crop possibilities, especially high-value crops, e.g., pulses (adzuki bean), quinoa, etc.</p> <p>Starting from the spring of 2017, OSU Extension professionals have participated in several meetings with several local growers who have encountered difficulties in growing adzuki beans. So far, we conducted field tests from 2017 to 2020, to evaluate the adaptability of adzuki bean in the region. The data proves that the Adzuki bean could be a promising rotational crop in the Columbia Basin. To maximize the crop production of adzuki bean, more questions need to be addressed including varieties selection, best agricultural conditions including planting, fertilization, irrigation, and best pest control management including weeds control and soilborne disease control. With the support of the Washington Specialty Crop Block Grant Program (\$195,844), in 2020, we conducted a variety evaluation on 135 varieties and plant configuration study for one customer available variety. More studies will be continued in 2021 and 2022.</p> <p>The first-year field trials on adzuki bean and quinoa had been presented at the 31st Pacific Northwest Vegetable Association Conference in 2017, the 44th Hermiston Farm Fair in 2017, and the 2018 Annual meeting of the American Society of Horticultural Science. In 2019, our proposal for developing adzuki bean is successfully awarded \$195,844 which will allow us to provide the best management practices for this crop in the region within a 3-year period. Currently, we collected the data of the trials in 2020 and the data will be presented in future meetings. It can be expected that the success of this project will benefit agricultural sustainability in the region. More funding opportunities towards increasing new rotational crops are ongoing.</p>	1
67.	Increasing Cover Crop Diversity During Post harvest Season	<p>In the Columbia Basin region, growers often grow wheat during late fall as a cover crop or rotational crop. Sometimes, growers grow mustard in the fall as a biofumigant source before potato planting. Because the cover crop option is quite limited, repeating the same crop (e.g., wheat) often happens, which is not a sustainable solution for soil resource conservation and crop production sustainability. Meanwhile, it will improve the disease/insect pressures because their life circle is not broken.</p> <p>In order to overcome the above issues, testing and selecting more proper cover crops is needed. Particularly, it is necessary to find several feasible crops, especially the ones that grow fast and tolerate cold and importantly uptake more residue nitrate. The over-wintering cover crops can contribute to greater cropping system sustainability by, among other benefits, adding carbon C and</p>	1

		<p>carrying over inorganic nitrogen (N) between harvest and planting of main annual crops such as potatoes. Therefore, we conduct this project to evaluate and select more cover crops for the Basin. The Collected data will be crucial to fill the knowledge gap on sustaining soil health and crop productivities with cover crops and optimizing the existing cropping systems in the region.</p> <p>The first-year field trial was conducted from mid-August 2019 to mid-March 2020. Twenty cover crop species and cultivars including 5 cool-season kinds of grass (i.e., wheat, barley, triticale, oat, and ryegrass), 5 warm-season kinds of grass (i.e., Proso millet, foxtail millet, teff grass, pearl millet, sorghum-Sudan), 5 legumes (i.e., crimson clover, winter pea, hairy vetch, cowpea, soybean), and 5 brassicas (i.e., turnip, radish, rape, kale, and forage brassica) were planted. Field measurements were conducted regularly. Through the winter months, only ryegrass, turnip, kale, and forage brassica survived and grew well, suggesting that they might be potential cover crop options for the region.</p> <p>The second-year field trial is on-going with 30 crop species. The data of the first-year study was presented in several meetings. Currently, we are exploring some funding opportunities.</p> <p>Two presentations based on this project were given at the regional and international conferences. The project has received attention from growers. It can be expected that the success of this project will benefit agricultural sustainability in the region. More funding opportunities towards increasing new rotational crops are ongoing.</p>	
68.	Restoring Fish and Wildlife in Columbia River Basin	<p>Achieving sustainable resource use while restoring fish and wildlife in the Columbia River Basin (CRB) is one of the largest challenges facing our region. More than 80% of Oregonians live in portions of the CRB. Due to the development of the hydropower system on the Columbia and its tributaries, as well as impacts of fish harvests, habitat changes, hatchery production, contamination, climate change, and other impacts, fish populations have declined dramatically from pre-development levels, and are listed as threatened and endangered under the US Endangered Species Act.</p> <p>Member of the Independent Scientific Advisory Board (ISAB) that serves NOAA Fisheries, Columbia River Indian Tribes, and the Northwest Power and Conservation Council (Council) by providing independent scientific advice and recommendations regarding scientific issues that relate to the agencies' fish and wildlife programs. The ISAB plays a high-level advisory role offering advice, recommendations, and analysis to the Council on science, policy and management questions. OSU Extension has played a role in bringing an economics and behavioral science perspective on questions that are inherently socioeconomic (e.g., making policy and management decisions toward restoration of endangered salmon and steelhead, including allocation of the Fish and Wildlife program's annual \$300 million budget. A focus of my efforts involves drawing attention to explicit consideration of using cost-effectiveness for allocating scarce resources, while minimizing other adverse impacts on the economy and stakeholder groups including farmers, fishers, and tribal interests. The Council oversees the Fish and Wildlife Program, which has spent more than \$6 billion over the past 40 years on restoration efforts. My participation involves regular Board meetings in Portland as well as independent and coordinated work on various projects, and</p>	1

		<p>field trips sites throughout the Columbia Basin to meet with stakeholders, scientists, tribal representatives, and local government officials.</p> <p>Significant contributions toward awareness and use of economic tools of analysis for prioritization of program activities; explicit use of quantitative measures of cost-effectiveness when prioritizing projects and programs; estimates of “return on investment” when evaluating the overall program progress and future trajectory, and the use of life-cycle models that combine biological models with socioeconomic models to better inform Council recommendations and policy decisions. These efforts have drawn attention to the need for systematic prioritization of activities directly tied to the goals of restoring fish populations.</p> <p>OSU Extension’s participation in the work of the ISAB has important spill-overs into other work for applied policy analysis and applied research. Two projects described elsewhere involve fish and dams and conservation in the Columbia River basin, and would not have emerged without the exposure to issues and knowledge-bases through my work with the ISAB.</p> <p>The work with the ISAB has resulted in two published reports in 2020 for the Northwest Power and Conservation Council:</p> <p>Gregory, S. V., Jaeger, W. K., Jones, C., Maule, A. G., Moyle, P., Myers, K. W., Quinn, T. P., Schroder, S., Schwartz, C. J., Turner, T. (2020). <i>ISAB Review of the Comparative Survival Study (CSS) Draft 2020 Annual Report</i> (pp. 169). Portland, Oregon: Northwest Power and Conservation Council. <a href="https://www.nwccouncil.org/reports/isab-review-comparative-survival-study-css-draft-2019-annual-report">https://www.nwccouncil.org/reports/isab-review-comparative-survival-study-css-draft-2019-annual-report</a></p> <p>Gregory, S. V., Jaeger, W. K., Jones, C., Maule, A. G., Moyle, P., Myers, K. W., Quinn, T. P., Schroder, S., Schwartz, C. J., Turner, T. (2020). <i>ISAB Review of Chapter 2 of the Comparative Survival Study (CSS) 2019 Annual Report</i> (pp. 169). Portland, Oregon: Northwest Power and Conservation Council. <a href="https://www.nwccouncil.org/reports/isab-review-comparative-survival-study-css-draft-2019-annual-report">https://www.nwccouncil.org/reports/isab-review-comparative-survival-study-css-draft-2019-annual-report</a></p>	
<p><b>69.</b></p>	<p>Extending Food Safety Training to Frontline Communicators with Seafood Harvesters</p>	<p>The OSU Better Seafood Processing School (BSPS), to an often overlooked group of individuals at primary processors: Fleet managers, Dock managers, and Buyers. These individuals have critical connections, interactions and communications with seafood harvesters (fishermen). They, essentially, serve as the frontline communicators for food safety to seafood harvesters. This group of individuals, however, is often overlooked when it comes to professional development and training in the area of food safety. Primary processors often focus scarce training resources on individuals in quality assurance and quality control. However, fleet managers, dock managers and buyer are a group of individuals at primary processing plants that can be very influential in communication of food safety and best practices with regard to sanitation to harvesters. The training modules and outreach of this project will provide a solid foundation based on scientific and best available knowledge for seafood safety, sanitation and quality best practices that support</p>	<p>2</p>

		<p>FSMA. Enhancement of seafood safety and quality awareness among this targeted audience can significantly improve integration of food safety practices in product chain of custody from harvesters to processors.</p> <p>Activities already have included engagement with processors in collaboration with the Seafood Products Association through a pre- survey sent in Dec 2019. Surveys were shared with 9 individuals representing 5 processing facilities. Survey results were then shared at a full day program development meeting held on Feb 20, 2020 in Seattle. The meeting had 12 attendees representing academia, an industry non-profit, a sanitation service company, and medium to large processing facilities and catcher processors located from northern California to Alaska. However, because of the current pandemic plans for the BSPS were significantly delayed.</p> <p>We plan on convening a meeting with processors to discuss the timing of the next Better Seafood Processing School and the pro's and con's of trying to deliver the proposed training in a virtual format with the target audience. However, based on input from processors for trainings they felt were most critical for this cohort (sensory) it is likely they will recommend the training needs to be in person. This is because a very important component of seafood safety training is not just understanding the ramifications of proper harvest and handling and sanitation for maintaining food safety and quality, but also understanding and experiencing, from a sensory perspective, how degradation and decomposition occurs in the product. This is something that is not easily achieved in a virtual environment. Information sharing on best practices and practical knowledge is also one of the goals of bringing this cohort together. These individuals are not usually afforded an opportunity to meet one another and share information. An important aspect of this proposal was to create a platform for exchange of ideas and information which is much harder to achieve, especially if this is the first time they are meeting each other, in a virtual environment.</p>	
70.	Novel treatment of vibriosis in shellfish hatchery production	<p>Molluscan shellfish represent an important segment of aquaculture in the United States, with production levels estimated at 16,000 metric tons of meat annually. Unfortunately, shellfish production is fairly regularly and severely affected by larval mortalities of many types of oysters, with associated decline in hatchery production. The resulting economic impact is very substantial. The shellfish industry is in need of non-antibiotic-based modalities to reduce or eliminate hatchery mortalities, particularly those caused by pathogenic <i>Vibrio</i>. The goal of this Seed Pilot project is to explore the development of cell permeable peptide-conjugated morpholino (PPMO) as a potential prevention and treatment strategy against the bacterial infection to the point when subsequent larger-scale studies and eventual commercialization should be feasible. Our laboratories were lockdown due to Covid-19 pandemic. Despite of it, we have made some progress on the project.</p> <p>In order to prepare for in vitro testing of <i>Vibrio coralliilyticus</i> susceptibility to PPMO treatment, we have developed a method for determination of minimum inhibitory concentrations in multiwell plates. We first identified colistin as an antimicrobial that can serve as a positive control for</p>	2

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		<p>inhibitory and bactericidal activity, finding that <i>Vibrio coralliilyticus</i> strain OCN008 is susceptible to this agent. Using our proposed method for determining minimum inhibitory concentration, we tested a range of colistin concentrations using data for <i>Escherichia coli</i> susceptibility as a guide, repeating the assay with increasingly finer concentration ranges and identifying the minimum inhibitory concentration for colistin in <i>Vibrio coralliilyticus</i> strain OCN008.</p> <p>We have designed two morpholino sequences of varying length and RNA binding affinities targeting the <i>acpP</i> gene in <i>Vibrio oralliilyticus</i>. Targeting this essential gene will allow us to determine the ability of PPMOs to exert inhibitory and bactericidal activity and will provide for determination of PPMO delivery into the bacterium before proceeding to <i>vcpA</i> metalloprotease-targeting PPMOs. The use of PPMOs of varying length, an important factor affecting passage of PPMOs into the cell, will enable us to optimize delivery.</p>	
71.	Landowner decisions to armor ocean front properties	<p>Coastal armoring has been a contentious issue on the Oregon Coast since 1977, when the state adopted Land Use Planning Goal 18. That goal, designed to preserve beaches and dunes from development and protect public access, includes a ban on armoring private property. But property developed or slated for development before Jan. 1, 1977, is exempt from the ban. There are about 9,000 oceanfront private properties on the Oregon Coast, with about half subject to the armoring ban and the other half exempt from it.</p> <p>Earlier this year, researchers found that Oregon’s current policy creates large economic value for the private homeowners who have the option to armor their properties. Ineligible properties adjacent to eligible ones sell for 8% less due to the potential for increased damage from deflected wave action.</p> <p>The goal of the latest study was to better understand what spurs eligible property owners to armor their coastlines. Researchers focused on data from Tillamook and Lincoln counties, where 95% of permitted armoring has occurred, between 1990 and 2015. During that period, 13% of eligible properties were armored. Drivers of the decision to armor include impending risk of erosion; random shocks from high wave and water cycles that occur roughly every 17 years; and economics, with higher value properties more likely to be armored. But the other significant factor for driver of armoring decisions is the peer, or neighbor, effect. When a direct neighbor armors their property, the likelihood of a land owner armoring their property increases.</p> <p>There may be two reasons for the neighbor effect. One, when a property owner begins steps toward armoring, it offers a learning opportunity for other neighbors to gain insight into the process and the cost. Two, neighbors may worry about the spillover effect – the shift of waves and water from an armored property to their property and the potential increase in damage to their property.</p> <p>Once the researchers determined how past armoring decisions had been made, they applied that decision-making process in a future simulation of the next 40 years. A comparison of armoring</p>	2

		<p>decisions with and without the effect of neighbors showed that the rate of armoring doubles when neighbors' decisions are taken into account.</p> <p>Assuming current land-use regulations, a similar pace of erosion and occasional high water and wave cycles, the simulations showed that armoring would increase by an additional 5% in four decades as sea level rises. If the state's Planning Goal 18 were no longer in place, and all property owners were allowed to protect their shorelines, the rate of armoring would increase by nearly 70%. The simulations highlight the important role policy is likely to play in future armoring decisions, Dundas said. "Land-use policy is going to be a critical component in determining how our coastlines evolve as sea level rises due to climate change.</p>	
72.	<p>Understanding the Ecological and Social Constraints to Achieving Sustainable Fisheries Resource Policy and Management</p>	<p>To understand the ecological and socioeconomic factors that structure and affect the health of fish communities, one must first ensure a detailed and accurate understanding of which species exist in each community, and how the composition of those communities varies across time and space. Agricultural production, as one example, has impacted the distribution and survival of numerous fish species, in some cases this has been beneficial (water storage to maintain stream flows) and in others the use of pesticides and herbicides have reduced population numbers or survival. In effect, one needs to understand which fish species exist, where they occur, and how those distributions have changed over time. This project will leverage specimens and data from the Oregon State Ichthyology Collection and other similar natural history collections to help achieve that spatial and temporal map of fish community composition. Products may include improved species distribution maps, the addition of dark data from specimen backlogs into global biodiversity clearinghouses like iDigBio and GBIF, the description of new species, improved dichotomous keys and identification guides, elucidation of the geographic boundaries among genetically distinct populations, and the creation of geospatial links between specimen and collection data to layers of ecological, climate, or sociological data that can be used to help achieve the overarching collaboration's analysis and outreach objectives.</p> <p>An Oregon State University research team used the university's Ichthyology Collection to confirm the historical presence and distribution of <i>Salmincola californiensis</i>, a freshwater parasite of increasing concern in Oregon's Willamette River Basin. They also found a <i>Salmincola</i> species that had never been documented.</p> <p>The parasites, crustaceans known popularly as gill-maggots, are an emerging threat to salmonids, the family of fish that include salmon, trout and other ray-finned fish. Gill-maggots can cause substantial gill damage that reduces a fish's swimming ability and can ultimately lead to its death.</p> <p>They found that 'new' gill-maggots were 'hiding' on 60-year-old fish in the OSU collection. In light of the potential effects of global warming, researchers responded to a call that was issued to use natural history collections to track changes in disease across time. There are more fish archived in</p>	2



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		large collections than any other vertebrate group, but they aren't widely used to track historical infections. The ability to detect historical infections as well as to identify previously undocumented parasites illustrates the incredible value of historical collections for modern explorations of fish infections and highlights a need to keep archival representatives in mind when collecting fish.	
73.	Tire chemicals contribute to Salmon deaths	<p>After several years of chemical detective work, researchers have identified the culprit that kills up to 90% of salmon as they return to their spawning streams in the American Northwest each autumn – a compound in car tires. Researchers have identified the long-suspected but undiscovered poisonous substance – 6PPD-quinone – as originating from worn tire fragments. At amounts similar to those measured flowing into salmon streams during autumn rainstorms, 6PPD-quinone killed Coho salmon in experiments within five hours.</p> <p>Previously, a team member had led a related study showing that solutions made from tire particles were toxic to salmon. The team had also shown that waters linked to salmon deaths had very similar chemical profiles to runoff from roads. 6PPD can comprise up to 2% of vehicle tires, being added to help stop the rubber degrading in reactions with ground-level ozone. 6PPD, whose formula is <math>C_{18}H_{24}N_2</math>, reacts with ozone to make a substance with a formula of <math>C_{18}H_{22}N_2O_2</math>, which the team calls 6PPD-quinone. Researchers suggest that 6PPD-quinone a newly discovered and clearly ubiquitous pollutant that is likely causing toxicity across the entire food web. The authors have provided a strong case for the need to remove 6PPD from tires and thus aquatic ecosystems.</p>	2
74.	Oregon Seafood Industry – Survey of impacts of coronavirus disease (COVID-19) in Oregon	<p>The novel coronavirus has had, and is expected to have, significant impacts on the Oregon seafood industry. These impacts will likely be primarily economic in nature, but may have lingering social and cultural affects as well. Current demand for seafood is extremely low, and many seafood restaurants are currently closed. Processors are largely still working, but many are facing labor issues, and cold storage for previously caught seafood is nearing capacity in some areas, potentially limiting future catch.</p> <p>Oregon Sea Grant is collecting information about the impacts of the novel coronavirus (COVID-19) pandemic on Oregon's Seafood Industry using a short, online survey. The online (Qualtrics) survey has questions about how the novel coronavirus (COVID-19) pandemic has impacted Oregons businesses, as well as individuals working within the seafood industry.</p> <p>We are seeking input from all individuals that are part of Oregon's seafood industry - owners, managers, and employees working as a seafood producer, processor or retailer.</p>	2

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		<p>We plan to share summaries (no raw data) with local, state, and federal decision makers and others that are working to help the seafood industry recover.</p> <p>The survey data was be used to design recovery efforts by local Sea Grant agents, as well as by local and regional decision-makers.</p>	
75.	State of the Coast moves Virtual	<p>Due to COVID-19, we could not offer the regularly held State of the Coast conference, an event which has grown to over 300 people. We felt that this event was still worthwhile to offer, in an alternative format, and that it could still be a beneficial professional development opportunity for students.</p> <p>To determine the best format, we surveyed our listserv of past attendees (~1500 people). This led us to a virtual event of half days (mornings) over two days, and on a weekday instead of the weekend. We then worked to find an external contractor (note that OSU at that time offered zero capacity to support virtual events) to help develop the event platform. We had all of the same components (Keynote, “ignite” style snapshots, student presenters, and break-out sessions). Our approach to staffing the event was drastically different. Instead of student posters, we had them do short videos. This was so well received, we will do this in the future, whether they are in person or virtual. We learned so much from doing this, we created a best practices document for any future virtual events.</p> <p>The virtual event had more people register than we could accommodate in person (coastal venues are very limited in their capacity), and people came from much further away (England! Germany!) and across Oregon. The student presentations were so well received, we will do this in the future, whether they are in person or virtual. We learned so much from the overall virtual event, we created a best practices document for any of our future virtual events. Participants who completed the survey were very appreciative of the event happening. Overall, it was a very successful event, attendance was higher than the in-person events, and if needed, we can do this again in the future.</p>	2
76.	Oregon's Ocean Resources Management	<p>For many important natural resource, marine, and policy questions, the State of Oregon relies on the Ocean Policy Advisory Council to provide guidance. On a variety of topics, OPAC calls on its Scientific and Technical Advisory Committee (STAC) to assist the Council by providing appropriate information to support decision making and advisory recommendations. As a member of STAC, OSU Extension professionals have an advisory role and also provide information and policy-relevant analysis that is relevant to a range of ocean, marine, and coastal economic issues.</p>	2

		<p>The Oregon Marine Reserves Program established five marine reserves along the Oregon coast 2012 -2016 as a new resource management tool. As part of this process, the Oregon Legislature in SB 1510 called for a long-term detailed monitoring and evaluation programs. The STAC met regularly to work with the ODFW to advise and oversee management, compliance and enforcement of the Reserve Programs, design and progress on ecological and human dimensions research and monitoring, as well as communications, outreach and communications. A central responsibility for STAC is oversight for the process that will produce a Final Report to the Legislative Assembly in 2023. During 2018 the STAC focused on advisory input on the monitoring of the review of the Marine Reserves Program. This monitoring included reports to summarize the ecological monitoring efforts of the Marine Reserves Program since data collection began in 2010, with an eye towards what may be included as a part of the synthesis report to be generated for the 2023 evaluation. Ongoing data collection is being conducted to be able to evaluate changes in socio-economic indicators that may be affected adversely by the marine reserves program. The STAC met several times for all-day meetings that included detailed presentations by ODWF staff on progress with both the ecological and socio-economic monitoring programs. STAC also developed proposed contingencies to address financial challenges for the activities.</p> <p>Senate Bill 1510 (2012) requires that the Scientific and Technical Advisory Committee to the Ocean Policy Advisory Council submit a report regarding marine reserves implementation to Oregon’s Legislative Assembly in March 2023. During 2019 a considerable amount of work by the Scientific and Technical Advisory Committee has been preparing for its legislatively-mandated role to select the university team that will prepare the report and ensure that the report is submitted in a timely manner.</p>	
77.		<p>The local food sector continues to evolve as consumer preferences for economic, environmental, and social values create markets for a range of products. Although measuring the economic impact of these complex systems can provide new insights, it remains challenging. This paper provides evidence of the effectiveness of presenting economic impact results to decision-makers as a way to increase public-sector interest in developing a small and growing local food system. Surveys of local leaders and statewide service providers indicate that most local decision-makers who were presented with the economic impact results say they are now more supportive of local food system development, especially in rural areas. In this region, both producing the economic impact study and pursuing a strategy for communicating the results of this study have promoted thinking about the potential of local food production in new ways and have informed conversations with policy-makers.</p> <p>We found the presentation of the results had a stronger and more positive impact among decision-makers in rural counties and the state service providers who work with Regional Solutions. The two urban audiences, Deschutes County and the city of Bend, had lower response rates and</p>	3

		<p>responded less positively to the study. Two survey respondents were openly critical of the idea of using public investments to support industry expansion. With just two audiences, our sample of urban decision-makers is small, and while we do not want to overgeneralize from these two responses, it is worthwhile to discuss this opposing viewpoint. This view may be partially explained by differences between the scale of the local food industry and those respondents' prior experiences in economic development. However, the responses of urban audiences also illustrate the ongoing challenges in both collecting accurate data from this industry and exclusively relying on economic impact analysis to justify public investment in the local food sector.</p> <p>Local foods are not an economic driver of the urbanizing Central Oregon economy and, as a sector, are economically dwarfed by the region's rapidly expanding tourism and construction sectors. Still, where some respondents see only the inefficiencies of local food, others see a small but growing industry that is producing more economic activity than expected.</p> <p>Furthermore, depending on how the conversation is framed, communicating the results of an economic impact assessment of just one segment of the local food system can be problematic. The total number of jobs, wages, and sales associated with Central Oregon producers were small. COIC and HDFFA built a communication strategy that emphasized the economic impact results from the growth scenarios. Framing the conversation in this way was meant to demonstrate the potential of the industry if additional value chain businesses were in place to support the expansion of small-scale, local production. The presentation included a goal to build a food hub but did not formally ask for resources. COIC and HDFFA have been analyzing different aspects of the local food system for nearly 10 years and felt that knowing the current and potential economic impacts was necessary to fill a gap in information. In an effort to keep the sessions short and understandable, the presentations largely focused on sharing the economic impacts as well as on providing a thorough definition of a local food system. Based on our initial findings, we suggest that it may be more effective-although more resource-intensive-to garner public investments by presenting a more comprehensive set of impacts for small and growing local food systems. This could entail combining an assessment of economic impacts with evidence of small business development and of health impacts, as well as staying aware of ongoing research into the environmental and social benefits of local food systems.</p>	
78.	Developing Multi-use Naked Barley for Organic Farming Systems	<p>The long-term goals of this multi-region, integrative project are to: (1) provide organic growers, processors, and consumers with a new crop, food, and raw material alternative that will be economically rewarding and sustainable (2) identify and release high-yielding, high-quality, flavorful and nutritious multi-use naked barley varieties for organic systems based on a regional variety testing program anchored in Oregon, Washington, Wisconsin, Minnesota, and New York; (3) characterize key agronomic and food, feed, and malt quality traits in a large, genetically diverse panel of naked barley germplasm grown under organic conditions and maximize the efficiency of selection in this panel via integration of phenotypic and genotypic data; (4) observe, analyze, and report the results of natural selection and artificial selection on an organically grown naked barley composite population - a vehicle for engaging K-12 students and home gardeners in organic grains</p>	3

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		<p>and foods; (5) understand the economic and environmental benefits of domestic organic naked barley production, and; (6) educate the public on the uses and production value of naked barley using a number of dissemination techniques.</p> <p>In the third year of the grant, participants grew out the final year of trials for this project. This involved growing over 400 naked barley lines in certified organic trials, characterizing them for agronomic traits, food and malt quality traits, weed competitive ability, and resistance to abiotic and biotic stressors. With the results of these trials, we have begun new breeding work to select for traits necessary for organic production. Journal and extension publications are in preparation to disseminate the results of these experiments to researchers and growers. Survey and interview results looking at the economic feasibility of growing organic barley have been published and will continue to be made available to growers. Hundreds of growers, processors, and consumers have been provided with trial results and information about naked organic barley at conferences, virtual field days, through personal communication, website postings, and social media.</p>	
79.	Diet and Microbiome Interactions During Age-Related Inflammation	<p>The overall goal of this project is to understand the impact of age-related gut microbial alterations on immune dysregulation, and identify dietary factors that modulate this impact and improve the health of elderly individuals. We will focus on zinc, which is an essential micronutrient required for normal immune function, has anti-inflammatory properties, and is competitively scavenged by gut microbiota. National surveys show that approximately 10% of the US population does not consume adequate zinc levels, but the prevalence of inadequate zinc intake is &gt;40% among individuals above 50 years of age. Moreover, zinc levels are also often depressed in aged individuals, even when consuming a zinc-adequate diet, suggesting age related deficits in zinc uptake render older individuals even more prone to deficiency. Low cellular zinc has also been proposed to contribute to enhanced inflammation in the elderly, and dietary zinc levels influence gut microbiome composition and function. Our central hypothesis is that age-related alterations in gut microbial composition contribute to age-related deficits in cellular zinc levels and enhanced inflammation. Moreover, enhancing zinc status in aged individuals will mitigate age-related inflammation.</p> <p>Serum zinc levels were measured by ICP-OES in mice from the zinc supplementation study. Old mice had significant decrease in serum zinc despite being fed a zinc adequate diet. Zinc supplementation restored their serum zinc levels to those comparable to young mice.</p> <p>The levels of six cytokines associated with inflammation (IL12, TNFa, IFNg, MCP1, IL10, and IL6) were determined in plasma samples from mice in the zinc supplementation study. In agreement with published reports, we observed age-associated increase in plasma MCP1. Zinc supplementation had a significant effect in decreasing MCP1 levels in old mice.</p> <p>Zinc supplementation improved the immune function of aged mice and reduced inflammatory</p>	3

		<p>response, and MZD further increased age-related inflammation. Our data suggest that zinc status is an important contributing factor in age-related immune dysfunction and chronic inflammation.</p> <p>Age effects overwhelm other effects on the mouse gut microbiome. Overall gut microbiome content is significantly different between the young and old mice, and individually, around 75% of the identified ASVs showed a significant difference between the age groups. Changing a single micronutrient such as zinc shows smaller effects that, when paired with a split study design, are difficult to measure.</p> <p>Short chain fatty acid analyses (SCFA) were done using samples from both animal studies. We were able to detect and quantitate acetate, propionate, and butyrate from colon and cecum contents from our animals. Acetate levels in the cecum and colon showed changes associated with changes in zinc levels in the diet. We are integrating these data with our microbiome data to explore correlation between changes in SCFA and microbiome (ASVs).</p>	
<p><b>80.</b></p>	<p>Engaging with the Dry Farming Collaborative for fundamental and applied research of endophytemediated drought tolerance in diverse crops</p>	<p>Drought is a common, perennial risk to our food system, and its effects are worsened with over-reliance on unsustainable irrigation practices. To mitigate the risks in drought-prone regions such as the American West, many farmers turn to dry farming, a general management practice that successfully grows crops with little or no irrigation during dry summer months, by utilizing drought-tolerant crop varieties in combination with soil management techniques that conserve soil moisture. The Dry Farming Collaborative (DFC) is a Pacific Northwest-based partnership of farmers, extension educators, plant breeders, and agricultural professionals working to increase knowledge and innovation of dry farming management practices. One emerging management tool for drought resilience is the use of non-pathogenic bacteria and fungi that commonly occur inside of plants, known as endophytes. When applied as a biological inoculant to the seed at planting, some naturally-occurring endophytes allow crops to better withstand the negative impacts of drought, maintaining higher yields and lower risks of crop failure. In this two-year research project, we aim to determine the efficacy of commercial and locally-produced endophyte inoculants in dry-farmed varieties of corn, beans, squash, and tomato.</p> <p>We have tested BioEnsure commercial endophyte inoculant in different crops and formulations and field sites across two years. We narrowed the testing to three specific crops during the 2019 field season, Open Oak Party Mix dent corn, Whipple dry bush bean, and Stella Blue kabocha squash, after determining that they responded most favorably to the product of all 12 crops and varieties tested in 2018. We found that BioEnsure significantly enhanced yield in corn and bean crop varieties by 20+% on our main research site across both years tested; however, the impact was specific to site and treatment, producing neutral-to-negative results on other sites.</p> <p>We have produced an endophyte library, comprising 120+ leaf, shoot, and root endophytes isolated from healthy, vigorous plants growing in water-limited conditions. We have begun testing this endophyte library on corn and bean seedlings in the greenhouse, and we have optimized a</p>	<p>3</p>

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		<p>screening method to trial 10 isolates at a time, with each screen taking 4 weeks. We have yet to identify and produce a novel endophyte for mitigation of drought stress.</p> <p>We are continuing to develop a local inoculant to determine if it performs better than the commercial inoculants. Additionally, we are working with the AST company to improve their formulation for testing into the future. Finally, we have started working with breeding material to determine whether we can breed for beneficial symbiosis with microbial inoculants.</p>	
81.	Undergraduate Learning Experiences in working with Big Data in Agriculture	<p>Agricultural scientists with expertise in working with big data are in high demand because of advanced technologies such as next generation sequencing, high throughput phenotyping, and precision agriculture, that have dramatically accelerated the pace of data collection. In fact, the need for workers with specialization in bioinformatics, biostatistics, and computational biology are in exceptional demand for many disciplines. Employers seek not only scientists with deep domain knowledge in the life sciences and skills in working with big data, but also those with experience in working with real world data, and the skills to communicate and collaborate effectively in teams. However, the training of undergraduate students in the life sciences has not been contemporized to meet the needs of today's sciences. To help address the needs, we have developed an undergraduate learning and research experience that targets students with interests in applying big data in the context of agriculture-related research. We have developed a novel structure that couples intensive coursework with mentored research experiences. Student learning will be structured around collaborative learning and mentoring and include not only domain knowledge in big data and the life sciences but also key skills in communication and team-work.</p> <p>To help address the needs, we have developed an undergraduate learning and research experience that targets students with interests in applying big data in the context of agriculture-related research. An intensive course will provide an active-learning environment to teach fundamentals in biocomputing. This course also functions to set the framework for the Big Data in Ag REEU and impress upon students the importance of gaining skills in working with big data, teamwork, and communication. In the second, students will select a mentor and do research for six weeks to gain deeper domain knowledge in agricultural sciences. Each mentor will be associated to a pod, each of which are defined on the basis of sharing common research goals. During this second phase of the Big Data in Ag REEU, students will continue to engage, via online education, as a learning cohort and work collaboratively as a research cohort and be jointly mentored by a pod of scientists. The Big Data in Ag REEU culminates in an event where students will present their work and describe their learning experiences.</p> <p>This project was initiated in 2020 and preliminary results are expected in 2021.</p>	3

<p>82.</p>	<p>Increasing food safety of raw oysters with a simple and rapid post-harvest treatment utilizing probiotics</p>	<p>Gastrointestinal illness can be very severe after the consumption of contaminated oysters with two specific marine bacteria. Approximately 80,000 people per year are affected in the USA and at least 100 Americans die of these infections. The people who die are almost exclusively infected with <i>Vibrio vulnificus</i>, which is the deadliest of any food-borne pathogens. These infections are very costly to the national economy due to loss of labor, increased health care costs, and potential reluctance/avoidance of consumers worldwide to buy U.S. oysters. In addition, these oyster-infections might increase in frequency in the future as our oceans are warming, therefore likely contributing to a wider and more frequent distribution of these bacteria. Producers can depurate their oysters after harvest to reduce contamination. Depuration is a process where the oysters are placed in sterile seawater and allowed to purge over the course of several days. However, this method has low acceptance with producers as it is not cost- and time-effective. We have recently isolated marine probiotics (beneficial bacteria) that can efficiently help clear the pathogens out of the oysters in a fraction of the time and with only minimal equipment needs in compare to costly traditional depuration methods. Safer, probiotic-depurated oysters could increase customer acceptance, while reducing incidences of seafood borne illness and associated costs.</p> <p>Genomic sequencing led to the revelation that the probiotics used in the preliminary data were non-pathogenic <i>Vibrio</i>. While there are labs that use <i>Vibrio</i> as probiotics in the growth of oyster larvae, recent publications and discussions made us pivot from those and decide to find non-vibrio probiotics for this project. The rationale is that 50% of all <i>Vibrio</i> species are pathogenic and that vibrios can readily acquire virulence factors via horizontal gene transfer. Our first goal was to screen our probiotic stocks that we are currently testing in another project for oyster larvae survival, growth, and settlement. This could be a two-fer if probiotics fed to oyster larvae early in their development, could remain in the oysters and prohibit or actively reduce human pathogenic <i>Vibrio</i> accumulation in adult oysters.</p> <p>When the water treatment control was compared against probiotic treatment, small improvements in Vp reduction were seen with most of the 8 non-vibrio probiotics tested. Our goal is to achieve the mandatory reduction of <i>Vibrio parahaemolyticus</i> of below 99.9698% (3.52 log) within 24 hours. D16 and B11 were both able to accomplish that after 24h in 30% and 25% of independent trials, respectively. A 48 h continuation of those trials did not perform better than when oysters were immersed in clean seawater. However, those results are encouraging as the probiotic concentration was relatively low and within +/- log of the Vp infection dose (which was 10<sup>7</sup> CFU/ml infection pressure in the water). A bit puzzling is that our tested water sources can strongly reduce Vp concentration by immersion alone, this outperforms published data, such as Agesen et al., 2018 who used a recirculation depuration system with UV sterilization and saw a pathogen retention of 56.4%+/-14.8 after 24h and 43.9%+/-13.7. Meanwhile, our pathogen retention is 90.52%+/- 15.9. This average is also lower than our previous preliminary data that was collected with urban distilled water vs the water that we are now sourced from the Oregon State University Hatfield Marine Science Center at the rural Oregon coast.</p>	<p>3</p>
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83.	Smoke taint risk from vineyards exposed to wildfire smoke: assessment and management strategies.	<p>Winegrape growers and winemakers require information concerning risk assessment associated with exposure of vineyards to smoke from wildfires and management strategies for both vineyards and wineries to mitigate the risks to grape and wine quality when a smoke exposure has occurred. Additionally, there are socio-economic concerns related to insurance adjustment for smoke related losses as well as how losses should be allocated between growers and wineries or processors. This planning project will bring together industry stakeholders, risk management stakeholders, researchers, and extension personnel in a series of regional meetings which will focus on identifying key areas of research and extension necessary to support industry needs for risk assessment of and management strategies for smoke exposed fruit and wines.</p> <p>The proposed planning project has two main long-term goals, as follows: (1) Review the existing body of studies that evaluate the effects of smoke exposure in vineyards on fruit and wine quality and with stakeholder input to identify gaps in current knowledge and develop research and extension priorities which address these gaps. (2) The second long-term goal for this project is to develop a robust research program that addresses the industry research and extension priorities identified in the stakeholder meetings.</p> <p>This project was initiated in 2020 and preliminary results are expected in 2021.</p>	3
84.	Food Science and Technology Collaborative: Increasing Oregon AITC's Capacity and Promoting Career Awareness for Rural Students	<p>Broadening participation in Science, Technology, Engineering and Mathematics (STEM) fields has been a clarion call for change across the educational landscape for several decades now. Federal agencies have supported efforts to address this issue by funding collaborative projects that have included institutions of higher education, yet this wicked problem persists. The Science and Math Investigative Learning Experiences (SMILE) Program at Oregon State University is a school-university partnership program with an explicit mission to provide access and opportunities to youth who have been historically underserved and underrepresented in STEM fields. For 32-years SMILE has partnered with scientists and researchers to develop curriculum and activities based on cutting-edge research that is accessible to K-12 teachers, youth and communities.</p> <p>This type of work is significant to the mission of land-grant university by providing quality outreach and bringing the work of the university to the broader state-wide community. The foundation for reaching a diverse target audience are SMILE's 26 afterschool STEM clubs (16 MS, 10 HS) serving over 400 students in grades 6-12 from populations underrepresented and underserved. Each school year, 43 science and math teachers deliver STEM programming in 25 one-hour club meetings. Middle and High School students will participate in an annual College Connection Challenge event that allows them to work with researchers and near-peer mentors in FANH disciplines. Additionally, OAITC reaches thousands of rural students and provides their teachers with professional development.</p>	3

