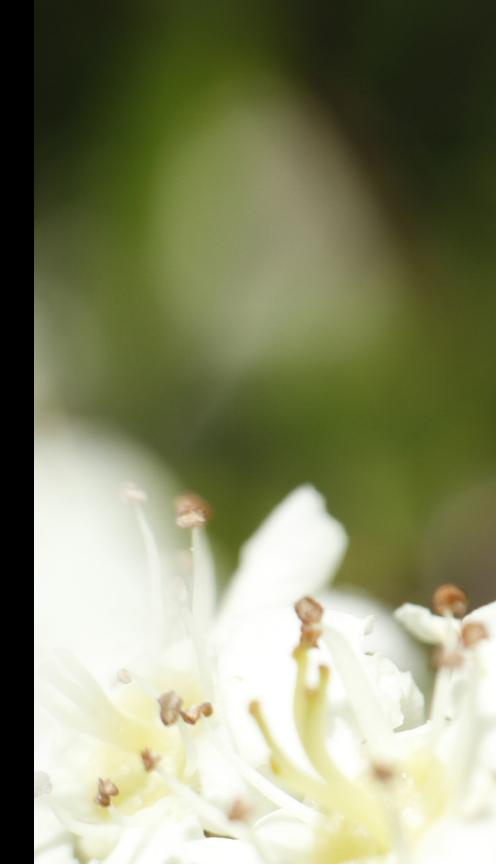


AGRICULTURAL RESEARCH FOUNDATION

1600 SW Western Blvd, Suite 320 Corvallis, Oregon 97333 P 541-737-3228

The Agricultural Research Foundation is a nonprofit 501(c)3 corporation. Gifts and charitable bequests to the Foundation are deductible and can help accrue tax benefits.

http://agresearchfoundation.oregonstate.edu



AGRICULTURAL RESEARCH FOUNDATION ANNUAL REPORT 2019-2020







President's Message 2019-2020 ARF Annual Report

Greetings from the OSU Agricultural Research Foundation (ARF). This annual report is a reflection of the Foundation's activities from July 1, 2019 through June 30, 2020. In my remarks, I will reflect on the activities of the past year and look forward to the coming year.

The last half of the fiscal year has become quite a year. In March of 2020, as we were preparing for our spring Board of Directors meeting the Covid-19 pandemic began. Initially, the thinking was that it would be over in four to

six weeks. It wasn't, and our staff has worked very diligently from remote locations to make sure that the goals and mission of ARF have been carried out. I thank them for their work in a difficult and changing time. Zoom meetings have been a constant way of life.

The mission of the ARF is to act as a holder of funds for agricultural and natural resource industries. We receive funds from donor partners and allocate them to the researchers as designated. We invest these funds and with the strong economy, our general fund

has shown strong growth.

I am pleased to announce that because of our strong growth the past several years we were able to increase this year's amount allocated to our Competitive Grants Program to \$723,000 and the award maximum to \$15,000.

Forty-eight proposals were selected for funding in January 2020. The results of past funded and completed Research Projects are available on the ARF webpage.

Dr. Dan Arp is our Executive Director. Dr. Arp began in January

2020. We thank him for his leadership during the chaos and challenging times since Covid-19 began. He is very much appreciated.

Marty Kaye began in October of 2020 as our Finance Director. He comes to us with a strong background in accounting and financial management. We want to thank our past financial manager Yanli Zang for her support and help to ARF during the transition and training Marty as he begins his time with ARF.

Charlene Wilkinson is in her sixteenth year with ARF and serves as our Office Manager.

It is our staff, past and future, that really makes ARF function efficiently. Thank you to them for their commitment to ARF. They make the job of the officers and the Board of Directors easy.

As of this writing, we will have had two Zoom Board meetings. The Board of Directors is a very diverse group of Agriculture and Natural Resource Leaders. I look forward to when we again can have in person meetings. They are a great group of individuals.

Till next year. GO BEAVS

Ralph Fisher, President



2019-20 Agricultural Research Foundation **Directors**

Today's ARF Directors and Officers, like the founders of the organization, are volunteers. They are chosen to represent the diversity of Oregon's agricultural and natural resource industries. They give generously of their time and expertise in setting policy and monitoring results from Foundation projects. The directors meet bi-annually to review budgets, analyze Foundation activities of the past year, and plan programs for the next.

Officers

President

Ralph Fisher
Sublimity, Grass Seed

Vice Presidents

Lance Lyon *Aurora, Nursery Industry*

Ron Hathaway

Klamath Falls, Professor Emeritus Extension - Animal Science

Treasurer/Secretary

Chelle Davis *Lebanon, Banking*

Directors

Dan Arp (through Sept 1) *Corvallis, Dean Emeritus*

College of Agricultural Sciences, OSU

Robert Bailey

The Dalles, Tree Fruits

David Beck

Amity, Wine Industry

Barbara Bond

Amity, Professor Emeritus Forest Ecosystems & Society, OSU

Stella Coakley

Corvallis, Assoc. Dean Emeritus College of Agricultural Sciences, OSU Tim Elbert

Central Point, Nursery Industry

Mike Hessel

Shedd, Fresh Market Vegetables

and Melons

Kaety Jacobson

Newport, Fishing Industry Lincoln County Commissioner

Tami Kerr

Corvallis, Dairy Industry

Josh Kvidt

Philomath, Internet

Elizabeth Levi

Portland, Attorney

Mike Macnab

Portland, Retired Non-profit Executive

Wheat Rancher

Pat Malone

Philomath, Christmas Trees Benton County Commissioner

Jean McKinney

Wasco, Wheat Rancher

Todd Nash

Enterprise, Cattle Rancher Wallowa County Commissioner

Bryan Ostlund

Salem, Commodity Commissions

Administration



Fred Postlewaite (through Oct. 1)

Newport, Banking
Shelly Sorem
Corvallis, CPA
Edwin Stastny, Jr.

