

OREGON STATE UNIVERSITY

2014 Federal Priorities

Oregon State
UNIVERSITY

2014 MESSAGE FROM PRESIDENT RAY TO THE OREGON CONGRESSIONAL DELEGATION

Oregon State University is Oregon's statewide university — defined and distinguished by its authenticity, commitment to inclusive excellence, collaboration and innovation. The university is an internationally recognized research institution and a leader in promoting a healthy planet, wellness and economic progress.

Last year marked my 10th year as president of OSU. As I reflect on the past decade and Oregon State's mission as a 21st century land grant and international research university, I am pleased to share with you our accomplishments and meaningful contributions to those we serve.

Over the past decade:

- OSU's enrollment has soared by 53 percent to nearly 29,000 students, making OSU Oregon's largest university on the basis of credit hours delivered.
- Our online enrollment has increased by nearly 400 percent to nearly 3,800 students. Ecampus has expanded to 33 degree programs and is ranked among the top online programs nationwide.
- The number of degrees awarded by Oregon State each year has grown steadily, with 5,256 graduates in 2013 — a new record.
- Research funding has increased by 69 percent to \$263 million in 2013.
- Record-breaking philanthropy has put Oregon State among the top echelon of universities nationwide. The Campaign for OSU will conclude this year having raised well more than \$1 billion.

I value OSU's partnerships with the federal government, particularly in the areas of student access, community outreach and scientific research.

OSU takes very seriously its land grant mission to bring economic prosperity and higher education to Oregonians. This fall, OSU enrolled 17,657 Oregon resident students, making Oregonians 63.2 percent of our total student population. Oregonians represent nearly 75 percent of our undergraduate students attending OSU on the Corvallis and OSU-Cascades campuses.

OSU's globally recognized research enterprise is a leader in climate science, wave energy, conservation biology, open source software, forestry, agriculture, nutrition and other fields. OSU researchers are renowned leaders in their fields, and successfully leverage support from key federal agencies — including the National Science Foundation, the U.S. Departments of Agriculture, Defense, Energy, Education and Interior, the National Oceanic and Atmospheric Administration and the National Institutes of Health. Numerous OSU administrators, faculty and researchers advise state and federal agencies in areas of national and global importance.

To better guide the university's mission and to accelerate our momentum over the next 10 years, OSU has established an independent governing board of trustees. The trustees, who officially take office in July 2014, will be responsible for establishing policies for university operations, establishing tuition and fees, guiding academic programs, approving the university's budget proposal to the state and appointing and employing the university's president.

On behalf of the Oregon State University community and our many diverse stakeholders, I look forward to working with you during the coming year to advance the health, prosperity and success of Oregon and the nation. Thank you for your ongoing service and support.

Sincerely,

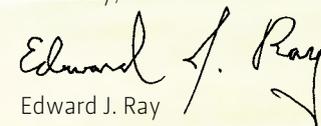

Edward J. Ray
President



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STUDENT PROFILE

Oregon State University's nearly 29,000 students come from every county in Oregon, all 50 states and U.S. territories and 58 foreign countries. This includes more than 23,000 undergraduates and more than 4,700 graduate and professional students. OSU continues to attract high-achieving students. Thirty-nine percent of incoming freshmen from Oregon high schools had a GPA of 3.75 or higher, and 149 of these students were the valedictorians of their high schools. Among public universities in Oregon, OSU leads in the number of full-time resident students. In fall 2013, OSU enrolled 14,318 full-time resident students, as compared to 13,145 at Portland State University and 11,280 at the University of Oregon. OSU-Cascades enrolls an additional 271 full-time resident students.

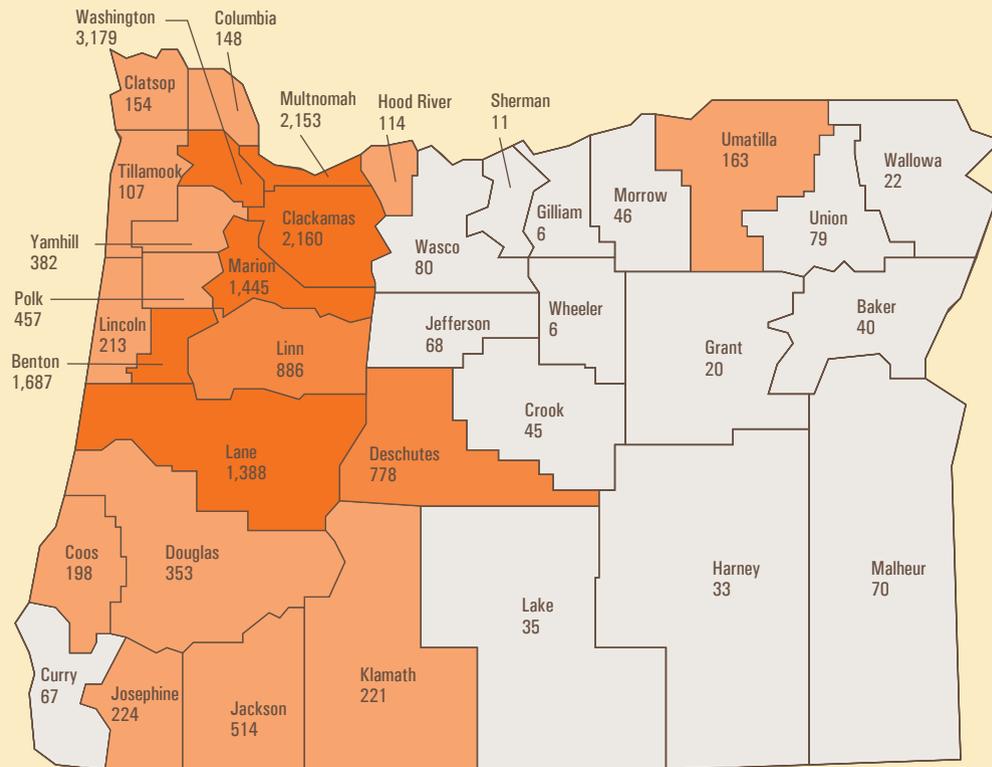


Oregon State Student Enrollment by Oregon County* – Fall 2013

Total students from Oregon*: 17,657

*Best estimation of assignment by county; does not reflect all Oregon resident students.

Source: Enrollment Summary Fall Term 2013, Office of Institutional Research, Oregon State University, November 2013.



Oregon State University Fall Term 2013 Enrollment by Academic College* and Student Level

Academic Unit	College of Agricultural Sciences	College of Business	College of Earth, Ocean, and Atmospheric Sciences	College of Education	College of Engineering	College of Forestry	College of Liberal Arts	College of Pharmacy	College of Public Health and Human Sciences	College of Science	College of Veterinary Medicine	Graduate School	University Exploratory Studies Program	Total
Undergraduate	2,161	3,156	511	5	5,682	820	3,614		3,082	3,143			987	23,161
Graduate	346	309	219	319	1,076	191	221	28	274	394	19	783		4,179
First Professional								362			223			585
Total	2,507	3,465	730	324	6,758	1,011	3,835	39	3,356	3,537	242	783	987	27,925

Top 10 States – Fall 2013

Total out-of-state enrollment: 7,285**

- 1 OREGON - 17,657
- 2 CALIFORNIA - 2,382
- 3 WASHINGTON - 1,308
- 4 HAWAII - 377
- 5 TEXAS - 212
- 6 COLORADO - 196
- 7 IDAHO - 192
- 8 NEVADA - 163
- 9 ARIZONA - 152
- 10 FLORIDA - 145

Top 10 Foreign Countries – Fall 2013

Total international student enrollment: 2,859***

- | | |
|----------------------|----------------------------------|
| 1 CHINA - 1,255 | 7 INDONESIA - 73 |
| 2 SAUDI ARABIA - 297 | 8 TAIWAN, REPUBLIC OF CHINA - 64 |
| 3 SOUTH KOREA - 120 | 9 CANADA - 54 |
| 4 INDIA - 116 | 10 JAPAN - 52 |
| 5 IRAN - 84 | |
| 6 OMAN - 75 | |

Thanks to an innovative collaboration with INTO University Partnerships, OSU's international student population has almost tripled since 2008. In 2013, international enrollment grew to 2,859 students, a 21 percent increase over 2012 and more than 10 percent of the overall student population.