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		<ul style="list-style-type: none"> <li>• Collaborated with Dr. Zhenglun Li and undergraduates in his FST 385 Communicating Food and Fermentation Science who designed and delivered three food science lessons to teachers in a virtual professional development for teachers titled, Exploring Food Science, Safety and Nutrition: <a href="https://precollege.oregonstate.edu/virtual-professional-development-teachers">https://precollege.oregonstate.edu/virtual-professional-development-teachers</a></li> <li>• Designed and facilitated one virtual field trip: <a href="https://youtu.be/IGWdGYkR7gc">https://youtu.be/IGWdGYkR7gc</a></li> <li>• Total number of students: 498</li> <li>• Total number of classrooms: 20</li> </ul> <p>Participating Schools: Chiloquin Elementary School, Tom McCall Elementary School, St. Mary's Academy, Territorial Elementary School, Helix School, Luckiamute Valley Charter School, Falls City Elementary School, Annex Charter School, Portland Christian Elementary School, Chehalam Elementary School, Yankton Arthur Academy, North Albany Elementary School, Powell Valley Elementary School, West Union Elementary School, Central Linn Elementary School, Creslane Elementary School, Homeschool (Glide, OR), Monroe Grade School, Morning Star Christian School                  Towns/Cities: Chiloquin, Redmond, The Dalles, Junction City, Helix, Dallas, Falls City, Ontario, Portland, Beaverton, St. Helens, Tangent, Gresham, Hillsboro, Halsey, Creswell, Glide, Monroe, Bend                  Counties: Klamath, Deschutes, Wasco, Lane, Umatilla, Polk, Malheur, Multnomah, Washington, Columbia, Linn, Douglas, Benton                  The curriculum is accessible on OSU's Precollege Programs website: <a href="https://precollege.oregonstate.edu/virtual-professional-development-teachers">https://precollege.oregonstate.edu/virtual-professional-development-teachers</a> and Oregon Agriculture in the Classrooms website: <a href="https://oregonaitc.org/programs/virtual-farm-field-trips/">https://oregonaitc.org/programs/virtual-farm-field-trips/</a></p>	
85.	The Impact of Archaeal and Bacterial Nitrifiers on the Fate of Digester N Applied to Fodder Crops	<p>Anaerobic digesters represent a promising strategy to reduce methane and nitrous oxide emissions released by conventional animal manure treatment. We know little about how effectively soil nitrification transforms the concentrated ammoniacal component of digester liquids applied to fodder crops across a range of soil temperature and water regimes. Two fundamentally different types of soil microbes (Archaea and Bacteria) are responsible for soil nitrification and their relative contributions are affected by soil temperature and ammonium availability. Both types of nitrifiers produce N<sub>2</sub>O as a side product of ammonia oxidation, but the soil and climatic factors affecting their respective N<sub>2</sub>O contributions in the field are unknown. Our proposal consists of a series of objectives that include laboratory and field experiments that will examine the influence of soil temperature, water content, and level of digester N on the relative contributions of Archaea and Bacteria to soil nitrification and N<sub>2</sub>O derived from nitrification. The second objective examines the influence of digester N on Archaeal and Bacterial nitrification under field conditions, and the effect of different phenological stages of fodder crop growth on N fate. The third objective evaluates how soil temperature affects the imbalance between nitrite production and consumption during nitrification, its recovery, and impact on N<sub>2</sub>O production. The research fits the ANRCVC</p>	3

		<p>program and Climate and Microbial Processes program area. It is focused upon the role of microbial nitrifier communities on GHG emissions from digester N applied to croplands across seasons where soil temperature and water availability range considerably.</p> <p>In this study, we compared the nitrification and nitrous oxide (N<sub>2</sub>O) and nitric oxide (NO<sub>x</sub>) production responses of agricultural soils from Columbia River Basin (eastern Oregon, pH 8.5) and Coastal Plains (western Oregon, pH 5.9), after amendment with 5µmol NH<sub>4</sub><sup>+</sup>-N g<sup>-1</sup> soil supplied as either DDE or ammonium chloride (NH<sub>4</sub>Cl). Soils were incubated at temperatures that reflect the range experienced at the respective sampling locations, including an extreme upper temperature that is occasionally reached. Columbia River Basin (CRB) soils were incubated at 10, 20, 30 or 40°C, and Coastal Plains (CP) soil at 10, 20, or 30°C. In Columbia River Basin soil, rates of nitrification increased between 10, 20, and 30°C, but declined significantly at 40°C. There was no significant difference (p &gt; 0.05) in rates of nitrification between DDE and NH<sub>4</sub>Cl at any temperature. In this soil NH<sub>3</sub>-oxidizing bacteria (AOB) contributed 88 - 96% of the NO<sub>2</sub> + NO<sub>3</sub> - accumulation activity at 10, 20 and 30°C. NH<sub>3</sub>-oxidizing archaea (AOA) made their largest contribution to rates of NO<sub>2</sub> + NO<sub>3</sub> accumulation at 30°C, but still contributed only ~12% of the total activity.</p> <p>In Coastal Plains soil, nitrification rates were at least twice as high as in the Columbia River Basin soil, and there was no difference in nitrification response to either N-source (Figure 1). Rates of nitrification ~doubled from 10 to 20°C; rates at 30°C were not different than at 20°C. Both AOA and AOB contributed significantly to NO<sub>2</sub> + NO<sub>3</sub> - accumulation activity in Coastal Plains soils with both N-sources, each contributing ~50% of the activity at 10 and 20°C, and AOA contributing up to 70% at 30°C. Unlike Columbia River Basin soil, the processes of NH<sub>3</sub> and NO<sub>2</sub> - oxidation in Coastal Plain soils remained coupled, with no accumulation of NO<sub>2</sub>. There was however, N<sub>2</sub>O production from the Coastal Plain soil. Maximum yields of N<sub>2</sub>O in Coastal Plain soils were observed at 30°C; however yields were ten-fold lower than those observed in Columbia River Basin soils, despite the greater overall rate of nitrification.</p>	
86.	Specialty Crops and Food Systems: Exploring Markets, Supply Chains and Policy Dimensions	Specialty crops including fruits and vegetables are increasingly recognized as providing for key nutritional needs in the human diet, but consumers still fail to eat them at recommended levels. Historically specialty crops have been under served by governmental policy, and while that has been changing research and outreach efforts are still short of achieving the increase in sought for in their consumption. The less than ideal consumption levels are without a doubt due to many factors; this project is intended to focus on improving our knowledge and strategies regarding their marketing and distribution to help in this effort. Research will focus on better understanding the factors that encourage consumption, but as this can only be achieved by improving distribution in terms of access, costs, and safety which will be the second focus. The USDA, food companies, and university researchers and extension specialists are providing more technical assistance, development resources and programs to support producers and food manufacturers interested in	3

		<p>developing products with healthful and sustainable attributes. However, consumer behavior towards such labels and the need to better understand how consumer perceptions are influenced by various types of marketing information (including differential nutrition, food safety, implied economic implications to family farms, carbon footprint of different production systems) are critical to matching demand with supply. Better understanding of food labeling strategies offers significant benefits to other scientists involved in food manufacturing and processing, as well as researchers in the health science arena that examine the consumer health consequences of food and nutrient intake.</p> <p>The ultimate outcome of this work will be information that industry members can use to improve marketing performance and strategic planning. Information produced will also assist policy makers in designing effective policy and programs related to consumer preferences and producer success, and to other researchers in developing their research and outreach activities.</p> <p>This is a Hatch-Multi-State Project that was completed and awaiting the final report.</p>	
87.	Beneficial and Adverse Effects of Natural Chemicals on Human Health and Food Safety	<p>Exposure of the fetus to environmental carcinogens, such as polycyclic aromatic hydrocarbons, results in cancers later in life. We seek to understand the contribution of genotoxicity by this important class of environmental carcinogens versus alteration of the fetal epigenome to maximize the effectiveness of chemopreventive dietary agents such as indole-3-carbinol from cruciferous vegetables. Results from these studies can be used to improve risk assessment and reduction for the sensitive fetus.</p> <p><b>Human studies-</b> These studies are founded on a strong premise and promise high impact for assessing carcinogen exposure and approaches for risk reduction. The remarkable technology of AMS, enhanced by ULPC, allows studying in humans the absorption, metabolism and excretion of an important environmental carcinogen. Results from these studies can be used to improve risk assessment and risk reduction in the general population for an environmental carcinogen associated with lung cancer, the major cause of cancer in humans worldwide.</p> <p>We will continue to utilize the mouse transplacental cancer chemoprevention model with a focus on the mechanism of transplacental polycyclic aromatic hydrocarbon (PAH)-induced cancer in the offspring as adults following in utero PAH exposure and its chemoprevention by maternal dietary supplementation with indole-3-carbinol (I3C). PAHs are formed from the incomplete combustion of organic material (coal, tobacco, wood, petroleum products, etc.). PAHs are a major health concern and represent 3 of the top 10 chemicals of concern at high priority polluted sites as evaluated by ATSDR (Agency for Toxic Substances Disease Registry, a component of the CDC). It has been estimated that 95% of exposure (for a non-smoker) to carcinogenic PAHs is through diet. We found epigenetic markers such as DNA methylation and profiles of non-coding RNAs were markedly altered in newborns from mothers exposed to a carcinogenic PAH in her diet and these alterations in the epigenome could be partially ameliorated by maternal dietary I3C. Outcomes from these studies will appear as scientific presentations at national/international meetings and through peer-reviewed publications.</p>	3

		<p>We expect to determine how rapidly oral ingested [<sup>14</sup>C]-BaP is absorbed into blood, metabolized by liver (including the identity of the metabolites) and excreted in urine. This will be the first dataset of its kind and will be used to build a physiologically-based pharmacokinetic (PBPK) model for human exposure to carcinogenic polycyclic aromatic hydrocarbons (PAHs) such as BaP. We will share this dataset and modeling with FDA and EPA in an effort to enhance their accuracy in performing risk assessment for PAHs in the diet. If we find that indeed Brussels sprouts and/or DIM lower BaP exposure by enhancing metabolism and excretion we will share that information with regulatory agencies, other scientists and stakeholders. The communications will be in the form of presentation at scientific meetings, peer-reviewed publications and media stories.</p>	
<p><b>88.</b></p>	<p>Impact of Environmental Chemicals: Bridging the spectrum of environmental toxicity by assessing exposures, distribution, and molecular mechanisms of effects of chemicals</p>	<p>The broad, long-range goals of this project is to understand the molecular mechanisms by which chemicals exert toxic effects on humans and the environment, in order to: 1) establish thresholds for safe tolerance levels in human and non-human exposure, and 2) to develop a mechanistic basis to develop and employ safer, more environmentally sustainable agrochemicals and application protocols and other consumer products, and to 3) better understand human and non-human exposure risks from environmental chemicals ingested through the food supply and other inescapable routes of environmental exposure. This project will complement work conducted currently and previously using grant monies from NIH, EPA, FDA, NSF, and USDA. The project is designed to build capacity at OSU through faculty work and student training to improve agricultural sustainability by acknowledging and adequately characterizing the potential risks of environmental toxins to the food supply and human health.</p> <p>Abiotic rapid assays are being developed to further characterize nanomaterials based on their reactivity in functional assays that represent properties such as hydrophobicity, redox potential and agglomeration state. Fundamental research on the environmental fate and toxicity of nanoplastics, in particular, have been fed into a regional risk assessment model specific for plastics to inform regulators, industry, legislators, scientists, and the general public on the inputs, transport, uptake and hazards of micro and nanoplastics in aquatic systems. Model ecosystems are being developed to establish quantitative of nanomaterials within model food webs to determine the bioavailability and biomagnification potential of nanoparticles.</p> <p>This project has focused on the topic of environmental forensic chemistry which will apply fundamental concepts in analytical chemistry to the interpretation, distribution, speciation, and bioavailability of chemicals in the environment. To address this issue, have continued to develop novel passive sampling devices (PSDs) that can sequester thousands of environmentally bioavailable chemicals for subsequent analysis. The improved bioaccumulation models that have resulted, will better predict chemical load in organisms with enhanced temporal and spatial resolution, permitting public health officials to make better regulatory and remediation program</p>	<p>3</p>

		<p>decisions.</p> <p>One project focused on the development and application of quantitative analytical methods for real world field-based research to investigate the fate and transport of environmental chemicals in groundwater and wastewater systems and municipal landfill leachates, which may each serve as the vehicle for direct human exposures or incorporation into crop plants and foodstuffs. This project included novel studies developing and using urinary biomarkers in municipal wastewater as indicators of human exposure to a wide array of chemicals. This method is now widely used to detect Covid-19 exposure in human waste streams.</p>	
<p>89.</p>	<p>Enhancing Microbial Food Safety by Risk Analysis</p>	<p>Foodborne illness remains a significant public health problem in the United States with an estimated 48 million cases and cost of \$89 billion annually. Research conducted under this program will lead to a better understanding of food contamination and will investigate and validate solutions for producing and processing safer foods. Due to the complexity of food products and its desired end use, production and processing interventions will be specific and tailored to individual commodities or categories. Food safety research projects will be varied in their methodology depending on the required research for the commodity or food category. In general, prevalence studies and validation studies will focus on detecting and inactivating Salmonella and other foodborne pathogens. Prevalence studies will utilize the statistical and microbiological approaches to identify likelihood and quantity of contamination in specific food commodities. Inactivation and process validation studies will quantify the efficacy of specific process to reduce contamination levels while retaining maximum product quality. Results from these studies will be communicated directly to the stakeholders that will benefit from implementing risk and reduction strategies. Implementation of effective interventions will lead to the production of safer food products which will improve the overall public health.</p> <p>This work will lead to changes in knowledge of the source and spread of pathogens in food systems and evidence to support the impact of processing variables on the inactivation of foodborne pathogens in diverse food systems. Specially, the outcomes will support efforts to enhance the safety of fruits and vegetables, seafood, meat, and poultry products. Workshops will be developed and delivered to increase food safety risks of regulatory personnel, producers, and processors.</p> <p>The widespread nature of <i>Listeria monocytogenes</i> and its presence in soil and agricultural environments, make it a challenging pathogen to control in the produce industry. The objective of this study was to assess diversity of <i>Listeria</i> spp. isolates (n = 113) previously recovered from five produce handling and processing facilities in the Pacific Northwest, using molecular and antibiogram typing. Antimicrobial resistance (AMR) profiles were obtained for all isolates.</p> <p>All <i>Listeria</i> spp. isolates were sensitive to ampicillin, erythromycin, gentamicin, imipenem, co-trimoxazole, tetracycline and vancomycin and resistant to ceftiofur and nalidixic acid. A high</p>	<p>3</p>

		<p>proportion (66%) of <i>Listeria</i> spp. isolates was resistant to clindamycin, whereas resistance to penicillin, ciprofloxacin, rifampin, and novobiocin was less common. Three <i>L. monocytogenes</i> isolates and one <i>L. innocua</i> isolate were multi-drug resistant (MDR; resistant to ≥3 antibiotics). While the majority of <i>Listeria</i> spp. remain sensitive to clinically relevant antibiotics, the presence of MDR in strains recovered from produce handling and processing environments is concerning and prompts further studies to understand the pressures driving the AMR changes in these microorganisms.</p> <p>This is a Hatch Multi-State project.</p>	
<p><b>90.</b></p>	<p>Agrochemical Impacts On Human And Environmental Health: Mechanisms And Mitigation</p>	<p>By the mid-century, the human population is predicted to reach nine billion. While there will be greater pressure to develop sustainable systems, agrochemical use will remain a cornerstone for protecting crop yield and thereby helping to meet demands for increased food production. Inevitably, a portion of the applied agrochemicals may be lost to the surrounding environment potentially adversely affecting human and environmental health. Thus, assuring sustainable crop production systems and human-environmental protection will pose increasingly difficult challenges. To minimize risks to humans and to ecosystem, environmentally sound crop and public health protection will require keen understanding of traditional as well as emerging approaches for the study of fate and effects of agrochemicals along with sound mitigation strategies. In the future it will be of equal importance investigating beneficial impacts of agrochemicals juxtaposed to adverse impacts.</p> <p>Outcomes include:</p> <ol style="list-style-type: none"> <li>1. Better understanding the adverse outcome pathways of pesticides as individuals and mixtures will reduce uncertainty and aid regulators conducting ecological risk assessments.</li> <li>2. The research on incorporating leading-edge risk assessment and decision-analytic techniques to improve integrated pest management will directly improve decision-making by producers and others in agriculture.</li> <li>3. Understanding the evolutionary responses of non-target organisms to pesticides may contribute to human resource development in agricultural technology.</li> <li>4. Publications and presentations from all projects will be used throughout the U.S. to inform policy debates on biotechnology crops, pesticides, environmental risk, and public health; citations of publications and citations indices are good indicators of outcomes. Collaborations of W-4045 researchers with the Center of Excellence in Regulatory Science at NC State will ensure results and expertise from this multi-state project are incorporated into workshops that include state and federal pesticide regulators as well as scientists in the agrochemical industries.</li> <li>5. All work will result in training of students who then will become professionals in these areas.</li> </ol> <p>Outreach activities include the development of pesticide risk assessment methodology, tools, and materials to communicate risks to the general public, stakeholders, and policy-makers. This effort includes university classes and workshops to lay and professional audiences, as well as adult continuing education. A primary goal is to translate scientific methods and findings to a broad and</p>	<p>3</p>

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		<p>diverse audience. This outcome-driven approach strives to promote transparency and dialogue about risks associated with exposure to pesticides and other environmental agents and to improve use of risk information in individual decision-making and public policy. Duties include Principal Investigator for the National Pesticide Information Center (<a href="http://npic.orst.edu">npic.orst.edu</a>), and Extension Toxicology Network (<a href="http://extoxnet.orst.edu">extoxnet.orst.edu</a>) cooperator.</p>	
<p>91.</p>	<p>Engineering for food safety and quality</p>	<p>US consumers have increased expectation on the food industry to develop and deliver safe, high quality, nutritious, and healthy food products while responding to emerging sustainability issues. These require a continuous improvement in conventional food processing and packaging technologies and the development of new alternatives. This project will investigate chemical, physicochemical, and biological properties of food ingredients, food, and food processing byproducts and develop their value-added applications. The project will also study environmental-friendly, sustainable food processing and packaging technologies for providing food with the highest retention in nutritious and eating qualities of food while eliminating foodborne and spoilage microorganisms for ensuring food safety and food quality and extending shelf-life of processed foods. Meanwhile, new value-added applications of low value food items and food processing byproducts will be developed to help the increase of social and economic benefit of food industry and sustainability of food processing. In addition, outreach programs will be implemented to disseminate best practices for enhancing food safety, quality and sustainability to stakeholders.</p> <p>Through investigating the chemical composition, bioactive compounds, and functional properties of food and food processing byproducts, it will develop new knowledge and potential new applications of food and food processing byproducts and help convert low value food items and byproducts into high value-added products. This would not only benefit the economics, but also increase agricultural sustainability by reducing the impact on the environmental pollution.</p> <p>By studying advanced food processing and packaging technologies, new value-added food products (fruit and vegetable, seafood, dairy based products) and sustainable packaging (edible, compostable or biodegradable) will be developed for ensuring food safety and quality, promoting sustainability, increasing social and economic benefits, and advancing nutritional value and health benefits of a wide range of food items to consumers.</p> <p>By disseminate new technologies and products to stakeholders and consumers through extension education and training programs, it will enhance food safety, quality and sustainability of commercial food products and increase nutrition and health benefits of foods to consumers.</p> <p>As an example, the effects of different high hydrostatic pressure (HHP) conditions on the composition, morphology, rheology, thermal behavior, color, and stability of high molecular weight melanoidins from black garlic were investigated. Because HHP promoted Maillard reaction, HHP treatments decreased the aldehyde content from 46.76% to 11.92% but increased ketones and heterocyclic contents 4.46% to 6.66% and 9.32% to 11.55%, respectively. HHP treatments induced production of five compounds that were not present in the control sample, including 5-methyl-2(3H)-furanone, 3-methyl-2-cyclopentenone, 2,3-dihydrofuran, 2-ethylfuran, and 2-</p>	<p>3</p>



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		<p>vinylfuran. Moreover, HHP improved the thermal stability and the stability under UV light of black garlic melanoidins. In general, HHP treatment enhanced the composition and structure of black garlic melanoidins and improved stability.</p>	
<p>92.</p>		<p>This project seeks to improve the management of crop health by increasing our understanding of the mechanisms that may lead to soilborne pathogen and disease suppression. We also hope to improve our ability to estimate yield losses due to soil-borne pathogens by developing reliable sampling methods and accurate action thresholds for specific pathogens. We will also evaluate currently available and new environmentally compatible disease management strategies (i.e., host genetics, bio-rational pesticides, changes to cultural practices, etc.).</p> <p>Research suggests that insects, specifically flies (dipterans) and moths (lepidopterans) effectively facilitate the dispersal of asexual spores (conidia) of ergot fungi (<i>Claviceps</i> spp.) in various agroecosystems through their foraging behavior. However, limited information exists about the insect-mediated dispersal potential of <i>Claviceps</i> spp. in cool-season grass growing regions of the U.S. Pacific Northwest. A two-year survey was conducted to characterize the insect communities present in perennial ryegrass (<i>Lolium perenne</i> L.) fields, determine the association of insect abundance with ergot disease in the lower Columbia Basin of Oregon and Washington, and quantify the incidence of contamination with <i>Claviceps</i> conidia using molecular techniques. Insects were sampled using universal black light traps, yellow sticky cards, and sweep nets. Thysanoptera was the most abundant insect order, followed by Diptera in both years. Dipterans, including muscid (<i>Fannia canicularis</i> L.) and anthomyiid flies (<i>Delia radium</i> L. and <i>Botanophila discreta</i> Meigen), were present in the grass seed fields surveyed. Pyralid and noctuid moths broadly represented Lepidoptera. A high-fidelity polymerase chain reaction detected the presence of <i>Claviceps</i> spores in 39% and 36% of dipteran insects collected in 2014 and 2015, respectively. Similarly, 44% and 17% of lepidopteran insects tested positive for the presence of <i>Claviceps</i> spores in 2014 and 2015, respectively. A significant positive correlation was observed between insect abundance and ergot incidence in perennial ryegrass seed fields surveyed.</p>	<p>3</p>
<p>93.</p>	<p>The Working Group on Improving Microbial Control of Arthropod Pests</p>	<p>Research efforts will be directed at identifying the occurrence of microbial control factors (biologicals) in OR agricultural fields that might help formulate long-term IPM strategies against this problem. We will study and improve microbial control options in IPM strategies for: a. large acreage crops (alfalfa, corn, dry beans, potatoes, and small grains) b. orchard systems (fruits and nuts) c. small fruits and vegetables (blackberries, blueberries, raspberries, strawberries, and vegetables) d. urban and natural landscapes, rangelands, and nurseries. This single objective encompasses four distinct projects based upon agricultural system and environment. Secondly, we will promote information transfer and microbial control options to IPM practitioners through an annual symposium event during the annual meetings of the Entomological Society of America (ESA), addition of the microbial control section to the topics presented at the ESA meetings, conduct extension events specific to microbial control, and offer opportunities for new collaborations and</p>	<p>3</p>

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		<p>multi-state project evaluation. This objective includes a formal outreach and evaluation process to refine and improve the direction of the research projects and expand the outcomes of the work.</p> <p>This is a Hatch Multi-State project that was initiated in 2020 with preliminary results expected in 2021.</p>	
<p><b>94.</b></p>	<p>Convening Direct Market Producer Support Organizations made COVID-19 response more effective and equitable</p>	<p>COVID-19 caused significant disruption for direct market farmers and ranchers. Producers lost important restaurant, school, and other institutional accounts, and farmers market sales were curtailed by emergency public health measures. At the same time, consumer interest in farm direct sales spiked, as people avoided grocery stores and opted for locally grown food. Also, producers had to respond quickly to protect their workers, secure needed PPE, assure consumers about food safety, and navigate complex economic relief options.</p> <p>Oregon has many nonprofit organizations and agencies who support direct market producers in different ways. They jumped into action, meeting in small groups but without a coordinated response, which led to duplication and limited effectiveness. In addition, relatively new efforts to address racial inequities in the direct market farming sector were in danger of being sidelined by the race to take action against COVID-19.</p> <p>In early April, OSU Extension began coordinating weekly calls with all of these organizations, to share updates and coordinate producer-focused outreach and education efforts. We maintained shared notes and resource lists, making sure everyone had access. Because of the trusted relationships our Center has built with Black-led food justice organizations, those leaders came to us with their frustrations about the loss of focus on racial inequity, instead of leaving the group entirely. We reorganized the meetings to lead with the needs and goals of Black, Indigenous, and People of Color producers and organizers. The group, which typically included 15-20 people from 10-15 organizations and agencies, met weekly in April and May, then met biweekly from May to August. At that point, we ended COVID-focused calls, but two subgroups continued, one focused on a collaborative survey of direct market producers about longer-term COVID impacts and responses, and the other focused on developing an anti-racism training program for direct market producer networks.</p> <p>This effort had three main outcomes:          First, this level of coordination, collaboration, and resource sharing made us all more effective in the support we could provide to direct market producers across Oregon. The calls allowed for more shared learning and creativity than emails or shared resource lists alone.</p> <p>Second, instead of individual organizations doing separate, disconnected producer surveys in early Spring about COVID impacts and needs, we agreed that ODA would do one statewide survey, gathering data not from individual producers but from the organizations. This “key informant” approach was very effective. We are now collaborating on a second statewide survey, this time of producers themselves, led by OSU Small Farms faculty Pami Monette.</p>	<p>3</p>

		<p>Third, instead of sidelining racial equity in the rush to respond to COVID, we were able to slow down and focus more seriously on racial equity in our orientation and our practice. COVID-19 has disproportionately harmed BIPOC communities because of historic and current systemic racism, and that applies to direct market producers as well. This fact influenced our COVID-specific work. In addition, five white-led organizations, including our Center, are now collaborating on developing an anti-racism curriculum and learning community for our farmer networks.</p>	
<p>95.</p>	<p>Partnering at the Farmers' Market to Expand Outreach</p>	<p>In partnership with the Redmond Farmers' Market and Deschutes County WIC program OSU Extension professionals responded to an increased demand for outreach at farmers' markets. Due to COVID-19, the program was altered by eliminating food samples and developing social distancing activities for youth to earn their ticket. The Moore Family Center Fellow wrote lessons for the youth that included a socially distant physical activity and a nutrition activity. Youth also received an activity to take home along with their ticket. Adults attending the market received quick, simple nutrition concepts. SNAP-Ed Deschutes County Unit and the Fellow attended the market for ten weeks connecting with 530 attendees. Each week's activity topics ranged from gardening to learning all about calcium's importance. 192 Food Hero tickets were earned by the youth, increasing fruit and vegetable consumption by \$768. COVID created a barrier for WIC families in attending the market and participating in the market tour resulting in fewer market tours than previous years. Out of the seven WIC tour participants, over half had not been to the market. Most participants agreed or strongly agreed that they gained knowledge and skill to purchase fresh fruit and vegetables at the best price, properly store them at home and prepare them in ways that my family enjoys by attending the tour. All participants agreed or strongly agreed that they were confident that they would return to the market to spend their vouchers.</p> <p>The beneficial thing that I learned during today's tour was: 'How amazing fresh food is and easy to obtain and use.', "more ways to cook vegetables," and "there is a variety of booths I can choose from."</p> <p>"The OSU Extension games and Food Hero ticket were the highlight of our time at the market! Thank you!"</p> <p>"This program is awesome for my son. He is a really picky eater and this booth has really helped him learn more about nutrition and to try new kinds of fruits and vegetables."</p> <p>"We purchased strawberries and blueberries and blackberries. We made blueberry oat bread and it was yummy!"</p>	<p>3</p>

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<p>96.</p>	<p>Genetic and Environmental Indicators of Climate Change Vulnerability for Desert Bighorn Sheep</p>	<p>Assessments of organisms' vulnerability to potential climatic shifts are increasingly common. Such assessments are often conducted at the species level and focused primarily on the magnitude of anticipated climate change (i.e., climate exposure). However, wildlife management would benefit from population-level assessments that also incorporate measures of local or regional potential for organismal adaptation to change. Estimates of genetic diversity, gene flow, and landscape connectivity can address this need and complement climate exposure estimates to establish management priorities at broad to local scales. We provide an example of this holistic approach for desert bighorn sheep (<i>Ovis canadensis nelsoni</i>) within, and surrounding lands administered by the U.S. National Park Service. We used genetic and environmental data from 62 populations across the southwestern U.S. to delineate genetic structure, evaluate relationships between genetic diversity and isolation, and estimate relative climate vulnerability for populations as a function of five variables associated with species' responses to climate change: genetic diversity, genetic isolation, geographic isolation, forward climate velocity within a population's habitat patch (a measure of geographic movement rate required for an organism to maintain constant climate conditions), and maximum elevation within the habitat patch (a measure of current climate stress, as lower maximum elevation is associated with higher temperature, lower precipitation, and lower population persistence). Genetic structure analyses revealed a high-level division between populations in southeastern Utah and populations in the remainder of the study area, which were further differentiated into four lower-level genetic clusters. Genetic diversity decreased with population isolation, whereas genetic differentiation increased, but these patterns were stronger for native populations than for translocated populations. Populations exhibited large variation in predicted vulnerability across the study area with respect to all variables, but native populations occupying relatively intact landscapes, such as Death Valley and Grand Canyon national parks, had the lowest overall vulnerability. These results provide local and regional context for conservation and management decisions regarding bighorn populations in a changing climate. Our study further demonstrates how assessments combining multiple factors could allow a more integrated response, such as increasing efforts to maintain connectivity and thus potential for adaptation in areas experiencing rapid climate change.</p>	<p>4</p>
<p>97.</p>	<p>Changes in abundance of Eight Sagebrush-Steppe Grass Species 13 Years after Co-Planting</p>	<p>Establishing stable bunchgrass populations enhances long-term restoration success and resilience of sagebrush steppe to degradation, principally due to the ongoing spread of highly competitive exotic invasive annual grasses that can increase fire frequency. Restoration success rates in sagebrush steppe are often low, and determining the ecological dynamics and processes associated with restoration outcomes provides critical information for ongoing efforts to maintain the integrity of sagebrush steppe ecosystems for use by livestock, game, and species of concern such as sage grouse.</p> <p>While stable bunchgrass populations are essential to resilience and restoration of sagebrush steppe rangelands, yet few studies have assessed long-term variation in plant abundance from a known starting point. We capitalized on a previous paddock study by reestablishing in 2011 nine replicate blocks consisting of 29 × 29 grid of cells, each planted in 1998 with a single individual of</p>	<p>4</p>

		<p>one of eight sagebrush steppe bunchgrasses, including the widely planted exotic, crested wheatgrass (<i>Agropyron cristatum</i>). Plant species and numbers were determined in 2011 for each cell, which were classified as holds or cedes, with ceded cells used to determine species-specific gains. We hypothesized the competitive crested wheatgrass would proportionally occur more in gained cells compared with native grasses. While crested wheatgrass did proportionally hold and gain the greatest number of cells, the relative number of plants within holds and gains was constant across all species, with most plants (80–87%) occurring outside cells originally planted with them. Crested wheatgrass had greater proportions of holds and gains where it was the only species within the cell and showed even presence across all cells planted with other grass species in 1998. Native grasses were underrepresented in 1998 crested wheatgrass cells and sometimes overrepresented in other native species cells. The ratio of total crested wheatgrass to native bunchgrass plants followed a sigmoidal step increase with increasing crested wheatgrass density. These results show population changes in sagebrush steppe bunchgrasses are determined by seed production and emergent seedling survival, both of which are stronger in the exotic bunchgrass. This study also showed that native grasses can maintain presence via seed in areas depending on crested wheatgrass density. This information could help shape management strategies capitalizing on the utility of crested wheatgrass and sustaining desirable levels of native grass productivity and diversity.</p>	
<p>98.</p>	<p>Do shrubs improve reproductive chances of neighbors across soil types in drought?</p>	<p>Plant reproduction is highly sensitive to stress from severe weather. While facilitation has been shown to buffer negative impacts along stress gradients, less is known about facilitating plant reproduction in drought periods. Because intensity and frequency of drought are predicted to increase, plant reproductive facilitation has important implications for a species ability to adapt to changes in climate. Our primary study objective is to test if nurse shrubs act as reproductive micro-refugia across soil types, by improving reproductive potential of perennial bunchgrass neighbors subjected to severe drought.</p> <p>To investigate this objective, we designed a fully factored study testing direct interaction between shrub and bunchgrasses in eastern Oregon sagebrush steppe, at two sites with different soil types. The study consisted of six simple effect treatments combining three moisture regimes (moist, ambient, and drought) with two shrub conditions (shrub intact or shrub removed). Our results indicate when facilitation of reproductive potential occurs, it occurs strongly and particularly in drought, consistent with the stress gradient hypothesis (SGH), where several species produced at least 54% more inflorescences in the presence of shrub neighbors. In addition, we found facilitation to be consistent with the SGH at the species level likely reflecting differences in plant strategy and perception of strain, but to follow alternative SGH models more closely at the site level where facilitation declined on the drier soil. Ultimately, our findings highlight the importance of facilitation in improving plant reproductive potential in drought and support the role of nurse shrubs as micro-refugia in a changing climate.</p>	<p>4</p>

<p><b>99.</b></p>	<p>Reducing Uncertainty to Advance Sustainable Groundwater Use Using an Integrated Hydro-Economic System Model: Investigations in the Harney Basin, Oregon</p>	<p>A major challenge for society is to achieve sustainable use of water systems, including groundwater systems which are particularly vulnerable to depletion. Aquifer depletion is largely uncontrolled in the U.S. West, imposing rising costs on farmers, rural communities, and the environment. The most challenging obstacle to sustainable groundwater use is the enormous uncertainty about both the groundwater system itself and the dynamics and feedbacks in the "coupled hydro-economic system." This project will reduce that uncertainty and contribute toward sustainable resource use in several ways. First, by constructing a hydro-economic model for the Harney Basin, Oregon, collaborating with the USGS and state agencies. Second, with extensive stakeholder engagement during the research process to acquire knowledge and gain trust between researchers and stakeholders. Third, to involve stakeholders in the development of scenarios and policy pathways to evaluate using the model. And fourth, to survey stakeholder attitudes, perceptions and preferences related to sustainable groundwater use pathways, and to conduct the surveys both before and after dissemination of research results, to discern the impact of the research on those attitudes. This could improve understanding about the potential benefits of coordinating research and analysis with engagement with stakeholders and policymakers to find a pathway toward sustainable use of water resources. An overarching objective of the project is to evaluate the influence research of this kind in terms of its impact on achieving sustainable use of groundwater resources, which could help improve the effectiveness of quantitative research for reducing uncertainty and informing stakeholders and policymakers.</p> <p>There are three noteworthy elements of the proposed project that are novel or unique. The first is the modeling of parcel-level spatial heterogeneity in agricultural productivity and economic rents. The hedonic methods for estimating land productivity as a function of land quality and other agro climatic characteristics makes it possible at high resolution to account for differences in land productivity in addition to difference in water rights seniority and pumping costs due to differences in well depth. These factors have been shown elsewhere in the region to give rise to order-of magnitude differences in the economic value of irrigation water. Other hydro-economic groundwater studies have not represented such parcel level heterogeneity. Second, the simultaneous development of the groundwater hydrology model and the socio-economic model, carried out with the consultation and participation of a large number of stakeholder representatives over a period of several years, represents a unique opportunity for communication and learning that will improve the quality of, and foster confidence in, the modeling by both the researchers and the stakeholders. The opportunity to work with a state-sponsored advisory committee for the hydrology model, and also to be engaged with the development of the economic model, and the coupling of the two model components, is novel as far as we know. Third, the project includes a component to evaluate the effectiveness of quantitative policy modeling through a before-after</p>	<p>4</p>

		<p>comparison of stakeholders' knowledge and attitudes related to groundwater resources and policies in the basin. A recent study of agricultural systems modeling found that a major factor limiting the use of modeling studies by stakeholders is their engagement in the research process and their access to model results (Antle, Jones, and Rosenzweig 2017). This study will be the first to provide evidence of the effectiveness of a participatory research process to increase the impact of quantitative policy research.</p> <p>Progress was made toward the development of models and survey instruments which are the main methods of the project. To that end, the research team traveled to the study region in October 2019 to make initial contact with community members, inquire about data, ask questions about community characteristics, farming techniques, and many other socio-economic, geophysical, political, demographic, historical, and hydrological aspects of the basin of study. We also made presentations and attended meetings. These included meetings of the Harney Community Based Water Planning (CBWP) Collaborative, and also meetings of the Greater Harney Valley - Groundwater Study Advisory Committee. A great deal of pertinent information was collected. The research team traveled to Portland, Oregon to meet with the subcontractors at USGS. These were planning discussions aimed and facilitating the development of compatible models of both the hydrology, land use, and economics of irrigation that will be eventually coupled into a hydro-economic model for simulation purposes. Researchers met with survey technicians at the Oregon State University survey research center to discuss development of the survey instrument to be implemented in the second year of the project.</p>	
<p><b>100.</b></p>	<p>Fine Fuels Management to Improve Wyoming Big Sagebrush Plant Communities Using Dormant Season Grazing</p>	<p>The sagebrush ecosystem is one of the most endangered ecosystems in America due to multiple threats, including non-native annual grass invasion and increased frequency and size of wildfires. Large wildfire increases the invasibility of sagebrush ecosystems on a massive geographical scale. Our goal is to implement an integrated ecological approach that combines extension with research that focuses on grazing to promote robust sagebrush plant communities within Oregon, Idaho, and Nevada. Our extension objectives contribute to the goal with at least: 1) 75% of the participants improving their knowledge of ecological outcomes related to dormant season grazing; 2) 75% of participants learning applied uses for remote sensing technologies and the implications to manage fine fuels; and 3) 75% of participants learning about basic rangeland ecology principles with at least 75 individuals using Google Earth Pro and GIS technologies to develop land management plans. Our research objectives test our hypothesis that dormant season grazing can be used at the landscape scale beyond traditional use to: 1) reduce fine fuels to lower fire risks benefiting less fire-adapted native plant species; and 2) promote perennial bunchgrasses by taking advantage of phenological differences between native and invasive annual grasses, and by reducing the amount of plant litter. We address the need to develop management tools and strategies that positively impact sagebrush ecosystems through the development of dormant season grazing practices (Program Area Priorities 4); specifically, tools and strategies that promote plant communities that are resistant to invasive annual grasses within the sagebrush steppe.</p>	<p>4</p>