Marty Vavra

LaGrande, Professor Emeritus

Rangeland Science
Bud Weiser

Malin, Irrigated Crops

Corvallis, Dean Emeritus

College of Agricultural Sciences, OSU

Committees

Audit

Josh Kvidt, Chair Chelle Davis Fred Postlewaite Shelly Sorem

Ralph Fisher, Ex-officio

Competitive Grants

Mike Hessel, Chair

Bob Bailey
David Beck
Barabara Bond
Stella Coakley
Ron Hathaway
Josh Kvidt
Elizabeth Levi

Lance Lyon

Jean McKinney Todd Nash

Bryan Ostlund Ed Stastny

Marty Vavra

Ralph Fisher, Ex-officio

Executive

Ralph Fisher, Chair

Chelle Davis
Ron Hathaway
Elizabeth Levi
Lance Lyon
Bud Weiser

Finance

Ron Hathaway, Chair

Chelle Davis Lance Lyon Mike Macnab Pat Malone

Ralph Fisher, Ex-officio

Nominations

Bud Weiser, Chair Stella Coakley Jean McKinney Ralph Fisher

Personnel

Lance Lyon, Chair Chelle Davis Ralph Fisher Ron Hathaway Elizabeth Levi

Honorary Directors

Alan Sams

Bud Weiser

Dean, College of Agricultural Sciences

Bill Boggess Exec. Assoc. Dean,

College of Agricultural Sciences

Ed Ray

President, Oregon State University

Emeritus Directors

Roy Arnold Lane Borg Ron Cameron Ellen Egan Larry Kaseberg Ken Messerle Sam Wade

Foundation Staff

Russ Karow (through Dec. 31)

Dan Arp (from Jan. 1) *Executive Director*

Meredith Wade (through Aug. 31)

Jianli Zhu (from Sept. 18) Manager of Finance and Research

Charlene Wilkinson Office Manager



The Agricultural Research Foundation

The Agricultural Research Foundation was established in October of 1934 to encourage and facilitate research in all branches of agriculture and related fields for the benefit of Oregon's agricultural and natural resource industries. The Foundation is the custodian of privately and publicly donated research funds as well as grant funds from commodity commissions and other producer associations. These funds support work conducted in Oregon State University (OSU) facilities in the Corvallis area and throughout the state, as well as some cooperative projects with university scientists in other states and around the world.

During the eighty-six years since its inception, the Foundation has provided leadership, incentive, and support for vigorous research programs across OSU agricultural and natural resource sciences. To date, the Foundation has received and managed nearly \$220 million in donor gifts and grants to support research on a wide range of topics. In addition, the Foundation itself has provided over \$9 million of its own funds, via its Competitive Grants Program, to initiate innovative research studies proposed by agricultural and natural resource scientists at OSU.

The founders of the Foundation envisioned a strong, collaborative partnership between OSU and Oregon's diverse agricultural and natural resource industries. The Foundation has achieved that goal and works toward enhancements each year.



ARF Honor Roll

In Memory of Roy G. Arnold (1941-2019)

Roy Arnold was elected as a member of the Agricultural Research Foundation (ARF) Board of Directors in 2006. He served on the Board until 2015 and then became a Director Emeritus. Roy was active on a number of ARF committees, including the Nominations Committee and the Audit Committee. But his service to ARF began many years before he joined the Board of Directors. Roy came to OSU in 1987 to serve as the Dean of the College of Agricultural Sciences. He moved to Provost and Executive Vice President of OSU from 1991-1999. He finished his career at OSU as Executive Associate Dean of the College of Agricultural Sciences from 2000-2006. In all of those administrative positions, he was also an ex-officio member of the ARF Board. He interacted closely with ARF during those nineteen years and helped foster the close working relationship that ARF currently enjoys with OSU.

While a member of the ARF Board, his extensive experience in university administration was a constant source of valuable advice. Roy was astute at assessing peoples' talents. As chair of the ARF Nominations Committee, he consistently persuaded busy talented people with diverse backgrounds to serve as Directors on the ARF Board. This broadening of the Board's expertise in evaluating research proposals was especially timely while the ARF Competitive Grants Program was markedly expanding.

As Provost, Roy played a pivotal role in bringing about a fundamental change in the value-system of OSU. The predominant narrow view of faculty scholarship at OSU, and other US universities, was "conducting research and publishing the results in refereed scientific journals". With Roy's quiet and often behind the scenes leadership, the definition was changed to "creative intellectual work that is validated by peers and communicated"—consisting of "the discovery, application and integration of knowledge and creative artistry." That change originated in the College of Agricultural Sciences, was soon adopted as the standard for all of OSU, and has since been adopted by other US and Canadian Research Universities with complex missions, public outreach programs and medical schools.



Roy was raised on a farm in Lyons, Nebraska. The first in his family to attend college, he earned a bachelor's degree at the University of Nebraska and then moved to Oregon State University where he earned a Ph.D. in Food Science and Technology. He returned to the University of Nebraska where he spent the next 20 years. He rose to the position of Vice Chancellor of the Institute of Agriculture and Natural Resources before returning to OSU as Dean.

Besides ARF, Roy was active in a variety of national and campus organizations, including serving as national President of the Institute of Food Technologists, and President of campus chapters of Gamma Sigma Delta, Sigma Xi, and Triad. He worked closely with the Kellogg Foundation to help bring about institutional change.

While in college at Nebraska, Roy met and married Jane. They raised two daughters together, Jana and Julie. Notwithstanding his active professional career, Roy was a devoted father, eager to share the world with his daughters. As grandchildren came into their lives, that passion was also shared with them.

Roy was a mentor to many individuals, some early in their careers and seeking counsel on career development, and others well along in their careers who were seeking advice on a pending decision or thorny situation. One could always count on Roy for a thoughtful response.

Roy was known by friends and colleagues as a person of integrity—his word was his bond; as a great listener and problem solver—"there are as least as many versions of a story as there are persons telling the story"; and of humor—his dry wit could come as a surprise to those who knew only his administrative persona. Roy had a tremendous impact wherever he went.

Memorial gifts can be made to Stone Soup in Corvallis, United Methodist Committee on Relief (UMCOR), or OSU Foundation (Memo to Roy Arnold/Peer Mentoring Committee).

Roy's death is a loss for us all, but his legacy lives on through his work and the many people he touched throughout his life.



2019–2020 Agricultural Research Foundation **Financial Summary**

The Agricultural Research Foundation is in good financial health with stable cash flow, strong investment results, and continued revenue growth. Project revenue decreased 5% from the previous year to \$8,441,182. Project expenses increased 9% to \$9,376,114. Total assets decreased by \$3.2M to \$29,859,368 and total liabilities decreased by \$3.3M to \$13,017,746. The Foundation's general fund provided support for the Competitive Grants Program in the amount of \$723,342, including \$12,000 in support of undergraduate student research. General fund support

for other special projects totaled \$13,950 - College of Agricultural Sciences (CAS) faculty and staff awards, financial support of the CAS Diamond Pioneer recognition program. In addition, the Foundation continues to have clean annual audits and keep operating expenses low.