*Unduplicated headcount based upon student's primary college.

**Residency based on student fee status.

***Foreign countries are based upon countries of citizenship.

Source: Enrollment Summary Fall Term 2013, Office of Institutional Research, Oregon State University, November 2013.

FINANCIAL AID BY THE NUMBERS

46%

of Oregon State University undergraduate and graduate students received need-based federal financial aid in the 2012-13 school year.



BEST BUY SCHOOL

The 2014 edition of the Fiske Guide to Colleges named Oregon State University a Best Buy School, one of only 41 colleges and universities nationwide and one of only three in the Pacific Northwest. This is the third time in four years OSU has made the list.

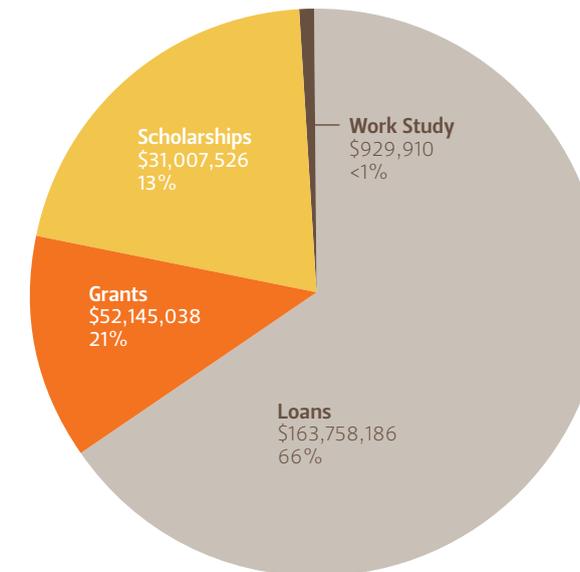


2012-13 Federal Financial Aid at Oregon State

Type of Financial Aid	Number of Students	Amount
Pell Grants	8,410	\$31,961,065
Federal Work-Study Program	591	\$929,910
Federal Supplemental Education Opportunity Grants	2,067	\$1,040,453
Perkins Loans	2,443	\$3,618,279
Federal Ford Direct Loans	13,987	\$150,818,151

Financial Aid dollars – 2012-13

Total: \$247,840,660



Pell Grants

	Pell Grant Recipients	Total Pell Grant Payments	% of Tuition Fees (Undergraduate Residents) Covered by Maximum Pell Grant
2007-08	4,287	\$12,007,204	74%
2012-13	8,410	\$31,961,065	69%



OSU's 3-year default rate is

6.1 PERCENT

compared to the national average of 14.7 percent.

Tuition and Fees Per Student

	Undergraduate*		Graduate**	
	Resident	Non-Resident	Resident	Non-Resident
FY 2009	\$6,187	\$18,823	\$10,975	\$16,807
FY 2014	\$8,322	\$23,514	\$13,110	\$20,643

*Oregon University System Academic Year Fee Book 2013-14. Assume 15 credit hours. All majors except business, engineering and some forestry and public health and human sciences majors, which have higher differential tuition.

**Oregon University System Academic Year Fee Book 2013-14. Assume 12 credit hours. All majors except business, engineering, master of public health and professional science masters, which have higher differential tuition.

Source: Oregon State University Office of Financial Aid and Scholarships, January 2013.

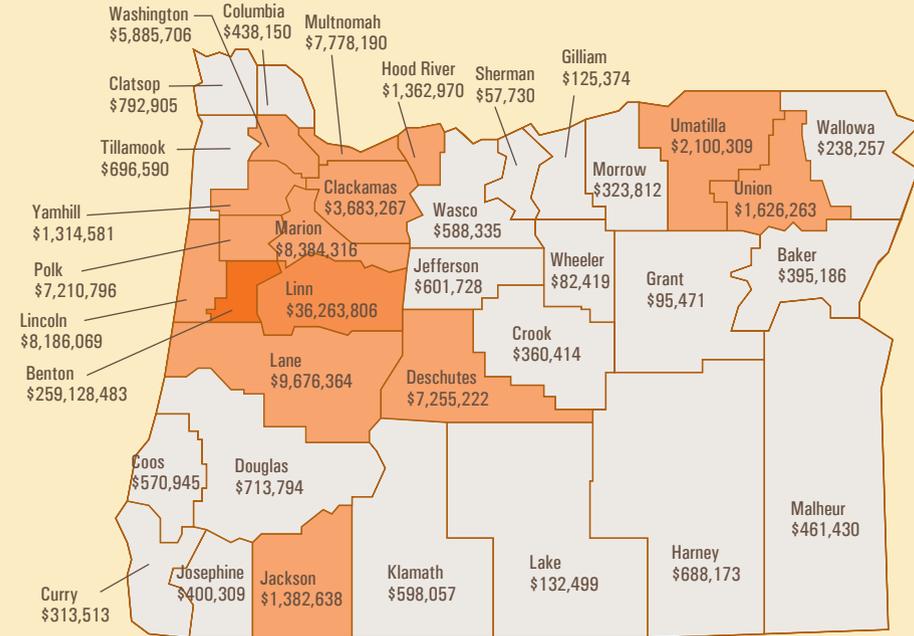


WORKFORCE AND ALUMNI FOOTPRINT

Oregon State Payroll by County 2013

Total payroll from Oregon: \$369,914,068

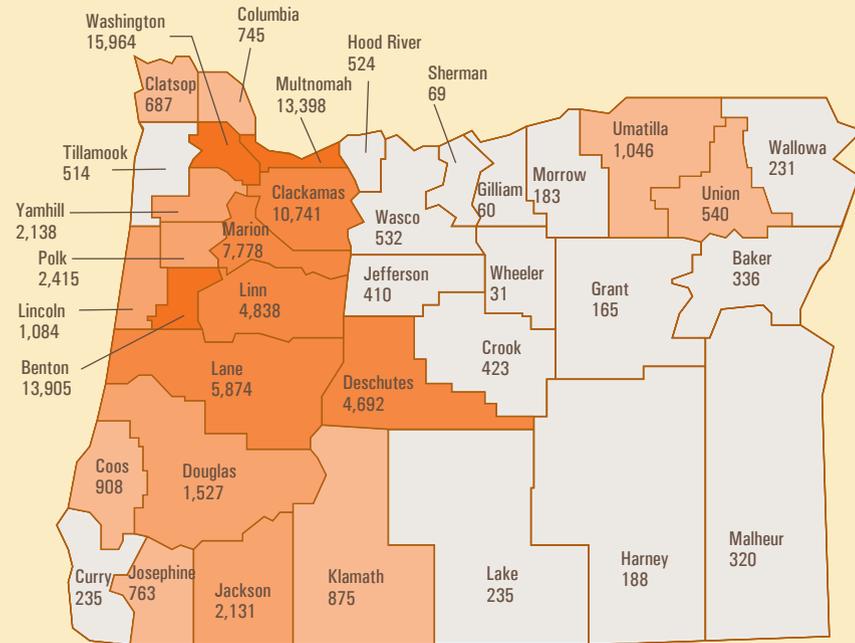
Source: OSU Office of Human Resources
Includes all paid Oregon State University faculty and staff, student employees and graduate assistants. Does not include OSU Foundation or OSU Alumni Association employees.