		<p>Exotic Annual Grass Cover: Exotic annual grass cover increased in South Camp Kettle and Saddle Butte pastures, and slightly decreased in McIntyre. When comparing exotic annual grass cover at the treatment level (no graze, traditional grazed, dormant grazed, and traditional + dormant grazed), an increase between 5 and 10% was measured across all four treatments. Species composition by functional group remained relatively unchanged from 2018 to 2019, with medusahead (<i>Taniatherum caput-medusae</i>) accounting for 82% and 80% of hits, and cheatgrass (<i>Bromus tectorum</i>) accounting for 10% and 16% in each year. Field brome (<i>Bromus arvensis</i>) and ventenata (<i>Ventenata dubia</i>) were present but minimal both years.</p> <p>Native Perennial Grass Cover: There were small changes in the cover of native perennial grasses at the pasture level, and cover stayed similar across all four treatments. The largest change was the increase of cover of western wheatgrass (<i>Pascopyrum smithii</i>); in 2018 it was not measured, and in 2019 it had an average cover of 3.3% across all six sites. This change was most prominent in the Saddle Butte pasture where it went from not being measured in 2018 to having 10% cover in the southern enclosure and 8.8% cover in the northern enclosure. Sandberg bluegrass (<i>Poa secunda</i>) decreased in total cover from 5.7% to 3.1%. Bluebunch wheatgrass (<i>Pseudoroegneria spicata</i>) and Idaho fescue (<i>Festuca idahoensis</i>) stayed consistent from 2018 and 2019 in both functional group composition and total cover.</p> <p>Litter Cover: At the pasture level, litter decreased on 5 out of the 6 pastures and ranged from a 1% to 12% decrease. At South Camp Kettle South litter cover increase by 17%. At the treatment level, the largest change that was measured was in the no graze, where litter cover decreased by ~12%. Both annual and perennial grass biomass increased in 2019 compared to 2018. This increase was seen in all three pastures and all four treatments. Difference may be due to a number of factors including, but limited to, precipitation, rotational grazing, and the timing of data collection.</p> <p><b>Annual grass biomass</b> increased by 344 kg/ha, 1060 kg/ha, and 183 kg/ha between 2018 and 2019 at South Camp Kettle, Saddle Butte, and McIntyre, respectively. Annual grass biomass on the No Graze treatment increased by 864 kg/ha from 2018 and 2019. Grazing treatments on average increased in annual grass biomass by 417 kg/ha between the two years; the Tradition + Dormant grazing treatment had the smallest increase of annual grass biomass (299 kg/ha between the two years). <b>Perennial grass biomass</b> also increased from 2018 to 2019. At South Camp Kettle, perennial grass biomass increased from 74 kg/ha to 153 kg/ha. At Saddle Butte there was an increase of 296 kg/ha between the two years, and at McIntyre there was an increase of 200 kg/ha. Perennial grass biomass increased by 253 kg/ha on the No Graze treatment plots, and on average 171 kg/ha on the three grazing treatments. <b>Litter biomass</b> is of particular interest due to medusahead's ability to germinate within the litter and its strong contribution to fuel continuity across the landscape. Litter biomass increased by 284 kg/ha at South Camp Kettle from 2018 to 2019. On Saddle Butte and McIntyre, litter biomass decreased by 1028 kg/ha and 450 kg/ha, respectively, between 2018 and 2019. Across all treatment litter biomass decreased. On the No Graze treatment, litter went from 2467 kg/ha in 2018 to 2092 kg/ha in 2019. When grazed once (either Traditional or Dormant season), there was an average decrease of 256 kg/ha. The Traditional + Dormant treatment decreased litter biomass by 704 kg/ha from 2018 to 2019.</p>	
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101.	Resilience of Rural Community to Climate Change and Extreme Events	<p>The wellbeing and sustainability of rural communities depend on but not only on sustained economic growth. They also hinge on community resilience, the capacity to absorb and recover from the occurrences of adverse socio-economic, political or natural shocks. This is an area of rapidly growing interests but with surprisingly limited empirical investigation. We hope to fill in the gap by focusing on the observed community responses to natural shocks, climate-change related extreme events in particular. This proposal also targets on the issue of climate change, an unprecedented challenge confronting many rural communities. It echoes the climate-resilient development initiative of United Nation Development Program, because the climate-resilient development is not only about climate-friendly development but also about the communities' ability to adapt to climate changes and the related extreme events. The latter might be a more pressing concern considering the first-ever period (2010-2015) of rural population decline in America.</p> <p>The primary objectives of the proposal include: (1) quantitatively measure rural community resilience to climate-related extreme events in order to identify communities that are relatively less resilient to climate-related extreme events; (2) explore the differences in resilience across communities and investigate its correlation with socio-economic and institutional factors; (3) investigate impact of climate change on rural community resilience. The proposed research is the first national scale study that quantify and empirically analyze rural community resilience to climate-related extreme events. The results from the proposed research are expected to address limitations in other branches of community resilience literature and therefore help to advance our knowledge of community resilience in general.</p> <p>The wellbeing and sustainability of rural communities depend on but not only on sustained economic growth. They also hinge on community resilience, the capacity to absorb and recover from the occurrences of adverse socio-economic, political or natural shocks. In this research-only project, we investigate community resilience through the perspective of the observed community responses to natural disasters. As a first national scale study on multiple types of climate related disasters, we are able to control for the differences in methodology, data resolution and study areas in the existing studies. We find that different employment and wage responses to different types of disaster can be partially explained by the economic demand- supply analysis. Some disasters tend to decrease labor demand while others tend to restrain labor supply. For instance, wage tends to increase after wildfires but decrease after flooding. While wage increase can push disaster-disrupted local business into more difficult situations, wage decreases can make the lives of disaster-affected workers much more miserable. In view of all these differences, the one-size-fits-all type of disaster preparedness/relief program needs to be modified to accommodate more differences among different disaster types so that local communities can be more resilient to natural disasters. At the community level, it is important to enhance human capital and social capital in order to improve the resilience of local employment to natural disasters. In our study, we find that employment in densely populated counties is less resilient to natural disasters. Counties</p>	4

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		<p>with higher human capital and social capital tend to be more resilient. The economic structure and local government finance in general have no significant impact on the resilience. Using post-matching regression method, we find empirical evidence showing that active adaptation can help the local government finance to become more resilient to disasters.</p>	
<p>102.</p>	<p>The Openly Published Environmental Sensing laboratory (OPeNS)</p>	<p>The Openly Published Environmental Sensing laboratory (OPeNS, Open-Sensing.org) started operation in 2015, and employs engineering undergraduates into teams to address current challenges in agricultural and environmental sensing. The lab currently employs over 30 undergraduates at one time (50 individuals over the course of 2020) who are working on 20 environmental sensing systems. Among others, sensor systems include a multi-parameter water quality sensor, a landslide detection system, a dendrometer, a sap-flow sensor, and an eGreenhouse sensor package (see <a href="https://github.com/OPeNSLab-OSU/OPeNS-Lab-Home/wiki">https://github.com/OPeNSLab-OSU/OPeNS-Lab-Home/wiki</a>). All designs are open source, and the undergraduates all have the opportunity to author peer-reviewed publications and attend conferences to communicate their findings (see products produced, wherein the lab seeks to publish about 5 peer-reviewed articles per year, and present 5 or more conference papers). The lab is organized with Dr. Selker being the principal investigator, Dr. Udell being the lab director, Ms Walter as logistical coordinator, Mr Singh as technical support staff, and Dr. Al-Agele as a post-doctoral scholar. The Hatch grant provides about 25% of the operating budget, with 50% coming from the National Science Foundation Earth Sciences program, and 25% coming from collaborating teams. The lab maintains many contacts with commercial entities and foresees significant spin-off of the developed technologies into private-sector suppliers.</p> <p>The lab supported 20 projects with internal and external PIs. For example:</p> <ul style="list-style-type: none"> <li>-Dr. Josh Roering at University of Oregon to deploy six real-time soil moisture-based landslide monitoring sensing systems in Sitka, Alaska</li> <li>- Continued collaboration with the Pacific Northwest National Laboratory (PNNL) to create river-sensing systems for their WHONDERS program.</li> <li>- Continued collaboration with industrial partner Weyerhaeuser to develop a satellite-reporting 1-cm resolution landslide monitoring system</li> </ul> <p>The OPeNS lab has established itself as a national leader in development of transformative sensor systems. The coming year will be our 6th year of operation and will be focused on a robust process by which we bring projects to completion, which includes a complete description and design documents available on-line, and the publication of peer-reviewed papers on each technological advancement. The OPeNS lab will continue to take on new projects (expected to be on the order of five new projects per year), while retiring an approximately equal number so as to keep a portfolio of approximately 20 projects. The lab seeks to add to its production capacity, so that the lab can serve the research community, and in so doing refine the designs based on field performance.</p>	<p>4</p>

103.	Data Science for the Public Good	<p>A faculty-led, student-driven Oregon State University initiative that uses data science to address issues in rural communities is underway with projects ranging from the impacts of air quality on health in Lane County to regulatory impacts on economic development in eastern Oregon. <a href="#">Data Science for the Public Good</a> leverages OSU's significant expertise, resources and infrastructure to address community needs. It launched this spring with five Young Scholars teams comprised a total of five graduate students and 10 undergraduate students from five Oregon institutions: OSU, the University of Oregon, Portland State University, Reed College and Southern Oregon University. The students participated in June in a 10-day training course in data analysis and programming. Through late August they will be guided and mentored by a faculty member with expertise in the relevant area.</p> <p>The students are learning about data formats, methods in machine learning and statistics, databases and storage, data visualizations, project management and common tools such as R, the statistical programming language, Leaflet, the interactive mapping library, and software development repositories git and GitHub.</p> <p>The projects were identified by local stakeholders through the OSU Extension Service and focus on analyzing data provided by those stakeholders, who are communicating frequently with the data-science research teams working on their project.</p> <p>The projects include:</p> <ul style="list-style-type: none"> <li>• Wintertime air quality health impacts in the Lane County communities of Oakridge and Westfir;</li> <li>• Impacts of dam water release policy on Deschutes River health and recreation;</li> <li>• Forecasting tools for cost analysis of water and wastewater facilities in Oregon small towns and cities;</li> <li>• Regulatory impacts on economic development in the eastern Oregon border region;</li> <li>• Water quality requirements for fresh produce growers.</li> </ul> <p>These projects are intended to provide the students with collaborative data science research experiences in real-world settings and provide rural stakeholders with data science analyses relevant to an issue of interest. Ten of the 15 students come from rural backgrounds. The initiative serves as a platform to introduce them to careers in the knowledge economy. In addition to student experiential learning, the initiative also focuses on creating a set of online resources for other universities and training Extension staff to bring data science projects into the communities they serve. Data science, also known as "big data," can be used in areas such as precision agriculture, resource management, inventory management, and medicine and healthcare. In an increasingly information-driven society, rural communities are facing new challenges. These challenges affect people, towns, local governments, businesses large and small, and industries ranging from</p>	4

		<p>manufacturing to agriculture. The solutions to some of the problems they are facing may be found in the data towns and cities already collect but lack the resources to access and analyze.</p> <p>“This is where Data Science for the Public Good steps in,” Tyler said. “There’s a growing disparity between access and the tools available with data science and rural communities. The data science needs for our rural communities is very extensive. The communities that are able to access data science approaches are doing well and those that can’t are falling behind.”</p> <p>Due to COVID-19, the Young Scholars Program is being conducted entirely online, with faculty, trainers, students, and stakeholders communicating via online messaging platforms.</p>	
<p><b>104.</b></p>	<p>Maintaining Resilient Sagebrush &amp; Rural Communities</p>	<p>Sagebrush (<i>Artemisia</i> spp.) ecosystems in western North America are considered one of the most imperiled ecosystems in the world. Currently, only half of the historic distribution of sagebrush land cover persists. Along with the conversion of landscapes from natural sagebrush ecosystems to agricultural lands, Euro-American settlement has resulted in an influx of exotic plant species. Countless acres within sagebrush ecosystems have been compromised by the presence of exotic plants that reduce primary productivity. Invasive grasses have increased risk for wildfire, which sagebrush ecosystems are generally not well- adapted. Juxtaposed to the threat of exotic plants with too frequent fire cycles, fire suppression has led to increases in conifer encroachment into western sagebrush ecosystems. It is difficult to determine which conservation actions are best to improve ecosystem function for sagebrush landscapes when considering the conundrum of too much current fire with exotic fuel with too little historic fire. In eastern portions of the sagebrush biome, a different set of threats predominate. As commodity prices increase private sagebrush lands are at increased risk to conversion to cultivated croplands. Additionally, energy development is a threat as oil and natural gas resources are abundant throughout much of the area. Infrastructural support for energy extraction (e.g., roads, powerlines, associated traffic), leads to fragmentation and direct loss of sagebrush habitats. Renewable energy, such as wind power, can also result in the disturbance and loss of sagebrush habitats and is an increasing threat primarily in eastern, but also throughout, sagebrush ecosystems.</p> <p>Much of the remaining sagebrush biome consists of working agricultural lands and is predominantly used for grazing of domestic livestock. Interestingly, evidence is mounting that the drivers of ecological function in this ecosystem are not only beneficial to wildlife resources but have shared values with sustainable agricultural practices. Recent unprecedented conservation efforts put forth to ensure long-term population viability of obligate sagebrush species such as sage-grouse (<i>Centrocercus urophasianus</i>), present a unique opportunity to evaluate both the biological and socio-economic outcomes of sagebrush conservation actions at a continental scale.</p> <p>Energy infrastructure and associated habitat loss can lead to reduced reproductive rates for a variety of species including the greater sage-grouse (<i>Centrocercus urophasianus</i>). Our goal was to refine our understanding of how the physical footprint of energy development relates to sage-</p>	<p>4</p>

		<p>grouse nest and brood survival. Our survival analyses were conditional upon the amount of surface disturbance female sage-grouse were exposed to during reproductive stages. We quantified levels of exposure and compared them to the surface disturbance levels of the surrounding area. From 2008–2014, we collected data in 6 study areas in Wyoming, USA, containing 4 primary types of renewable and nonrenewable energy development. Our research focused on press disturbance (i.e., disturbance sustained after initial disturbance and associated with existing energy infrastructure and human activity). Our results suggest exposure to press disturbance during nesting and brood-rearing was related to lower nest and brood survival, which manifested at different spatial scales. Our analysis of nest survival suggested that the likelihood of a successful nest was negatively associated with the amount of press disturbance within an 8-km<sup>2</sup> area. Broods exposed to any press disturbance within a 1-km<sup>2</sup> area were less likely to survive compared to broods not exposed to press disturbance. Female sage-grouse consistently used habitat with lower disturbance levels during reproductive periods. Greater than 90% of nest and brood-rearing locations were in habitat with &lt;3% press disturbance within a 2.7-km<sup>2</sup> area. Our research links surface disturbance associated with press disturbance to reproductive costs incurred by sage-grouse exposed to diverse energy development. Our results demonstrate a pattern of female avoidance of areas where press disturbance was high during nesting and brood-rearing and survival of nests and broods were highest in areas that had the least amount of disturbance. Our findings underscore the importance of minimizing disturbance to maintain viable sage-grouse populations.</p>	
<p><b>105.</b></p>	<p>Optimizing land use for beef cattle production</p>	<p>Iconic populations of salmon and steelhead are limited to a fraction of their historic habitat in the Pacific Northwest. Within the Grande Ronde River watershed, including Catherine Creek, endangered aquatic focal species of spring Chinook salmon, steelhead, and bull trout, have been severely impacted by riparian and instream habitat degradation. Habitat degradation, including poor water quality and higher water temperatures, especially in summer months, is caused mainly by low instream water flow, which has been credited, in part, by irrigated agriculture. In contrast, livestock production and irrigated agriculture are the most important agricultural commodities in eastern Oregon and vital to the rural economies. The climate in this region is characterized by a maritime pattern with cool wet winters and warm dry summers. As a result, irrigation during late spring and summer becomes vital to ensure adequate forages for both breeding stock and non-weaned offspring under current management options for grazing livestock operations in eastern Oregon. Therefore, a sustainable forage production system with high respect to water conservation is urgently needed. The study of new forage production systems, the development and demonstration of these specific systems and application of these systems at a large scale will be the ultimate and sustainable way to balance agricultural production and fish and wildlife habitat conservation.</p> <p>More than 40 forage species will be tested in field under irrigation timing treatments. We will identify forage species that are drought avoidant, drought tolerant, or water-use-efficient. Research</p>	<p>4</p>

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		<p>information will be used by forage growers to match their water rights with the corresponding forage species selection. The information will be used by Extension agents to describe forage species in detail as fact sheets and booklets to facilitate forage producers' management changes. Selection of research-demonstrated species will reduce water conflicts between agricultural and fish and wildlife water requirements. Outcomes in this project will include 4 field tours and 2 industry trade articles. Late-season irrigation water lease to non-profit environmental groups will decrease irrigation water consumption. Grazing season extension in the early-spring and late-fall will lead to feeding cost savings.</p> <p>This project is a Hatch Multi-State that was initiated in 2020. Preliminary results are expected in 2021.</p>	
<p><b>106.</b></p>	<p>Tracking landscape origins of chemical signatures present within hypereutrophic lakes of the Upper Klamath Lake Sub-Basin</p>	<p>Phosphorus (P) has long been known to degrade water quality and ecosystem health, yet it is one of the most common and widespread pollutants in the environment. P has multiple natural and anthropogenic sources, thus making it difficult to identify sources with the greatest contribution to water quality declines and ecosystem health declines. P is a major contributor to harmful algal blooms, which cause human and wildlife illnesses and makes it difficult to treat drinking water. P pollution is particularly problematic at Upper Klamath Lake, in central Oregon. Following European settlement, activities including farming, ranching, logging, and reservoir management have triggered additional P releases into the system. Despite significant restoration efforts over the past 30+ years, reductions in P loadings and improvements in ecosystem health have not been observed, suggesting that the current approach to monitoring or management is inappropriate. Herein, we propose using a state-of-the-art chemical-forensics workflow to pinpoint the landscape sources that contribute most to the chemical composition of Upper Klamath Lake. Samples will be collected from different sources, including agricultural fields, irrigation water returns, natural waters, forest soils, and others. The holistic chemical composition of these samples will be measured using mass spectrometry instruments, and the diagnostic "chemical fingerprints" associated with each pollution source and land use/cover type within the basin will be identified using machine-learning tools. Preliminary data indicate that sources are distinguishable with near perfect accuracy based on the chemical composition of a sample. The fingerprinting process we develop will allow managers to pinpoint the pollution sources that are disproportionately high compared to other sources. This information is necessary for making decisions that reduce nutrient loads to surface or ground waters within the Klamath Basin and other watersheds. We expect this tool will be useful for managing nutrient runoff worldwide.</p> <p>We anticipate multiple outcomes by the end of this project. These relate to the specific objectives of the project and are as follows:</p> <ol style="list-style-type: none"> <li>1. We expect to identify the diagnostic chemical fingerprints that are indicative of specific chemical sources within the Upper Klamath Lake sub-basin. Sources include the following: <ul style="list-style-type: none"> <li>• Agricultural sources- grazed pasture runoff, flooded crop fields, irrigation water, and irrigation return ditches.</li> </ul> </li> </ol>	<p>4</p>

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		<ul style="list-style-type: none"> <li>• Background sources- wetlands, groundwater/springs, forest soils</li> <li>• Other sources- river and lake sediments.</li> </ul> <p>2. We expect to identify the diagnostic chemical fingerprints that are indicative of various landscape gradients, including agricultural gradients, forested gradients, developed gradients, etc, within the Upper Klamath Lake basin.</p> <p>3. 3) We expect to identify the terrestrial origins of chemical loadings into Upper Klamath Lake.</p>	
107.	2020 Oregon Wildfires: Post-Fire Response by OSU Extension's Forestry & Natural Resources Program	<p>Westside Oregon landscapes that typically don't see frequent wildfire events were hit hard by the 2020 Labor Day fires. Fueled by dry conditions and fierce east winds, the westside fires burned over one million acres and wreaked havoc on communities, economies and ecosystems. Many Oregonians were not prepared. The Oregon State University Extension's Forestry &amp; Natural Resources Program quickly realized the need for post-fire resources and mobilized a team with its state and federal partners to develop and implement a post-fire recovery campaign. Led by FNR Extension's new Fire Program, the team provided Oregonians with a listening session and a webinar series on a variety of post-fire topics. Webinar recordings were made available on the Extension website and YouTube channel and included resources specific to each topic.</p> <p>A resource of note, is the After the Fire Checklist created by FNR and the Natural Resources Conservation Service (NRCS) to chart a path forward for landowners as they assess their properties. The checklist opens the door for landowners to connect with agencies for resources like funding. With an overall fire hose of information following the fires, no entities provided a central place to go for resources. The post-fire team supported the development of a one-stop shop After the Fire StoryMap that documents the 2020 wildfires and offers information and resources for property owners affected by the fires.</p> <p>The StoryMap offers a range of tools and layers that allow landowners to zoom in on their property and view attributes such as burn severity. Users are then guided on how to assess their property using the map and resources provided in the StoryMap. State and federal agencies are also utilizing the StoryMap on their websites and have expressed "<i>Many thanks for this, the StoryMap is excellent</i>" – Renee Davis, OWEB and "<i>It is a very impressive compilation of information in multiple media formats</i>" – Anonymous</p> <p>Recognizing that some communities don't have access to broadband, the team packaged the resources into digestible one or two pagers for each post-fire topic and distributed the resource packets to landowners through postal mailings and one-on-one contact through post-fire site visits. For FNR Extension, these site visits are the heart of who we are and what we do.</p> <p>Participation in the Post-fire listening session and five educational webinars totaled 1,595 attendees at live sessions and 2,522 views of recorded versions. The connections made with</p>	4

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		these participants provided an avenue for ongoing outreach and assistance with post-fire recovery. This was used for assessing fire-affected landowner needs for a new Reforestation Assistance program to connect landowners with supplies of tree seedlings and tree planting services.	
108.	OSU Extension Helps Landowners Replant the Burn	<p>Due to the 2020 wildfires, there are not enough tree seedlings and tree planters to meet demand. The Oregon Forest Industries Council estimated roughly 100 million trees will be needed overall. About 1,000 non-industrial family forest owners were affected by the fires on about 70,000 acres. Many of them need help learning about reforestation, getting tree seedlings and finding tree planters. Extra capacity is urgently needed.</p> <p>Led by OSU Extension Forestry and Natural Resources is working with the Oregon Small Woodlands Association, Oregon Department of Forestry, US Forest Service, and other partners to assess the reforestation need and develop extra capacity to produce seedlings and plant trees. Fire-affected landowners were identified using GIS overlay of fire perimeter and County taxlots. Outreach to landowners included a survey feeding a database for tracking and aggregating their needs. Forest tree nursery capacity throughout the Pacific Northwest region was assessed and new orders for about 450,000 seedlings were made. Seed are being donated by Port Blakely and also being made available from the Oregon Department of Forestry Schroeder seed orchard and other programs.</p> <p>Response to our outreach so far (2020) shows about 200 landowners needing over 3.5 million trees. Ongoing effort includes more nursery orders, tracking of needs, transport, storage, and distribution of seedlings. After initial contact, landowners are tapping into ongoing educational assistance to decide what actions are needed for site preparation, species selection, planting density, and maintenance needs. Focused capacity of forestry consultants and contractors to implement site preparation, planting, and maintenance is also being developed. Volunteers including Extension Master Woodland Manager and SAF members are signing up to assist with further implementation. The program is also being linked with the USDA Emergency Forest Restoration Program (EFRP) to provide assistance to landowners enrolled in EFRP.</p> <p>A funding proposal is in development with Oregon Department of Forestry, USDA Natural Resources Conservation Service, and non-profit partners to provide longer term educational and technical assistance along with financial assistance for implementation of post-fire reforestation and restoration.</p>	4
109.	Land Steward Online Training Reaching and Teaching More Land Owners	More than 40% of land in Oregon is held by private land owners. These private land owners have a significant collective influence on natural resources issues ranging from wildfire to invasive weeds, yet many land owners are new and inexperienced. Land Steward Training has helped 382 new and experienced land owners in southern Oregon manage their more than 12,000 acres of private land in southern Oregon since 2009. Until recently, this effective program was only offered in Jackson County. A new instructor-led online hybrid PACE version of the program is helping to get this impactful education to landowners in other parts of the state by making it easier for agents and specialists to deliver. The hybrid also makes the program more accessible to	4



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		<p>participants with 9-5 work schedules or who live far away from extension offices. The short course is a hybrid of online and in-person instruction offered on evenings and weekends, making it more accessible to the target audience and a lighter coordination lift. This new hybrid training design has allowed the program to burst its county boundaries as two new counties are now offering the program to land owners and managers.</p> <p>In 2020 the course was adapted for COVID to include three in person zoom sessions in lieu of in person classes and tours. Before the development of the online options of the Land Steward Course, we could only serve 30 land owners a year. In 2020, 96 landowners registered for the training. The 52 participants in the fall program represented 1,300 acres. Participants in the program learn best practices for natural resource management and create stewardship plans for their property. By the end of the course they many report already beginning management improvements such as fire risk reduction in their forest by fuels thinning, pasture improvements such as implementing invasive species removal, and wildlife habitat improvement along with many others.</p> <p>The new hybrid is successful in inspiring improved practices among land owners. We used an online survey to evaluate the results of the course. For the fall 2020 Online course, 100% participants responding to our survey said the program had provided them with new knowledge and improved their awareness of the topics covered. 100% said they had gained new knowledge or the program had modified their opinions. 80% said they were more connected to professional and technical resources. 100% said they would implement something they learned in the program in the next year. 60% reported the new format of the training made it possible for them to attend, fulfilling one of the goals of the new design to reach new audiences. 80% of those surveys said that creating the management plan during the course was very effective or effective in helping them develop and meet their land stewardship goals. The program educates, connects them with technical assistance, and gets them on the road to good management.</p>	
110.	Tree School Online Helps Woodland Owners During the Pandemic	<p>Over 79,000 family forest owners in Oregon manage 3.6 million acres of private forestland, providing substantial economic, social, and ecological values. Surveys show that landowner goals are very diverse, as are the challenges they face in their forest stewardship. Annual OSU Extension Tree Schools in Oregon are a major opportunity for landowners to gain knowledge and skills or find assistance to help them succeed. But the Covid pandemic forced cancellation of all three in-person Tree Schools in 2020.</p> <p>After Covid19 forced cancellation of Tree Schools statewide, we created Tree School Online, a series of 35 webinars. This effort was led by OSU Extension Clackamas County and the OSU Extension Forestry and Natural Resources Program, in collaboration with the Oregon Forest Resources Institute (OFRI) and the Oregon Partnership for Forestry Education. OFRI played a major role, working with the OSU Tree School team and hosting the webinars, supported by funding from the Oregon Department of Forestry and the US Forest Service. Other major collaborators include Forests Forever Inc., Oregon Department of Forestry, the Oregon Small</p>	4

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		<p>Woodlands Association, Ecotrust, Soil and Water Conservation Districts, Clackamas Community College, Clackamas County, and many other organizations, businesses, and volunteers. Forty one instructors and hosts developed and delivered the webinars in 2020.</p> <p>Tree School Online had more than double the number of person-hours of engagement online in 2020 compared to in-person class time in 2019. Participation included a total of 3,046 attendees on live webinars (90-minutes each), 5,796 views of recorded webinars on YouTube, and 4,019 views with 783 engagements on Facebook.</p> <p>While people miss the in-person event and social networking, the online format allowed many more people to join sessions compared to typical sessions limited by classroom size and availability to join in person. The large number of views of the recorded sessions shows that this option greatly expanded the availability of Tree School classes compared to the in-person event.</p> <p>In post-program polls (1,420 respondents), 98% of participants said the classes were very useful (64%) or useful (34%). 96% said they were very satisfied (65%) or satisfied (31%) with the webinars. 97% of participants they would use the information they learned.</p>	
111.			
112.	<p>Climate resilient and sustainable forage-based livestock production systems for Oregon</p>	<p>This project will (i) estimate the forage production potential of Oregon under different management scenarios and resource availabilities (ii) evaluate pasture forbs with high bioactive compounds for livestock production, health and environmental effects (iii) develop forage and livestock grazing practices in agrivoltaics systems; (iv) develop pollinator friendly, dual use pasture management practices and (v) evaluate alternative forage-based byproducts (spent hemp biomass) in ruminant nutrition. Expected outcomes include the following:</p> <p><b>Agronomic</b>          These proposed studies will help pasture-based livestock farmers make more informed decisions on choosing appropriate pasture species, cultivars and mixtures that may suit their specific sites and farming conditions in both rainfed and irrigated production systems in Oregon. The results will also provide information on the seasonal responses of particular pasture plants and mixtures to climate and irrigation in relation to their growth patterns and agro-ecological requirements. Farmers will be able to utilize the information as the basis for better managing their pastures, designing successful grazing systems and feed budgeting through successful matching of animal requirements with changing pasture production.</p> <p><b>Economic</b>          Financial impacts of improved seasonal and annual forage production will be calculated based on current forage prices multiplied by yield potential vs. actual yield multiplied by annual hay prices. Furthermore, exploring the alternative feed sources such as spent hemp biomass may provide an</p>	

		<p>option for a high quality and inexpensive feed for livestock producers. Our feeding trials will generate fundamental data for the legalization of hemp byproducts to be used to livestock for the production of meat and will provide data to the livestock industry about the safety of using spent hemp biomass with livestock. Unlocking the potential of spent hemp biomass as a feed source may help developing a potential ancillary hemp feed industry.</p> <p>Social Improvement in quality-of-life estimates will be determined with farmer/rancher. surveys and interviews. Ecological Environmental benefits will be estimated through pasture/grassland/rangeland condition scoring and the associated reductions of wind and water erosion. In particular the evaluation of forage species for both pollinators and livestock can present a number of ecological impacts. Dual purpose management of pastures may provide nectar sources during summer months providing resilience to colonies. This in turn provide a multiple ecological and agronomic benefits.</p>	
113.		<p>Semiarid ecosystems have been shown to impact global carbon dynamics. Ecosystem respiration strongly influences net carbon balance and contributes significantly to variability in the net carbon exchange of semiarid ecosystems. Soil carbon dioxide (CO<sub>2</sub>) efflux (<math>F_{soil}</math>) represents CO<sub>2</sub> efflux due to belowground plant and microbial respiration and biogeochemical processes and is a major component of total ecosystem respiration. Increased understanding of the processes underlying <math>F_{soil}</math> variation in globally expansive semiarid ecosystems is necessary to reduce uncertainty in terrestrial carbon dynamics. While controls on respiration processes in more mesic regions are well documented, <math>F_{soil}</math> in water-limited ecosystems exhibits spatial and temporal variability associated with dynamics in moisture availability and biological activity. Compared to mesic sites, <math>F_{soil}</math> estimates in water-limited ecosystems are more uncertain, partially due to relatively sparse data in drylands despite the recent increase in measurements of <math>F_{soil}</math> globally. Limitations in available data inhibit the development and evaluation of new <math>F_{soil}</math> models for application in water-limited ecosystems. Measurements that examine the processes underlying variability in <math>F_{soil}</math> across a variety of environmental and biological conditions would be useful to develop and evaluate models that recognize the role of temperature, moisture, and substrate limitation on carbon exchange, particularly in globally extensive drylands projected to expand in response to global change.</p> <p>Soil CO<sub>2</sub> efflux (<math>F_{soil}</math>) is a major component of the ecosystem carbon balance. Globally expansive semiarid ecosystems have been shown to influence the trend and interannual variability of the terrestrial carbon sink. Modeling <math>F_{soil}</math> in water-limited ecosystems remains relatively difficult due to high spatial and temporal variability associated with dynamics in moisture availability and biological activity. Measurements of the processes underlying variability in <math>F_{soil}</math> can help evaluate <math>F_{soil}</math> models for water-limited ecosystems. Here we combine automated soil chamber and flux tower data with models to investigate how soil temperature (<math>T_s</math>), soil moisture (<math>\theta</math>), and gross ecosystem photosynthesis (<math>GEP</math>) control</p>	4

		<p><math>F_{soil}</math> in semiarid ecosystems with similar climates and different vegetation types. Across grassland, shrubland, and savanna sites, <math>\theta</math> regulated the relationship between <math>F_{soil}</math> and <math>T_s</math>, and <math>GEP</math> influenced <math>F_{soil}</math> magnitude. Thus, the combination of <math>T_s</math>, <math>\theta</math>, and <math>GEP</math> controlled rates and patterns of <math>F_{soil}</math>. In a root exclusion experiment at the grassland, we found that growing season autotrophic respiration accounted for 45% of <math>F_{soil}</math>. Our modeling results indicate that a combination of <math>T_s</math>, <math>\theta</math>, and <math>GEP</math> terms is required to model spatial and temporal dynamics in <math>F_{soil}</math>, particularly in deeper-rooted shrublands and savannas where coupling between <math>GEP</math> and shallow <math>\theta</math> is weaker than in grasslands. Together, these results highlight that including <math>\theta</math> and <math>GEP</math> in <math>F_{soil}</math> models can help reduce uncertainty in semiarid ecosystem carbon dynamics.</p>	
<p>114.</p>	<p>Fine Fuels Management Dormant Season Grazing Project on the Three Fingers Allotment</p>	<p>Approximately 72% of Malheur County lands are publicly owned and federally managed. Cow-calf producers with public land grazing permits rely on the use of these rangelands. The greatest threat to southeastern Oregon sagebrush rangelands includes annual grass invasion and wildfire resulting from an abundance of fine fuels on the landscape. In the last seven years, approximately two million acres of rangelands burned in fires with perimeters within Malheur County. These wildfires devastate the landscape and the associated natural resources. Previous research from EOARC-Burns and the University of Nevada-Reno highlight that grazing when perennial grasses are dormant can be an effective tool to mitigate wildfire and recuperate rangeland health and function. Furthermore, there is a push for a landscape-scale focus with broad-based support from public agencies, non-profit organizations, and private landowners.</p> <p>OSU Extension partnered with the Vale District BLM, USDA-ARS scientists, UI Extension Service colleagues, and University of Nevada Cooperative Extension faculty to create a broad-based team to address fine fuels management on public land. I worked with the Vale District BLM to go through the necessary National Environmental Policy Act categorical exclusion procedures to begin a research and extension project on public land. We created short- and long-term goals and secured 1,700 cows to graze the Three Fingers Allotment during the dormant season. Furthermore, I organized a tri-state field day highlighting the scientific rationale behind dormant season grazing for fine fuel management ecological restoration.</p> <p>As a result, a four institution, tri-state, collaborative team to conduct a dormant season grazing research &amp; extension project on 25,000 acres of public lands for the next decade. I was directly involved in creating the formal MOU between OSU and the BLM. In 2020, grazing during the non-traditional dormant season saved five grazing operators \$133,000 on winter feed costs, which removed 1,000 tons of fine fuels to mitigate wildfire.</p>	<p>4</p>

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<p>115.</p>	<p>Inland Northwest Pasture Calendar</p>	<p>There is a need for Extension Agents, NRCS, Soil and Water Conservation, Watershed Councils, and Ag consultants to stay up to date on pasture and grazing management education in the inland Northwest (ID, OR, &amp; WA). A train the trainer educational event based on the Inland Northwest Pasture Calendar was published. The bulletin content was worked on though multiple in person sessions, over many months, by Extension agents, specialists, and NRCS personnel, from OR, ID, &amp; WA, at the Hermiston Ag Research and Extension Center. Descriptions of plant growth, every two weeks of the calendar year, were defined for dryland and irrigated pastures in all of the Major Land Resource Areas east of the Cascade Mountains in the 3 PNW states. Numerous other management chapters are being added to the pasture calendar and the MLRA chapters by numerous authors, which will become a PNW Extension publication.</p> <p>The train the trainer event was held November 3-6, 2020 via <i>Zoom</i> from 8:30 to noon every day. (Originally the training was scheduled to be in person at 3-4 locations with in each state.) An evaluation of workshop will sent out at a later date to document knowledge gained and impact.</p> <p>Seventeen (17) Extension and 3 NRCS individuals from Oregon, Washington, and Idaho are involved in this project. For the webinar training part, Extension OSU Extension professionals presented information to the clientele during the webinar, along with other Extension personnel from Washington and Idaho, along with NRCS personnel from Idaho, Washington, and Oregon. 160 people who had signed up for the training. Progress is being made on editing and writing up the bulletin. The bulletin was submitted for PNW blind review to the Extension Service and NRCS in Oregon, Washington, and Idaho. Edits are back and work continues on the Extension bulletin to be resubmitted.</p>	<p>4</p>
<p>116.</p>	<p>Maintaining your forest in an Uncertain Climate - Workshop Series</p>	<p>As the local climate conditions in southwest Oregon change, bringing warmer temperatures, longer fire seasons, and erratic precipitation patterns, forest landowners are left wondering how best to adapt their forests to the changes. Landowners are looking for guidance not just to keep their forests healthy for today, but to continue to have healthy forests in the decades to come.</p> <p>Under a grant through the Western Extension Risk Management Education center, a workshop series was developed to help forest landowners address climate variability concerns. Three field workshops were held in fall 2019 and winter 2020, and then following the emergence of the COVID pandemic the team pivoted to develop a 6 part webinar series. The target audience was forest landowners in Coos, Curry, Douglas, Jackson and Josephine counties. Workshop and webinar topics included assessing climate risks, climate trends, wildfire, forest health, and getting the work done. A risk management plan template was created and workshop participants were assisted in completing it. In addition, follow up field visits were made to selected participants.</p> <p>There were a total of 208 participants in the workshops , webinars and field visits. Post workshop evaluations (n=40) and interviews of a sample of participants (n=20) were used to assess</p>	<p>4</p>

		<p>outcomes. Participant understanding, on a scale of 1-5, where 1=no understanding and 5=complete understanding, increased from 3.4 to 3.9. More than 90% of participants said the workshop met their expectations and would recommend it to others. 83% said they were using or planned to use the vulnerability assessment and action plan. Most participants took concrete steps following the workshops to address climate risks by reducing vulnerability to fire and improving forest health, via thinning and fuels reduction. Some owners also improve utilization of by-products, e.g., by creating biochar. Overall the series helped participating owners better cope with climate changes and variability.</p>	
<p>117.</p>	<p>My Southern Oregon Woodlands - Outreach Campaigns that help landowners get work done in their forests</p>	<p>Private forest landowners in southern Oregon have to deal with some of the worst fire seasons on rough landscapes intermixed with public lands, while contending with typical issues of forest management. Many do not have all the resources they need to take effective action on their landscape to reduce fuels and improve forest health. Barriers to action may include lack of technical information, knowledge of management options, capacity to complete the work and funding.</p> <p>The My Southern Oregon Woodlands outreach program (MSOW), works to connect landowners with the resources needed to take action on their landscapes, improving forest health and reducing risk of catastrophic wildfire. This program reaches out to landowners, usually not already engaged in OSU Extension programming through targeted 2-touch mailing campaigns, the American Forest Foundation's WoodsCamp online application, and by hosting and advertising various events around the counties.</p> <p>In addition to making initial outreach, MSOW focuses on a method of developing relationships with landowners to guide them through their "Landowner Journey" by meeting the landowner where they are at and continuing to engage them as their needs and understanding of their forests evolve. What may start as a landowner responding to an offer of an informational publication may turn into a request for a forester visit in the future, and possibilities of cost-share later on. Since the tail end of 2018, MSOW has added a new offer, the Woodland Neighborhood Network. Comprised primarily of Master Woodland Manager graduates, these volunteers make visits to woodland landowners, provide recommendations and suggestions for forest management, and develop a written report of their observations, which are shared with the landowner. These volunteers accomplish two goals, 1) make in-roads with landowners more reticent to engage with professional foresters from a state agency, making them more willing to sign up for forester visits and/or cost-share in the future and 2) engage with and provide meaningful technical information to landowners who do not require as much information as a professional forester might have, thereby reducing the demand for ODF forester time, which is lower than current demand.</p> <p>MSOW has been responsible for the development of several Firewise Communities, hundreds of forester visits, and several forest landowners hooking into cost-share funding opportunities to get work done on the land and/or develop forest stewardship plans over the years.</p> <p>This year MSOW was hit hard by both the Covid-19 pandemic, and being on hiatus due to</p>	<p>4</p>