The Foundation generates its operational and special programs support funds through investments. To balance risk and return in recent years, the Foundation's investment policy has allowed investment in dividend paying equities up to 25% of assets (20% goal with 5% allowed flexibility to account for trade timing

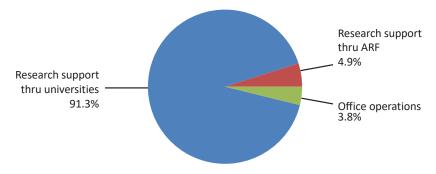
differences). The net rate of return on investment was 5.34%, 2.7% less than the rate of the previous year. At the June 30 year end, our investment portfolio had an unrealized gain of \$2,275,402, reflected in net assets as market value above the cost of investments.

The financial statements and related financial information in this Annual Report are the responsibility of the Foundation management and have been audited by Jones & Roth, P.C. independent public accountants.

Yanli Zhang Interim Finance Manager



2019–2020 Agricultural Research Foundation **Financial Charts**



Blue:

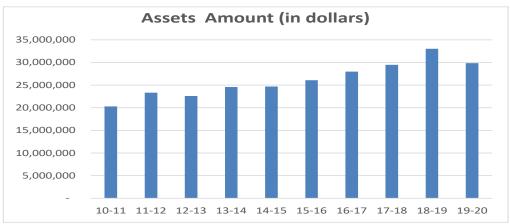
Transfers of research funds (gifts and grants) from external sources to universities to support faculty research

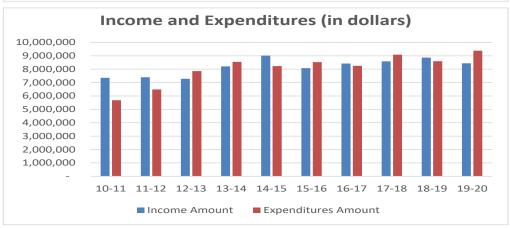
Red:

ARF Competitive Grants research funding

Green

Staff salaries and benefits, office expenses, board expenses, etc.





Income (All funds contributed for research projects excluding general fund investment income)

Expenditures (All funds spent for research projects excluding office operations)

AGRICULTURAL RESEARCH FOUNDATION

AUDITED STATEMENTS OF FINANCIAL POSITION*
YEAR ENDING JUNE 30, 2020 – ACCRUAL BASIS

2020 ASSETS		
CURRENT ASSETS		
Cash and cash equivalents	\$	816,300
Short-term investments		7,340,163
Investment earnings receivable		255,269
Contracts receivable		141,405
Advance research payments		395,099
Total current assets		8,948,236
NONCURRENT ASSETS		
Equipment and leasehold improvements, net		6,592
Other long-term investments		19,745,888
Restricted endowment investments		1,158,652
Total noncurrent assets		20,911,132
TOTAL ASSETS	\$	29,859,368
LIABILITIES AND NET ASSETS		
CURRENT LIABILITIES		
Accounts payable, trade	\$	
Accounts payable, trade	Ψ	27,937
Accounts payable to Oregon State University	Ψ	27,937 186,133
Accounts payable to Oregon State University Contracts payable to Oregon State University	Ψ	
Accounts payable to Oregon State University Contracts payable to Oregon State University Unearned contract revenue	Ψ	186,133 5,005,832 7,784,175
Accounts payable to Oregon State University Contracts payable to Oregon State University Unearned contract revenue Accrued compensated absences	Ψ	186,133 5,005,832 7,784,175 12,812
Accounts payable to Oregon State University Contracts payable to Oregon State University Unearned contract revenue	_	186,133 5,005,832 7,784,175
Accounts payable to Oregon State University Contracts payable to Oregon State University Unearned contract revenue Accrued compensated absences	_	186,133 5,005,832 7,784,175 12,812
Accounts payable to Oregon State University Contracts payable to Oregon State University Unearned contract revenue Accrued compensated absences Capital lease liability	_	186,133 5,005,832 7,784,175 12,812 857
Accounts payable to Oregon State University Contracts payable to Oregon State University Unearned contract revenue Accrued compensated absences Capital lease liability Total liabilities	_	186,133 5,005,832 7,784,175 12,812 857
Accounts payable to Oregon State University Contracts payable to Oregon State University Unearned contract revenue Accrued compensated absences Capital lease liability Total liabilities NET ASSETS	_	186,133 5,005,832 7,784,175 12,812 857 13,017,746
Accounts payable to Oregon State University Contracts payable to Oregon State University Unearned contract revenue Accrued compensated absences Capital lease liability Total liabilities NET ASSETS Net assets without donor restrictions	_	186,133 5,005,832 7,784,175 12,812 857 13,017,746 5,848,969**

^{*} The financial statements of ARF as of and for the year ended June 30, 2020 were audited by Jones and Roth, P.C. and their report dated September 24, 2020 expressed an unmodified opinion on those statements. A copy of the full audit report is available from the ARF office.

^{**} Net assets unrestricted and undesignated totaled \$3,013,632 at the end of FY20. These funds are fully at ARF Board spending discretion. This total was \$\$2,377,118 for FY19 and \$2,160,988 for FY18.

AGRICULTURAL RESEARCH FOUNDATION

AUDITED STATEMENTS OF ACTIVITIES
YEAR ENDING JUNE 30, 2020 – ACCRUAL BASIS

			2020		
		Without Donor Restrictions	With Donor Restrictions	,	- otal
REVENUES, GAINS, AND OTHER SUPPORT	_				
Contract income	\$	5,802,927	\$ -	\$	5,802,927
Contributions			2,638,255		2,638,255
Investment earnings		893,651	47,444		941,095
Realized loss on investments		(27,768)	(1,131)		(28,899)
Net assets released from restrictions - fullfillment of purpose		2,784,987	(2,784,987)		-
Total revenues, gains, and other support		9,453,797	(100,419)		9,353,378
EXPENSES					
Program services:					
Research expenditures paid through Oregon State University		8,707,753			8,707,753
Research expenditures paid through the Foundation		477,280			477,280
Research expenditures paid through other universities		191,081			191,081
Supporting services: Management and general		374,817			374,817
Total operating expenses		9,750,931	-		9,750,931
Changes in net assets before unrealized gain on investments		(297,134)	(100,419)		(397,553)
Unrealized gain on investments		537,508			537,508
Change in net assets		240,374	(100,419)		139,955
Net assets, beginning of year		5,608,595	11,093,072		16,701,667
Net assets, end of year	\$	5,848,969	\$ 10,992,653	\$	16,841,622

ARF Competitive Grants Program Impacts:

Cultural Practices to Improve Hazelnut Production

Hazelnuts are a uniquely Oregon crop in the US, with over 99% of the US production in the Willamette Valley. With rapidly growing acreage, scientists at OSU are working from a variety of directions to improve hazelnut production, processing, and marketing. One of those scientists is Nik Wiman, an Assistant Professor of Horticulture located at the North Willamette Research and Extension Center (NWREC). Since starting as an Assistant Professor at OSU in 2015, Nik has taken full advantage of ARF's competitive grant program to fund research relevant to a variety of aspects of hazelnut production.