Oregon State Alumni Count by County 2013

Total Alumni from Oregon: 96,505

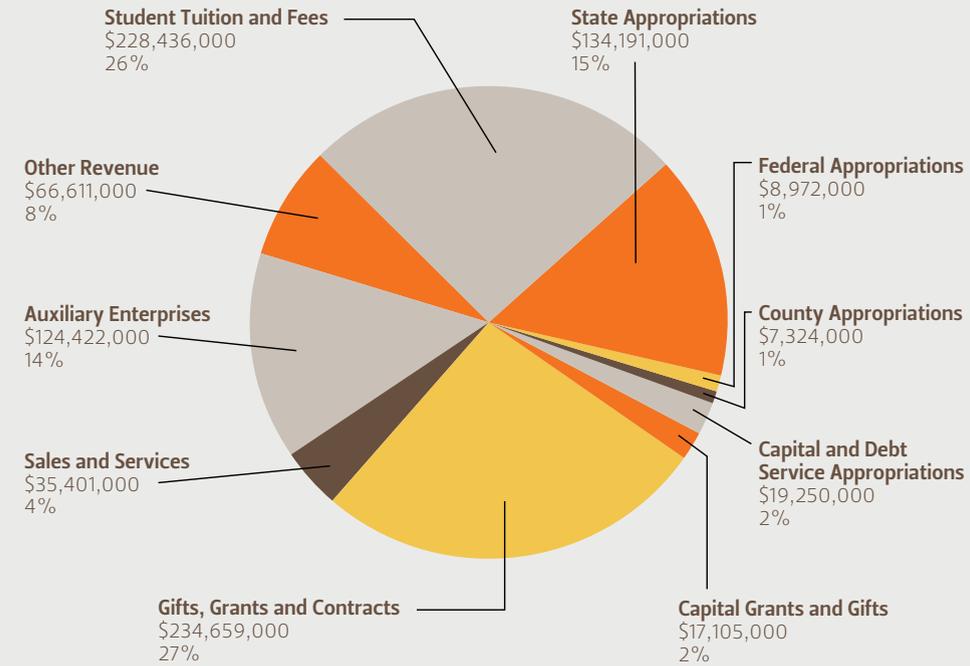
Source: Active Alumni Demographic Data report, OSU Foundation, December 2013.



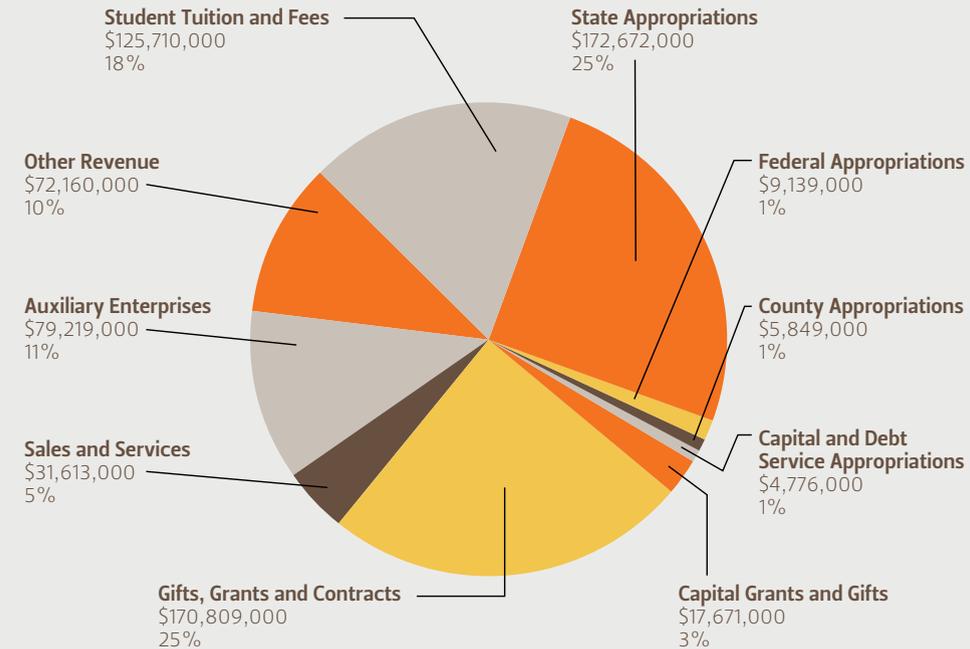
FINANCIAL PROFILE



Source of Funds – FY 2013
Total: \$876,371,000



Source of Funds – FY 2008
Total: \$689,618,000



Source: Oregon University System Audited Financial Statements. Using FY08 numbers restated for comparison to FY13 presentation.

OREGON STATE'S RESEARCH ENTERPRISE

Oregon State University is ranked in the Carnegie Foundation's top tier for "very high research activity" and is one of only two research universities in America to hold the federal land, sea, space and sun grant designations simultaneously. OSU is the leading public research institution in the Oregon University System, receiving approximately half of the total federal research funding in the OUS (see graph on page 11).

In 2012-13, Oregon State faculty earned more than \$263 million in research contracts and grants. In addition:

DEVELOPMENT

- Five** new start-up companies were created: Northwest Medical Isotopes, LLC; CSD Nano LLC; Online labs, LLC; OilEx Tech, LLC; Amorphyx Inc.
- 62** new patent applications were submitted
- 80** new invention disclosures were submitted

REVENUE

\$7,765,984 in licensing income was generated from commercialization activities

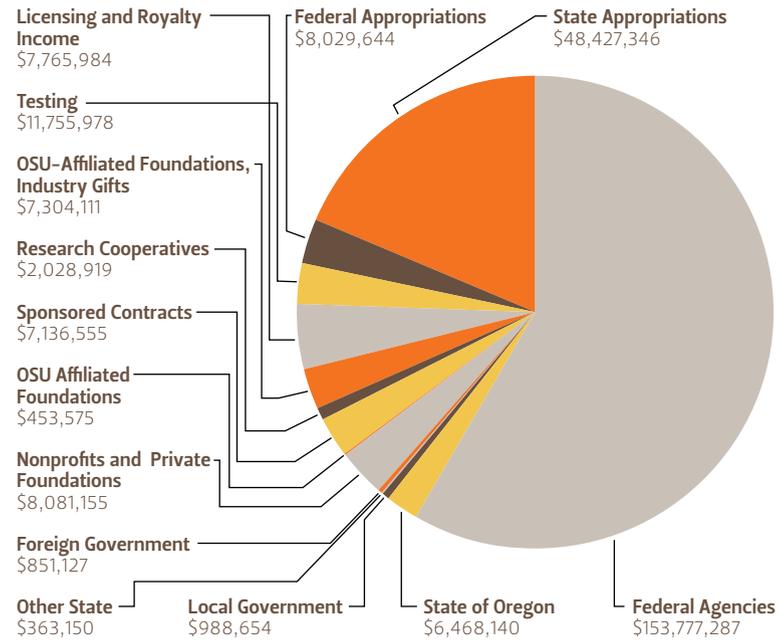
AGREEMENTS

- 117** material transfer agreements
- 144** confidentiality agreements
- Three** option agreements
- 88** exclusive and nonexclusive license agreements

Source: OSU Office for Commercialization and Corporate Development.