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		<p>maternity leave for over 3 months. Maternity leave meant fewer campaigns and the Covid-19 pandemic put the peer mentor Woodland Neighborhood Network off-line for most of the year except for the months prior, and from the end of September to the middle of November where conditions were deemed safe enough to continue visits.</p> <p>Campaigns were focused on tying landowners with funding for their forest, either for forest health, or as post-fire recovery. For these campaigns MSOW partnered with the Natural Resource Conservation Service, the Farm Service Agency, and Jackson Soil and Water Conservation District. For the year of 2020, MSOW made contact with 120 forest landowners. This represents 6,596 acres of privately owned forest lands in Jackson, Josephine and Douglas counties. Forester visits were completed with 63 forest landowner contacts, representing 6,473 acres.</p> <p>Developed and continued the Woodland Neighborhood Network, accomplishing 14 visits with volunteer mentors (MWM graduates) to forest landowners' properties for the year of 2020. Some of these visits have been referred to Oregon Department of Forestry for funding for Stewardship Plans.</p> <p>In 2020, only one community meeting was held and it was altered to be delivered online after the pandemic hit. We are continuing our partnership with the local group, Prescriptions for Safety, for the 2021 year as they acquire funding to do fuel reduction.</p>	
118.	Northwest Plant Evaluations	<p>One area of focus that has provided an opportunity to serve the public and the green industry, and involve the Research Faculty at OSU, Master Gardeners and the nursery industry over the last 18 years has been the development of several plant evaluations at the North Willamette Research and Extension Center (NWREC) and at the Oregon Garden. The original goal of these evaluations was to research the hardiness of Hebe, a genus of flowering shrubs native to New Zealand which are very popular and showy, but which in many cases lack sufficient cold hardiness for landscape use in western Oregon. The over-riding goal of all subsequent trials has been to develop fully drought-tolerant, hardy shrubs, especially groundcovers, for use in "low-input" Northwest landscapes. Development of genuinely low-input landscapes for western Oregon will require use of drought-tolerant, evergreen groundcovers, few of which are currently used in local landscapes because data on their adaptability to local conditions are not available. As a result, landscapers tend not to request these plants and nurseries do not grow them in the absence of these data. Instead, better known but poorly adapted species are used which tend not to thrive without significant inputs of water, fertilizer, pesticides and labor. Local evaluations of drought-tolerant, evergreen groundcovers would provide gardeners and landscapers with data on plant adaptability to this region and provide nurseries with access to plants for propagation.</p> <p>In this program OSU Extension led the evaluation of cultivars and species of Hebe (2000-2009), <i>Cistus</i> and <i>Halimium</i> (2004-2009), <i>Ceanothus</i> (2001-2005), and <i>Grevillea</i> (2011-2014) to determine plant growth, hardiness and overall quality in western Oregon. In each case, cooperators, domestic and international, provided plant material which was propagated, grown on</p>	4

		<p>and planted out at NWREC for evaluation in the field. Data on each plant group are acquired over several years and included plant size, flowering and overall landscape worthiness, as well as cold hardiness ratings. A similar evaluation of <i>Arctostaphylos</i> was planted out in 2011 and data collection continued on that through spring 2019</p> <p>A new evaluation of broadleaved evergreen groundcovers was undertaken in 2017 including an expedition to France to collect drought-tolerant plants at Olivier Filippi's nursery, Pepiniere Filippi, in Meze. The initial planting in this evaluation took place at NWREC in September 2019 and featured 80 different groundcovers, differing widely in size as well as all ornamental characteristics. A second evaluation of groundcover plants is being planned. This will include new accessions of <i>Phlomis</i> and <i>Cistus</i> collected at the Plant Heritage collections of those genera in Morteheo, Devon, UK and Leeds, UK. It will also include new groundcover rosemary cultivars from the Plant Heritage National Collection in Kent, UK. These collaborators have supplied novel accessions for this evaluation which have not been previously available in North America.</p> <p>We have also begun a new evaluation of cold hardiness and growth of 21 <i>Camellia sasanqua</i> cultivars which were planted in 2018 at Lewis-Brown Horticulture Farm in Corvallis. Data collection on these plants commenced in 2019 with size and flowering characteristics. These trials have been maintained with over \$53,000 in grant funds. All information on the evaluations is available at the Northwest Plant Evaluations website, which is updated with results regularly. As results have become available, OSU Extension has shared the evaluations in popular and trade publications such as Digger, Nursery Management and Production (NMPPro), and Pacific Horticulture. The <i>Cistus and Halimium, Ceanothus and Grevillea evaluations</i> were published in refereed journals.</p> <p>Specific cultivars of these genera identified in these evaluations have been utilized with suitable companion plants in a variety of un-irrigated landscape projects around Marion and Polk Counties. We have installed landscapes at the St. Francis Shelter in Salem (2007), the Oregon Garden in Silverton (2007), the Willamette Valley Humane Society in Salem (2008), Rotary Park in the City of Dallas (2008) and most recently in several sites in collaboration with the City of Monmouth, including Madrona Park in September 2017 and the OSU Linn County Extension office in November 2017.</p> <p>The program aims to introduce new cultivars into the nursery trade at both the retail and wholesale level in order to encourage landscape use of the plants. As of 2019, 7 retail and 8 wholesale nurseries in Oregon, Washington and California have taken cuttings from these evaluations to date and are known to be growing and marketing these cultivars. The nurseries are each growing and selling an average of 11 <i>Hebe</i> cultivars, 14 <i>Cistus</i>, 4 <i>Halimium</i> and specifically derived from the evaluation trials. A nursery (Xera Plants, Sherwood, OR) named and is selling a <i>Grevillea</i> selected from one of my trials as a new cultivar 'Neil Bell'. Cuttings from the manzanita evaluation have been shared with 4 wholesale and 2 retail nurseries in the Valley in 2017-18 as well as the McMenamins group.</p>	
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<p><b>119.</b></p>	<p>Reducing fire risk at the South Slough visitor center</p>	<p>The South Slough National Estuarine Reserve is a 6000 acre natural area located near Charleston, Oregon. The reserve's education and research opportunities draw both visiting scientists, school groups and the general public. The focal point of the reserve's activities is a visitor center located on a ridge above densely forested slopes leading down to the estuary. The adjacent dense vegetation and dead and dying Port-Orford-cedar created a fire risk to the visitor center, which lacked defensible space.</p> <p>OSU Forestry and Natural Resource Extension faculty provided technical assistance to the reserve management staff to conduct a risk assessment and improve defensible space for the visitor center.</p> <p>The reserve staff implemented a defensible space project around the visitor center involving removing dead trees and dense underbrush. Logs were provided to the Coquille Indian Tribe and the Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indian (CTCLUSI) for cultural use. Additional logs were utilized to create benches and wildlife boxes at the slough. The staff then created interpretive signage that showed before and after photos and explained the benefits of the project. OSU Extension and South Slough will partner to host defensible space workshops for the community.</p>	
<p><b>120.</b></p>	<p>Master Woodland Manager - Douglas County</p>	<p>Oregon's family woodland owners collectively manage close to 4.5 million acres (40% of private forestland), providing substantial contributions to local economic, social, ecological and recreational services. Building community networks among such a diverse group, providing these landowners with opportunities to learn from experts as well as from each other, and ensuring support for their stewardship efforts is a challenging task for Oregon's many forestry agencies, institutions, and non-governmental organizations.</p> <p>Oregon's Master Woodland Manager (MWM) program trains woodland owners and managers in technical forestry topics, ensuring enhanced management of family forestlands. MWM also provides a venue for networking and collaboration, as well as excellent leadership training, all of which facilitate development of the necessary social and political capital that create a sense of community and place. In turn MWMs work to foster forest landowner networks in their local communities by educating other woodland owners, taking on leadership roles in forest landowner organizations, educating non-woodland owners, participating in citizen science projects, and much more.</p> <p>Volunteers self-reported activities using provided hard copy volunteer logs or an on-line volunteer reporting form. In addition, new volunteers completed course and teaching evaluations. The collective information provides a rich sense of how volunteers perceive the impact of the MWM program on their personal management as well as how they apply it to volunteer service.</p> <p>Volunteers in Douglas County reported 509 hours of unique activities for over 1468 people from the public, family forestland owners, youth, watershed councils, and various other organizations in</p>	<p>4</p>

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		<p>2020. Volunteers contributed through their communities via leadership, interactions with the general public, woodland owner education, and citizen science projects.</p> <p>Statewide we find that more than 80% of MWM volunteers remain active past their required volunteer service commitment, with some now serving as long as the program has been in existence, over 35 years.</p> <p>MWM creates lifelong friendships for many of its participants, strengthening local forestry communities. For some, MWM carries with it a prestige and reputation for objectiveness that provides landowners with the self-confidence needed to work confidently with professionals, policy makers, and their peers. As one MWM put it: "The knowledge I gained by taking the MWM training gave me the confidence to serve on local boards and committees as well as enough confidence that I could intelligently express my concerns, problems, and solutions."</p>	
121.	Agricultural Wildfire Preparedness and Prevention	<p>In 2018, the Substation Fire in North Central Oregon burned 80,000 acres and resulted in a fatality. The Oregon Wheat Growers League and Oregon OSHA subsequently created new wildfire training requirements in 2019, but no corresponding trainings. Many producers are still not aware of these new requirements and currently do not meet them. Producers who have employees who engage in suppressing fires on their operation are required to document farm plans for fires and medical emergencies and ensure employees are trained in basic aspects of wildland firefighting. Plans that need to be completed include an emergency action plan, firefighting action plan, fire prevention plan, and job hazard analysis to determine what types of PPE are necessary with agricultural wildfire. Basic wildland firefighting training needs to cover fire behavior, fire control, and fireline safety. In addition, employers and employees must go through an annual refresher on those aspects of wildland firefighting.</p> <p>In February 2020, I hosted a workshop to inform Wasco and Sherman county producers of the new requirements and provided wildfire training to meet requirements. Sixty producers attended the workshop. I also collaborated with a local producer in developing templates for required emergency plans. A detailed outline of requirements was created, along with templates to create an emergency action plan and emergency farm map, firefighting action plan, and a fire prevention plan. At the request of producers, I also provided additional training through an online eXtension Campus course (<a href="https://campus.extension.org/course/view.php?id=1842">https://campus.extension.org/course/view.php?id=1842</a>), completed by 33 producers. In terms of changing wildfire preparedness behavior, 44% of course survey respondents said they are likely to take actions, 33% are undecided, and 22% are somewhat unlikely. Survey results after the training also found that 22% of participants are very likely to change how they suppress agricultural wildfires as a result of my training, 22% are likely too, 11% are somewhat likely, and 44% are undecided. At the end of the training producers were asked if they perceive fire as being a likely threat. Only 11% said very unlikely, while 22% said somewhat likely, 44% replied Likely, and 22% replied very likely. There was also an interest in increasing more specific training of active fire suppression on the ground.</p>	4

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		<p>Ten months following training 80% of survey respondents reported creating a wildfire emergency action plan and 20% are still planning on creating one later. 40% have created a farm emergency map and 20% hope to create one later. 60% created a wildfire firefighting plan and 20% hope to later. 60% of participants created a wildfire prevention plan in writing, 10% have at least created a verbal plan and 20% hope to later. 40% of participants decided to stop harvesting operations for a day or a few hours due to hazardous fire weather conditions during the 2020 wheat harvest.</p> <p>Following the training, survey respondents reported doing the following:          18% reported clearing flammable debris from around farm infrastructure          9% created fuel breaks          18% grazed strategic areas to reduce fuel loads          27% discussed wildfire hazards, prevention, and firefighting strategies with those working on their farming operation          18% set criteria for equipment shutdown during fire weather conditions          9% identified and created safety zones and escape routes in the event of a wildfire</p>	
122.	Study of the Pathogenesis of <i>Mycobacterium paratuberculosis</i> , to innovate the therapy	<p><i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (MAP) is the causative agent of Johne's disease which results in chronic, and fatal diarrhea in ruminant species and hundreds of millions of dollars in losses for the agricultural industry. Natural infection usually begins with the uptake of MAP by the epithelium of the small intestine followed by translocation and ingestion by tissue macrophages and dissemination, via the lymphatic or blood system, throughout the body. To gain insights into the adaptation of MAP within phagocytic cells, a cell culture passage model that mimics the interaction of MAP within intestinal epithelium, followed by uptake by macrophages and the later release of the pathogen to infect the intestinal epithelium, was previously developed. The heat map analysis for gene enrichment revealed the predominant functional groups in the D1 group were related to cytokine signaling, positive regulation of defense response, cell activation involved in the immune response and adaptive immune system. These responses were absent in the II 24 hour and II 10 days groups of the macrophage infection. In those II macrophages, we observed enrichment in cellular pathways such as cell cycle, healing, cell surface integrins and SNARE trafficking signaling in these groups. It was hypothesized that macrophages that were infected with the passaged II MAP would initiate stronger binding to the endothelial cells and will leading to bacterial spread and dissemination. Identification of specific changes in the macrophage proteome during MAP infection significantly expands our understanding on the signaling pathways of the phagocytic cell and reflects the immune response that may allow the pathogen to survive within the host for an extended time.</p> <p>Characterization of how innate immune cells respond to changing bacterial phenotypes is the ultimate goal of this study. These data provide a new perspective of JD pathogenesis. Proteomics studies provide a refreshing source for interrogating complex disease processes and gaining insights. Massive data banks can only be useful, however, when navigated in light and knowledge of current literature and understanding of the subject matter. It is also important to pair proteomic findings with biological assays in an attempt to validate the proteomic findings. In this study we used both bioinformatics and branch top assays to investigate the host pathogen interaction.</p>	5

<p><b>123.</b></p>	<p>Comparative genomic analysis of <i>Vibrio</i> bacteria indicated genes potentially associated with virulence towards Pacific oyster larvae</p>	<p>Vibriosis has been implicated in major losses of larvae at shellfish hatcheries. However, the species of <i>Vibrio</i> responsible for disease in aquaculture settings and their associated virulence genes are often variable or undefined. Knowledge of the specific nature of these factors is essential to developing a better understanding of the environmental and biological conditions that lead to larvae mortality events in hatcheries. We tested the virulence of 51 <i>Vibrio</i> strains towards Pacific oyster (<i>Crassostrea gigas</i>) larvae and sequenced draft genomes of 42 hatchery-associated vibrios to determine groups of orthologous genes associated with virulence and to determine the phylogenetic relationships among pathogens and non-pathogens of <i>C. gigas</i> larvae.</p> <p><i>V. coralliilyticus</i> strains were the most prevalent pathogenic isolates. A phylogenetic logistic regression model identified over 500 protein-coding genes correlated with pathogenicity. Many of these genes had straightforward links to disease mechanisms, including predicted hemolysins, proteases, and multiple Type 3 Secretion System genes, while others appear to have possible indirect roles in pathogenesis and may be more important for general survival in the host environment. Multiple metabolism and nutrient acquisition genes were also identified to correlate with pathogenicity, highlighting specific features that may enable pathogen survival within <i>C. gigas</i> larvae. Further study of <i>V. coralliilyticus</i> and <i>V. tubiashii</i> is needed to (i) determine their infectivities in shellfish stressed by increased temperatures, low oxygen levels, acidified seawater, etc., (ii) examine the combined effects of environmental stresses and bacterial exposure on larval mortalities, (iii) quantify the prevalence and persistence of <i>V. coralliilyticus</i> and <i>V. tubiashii</i> in Atlantic and Pacific coastal environments and within hatcheries, (iv) better identify their molecular virulence mechanisms, and (v) determine if shellfish, corals, or other marine life are reservoirs supporting either the prevalence or the persistence of these pathogens in the marine environment. Since <i>V. coralliilyticus</i> is better known as a coral pathogen, research is also needed to identify potential causal relationships between coral disease and shellfish disease. It is unclear whether larval shellfish or corals are more susceptible to <i>V. coralliilyticus</i>, but such a determination would be within easy reach for researchers today. It would also be worthwhile to determine if <i>V. tubiashii</i> can infect corals, too, much as some strains of <i>V. coralliilyticus</i> are known to infect both corals and larval shellfish. The information provided in this work identifies some potential virulence factors of <i>V. coralliilyticus</i> required to cause mortalities in apparently healthy Pacific oyster larvae. It is hoped that this information will ultimately lead to better water quality monitoring within hatcheries to prevent outbreaks of shellfish disease.</p>	<p>5</p>
<p><b>124.</b></p>	<p>Prevent diseases in cattle and optimize cattle health and calf production by feeding selenium (Se) biofortified forages</p>	<p>Major parts of the US, including Oregon, are deficient in Se. Regional differences are reflected in the Se content of forages and in whole-blood Se concentrations in cattle consuming these forages. In plants (and in yeast), Se is incorporated into methionine as selenomethionine, and when forage is consumed by cattle, Se from selenomethionine is incorporated into selenoproteins, whose</p>	<p>5</p>

		<p>functions range from antioxidant, anti-inflammatory, and detoxification to thyroid hormone activation. We plan to supplement pregnant beef cows with Se-yeast at different stages of pregnancy, i.e., fetal development, to enhance proliferation of myogenic precursor cells and improve the efficiency of lean growth and pre-weaning calf performance. We will correlate postnatal whole-blood Se concentrations and muscle gene expression.</p> <p>We previously reported that feeding Se-biofortified alfalfa hay to weaned beef calves in a preconditioning program decreases morbidity and mortality during the feedlot period. To understand the mode of action by which supranutritional Se supplementation supports calf health, we examined the effect of agronomic Se-biofortification on nasal microbiome and fecal parasites. Recently weaned Angus-cross beef calves (n = 30) were randomly assigned to two groups and fed an alfalfa hay-based diet for 9 weeks in a preconditioning program. Alfalfa hay was harvested from fields fertilized with sodium selenate at a rate of 0 or 90 g Se/ha. Calculated Se intake from dietary sources was 1.09 and 27.45 mg Se/calf per day for calves consuming alfalfa hay with Se concentrations of 0.06 and 3.47 mg Se/kg dry matter, respectively. Feeding Se-biofortified alfalfa hay for 9 weeks was effective at increasing whole-blood Se concentrations (<math>556 \pm 11</math> vs <math>140 \pm 11</math> ng/mL; <math>P &lt; 0.001</math>) and increasing body weight (<math>P_{Treatment} = 0.03</math>) in weaned beef calves. Slaughter yield grades were higher for calves that had been fed Se-enriched alfalfa hay during the preconditioning period (<math>P_{Treatment} = 0.008</math>). No significant differences were observed in fecal parasite load, which remained low. The nasal microbiome and microbiota diversity within calves and across calves expanded from weaning (week 0) to the feedlot period (week 12), which was promoted by feeding Se-biofortified alfalfa hay. Especially concerning was the expansion of nasal Mycoplasmataceae in the feedlot, which reached over 50% of the total microbiota in some calves. In conclusion, we identified dietary Se-biofortified alfalfa hay as a potential promoter of nasal microbiome genome and microbiota diversity, which may explain in part high-Se benefits for prevention of bovine respiratory disease complex in beef calves.</p>	
<p>125.</p>	<p>Variable antigen production in <i>Chlamydia abortus</i> from Oregon sheep</p>	<p>Ovine Enzootic Abortion (OEA) is a disease associated with infection of pregnant ewes by the bacterial pathogen <i>Chlamydia abortus</i>. This pathogen is present in sheep flocks in most countries and can be a very significant burden both in terms of sheep health and economic productivity. The challenge of OEA is felt locally as well: <i>C. abortus</i>-induced abortion of sheep is a common problem in the Willamette Valley and throughout most of the western USA. Vaccines are available but there are significant concerns both about their efficacy and, in the case of the live attenuated vaccine, their safety to sheep and to pregnant farm workers. In this project we are examining the hypothesis that poor vaccine efficacy is a function of genomic attenuation during culture of the pathogen <i>in vitro</i>. To explore this, we have developed an egg-culture system that will allow full genome sequencing of the pathogen after culture in embryonated eggs and in cell culture. We will compare these sequences and determine if there are differences that are a function of the different culture conditions. If differences are identified, we will examine the specific proteins involved and ask whether they might be important proteins that function in protection against infection and disease.</p>	<p>5</p>

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		Genome sequence analysis of a variety of different <i>C. abortus</i> strains. The most noteworthy result is that a strain of <i>C. abortus</i> was collected from a fetus that was virtually identical to the vaccine strain used successfully on that farm. This shows that, even in the face of significant protection from disease, virtually identical strain can persist in animals on a specific farm. But, there is no disease on the farm, and thus the vaccine is protecting the sheep. The vaccine strain can be made available to any producer who wishes to use it, or perhaps to a company that wants to work on commercializing the product. There is also a tremendous opportunity here for exploring why this vaccine works and available commercial vaccines do not work so well, even though the preparation of the vaccine is generally similar in both cases. Creation of clones of individual strains that showed antigenic variation is a constant process and individual unique clones cannot be cloned out of a population. Established lines of communication among sheep producers that led to the successful creation of a fully sequenced <i>C. abortus</i> strains that protects against infection on different farms.	
126.	Development of a Rapid, Sensitive and Specific Probe-based Real-Time PCR for the Detection of Chronic bee paralysis virus, Sacbrood virus and Chalkbrood in honey bees	The honeybee pollination of crops is critical to Oregon's agricultural economy. There has been much concern over the steep decline in populations of honeybees due to Colony collapse disorder and other infectious diseases that abruptly wiped out entire hives of honeybees across the United States, exacerbating the already dire situation for honeybees. The most important causative agents of some of the most destructive honeybee diseases are Deformed wing virus (DWV), Paenibacillus larvae, Acute Bee Paralysis Virus (ABPV) and microsporidian parasites Nosema ceranae and Nosema apis. We have received funds to work on DWV and Paenibacillus larvae and therefore, we proposed to add Chronic bee paralysis virus, Sacbrood virus and Chalkbrood (a fungal disease) for this grant submission. The current diagnostic methods for these pathogens, such as culture and conventional PCR, are not only time-consuming, but their efficacy is hindered by low sensitivity and specificity. Hence there is an urgent need for rapid, highly sensitive and reliable diagnostic tests to detect the above pathogens. Our goal is to develop a rapid, selective, sensitive, and quantitative real time probe-based PCR assay to detect Chronic bee paralysis virus, Sacbrood virus and Chalkbrood. We have successfully developed a real-time PCR for Chronic bee paralysis virus, Sacbrood virus and Chalkbrood in vitro in spiked samples and validation of the tests in field samples have been completed. Out of 50 field samples obtained, only two samples had Chronic bee paralysis virus, one sample had Sacbrood virus and 4 samples had Chalkbrood. In conclusion, the above viruses and the fungal disease are not very much prevalent to affect the overall health of the bee colonies. The Information obtained from this study will enable the Oregon Veterinary Diagnostic lab and the OSU Honey Bee Lab to serve the stakeholders (growers and beekeepers) by providing timely diagnosis to mitigate risks to bee colonies, potentially strengthening the economic sustainability of both beekeepers and producers.	5
127.	Development of alternative strategy for Johne's disease control in dairy cows	<i>Mycobacterium avium</i> subsp. <i>paratuberculosis</i> (MAP) is a causative agent of Johne's disease that has a significant economic impact on the dairy industry. Johne's disease does not currently have a cure and to control MAP infection transmission in the dairy herds is very challenging due to long silent infection, the high rate of bacterial shedding in the environment, a lack of reliable low-cost diagnostic and effective preventive methods. One promising new solution for control, treatment and prophylaxis of MAP infections is to employ bacteriophages. Phages are bacterial viruses that	5

		<p>specifically infect and kill only bacterial cells, they are safe and inexpensive to cultivate. In addition, "phage cocktails" have been used as clinical therapeutics, environmental disinfectants and diagnostic tools. The goal of this application is to isolate effective phages against MAP and create an invaluable resource for research, development and ultimate production of phage cocktails to improve animal health.</p> <p>In our preliminary work, more than 800 pasture specimens have been collected from dairy farms and, out of 150 samples screened, we have identified 4 lytic phages against MAP. We will characterize for stability and genetically sequence these phages to create an effective cocktail. Based on our preliminary study, we believe that we successfully will identify more lytic phages against MAP. This will allow us to create more than one phage cocktail that can be alternated and used seasonally to have most efficient alternative product for Johne's disease control in dairy herds.</p>	
<p><b>128.</b></p>	<p>Improving thyroid hormone testing for hypothyroidism in llamas and alpacas</p>	<p>Hypothyroidism is a common endocrine disease in which the thyroid gland does not produce enough thyroid hormone (triiodothyronine and/or thyroxine). Hypothyroidism has been reported in every domestic animal. Primary hypothyroidism is the most common form of hypothyroidism, but other causes include deficiency of thyrotropin-releasing hormone or deficiency of thyroid-stimulating hormone, or consumptive hypothyroidism from excessive inactivation of thyroid hormone. Subclinical hypothyroidism can occur when there is elevated thyroid-stimulating hormone but a normal thyroxine concentration. Hypothyroidism is a serious clinical entity in llamas and alpacas, associated with a variety of symptoms. Smith and colleagues reported on a syndrome in hypothyroid llamas that presented with depression, low body weight, fleece abnormalities, anemia, and erythrocyte dyscrasia. Hamir and coworkers commented that thyroid nodular hyperplasia and cysts may be partially responsible for infertility in female llamas. McLaughlin and colleagues described symptoms of hypothyroidism in newborn llamas including reluctance to suckle, lack of vigor, unable to thermoregulate, and poor growth. Unfortunately, hypothyroidism in llamas and alpacas is rarely diagnosed by veterinarians because of confusion that exists around interpreting the test results. A number of studies have investigated thyroid function in healthy and unhealthy llamas using radioimmunoassay. Radioimmunoassay is considered to be the "gold standard" for which all other methods for endocrine concentration determination must be validated against. However, radioimmunoassay's have several disadvantages over other assay techniques, including short shelf-lives of the radioactive reagents, radiation safety hazards for personnel, and stringent requirements for waste disposal. As a result, measuring hormone concentrations by radioimmunoassay is more expensive and time-consuming compared to other methods. The majority of commercial automated immunoassay analyzers in use today utilize chemiluminescence because chemiluminescence is equal to or exceeds that of radiolabels in analytical sensitivity. There have been no studies published to date in which chemiluminescence has been utilized for determining any endocrine concentrations in llamas or alpacas. Research is needed to validate these chemiluminescence assays, so that clinical diagnoses (e.g., hypothyroidism) made following results obtained from these assays are reliable.</p>	<p>5</p>

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		<p>The goal of this research is to validate the chemiluminescence assays for thyroid hormones (thyroxine and triiodothyronine) in llamas and alpacas. This will be accomplished by measuring the thyroid hormone concentrations using radioimmunoassay and then comparing the reliability between the assay methods. Thyroid-stimulating hormone concentrations will also be determined using both assay methods to compare the reliability for this measurement as well. Samples from animals previously collected will be used. Although some hormones degrade over time even when kept frozen, the proposed hormones to be tested (thyroxine, triiodothyronine, and thyroid-stimulating hormone) have been shown to be stable (no sign of degradation) after 29 years in storage.</p>	
<p>129.</p>	<p>Moore Family Center Healthy Community Outreach Fellowships Train the Next Generation of Leaders</p>	<p>The OSU Moore Family Center is dedicated to helping individuals and communities live healthier through healthy foods and good nutrition. The Moore Family Center's goal is to take a multidisciplinary approach to understand the role of all foods, including whole grains, in health promotion and disease prevention. Through research, education and outreach, the center connects the science of whole foods and nutrition to its practical application in the community. The Moore Family Center partners with OSU Extension Service health outreach programs to reach every corner of our State with information and resources to enhance nutrition and healthy living programs and to positively influence the food environment.</p> <p>An important part of this work is training the next generation of leaders in nutrition and health promotion. Our College of Public Health and Human Sciences students deserve the opportunity to learn from the great work happening in communities through Extension. However, it has historically been difficult for faculty working in counties located far from campus to recruit student interns. By providing paid fellowship opportunities, we are better able to engage our students from diverse backgrounds in doing work in rural and underserved communities.</p> <p>OSU students have been significantly impacted by COVID 19 restrictions as opportunities for engaging internships in summer 2020 dried up due to organizations transitioning to remote work and limiting outside visitors. The OSU Moore Family Center was determined to still find ways to support our students through our paid summer fellowship program for students in the OSU College of Public Health and Human Sciences. Working in partnership with OSU Extension county-based faculty, these paid positions provide funding and career training opportunities for students to work in communities across Oregon to improve health, nutrition and the food environment. Thanks to the flexibility and creativity of our county faculty we were able to still support three students in completing fellowships this summer in remote / hybrid internships. The three Extension host sites who mentored fellows in 2020 included Hood River County and the Columbia River Gorge region (Strong Women / Strong People Project), Deschutes County (Food Hero at the Farmers Market and Kids on the Move project), and Benton County and beyond (Master Food Preserver Digital Media Campaign).</p> <p>Three CPHHS undergraduate students successfully completed their summer fellowships under the</p>	<p>6</p>



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		<p>mentorship of Extension FCH Faculty. The students worked on projects dedicated to creating online and digital engagement tools to support online and remote Extension education programs. More information about the summer fellows projects on the Moore Family Center website here: <a href="https://health.oregonstate.edu/moore-center/hcop/fellowship">https://health.oregonstate.edu/moore-center/hcop/fellowship</a>. This summer fellowship opportunity will be available through the OSU Moore Family Center each year.</p>	
<p><b>130.</b></p>	<p>Juntos shares impact with a national audience</p>	<p>Outcomes of pre-college and youth development programs are often measured through a white-centric lens that discounts the cultural capital of people of color and first-generation students and families. In an environment where Latino students experience persistent disparities in high school completion and college access, it is imperative to offer pre-college support that honors the socio-cultural context of Oregon’s Latino communities.</p> <p>Juntos is unique among college access programs because it engages students’ families in learning about post-secondary pathways and making college a family goal. Program delivery utilizes a community partnership model which promotes investment from local stakeholders in educational equity for Latino learners.</p> <p>To address systemic biases in our education system, the Juntos evaluation assesses the school and community environment with measures associated with student outcomes in K-12 and post-secondary settings. Since this framework was implemented in 2016, data from the evaluation has been used to inform Juntos curriculum updates, engage partners in equity work, and secure financial support from University and external sources.</p> <p>With the demonstrated success of the Juntos program and evaluation models, we have utilized engaged scholarship to share program impacts across disciplines. In 2020, the Juntos team delivered peer-reviewed presentations at:          The Oregon Public Health Association annual conference          The American Evaluation Association annual conference          Hispanic Association of Colleges &amp; Universities annual conference</p> <p>A research brief on findings from the Juntos evaluation was published in the Journal of Extension and another paper is currently under review. An abstract for 2021 annual conference for the National Institute for the Study of Transfer Students has been accepted. The OSU Juntos program and evaluation model has been recognized by the national Juntos 4-H program as an example of effective culturally-responsive evaluation and OSU Juntos co-facilitated development of common measures to be implemented in nine affiliated states.</p> <p>During COVID-19, presenting at virtual conferences and symposia enabled the Juntos team to maintain engagement with research and scholarship despite the challenges of remote work and program delivery. The AEA conference session reached over 400 people on the virtual platform, and we estimate over 100 people attend the HACU session.</p> <p>The diversity of scholarship activities associated with Juntos demonstrates the relevance of this work, particularly as it pertains to promoting Latino educational equity, across sectors. These scholarship activities also represent opportunities for collaboration and professional development</p>	<p>6</p>

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		within the Juntos team. The above scholarship activities are the product of collaboration among ten Open Campus faculty members, three community partners, two graduate students, and one undergraduate student.	
131.	4-H & U: Free Online Education by Mentors to Students	4-H & U is an online-based educational program that is free for youth. With a variety of STEM and Arts programs, 4-H & U makes it easy for students to sign up to our many 4 week long classes and limited to a maximum of 8 students. During the year 2020, the program served over 230 youth and offered 29 different courses. Developed curriculum, co-taught classes, trained volunteers/instructors, taught individual classes, created marketing material, managed class registry, and kept families engaged via news letters, managed to connect with OSU College of Education to provide volunteer teachers via partnership. 4-H & U managed to teach 29 different courses and enroll 232 students. Classes were offered from Spring into Winter 2020.	6
132.	Mental Health Support for Students and Storytelling Retreat	Due to COVID-19 many in-person academic programs and extracurricular activities had to be postponed or canceled. Opportunities for youth to connect with peers and mentors are limited and unfortunately, this is having an impact on our students' mental health. During the week of July 27-31, we offered a virtual summer camp (Semana Sensacional de Verano) for students 9-12 grades, serving a total of 18 students from various counties in the state, including students in Lane, Klamath, Josephine, and Jackson counties. The three values for Semana Sensacional de Verano were connection, fun, and wellness. Mental Health was a priority for our program; we connected students to a local mental health therapist and a life coach who lead a class on coping skills and offered virtual office hours for individual support. On the last day of the camp, we partnered with a local non-profit organization that utilizes the power of stories to heal, connect, and enrich communities to lead a storytelling workshop. Our students felt empowered to share their personal stories with peers and find similarities and connection through their stories. During the week students met college students, mental health experts, and our staff that they can reach out to regarding future planning and life skills to guide them in their academic journeys	6
133.	Southern Oregon Fire Relief Efforts	On September 8, 2020, a massive fire impacted multiple towns in Jackson county completely or partially destroying more than 2,300 structures. Out of the 19 Juntos families we serve in the Phoenix-Talent School District, 11 families lost their homes or were temporarily displaced. OSU Extension supported various agencies offering services at the Jackson County Expo, which served as the main resource center and shelter for the region. Helped families fill out intakes to identify what agencies and services they needed to be connected to. Participated in weekly multi-agency meetings to discuss concerns or updates regarding government assistance and MARCs (Multi Agency Resource Centers) established throughout the region. Because of our previous relationship with Latino families in the Phoenix-Talent School District families and across the county, our staff served as community advocates; connecting not only Juntos families but many other Spanish speaking community members to partner agencies and appropriate resources (shelter, food & hot meals, monetary assistance, among other services).	6

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134.	Jefferson County 4-H COVID Fair Livestream	<p>As COVID-19 has impacted everyone in different ways. Both youth and families of Jefferson County 4-H were limited to the number of public audience that could attend and support the youth while they were exhibiting their projects they had worked so hard on throughout the year. The decision was made to livestream the livestock shows. Using equipment that was purchased to create quality videos we were able to stream the 4-H and FFA youth exhibiting their animals live. A web link was created with the title of each class and shared via the Jefferson County 4-H Facebook page for parents, grandparents, friends and public supporters to watch live. OSU Extension professionals tracked the outcome of this project using Facebook insights. Insights shows the level of interest in the post or in this case, the link being clicked on. Total reach for fair was 7,132 people. We were also able to track views from YouTube as well which were: total views 4853, the average views per livestream were 180, and 922 views of the youth market auction. As Jefferson County is a rural farming community and fair is during bluegrass harvest, we heard many farmers were streaming the live video while in the combine. We have been asked to continue this project each year for those that are not able to attend in person.</p>	
135.	OSU Babysitter Training Prepares Teens for Caring for Younger Children	<p>Teen babysitters have always been in need; however, during a pandemic they are more in need than ever before, activities are more limited than ever before and training opportunities are limited. Babysitter training has been relevant for years. Providing teens with tools to successfully care for children for short periods of time has been great for entrepreneurial skill building and a pathway to early child care and education. During the 2020 pandemic these skills are even more important as many youth are positioned unexpectedly to care for younger siblings, neighbor children and extend family. This in-person training was adapted to virtual to meet the high demand of teens wanting to learn basic child care skills. Through three virtual courses conducted, 38 teen babysitters were trained in the basics of child care including baby care, toddler care, healthy snacks, business tips, age appropriate games, first aid and safety.</p> <p>The curriculum was shared with colleagues across the state and in the first two virtual courses we had 25 counties represented and one from California. We taught a total of 156 youth. Additional workshops were added by counties to capture another 20 participants. The 4-H team will continue to offer this program virtually statewide 3-4 times a year.</p>	6
136.	COVID summer youth programs closures demand pivot to at-home activities to keep learning	<p>Normal summers, the Portland SNAP-Ed team present lively, interactive hands-on nutrition classes, cooking healthy recipe and playing fun physically active games. This year, due to COVID, has been anything but normal. Stay safe at home orders and school closures demanded programs look at ways to pivot nutrition education delivery models.</p> <p>Summer meals, continued to be provided to all youth as grab and go, pick up. Portland Public Schools Nutrition Services, as the meal provider to schools and park sites in Multnomah County, partnered to provide Food Hero Kids activity sheets for pick up with meals. Kids activities sheets, with games, recipes and coloring activities were paired with meals at all PPS school (14) and</p>	6