2015-17. Evaluating Candidate Feeding Deterrents for Brown Marmorated Stink Bug as an Alternative Management Strategy

2016-18. Berms for Hazelnut Plantings: A Potential Modernization with Implications for Improved Production

2017-19. Evaluating overwintering behavior of an Asian egg parasitoid of BMSB in hazelnut orchards

2018-20. Establishing fertilizer guidelines for non-bearing hazelnut trees

2019-21. Exploiting vibrational communication of brown marmorated stink bug for detection and management

2020-22. Nontarget effects of the samurai wasp on native stink bugs when used for biological control of the brown marmorated stink bug in field settings

Reports for the first five projects

are available on the ARF website (https://agresearchfoundation. oregonstate.edu/past-projects) and the most recent project is just getting underway.

Brown marmorated stink bugs (BMSB) are the subject of four of Nik's ARF projects. BSMB are an invasive insect pest from Asia that is known to be highly destructive on a wide range of commercial specialty crops produced in Oregon. Nik's projects have investigated alternatives to insecticides, including altering feeding patterns, using vibrational cues to disrupt hatching, and using parasitoid wasps. The primary goal of Nik's first project was to assess feeding deterrents for BMSB as a potential management strategy and alternative to current insecticide-based management in blueberries. This work helped lay the groundwork for a five-year USDA Specialty Crops Research Initiative grant and Nik's subsequent work with hazelnuts. In his current position at NWREC, Nik has continued his interest in BSMB. In a project with Vaughn Walton, a Professor of Horticulture, Nik and colleagues examined the vibrational communication among stink bugs with an eye towards using this understanding to disrupt hatching of eggs and to attract overwintering adults. BSMB communicate through release of pheromones and by vibrating their abdomens, vibrations that are transmitted through plant leaves. Studying these vibrations in

a laboratory setting, where buildings (HVAC, elevators, exhaust fans) can 'hum' at the same frequencies, required establishing a sound proof chamber with a controlled climate. This work is ongoing.

Biological control is an alternative to pesticides. One option is the samurai wasp (*Trissolcus japonicus*), a specialist parasitoid that requires low inputs. This species lays eggs and develops inside BMSB eggs. Since the samurai wasp's initial detection in 2016 in Oregon, it has been released in multiple regions of Oregon where there are specialty crops grown that are susceptible to damage. However, it was unclear how well the wasp would overwinter in a wet, warmer winter such as in the Willamette Valley, relative to the wasp's native Asian origins. Nik's laboratory experiments showed there was no immediate mortality within 48 hours of exposure to below or nearfreezing temperatures. He also found no difference in *T. japonicus* survival by initial cold-shock temperature. In field experiments, there was 60-75% mortality within the first 2 weeks of placing wasps in overwintering environments. All wasps died within 10 weeks. There was comparable T. japonicus mortality between all woody substrates and in indoor and outdoor locations (Fig. 3). Lack of protection from precipitation in the sample design was considered the cause of poor survival.

Samarai wasps can be effective at controlling BSMB in field settings.

However, their impacts on non-target species is not well understood. Nik and his colleagues received funding to investigate the effects of this promising biological agent on non-target species.

Hazelnuts don't like to have wet feet, and this can be a problem during the winter in particular when Willamette Valley soils can become waterlogged. One solution is to grow trees on berms to improve drainage and aeration. Though standard practice for growing orchard crops in California, berms are not as common in the Willamette Valley. Nik's 2016-2018 ARF Competitive Grant focused on establishing hazelnuts planted on berms at NWREC and then using these to look at a variety of mulch treatments and factors associated with the successful establishment and management of berms. Darin Olson, a hazelnut grower with orchards near Salem, participated in the project. In the first year of the project, the plantings were established and several management practices associated with growing trees on berms were established. The ARF grant allowed these orchards to be established. The trees remain under investigation as part of a long-term study. The first yield data became available this past year.

Another ARF Competitive Grant allowed Nik to establish fertilizer guidelines in non-bearing hazelnut trees. How much and what kind of fertilizer is most beneficial to provide to young trees before they start bearing nuts? Nik's work showed that nutrients (K, P, and Mg) other than N and S added with Blend (a commercial hazelnut blend) did not show a clear or consistent difference in tissue nutrients compared to

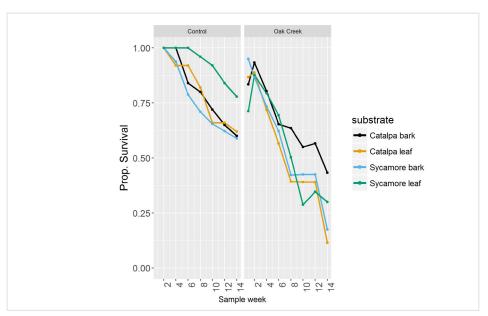


Figure 3. *T. japonicus* survival in woody substrates in **2017-2018**. Data are pooled across each woody substrate (treatment). Each bi-weekly sample event is 2 weeks.



Figure 4. Flat planted trees underwater (left) and trees on berms above the water (right).

the Urea treatment or the unfertilized control. There was a consistent trend that trees receiving the Blend grew slightly faster (as measured by increase in trunk cross-sectional area) compared to Urea alone. Adding urea alone caused excessive N:S ratio in the trees, leading to S deficiency symptoms and poor growth.