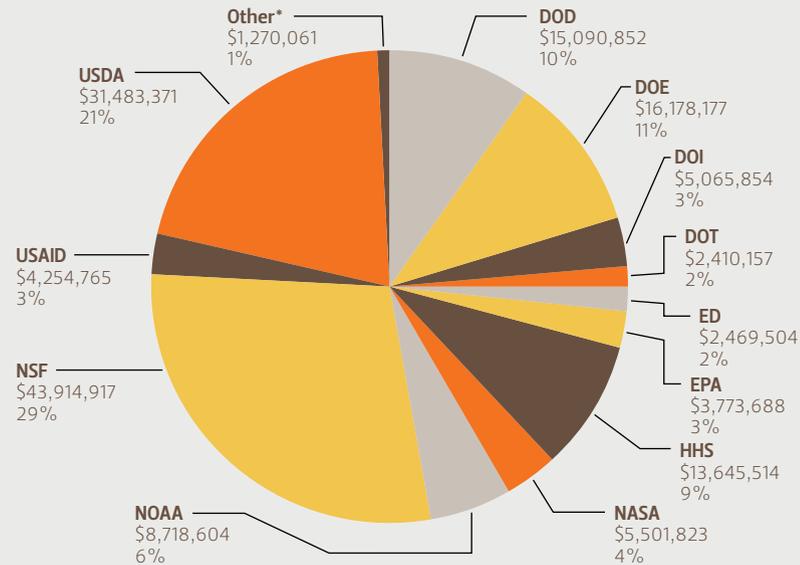
OSU Externally Funded Awards – FY 2012-13

Total: \$263,431,625



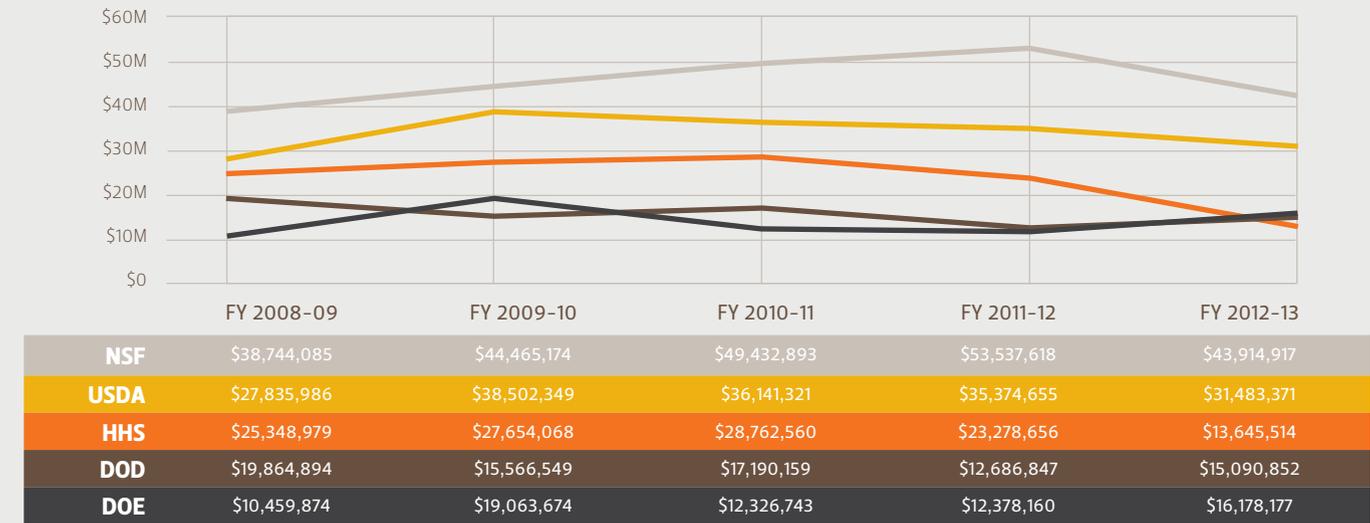
OSU Federal Agency Awards – FY 2012-13

Total Federal Agency Awards: \$153,777,287



Competitively Awarded OSU Grants and Contracts by Federal Agency

FY 2008-09 to FY 2012-13



OSU's contribution in federal research dollars awarded is consistently around

50 PERCENT of the OUS total.

*Based on OUS count.

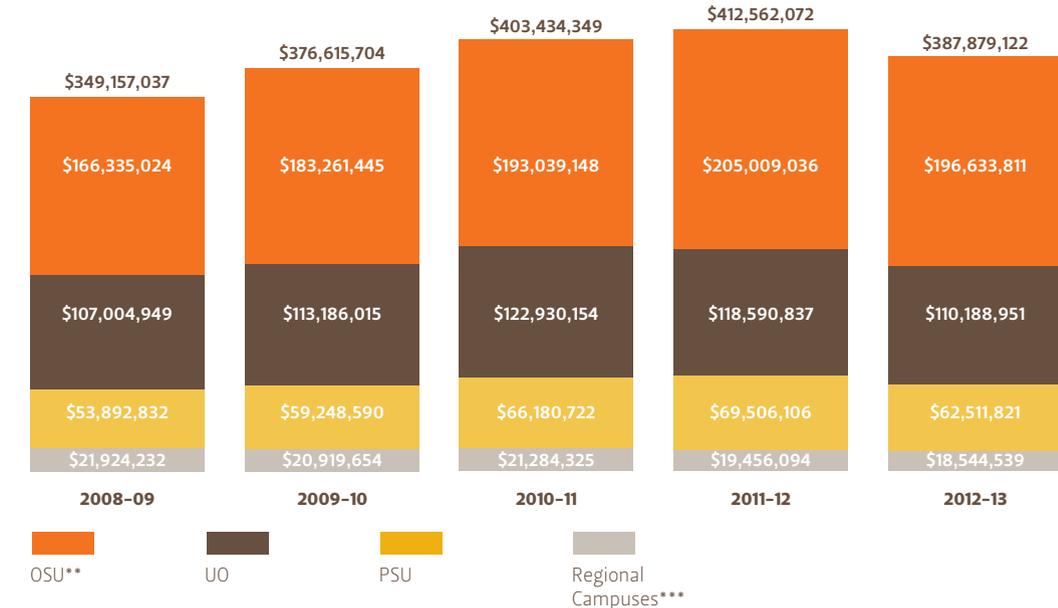
**Does not include statewide Public Service Programs.

***Includes EOU, SOU, WOU and OIT.

Source: Oregon State University Research Office; Oregon University System 2013 Fact Book.

Oregon University System Federal Research Dollars Awarded

5-year trends by institution*



THE OREGON STATE UNIVERSITY ADVANTAGE DRIVES INNOVATION, CONTRIBUTES TO BUSINESS SUCCESS

Launched in early 2013, the Oregon State University Advantage connects businesses with faculty expertise, student talent and world-class facilities to provide research solutions, help bring ideas to market and launch companies. Already, the OSU Advantage is making an impact through its three programs:

Advantage Partnerships develops collaborations with industry, matching faculty expertise and student talent with companies across Oregon. This includes three jointly funded projects with Hewlett-Packard, as well as ongoing relationships with Intel, Portland General Electric, Daimler Trucks and Blount International.