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		<p>Portland Parks and Recreation (26) meal sites in Multnomah county.</p> <p>9500 take home Food Hero kids activities were delivered to hungry kids in July and August 2020. The Food Hero Strawberry Activity Sheet delivery was perfectly timed when strawberries and yogurt were on the menu. Several youth, who picked up lunches at a meal site in SE Portland, used the strawberries and yogurt to whip up the strawberry smoothie recipe from the sheet.</p>	
137.	<p>Teamwork to create Asynchronous Lessons for school aged youth during the pandemic</p>	<p>Due to COVID school closures that curtailed all in-person youth school programming, the Portland SNAP-Ed team had to adapt and develop digital nutrition education lessons to meet the needs of our school partners for the 20 – 21 school year. Schoolteacher and administrator partners were surveyed to determine lesson formats and digital tools that would best support nutrition education needs and goals of our SNAP-ed youth and family clients. A plan to create weekly asynchronous lessons that teachers could post to their virtual classrooms was developed.</p> <p>Our collaborative efforts have met the needs of our partners, providing weekly video lessons covering Food Hero Feature Foods and a six video MyPlate series. Drawing content from USDA, MyPlate and SNAP-Ed approved curriculum, lessons are further enhanced with materials from the Oregon State University Extension Service Food Hero website. Paring lessons with Food Hero recipes and topic-relevant activity and coloring sheets, the lessons have actionable resources and promote healthy living for youth and families.</p> <p>4,600 students in 11 Portland Public Schools received these lessons during their remote school October – December 2020. Additionally, because of the success of our work, we provided a training for Oregon State SNAP-Educators, inspiring colleagues and providing needed resources to use statewide.</p>	6
138.	<p>Student Watershed Assessment Teams provide high school students with real-world experience in environmental monitoring while producing usable data for agencies and organizations</p>	<p>In Jackson County, as in many other parts of the state, there are far more restoration projects needing pre-project or follow-up monitoring than there is money or capacity to complete monitoring. On the other side of the equation, high school students preparing for college may not be aware of the possibilities of a career in environmental science and natural resource management, or may not understand the requirements of such a career.</p> <p>The Student Watershed Assessment Teams (SWAT) program is designed to both engage students by giving them hands on experiences with environmental monitoring, while also helping to fill in the capacity gap some agencies and organizations have to monitor field sites. Students visit sites ranging from sub-alpine forests to valley riparian zones, collecting data on water quality, vegetation, forest stand inventory and fuel loading.</p> <p>Since 2014, we have partnered with Logos Charter School, with science teacher Chris VanNess and his students for this program. Participation by students is limited to those whose applications are accepted to the program, and van space for transportation, meaning that the class is limited to</p>	6

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		<p>about 12-15 students per year.</p> <p>At the end of the academic year, students present the results on their activities to the funder Jackson Soil and Water Conservation District, and collected and processed data is sent to the relevant agencies and organizations.</p> <p>The Covid-19 pandemic hit the SWAT program significantly. In person classes were ceased early on so only 2 of the final 5 site visits to be completed for the 2019-2020 academic year could be completed. Students were able to do a day of data entry with online instruction and presented their results to Jackson Soil and Water Conservation District in May via Zoom. SWAT is on hiatus for the 2020-21 academic year but is expected to resume in the 2021-2022 academic year. For the 2019-20 academic year, SWAT recruited 10 students and collected data for Oregon State University at the Collins Demonstration Forest monitoring tree mortality and Bear Creek in partnership with the Rogue Valley Council of Governments to monitor water quality. Plans were made to continue monitoring work at the US Forest Service at the Cascade Siskiyou Monument before Covid-19. The 2019-20 academic year for SWAT has 10 students.</p>	
<p><b>139.</b></p>	<p>4-H Members are Thriving as Writers, Illustrators, and Readers</p>	<p>4-H members were struggling from a lack of motivation to keep engaged after being quarantined for over half a year due to Covid-19. Mental health was on decline. Youth also didn't have the opportunities as they did before to build on and showcase their skills in creative writing, art, or public speaking. Most importantly, they didn't feel they had opportunities to interact with their peers.</p> <p>Part of the issue was that our county contests and programs were being cancelled or made virtual so it always seemed something was being taken away, rather than added to their options.</p> <p>OSU Extension received feedback from our 4-H leaders during leader meetings and the Benton County 4-H Ambassadors during one of their meetings on a program I had been planning. It was called the 4-H Reading Circle. It would encourage group work in order to create a book and share it with the public, including our Cloverbud members. Youth would sign up as writers, artists, and/or readers. They would create a book that would be printed. Then they'd read the books to the Cloverbuds over a Zoom call.</p> <p>The project was well-received at meetings and I created an application. We had twenty-four applicants, most of whom stayed involved even as meetings had to stay virtual.</p> <p>A partnership was also created with the Public Library system in Benton County to have the books available for check out once printed. The library coordinator agreed to purchase copies of the books for each of the four branches in Benton County (Corvallis, Aalsea, Monroe, and Philomath). She also agreed to having the participants record a reading of their book and sharing the recordings on the Public Library website, providing an additional opportunity for the youth to build communication skills.</p>	

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		<p>Plans were made to get the books translated to Spanish and, pending a potential partnership, Braille as well.</p> <p>Virtual planning, teaching, and collaboration meetings have been taking place so far. The 4-H members started with a pre-evaluation to see growth through the project. They also learned about what makes a good children's book, how to improve their current skills, and the goals of the project. Despite other groups struggling to maintain participation with Zoom meetings, the 4-H Reading Circle participants continue coming to meetings and are energetic when they do. We've played games at the start of meetings that help them with their story-writing, get energized, and bond. The 4-H members also cheer for their fellow participants when they share their stories. Camaraderie is high with the group, despite the wide age range (9-17 years). Having a goal of having their book out for the public to see has been a huge motivating factor for the 4-H members. They've also enjoyed the input they get to have in the logo for the program, t-shirts, and all aspects. It has created buy-in and a sense of responsibility for the success of the program.</p> <p>So far, members have shared sentiments such as "I have enjoyed being in reading circle and I am excited for all of our books! They are going to turn out great".</p> <p>This is an ongoing project and we will complete the first round in mid-2021. We will open the second round up to other counties around the state that want to participate.</p>	
140.	4-H Central: At Home Magazine for Oregon Families During COVID-19	<p>4-H Central is a biweekly magazine provided to our families for free by 4-H's Marion County team and is available to anyone in the state of Oregon. With over 100,000 devices reached, our biweekly magazine is bilingual and available to anyone with access at: <a href="https://beav.es/4fv">https://beav.es/4fv</a></p> <p>Thirty issues were released reaching over 100k viewers. The publication was released in English and Spanish to reach a more inclusive audience.</p> <p>Recognized as National 4-H website as a "Resource of the Month" and shared statewide.</p>	
141.	Virtual Outdoor Explorers Camp	<p>Local organizations identified a lack of hands-on opportunities for youth to engage with environmental literacy curriculum within community parks and outdoor spaces. In addition, there was a lack of non-sports physical activity programs, designed to provide healthy living opportunities to youth not interested in traditional sports programs. These issues were exacerbated by the stay at home orders that came as a result of the COVID-19 pandemic.</p> <p>To address these needs and increase environmental literacy, promote healthy living through physical activity, and connect youth to their local outdoor areas, we developed a place-based Outdoor Explorers camp. Polk County 4-H worked with Monmouth and Dallas Parks and Recreation to identify programmatic goals, and secure outdoor spaces to provide enriching STEM education in the camp setting. We then developed engaging curriculum designed to immerse youth in outdoor STEM learning, incorporate physical activity, and develop healthy living skills through</p>	6

		<p>nutrition education. This camp engaged professionals from numerous organizations including Oregon Department of Fish and Wildlife and the Bureau of Land Management who would provide expertise and enhance educational programming with real-world applications.</p> <p>In addition, we engaged our Polk County 4-H Ambassadors in the planning process, providing quality youth leadership opportunities. The Ambassador group helped to plan lessons, design promotional materials, and develop strategies to increase comradery during camp. In addition, the Ambassadors were trained to teach STEM lessons, and act as camp counselors during the event.</p> <p>Due to the COVID-19 pandemic this camp was converted to a virtual platform. While this conversion created barriers to meeting our initial program goals, it also created opportunities to increase program accessibility and widen our reach. As part of the virtual conversion, we developed camp kits containing supplies needed to participate from home. These kits added value and excitement to our virtual camp, and helped make it an immersive educational opportunity for all. By providing camp kits free of charge and offering no-contact curbside delivery, we were able to expand many family's ability to participate. In the post camp survey 100% of respondents stated that the camp kits increased accessibility, and 72% stated that they would have been unable to participate if the camp kits were not provided and delivered. The elimination of resource, transportation, and economic barriers increased the accessibility of this program despite being unable to provide an in-person opportunity.</p> <p>We utilized Zoom and age specific breakout rooms, where trained volunteers provided daily instruction. Youth were paired with the same teen leaders each day, creating an opportunity to develop healthy peer relationships, create mentorship opportunities, and increase stability throughout the camp experience.</p> <p>Over three days, thirty-five youth in K-5<sup>th</sup> grades and eleven youth in 9<sup>th</sup> – 12<sup>th</sup> grades participated in the virtual Outdoor Explorers camp as campers and counselors. When asked to rate the camp on a scale of 1 (terrible) to 5 (excellent) nearly all respondents reported their camp experience was excellent, with just two respondents indicating it was good (4). Youth participants were eager to participate each day, and many parents expressed that their child's excitement and enthusiasm lasted long past the camp's end. Campers expressed interest in learning more about the outdoors, and enthusiasm in exploring their outdoor spaces.</p> <p>In an anonymous post camp survey, camp counselors unanimously rated this camp as an overwhelming success. Furthermore, counselors indicated that the planning and implementation experience gained at this camp increased their confidence, comradery, and planning abilities. Finally, counselors expressed that the social and emotional impacts of this camp during quarantine were great, and provided youth with a positive outlet to engage with their peers.</p> <p>Overall, this camp was rated a success by participants, parents, and volunteers, who are all looking forward to the next opportunity to participate in the Outdoor Explorers Day Camp. We are excited to have had the ability to offer this long running camp virtually during these trying and</p>	
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		difficult times, and to provide a positive experience and happy memories for all involved. This camp sparked an interested in STEM for many participants, and similar activities are currently in development.	
142.	Sparking interest in Natural Resources	<p>In a normal school year, elementary and middle school students would be participating in numerous out of school activities. At the beginning of the 2020-2021 school year staff at Tillamook School District #9 and partner organizations knew that the "normal" yearly natural resource field trips, in-school programming, and other supplemental activities were not going to occur due to COVID-19 restrictions.</p> <p>The group of partners came together to brainstorm how to bring the same level of education into the homes of students in our communities. The decision was made to create Naturalist Kits to be delivered to students in the entire county grades 3-6. This kit would include items such as: science journal, magnifying glass, measurement tools, and assorted writing instruments. Items needed to complete a set of activities curated by the group to get students outside and learning. Once, the kits were delivered the group started to create activity videos that walked students through each activity. Activities included plant identification, observing the environment, journaling their findings, etc.</p> <p>As a result, 1600 kits for students in Tillamook County. Seven videos that included activities such as plant identification, observing the environment, journaling their findings, etc.</p> <p>One impact of this project is the idea of getting families outside and learning about the nature around them in a safe way during a pandemic. The activities were focused on the youth however, with the age participating we knew that a parent would have to be a part of the experience. The group felt that we needed to provide more than just education on a computer screen but have the students go out and explore with their families. This not only provides education for the youth but provides opportunity for family activities that are outside in nature.</p> <p>The project is starting point for science education at home in the county.</p>	6
143.	Wildfire Curriculum for Community Resilience and Career Pathways, curriculum development and in-school implementation	<p>Agencies such as the Oregon Department of Forestry are often looking for up and coming students who have an interest in a career in forestry or wildfire, but students are not always aware of the opportunities available.</p> <p>A Landscape Restoration Scale grant was awarded to the Oregon Department of Forestry to develop a foundational but comprehensive curriculum to bring tangible and practical education in forestry and wildfire careers to local high schools: The Wildfire Curriculum for Community Resilience and Career Pathways. Oregon State University was brought on board to do much of the work developing the curriculum and implementing it in schools.</p> <p>The 5 modules of the curriculum include: Living in an Era of Megafires, Forests in a Wildfire-Prone Environment, Exploring Wildfire, Wildfire Careers and Protecting your Community from Wildfire.</p>	6



		<p>OSU Extension continued drafting the curriculum and now has a working draft to be utilized in class. We have expanded the original 4 modules to 5 and added more activities for teachers to use to illustrate concepts. By the start of 2020 we were on track to complete implementing modules in two classes at two different schools when Covid-19 forced the closure of those schools. Ultimately, only two modules in one class and almost 3 in the other were completed for the 2020-21 academic year. This represented 34 students have been a part of these modules which include 3-8 hours of classtime and one follow-up field tour for each module. Partners include the Oregon Department of Forestry, the Southern Oregon Forest Restoration Collaborative, the Oregon Forest Resources Institute, Keep Oregon Green, the Bureau of Land Management, the US Forest Service, the Southern Oregon Land Conservancy and the Applegate Partnership.</p>	
<p><b>144.</b></p>	<p>Through SBS Network, Out of School Youth STEM Educators Respond to Changing Conditions</p>	<p>The statewide SBS project focuses on increasing access to STEM professional development (PD) opportunities for out-of- school educators statewide who work primarily with students experiencing poverty, students of color, English Language Learners, and students with disabilities in grades 3-8. Out of school programs may provide students with their only access to and engagement with STEM learning opportunities.</p> <p>The goal is for programs to develop and deliver programming that increases students’ “STEM identity” - their perception of themselves as a student who can excel at STEM subjects - a key predictor of student success in post-secondary STEM opportunities.</p> <p>Through a networked community of practice and PD opportunities, project activities will increase high-quality out-of-school STEM learning for our educators’ students by increasing the use of research-based best practices through the STEM Beyond School (SBS) 4 Core in after-school STEM programs. PD opportunities empower out-of-school educators to provide learning opportunities for youth that incorporate the practices of the Next Generation Science Standards (NGSS), and SEL in community and culturally based programs, synthesized by the 4 Core:</p> <ol style="list-style-type: none"> <li>1. Students are doers and designers. “I (can) do it.”</li> <li>2. Activities are place and community based. “It’s relevant to my life.”</li> <li>3. Youth interests drive programming. “I have Voice and Choice.”</li> <li>4. Youth apply their learning to new situations. “I can do what I’ve learned again and apply it to a new problem.”</li> </ol> <p>The SBS Community of Practice builds capacity of our educators to develop and provide relevant and inclusive out-of-school STEM programs and creates new regional and practitioner relationships through our networked statewide community, including the STEM hub network.</p> <p>The after- and out-of-school field and staff have been highly impacted by school and facility closures associated with the pandemic. SBS is primarily a virtual network, but we adjusted formerly hands-on workshops/events to be provided online and respond to changing conditions and needs such as virtual supports and trauma-informed practices. Through Dec. 2020, SBS directly provided the opportunity for 60 hours of Professional Development for after- and out-of-school elementary and middle school educators statewide, including webinars, workshops, trainings, reflective</p>	<p>6</p>

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		<p>practice, and discussion; from March-Dec., 44 educators collectively participated in over 620 hours not including partner offerings. SBS educators represent a wide range of programs: youth development organizations including 4-H, non-profits, museums, CBOs, libraries, and outdoor watershed-based educators. As of Nov. 2020, they reported working with students from 35 districts statewide; school district data includes geography where students were served before and during the pandemic.</p> <p>Rather than just providing one-size-fits-all PD, SBS crowdsourced educators' needs and leveraged expertise statewide to address specific training/coaching needs. SBS STEAM educators have explored and implemented (where possible) new ways to support student learning within conditions imposed by CoVID including adjusting to deliver virtual programming or provide emergency child care. A critical part of the educational ecosystem, out-of-school time supports hands-on inquiry and real-world learning, and providers are flexible and dedicated to supporting student needs and interests.</p> <p>STEAM best practices that are key to SBS (SBS 4 Core, the NGSS Practices, and the National Research Council's (NRC) "Identifying and Supporting Productive STEM Programs in Out-of-School Settings") are well-suited to providing trauma-informed programming to youth during and after this time. We also employ a growth mindset to provide ongoing virtual learning to model new approaches, have our educators try them out for their youth, and share their innovations-successes-challenges with one another, to continue to respond to changing conditions.</p>	
145.	College Access for High School Seniors - peer to peer	<p>Out of 5 high schools we have less than 1 full time dedicated counselor in our county, and a college going rate of 19% in the county, while Oregon is at 33%, and our urban peers sit at 37%. Many youth are disconnected from college access and lack an appreciation and understanding of how to apply for college and financial opportunities, how to prepare for life after high school, and what to expect.</p> <p>Students at Prairie City school participated in a series of zoom experiences over a 8 week period with current OSU college students facilitated by OSU Open Campus in partnership with the Prairie City School faculty. Topics included types of colleges and degrees, financing higher ed, housing, stress management and more.</p> <p>Prairie City Seniors have a peer experience that has given them examples and time to navigate through the next few months of graduation and then entry into post secondary education. They have also created relationships with college students and Open Campus faculty for continued support through critical decision making times. All seniors have completed their FAFSA! Data collected after the series demonstrated the following: Over 80% of students reported it will help motivate them to complete high school. Over 70% of participating students reported it motivates them to go to to college Over 50% stated it has created conversations with their parents about college 87% of students discussed that they were better able to find answers to questions concerning college.</p>	6

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<p><b>146.</b></p>	<p>Building Foundational Elements Necessary for Youth to Explore Teaching as a Career Through Experiential Learning</p>	<p>Teen Teacher Corps (TTC) is a program designed to empower youth, ages 13 – 18, to explore teaching as a career through experiential learning. Learning goals and objectives of the TTC program include building enhanced communication skills, writing competence, time management awareness, organizational proficiency, teamwork, leadership expertise, creativity, confidence and instructional skills.</p> <p>COVID-19 necessitates virtual delivery of the TTC program and subsequently has eliminated the barriers of time, travel, and distance and has thus positively enhanced accessibility to diverse, remote and underserved communities.</p> <p>From October to December 2020, virtual delivery and statewide collaboration of the TTC program made it possible for colleagues of OSU Extension Service to lead six weeks of programming nationally, reaching youth, partners and volunteers in Oregon and beyond. The program continues to thrive into the 2021 calendar year.</p> <p>Nationally, TTC teens completed six weeks of training and at the conclusion of the training, Eastern Region teens were provided a t-shirt and a stipend payment as a recognition of their industrious work. Malheur County Extension Program Coordinator Barbra Brody successfully obtained the opportunity to endow the stipend through the Healthy Communities Grant funded by Bob’s Red Mill Natural Foods, Inc. When given the choice, Eastern Region TTC teens participants opted to create an Eastern Region TTC workgroup, spawning an offshoot of the Teen Teacher Corps program creating, the Eastern Region Teen Teacher Corps initiative.</p> <p>Finally, as the Eastern Region TTC program progresses, the cost of materials and supplies will be covered by grant monies, henceforth costing Oregon State University zero dollars.</p> <p>The Teen Teacher Corps service-learning program has taught teens to identify, address and access goals, objectives, needs and opportunities for target audiences. Youth show a clear and driven motivation to learn new skills through exploring the teaching profession by active participation, submitting relevant materials, and program contribution. The TTC program is an ongoing program and the number of individuals influenced is unknown but the potential to reach several hundred individuals is possible.</p>	<p>6</p>
<p><b>147.</b></p>	<p>Animal Science Education Continues Virtually</p>	<p>Educational opportunities for 4-H Animal Science members have been abundant in spite of the “pivot” to virtual programming beginning in March of 2020. The COVID-19 pandemic led to many in-person 4-H opportunity cancellations and others that had to be postponed or transitioned to virtual events. Animal Science projects were no exception to this challenge. Providing on-line opportunities with similar education, competition, leadership, and social interaction as traditional shows and fair experiences, not to mention interactive contests like Quiz Bowls, Skills and Judging Contests, would prove to be a significant hurdle. In fact, providing that traditional fair feel or a</p>	<p>6</p>

		<p>Spring Classic awards ceremony with over 300 people in attendance were just a couple things we knew we could not provide. However, instead of spending our focus on what could not be provided, we began to focus on what we could do.</p> <p>With a focus on youth and adult interaction, youth engagement, animal science education, and positive youth development the work began. First in an effort to keep youth engaged in learning about animals, Animal Science Challenges were developed, first weekly, then every 2 or 3 weeks up to the virtual fair season. Members were able to practice and learn with small and large animal, as well as a variety of project specific challenges. First with traditional fillable pdf documents and then the technology journey began. With simple online programs like EasyTestMaker, Kahoot!, Livestockjudging.com and others, challenges became more interactive, fun, and not as labor intensive. Scores were tracked with winners announced for each set of contests and finally overall winners who participated in multiple challenges, over 400 unique members participated in nearly 50 individual tests.</p> <p>In the midst of the challenges, it was Spring Classic time. This event previously hosted in-person, was a long-time horse only contest, but transitioned just two years ago adding livestock and in 2019 small animals were added – and now we needed to make it a virtual contest. Spring Classic includes intermediate and senior competitions in 5 different project quiz bowls, 2 project skills contests, 4 project judging contests, and 3 different project areas of public speaking and presentations. Providing a quality experience for participants, engaging them fully, and recognizing their intense efforts of practice and readiness would prove to be a new challenge. The team of professionals who helped make this endeavor successful and a respected and valued event included University IT, 4-H Staff and Volunteers; but those who made it most special, the committed youth and their coaches who participated. Over 100 volunteer coaches and nearly 400 4-H members participated in a variety of contests. Survey results gathered following the event, noted that 63% of the respondents had a “better than expected” experience and 86% “would participate virtually again if necessary.” This as a win; a quality first effort.</p> <p>In addition to these two significant opportunities, we also hosted a virtual Showmanship Contest. Touted as “showmanship different than before...” The event was open to intermediate and senior animal science members since it was “in lieu of the state fair experience.” Members from all areas of animal science participated, 65 members in all. They brought their animals to a ZOOM interview with a committee of judges and were scored on handling, preparedness, knowledge, and interview skills. Every interview was special and every judge, without exception, felt much joy from their youth and animal interactions. Members competed and received awards for recognition, a social media slide show during 4-H week and results and photos were shared on the statewide 4-H web pages.</p> <p>To conclude the summer opportunities, a small statewide virtual Ranch Horse show. Members submitted videos of roping and cow working, participated in a knowledge competition, and submitted a marketing flyer all as part of the statewide Ranch Horse Skills Invitational. This contest was not simply impacted by the pandemic, but wildfires postponed the deadlines for nearly 6</p>	
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		<p>weeks. Those that still chose to participate did so with competence, confidence, and enjoyed the opportunity.</p> <p>While switching so much to virtual opportunities has been challenging, labor intensive, and at times even a bit frightening for organizers and participants alike, much has been gained. I have had many opportunities to engage with youth by interviewing, answering questions and gathering information. Quality and often communication was a necessary ingredient in the success of all opportunities and often that communication was directly with the youth we serve; without exception those times have been the best part of 2020.</p> <p>Additionally, lots of new computer and software applications that I previously did not know existed were now valuable tools; the learning curve was steep, fun and worthwhile. Youth who participated were engaged in learning; animal science education, more than competition, became a genuine focus. Youth participated; with so much screen time required for school and other engagement, I wasn't sure, but we provided well organized inclusive events and youth participated and in most cases would do it again if necessary.</p> <p>Animal Science looked much different across our state in 2020, but education, youth development, youth engagement, and fun opportunities prevailed. Challenging, difficult, and <b>worth the effort</b>.</p>	
<p>148.</p>	<p>A Rapid Response Call is Answered with New Partnerships and Innovative Solutions</p>	<p>COVID-19 illuminated disparities of young people's access to learning opportunities and connections to inspiring mentors. After the quick transition to distance learning, teachers and caregivers share one difficulty is keeping young people engaged with virtual lessons. In particular, the lack of hands-on STEM and agriculture learning and experiences attenuated effectiveness in sparking interest, fostering connections, and building skills. Recognizing the immediate need of learners and educators in a COVID-19 era for accessible and engaging virtual agriculture education resulted in a rapid response call for federal funding.</p> <p>To address this immediate need, a team forging new partnerships, fostering connections with community partners and focusing on youth engagement created an innovative solution. Together, Oregon State University's Precollege Programs, SMILE Program, and OSU Extension 4-H Youth Development Program led the effort with community partners to implement a Distant Immersive Virtual Education for Agriculture Literacy (DIVE4Ag) toolkit. One pivotal partnership is Timelooper, a virtual and augmented reality technology team that creates immersive educational experiences. Agriculture in the Classroom, Oregon Farm to School, OSU Extension Sea Grant, and Washington State Extension partners will leverage their networks to amplify DIVE4Ag's impact. Local farm producers, school administrators, and agriculture experiment stations are instrumental to connect young people to ways agriculture impacts communities from farm practices to products that feed and enrich their lives. Finally, the thoughtful partnership between OSU Precollege Programs and Extension 4-H Youth Development brings youth co-creation and social-emotional learning to virtual programs.</p> <p>The DIVE4Ag project will deploy agriculture distance education virtual programming for youth in</p>	<p>6</p>

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		<p>middle and high school, provide professional development for educators, and strengthen connections with agriculture experts and local farmers. The open resource toolkit will include virtual reality apps giving kids and teens the opportunity to experience aquaculture, dairy, horses, sustainable and urban agriculture. Encompassing hands-on activities, OSU Beaver Hangouts, and Ag Teen Science Café programs, brought to the DIVE4Ag project by OSU Precollege programs and Extension 4-H will deepen youth engagement. Furthermore, the 4-H Teens as Teachers approach is utilized to incorporate youth co-creation and skill building for the virtual reality apps and Ag Teen Science Cafes. OSU Precollege programs' expertise working with educators bolsters the fidelity of educator professional development. Throughout DIVE4Ag, robust program evaluation is integrated to measure the impact on youth, educators, and partnerships. Combined, the open source DIVE4Ag toolkit will create meaningful learning opportunities and impactful connections for our communities.</p>	
149.	<p>Extension Afterschool Program Meets Community Need for Positive Youth Development</p>	<p>When COVID-19 hit Oregon, Sherman Schools closed to in-person instruction in mid-March 2020. All youth activities including extra-curricular sports and 4-H club meetings were suspended. This meant months of isolation and being home-bound for the 240+ Sherman School students. In the fall of 2020, Sherman Schools were finally able to open in a very limited basis in early October.</p> <p>OSU Sherman County Extension 4-H/SNAP-Ed educator Cindy Brown recognized a great need for in-person positive youth development activities for children in Sherman County. She was able to offer a few, limited attendance, highly-modified day camps during August and early September for local youth. She then expanded these offerings to a weekly Extension Afterschool program at the Extension Office on Tuesday and Thursday afternoons. These activities followed all guidelines from OSU and the Oregon Health Authority for in-person youth programming.</p> <p>The offerings of a twice-weekly Extension Afterschool program were well-received by local families, following promotion on social media and flyers at local post offices. The limit of 10 youth per activity was quickly filled up by parents signing up their youth for all the upcoming programs. Parents were very enthusiastic about this positive youth development activity for youth, which included activities such as cooking, art, crafting, and STEM learning.</p>	6
150.	<p>Making changes to the food system to address food insecurity, a social determinant of health</p>	<p>Making changes to the food system to address food insecurity, a social determinant of health (SDOH) requires ongoing commitment, collaboration, and support from various partners. Food insecurity, the lack of or limited access to food, is an important SDOH in rural communities. An estimated 2.3 million rural families face hunger and are considered food insecure — the most vulnerable are children living in rural communities.</p> <p>Childhood poverty in Malheur County is the highest in the state. There are systems in place when children are in school to offset insure they receive nutritious meals and snacks but what happens when they are on break? For some, hunger is a reality and more so during these unprecedented times.</p> <p>In early October, OSU Extension was contacted by Ontario School District Nutrition Services to begin open dialogue about what could be done to address this need. In collaboration with Oregon</p>	6

		<p>Dairy Council, OSDNS and Ontario School District Administration the team planned, developed and organized a Meal Kit for children to offset hunger and provide nutritious breakfast and lunch during the Thanksgiving break. In addition to the main objective, of offsetting food insecurity, the secondary goal was to provide education, teach basic cooking skills, and encourage physical activity. Meals were selected that were easy to prepare. Food Hero recipes were incorporated into the menu. In addition to the menu and recipes, other information such as proper hand washing and food storage, and activities for the children to do over the break were included in the educational packet and Oregon Dairy Council reinforcements that accompanied the meal kit. All materials were provided in both English and Spanish.</p> <p>Second, the team had to plan a system for registration and distribution of the meal kits. The school district team but together a registration system through the school communication team for families to register. OSU Extension shared the methods they had used during other mass distribution. This was replicated at this distribution.</p> <p>As a result of this work, over 1100 meal kits were distributed to children.</p>	
<p>151.</p>	<p>Addressing Barriers to Serving Local Foods in School Cafeterias</p>	<p>Many of Klamath County School's District's 6,600 students live in poverty, they often don't eat fresh produce or unprocessed foods at home. Farm-to-School is changing that. But the program is limited in scope because of barriers to developing a supply chain between schools and local farms. The annual expenditure for school food service is \$1.52 million; of that only about \$10,000 is currently used to purchase regional products. A local rancher last spring spent more than 20 hours working with our district so it could use his locally raised beef for hamburgers in one school cafeteria – the rancher had to make significant accommodations to meet the specifications of the district food program. We are a rural, high elevation and large geographic area. Growers need support and tools to help them meet school requirements. The district and its partners also serve more than 21,000 meals as part of a summer lunch program. Currently little to none of the ingredients are regionally sourced, but there is interest in exploring the feasibility of incorporating local products into the program if volume, costs and labor could be addressed.</p> <p>Extension facilitated the conversation of how to purchase/sell locally, and inform of USDA and OR state Farm to School grant funding opportunities; developed Klamath County School District vendor requirements to standardize on-boarding of local vegetable, meat and egg producers so producers could more easily sell products to schools; determined necessary liability insurance, food safety and license checks that the school district would require to purchase local products. Identified "most wanted" products schools would most likely purchase locally.</p> <p>Provided training to 40 producers and to other school-based institutions on what we learned about procurement rules/guidelines in Oregon and how we developed them for Klamath County school district.</p> <p>Provided additional training to Early Child Development Centers on how to use Oregon Farm to School procurement grant funds and where to purchase local and Oregon grown products.</p>	<p>6</p>

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		<p>The trainings and other related opportunities helped connect local producers and buyers. As a result of these training, 8 local producers* (meat, potatoes, eggs, and produce) and one local distributor submitted documents required by KCSD to set up their vendor profiles, paving the way for Food Service to purchase local products.. Menus were developed for 2020 school year that reflected availability of local products including potatoes, beef and eggs. In addition, Head Start and other Early Childhood Care Centers purchased local products from Klamath Online Farmers Market for distribution to families during pandemic.</p>	
<p>152.</p>	<p>Food Corps Expands to Klamath County</p>	<p>One in four U.S. children struggle with hunger, while one in three is obese or overweight. Yet the root cause is the same: lack of access to healthy food. Schools are poised to be the front lines in our nation’s response to childhood obesity: 32 million children eat school food – the source of half their calories – 180 days of the year. What we feed children, and what we teach them about food in school shapes how they learn, how they grow and how long they will live.</p> <p>But who will do this work? The responsibilities fall in different and often incongruent departments within a school: classroom, PE, food service, afterschool, etc. Food Corps mission aligns with OSU Extension FCH and SNAP Ed programs and would allow our program to expand its reach by placing a service member for a full year in 2 schools to influence what youth learn about and experience food. However Food Corps is not available in Klamath County.</p> <p>Extension FCH and SNAP Ed Staff met with Oregon Food Corps coordinators over 3 years to determine if the program could, at some point, serve Klamath County. FoodCorps is a nationwide team of AmeriCorps leaders that connects kids to real food and helps them grow up healthy by placing motivated leaders in limited-resource communities for a year of public service. Serving under the direction of local partner organizations, service members focus on three areas of service:</p> <p><b>Hands-on learning:</b> students grow, cook, and taste new foods, which builds their skills and changes food preferences; <b>Healthy school meals:</b> the cafeteria experience steers students towards the healthiest options and gets them excited to try new healthy foods; <b>Schoolwide culture of health:</b> as a whole, the school community and environment – from hallways to classrooms to cafeteria to grounds – celebrates healthy food. We measure our success in terms of changes in children, schools, and systems.</p> <p>In 2019, Extension faculty facilitated discussions with administrators at both school districts and Oregon Food Corps leaders to determine feasibility of hosting Food Corps Service member. To host a service member there must be commitment for funding, 2 schools as host sites and an identified site supervisor. This effort resulted in BOTH districts submitting an application to host a service member. Extension facilitated all activities associated with creating buy-in at district level, agreeing to be supervisor for service member and leading selection of service member.</p> <p>In 2019-20 school year, service member served in two school in Klamath County School District. Despite the disruptions of covid the member remained in the community and assisted school food</p>	<p>6</p>



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		<p>service in distribution of food and worked with Extension team to develop new strategies for remote delivery.</p> <p>Ultimately, stronger partnerships were formed between Extension and the school district. To the point that even during covid, the two targeted schools committed to having another service member in 2020-21 school year. The principals and community partners on the selection committee met during the summer of 2020 and went through the whole process of selecting another service member. When the final selections were made, service members declined offers and Extension and its partners decided NOT to put the program on hold for 2020-21 school year.</p>	
<b>153.</b>			
<b>154.</b>	<p>The Gorge Juntos Program collaboration with Region 3 &amp; Region 9 Migrant Education Program</p>	<p>Schools mandated to close across the state of Oregon due to covid-19. Students asked to continue in school but in a virtual platform. Support programs like the Juntos Program and Migrant Education Programs to modify the way of serving students and families. Purpose of being involved: Funding partners, support high school graduation rates for Latino students/Migrant Education Program participants, college access and career preparation, and Public Health.</p> <p>Migrant Education Program students in The Dalles High School make up about 16.8% of student population. There is 817 students enrolled at TDHS. The Dalles Middle School has 18.8% of students identified as MEP participants. There is 595 students enrolled at TDMS.</p> <p>Migrant Education Program students in middle school and high school in Hood River County make up about 161. Here is the breakdown; 78 students attend Hood River Valley High School, 14 students attend Hood River Middle School and 69 student attend Wy'East Middle School.</p> <p>Hood Migrant Education Program Graduation Coach, Columbia Gorge Education Service District Migrant Education Program Graduation Coach and The Gorge Juntos Program Coordinator met via zoom to discuss how to cross regionally support each others work. My position is funded 0.20 FTE from Region 3 and Region 9 Migrant Education Programs. Which allows me to work a total of 16 hours with Migrant Education Program in The Gorge. This allowed me to build a bridge between both regions.</p> <p>A cross regional family engagement event for Hood River Migrant Education Program (Region 9) and Columbia Gorge Education Service Department Migrant Education Program (Region 3) happened on October 21 virtually via google meeting. The Gorge Juntos Program also collaborated in this effort. The topic for the night was Know your Graduation Requirements and Career Planning. Regions had breakout sessions with their students school counselors. A session together on Career Planning a moderated session led by the Juntos Program in The Gorge. Five guest panelist were invited to participate and share about who they were, obstacles they faced and how they over came while pursuing their career focus. I facilitated and moderated the panel. We</p>	6

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		<p>had 13 guest including Migrant Education Program staff, panelist and staff from district office. We had a total of 35 parents and a total of 22 students participate.</p> <p>"Andrea's commitment to students, families and colleagues is second to none. She honors her commitments to serve as a team member on collaboration projects and presentations such as FAFSA night, Graduation requirements and paths to careers. Partnering with Andrea has been the best decision I made as a graduation coach for the Region 3 Migrant Program; I'm glad I made that decision early. Finally Andrea's work with Juntos, and her willingness to invite me to attend, allow me offer opportunities to students and even be a guest speaker there has been the most positive impactful and inspiring aspect of my collaboration with her." -RS</p> <p>"The collaboration between the Juntos Program and the Hood River Migrant Education Program have helped amplify services to our Migrant students and families." -JR</p> <p>Programs plan to do cross regional events monthly for Migrant Education Program participants in Region 3 and Region 9.</p>	
<p><b>155.</b></p>	<p>4-H ExCEL (Exploring Careers, Education and Leadership) Prepares Portland High School Youth for their Future</p>	<p>When many of students from low-income and culturally diverse communities or first generation Portland students imagine a future that includes higher education or a career in research, community health, business or engineering, they don't always realize there are other many possibilities.</p> <p>The initiative aims to increase high school seniors knowledge about what to expect during their first weeks of college so they are prepared and ready for success. Workshops were offered in study skills, how to read a course syllabi, day one of business class, student life and study skills/time management. . Over the course of the 4-hour training, teens also explore the different education paths to reach their career goals, learn about what they need to do now to prepare for college.</p> <p>In 2020, seventy-eight teens in 12th grade from four Portland area high schools participated in the program. They represented a culturally diverse group (27% white, 24% Hispanic, 22% African American, 3% Pacific Islander, 9% Asian, 9% Native Americaand 6% more than one race). In a follow-up survey. 62% of the participants reported the their parents have a 12 grade or less education. On a scale of 1-5 with 5=very true, the 78 participants reported on average:</p> <ul style="list-style-type: none"> <li>-I feel more confident about being successful in college (3.2)</li> <li>-I have a better understanding of what I need to do to prepare for my future (3.5)</li> <li>-I have a clearer understanding of college challenges I will need to address (3.6)</li> <li>-These programs should be offered to all high school seniors (4.0)</li> <li>-I have a clearer understanding of who and where I can go to get help on a college campus if I experience a barrier (3.5)</li> </ul>	<p>6</p>

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		<p>When asked which of the following workshops would they like to attend in the future, students indicated high interest in many workshops</p> <ul style="list-style-type: none"> <li>- personal financial management (65%)</li> <li>- How to select a college (48%)</li> <li>- How to select a major (60%)</li> <li>- Study Skills (61%)</li> <li>- how to find work opportunities at college (56%)</li> <li>- Time management (62%)</li> </ul> <p>Teachers reported a high satisfaction with the program for helping prepare their students for college entry. On a scale of 1-5 with 5 being Extremely satisfied, 100% teachers gave the program 5 and 100% indicated that they would be interested in attending a summer teacher institute to increase their own knowledge and skills around career and college readiness.</p>	
156.	College Talk Tuesday - Engaging Students in a Time of Change	<p>When a pandemic hits, schools and other public spaces shut down and you have around 45,000 graduating seniors in the state there is a dire need to get the information regarding college/postsecondary access to those students in the easiest way possible. OSU Open Campus realized the opportunity to help those students and families connect to the vital information and mentoring they may need to be successful in attending a postsecondary option through a virtual format.</p> <p>The OSU Open Campus Team decided to start a virtual program called College Talk Tuesdays to connect with high school students, community college students and families to help disseminate the information vital for making informed and practical decisions in regard to attending a postsecondary educational choice. Sessions are held live every Tuesday via zoom and cover topics anywhere from how to apply to college, fill out FAFSA, applying for housing, getting involved on campus, signing up for work study and how to upload immunization records plus a plethora of other topics to assist students in the process. We have been marketing our efforts through mass emails to counselors, administrators, and mentors across the state and through our social media outlets.</p> <p>The talks have been recorded and uploaded to a resource webpage found here: <a href="https://gateway.oregonstate.edu/college-talk-tuesdays-resource-library">https://gateway.oregonstate.edu/college-talk-tuesdays-resource-library</a> and to a You Tube channel found here: <a href="https://www.youtube.com/channel/UCVL6B7gY0Gt8nJ9vpNyxm4g/videos">https://www.youtube.com/channel/UCVL6B7gY0Gt8nJ9vpNyxm4g/videos</a>. With a total of 91 videos created so far we have made an extensive library of resources available for students, families and educators to access for supporting individuals seeking a higher education. Community members, educators and students (past and present) were called upon to help create this amazing content.</p> <p>As stated above a total of 90+ videos have been edited and uploaded to the resource pages listed. Approximately, 150 individuals have registered for the talks. The videos have been viewed around</p>	6