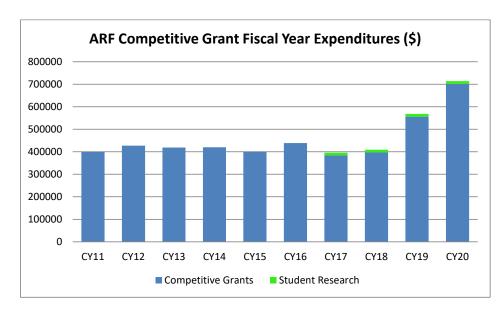
Competitive Grants Program

The Competitive Grants Program of the Agricultural Research Foundation is designed to encourage and fund research studies at OSU that will enhance Oregon's agricultural productivity, the quality of its produce and products, and wise management and use of its natural resources – air, water, forest, fisheries, and wildlife. Our goal is to make small catalytic grants that help young scientists launch their research and help established scientists embark on new research directions or approaches. Grants for the 2020-22 period funded in fiscal year 2019-20 ranged from \$9,660 to \$15,000 (the grant maximum). The average amount of the 48 grants given was \$14,626. Grant total was \$711,345. Ninety-seven proposals were submitted for 2020-22 funding.

The funds available to support the Competitive Grants Program are discretionary funds generated by the Foundation's investments. The level of funding available for the program is determined each year by the Board of Directors. Funding the Competitive Grants Program at the highest level possible is a Board priority. Following an assessment of general fund reserve levels during the 2019-20 fiscal year, the Board decided to provide \$700,000 to the Competitive Grants program and added an additional \$23,342 to fully fund proposals with tie scores.

In 2016-17 the Directors decided to provide \$12,000 in competitive grant funding to undergraduate research in the College of Agricultural Sciences (CAS). Funding at this level was continued in 2019-20. In this program, undergraduate researchers are paired with a faculty partner to do a specific research project. The ARF Executive Director works with the CAS Experiential Learning Program coordinator to manage this program.

A history of this Competitive Grants program can be found at https://agresearchfoundation.oregonstate.edu/sites/agresearchfoundation.oregonstate.edu/files/arf_comp_grants_history_03-26-19.pdf





Competitive Grant Awards 2020–2022

RESEARCHER	PROPOSAL TITLE	UNIT			
Arismendi, Ivan	Understanding the status of an endemic Oregon fish to inform best agricultural management practices	Fisheries & Wildlife			
Ates, Serkan	Lamb growth, grazing behavior and welfare in agrivoltaic systems	Animal & Rangeland Science			
Bionazm, Massio	Legume hay with high bioactive compounds and organic selenium to improve the transition from pregnancy to lactation using sheep as animal model	Animal & Rangeland Science			
Bishop, Cecily	Increasing vitamin D levels to improve fertilization rates in cattle	Animal & Rangeland Science			
Bouska, Cassie	Fruit Cracking in Cranberry	Coos Co Extension			
Brunharo, Caio	Developing molecular markers to identify glyphosate-resistant weed seeds in cool-season grass seed lots	Crop & Soil Science			
Buckland, Kristie	Improving soil health and hardpan layers with crop system management	North Willamette Research & Ext Center			
Chaplen, Frank	Genomic Characterization and Modeling of Second Permeable Reactive Barrier (PRB) (Wood-Chip Bioreactor) at OSU Experimental Farm in Corvallis to Facilitate Development of Best Management Practices for Oregon Agriculture	Biological & Ecological Engineering			
Chapple, Taylor	Determining the role of Salmon Shark (Lamna ditropis) feeding ecology on salmon stocks in Oregon	COMES - Newport			
Choi, Man-Yeon	Biologically based thrips management for Oregon nursery	Horticulture			
Davidson, Joseph	Towards Robotic Pruning of Trellised Cherry Systems	School of MIME			
Dung, Jeremiah	Development of a field-deployable assay for detecting ergot spores in grass seed production systems	Central OR Ag Research & Ext Center			
Duringer, Jennifer	Nutritional and potency characterization of hemp as a possible feed source for livestock	Environmental & Molecular Toxicology			
Fernandez-Salvador, Javier	Optimizing Lighting in Tabletop Substrate Systems for Improved Yield and Photosynthetic Efficiency in Off-season Oregon Strawberry Production	Marion Co Extension			
Garrett, Amy	Breeding for climate and ecology: Improvement of a local dent corn variety for dry farming and plant microbiome research	Benton Co Extension			
Goyer, Aymeric	Improving detection of PVY-infected plants with innovative peptide application	Hermiston Ag Research & Ext Center			
Hagerty, Christina	Hemp cover cropping for dryland wheat farmers: opportunities for disease suppression and increased yield	Columbia Basin Ag Research Center			
Higgins, Chad	Reclaiming Agricultural Land below Solar Power Installations	Biological & Ecological Engineering			
Jin, Xue	Nutrients and Clean Water Recovery from Agriculture Waste for Sustainable Food Production	School of CBEE			
Jones, Gerrad	Quantifying Chemical Habitat Suitability of Aquatic Species Assemblages	Biological & Ecological Engineering			
Kaur, Navneet	Biology and ecology of the winter cutworm, Noctua pronuba (Lepidoptera: Nocutidae) in grass seed production systems	Crop & Soil Science			
Kovacevic, Jovana	Generating new insights into antibiotic and sanitizer resistance development in Listeria species isolated from produce handling and processing environments in the Pacific Northwest	Food Innovation Center			
Kutzler, Michelle	Investigating the prevalence of honey bee bacterial diseases and Improving beekeeper access to antibiotics by expanding veterinarians' knowledge base	Animal & Rangeland Science			