The **Advantage Impact** program negotiated agreements licensing Oregon State research innovations to four Corvallis-based startup companies: CSD Nano, NW Medical Isotopes, Online Labs and Amorphyx. The University Venture Development Fund has provided additional financial support.

The **Advantage Accelerator** offers a variety of business consulting resources, entrepreneurial expertise and networking with investors and strategic partners to help launch successful startups. The program chose its first 13 companies in July 2013, a mix of Oregon State faculty and student research concepts in clean energy, health care, e-commerce and other fields.



PUBLIC HEALTH AND HUMAN SCIENCES: WHAT MAKES US HEALTHY

2014 is a signature year for Oregon State's College of Public Health and Human Sciences (PHHS). Pending accreditation, it will become Oregon's first accredited college of public health, bolstering its visibility and reputation, as well as its ability to attract committed students and faculty.

Accreditation ensures the college has the resources to educate the next generation of globally minded public health and human sciences professionals, research new ways to ensure health across the lifespan and continue its community partnerships through OSU Extension programs.

The field of public health focuses on the 90 percent of factors that make us healthy — our biology, environment, lifestyle and behavior — rather than health care delivery, which influences 10 percent of human health. As a result, the college is well-positioned to improve health, lower health care costs, affect health system change and work to prevent the leading causes of death, disease and injury.

The college is also launching a center on global health — which joins three existing PHHS research centers — and is at the forefront of a national movement to integrate its curriculum across all academic disciplines. These include public health, nutrition, exercise and sport science, and human development and family sciences.

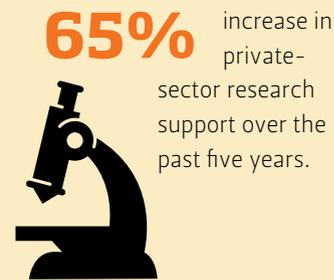
OREGON STATE RESEARCH BY THE NUMBERS



88 licensing agreements signed with businesses to commercialize Oregon State research in the fields of information technology, agriculture, industrial materials, biotechnology, forest products, healthy aging and manufacturing.



\$7.7 MILLION in licensing and royalty income, a new record.



65% increase in private-sector research support over the past five years.



80 invention disclosures, a record number of research findings with commercial potential.



\$36 MILLION in external research funding from licensing and royalties, sponsored contracts, industry gifts, research cooperatives and testing.



\$263 MILLION in research grants, contracts and awards.

OSU-CASCADES: OREGON STATE UNIVERSITY IN CENTRAL OREGON

OSU-Cascades is Oregon State University's branch campus in Bend, offering 18 undergraduate degrees, three graduate degrees and 30 minors and options. With small classes, one-on-one mentoring from world-class faculty and a vast natural laboratory for hands-on learning, OSU-Cascades brings Oregon State's academic excellence and innovative research to Central Oregon.

Expanding to a four-year university

OSU-Cascades fulfills a 30-year grassroots effort to bring a university to Central Oregon. Since opening in 2001, OSU-Cascades has steadily expanded academic programs and awarded more than 2,000 degrees. Based on record enrollment growth — 44 percent since 2009 — and community financial support, the Oregon University System endorsed OSU-Cascades' expansion to a four-year university, with freshman and sophomore classes scheduled to begin in fall 2015. Enrollment is expected to reach 3,000 to 5,000 students by 2025.

Building a new campus

OSU-Cascades has purchased properties totaling 56 acres on Bend's west side to build the new campus. Preliminary designs for the first phase of development feature a dining hall, academic buildings and two residence halls in a pedestrian-focused layout that takes advantage of mountain views. OSU-Cascades is collaborating with the City of Bend, Deschutes County and community and business leaders on its expansion plans.

Academic excellence, world-class faculty, community partnerships

OSU-Cascades has developed degree programs to meet the education, economic and community needs of Bend and Central Oregon, as well as global demand for qualified graduates in energy, natural resources, health, recreation and tourism and other fields. OSU-Cascades has more than 40 full-time faculty, including distinguished professors, recipients of prestigious fellowships and awards, published authors and leading researchers in energy systems, public health, business and the humanities. OSU-Cascades is a vibrant part of the community, partnering with more than 150 businesses, government agencies and nonprofits in Central Oregon for student internships, research and economic development.

BY THE NUMBERS

Based on fall 2013 enrollment, unless otherwise noted

274 students engaged in internships, practicums and study abroad programs with businesses, organizations and agencies in Central Oregon and around the world (2011)

1,200 community members attended lectures in Central Oregon presented by Oregon State faculty researchers from Bend and Corvallis

1,111 enrolled students, including 936 upper division and graduate students and 175 attending classes at Central Oregon Community College (COCC)

\$2.03 MILLION awarded in scholarships since 2001 through the OSU Foundation

80% of students are from Central Oregon, 16% are from other Oregon communities, and 4% are from out of state

50% of graduates are the first in their family to attend college (2010)

50% of students plan to live and work in Central Oregon after graduating (2010)

2,145 degrees awarded since founding in 2001

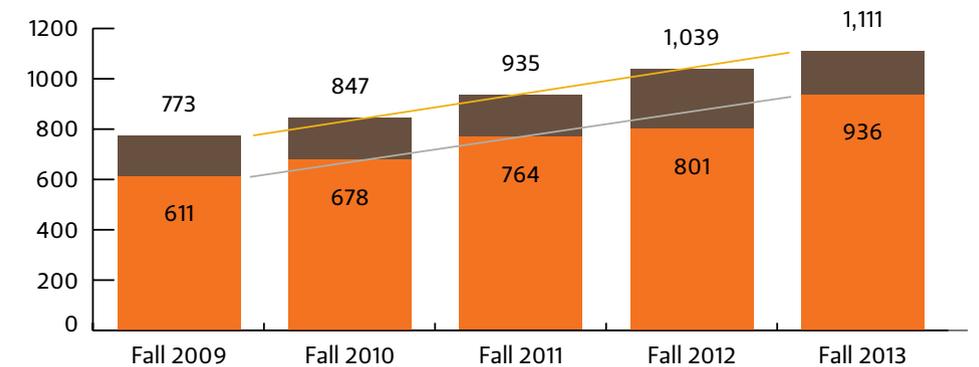
17 students on average in upper-division courses

42% of students transfer from COCC

18 academic majors offered

OSU-CASCADES ENROLLMENT 2009-2013

- Upper division and graduate students
- COCC dual enrollment
- Linear (upper division and graduate students)
- Linear (campus total)



STATEWIDE PUBLIC SERVICES

100+ years of service to Oregonians and the Oregon economy

Oregon State University's three Statewide Public Service Programs — the OSU Extension Service, Agricultural Experiment Station and Forest Research Laboratory — have been improving quality of life and bolstering the state's economy for more than a century.

196
faculty
+14,000
volunteers

OVER **2**
MILLION
Oregonians served every year

Source: OSU Extension, July 2013.

Serving Oregon's 36 counties

Since 1911, the OSU Extension Service has been providing research-based educational programs across the state. A total of 196 Extension faculty are located on the Corvallis campus and in each of Oregon's 36 counties. Programs focused on agriculture, family and community health, forestry, 4-H youth development and marine resources help Oregonians of all ages and in both rural and urban settings solve problems, develop skills and manage resources wisely. A statewide network of more than 14,000 volunteers works with OSU Extension Service faculty to lead programs such as 4-H, Master Gardeners, nutrition and health assistance and others. OSU Extension Service programs reach more than 2 million Oregonians every year — more than half of the state's population.