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		<p>330+ times. We have had the opportunity to personally connect with families and students through the College Talk Tuesday series that we most likely would not have connected with otherwise. We have also had the opportunity to get this pertinent information into the hands of other educators that are working with students across the state. We continue to learn and discover best practices and change up how we deliver, connect and support the students across the state that need it the most. Delivering pertinent information vital to the success of the students and in the future the economic status of the state.</p>	
157.	Collaborating across states to develop Walk With Ease resources	<p>Walk With Ease is an evidence-based walking program developed by the Arthritis Foundation. OSU Extension has implemented Walk With Ease since 2012 in three formats: instructor led in-person classes, online virtual classes, and a self-directed program. The self-directed program is email-based and does not include an in-person component. Educational videos would strengthen the program, potentially improve engagement and reduce program attrition, and communicate the information in a different way.</p> <p>During Fall 2020, OSU Extension developed a series of six videos to strengthen the self-directed program. Currently, when participants register for the program they receive a Walk With Ease workbook in the mail and are enrolled in a series of six weekly emails with additional resources to guide them through the program. The videos would be embedded in each of the six weekly emails and would provide additional information, similar to what would be presented at an in-person class, as well as present the information in a different format. Extension Communications accepted the project and we began filming in March 2020.</p> <p>Around that same time, the project was shared on a call hosted by the National Association of Chronic Disease Directors (NACDD) and Extension professionals from South Dakota State University and University of Delaware indicated interest in assisting with video development and utilizing the videos as part of their programming. As a result, a partnership was developed between the three universities and the Arthritis Foundation to develop a series of six videos.</p>	6
158.	4-H Horse Fair Gallops to Virtual Success	<p>Each year, 4-H Horse club members look forward to demonstrating their progress at the annual Horse Fair, a 6-day horse show. Due to COVID-19, it was impossible to gather for in person activities, especially an event that draws hundreds of participants.</p> <p>The Clackamas County 4-H Horse Advisory committee and 4-H faculty member Wendy Hein went to work on the problem. They identified the key components of horse fair (testing skills along with fun activities) and found creative solutions. Some activities were not offered because they could not be done safely by members alone at home. The classes that stressed core horsemanship skills were adapted to a virtual format. They created how-to guides to help parents or friends film the member at their home barn.</p> <p>148 youth participated in the Virtual Horse Fair, which is 80% of the 2019 entry total. Members submitted videos in 8 performance classes. Trained 4-H judges were able to view and score the videos remotely, and members received ribbons and comments sheets to document the skills</p>	6

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		<p>learned this past year. The Junior Horse Advisory offered fun contests for art and costumes. Now that Extension has the videos, they can be used in other educational settings. For example, they were used to create classes for the 2020 Virtual Horse Judging contest in December.</p>	
<p><b>159.</b></p>	<p>Iron Chef in the Nutrition Kitchen - Jackson County SNAP-ED 2020</p>	<p>“Iron Chef in the Nutrition Kitchen” (“ICNK”) is an adaptation of Kids in the Kitchen developed by OSU SNAP-Ed and 4-H faculty. The 8-week cooking series culminates in a competitive cooking experience. This ICNK series was the second cohort at Kids Unlimited Academy (KUA) following a pilot in 2019. SNAP-Ed staff brought together the culinary enrichment program instructor, head chef and afterschool enrichment coordinator at KUA, and the 4-H coordinator at Oregon State University Extension Service to implement this program. KUA remains the only school in Southern Oregon to offer ICNK to students.</p> <p>Twelve middle school students (grades 6-8) were selected to participate in this program and worked in pairs to create six teams. Lessons included food safety and preparation, focused cooking skills, nutrition lessons, and hands-on recipe preparation. Each team participating in the final cook-off event had to use a secret ingredient in their original recipe creation, and they had 40 minutes to complete their dish. The Iron Chef “cook-off” event was judged by three guest judges. One team was selected as the “KUA Iron Chefs!”</p> <p>This event took place in front of KUA’s elementary and middle school student body (~260 attendees). The local newspaper covered this story with an article about the final cook-off event (see media attention).</p> <p>Youth acquired key skills such as: food safety, safe use of kitchen tools and techniques, nutrition and menu planning using MyPlate, label reading, and following a recipe. The 4-H led activities focused on building relationships and working in a team, leadership and creative &amp; critical thinking skills.</p> <p><b>Students participating in ICNK obtained their Food Handler’s Safety Card certification</b> and also received a Food Hero “recipe book” and cooking utensils incentives. Participants gain independence, confidence, and they are able to apply what they learned to “real world” settings. <b>This series spurred the renewal of the student culinary arts program at KUA.</b></p>	
<p><b>160.</b></p>	<p>Nourished and Thriving Foster Families Online Course Funded</p>	<p>According to the Health Share Oregon report “Foster Care: Life Course Experiences, Health, and Health Care” we know that 89% of individuals who had been in foster care during their childhood reported experiencing 4 or more Adverse Childhood Experiences (ACES). In addition, 35% of individuals who had been in foster care reported that they had gone without food in the last 12 months, compared to only 19% of individuals who had not been in foster care. Adults who had been in foster care also reported higher rates of chronic disease diagnosis (88%) and Mental Health diagnosis (92%). In Columbia County, the OSU Extension Service Nutrition Education Program has a proven track record of serving our local foster youth and foster parents. Our program has been partnering with the DHS Child Welfare office for the past 10 years to deliver hands-on nutrition education programs for families affected by the child welfare system.</p> <p>In 2019 the Columbia County Extension Service Family &amp; Community Health program received a</p>	

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		<p>grant from the Columbia Pacific Coordinated Care Organization to deliver a trauma informed nutrition and feeding education program for foster families using the Nourished and Thriving Children Toolkit, which was developed by the Spoon Foundation. This Toolkit contains 24 modules to help foster families navigate nutrition and feeding challenges that children in foster care experience. The Columbia unit delivered 4 of these modules in partnership with the local DHS Child Welfare Office in Fall and Winter of 2020, which also included a food hero hands-on recipe component.</p> <p>After COVID 19 closures, the Columbia unit was no longer able to deliver this program in person. So work began to transition this project to an online, self-guided course that foster parents in any region could access for continuing education. The Columbia unit made a second request for funding from the Columbia Pacific CCO to fund the full development of this online course and that grant in the amount of \$15,000 was awarded in September of 2020. The Columbia unit is excited to partner with SNAP Ed's Food Hero team to integrate Food Hero resources into this course, along with the materials developed by the Spoon Foundation.</p> <p>In addition, a series of professional development webinars for Early Childhood Educators through the NW Regional Education Service District has been scheduled for Winter 2021. The first webinar had 90 educators in attendance. The increased reach that this program is able to achieve using online and remote education platforms is far beyond what we could have accomplished with in person education.</p>	
161.	Juntos program in Tillamook	<p>Due to COVID-19 the Juntos program in Tillamook county was put on pause; In October the program was restarted for the Latinx families in the community. We are now reaching families through virtual workshops and check ins.</p> <p>Juntos (meaning “together” in Spanish) works to empower families around education. Uniting with community partners to provide culturally relevant programming for 8-12th grade students and their parents, Juntos is designed to provide families with knowledge, skills, and resources to prevent youth from dropping out of high school, and to encourage families to work together to gain access to college. Parent/Family Involvement 5-week for Middle School and 6-week workshop series for High School: increase collaboration between families and school districts, increase high school graduation and empower families to pursue higher education. Building upon the success of the OSU Juntos Program, Open Campus will increase opportunities for Latino families to access educational resources, including Spanish-language and culturally-responsive programming.</p> <p>Objectives:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Identify, understand, and respond to Juntos family needs</li> <li><input type="checkbox"/> Create a college-based support curriculum for students in higher education</li> <li><input type="checkbox"/> Address equity gaps in high school graduation rates and post-secondary education enrollment rates for Latino students.</li> </ul> <p>Juntos in Tillamook county began with collaborating with different school faculty and staff, and members of the community to recruit students and their families. I held weekly family sessions during the month of November to engage with families. Juntos families now connect with me</p>	6

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		<p>during monthly family nights and students meet weekly in their schools Juntos club.</p> <p>Since Juntos started up this fall I have been asked by Commissioner Bell to help connect the Latino community with the County Advisory Council. Our goal is to hear the experiences of the Latino community and find ways to better the public relations.</p> <p>The Tillamook high school has a Juntos Club running with a group of students that participated in the Family sessions. Tillamook Bay Community College will begin their sister Spanish club, La Sociedad de Juntos, Feb of 2021.</p> <p>Tillamook high school Leadership group worked with the Latino community in their High School to create a recruiting video for the Juntos program. The video was posted to the Tillamook High school website and Tillamook County Open Campus and Juntos Facebook page for families and students to view.</p> <p>We have begun working with a member from Food Roots to begin a seed distributions project with culturally relevant seeds and recipes in the packets. The goal is go have Juntos families share a family recipe that others can try and have the chance to grow plants that will be used.</p>	
<p><b>162.</b></p>	<p>Hopkins Demonstration Forest goes Virtual to Enhance Distance Learning</p>	<p>As March 2020 progressed and distance learning became the new norm, schools and activities out at the Hopkins Demonstration Forest (used by OSU Extension to support outdoor youth/adult education in natural resreouces) were cancelled and the 140-acre forest was closed to all visitors (April-June).</p> <p>When this support structure was closed and many programs moved to distance learning for the remainder of 2020, most groups were unable to attend in-person events and needed some enrichment content to fill the void. As a result, Hopkins turned its education and outreach efforts to virtual meets, social media, and YouTube to help fill the void for these field experience.</p> <p>As schools began the process of remote learning back in late March, the OSU Extension Forestry Educator at Hopkins initiated remote outreach efforts. The first was a series of online videos developed for educators and also allowed the public to access as well. These videos aligned with typical field experiences students and visitors to Hopkins would experience if in person. School programs that had to be cancelled were contacted and directed to the Hopkins Facebook Page and a newly created YouTube Channel (found by simply searching 'Hopkins Demonstration Forest' in YouTube). Some live events were run through Facebook and Zoom platforms during the spring of 2020, but switch away from those as access and learning equity became a change with the restart of the fall 2020 'new' school year.</p> <p>Also the Oregon Future Natural Resources Leaders State Convention and Career Development Event for high schools would have been at Hopkins in late April. That event had to be converted to a virtual format. OSU Extension/Hopkins took the lead and rallied a team of high school natural resources educators from around Oregon to pull off what seemed impossible in just over a month.</p>	<p>6</p>

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		<p>In the end, this entirely teacher-developed and student-led event was a success and gathered high school educators to work together, virtually, not only last spring and in preparation for the convention, but through the summer, fall, winter, and into 2021 statewide. The initial effort to convert the State Convention (to go virtual at Hopkins) was the catalyst to kickstart and grow a new educational association for high school natural resources programs of study statewide (Oregon Natural Resources Educator Association or ONRE Association). Grown from 6 programs to now 40 statewide since 2015, OSU Extension and a retired, partnering area high school teacher (Rob Waibel, North Clackamas School District and Sabin Schellenberg Center) helped set the stage to make this possible.</p> <p>The virtual efforts kept moving forward with professional development workshops for teachers and Career Development Events/online activities for students and of course more videos to provide enrichment to distance learning programs.</p> <p>This effort by OSU/Hopkins produced twenty-two (5-15 minute) videos with Facebook views exceeding 8,000 and the YouTube Channel with over 1,000 views. Many of the YouTube views were video captured for online sharing or used in virtual classroom presentations to multiple student learners—so, the actual number is far higher than reported.</p> <p>Hundreds of high school students both local and statewide benefited from the virtual/distance learning enrichment efforts and provided needed content and social connections to their classmates and other schools groups (virtually). It was noted by some teachers that these combined efforts saved some of their students from dropping out too and promoting better mental health during a critical time in their 'young' learning careers.</p> <p>The natural resources industry partners and ultimately employers of some of these students will benefit as well as these programs feed the local and statewide need for skilled high school graduates in to the workforce. In addition these programs feed into other continuing education programs like OSU or local community colleges.</p>	
<p>163.</p>	<p>SAFE (Screening Applicants for Effectiveness): Guidelines to Prevent Child Molestation in Mentoring and Youth-Serving organizations</p>	<p>Why is there a need for this type of training for people who screen volunteers that will work with youth? Because 4-H is a youth organization it is a conduit to youth and a percentage of predators will target child-service groups (<i>Sirota, Perry. Sirota Psychological Service Calgary, Alberta (personal communication with Cooper, Becky, MA, BA, 2004).</i></p> <p>“In the United States, society’s historical attitude about sexual victimization of children can generally be summed up in one word: denial.” (<i>Lanning, Kenneth, Child Molesters: A Behavioral Analysis, https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=255886, 2010</i>). Along with denial, there is the horrific fact that most predators have never been caught and child sexual abuse in vastly unreported. In a study of 13,000 people about child sexual abuse, only <b>6% of those abused</b> indicated that the abuse was ever <b>reported</b> to the police (<i>Child Molestation Research &amp; Prevention Institute, February 2009</i>)</p> <p>Only one out of every 150 <b>reported</b> incidents – or .6% -- ever leads to an <b>arrest</b> An estimated 10% of all school-aged children are sexually abused. 1 out of every 4 girls 1 out of every 6 boys 90%</p>	<p>6</p>



		<p>of abuse is never reported. It is imperative that we educate our youth professionals who work with volunteers that have direct access to youth.</p> <p>Research has shown that the most effective means of addressing child sexual abuse prevention is by educating youth professionals; the least effective means of addressing this issue is by educating youth. Though educating youth can be highly beneficial when children actively prevent child sexual abuse by their own actions. However, when a child molester's sophisticated techniques prove to be greater than those of the child, the victim may feel as if it was his or her fault for allowing it to happen or that the abuse isn't really abuse at all. In addition, one survey of adults who were sexually victimized by adults as children reported that 91% did not disclose the abuse when it was happening. Most Predators have never been caught. Processes we use can lead to a false security. Background and Criminal History checks are just tools to identify individuals who have actually been caught they have significant limitations and errors. <b>THEY DO NOT GUARANTEE THE SAFETY OF YOUTH IN A PROGRAM.</b> Predators are experts and grooming the youth and those close to them. A strong screening, training, and monitoring process provides multiple opportunities to spot red flags and frustrate perpetrators.</p> <p>Youth professionals who work with adult volunteers are the frontline in protecting youth that are involved in their program. SAFE is a training program that offers recommendations to youth serving organizations regarding screening and monitoring tools and processes, and on development policies and procedures to ensure maximum safety. SAFE also offers a thorough review of what is known about child sexual abuse perpetrators, helping youth professionals understand what to look for when using the recommendations. <i>(Statistics and information taken from the SAFE Training)</i></p> <p>Nineteen participants completed the training. Participants rated the training as "excellent".</p>	
<p><b>164.</b></p>	<p>OSU Extension Helps High School Natural Resources, Programs of Study Around the State unite during Covid-19 and Distance Learning.</p>	<p>Due to Covid-19, every high school, program of study in natural resources statewide was transitions into some form of distance learning. Many of these programs were in their first one or two years of existence at their perfective school and given the hands on nature, many were left with limited online resources and guidance to move forward and lacked relevant curriculum and activities to go online remotely. Approaching over 40 programs of study statewide, there were hundreds of high school students and their teachers in need of assistance beginning in March 2020.</p> <p>Beginning with some history... in 2015 there were only 6 recognized programs of study in Natural Resources (NR) at the high school level statewide. Through efforts from the Oregon Department of Education, regional partners and existing NR programs, OSU Extension Service leadership and a former teacher from the Sabin Schellenberg Center (North Clackamas School District) a statewide High School, Career Technical Student Leadership Organization was formed, Future Natural Resource Leaders (FNRL). This program supports the students and their programs of study and grew to 24 officially recognized programs and over 2,000 students in 2020 with more wanting to join. Between these new programs, most networking and interaction occurred around the live face-</p>	<p>6</p>

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		<p>to-face career development events and associated student activities that these programs offered regionally and at Hopkins statewide. Since these activities and events were cancelled a plan had to quickly be made to create a networking mechanism for these old/new programs and their teachers to share resources and help each other on the path forward. So to do that...</p> <p>While in concept since the creation of the FNRL in 2015, another organization was proposed but only began to form at the end of 2019 to complement the success of the FNRL student leadership model but focuses on the teachers and program leaders. Again led by OSU Extension and with support from the North Clackamas, Sabin Schellenberg NR program the Oregon Natural Resources Educator Association emerged (late 2019). This newly created professional group quickly became active and began to meet weekly in April 2020 to provide a support network for the non-traditional/informal teaching styles of many of these NR programs. Building on an existing listserv of contacts over 40 NR teachers and program leaders from around the state joined together to help plan for virtual student leadership activities, career development events, and connect youth with NR industry partners. While attendance varied over 2020, meetings ranged from near 50 attendees to a typical week over 8-16 teachers that still meet weekly in 2021.</p> <p>The results of OSU Extension's leadership along with local and statewide partners; high school teachers were able to pool their resources, learn from each other, share individually created activities/online resources, and provide moral and experienced teacher support to newer programs (to name a few). A Google platform was set-up to facilitate the exchange of lesson plans, virtual activities, virtual career development events, virtual FNRL State Convention, contacts, and collaboration of joint curriculum/activities through open editing.</p> <p>The impact of these efforts was huge as the statewide programs of study in NR continue to grow as other Career Technical Program's struggle. The NR programs of study were highlighted as an example by ODE (to other similarly structured programs) of how to move forward and adapt more successfully to distance learning through statewide teamwork and inclusiveness. Hundreds of high school students have benefited from this newly created association through an enhanced distance learning experience and several programs were likely saved and in some cases, programs saw an increased growth too.</p> <p>The natural resources industry partners and ultimately employers of some of these students will benefit as well as these programs feed the local and statewide need for skilled high school graduates into the workforce. In addition these programs feed into other continuing education programs like OSU or local community colleges.</p>	
165.	Youth Tractor Certification adds people to workforce during Pandemic	This year during the pandemic all of the our in person programming was suspended. Youth Tractor Safety Certification was a highly sought after class because of the shortage of farm labor this summer. We were fortunate to receive approval to modify the class and have a portion of it in person. The number of students per class were limited and some classes were canceled so options were limited.	6

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		OSU Extension ran three to four sessions each day with 10-12 students per session. At the completion of the two session of Youth Tractor Safety 79 youth were successfully certified to be employed on a farm.	
166.	Youth Environmental Educators	<p>The Federal Reserve states low income earners are most at risk to be laid off due to COVID-19. This is especially significant when looking through an equity lens for youth in BIPOC communities. Many youth in these communities must work to support their families. Most internship opportunities for middle and high school youth are unpaid which is a disadvantage to those youth who must choose a paying job. Providing positive youth development internships with financial compensation offers job work-life skills, financial literacy, and support for the family.</p> <p>The partnership between Metro Regional Government was created to reach youth in historically underserved and underrepresented communities in a program called the Youth Environmental Educators Program (formally known as Blue Lake Young Rangers) which was piloted in the summer of 2015 and has since continually expanded into what is now a yearlong program. A program that works with the visitors of Blue Lake Regional Park during the summer to provide hands on activities became a challenge in 2020 due to COVID-19 and could no longer be possible to host an in person program. The valuable life skills that youth learn could not be put on hold this year like many other face to face youth centered programs. OSU and Metro prioritized the continuation of the program and staff worked to completely reorganize and shift to a virtual space. 11 youth participated in the 2020 9 week virtual program alongside OSU Extension service 4-H and Metro staff where they worked on activities that could be made into grab and go kits, interactive self-guided garden activities, and focused on their own career readiness skills by creating individual professional portfolios with the 2 college Metro WPES interns. The participants meet regularly with OSU staff and volunteers throughout the year as they prepare to participate in the summer program. Work-life and career building skills gained during the school year help in their success in the program in the summer as paid employees. Participants who become official "Environmental Educators" do so through a competitive application process, another life-long skill building experience for the students.</p> <p>Ages of the Environmental Educators during the 2020 year ranged from 12-17 and 100% of the program participants stated this was their first paid work experience. 82% of youth identified as BIPOC and 7 different languages are spoken by program participants. 45% identify as male while 55% identify as female. Additionally, 91% of the program participants qualified for their schools free or reduced lunch program. One major highlight in the 2020 program year was that of Lekchok (who has been involved in the program for 5 years) let OSU and Metro staff know that he had been accepted into Stanford University and stated that the Youth Environmental Educator program "played a big part in [his] essays"</p>	6
167.	Overcoming Covid Barriers to 4-H Latinx Outreach to support underserved youth and families	Covid 19 has created additional barriers to 4-H programming with Latinx youth and their families, especially in rural areas. Just prior to Covid, the 4-H Latinx Outreach program had lost .5FTE of a bi-lingual educator, and had most of its program budget eliminated by administration. The loss of staff time and an educational contractor resulted in a reduced ability to maintain connection with	6

		<p>youth and families.                  Several strategies were put in place in order to maintain communication and programming with youth, and help families find resources for basic needs.                  OSU Extension worked directly with families (one at time and adhering to social distancing) to continue programming around the 4-H community garden on-site in Molalla. We developed four distance learning, hands-on soil STEM lessons and material kits that were delivered directly to families. We complimented the lessons with YouTube educational videos through 4-H specific site that youth could access via smart phone. They could then spend time in the garden as individual families and apply the lessons in the context of growing their own food. We communicated with families periodically via phone calls. The team included two bi-lingual employees who communicated with parents as most parents are Spanish speakers. We developed a new bi-lingual newsletter with articles relevant to the Latinx communities. Further, we created a list of the organizations that could assist families with basic needs which were shared via phone calls and newsletters for things such as food boxes, bill and rent assistance, and other social services. We loaned out our 4-H program electronic notebooks to youth who did not have a school tablet to use to assist them with on-line school. We are expanding this work into other counties (Multnomah 4-H) to offer “4-H Teens As Teachers Corps” in partnership with Hacienda at Plaza Los Robles in Molalla. Teens are trained, given a stipend, and in return teach elementary youth hands-on bilingual educational activities related to gardening, cooking &amp; nutrition, and entrepreneurship.</p> <p>The Latinx Outreach staff have learned how greatly disasters magnify the barriers that people of color experience compared to their white counterparts, and how necessary equity in Extension is to reduce those barriers. Two bi-monthly newsletters were mailed to over 40 4-H families. “At home” STEM lessons were delivered to 40 families in Molalla and Milwaukie. All 4-H Latinx families received phone calls from 4-H Outreach staff. Six bi-lingual teens are receiving training in the “Teens As Teacher Corps” project. A list of Spanish speaking organizations that provide financial assistance to Latinx families has been developed and shared with families. Adult volunteers in Molalla transitioned to leading activities with their own children to apply soil-science lessons in their own garden to grow some of their own food.</p>	
<p>168.</p>	<p>A New 4-H STEM Program Designed by Teens for Teens</p>	<p>Even though nationwide STEM careers are experiencing economic growth, over 2 million STEM careers are predicted to go unfilled in the next five years. Young people’s lack of STEM career and technical education has resulted in a low supply of educated and skilled STEM professionals in the workforce. Middle and high school students report they do not understand how science and math skills translate to the real world and do not know someone in a STEM career, making it harder to see themselves in one.</p> <p>The 4-H program launched <b>Oregon Teen Science Cafés</b> to bridge the lack of awareness and visibility of STEM professionals in young people’s lives. Oregon Teen Science Cafés is a series of fun, free, out-of-school events for teens in 7<sup>th</sup>-12<sup>th</sup> grade. Teens learn first-hand how local scientists and technology experts are making discoveries and solving our world’s problems.</p> <p>Cafés are once a month with a different STEM career focus. Before COVID-19, Oregon Teen</p>	<p>6</p>

		<p>Science Cafés hosted five events where teens socialized over free food and then engaged with STEM professionals in lively discussions and hands-on activities. Over fifty teens learned about animal science, environmental science, textile, mechanical and electrical engineering. STEM professionals from OSU, Nike, Intel, and Metro engaged with teens to do hands-on activities including colorimetric assays, building and launching paper rockets, and dyeing canvas bags with a homemade dye.</p> <p>More importantly, Oregon Teen Science Cafés are for teens because teens design and lead the program with the support of adult mentors. During the summer of 2019, five 4-H young people joined the Youth Leadership Team (YLT). Together with four 4-H volunteers, they brainstormed STEM topics they were interested in learning more about and bonded as a team at a day-long retreat. The YLT were active leaders in planning the café events. Before the café event, each STEM professional gave a practice-run of their presentation and hands-on activity for the YLT via video conferencing calls. This gave the YLT a unique opportunity to use technology, develop public speaking skills, and work closely with a STEM professional in their community.</p> <p>Oregon Teen Science Cafés quickly adapted to going virtual during COVID-19. It was important to continue connecting teens to STEM professionals during physical distancing to promote a hopeful purpose. So far, three recorded interviews with a cancer biologist, a recent OSU animal science graduate, and a podcaster and writer have been viewed almost 200 times.</p> <p>Oregon 4-H Foundation’s support was instrumental for launching and growing the Oregon Teen Science Café program its first year. Funds were used for the YLT day-long retreat, café event food, and hands-on activity materials. Overall, Oregon 4-H Foundation’s support gave kids in 4-H and local schools the opportunity to connect with STEM professionals and learn together at no cost.</p>	
<p><b>169.</b></p>	<p>Educator Professional Development Program Deepens Student Connections to Coastal and Marine Ecosystems</p>	<p>Oregon’s thriving coastal communities and ecosystems depend on having an environmentally literate population; one that understands the complexities and benefits of - and human impacts on - marine environments. Educators play a critical role in developing the next generation of environmental stewards, but often lack the resources needed to integrate reading, writing, and science with outdoor student field experiences and student action projects in coastal and marine environments.</p> <p>The <i>Discoveries at the Edge of the Pacific</i> project implemented a teacher professional development program that uses the children’s book <i>Ellie’s Strand</i> as a framework for exploring and addressing coastal and marine issues. Through activities focused on nature journaling, observation, outdoor exploration, and stewardship, educators were equipped with the skills, relevant materials, and best practices needed to engage upper elementary students in hands-on learning that deepen connections to coastal and marine ecosystems.</p> <p>We recruited educators to attend the summer workshop using the communication networks of Oregon Sea Grant and the Oregon Coast STEM Hub. Our targeted audience was educators from the Oregon Coast, and 50% of workshop participants came from coastal communities in Lincoln</p>	<p>6</p>

		<p>(8) and Coos (1) Counties. The remaining participants came from inland communities in Multnomah (2), Benton (2), Clackamas (1), Polk (1), Jackson (1) counties, as well as one participant who attended from Pacific county in coastal Washington, and one educator from China who was an International Fellow at the World Forestry Center in Portland.</p> <p>In collaboration with <i>Ellie's Strand</i> authors Peg Herring and Judy Li, OSG the project team led and modeled a number of indoor and outdoor hands-on activities with participants. Activities focused on nature journaling, scientific observation, scale and perspective, and connections to Next Generation Science Standards. Science Standards.</p> <p>Following the in-person workshop, participants were invited to attend up to three online CoP sessions to continue discussions on these topics. In the first session held in November, we talked about ways to engage students in activities focused on marine debris reduction activities such as participating in beach clean ups and reducing single-use plastics in the classroom and at home. The discussion continued in February and included guest speakers from Surfrider and Oregon Shores Conservation Coalition. In our April discussion we returned to the topic of nature journaling with students, with a particular focus on culturally responsive teaching. This last session also reached a broader geographic audience; two teachers joined from Washington D.C., and one from Japan.</p> <p>Throughout this project, facilitators worked to ensure that discussion topics were relevant to Oregon students and educators by making local and cultural connections. For example, we featured Oregon coast field sites, beach clean-up events in Oregon, and organizations such as Oregon State Parks, Surfrider, Oregon Shores Conservation Coalition, SOLVE, and Diack Ecology Education. Similarly, we provided educators with access to local materials such as class sets of books, boots, and other equipment that could be borrowed from the Oregon Coast STEM Hub and used to support student learning.</p> <p>As a result of this project, 28 educators received ongoing professional development training that helped them integrate children's literature, nature journaling, and environmental stewardship in their teaching practice. They gained confidence to use an engaging, culturally and environmentally relevant children's book in conjunction with nature experiences to meet standards, integrate subjects, and teach students about coastal environmental issues.</p> <p>All participants indicated at the end of the summer workshop day that they intended to implement at least <i>one</i> activity from the workshop with their students during the 2019-20 school year. A follow up survey in April 2020 indicated that many participants had implemented <i>several</i> workshop activities with their students.</p> <p>As a result of this project, Oregon Coast educators gained free access to borrow <i>Ellie's Strand</i> books; a class set of 30 books was placed in the Oregon Coast STEM Hub resource trailer in Lincoln County, and sets will be placed in trailers in Clatsop, Coos, and Curry county trailers when COVID-19 restrictions are lifted.</p>	
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		<p>This project was supported by a webpage on the Oregon Coast STEM Hub website that was developed in August 2019 and houses information about the workshops and online opportunities throughout the year. Today this space also shares some of the outcomes of the <i>Discoveries at the Edge of the Pacific</i> project, including some of the activities teachers and students have engaged in as a result of the project, and two short videos created by author Peg Herring. Website: <a href="https://oregoncoaststem.oregonstate.edu/discoveries-edge-pacific">https://oregoncoaststem.oregonstate.edu/discoveries-edge-pacific</a></p> <p>This project now serves as a model for professional development trainings which could be held in other areas of the Pacific Northwest. One participant from OSU Extension included activities demonstrated at our summer workshop at two teacher professional development trainings she facilitated in February 2020, with great success.</p> <p>Economic Impact: \$13,892</p>	
170.	High Speed Hand Washing Materials Adapted for Use during COVID-19 Pandemic	<p>Effective hand washing is one of the most important ways to reduce disease transmission. For the last decade, Extension educators have used the High Speed Hand Washing (HSHW) Method in SNAP-Education classrooms to assist youth with effective and efficient hand washing before preparing or sampling food. As the COVID-19 pandemic threatened both health and economic crisis in our communities, Extension faculty adapted HSHW resources with COVID-19 prevention in mind.</p> <p>An OSU Extension professional in Deschutes County developed the High Speed Hand Washing (HSHW) method in 2008. Since then, the HSHW method has been adopted by SNAP-Educators across the state and utilized in elementary school classrooms to implement effective and efficient hand washing before preparing or sampling food. Many classroom and preschool teachers have incorporated the practice throughout the school day to prevent the spread of illness. As COVID-19 spread across the globe in the spring of 2020, public health experts, the world over reminded people that one of the simplest ways to prevent its continued spread was to wash our hands. At that time, there was still confusion about how COVID-19 could be spread, whether by contact with services or purely airborne, so frequent hand washing proved an effective way to help address contamination. Extension educators set about doing what they do best; use the resources they have to address community challenges. OSU Extension professionals and the Food Hero team updated the existing HSHW posters to illustrate proper COVID prevention practices, including mask wearing and six-feet of physical distancing between participants. The materials went through several rounds of edits, including plain-language and Spanish translation. The method was refined to recommend that participants walk along the backside of other individuals in line to reduce exposure to exhaled breath. Two sets of materials were developed: one featuring adults in the workplace setting and the other featuring children in school or early childhood childcare setting. The two sets of materials are available to be downloaded and printed as English, Spanish, or bilingual and all versions were made in a full color and gray scale versions. The team developed supplemental materials including flyers, lesson plans and protocols for implementing HSHW. A video featuring HSHW demonstrated by young children was created. The team worked with early childhood expert, to create a tip sheet for having conversations about COVID-19 and hand</p>	7

		<p>washing utilizing this video. Kraemer worked with the Food Hero team once more to adapt three STEM activities to help with reinforcing the importance and effectiveness of hand washing. Two different Extension websites host the materials, including a more comprehensive <a href="https://beav.es/HighSpeedHandWashing">https://beav.es/HighSpeedHandWashing</a> page and the existing <a href="https://foodhero.org/handwashing-tools">https://foodhero.org/handwashing-tools</a> page.</p> <p>In addition to the Extension websites, the materials are hosted on the Oregon Department of Agriculture and Oregon Health Authority websites, dramatically increasing their visibility, use, and dissemination. In partnership with the Oregon National Guard, Operation Palette Drop distributed over one million disposable face masks and hand sanitizer across the state via local county Extension offices. Participating Extension faculty provided several thousand waterproof copies of the adult bilingual HSHW posters to our agriculture sector partners during those distributions. Many farms, orchards, and packinghouses implemented the HSHW method during the 2020 harvest season. A Qualtrics survey has been disseminated to farmers, orchardists, and packinghouse managers asking about this implementation and this statement will be updated with those findings. HSHW is being explored for implementation in other sectors, including fisheries, forestry, and other congregate workplace settings. Hyde is aware of some processing facilities incorporating the practice after hearing her speak at a National conference. In October, the youth materials were spotlighted with a High Speed Hand Washing campaign focused on Early Childhood Parents and Childcare Providers. Kraemer worked with Greg Aronoff (PACE) and Ann Murphy (Extension Communications) to develop the campaign, which featured paid Facebook Ads, HTML formatted emails from Extension FCH and SNAP-Ed faculty and staff, Instagram posts and stories, the video developed featuring his children practicing HSHW at home, and three STEM activities. The campaign kicked off on October 15<sup>th</sup>—Global Hand Washing Day, and ran for two weeks. The campaign was developed in both English and Spanish and targeted Moms and Early Childhood Educators. The Facebook ads resulted in 63,610 impressions, a reach of 50,234 people, and 2,237 link clicks. The average cost per click among Educators was \$.07 and among Moms between \$.11 (Spanish) and \$.17 (English), resulting in a great return on investment for the \$487.69 spent on the paid ads. It was a great partnership and learning opportunity between Extension Faculty, PACE, EC, and our Food Hero and Statewide SNAP-Ed team. We also explored some of the amazing 'behind the scenes' technology available through Facebook to do highly targeted advertising. We hope to replicate aspects of this campaign with the agriculture sector this spring as we prepare for incoming MSFW and the 2021 harvest season.</p>	
171.	Lincoln County Local Food Guide	<p>Lincoln County has many diverse needs. The emergence of the COVID-19 pandemic and subsequent sheltering-in-place orders elevated many of those needs. Many local food markets shifted or went away completely. There was a need to respond immediately and there was an opportunity to both support small farms and food businesses while ensuring regional food systems were secure, sustainable, and inclusive. One way to do this was by launching a program for consumers to direct-buy locally grown and raised products.</p> <p>To do this, OSU Extension developed the Lincoln County Local Food Guide, which aims to provide</p>	7



		<p>community members with all of the resources they need to eat farm fresh foods from Lincoln County growers, ranchers, and fishers. The work was promoted via a website created by an OSU Extension professional, through radio publicity and social media outlets.  <a href="https://extension.oregonstate.edu/lincoln/lincoln-county-local-food">https://extension.oregonstate.edu/lincoln/lincoln-county-local-food</a> On the Lincoln County Local Food Guide one can find an updated list of all the producers who are doing farm direct sales. Through the direct sales methods, this guide connects the community to farm stands, local food deliveries, U-pick, CSAs, whole/half pastured animals, and on-dock sales. These methods not only offer greater awareness for the consumer regarding where their food comes from, they also have offered accessibility to the community in a restricted travel environment and have promoted economic resiliency for small producers. Longer term, this is proving to be an ideal system to supplement farm sales in the geographically segmented micro-market economies of producers which exist along the coast. The local food guide covers the entire county and ensures that despite normal supply chain disruptions, Lincoln County residents have safe, reliable food systems and farmers have markets as restaurants have reduced their demand.</p> <p>The Lincoln County Food Guide received a lot of local publicity and also was recognized through the OSU College of Agriculture Stay at Home Hero Award. The Lincoln County Local Food Guide website had a total of 2,697 page views since it's launch and people spend over six minutes on the website meaning that they are really spending time going over the information. We have also turned the guide into a printed brochure and done an initial run of 250 copies of the document. This will be handed out a farmers markets and at the Newport visitors center. Anecdotally, several farmers said that they have received new orders and customers who have found their products via this local food guide. We also have plans to translate the guide into Spanish. This work aims to allow Lincoln County residents and businesses to remain thriving and healthy during this otherwise challenging and unprecedented time.</p>	
172.	Metro Area Master Gardeners Maintain Essential Public Service During the COVID-19 Pandemic	<p>Answering horticulture and pest management questions from the public is the primary public service of the OSU Extension Service Master Gardener Program™ and is at the core of OSUs public outreach mission. Clients seek out the Master Gardener program and Ask an Expert to get practical, research-based information from OSU to help them solve problems.</p> <p>Public demand for this service is more relevant than ever. In 2020, there were 10,453 questions answered via OSU's Ask and Expert system. An estimated 80% of the Ask an Expert questions are focused on sustainable gardening and pest management for home and community settings.</p> <p><b>Ask an Expert:</b> Entering 2020, we had a group of 8 metro area Master Gardener volunteers that have been answering questions on Ask an Expert for many years.</p> <p><b>Online Helpline:</b> In June, we launched an online question &amp; answer helpline using a low cost Customer Relationship Management web application. We posted the contact information on our webpage (<a href="https://extension.oregonstate.edu/mg/metro">https://extension.oregonstate.edu/mg/metro</a>) and coordinated with the Clackamas and Washington Extension offices to direct traffic to the new system. Master Gardener volunteers worked from home in teams to answer gardening and pest management questions. We trained 50</p>	7