Lightle, Cani	Evaluating Alternatives to Chlorpyrifos in Grass Seed Production Systems	North Willamette Research & Ext Center			
Lukas, Scott	Impact of Temperature, Ozone and Feedstock on Biochar Produced to Improve Soil Characteristics for Blueberry Systems in Eastern Oregon.	Hermiston Ag Research & Ext Center			
Mahaffee, Walt	Development of a mealybug-detecting biosensor for the protection of Oregon's wine industry	Botany & Plant Pathology			
McGregor, Ian	Evaluation of interseeding annual grain species into established perennial pasture to cope with unexpected drought and its effect on the existing pasture	KBREC Experiment Station			
Melathopoulosm, Andony	Evaluation of methods for statewide survey of bumble bee populations	Horticulture			
Moore, Amber	Plant nutrient availability of municipal biosolids produced in the PNW	Crop & Soil Science			
Moretti, Marcelo	Developing a Natural Liquid Mulches as Polyethylene Alternative	Horticulture			
Mueller, Ryan	Probiotic solutions to improve Pacific oyster larvae growth and development	Microbiology			
Ocamb, Cynthia	Evaluation of UV-C Seed Treatments for Controlling Seedborne Pathogens	Botany & Plant Pathology			
Powers, Mattew	Investigating thinning intensity impacts on tradeoffs between drought adaptation, stand productivity, and understory tree growth in Douglas-fir plantations	Forest Engineering & Resources & Management			
Ranches, Juliana	Mineral supplementation of pre-weaned calves: What is the current recommendation?	Eastern OR Ag Research Center - Burns			
Santamaria, Luisa	Marvelous Microalgae: The Role of Photosynthetic Microorganisms in the Biology of Nursery Retention Pond Water	North Willamette Research & Ext Center			
Shellhammer, Thomas	The regional identity of hops grown in the Willamette Valley, a collaborative study with Coleman Agriculture	Food Science & Technology			
Spring, John	Presence and Distribution of Herbicide Resistant Weeds in Central Oregon Carrot Seed Production	Central OR Ag Research & Ext Center			
Tilton, Susan	A Novel In Vitro Model to Assess Phytochemical Intervention In Respiratory Disease	Environmental & Molecular Toxicology			
Tullos, Desiree	Innovative tools for understanding triggers and mitigation of Harmful Algal Blooms	Biological & Ecological Engineering			
Udell, Chet	Using Multi-Spectral Imaging for Real-Time Weed Control in Fallow Fields	Biological & Ecological Engineering			
Verhoeven, Betsy	Tracking nitrogen fertilizer fate in tall fescue production	Marion Co Ext			
Wadam, Sugae	Validating the model medium formulations for a wider range of blueberry cultivars	Horticulture			
Waltonm, Vaughn	Red Blotch virus and insect vectors: DNA-sequence based identification and occurrence of Red Blotch virus insect vectors in Oregon vineyards	Horticulture			
Wangm, Guojie	Long-term Forage Production of Perennials Effects on Soil Health under Limited and Competing Water Resources in Eastern Oregon	Eastern OR Ag Research Center - Union			
Warren, Dana	Evaluating riparian buffer alternatives and their influence on fish and food webs in western Oregon headwater ecosystems	Fisheries & Wildlife			
Warren, Timothy	Testing the long-distance dispersal capacity of spotted-wing Drosophila	Horticulture			
Wiman, Nik	Nontarget effects of the samurai wasp on native stink bugs when used for biological control of the brown marmorated stink bug in field settings	North Willamette Research & Ext Center			
Zasada, Inga	Development of a nematicide efficacy monitoring assay for the plant-parasitic nematodes Meloidogyne hapla and Pratylenchus penetrans	ematodes Botany & Plant Pathology			

Contributors 2019–2020

A to Z Wineworks, LLC

Abel, Dana

Acord, Donna

Adams, Aislinn

Adaptive Seeds, LLC

Adkins, Joshua

AEF Global

Alaska Fruit

Albaugh, LLC

Albert, Dennis

Allardt, Mary

Alleman, Carol

Alsberg, Josh

Alton, Gordon

AMBQ Assoc. Des MicroBrasseurs

American Society of Brewing

Chemists

American Vineyard Foundation

AMVAC Chemical Corporation

Anzinger, Dawn

Arysta Life Science

Atkins, Steven

Augustine, Elizabeth & William

Baker, Gail

Ball Horticultural Company

BAMBU, LLC

Barenbrug Barney, Andrew

Barton, Claire

BASF Corporation

Bayer CropScience LP

Beetanical Apiary

Bejo Seeds, Inc.

Belchim Crop Protection Canada, Inc.

Bella Vista

Benton Soil and Water Conservation

District

Bierly, Kenneth & Linda

Birkemeier, James & Margaret

Bloch, Paul Blue Hill

Blue Mountain Community College

Bluhm, James

Bluhm, Wilbur

Boyer, Lynda & Clifford

Breder-Albright, Stefanie

Brewer, Kathy & Dean

Brickey, Susan

Brif, Constantin

Brockett, Daniel

Broshot, Nancy

Brown Paper Tickets, LLC

Brown, Dennis

Bruce McCune Ecological Serv

Bryan Jr., Richard

Burgerville, LLC

Buxton, Bonnie

Byrne, Sheila

California Walnut Commission

Camp, PA

Campbell, Brian

Carollo, James & Mary

Carr, Gerald & Barbara

Carroll, George & Fanny

Casa Bruno, LLC

Cascade Foods, Inc.



Cascade Mycological Society

Central Coast Beekeepers

Central Oregon Beekeepers

Central Oregon Master Gardener's

Assoc.

Central Oregon Seeds, Inc.

Certis U.S.A., LLC

Chambers, Kenton

Chapman, Nancy

Chevis, Cheryl

Chirman, Darlene

Christmas Tree Promotion Board

CLIF Bar & Company

Clodfelters

Coakley, Stella & James

Coe, Kent & Pricilla

Coleman Agriculture, Inc.

Collins Agricultural Consultants, Inc.

Columbia Basin Grass Seed Assoc., Inc.

Columbia Beekeepers Assoc.

Columbia Seeds

Colwell, Linda

Combs, Barbara

Comfort, Felecia

Confederated Tribes of Siletz Indians

Conover, Margaret

Control Solutions, Inc.

Cook, Jeffrey

Cook, Stanton

Cornell University

Corteva Finance

County of Umatilla

Craft Brew Alliance, Inc.

Crumb, Ellen

Cultiva, LLC

Custer, Robert & Geraldine

Dally, Elisabeth

Dean, Stanley

del Carpio, David

DeLisle, Jeremy

Denney, Crystal

Detweiler, Kathleen & Thomas

Dirt Hugger, LLC

DLF Pickseed

Dobak, David

Dorow, Janet

Douglas, Charlotte

Draves, Jacob

Dryden, Linda

DSM Biotechnology Center

Dunham, Suzanne

E & J Gallo Winery

E.I. Dupont DE Nemours & Company

East Multonmah Soil and Water

Conservation District

Eastman

EB & Bean, LLC

Echo Electuary

Edwards, Lynn

Elmer's Irrigation, Inc.

Emery, Brandon

Enza Zaden USA, Inc.