Identifying potential invasive species

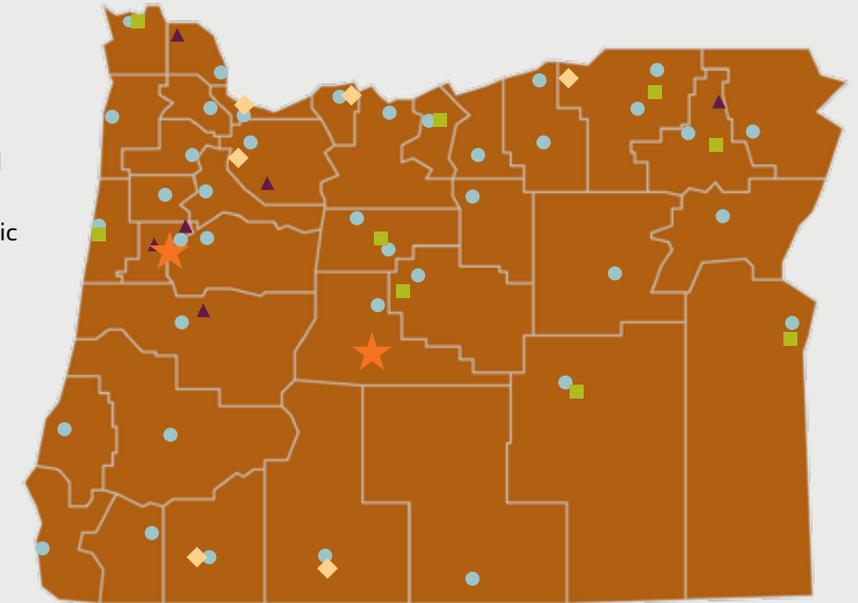
When a 66-foot dock from Japan washed up on the beach near Newport, Ore., in 2012, it highlighted the potential threat of invasive species — one of the long-lasting effects of natural disasters like the 2011 Japanese tsunami.

Sam Chan is Oregon Sea Grant Extension's expert on aquatic invasive species. He says much of debris from the tsunami — with all sorts of aquatic plant and animal life clinging on — is currently swirling around the ocean in what's known as the Great Pacific Garbage Patch. But some potentially invasive species, such as the Asian shore crab, the Northern Pacific starfish and wakame seaweed, have been found near Vancouver, British Columbia. Chan has been working with his Canadian counterparts to identify these invaders and prevent them from crowding out native species and causing other ecological and economic damage.

Oregon is our campus

OREGON STATE UNIVERSITY has a presence in each of Oregon's 36 counties. The 64 physical locations are supplemented by the virtual presence of OSU Extended Campus and Oregon Open Campus programs, making the university a vital partner in workforce and economic development, locally focused research, public health assistance and other issues.

- ★ OSU Campuses
 - OSU Extension Offices
 - ◆ OSU Research and Extension Centers*
 - Oregon Agricultural Experiment Station Sites
 - ▲ Oregon Forest Research Laboratory Research Sites
- *Colocation of AES and Extension faculty



Hatch, Smith-Lever and McIntire-Stennis Act funds are all distributed according to a statutory formula to each of the 50 states. A dollar-for-dollar match is required from the states, but many jurisdictions provide a greater amount.

Hatch Act: The Hatch Act of 1887 established a sustainable federal funding stream for state agricultural experiment stations. The Hatch Act authorized direct payment of federal grant funds to each state to establish agricultural experiment stations under the direction of each state's land grant college. These funds provide each state with basic infrastructure, scientific expertise and facilities for conducting research. Hatch Act FY13 funding was \$2,244,615 for Oregon State and \$218,300,000 nationwide.

Smith-Lever Act: The Smith-Lever Act of 1914 established a stable federal funding stream for cooperative extension programs. Current extension education programs are creating social, economic and environmental benefits. Extension programs contribute to economic growth; sustainable agricultural, forestry and marine production methods; improved health and wellness

of limited-income populations; positive rural development; and disaster management, responding to the diverse needs of Oregonians. Smith-Lever Act FY13 funding was \$4,112,436 for Oregon State and \$271,600,000 nationwide.

McIntire-Stennis Act: The McIntire-Stennis Act of 1962 provides ongoing federal funds in a federal-state partnership to support university-level forestry research. Research efforts of faculty and graduate students have focused on sustainable, healthy forests that provide economic, social and ecosystem benefits to the state, region and nation. The scientific results and management technologies developed from a variety of research activities are delivered to policy makers, forest managers, forest land owners and other scientists. McIntire-Stennis Act FY13 funding was \$943,793 for Oregon State and \$30,400,000 nationwide.

STRONG MARINE SCIENCE PROGRAM POISED FOR EVEN GREATER GROWTH, IMPACT



Long recognized internationally for excellence in marine sciences, Oregon State University is leading new research and education initiatives on the Oregon coast. Growth is coming to the university's Hatfield Marine Science Center (HMSC) in Newport. President Ed Ray met with coastal leaders in summer 2013 about developing undergraduate programs and curriculum that would bring some 500 students to a residential campus.

In addition, plans are underway to expand research capacity and infrastructure at HMSC, where the National Oceanic and Atmospheric Administration (NOAA), U.S. Environmental Protection Agency, U.S. Department of Agriculture, U.S. Fish and Wildlife Service, U.S. Geological Survey and the Oregon Department of Fish and Wildlife collaborate with the university on marine science research.

The National Science Foundation (NSF) last year chose Oregon State to lead the design and construction of as many as three new coastal research vessels. Oregon State will receive nearly \$3 million for the design phase, and if all three vessels are built, the total grant is projected to reach \$290 million over 10 years.

These developments build on other major initiatives in Newport, including the relocation of NOAA's Pacific marine fleet to Newport and the Ocean Observatories Initiative, a \$386 million NSF-funded project jointly led by Oregon State's College of Earth, Ocean, and Atmospheric Sciences.

FEDERAL SCIENTIFIC RESEARCH PRIORITIES

*The figures in parentheses represent the FY13 appropriated amounts, before across-the-board cuts to adjust for the FY13 budget caps per the American Taxpayer Relief Act of 2012 and before the cuts of the federal budget sequestration.

	FY 2013 Estimated (pre seq)*	Omnibus FY 2014	President's FY 2015 Request	OSU's FY 2015 Request
\$ in millions				
Agriculture Bill				
Agriculture and Food Research Initiative (AFRI)	277	316.4	325	360
Hatch Act Funds	218.3	243.7	244	244
Smith-Lever Funds 3(b) and 3 (c)	271.6	300	300	300
McIntire-Stennis Cooperative Forestry	30.4	33.9	34	34
Commerce-Justice-Science Bill				
National Science Foundation (NSF)	6,901	7,172	7,255	7,500
National Aeronautics and Space Administration (NASA), Science Mission Directorate	(5,144)	5,151	4,972	5,250
NASA, Space Grant Program	(40)	40	24	40
National Oceanographic and Atmospheric Administration (NOAA), Oceanic and Atmospheric Research (OAR)	369	416	462	462
NOAA, OAR, Sea Grant	62	62.8	63.4	80
Defense Bill				
Department of Defense (DOD), Science and Technology (6.1-6.3)	12,147	12,185	11,515	12,389
DOD, Science and Technology, Basic Research (6.1)	2,130	2,167	2,017	2,230
DOD, Defense Advanced Research Projects Agency (DARPA)	2,817	2,778	2,914	2,914
Energy and Water Development Bill				
Department of Energy (DOE), Office of Science	(4,875)	5,066	5,111	5,223
DOE, Advanced Research Projects Agency for Energy (ARPA-E)	(265)	280	325	325
DOE, Energy Efficiency and Renewable Energy (EERE), Water Power R&D Account	54.7	58.6	62.5	82
Interior-Environment Bill				
United States Geological Survey (USGS), Water Resources Research Institute (WRRRI)	(6.5)	6.5	3.5	8.8
Environmental Protection Agency (EPA), Office of Science and Technology	(794)	759	763	794
Labor-Health and Human Services-Education Bill				
Health and Human Services (HHS), National Institutes of Health (NIH)	29,001	29,900	30,203	32,000
State-Foreign Operations Bill				
USAID, Feed the Future Innovation Labs (specifically Collaborative Research Innovation Labs)	(31.5)	32	Not Referenced	43 (33)