		<p>people to use the system and generated a cohort of about 20 regular volunteers who staff the system on an ongoing basis.</p> <p><b>Garden Webinar Series:</b> To keep gardeners connected, we produced 26 garden focused webinars and hosted Zoom meetings for our 3 Master Gardener.</p> <p><b>Support Master Gardener Associations:</b> We coordinated with our 3 Master Gardener chapters to continue activities remotely and in-person for demonstration gardens.</p> <p><b>Ask an Expert:</b> Our small group of staff and Metro area Master Gardeners answered 6,612 questions from the public in 2020 via OSU's Ask an Expert system, which is 65% of the questions for the whole statewide system including all topics. I answered 253 questions myself.</p> <p><b>Online Helpline:</b> Since the launch of the online help desk, Master Gardeners have answered nearly 1,000 gardening questions from the public. I personally answered 124 questions through this mechanism.</p> <p><b>Garden Webinar Series:</b> To keep gardeners connected, we produced 26 garden focused webinars. The webinar series had over 3,390 unique views. You can watch the series at <a href="https://beav.es/4hK">https://beav.es/4hK</a>.</p> <p><b>Support Master Gardener Associations:</b> We coordinated 17 Master Gardener chapter sponsored seminars with 1,140 unique views. Additionally, we submitted OSU COVID paperwork and oversaw the opening of 2 demonstration gardens. Skeleton crews of volunteers maintained sites open to the public. Volunteers donated over 7,000 pounds of produce from the demonstration gardens to local food pantries.</p>	
<p>173.</p>	<p>Double Up Food Bucks Josephine County Pilot 2018 and 2020 update</p>	<p>In Josephine County 26 % percent of residents receive SNAP assistance (\$35 million federal SNAP dollars in 2017). SNAP customers are often reluctant to shop at farmers market due to a variety of barriers. They may perceive the farmers market as being too expensive and markets are not always convenient or accessible due to limited hours and/or lack of reliable transportation. Double up Food Bucks (DUFB) aims to provide equal access to fresh produce for low-income SNAP recipients. EBT was recently reestablished at the Grants Pass Growers Market(GPGM) and there has not been a SNAP match or incentive program offered previously.</p> <p>DUFB was implemented at the GPGM from 7/7/18 – 10/27/18 providing an extra \$10/week for SNAP customers to purchase produce. Promotional materials describing the benefit were distributed through agencies who serve SNAP recipients in Josephine County. Presentations were given for staff at DHS, WIC, and CCO client support to increase awareness of the pilot program. Social media/ Facebook outreach efforts were also used.</p> <p><b>12/2020 Update:</b> The Grants Pass Growers market in 2020 distributed over \$13,000 in DUFB and SNAP dollars spent at the market were over \$33,500. This program is currently fully integrated into</p>	<p>7</p>

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		the weekly business model for this market. It has proven to be a sustained approach to make local produce more available to low-income residents.	
174.	Yamhill Extension Service Teams Up with National Guard for PPE Distribution to Ag. Workers	<p>In May of 2020 Oregon State University Extension Service was tasked with coordinating with state officials and the National Guard to plan a mass distribution of personal protection equipment to agricultural workers as a support to reduce the spread of COVID-19. Each county needed staff to help with the communication to community to raise awareness of the opportunity, and to help with day-of distributions.</p> <p>At the request of my county office I helped with the translation of flyers and documents or messages regarding the PPE distribution event to Spanish and helped with the distribution of those materials and message within my Spanish-speaking network in Yamhill County. In addition, I was present at the local fairgrounds on May 27th to help distribute the PPE and to help interpret for anyone who needed to communicate in Spanish.</p> <p>In total we managed to help distribute over 76,000 K-95 masks and 300 gallons of hand sanitizer to Farmers, Farm Workers, Wineries, Dairies, and others in the agricultural industries.</p>	7
175.	Grow It Oregon Gardening Challenge increases gardening supports during Covid-19 pandemic	<p>Through the Blue Zones Project Umpqua discovery phase, the Food Policy narrowed down the community initiatives to focus our coalition work. One of the initiatives was community and school gardening. Douglas County SNAP-Ed unit set a goal in the Federal Fiscal year 20 to increase gardening with youth. SNAP-Ed worked with the Blue Zones Food Policy coalition in applying for an AmeriCorps member to focus on this work. Through the coalition and community partners, \$8000 was raised to host an AmeriCorps member.</p> <p>The Douglas County SNAP-Ed unit housed the AmeriCorps member and outlined day to day work. The AmeriCorps member primarily worked with three school gardens. Through this position Winchester Elementary School created a new garden and advised creation of a new garden at Melrose Elementary. The member started afterschool garden clubs at Fir Grove and Green Elementary School. Creation of gardens and an increase in youth gardening education helped Douglas County meet one of the coalitions outlined goals to develop gardening efforts in the county. However, when Covid-19 hit the Unit had to look for new ways to reach our target audience to provide gardening education. With a large donation of seeds from Bi-Mart, SNAP-Ed had an opportunity to provide seeds to individuals and groups to do growing at home. Bi-Mart donated 805 seed packets totaling \$1,865.26. With help from the SNAP-Ed state team, the Douglas County unit was able to learn about and recreate a Grow It Gardening Challenge that was utilized in the West Virginia SNAP-Ed program. This challenge provide SNAP-Ed the avenue to distribute seeds to Oregonians by mail. Throughout the challenge, education was provided through the Food Hero YouTube channel gardening series. This series was created by the Douglas County AmeriCorps to help new gardeners work through the steps to starting a successful garden. Weekly Facebook live question and answer times were provide by the AmeriCorps.</p> <p>In nine days 3,500 English and Spanish speaking households joined by filling out a short survey to receive four types of seeds, a fun monthly email with garden tips, and the chance to grow food</p>	7

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		<p>together. Monthly gardening newsletters were distributed to the list serve of 3500 individuals and groups that signed up to participate in the challenge. The live events were sometimes held in the school gardens created before Covid-19, so that students could be linked in to seeing how their school gardens were doing. All together there was 18 videos created as part of the gardening series found on the Food Hero YouTube page for this challenge. The introduction video to the Grow This Challenge was created in English and Spanish. Total views for all the videos is 5,325. The most watched video was on making plant pots, with 968 views. The Spanish introduction video was viewed 113 times. Individuals that participated in the challenge responded that they signed up to learn about gardening, increase their knowledge, get tips and tricks to gardening and to feel more successful while gardening. This program was able to provide these individuals with education about gardening, the seeds needed to garden, then ideas on how to cook with the produce once it was harvested.</p>	
<p><b>176.</b></p>	<p>Improving food access with community partnerships</p>	<p>Nearly 40% of Malheur County's children live in poverty, more than double the state average and ranking second only to Wheeler County, according to Oregon by the Numbers. Thirteen percent of the county's roughly 30,500 residents report they face insecurity, and only 12% report having a healthy diet.</p> <p>In response to the poverty faced by Malheur County residents, Oregon State University Extension faculty and staff have served as planners, organizers and facilitators of "Poverty Simulation" events, held since 2018.</p> <p>The Adrian Food Pantry was established in January 2019 after the principal of Adrian High School and several other townspeople attended a Poverty Simulation in Ontario. The previous year, the small town's only grocery store closed, forcing locals to drive nearly 25 miles round trip to the nearest store. This created hardships for low-income families and those that have transportation challenges with transportation.</p> <p>Extension staff and faculty were brought in as a resource to help plan for the food pantry. In its first year operating out of the high school, the pantry distributed roughly 90,000 pounds of food to 122 unique households comprising of 527 individuals. During that time, the pantry received approximately 6,500 pounds of donated foods from local donors.</p> <p>"From the very beginning the community was excited to see the food pantry be established and the volunteer base has grown from seniors greeting shoppers to school-age children helping shoppers load groceries in their cars or keep the little children entertained while their parents shop," said Barbara Brody, Associate assistant Professor of Practice for 4-H/Family &amp; Community Health, and SNAP-Ed manager for Malheur County Extension. "The atmosphere is warm and welcoming and continues to grow stronger."</p> <p>Extension has helped ensure that Food Hero resources and recipe tastings have been front and center for the pantry volunteers and participants. Food Hero is an initiative of Oregon Supplemental Nutrition Assistance Program Education (SNAP-Ed) program and developed by</p>	<p>7</p>

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		OSU Extension. Food Hero messaging is also found in the school cafeteria, and classroom education.	
177.	It's Takes a Crisis: A Community Comes Together to Create a Food Pantry	<p>The Boardman community is home to just over 5,000 residents on the shore of the Columbia River in Morrow county. We boast one of the lowest unemployment rates and one of the highest median incomes. Yet, our local elementary schools boast a 100% free and reduced lunch rate. The nearest emergency food pantry was located 13 miles away in the community of Irrigon, only open on Wednesdays from 1-3. Food insecurity is a very real issue with few resources for emergency and everyday deficiencies.</p> <p>With the onset of the COVID-19 pandemic, a local community church established an emergency food pantry with the intention to provide emergency food resources during the lockdown. With the impending need for further resources and funds, a group previously working on FEAST grant from the Oregon Food Bank, rallied to appropriate funds to be used for the pantry purpose. Extension quickly organized virtual community meetings, recruited partners and soon a committee was formed. The new committee worked across a variety of partnerships to establish a non-profit business, board members, bylaws, and a mission, vision and values.</p> <p>Between March and December of 2020, the newly formed Boardman Food Pantry amassed nearly \$300,000 in grants and donations. The food pantry was able to purchase in cash, a new building and furnish the building with shelving, refrigerators and freezers. In addition, the pantry has been providing food boxes to approximately 60 households and nearly 200 people per week. Due to COVID-19 restrictions, the Oregon Food Bank was unable to certify the space to receive distributions from the state agency, as such, volunteers have been shopping and sorting donations for all the pantry food supplies. For 2021 the food pantry will receive certification from the Oregon Food Bank to provide food distributions on a larger level and serve more members of our community.</p>	
178.	Rogue Flavor Guidebook	<p>The Rogue Flavor Guide, published since 2005, provides a comprehensive list of local farms, farm stands, u-pick, caterers, and restaurants who serve local food. It serves to connect consumers with local food resources. The guide was created by the non-profit organization Thrive, which operated in the Rogue Valley from 2004-2018. In 2018, the organization closed its doors, leaving the Rogue Flavor guide in danger of being discontinued.</p> <p>The Rogue Valley Food Systems Network, and a group of five steering committee members, an OSU Extension professional, and representatives of Rogue Farm Corp, Rogue Valley Farm to School, the Medford Food Coop, and 1,000 Friends of Oregon, worked to gain non-profit status for the organization in order to take on publication of the guide.</p> <p>The guidebook brings value to the Southern Oregon business community by providing a user-friendly resource on how and where to source local food. The guidebook helps consumers find locally-produced products and the retail outlets that offer them. It also educates consumers about food labels and business sustainability efforts, and the many reasons to buy local food. The guide</p>	7

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		<p>includes listings in many categories, including farms and ranches, grocery and specialty markets, restaurants and caterers, artisan foods, and wine, beer &amp; spirits. It also features a "Know Your Food" section that defines the various food certifications and labels used.</p> <p>Increasingly, health care providers are giving the guide to their patients because they recognize the connection between eating local, organic food and better health. The Oregon Department of Agriculture Farm to School Coordinator, Amy Gilroy, reports that regional guides such as the Rogue Flavor guidebook are an invaluable asset in her work of connecting schools to local farmers and food producers. This is a great example of how the Rogue Flavor guidebook is increasing collaboration and communication among local and regional economic development partners. In 2020, 10,000 copies of the guide were distributed in 100 locations around Southern Oregon.</p>	
179.	Sherman Families Able To "Grow Your Own Groceries" During COVID-19	<p>OSU Sherman County Extension 4-H/SNAP-Ed educator modified a vegetable gardening class taught each spring in this rural county to a series of on-line social media posts via Facebook. The "Grow Your Own Groceries" posts were very helpful to local gardeners, as much of the information was from the Oregon-Washington Master Gardener Handbook.</p> <p>As part of this outreach, OSU Extension was able to partner with the Columbia Gorge Oregon Food Bank and give away 30 "Garden Starter Kits" consisting of about 20 assorted vegetable seed packets as well as OSU vegetable gardening publications. These primarily were given to local low-income households.</p> <p>Short-term outcomes were the hands-on learning experience of planting seeds and growing a garden combined with the text-based learning provided by the social media posts and the OSU publications Brown sent with each Garden Starter Kit. Medium-term outcomes were that at least 8 of the 30 participants reported that they did plant their seeds and had a vegetable garden in 2020. Long-term outcomes will be if participants continue to plant vegetable gardens, continue to grow some of their own food, share food with others or preserve it for future use, and consider themselves "gardeners".</p>	7
180.	More Pressure Gauges Tested in Four Months During COVID-19 Than in Previous Nine Years	<p>One of the positive outcomes of the COVID-19 pandemic in the United States since March 2020 is an increased interest in home gardening and food preservation. People were home more, looking for home-based activities, wanting something fun to do outdoors, interested in teaching their children about gardening, concerned about shortages in the food supply, and/or desiring to ensure a safe food supply.</p> <p>As a result of this interest, OSU Sherman County Extension 4-H/SNAP-Ed educator set up a table at a local monthly farmers' market. Up-to-date food preservation information and test pressure canner gauges, a critical function of Extension for food safety was provided. This in-person outreach was done as per OSU safety and health guidelines during COVID-19.</p> <p>With drop-ins at the Extension Office, and during the July, August, September and October once-a-month farmers markets in the small town of Grass Valley (population 157), OSU Extension in Sherman County conducted 14 tests of pressure gauges. This is more tests in a four month period</p>	7

		<p>than conducted at the Extension Office since 2011. The short-term outcome of this program was that more households in Sherman County learned about the opportunity to easily have pressure gauges tested for food safety reasons. A medium-term outcome of this program is that 14 pressure gauges now are assured of being safe for food processing, as their owners took the action of having the gauges tested by Sherman Extension staff. A long-term outcome would be if more home food preservers would make it a common practice to have their pressure gauges tested each year prior to canning, in order to ensure food safety for their products.</p>	
<p>181.</p>	<p>Addressing obesity with community coalitions</p>	<p>In the U.S., among adults under the age of 70, obesity is second only to tobacco in the number of deaths it causes each year. As tobacco use continues to decline, and obesity rates continue to rise, the number of deaths due to obesity may soon exceed that of tobacco. Malheur County has one of the highest adult obesity rates in the state. On-going and collaborative work, through community coalitions, aim to address this need and create systems to create a change. The Four River Healthy Communities coalition identified the need to provide education for this target population and bring community partners together to accomplish this identified need impacting the community.</p> <p>In late 2019 the team pilot tested a the project which resulted in positive impacts. As a results OSU Extension Family and Community Health faculty partnered with Valley Family Health Medical Center (VFHMC) to secure funding from the Eastern Oregon Coordinated Care Organization Community Benefit Investment funds for the Fruit and Veggie Rx program. The program targeted food insecure adults at risk for chronic disease. Primary recruitment occurs through VFHMC in Ontario. Those who screen positive for targeted health and food security risk factors are enrolled and receive a monthly card to purchase at the local grocery store paired with hands-on cooking classes open to the entire family. Health risk factors include overweight or obesity (per CDC BMI) and/or a self-reported health care provider diagnosis of hypertension, Type II diabetes, gestational diabetes or other nutrition related disease. The team was able to work with a locally owned grocery store who agreed to accept the Veggie Rx purchase card. This was a critical piece in the program because it allowed participants the opportunity to select and purchase fruits and vegetables independently.</p> <p>As a result, 32 adults from the target population participated in a series of 6 classes and received their Veggie Rx card after each session to purchase fruits and veggies to incorporate into their diet. In addition, Food Hero resources were intentionally weaved throughout the program resulting in increased awareness and access to resources and tools to use for success.</p> <p>Ontario Veggie Rx program participated in the Veggie Rx state collaborative for program evaluation. Program results were analyzed by an Oregon Health and Science University medical student using a Wilcoxon signed-ranks test. Statistically significant improvements were shown food insecurity, self-perceived health condition, social interaction and number of prescription medications used by participants.</p> <p>"We have found vegetables we like to eat and cook. We really like making our own spices from the</p>	<p>7</p>

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		<p>Food Hero recipes.”</p> <p>“We eat more vegetables that we hadn’t before. We have been trying new recipes and whole family cooks more.”</p>	
<p><b>182.</b></p>	<p>Lincoln County SNAP-Ed Achieves Multi-Level Programming, Remotely</p>	<p>Prior to March, 2020, SNAP-Ed programming in the North County Lincoln City Hub focused primarily on indirect Food Hero social marketing events at the local food pantry and schools, and direct program activities with Head Start and afterschool programs. The Pandemic brought these actions to a halt; however, in the months following SNAP-Ed deepened existing and developed new connections (internal and external to Extension) with community partners and community members. This resulted in innovative, remotely-driven multi-level programming.</p> <p>SNAP-Ed stayed engaged with key partners such as the Samaritan Culinary Health Education and Fitness (CHEF) program, the Department of Human Services (DHS) Newport Self Sufficiency Office, Centro de Ayuda, and Northwest Coastal Housing (NCA). A new partnership was developed with Habitat for Humanity. These partnerships helped to assess need and influenced the achievement of remotely-driven, multi-level programming.</p> <ol style="list-style-type: none"> <li>1. Remote Cooking Matters and Walk with Ease classes for Lincoln City Latinx families, including grocery gift cards funded by CHEF and Centro de Ayuda, and grow kits funded by the Healthy Community Outreach grant, Project PLANT.</li> <li>2. The formation of a community workgroup that will train Latinx community members to implement a modified HEAL MAPPS in Lincoln City in FFY 2021, which will assess gaps and needs related to healthy eating and active living (including barriers to navigating the local growing system, which is a goal of Project PLANT).</li> <li>3. The distribution of growing kits to community members in partnership with DHS and The Ridge (a NCA affordable housing site in Lincoln City).</li> <li>4. The adoption of a policy at The Ridge to support criteria the NCA director had previously only expressed verbally to residents, regarding planting a ratio of vegetables (to non-edible plants) when utilizing the site’s shared garden space.</li> <li>5. The establishment of a free Garden Container Recycle Station located at the Lincoln City Habitat for Humanity, to open in spring of 2021. This will support sustainability elements of Project PLANT by increasing access for low-income community members to obtain materials needed for</li> </ol>	<p>7</p>



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		<p>growing vegetables in containers.</p> <p>6. Food Hero Social Marketing integration throughout all efforts.</p>	
<p><b>183.</b></p>	<p>BEPA 2.0 Train the Trainer and Direct Delivery Models at 3 Redmond Elementary Schools</p>	<p>The National Physical Activity Guidelines for Americans recommends that children ages 6-17 get 60 minutes of moderate to vigorous activity every day. Studies have shown that small bouts of physical activity have positive health and academic outcomes for children. [i] Oregon House Bill 3141 requires Oregon elementary schools provide 150 minutes of physical education per week starting in the 2020-2021 academic year. [ii] Classroom teachers may contribute 45 minutes to the total amount of physical education provided to students each week. The OSU Extension Service Nutrition Education Program has trained staff at three Redmond elementary schools in the use of BE Physically Active 2day (BEPA 2.0), the OSU Extension created, state and national standard-aligned curriculum. The OSU Extension Service Education Program Assistant (EPA) provides multiple student and teacher supports to assist in the implementation of the BEPA 2.0 and contribute to a health promotional environment.</p> <p>BEPA 2.0 continued to be utilized in the three SNAP-Ed eligible Redmond School District elementary schools. The SNAP-Ed EPA demonstrated 510 minutes of activities in 34 classes during the 2019-2020 school year (FFY 2020). Even with the shortened school year, eight teachers delivered 4,617 minutes of extended BEPA 2.0 activities to 223 students. However, teachers were provided a document of ‘at-home physical activity resource’ to continue being active with their students. BEPA 2.0 electronic newsletter was sent to 47 teachers with an average opening rate of 73%. Over the last five years, the OSU Extension Nutrition Education Program has equipped staff at its four (three since 2017) partner schools in the Redmond School District with the supports needed to implement classroom-based physical activity. Trainings, BEPA 2.0 teaching demonstrations, simplified instructions, and monthly newsletters support teachers’ efforts to engage students in at least 45 minutes of physical activity a week. Total minutes of extended delivery – BEPA 2.0 activities led by the classroom teacher – has increased over the years alongside the number of teachers trained. SNAP-Ed Educators implemented thirteen BEPA 2.0 staff trainings district wide since FFY 2016. A total of 52 Redmond School District teachers delivered approximately 246 hours of physical activity utilizing the BEPA 2.0 Toolkit from FFY 2016 to FFY 2020. Mailchimp newsletter were sent monthly to staff since FFY 2018 with 73% to 93% recipients of the BEPA 2.0 electronic newsletter opening at least one newsletter during the school year.</p>	<p>7</p>

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<p><b>184.</b></p>	<p>Hay for Wildfire-Affected Livestock</p>	<p>The wildfires that ravaged western Oregon in September displaced thousands of head of livestock, along with their owners. County Fairgrounds became evacuation destinations for cattle, horses, sheep, goats, camelids, poultry, rabbits, and more. Many other livestock found their way to private quarters on farms, at rodeo grounds, at horse-training facilities, and kind strangers' back 40s. Many lost hay or pasture in the fires leaving them challenged to feed their animals once they returned home. Others were feeding displaced animals, often dipping into their own stores of feed. OSU Ag Extension coordinated a statewide hay donation and distribution program to help those in need. Three regional locations were set up for receiving hay donations and distribution, in Aurora, Roseburg, and Central Point. I served as the coordinator for the distribution point at the North Willamette Research and Extension Center. Working with other Extension colleagues, I helped coordinate transportation of hay donations from multiple locations in the state to NWREC. I developed an online survey tool, easily accessible via computer or mobile device, to collect information from those needing hay. From this needs survey, site coordinators could contact people needing hay to get a fuller sense of what they required and to communicate hay availability and pick-up details. I facilitated hay movement in and out of NWREC through communication with those donating, coordinating acquisition, and transporting hay; personnel at NWREC doing the physical work; and those needing hay. To help track inventory, I created a short exit survey to be completed when people picked up hay. This tracking had both an online—accessible via QR code—and a hard copy form-on-a-clipboard option at the hay storage site.</p> <p>Nearly 100 tons of hay was distributed from NWREC during the month of October to provide forage for hungry horses, goats, sheep, cattle, and camelids. I was able to connect people with hay to donate and with hay at other evacuation sites with a private feed and supplies distribution point in the Santiam Canyon.</p>	<p>7</p>
<p><b>185.</b></p>	<p>Benton County 4-H helps hundreds of animals evacuated by wildfires</p>	<p>When fires raged throughout Oregon in early September, those who evacuated their homes needed a place to house their animals while they found shelter. There were approximately 180 animals that needed to be taken care of at the Benton County Fairgrounds. The Benton County 4-H saw a need and jumped up to assist! Carolyn Ashton coordinated a group of nearly 80 4-H members and adult volunteers to help provide 24/7 care for approximately 180 animals. Benton County was able to welcome evacuated animals long after other counties in the Willamette Valley reached capacity. All animals were returned to their owners, well rested, well exercised and well fed.</p>	<p>7</p>

<p>186.</p>	<p>Home Food Preservation in response to 2020 challenges</p>	<p>Oregonians already focus on eating locally, reducing food waste and emergency preparedness, a necessity here in the Cascadia Subduction Zone. The challenges of the COVID-19 pandemic and world-wide concerns about food handling, storing, preserving and preparing food in a safe, healthy and economical way were made even greater when forest fires swept across Oregon, jeopardizing food supplies and depositing ash on harvest-ready produce. All this contributed to an increase in home food preservation activities across the state. During 2020, the toll-free food preservation hotline, staffed by Master Food Preserver volunteers from Lane and Douglas counties responded to close to 1,500 calls in 2020, an increase of 80% from the previous year. 1707 more phone calls were fielded by FCH faculty throughout the state.</p> <p>Ask an Expert online, received 569 questions, up from 293 in 2019.</p> <p>County offices reported testing 713 pressure canner gauges for accuracy, a true testament to managing the safety protocols required to operate during the COVID-19 pandemic.</p> <p>Extension Marketing coordinated the creation of a flyer for statewide distribution, noting how to access desired information from OSU Extension sources. Following that, brochures with basic food preservation information for state-wide use based off Lane County brochures were formatted and translated into Spanish. A partnership with Bi-Mart resulted in “shelf talkers” being created based on each method of food preservation. Bi-Mart Stores printed and installed these in all of their Oregon stores. The signage was rebranded for use in some Ace Hardware and Wilco stores. These could all be accessed from the OSU Extension Marketing Templates, Tools and Inspiration website.  <a href="https://oregonstate.app.box.com/s/j17s2fg8y3wfrh97fjk05w9x6j1o0abg/folder/116038105004">https://oregonstate.app.box.com/s/j17s2fg8y3wfrh97fjk05w9x6j1o0abg/folder/116038105004</a></p> <p>Sign content was formatted into posts for social media and received the following reach and engagements on OSU Extension Service Facebook:</p> <p>Continuing to provide current, relevant information to Oregonians during the pandemic required shifting to virtual presentation. Interaction with community members through Facebook and websites became vital.</p> <p>OSU Extension Service Food Preservation website  <a href="https://extension.oregonstate.edu/food/preservation">https://extension.oregonstate.edu/food/preservation</a> remains a trusted and active source of information. It saw increased traffic during 2020:          16,000 unique page views, a 15% increase over 2019, March to October          6,680 unique visitors, 26% increase over 2019, March to October</p>	<p>7</p>
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		<p>Top web content viewed March-October:            3,733 Pickling Vegetables <a href="https://catalog.extension.oregonstate.edu/pnw355">https://catalog.extension.oregonstate.edu/pnw355</a>            2,158 Canning Timer and Checklist app <a href="https://catalog.extension.oregonstate.edu/pnw689">https://catalog.extension.oregonstate.edu/pnw689</a>            1,667 Canning Tomatoes, Tomato products <a href="https://catalog.extension.oregonstate.edu/pnw300">https://catalog.extension.oregonstate.edu/pnw300</a></p>	
<p><b>187.</b></p>	<p>Celebrating Portland’s Black Community through Hair Health and Wellness</p>	<p>According to the U.S. Centers for Disease Control and Prevention, over 80% of American women are overweight or obese as a result of various factors, including lower than recommended physical activity levels and fruit and vegetable consumption (2015). Reasons for this disparity are multiple and varied, but center around behavioral and lifestyle factors, compounded by environmental, cultural and socioeconomic issues.</p> <p>In Multnomah County, local prevalence of obesity among Black/African Americans is 34.8% compared to 44% nationally (Report Card on Racial and Ethnic Disparities, 2014).</p> <p>Research supports increased fruit and vegetable consumption and a minimum of 30 minutes of daily physical activity for good health. However, nearly one third of white adults (32%) ate fruits and vegetables at least three times per day compared to just 21% of African-Americans (2011-12 CHIS) and up to 36.1% of African American women engage in recommended levels of physical activity (2013 JAMA Dermatology). Studies have found that African American women exercise less or not at all because of the negative impact on their hairstyles, making the fight to get healthy and turn the obesity epidemic much more difficult.</p> <p>While health education tools and resources exist to address chronic disease prevention and health promotion in communities, there remains a great need for cultural relevance and sensitivity when communicating this information in the African American community. The *AARP report <i>“African American Women’s Hair Issues and Engagement in Physical Activity,”</i> (November, 2009) is a reminder that there are cultural barriers to involvement in health engaging activities specific to African American women that must be addressed and presented in a way that is meaningful and relevant to the African American community.</p> <p>In 2020, Oregon State University Extension Service’s (Family &amp; Community Health- FCH) SNAP-Ed Program held their 4th My Hair My Health PDX! annual event made to empower Black women and their communities to live long, vibrant, resilient and healthy lives. Due to the pandemic, this was our first event held via Zoom.</p> <p>My Hair My Health PDX! is a culturally-tailored health-promotion program that encourages Black</p>	<p>7</p>

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		<p>women to celebrate their beauty from the inside out. The Portland event aims to empower participants by offering tools and resources to: (1) promote healthy behaviors, such as increased fruit and vegetable consumption and regular physical activity; (2) boost knowledge and skills to overcome barriers to healthy behaviors; (3) improve self-image and self-acceptance; and (4) heal body, mind and soul.</p> <p>Reached 70 participants during live event          Event recording has 23 views on our YouTube channel          Social media presence in 2020 with 233 followers (Instagram)          48 surveys collected via Google Forms (more than double our typical survey response rate in previous years with in-person programming)</p>	
<p><b>188.</b></p>	<p>Master Gardener Program Challenged, but Resilient, to COVID-19</p>	<p>COVID related restrictions and cancellations challenged OSU Extension Master Gardener faculty, staff, and volunteers in a variety of ways. Overall, we saw a reduction in our traditional services and reach, as we learned to navigate new systems and created new platforms for engagement. However, at the same time, we documented an explosion in new ways to engage and serve the public (see 'How We Adapt to Change').</p> <p>The number of OSU Extension Master Gardeners held fairly steady in 2020, at nearly 2,900 volunteers, which is well within the standard deviation of the average number of volunteers across the previous 12 years (2008-2012; mean = 3,438 ± 561 volunteers). However, the percent of new Master Gardeners who were able to complete their training and initial year of volunteer service hours declined precipitously. Even with COVID disruptions, 73% Master Gardener trainees were able to complete their required coursework. However, only 12% were able to complete the volunteer service hour requirement (minimum of 40 hours) to become certified Master Gardener volunteers. This is significantly lower than the 12 year running average of 70% (± 0.04%) of completion rates for new Master Gardener trainees. Recertification rates for continuing Master Gardener volunteers was much better, at 58%. However, this represented a significant drop from the running average of the previous 12 years' recertification rates (mean = 66% ± 0.07%).</p> <p>At the time that COVID disrupted programming, there were limited distance opportunities for volunteerism. However, opportunities such as 'virtual plant clinic' and 'Ask a Master Gardener' were rapidly developed. It was not until June that limited face-to-face volunteer activities were available within gardens. A variety of factors could explain why many Master Gardeners reduced or stopped their volunteerism for OSU Extension during this time, including: no to low internet and/or computer access; health, homeschool, or economic concerns related to COVID; or no to low interest in engaging in online volunteerism. No matter the reason, the significantly higher</p>	<p>7</p>

		<p>recertification rate for continuing Master Gardener volunteers (58%) compared to the certification rate for new trainees (12%) suggests that established volunteers might have been able to better navigate and network within the new systems that were being created for Master Gardener engagement.</p> <p>Not surprisingly, the number of volunteer hours provided to OSU Extension and to their communities (134,993 hours), and the number of people that we reached (34,424), was also impacted by COVID. The magnitude of our reach in 2020 represented a significant drop in volunteer hours (203,177 ± 13,768) and direct public contacts (163,566 ± 39,000) across the previous 12 years (2008-2019). Nonetheless, it is notable that Master Gardener volunteers were able to be of direct service to more than 34,000 Oregonians while under COVID-related restrictions. These public contacts represent people who attended online webinars and gardening classes, or who asked questions during open Zoom events or Ask an Expert. If we add in the number of people who signed up for the online Master Gardener courses (61,655), our public reach in 2020 is substantially higher at 96,079. However, even this value fails to fall within the range of previous years' reach.</p> <p>With COVID restrictions keeping Master Gardeners out of shared use gardens until mid June, many of our food-producing gardens, such as the Grow an Extra Row Giving and Learning Garden in Clackamas County, could not be prepared, seeded, and planted in a seasonal fashion. Thus, it is no surprise that fresh food donations from Master Gardener-tended gardens dropped to 21 tons, from a running average of 45 ± 14 tons across the previous 9 years (2011-2019).</p> <p>Disruptions to programming also impacted revenue to OSU Extension Master Gardener Programs. In total, approximately \$88,500 was lost, due to cancelled contracts and fee-based programs. This value does not include revenue lost by our 501(c)3 partner organization, the Oregon Master Gardener Association and its chapters. Cancelled plant sales, conferences, and garden fairs totaled in excess of six-figure losses, across all the state.</p> <p>We held our first ever virtual celebration of Master Gardeners. 'Celebrate Oregon's Master Gardeners' week, included messages from OSU leadership and OSU Extension MG faculty and staff, a film festival and discussions, and a live, virtual trivia event. A total of 639 people enrolled, and between 40-50 participated in the film discussions. A follow up survey revealed that 96% of participants wanted to see this as an annual activity.</p> <p>For the first time, many counties started to experiment with FB live, podcasts, YouTube to engage</p>	
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		<p>the gardening public. New methods were developed for distance volunteerism, including 'Seed to Supper at Home', 'Ask a Master Gardener' Zoom chats, and the 'Virtual Plant Clinic'.</p> <p>Partner organization (OMGA) worked on online &amp; distanced plant sales and/or donated plant starts to the community.</p> <p>At the same time that we were learning to navigate this new environment, more people than ever were turning to Master Gardeners for help. We saw a 67% increase in the number of people submitting questions on OSU's Ask an Expert Service. We saw a 125% increase in the number of people who 'liked' us on Facebook. We saw a 2,806% increase in the number of people signing up for our online gardening courses! In times of crisis throughout history, people have turned to gardens for food, comfort, and connection. This was certainly the case in 2020.</p> <p>When gardeners of all kinds and levels needed us, we rose to the challenge of cultivating healthy and resilient communities throughout Oregon. Lane County Master Gardeners donated 2,200 vegetable plant starts to organizations dedicated to providing food to others. The Central Gorge Master Gardeners created a virtual platform that enabled Master Gardeners to receive and respond to gardening questions from home. Benton County Master Gardeners took the popular 'Seed to Supper' beginning gardening classes online. Klamath County Master Gardeners hosted at-home garden trivia events. Shooting and posting YouTube videos, creating podcasts, and hosting Facebook live broadcasts were new endeavors that many of us ventured into in 2020, all in an effort to continue serving Oregon's gardening public.</p>	
<p><b>189.</b></p>	<p>Columbia River Gorge Responds to COVID-19; Provides Support to Migrant and Seasonal Farm Workers</p>	<p>Every year roughly 6,000-15,000 Migrant and Seasonal Farm Workers (MSFW) come to the Columbia River Gorge. MSFW work in orchards, packing houses, and on farms to harvest, pack, and process the region's cherries, apples, peaches, pears, blueberries, and wine grapes. In 2020, MSFW and their families were identified as among the most vulnerable groups for COVID-19 given their congregate traveling, working, and housing conditions. A team of community organizations, including OSU Extension, mobilized throughout the 2020 harvest season to support MSFW with food, quarantine housing, PPE (personal protective equipment), communication, and telehealth.</p> <p>In spring 2020, alarm bells began ringing in the ears of local Extension faculty and staff as word of COVID-19's spread threatened our local agricultural sector—posing both a humanitarian and economic crisis. Every year roughly 6,000-15,000 Migrant and Seasonal Farm Workers (MSFW) come to the Columbia River Gorge in late May and early June to begin the cherry harvest in Wasco County before moving to other crops in Hood River County and Klickitat County,</p>	<p>7</p>

		<p>Washington. MSFW work in orchards, packing houses, and on farms to harvest, pack, and process the region's cherries, apples, peaches, pears, blueberries, and wine grapes. In 2020, MSFW and their families were identified as among the most vulnerable groups for COVID-19 given their congregate traveling, working, and housing conditions. As counties mobilized their Emergency Operation Centers (EOC) and Incident Command (IC), Extension faculty played a critical role in supporting MSFW with food, quarantine housing, PPE (personal protective equipment), communicating about COVID symptoms, testing, prevention, as well as supporting new technology for regional medical providers to offer telehealth and for children to participate in distance learning. OSU Extension professionals served on local EOC and IC committees. One served on the MSFW Taskforce, a Food support subcommittee and separate MSFW Advisory Board and Evaluation Team Meetings. Another OSU Extension professional has served in the ESF-11 role providing support to the agriculture sector in the region, offering webinars, training, and support and evaluation to local orchardists. Our third teammate managed volunteers and supported PPE donations and distribution. Extension worked with a skilled summer intern, Daniela Valle, who developed plain-language pictorial PSAs and infographics about COVID-19 symptoms, prevention, mask wearing and care and that were shared via email as posters and flyers, as well as through Instagram and Facebook posts. The team worked with the FoodHero team to adapt existing High Speed Hand Washing materials for adults in the workplace. These materials were shared statewide through Extension channels as well as on the Oregon Department of Agriculture and Oregon Health Authority webpages. Extension faculty distributed face coverings as well as HSHW materials on waterproof paper to local agriculture partners to encourage efficient and effective handwashing practices.</p> <p>The COVID-19 pandemic is ongoing, but through the efforts of our faculty and partners, we have provided an incredible and well-rounded response locally that has surely resulted in fewer cases of COVID as well as less health and economic hardship. In total—hundreds of thousand of disposable face coverings and over 4,000 reusable cloth face coverings were distributed among our agricultural communities. Hand sanitizer, wi-fi hot spots, and other support were provided to farmers and orchardists free of cost, saving orchardists \$45,000. In Wasco County, the COVID-19 infection rate among migrant workers was 0.41%. There were 0 deaths or hospitalizations among MSFW and 0 cases in Wasco County packing houses. None of this would be possible without the extensive partnerships and collaboration across our region. Hundreds of hours were spent in dozens and dozens of meetings over the last year coordinating our collective response. This has both strengthened and deepened local partnerships and enhanced the trust and rapport we have with our partners and clients. In a recent (January 2021) Wasco County Advisory Board meeting,</p>	
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		<p>two local orchardists, a county administrator, and county commissioner shared their deep gratitude and pride in our organization for our response to COVID-19 and the support provided to our region.</p>	
<p><b>190.</b></p>	<p>Covid-19 was not a barrier for Food Safety continuing education in the agricultural workforce in Oregon.</p>	<p>During the COVID-19 pandemic, the agricultural sector was considered vital, and many farms have stayed open, despite challenging and evolving guidelines and regulations during this period. However, even in normal times, farms must remain especially vigilant to ensure their fruit and vegetables are pathogen-free and maintain high standards in cleaning and sanitation practices to prevent potential outbreaks. The “Train the Trainer” Food Safety Workshops offered by the Healthy Plants and Bilingual Education Program at NWREC – Aurora has maintained a close connection with growers, food safety trainers, and labor contractors in Oregon to support food safety education. We wanted to continue offering this training despite the pandemic, and we moved from in-person to a virtual format training.</p> <p>Food Safety education is the key to prevent the risk of food contamination, especially when crops are harvested, directly manipulated by workers, and then directly sold or delivered to the consumer. Farms and contractors need to train their workers at the beginning of the harvest season. There are always new workers, and it is important to refresh good agricultural practices among permanent workers to reduce any risk of food contamination. Every year we receive several requests to offer our Food Safety training. In 2020, we offered 10 workshops, 5 in English and 5 in Spanish with a length of 3hr each. The berry commissions have been the greatest supporters of this education program, especially the Oregon Blueberry Commission, who support and approach our program to continue offering this training. We modified and adapted our curriculum to a Zoom platform, including activities using breakout rooms, and updating important information for the agriculture sector about COVID-19 regulations. We wanted to engage participants and promote participation even in this new format.</p> <p>The “Train the Trainer” Food Safety Workshops reached the 8th year of outreach and education among berry and vegetable growers. This training is not required by any law; farmers attend out of their interest and willingness to learn and adapt current practices. Despite the COVID-19 pandemic, in 2020, we had a total of 169 participants, representing growers, workers, crew leaders, and labor contractors. They participated in a 3hr long workshop preparing for a new harvest season. Participants also adapted to the virtual format instead of in-person instruction. Most of the participants that attended these training events come from different farms, and generally are official trainers at their farms. They can train crews in the field that can go from 50-500 individuals per day in the height of the season. Personal communication with some of them mentioned they could train over 1000 in the whole season (May-August). If we think of an average</p>	