Equilibrium, LLC

Erath Family Foundation

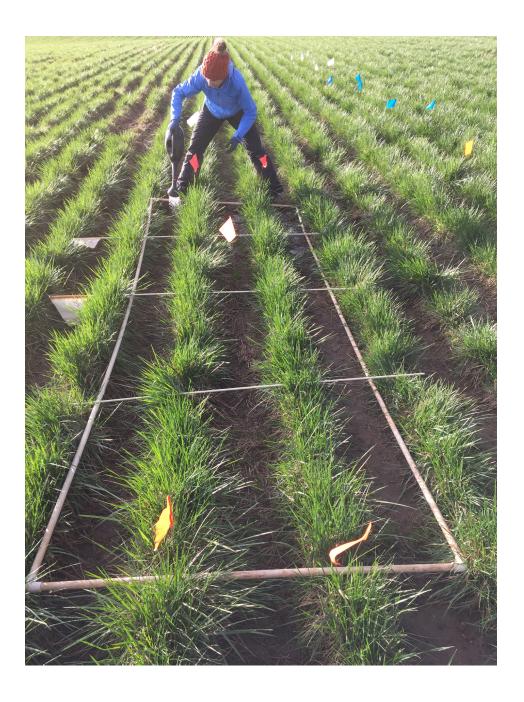
Evans, Amy

Expert Fish Pathology, LLC



Fairchild Tropical Botanic Garden Ferriel, Roger Fine Americas, Inc. First Fruits Foundation First Key Consulting Inc. Fischer, Scott Fleener, Henry Flora USA Inc. Flory, James & Eileen Forest Industry LTS Foss, Timothy & Sharon Freser, Edward & Kathleen Friedman, Linda Friedman, Sam Fuder, Josh Fuller, Terry GCE Holdings Geschwill, William & Heidi Gilmore, Clare & Paul Giustina, A. J. & Adriana Giustina, Sylvia Goulder Family Foundation Gowan Company, LLC Grewell, Brenda Grier, Naomi Gustafson Logging Co. Guth, Candice Hagerman, James Haifa North America, Inc. Halls Ferry Farms Halsey, Kimberly Hampton Lumber Mills, Inc. Handley, Jeffrey Haniff, Tariq

Hansen, Everett Hansen, Lisa



Hansen, Robin Harmon, Janice

Harney County Farm Bureau

Harrison, Victoria Hartley, Sandra Hartman, Michael Harvey, Tanya

Hawaiian Shellfish, LLC

Hawman Farms, Inc.

Hays, Phillip

Hazelwood Orchards, LLC

Hazen, Rebecca Herbst, Dax

Heycke, Christine

Heyer, DF

Himes, Kenneth

Hixon, Nancy

Hodson, Matt

Hoffmann, James & Grace Hog Island Oyster Co., Inc.

Holmgren, Noel & Patricia

Hop Quality Group

Hop Research Council

Hopkins, Nancy Humbug Farms

Hummingbird Wholesale

Idaho Bean Commission

Idaho Eastern Oregon Onion

Committee

Idaho Wheat Commission

Impact NW

Indie Hops, LLC

Institute for Applied Ecology

Integrated Seed Growers, LLC

Ishaq, Suzanne

J Frank Schmidt Foundation

J Marchini Farms

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Jacquelyn Leigh Landscape Design

Janeway, Lawrence

Jaster, Anne

Jaster, Theodora

Jefferson County Smoke Management

Program

Jenbek Foundation

Jernstedt, Kathryn

JMC Enterprises, Inc.

Johnny's Selected Seeds

JoVE

Jung III, Frederick

Kalous, Jay

Karoly, Keith

Kephart, Susan

King and Prince Seafood Corp.

King, Ronald & Janice

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Kleeger, Sarah

KOCH Companies Community Fund

Koenig, John

Kraemer's Nursery, Inc.

Kraker, Stacy

Kwidza Agro

L & C Tree Farms, LLC

Lallemand Inc.

Lane Community College Foundation

Lane County Beekeepers Assoc.

Larsen, Lynn

Larsen, Steen

Larson, Richard

Lea, Elainne

Lee, Richard (FMC)

Legacy Health System CPC, LLC



Legg, David

Lehigh Agri & Bio Services, Inc.

Life Technologies

Linn Benton Beekeepers Assoc

Lippert, Jennifer Lipscomb, Barney Liston, Aaron & Sara

Little Prince of Oregon Nursery, Inc

Little, Richard & Karen

Longden, Brian Lorang, Jennifer Lord, Karen

Love, Glen & Rhoda Luoma, Daniel Lynch, M.D. & Peggy Magnuson, Karin

Maher, David

Makhteshim-Agan of North America, Inc.

Maletzky, Barry Manitou Fund

Marc Adams School of Woodworking

Marcus, Craig

Marion Ag Service, Inc.

Marion Soil and Water Conservation

District

Mark, Stephen

Marquering, Henry & Louise Marrone Bio Innovations, Inc.

Marshall, Paul

Martin, Warren & Rose Ann

Marzyck, Catherine

Master Gardeners Assoc. of Oregon

Mauritz, Charles & Sara McBride, Margaret & Dale McCaffrey, Cheryl A. McCain Foods USA, Inc. McFadden, Thomas

McGregor Company~The

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McLane, Carla & Bruce

Mcmilllen, Anikah

McMorries, David & Holly

McNeil, Deborah

Medicinal Botanical Seeds, LLC

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Meierhenry, Stanley & Margaret

Melathoupoulos, Andony

Mendius, Barbara Mendoza, Dalila Meter Group, Inc. MGB Ingredients, LLC Michelle Dermody Miller, Marilyn Miller, Peter

Mint Industry Research Council

Mueller, Felicia Mumblo, B A

Minnick, Sarah

Mycological Society of America

Nachurs Alpine Solutions

Nankivell, Becky

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Pierce, Allen Pili Hunters, LLC Platz, Charles & Janet

Oregon Seed Council



Poinsett, Sandra

Polehn, Kenneth & Elizabeth

Polyodon Regulatory Consulting, LLC

Port Blakely Tree Farms LP

Portland Metro Beekeepers

Posey, Judith

Post, JT & VC

Potato Variety Management Institute

Prag, Raymand & Margaret

Premium Growers, LLC

Prusz, Richard

Puget Sound Anglers

Puget Sound Mycological Society

Pure Potato, LLC

Reed, A Scott

Reed, Arthur

Reich, Lee

Reynolds, Wes & Susan

Rhizosolutions, LLC

Rike, Dennis & Carla

Robert Satterfield, Robert

Robinson, Michael & Nancy

Robison, Steven & Melissa

Rochester Woodworkere Society, Inc.