Source: Association Public and Land-Grant Universities (APLU) Council on Government Affairs (CGA), updated January 14, 2014

NATIONAL IMPACTS OF FEDERAL RESEARCH

Oregon State University's globally recognized research enterprise has more than doubled in the past decade. The university is a pacesetter in research on climate science, wave energy, conservation biology, open-source software, forestry, agriculture, nutrition and other fields. Oregon State researchers are renowned leaders who are designing the next generation of oceangoing research vessels, developing novel green materials, creating a national ocean-observing program, exploring multiple sources for renewable energy, and determining ways to enhance wellness as people age. Oregon State researchers advise state and federal agencies and international research organizations in areas of national and global importance.

National Science Foundation (NSF)

NSF support for Oregon State research during the past five years has totaled almost \$230 million, including nearly \$44 million in FY13.

Developing algorithms to model bird migration

Thomas Dietterich and an Oregon State computer science team have developed machine learning algorithms to model bird migration. As part of the BirdCast project led by the Cornell Lab of Ornithology, these algorithms extract information on biomass, migration direction and speed from Doppler radar scans. When combined with weather forecasts and volunteer observations, this information helps scientists infer migration patterns and factors that affect where and how far birds fly. Dan Sheldon, Dietterich's former post-doc now at the University of Massachusetts, Amherst, led the radar work. Knowledge of migratory behavior can help inform decisions for placement of wind turbines and nighttime lighting of tall buildings. The project has received funding from the NSF Division of Information and Intelligent Systems.

Standardizing plant data sets

With funding from the NSF Division of Integrative Organismal Systems, a team led

by Oregon State's Pankaj Jaiswal has created the Plant Ontology, a collaborative, publicly available online pilot database and resource for researchers that links plant genomics data with controlled vocabularies of plant anatomy and developmental stages. Researchers have also developed software for annotating images. This advance in bioinformatics enables students, teachers, plant breeders and scientists to use commonly accepted terms for educational, research and plant breeding purposes.

Observing learning beyond the classroom

With support from the NSF Division of Research on Learning in Formal and Informal Settings, Oregon State researchers have created an observation system to study informal science education. Led by Oregon State's Shawn Rowe at the university's Hatfield Marine Science Center Visitor Center in Newport, Ore., researchers installed cameras and microphones to track visitor interaction with exhibits. Findings have been used for training visitor center docents and public school teachers, as well as in methods courses for Oregon State students.

U.S. Department of Agriculture (USDA)

USDA support for Oregon State research during the past five years has totaled almost \$169 million, including more than \$31 million in FY13.

More precise data informs U.S. crop insurance program

Oregon State's Chris Daly has developed one of the nation's most sophisticated weather and climate analysis systems, and with support from the USDA's Risk Management Agency, Daly's PRISM system is helping to improve the efficiency and integrity of the federal crop insurance program. Refined over 20 years, the PRISM system factors topography into climate parameters such as precipitation and temperature, and it can provide precise daily estimates of weather and climate conditions across the conterminous U.S. Using PRISM, the agency is more quickly substantiating weather events and producer claims, preventing abuse, improving the underwriting process and saving taxpayer dollars in the \$120 billion crop insurance program.

Managing the threat of stink bugs for orchards and specialty crops

The brown marmorated stink bug is an extremely invasive and damaging pest, first identified in Portland in 2004 and spreading throughout the Willamette Valley and Columbia Gorge by 2012. The first significant damage to Oregon orchard crops, small fruit, vegetables and ornamentals was seen in 2013. Peter Shearer, an entomologist at Oregon State's Mid-Columbia Agricultural Research and Extension Center in Hood River, Ore., is leading research funded by the USDA's Agricultural Research Service to characterize the stink bug's biology.

Shearer and his colleagues have found the fast-spreading pest can have multiple generations per year and disperse up to 50 miles in a 24-hour period. The research team is working to provide more resources and periodic research updates for specialty crop producers.

Providing resources to support weight-healthy kids in rural communities

Oregon State researchers Deborah John and Kathy Gunter identify multiple factors that contribute to childhood obesity in rural communities: long bus commutes, few resources for physical activities and a lack of healthy food choices. With a grant from the USDA's National Institute of Food and Agriculture, John, Gunter and colleagues have developed three community-based, participatory action research tools to improve the food and physical activity environments and policies in the community, in schools and at home. These programs have been employed in 16 rural communities in Oregon, Washington and Nevada, with partners in Colorado and Idaho preparing to implement programs in 2014. OSU Extension is working collaboratively with land grant universities across the western U.S. to make healthy nutrition and regular physical activity the easy option for rural children and families.

Innovative modeling process helps define critical spotted owl habitats

Long-term demographic studies at Oregon State by Robert Anthony, Eric Forsman and Katie Dugger have provided essential data for meeting management and policy objectives for recovery of the northern spotted owl in Oregon and Washington. With funding from the U.S. Forest Service, these Oregon State researchers assisted a modeling team including Nathan Schumaker of the Environmental Protection Agency and Brian Woodbridge of the U.S. Fish and Wildlife Service in developing state-of-the-art modeling tools to design and evaluate habitat conservation networks for northern spotted owl recovery. This is the first time that such modeling tools have been used to designate and refine a critical habitat network.

Department of Health and Human Services (HHS)

HHS support for Oregon State research during the past five years has totaled more than \$118 million, including \$13.6 million in FY13.

Exploring antioxidant therapies to resist chronic disease and aging

Oregon State's Linus Pauling Institute (LPI) is an international leader in research and education about micronutrients and antioxidants, focusing entirely on health promotion and disease prevention. Current research funding from renewal of the Center of Excellence for Research on Complementary and Alternative Medicine Antioxidant Therapies (CERCAT) is led by LPI director Balz Frei and LPI faculty members Tory Hagen and Joe Beckman, in collaboration with faculty at Oregon Health & Science University (OHSU). Their work has led to a new understanding of how antioxidants function in the body, supporting development of new treatments that reverse cell and tissue dysfunctions. Research is ongoing to better understand the mechanisms of action and to test the efficacy of protocols with the potential to substantially improve the body's resistance to chronic disease and aging — allowing people to enjoy good health longer.

Microtechnology makes portable dialysis possible

More than 400,000 Americans with end-stage kidney disease depend on regular dialysis treatments to keep them alive. Most spend hours every week in centers hooked to a machine the size of a refrigerator. Microchannel technology developed by Oregon State chemical engineer Goran Jovanovic could change that. Home Dialysis Plus, a spinoff of the Oregon Nanoscience and Microtechnologies Institute (ONAMI) and the Microproducts Breakthrough Institute (MBI), is commercializing a microchannel device for portable dialysis treatment that will let patients receive dialysis

treatments at home, often while they are sleeping. Research for the microchannel dialyzer received funding support from the National Institute of Biomedical Imaging and Bioengineering.