		<p>of 50 workers trained by each of the individuals attending our class, we can get a final conservative estimate of around 8000 individuals that will be trained using our education guidelines and concepts. This is an important number that reflects the impact of this program. In 2013, in a follow-up survey after attending these events, 30 individuals answered a short survey about the number of people they trained. After compiling the answers, a total of 6000 individuals were trained during the season after our training. Our estimate is low what it could be in real numbers. Beyond the number of people trained with our curriculum, it is important to emphasize that there is not any similar program that offers educational opportunities to agricultural workers. Because this program is always offered in Spanish, language is not a barrier. Our training targets and includes a group of agricultural workers that are not included in any formal education program. This agricultural workforce plays an important role in the prevention of food contamination and it is vital to keep them trained. This curriculum fills this education gap and supports good agricultural practices to prevent the risk of food contamination.</p>	
<p><b>191.</b></p>	<p>Wine Grape Marketing Program Impacted by State Shutdown for Covid 19</p>	<p>Our wine grape marketing program for the Umpqua Valley was going well for January and February before the statewide shutdown for Covid 19. After the shutdown in mid March people stopped traveling and visiting our area. Wine sales fell by more than 60% for our region during the remainder of 2020.</p> <p>So what did we do. Visitors from outside the area stayed away until June and July and shipping orders did not grow in that time frame. By August local producers were able to use our new marketing strategy which was focusing on direct sales to wine clubs and discounts for volume purchases in November .</p> <p>The impact of Covid 19 and the shutdown was a reduction of wine sales by about 50% during the March-July period in 2020. Wineries also had to reduce their production of wine in 2020 since the new crop size was down by about 50% over the whole region and state. Our marketing group changed our focus from encouraging tourism to getting local customers in Southern Oregon and visitors who had made purchases in the past, to order wines directly from our wineries. This was done through direct marketing ads and fliers that were sent to customers representing our 40 wineries. Local sales grew back by 20% over the last five months of the year versus the five months from March to July. The value of these gains amounts to an estimated \$350,000 over our Umpqua Valley Winery group during the August-December period. The wineries with large winery club memberships with direct wine sales benefited the most. These are the wineries that have followed our marketing team guidelines to diversify their sales the most over the past ten years.</p>	<p>7</p>

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		<p>After the fall recovery most of these wineries saw total wine sales down about 15% on the year versus 30% for those wineries not using direct sales to customers. Our board of directors has led several online classes on building wine club memberships for those wineries who have not been involved in direct marketing in the past.</p>	
<p><b>192.</b></p>	<p>Juntos en Colaboracion: working together to support thriving Latino and indigenous communities in Lincoln County</p>	<p>Following the a COVID-19 outbreak in June 2020, the OSU TRACE-COVID-19 project conducted an estimate of COVID-19 prevalence in Newport. OSU Extension professionals learned of the results showing an alarming prevalence just before the press release went out. According to the Lincoln County public health department, the COVID-19 outbreak disproportionately affected Latino and indigenous community members who spoke Spanish and Mam, a Mayan language from Guatemala.</p> <p>OSU Extension professionals, specifically a SNAP-Ed EPA and Newport city councilor, who has strong relationships with people who are members of the Latino and indigenous communities provided guidance. It was identified that there was a dire need for information in Spanish and Mam languages about COVID-19 as well as assistance programs. She also described systemic barriers that prevented people who spoke Spanish and Mam from accessing critical healthcare services for COVID-19 testing, diagnosis and treatment. There were also significant limitations in access to information about what to do when someone has the disease in the primary languages spoken by those most affected.</p> <p>Our first project was to respond to the data collected by OSU TRACE and respond with educational information in Spanish and Mam to reduce the risk for COVID-19. We developed videos in Spanish and Mam to get the critical information needed to those most affected by the outbreak. Public health research shows us that people trust doctors, friends and family for health information. We heard that some of the community members did not trust government information and most of the COVID-19 information was coming from the county public health department. In order to get information out quickly, we decided it would need to be from trusted community members. We also learned from community members that the Guatemalan community members who spoke Mam often did not use a written language, so video and audio would be important media. We developed a series of short videos with information from community members that had guidance for reducing the risk of COVID-19 and connected people to local resources.</p> <p>We produced eight informational videos (five in Spanish and three in Mam) about how to reduce spread of the corona virus and what to do if someone is sick. Lincoln County public health and OHA helped us develop scripts consistent with the state and county messages. We prioritized</p>	<p>7</p>

		<p>video topics based on what we had heard from community members during a listening session hosted by Beatriz Botello. We collaborated with community members to translate, produce and record the videos. We created a youtube channel called Novedades del Condado de Lincoln to distribute the videos and worked with community partners to distribute them.</p> <p>We also supported three additional community listening sessions to connect members of the Latino and indigenous communities with decision-makers. Spanish and Mam-speaking community members attended these sessions and had an open floor to ask questions and raise issues to local decision makers. The decision makers included a county commissioner, director of the public health department and CEO of the Samaritan Pacific Communities Hospital and Samaritan North Lincoln hospital.</p> <p>From July to August, these videos were viewed more than 1,900 times. The three videos in Mam accounted for more than half of those views and were shared among their friends and family all over the West Coast. In September, these videos were also disseminated by public health and Extension staff in Clatsop County in response to an outbreak in the seafood industry in Astoria.</p> <p>In August, the success of these videos earned press attention locally and statewide thanks to a press release by Chris Branam:</p> <p><b>Extension</b> &lt;a href="https://extension.oregonstate.edu/news/lincoln-county-extension-builds-coalition-inform-latino-indigenous-communities-about-covid-19"&gt;<a href="https://extension.oregonstate.edu/news/lincoln-county-extension-builds-coalition-inform-latino-indigenous-communities-about-covid-19">https://extension.oregonstate.edu/news/lincoln-county-extension-builds-coalition-inform-latino-indigenous-communities-about-covid-19</a>&lt;/a&gt;</p> <p><b>News Guard Lincoln City:</b> &lt;a href="https://www.thenewsguard.com/news_paid/lincoln-county-extension-builds-coalition-to-inform-latino-indigenous-communities-about-covid-19/article_ca758e82-dcbd-11ea-aa5a-a7bea8c46799.html"&gt;<a href="https://www.thenewsguard.com/news_paid/lincoln-county-extension-builds-coalition-to-inform-latino-indigenous-communities-about-covid-19/article_ca758e82-dcbd-11ea-aa5a-a7bea8c46799.html">https://www.thenewsguard.com/news_paid/lincoln-county-extension-builds-coalition-to-inform-latino-indigenous-communities-about-covid-19/article_ca758e82-dcbd-11ea-aa5a-a7bea8c46799.html</a>&lt;/a&gt;</p> <p><b>Newport News Times</b> &lt;a href="https://newportnewstimes.com/article/coalition-formed-to-provide-covid-19-information"&gt;<a href="https://newportnewstimes.com/article/coalition-formed-to-provide-covid-19-information">https://newportnewstimes.com/article/coalition-formed-to-provide-covid-19-information</a>&lt;/a&gt;</p> <p><b>KLCC (NPR for Oregonians)</b> &lt;a href="https://www.klcc.org/post/lincoln-county-reaches-out-mam-speakers-part-fight-against-virus"&gt;<a href="https://www.klcc.org/post/lincoln-county-reaches-out-mam-speakers-part-fight-against-virus">https://www.klcc.org/post/lincoln-county-reaches-out-mam-speakers-part-fight-against-virus</a>&lt;/a&gt;</p>	
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		<p>The listening sessions and the needs assessment have already resulted in changes to increase access to services in response to COVID-19. Samaritan hospitals and Lincoln County enhanced services in Spanish and Mam. Susan Trachsel, Lincoln County public information officer and member of Juntos en Colaboración, said recently, “Public health and emergency management has been able to use this partnership to build a system that ensures media releases, weekly updates, and urgent messages are sent to key leaders and the public to help spread the message. Examples include COVID-19 updates and the Echo Mountain Fire updates. We continue to work to improve our systems. Honestly, without the help of people in this group last summer, then OSU jumping in to create this official group, we would still be struggling to make sure our local community was getting lifesaving information.”</p>	
193.	Extension Professionals assists Emergency Operations' Pandemic Response	<p>COVID-19 hit our community fast and furious. The immensity of the planning due to the extent of the reach of the pandemic resulted in the creation of a Unified Command including law enforcement, fire professionals, public health and Emergency Management. The number of people needed to staff the Incident Command Structure was daunting and help was requested from Wasco County Extension professionals was requested.</p> <p>OSU Extension was tapped to serve in the Emergency Operation Center (EOC) under ESF6 and ESF11; serving as donations and volunteer manager and PPE distribution. We worked in the EOC from May through July obtaining and distributing PPE supplies (both community donated and government donated) to the Ag industry, government agencies, businesses and schools. She also requested and received from the community child sized face-coverings for migrant education and our local tribes.</p> <p>OSU Extension professionals took the ESF11 lead due to relationships with the regional orchardists and vineyards. OSU Extension was ahead of the government agencies in responding to ag worker's and orchardists' needs by researching and developing educational materials and learning sessions.</p> <p>The Wasco County Commissioners and county finance director have praised and thanked us for our assistance during this trying time and the value of the Extension Service has increased in their eyes and in the eyes of the public.</p>	7
194.	Growing Food in a Food Desert During a Pandemic	<p>When the COVID-19 pandemic brought their regularly scheduled activities to a halt, the team was aware of how vulnerable the community was. With only one small store in Warm Springs, community members must travel off the reservation into the town of Madras to go to the grocery</p>	7

		<p>store. Many in the community are unable to buy more than a few days of food at a time making it unrealistic that families would be able to shelter in place for the duration of the shut-down. The Warm Springs Extension team saw the opportunity to continue providing their “food focused” programming and to give the community the means to provide their own food for their families, elders, or neighbors while allowing their grocery budgets to stretch farther.</p> <p>The Warm Springs Extension team reached out to the Warm Springs Community Action Team to collaborate and pool resources to reach a larger portion of the community. Initial plans were to repurpose funds that would have typically been used for travel and in-person classes or events. A grant from the Native American Agriculture Fund allowed the team to more than double the number of garden kits that would be available from 200 kits to 500! The team reached out to Sakari Farms in Tumalo, OR that grows a variety of plants for food and medicinal purposes including Native American tribal foods in Tumalo, OR. Farm owner, Spring Alaska Schreiner is an Alaskan Native with a deep commitment to food sovereignty and food access, she is a member of the Indigenous Seed Keepers Network. Sakari Farms provided tomato and pepper starts and a variety of seeds from the Northwestern Tribal Seed Bank that is housed on the farm. High Desert Organix in Madras, OR donated 30 cubic yards of soil for the kits as well.</p> <p>The team sent out an initial survey in April to gauge community interest in participating and to learn what plants the community was interested in growing. The survey gathered over 100 responses in just a few days.</p> <p>From the survey responses, the team made lists of seeds and starts, lumber estimates, and what resources would be included. The primary concern for the team was that resources be hard copies as a large portion of the reservation lacks reliable internet access. The SNAP-Ed team members supplied Food Hero recipes and flyers that corresponded to the seeds and starts that would be supplied with the kits, simple food preservation methods were provided such as freezing or drying, and Food Hero coloring sheets and crayons to help students that were suddenly learning remotely stay engaged and spark interest in the gardens. Garden boxes were kept small (2ft by 2ft) to maximize the success of first-time gardeners and to minimize water requirements. Over 100 kits were distributed in 2020 with requests for more in the coming growing season.</p>	
<p><b>195.</b></p>	<p>OSU provides timely, expert information about disinfectants in response to COVID-19</p>	<p>As the novel Coronavirus begins to spread in the United States, disinfectant sales are sky-rocketing. While they are essential tools in protecting public health, they also have the potential to be misused (ineffective) and over-used. Excessive use of disinfectants can cause respiratory health effects, especially in children.</p> <p>Disinfectants are considered 'pesticides' because they kill germs. The National Pesticide</p>	<p>7</p>

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		<p>Information Center (NPIC) is housed at Oregon State University, and funded by the US EPA. NPIC faculty have expertise in pesticide toxicology, use practices, and risk-communication. We developed a one-page publication about reducing risk when using disinfectants, especially around children. It was developed, reviewed by the Antimicrobials Division (US EPA), and publicized within one week's time. Amy Cross was the primary author of the document, and she involved every member of the NPIC team in the process.</p> <p>Our one-page guidance document is now available, on March 5, 2020, and distribution to national networks has begun. In particular, these long-standing NPIC partners are spreading the word: the Association of American Poison Control Centers (AAPCC) and the National School IPM Workgroup.</p>	
<p><b>196.</b></p>	<p>Dairy Innovation Program Leadership</p>	<p>The dairy industry in the US Pacific Northwest is an important part of each state's current and long term economic viability. Milk is fifth in terms revenue relative to other agricultural commodities in Oregon and 14<sup>th</sup> in the US relative to other dairy producing states. This excludes the value generated in the rest of the ecosystem that either supports Oregon's Dairy industry or benefits from it which equated to \$2.6Bn in 2018. Stakeholder groups along the value chain are reliant on each for sustained success and agree that consistent innovation in new products, packaging and processing are essential to that success. There are 34 Dairy processors in the PNW with mainly the largest ones (e.g. Darigold, Tillamook) having internal resources to create their own innovation pipelines. This number excludes all of the farmstead and artisan cheesemakers who are both resource constrained as well as have varying degrees of capability related to innovation and new product development. Though the volume of cheeses these artisan processors produce is smaller relative to their counterparts, they play an essential role to the dairy industry due to the rate of growth of specialty cheeses, their unique engagement with consumers (e.g. direct sales/marketing, restaurants) and the marketing exposure through high profile awards (e.g. Rogue Creamery and World's Best Cheese). Having access to guidance and expanded capacity of effective new product development resources is key to thriving in the short and long term.</p> <p>OSU Extension Dairy specialist and a member of the OSU Arbutnot Dairy Center collaborated across the PNW dairy 'ecosystem' including Oregon Dairy Farmers Association (ODFA), Oregon Dairy and Nutrition Council, industry stakeholders and the collective resources in OSU FST that enable the dairy industry. The opportunity was to create capacity through budget advocacy, creating a framework for Innovation support and effectively communicating with stakeholders to ensure market impact and sustained support from champions. Led effort within OSU FST to define an operating framework that defined roles and responsibilities, how the multi-year budget will be managed; defined principles for choosing projects to ensure breadth of impact and a portfolio that reflected the processor group and fully leveraged OSU FST's capabilities; developed a communicate strategy to ensure engagement, gain input and build confidence. Brought stakeholder groups together to align on priorities, surface concerns, clarify roles and how the framework would operate, including ongoing priority setting. Leveraged existing stakeholder forums to communicate plans and status (e.g. ODFA and ODNC Board meetings, Oregon Cheese Guild annual conference). Communicated directly with small to medium scale processors to check</p>	<p>7</p>

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		<p>for understanding and identify potential projects. Ensured a project portfolio effectively spanned multiple product types, processors of varying sizes and FST's capabilities from ideation, new product development, food safety and consumer testing.</p> <p>Thirteen requests were received and processed between December 2019 and August 2020. Of those 3 were deemed a poor fit for the program, 2 the client decided not to proceed and 1 was successfully initiated but paused due to reprioritization by the processor due to COVID. Of the remaining 8, 6 were successfully completed and are being commercialized by the client, 1 will wrap before year end and the final project, a consumer test will be completed in 2021. Client feedback was uniformly positive.</p>	
197.	<p>Marion Farm Loop helps connect people to their local food systems during COVID-19</p>	<p>People are always looking for a way to connect with local products and family friendly activities. During the COVID-19 pandemic, connecting to local food systems became extremely important as restaurants closed and some large grocery stores ran out of products. School, sports, places of worship, and other social activities became limited or were moved to a virtual setting. Instead of traveling out of state on big vacations people were limited to what was available locally, looking for places that had safety measures in place. Because of these drastic life changes, people began to look closer to home for food and entertainment their families could do safely. And because farmers were still farming and producing product, the agritourism operations were positioned well to help with this.</p> <p>Although the Marion Farm Loop is not a new project, moving into it's fourth year in 2020, it became an easy way for the public to connect with their local farms. The 24 farms that make up this cooperative marketing effort are packaged together in a printed brochure and interactive website that allow visitors to easily find information about each location, their hours and what they offer. These farms offered a wide variety of products and activities to people looking to reconnect with their local food systems and get their families out of the house to fun, educational and safe locations. OSU Extension agritourism program played a role in helping to support the Marion Farm Loop and the organization that runs it, Oregon Agritourism Partnership, through organization of meetings, helping edit and produce brochures and some farm visits. OSU Extension also worked with the Marion County GIS department to produce the printed map for brochures as well as an interactive online map for the website for visitors to easily explore farm stops.</p> <p>Five thousand Marion Farm Loop brochures were distributed locally, and the loop had hundreds of social media and website interactions. These 24 agritourism farms knew they were going to be taking a financial hit due to the fact capacity at events and activities were limited, sometimes cancelled all together. However, because more of the local population began exploring out their own backdoor to supply their families with locally grown and produced food with help from programs such as the Marion Farm Loop, the financial impact to the farms was somewhat lessened. New customers discovered or rediscovered U-pick, farm stands, CSAs, on-farm bakeries, nurseries, and modified harvest festivals. All locations implemented virus safety measures like social distancing, disinfecting, mask wearing, sanitation stations, and sneeze guards</p>	7



		to help keep their customer's safe while providing them with locally grown and nutritious food.	
198.	Increasing Community Capacity to Adopt Healthy Behaviors	<p>Coos County lacks opportunities for health providers to make nutrition referrals to qualified specialists. Only one facility in Coos County employs Registered Dietitians (RDs), providing 4.8 FTE. The other 9 facilities have no options for dietetic referrals. Even the public health department, which is mandated by Federal requirements to have a Registered Dietitian for high-risk WIC participants, outsources RD services to another county. In addition, there is only one Certified Health Coach in Coos County, and this person has a private business charging fees most residents could not afford.</p> <p>The only dietitian providing education to Coos and Curry residents is provided through OSU Extension Family &amp; Community Health. County assessments reveal the growing interest in nutrition cannot be addressed with our current capacity.</p> <p>A county-wide assessment determined that health providers believe nutrition is important but do not screen their patients because they have limited options for referring those found to be at risk. Possible options could include group medical appointments, Certified Health Coaches, community cooking classes and nutrition presentations.</p> <p>As a breakthrough for health coaches, the American Medical Association (AMA) has approved the creation of new Category III CPT® codes for health and well-being coaching. The proposal was submitted by the National Board for Health and Wellness Coaching (NBHWC). These Health and Well-Being Coaching CPT® codes will go into effect on January 1, 2020.</p> <p>In Oct 2020, Coos Co OSU Extension FCH arranged for a Health Coach Certification Training to be held virtually (due to COVID) for local professionals and para-professionals. The training was provided through Real Balance Global Wellness, Inc, one of the premier training organizations for health coaches. Organizations were encouraged to send their employees or sponsor community partners to the training.</p> <p>The training was conducted for 2 hours per night, 2 nights per week for 8 weeks in Oct and Nov 2020. Fees were collected using online registration and a minimum of 12 students was required to cover the costs of the Real Balance trainers.</p> <p>Thirty-two hours of continuing education units were provided through Real Balance for RDs, RNs, PTs and CHES. Completion of the training is the first step in certification. Participants have 6 months to complete the 5 buddy coaching sessions, an 8-session case study and the certification exam. Completion of the Real Balance training also qualifies coaches to sit for the National Board for Health and Wellness Coaching exam.</p> <p>Graduates of the coaching certification will be invited to join a network of coaches to help them find coaching referrals and get reimbursement. Those that achieve certification will have their contact</p>	7

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		<p>information included in the Nutrition Resource Booklet being developed for the WE CAN cancer study in Coos County and distributed across 2 counties.</p> <p>A minimum of 12 registrants and maximum of 20 was set for the training. But the interest was so great that we soon had more than 30 interested. At the advice of Real Balance, we capped the training at 30 which required the addition of a second trainer. Despite this additional cost, we had enough in registrant fees to cover all training costs. In addition, OSU Extension was able to reduce the cost of the training from \$1,450 to \$700 per registrant, allowing more local residents to attend, particularly those not being sponsored by their employers.</p> <p>The participants were employees from agencies like The Confederated Tribes, Advanced Health (CCO), Coast Community Health (FQHC), Coos Health and Wellness (PH Dept) and Bay Area Hospital. This is a key element in the seeding of Certified Health Coaches in multiple community organizations. The training also allowed collaborating partners like the Jackson County YMCA to sponsor employees. Other registrants included nurses, dietitians, therapists and personal trainers.</p> <p>Twenty eight of the 30 class registrants completed the 8 week training, which is outstanding given the COVID circumstances and serious Oregon fires. Graduates now have 6 months to complete their requirements and attain certification. Already, 3 students have achieved certification and each has indicated interest in preparing for the National Exam in 2021. This will increase the likelihood for receiving medical insurance reimbursement for health coaching services in Coos County.</p> <p>Since there was limited seating available for this training, some organizations like La Clinical FQHC and AllCare CCO, who were interested in sending employees, had to be turned away. I was able to put them in direct contact with the training agency to arrange Health Coach Certification trainings at their sites. They are due to arrange these trainings in 2021.</p> <p>The network of Certified Health Coaches in Coos and Curry County will give healthcare providers options for low-risk patient and increase community capacity for residents to get the support they need to adopt healthy behaviors.</p>	
<p><b>199.</b></p>	<p>Oregon Master Naturalist programs shift to a virtual world</p>	<p>Three days before it was scheduled to begin in March of 2020, the Oregon Master Naturalist (OMN) North Willamette Ecoregion Course was cancelled due to growing concerns about the novel coronavirus. Some participants had already withdrawn from the course over fears of the new virus but their spaces had immediately been filled by those who had been waitlisted. Several months in planning, the ecoregion course was finally returning to the Portland Metro area after two years without a local coordinator.</p> <p>As the reality and danger of the coronavirus set in, all upcoming events started disappearing from calendars. One such event included the OMN Portland Metro Chapter's spring quarterly meeting which was scheduled to be held in April at PCC Rock Creek with tours of the beautiful new Master Gardener display garden and a presentation on pollinators from the Xerces Society.</p>	<p>7</p>

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		<p>Faced with the uncertainty around when in-person meetings would be possible again, the OMN Portland Metro chapter suggested that their meeting be transitioned to a virtual setting. As discussions emerged around the idea of virtual and distance learning, we decided to offer a webinar series. The chapter was responsible for identifying and reaching out to presenters and I took on a new role of learning the ins and outs of hosting Zoom webinars. With the volunteers' assistance, we were able to cohost three chapter-organized webinars with a speaker from the Xerces Society, a local Zoologist, a nationally-known environmental journalist and author, and a speaker from the Oregon Natural Desert Association.</p> <p>The webinar series caught on. As a result of the initial three webinars, the OMN program continued the series through July with new speakers brought in by Jason O'Brien and Ann Harris. With new found confidence in hosting webinars, the Washington County OMN program reached out to Tualatin SWCD to coordinate a series of six webinars geared towards homeowners in the greater Washington county areas which were held in July and August.</p> <p>Although the webinars were well attended, they did not replace the cancelled ecoregion field course. As webinars continued, OSU Extension began planning and brainstorming what an online ecoregion course might look like. Concerned about how to provide a more immersive experience than a webinar, yet over the same platform, We spent time researching other state's virtual naturalist programs and educating myself about best practices for virtual teaching. Throughout this time OSU Extension heard from participants of the cancelled course expressing their interest in participating in a virtual or hybrid course. After much planning, OSU Extension hit the ground running and organized a fully online ecoregion course focused on the North Willamette Region, the impact of which OSU Extension professionals plan to share in 2021 upon its completion. The course began on November 30, 2020 and runs through the end of February.</p> <p>Our initial three OMN Portland Chapter webinars lead to an extensive summer series of virtual opportunities for Oregon Master Naturalists across the state. Through evaluations, we not only were able to capture people's experiences and feelings about speakers, but also areas of interest for future webinars and workshops. Additionally, we reached a much wider audience than we would have for our in-person chapter meetings, which usually would cap out at around 25 attendees. At the end of the summer, we had reached hundreds of people across all of Oregon and as far away as England.</p>	
<p><b>200.</b></p>	<p>U-pick farms get a boost from public-facing article about visiting during COVID-19</p>	<p>The COVID-19 pandemic hit Oregon just a few months before U-pick farms were planning to open for the season. There was uncertainty in the Willamette Valley farming community as to how state regulations would affect their picking season. Would they even be allowed to have visitors onto their farms? Then farms and farming were deemed essential by the government and they were allowed to remain open and supply the public with their farm products. But there was a great deal of uncertainty surrounding how they would go about opening to the public, keep their customers safe and follow all state mandated guidelines. Mask requirements, hand sanitizer and social distancing quickly became the normal on farms. The U-pick operations began to space customers out by rows and sometimes having them bring their own containers. But the farms were concerned</p>	<p>7</p>

		<p>they would get negative interactions from taking these actions or that the public would have no idea these safety measures were in place before visiting. There was not a lot of universal coverage in Oregon about how to act on these farms during the pandemic.</p> <p>Recognizing this lack of communication to the general public could be an issue as the first major U-pick crop appeared on the horizon, berries, Melissa Fery and myself wrote a public-facing article about what the visiting public should expect on when visiting a U-pick operation during the COVID-19 pandemic. "With accommodations, Oregon U-pick farms are opening for business" included quotes from local farms about what they were doing to follow state regulations put in place to help stop the spread of the virus. It also contained a bullet point section of things to keep in mind when visiting a U-pick such as checking farm websites and social media for hours and updates, keeping in mind wait times may be longer at checkout due to extra sanitation and to keep socially distant even in the fields. The article also contained a link to the Oregon Department of Agriculture's U-pick guidance for farms and public to further the reader's knowledge.</p> <p>The article was circulated through Oregon State Extension's digital platforms such as social media and was posted to a few different websites. This singular document had 2,508 website views and 21 out of 21 positive website interactions in 2020. On Facebook, the article had 30 reactions and 18 shares just on the main OSU Extension Service page. The sharing of this digital media allowed information about how to visit U-pick farms during the pandemic reached thousands of readers. U-pick operations in the Willamette Valley reported more people than in years past looking to get their produce directly from the farm which increased their customer base and sales. Looking forward, the industry expects to see the number of U-pick farms increase in 2021 as the virus continues to limit certain market channels such as restaurants.</p>	
<p><b>201.</b></p>	<p>Creating community of resources for educators working with Indigenous communities</p>	<p>Culturally significant appropriate programming and educational resources for our Indigenous communities were lacking within our SNAP-Ed and other extension programs. Background and historical significance of our local Indigenous populations were also lacking within our Extension educators. The importance of reaching our local Indigenous communities where they are and with resources that pertain to them is greatly important, not only as extension offices that are for the people but as a land-grant university.</p> <p>The Native American/Indigenous people's workgroup began its work two years ago by collecting survey information from tribal communities to help inform the design of culturally appropriate recipes and educational materials. In 2019-20, the group created Food Hero recipes, coloring sheets and assisted in updating the salmon monthly to be culturally appropriate.</p> <p>In 2020, this work group agreed to a name change; from Native American to Indigenous Peoples. To more accurately reflect the work group members and audience served. The work group has a two-prong structure: an external work group, which includes four Tribal Education Advisors from the Oregon Department of Education; a Farm to School advisor and an internal extension work group, which includes any faculty/staff member who works with or wants to work with indigenous peoples. The workgroup began with a SNAP-Ed focus and has evolved to include other extension departments such as 4-H and Master Gardeners. The co-leaders of this group facilitate a monthly</p>	<p>7</p>

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		<p>statewide workgroup meeting. On a rotating schedule, the co-leads also meet monthly with staff from one of the 9 federally recognized tribes to assist them in successful communication and understanding with local indigenous populations. The guiding principle for this group is: "We gather to help each other to lead change in a way that is sustainable and moving forward with cultural humility."</p> <p>Interest continued to grow through out extension staff, faculty and administration. To answer the call and help extension educators and all of Oregon's tribal communities the IPWG provided multiple presentations and educational opportunities. During Extension Annual Conference, 2020, the IPWG along with other SNAP-Ed based cultural workgroups, presented on key aspects of working with non-white communities along with importance for cultural humility. The co-leads and an IPWG member held a tabling event at conference to promote additional questions regarding extension working with Oregon's tribal communities. A more detailed presentation speaking to Oregon's Indigenous history, Land Grant Universities, importance of working with IPWG when developing materials, cultural humility, traditional food ways, and Senate Bill 13 was delivered on Decembers SNAP-Ed state call.</p> <p>The IPWG strives to increase the knowledge of Oregon's Indigenous Peoples, for extension educators, our communities and to support these efforts for all of OSU students, staff and administration. When working through goals and objectives, we are always looking through eyes and hearts of cultural humility. Workgroup membership continues to grow and educators thrive in strengthening their confidence and relationships within their local tribal communities. Many extension educators have commented on the positive impact the workgroup continues to be for their programming and partnership growth. Working with statewide stakeholders such as ODE, provides enhanced opportunities for discussions on education efforts affecting all 9 federally recognized tribes of Oregon. The ODE tribal education liaisons have expressed their support of the workgroups goals and objectives, and have praised the workgroup for how we go about achieving them.</p>	
202.	Advanced Training Webinar Series reaches OSU Master Gardener volunteers across the state	<p>OSU Extension Master Gardeners are required to attend a minimum of ten hours of approved continuing education units annually to remain current in the program. The goal of this continuing education is to ensure that Master Gardener volunteers have the most current, research-based information for use when educating the public. County faculty and staff are responsible for offering these advanced training opportunities. Currently, most continuing education classes are offered at face-to-face events offered throughout the year. While providing high-quality training, face-to-face events may be difficult for some Master Gardeners to attend due to timing, travel, and/or financial reasons. It may also be difficult for program coordinators to offer continuing education with geographic and financial limitations.</p> <p>To help meet the requirements for continuing education in Linn and Benton County, an annual webinar series started in late 2017. In order to reach the most Master Gardeners and to share resources across county lines, the webinars were open to all Master Gardeners statewide. Topics are selected with input from the statewide Master Gardener coordinator and statewide faculty and</p>	7

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		<p>staff working with the Master Gardener program. The webinars are presented by guest experts from OSU and promote newly published Extension publications as well as increase knowledge of new pest and disease problems that Master Gardeners may see in their counties. The webinars are promoted nationally through the Extension Master Gardener Coordinators working group newsletter, the Western IPM Center newsletter and other related partner organizations. The series is promoted statewide through internal communications to county program coordinators and to the general public via social media platforms. The webinars are presented live via Zoom with time dedicated to a moderated question and answer session. The sessions are recorded and posted on a publicly available YouTube channel for future viewing and for those who could not attend the live event.</p> <p>Six webinars were delivered in 2020. Presenters were from OSU Departments of Fisheries and Wildlife, Botany and Plant Pathology, and Horticulture. The focus this year was on sharing outreach projects and new Extension publications.</p> <p>The 2020 webinar series (6 webinars) had 2,060 participants in the live webinars and 3,352 recording views. Registration data shows that live webinar participants joined from 30 Oregon counties, 45 U.S. states, and Canada. For the entire 2017-2020 webinar series (32 webinars) the total live participants were 5,911 and cumulative recording views was 39,283 (as of 12/31/20).</p> <p>Participant comments from the 2017 surveys indicate that offering flexible continuing education opportunities and formats may have positive effects on volunteer retention: "Love these webinars. I'm an MG still working full time, this allows me to complete my education hours without having to burn vacation days to go to workshops. Thank you!" and "I appreciate these webinars as my county is offering fewer and fewer options for continuing education. Plus, I don't have to drive 44 miles to the extension office!"</p> <p>The survey instrument was improved for the 2018 series. 93% of respondents (n=368) indicated that they either 'significantly' or moderately improved their understanding of the webinar topic. 91% of respondents (n=385) indicated that they will implement the knowledge gained from the webinar into their work as Master Gardener volunteer educators. 73% of respondents (n=384) indicated that they will make changes in their personal gardening practices to incorporate what they learned from a webinar. Interesting note: of the responses indicating 'no changes will be made to my gardening practices' only one disagreed with the webinar findings, the remaining either didn't have that particular type of garden or had already implement the practices. Similar results were seen in 2019 &amp; 2020 surveys.</p>	
203.	Enrollment in Online Home Horticulture/ Master Gardener Course Surges	Enrollment in the winter 2020 MG/Home Hort course increased slightly from 2019, with the balance shifting towards Home Hort. In 2019 winter enrollment was 73 (39 Home Hort, 34 MG) plus 45 Home Hort students in the summer, for a total of 118.	7

		<p>In 2020 winter enrollment was 72, including 47 Home Hort (18% increase), 25 MG (26% decrease) plus 53 Home Hort students in the summer, for a total of 125 (6% overall increase). This was before COVID-19 struck. The stay-at-home restrictions caused interest in gardening to skyrocket. The online Summer Intensive Home Horticulture/Master Gardener course was well positioned to meet the increased need.</p> <p>In response to the high level of interest in gardening education, we moved the start date of the Summer Intensive online course from July in 2019, to May in 2020, so that students could put the information into practice immediately, with a small increase in the enrollment cap.</p> <p>In 2019, 45 students enrolled in the Summer Intensive course, and there was no waitlist. In 2020, despite increasing the enrollment cap, the waitlist (84) substantially exceeded the number of students that could be accommodated (53). Actual enrollment increased 18%, but it would have been much higher if we could have enrolled all students.</p> <p>Registration for the 2021 winter course takes place in 2020. For 2021 it will be Home Hort only, with no MG section. In light of the heavy summer demand, we raised the cap to 100. Despite this, demand was so strong that the class will open with a waitlist of 56. While we have been able to serve substantially more students, we have still not been able to fully meet the demand for online gardening education this year.</p> <p>In addition, over 40,000 students enrolled in the free Vegetable Gardening we offered in spring, which led to the side benefit of substantially increased enrollment in the other paid Short Course.</p> <p>The complete enrollment statistics for 2020 are:  <u>Instructor-Led Course Enrollment - 125</u>          •Home Horticulture Summer Intensive: 53 (45 in 2019)          •Home Horticulture Winter Term: 47 (39 in 2019)          •Master Gardener Winter Term: 25 (34 in 2019)  <b>Total: 125 (118 in 2019)</b></p> <p><u>Short Course (Self-paced) Enrollment – 60,311</u>          Vegetable Gardening (Free for Part of the Year) 40,081 (46 in 2019)          Introduction to the Master Gardener Program (Free) 18,566 (1041 in 2019)          Integrated Pest Management 89 (19 in 2019)          Basic Botany 511 (129 in 2019)          Soils and Compost 318 (48 in 2019)          Sustainable Landscape Design 182 (458 in 2019, 18 paid)          Plant Pathology 145 (20 in 2019)          Entomology 93 (15 in 2019)          Sustainable Landscape Management 69 (331 in 2019, 12 paid)          Pesticide Safety 53 (10 in 2019)          Herbaceous Ornamental Plants 134 (24 in 2019)          Woody Landscape Plants 70 (11 in 2019)</p>	
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2020 Annual Report of Accomplishments and Results (AREERA)

		<p><b>Total 2020 Enrollment 60,311</b>  <b>Total 2019 Enrollment 2,182</b></p>	
<p><b>204.</b></p>	<p>Stepping into the work of Diversity, Equity and Inclusion in the Master Gardener Program</p>	<p>The OSU Extension Master Gardener program serves the needs of Oregon’s broader gardening community, in partnership with volunteers who have been certified as Master Gardeners. These Master Gardener volunteers, themselves, are predominantly over the age of 55, female, and white. Consequently, the gardening public that the program serves are only a subsection of the broader community of Oregon gardeners. Issues regarding diversity, equity and inclusion are deeply embedded into many aspects of the program, from when and where programming occurs, to cost, to insular outreach, to name a few. Work addressing these issues has previously been done on a county by county basis, but without statewide momentum. Some volunteers have called for the program to modernize in its inclusion and diversity, while many volunteers have been unaware of the issues related to inequities and accessibility of the program. First with COVID and then with the social unrest of the summer of 2020, the need to do this work rose to the surface like never before.</p> <p>OSU Extension professionals conducted Interviews with coordinators across the state to inform the current status of the program regarding its DEI efforts and needs. Research, conversations and collaborations with other state program leaders, including Rhode Island, California and Minnesota, helped to inform work being done across the country and build upon their findings and examples. OSU Extension convened a workgroup of 6 county coordinators and 2 state leaders began to meet monthly to explore, identify, and prioritize DEI work. A presentation of the assessment and recommendations was made to the group. A diversity and inclusion training was held for all coordinators, facilitated by an external resource. Immediate needs were identified, including development of land acknowledgements and pronoun use to support our LGBTQ colleagues and volunteers, and began implementation from the statewide level and demonstration for county leadership to follow in 2021.</p> <p>Outcomes from this work include:</p> <ul style="list-style-type: none"> <li>· published thought pieces and statements communicating and prioritizing our commitment to DEI.</li> <li>· Invited presentations to peers at the national Extension Master Gardener Coordinators Conference and the Cornell Agriculture Inservice Day</li> <li>· Clear communications were made from statewide leadership to support the work of county leaders and chapter/association leadership to move forward in their own DEI work. These communications include specific guidance on pronoun use and land acknowledgements in the Master Gardener programs.</li> </ul> <p>Impacts include:</p> <p>Commitments were made toward building an anti-racist Master Gardener program, invoking both support and outrage from volunteers. The foundation was set for a larger DEI workgroup, including volunteers, to convene in 2021.</p>	<p>7</p>