Roesner, Shani

Rogue Farm Corps

Ronald, Bruce & Alice

Ross, Robert

Rossman, Amy

Roy, Barbara

Russell, June

SAIF Corporation

Samuel Adams The Boston Beer

Company

Sanchez, Tonya

Sanderford, Kimberly



Saul, Susan Savonen, Carol Schleuning, Patricia Schmeck, Stephen Schneider, Peggy Schwindt, Rachel Schwinster, Ernst

Scoggins, Thomas & Joan

Sedlack, Elaine SePRO Corporation Shepherd, Anthony

Sierra Nevada Brewing Co.

Simplot

Siskiyou Chapter Native Plant Society

of Oregon

Siskiyou Chapter of the North American Rock Garden Society

Slichter, Paul Smith Nut Farms Smith, Court & Linda Smith, Jacquelyn Smith, James

Smith, Paul & Roufs, Renee

Smith, Scott Smyth, Johanna

Snake River Sugarbeet Research and

Seed Alliance LLC

Sneller, Erin

Society For The Study of Evolution, Inc.

Sondenaa, Angela

Sonoma County Mycological Associ

Sorensen, Janelle

Southern Oregon Beekeepers

SP Provisions

Specialty Seed Growers of Western

Oregon

Spiers, Kirsten (KD Media UK)

Starker Forests, Inc.

State of Alaska

State of Oregon Steel, Bart (BASF)

Stewart, Elaine

Stewart, Karlyn Stone, William

Streit, Lori & Glagola, Bruce

Stubb, Kerri Rose Summit Foods, Inc. Sundberg, Kent Sundberg, Mark Swanson, Susan

Swanson's Pest Management

Swartz, Harry Sweeney, Michelle

Syngenta Crop Protection, LLC Syntenta Professional Solution T. Hasegawa U.S.A., Inc.

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Takasago International Corp (USA)

Taminco US

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Territorial Seed Company Tessenderlo Kerley, Inc.

Thapliyal, Mrinal **Tides Foundation**

Tillamook Clatsop Chapter Society of

American Foresters Trident Ag. Products, Inc.

Trident Products & Services, LLC

Tualatin Valley Beekeepers

Turner Ag Research, Inc. Umatilla Electric Cooperative

Unferth, Julia

Union County Seed Growers Assoc.

United Phosphorus, Inc.

Unitis, Matt

University of California - Daivs University of Wisconsin Madison

Utah State University Valent BioSciences Valent USA Corp.

Van Winkle, Michael & Mary Vanasche, David & Ellen

Vance, Mary

Vanleeuwen, James VanVechten, George Vargas, Patricia Various - Other

Verdesian Life Sciences Vestaron Corporation

Wadsworth, Spike & Sheng, Sherry

Wagner, David Walker, Coral Walker, Jeffrey Walters, Kenneth Ward, Megan

Warm Springs Composite Products

Wasco Electric Cooperative

Washington Blueberry Commission Washington County Master Gardner

Assoc.

Washington Hop Commission Washington Oilseeds Commission Washington Red Raspberry

Commission

Washington State University

Washington Tree Fruit Research Commission

Washington Turfgrass Seed Commission

Waugh, Bruce & Christine

Weems, Japhet

Weinstein, Sandra

Westbridge Agricultural Products

Westcott, Richard & Kathleen

Wetlands Conservancy

Weyerhaeuser

Whiskey Creek Shellfish Hatchery

White, Diane

Wilbur-Ellis Company

Wilcox, Chester

Willamette Valley Beekeepers

Williams, Corrinne

Williams, Heike

Wilson, Mark

Wise, David & Janeen

Witters, Robert & Carolyn

Wylie, Jeremy

XpertSea, Inc.

Yang, Sunia

Yeager, Jo Ann

Yeast Craft, LLC

Younger, Michael

Zahl, Eric

Zamudio, Desiderio & Karen

Zinn, Shari

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Photo Credits

Cover: *Bee on hawthorn shrub* — Scott Mitchell

Page 1: Field plots flagged for 15N treatment

Betsy Verhoven

Page 2: *Treating a short stubble plot* — Judit Barroso

Page 3: Flowering potato — Ruijun Qin

Page 4: Tomato yield UVC trial — Kristine Buckland

Page 5: (Upper right) Tomato UVC treatments

Kristine Buckland

(Left) Prepping for 15N applications

- Betsy Verhoeven

Page 8: Producer sampling Grand Ronde

- Rory McDonnell

Pg 10-11: From competitive grant report − Alec Kowalewski

Page 13: *From competitive grant report* − Nik Wiman

Page 14: *Bee on willow* − Scott Mitchell

Page 17: Carbon planting of perennial ryegrass fungicide trial

KC Achala

Page 18: Soil core bulk density samples

- Betsy Verhoeven

Page 19: Laying out plots for 15N application

Betsy Verhoeven

Page 20: Going to the field to treat the plots

- Judit Barroso

Page 21: Soils drying for soil health project

- Betsy Verhoeven

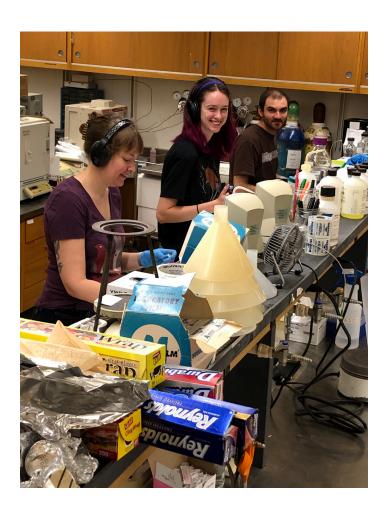
Page 22: *Zumwalt landscape* — Scott Mitchell

Page 23: Cow investigating slug sampling ground cover

- Rory McDonnell

Page 25: *Insect sampling in quinoa* — Kristine Buckland

Page 26: *Undergraduates (pre-COVID) busy working on ARF grant* — Anne Taylor



From the Archives

Ledger pages from some of the early projects managed by ARF

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16 Independent Lumber Co. Inc.	(c) 213		1942	146669		Industrial accident Com.	16.80 (2) 324			
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20 Shell Oil Company	(t) 220 N	1	368			Standard all Co.	2.36 (c) 329		596	4892
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24 Wild Life Grater (Dish, Game, and Day anim	tute me	uagement	Problem	-)	,	(Fish, Sh	Wildlife - me, and Fur	Gratiti Anima	eti l Mana	gement (25 Problems
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