Training the next generation of environmental health scientists

For more than 35 years, the National Institutes of Environmental Health Sciences (NIEHS), through a training grant, has provided support for dozens of Oregon State graduate students and postdoctoral scientists in the area of environmental health sciences. Past trainees hold prominent positions in the academic, private and government sectors. Robert Tanguay, current director of the NIEHS Toxicology Training Grant, has also received substantial NIEHS support to advance the use of zebrafish to protect and improve human health. Tanguay pioneered the use of zebrafish for environmental health sciences. Zebrafish offer many advantages because like humans, they are vertebrates and share many of the same genes, but they are transparent and develop in a matter of days instead of months. The main goal is to determine what chemicals in the environment pose a risk to humans.

U.S. Department of Energy (DOE)

DOE support for Oregon State research during the past five years has totaled more than \$70 million, with more than \$16 million in FY13.

An affordable home filling station for natural gas vehicles

The scarcity of natural gas refueling stations in the U.S. has been a big obstacle to the widespread adoption of natural gas-powered vehicles. Chris Hagen, an assistant professor in the Energy Systems Engineering program at Oregon State University – Cascades in Bend, Ore., is using DOE funding to modify a passenger vehicle so that its internal combustion engine can be used to compress natural gas for storage

onboard the vehicle. The new design will compress gas in a single cylinder of the engine itself, allowing the car to act as its own refueling station. The design should cost from \$500 to \$1,000 and pay for itself with fuel savings in less than six months. Hagen and his colleagues have created a prototype of the compressor. A spinoff of the research, Onboard Dynamics, Inc. aims to equip vehicles with the system, allowing for refueling at any standard home or business natural gas line.

A better process for handling nuclear fuel waste

Most nuclear reactor systems use a fuel designed to contain the fission products generated over the life of the fuel. Over the past few years, several high-temperature, gas-cooled reactor system design concepts have been proposed that vent and trap these materials in a collection system to reduce the pressure within the fuel elements and enable longer fuel life. With a grant from the DOE, Oregon State nuclear engineer Andrew Klein is analyzing the safety of these advanced concepts by conducting a probabilistic risk assessment to provide a modern safety analysis of this venting and removal system. To date, Klein's team has provided a better understanding of the fission product release from carbide nuclear fuels as well as the flow and fission product trapping ability of the helium purification system.

Development and testing for wave energy

With DOE support, the Northwest National Marine Renewable Energy Center (NNMREC) is continuing engineering design and planning for the Pacific Marine Energy Center (PMEC) South Energy Test Site (SETS) near Newport, Ore. NNMREC and regulatory officials are working with more than a dozen state and federal agencies to anticipate monitoring and permitting issues to avoid costly delays or obstacles. A North Energy Test Site (NETS) is already operational near Newport using the Ocean Sentinel, a portable instrumentation buoy that monitors and tests wave energy

devices. The SETS will have grid-connection capability to harness energy from the waves via wave energy conversion devices. PMEC comprises multiple testing facilities in Oregon and Washington and is now the leading center of its type in the U.S.

Department of Defense (DOD)

DOD support for Oregon State research during the past five years has totaled \$80 million, including \$15 million in FY13.

Robots replicate how people walk

Jonathan Hurst, head of Oregon State's Dynamic Robotics Laboratory, is leading a multi-institute project that has produced three identical biologically inspired, human-scale bipedal robots named ATRIAS, one sent to Carnegie Mellon University, one to sent to University of Michigan and one that remains at Oregon State. ATRIAS is the first machine to demonstrate a spring-mass walk, which reproduces the fundamental physics of animal and human walking. This approach has the potential for agile, efficient walking and running over unpredictable, rough terrain, meeting or exceeding the performance of animals and humans. The innovations, achieved through Defense Advanced Research Projects Agency (DARPA) support, will enable exoskeletons, prosthetic legs and robots that can navigate rough terrain to aid in disaster response or take on dangerous missions.

Improving accuracy for detecting data anomalies

Thomas Dietterich, director of Intelligent Systems at Oregon State, is leading a project to detect insider threats to organizations and prevent such threats as stolen intellectual property or sabotaged computer operations. As part of the Defense Advanced Research Projects Agency (DARPA) Anomaly Detection at Multiple Scales (ADAMS) program, Dietterich's team has developed several new algorithms for anomaly detection. These are being applied to data

collected from desktop computer monitoring in a real corporation, but with simulated insider threats inserted into the data by a Red Team led by the CERT Division of the Software Engineering Institute (SEI). Results on these data show that the Oregon State methods are the most accurate and exhibit low false-alarm rates. Dietterich's team has also developed a comprehensive set of benchmarks for evaluating anomaly detection algorithms. This promises to help the entire research community measure and improve the performance of their algorithms.

Mixing in the South China Sea

The South China Sea is one of the world's most important pieces of ocean real estate — for fishing, trade and energy resources — and it is also one of the world's most dangerous, according to a study by the WWF. Seasonal monsoons bring wind and rain, very strong tides, and the fast, warm currents of the Kuroshio create a natural laboratory for the study of mixing in the ocean and the impacts on ocean ecology and productivity. In a long-range basic and applied research effort for the Office of Naval Research, Oregon State oceanographers Kipp Shearman and Emily Shroyer are leading a coordinated effort to assess the processes that drive mixing in the South China Sea using novel combinations of ship- and glider-based surveys equipped with sensitive instruments that measure turbulent motions.

U.S. Department of Commerce (DOC)

DOC support for Oregon State research during the past five years has totaled almost \$58 million, with more than \$8 million in FY13.

Improving management of marine resources

Oregon State's Cooperative Institute for Marine Resources Studies (CIMRS) is a long-term, strategic collaboration between NOAA and university researchers in areas where

OSU expertise can offer help to the NOAA mission. One CIMRS project works to improve management practices for deep-sea and coastal waters. Efforts here find new ways to measure and predict how natural processes influence interdependent marine organisms as well as develop tools to assess the impact of natural and anthropogenic noises in the marine environment, characterize marine habitats and protect them. Through the Cooperative Institute, DOC funds have enhanced the ability to predict volcanic eruptions along the Juan de Fuca Ridge, approximately 300 miles off the coast of Oregon. Successful prediction of an eruption at Axial Seamount in 2011 was a first for marine volcanology. They have also improved assessments of ambient ocean noise and updated Oregon Coastal maps to identify essential habitat for Pacific coast groundfish.

Protecting people, property and habitats

DOC funds support Oregon State's contribution to the Northwest Association of Networked Ocean Observing Systems (NANOOS), which provides an integrated picture of conditions in oceans and estuaries of the Pacific Northwest. Using land-based radars, autonomous underwater gliders and stationary and floating at-sea monitoring devices, eight labs monitor and respond immediately to input concerning surface currents, water temperatures, salinity, dissolved oxygen levels and other metrics. Beach cross sections are also tracked, as are near-shore waves as they enter shallow waters near coastlines. NANOOS data has enabled safer navigation and has better informed search and rescue missions. The data also provides fast and accurate tracking of acidification, hypoxia dead zone development and shoreline erosion. Additional NANOOS services include data delivery, presentation and aggregation, along with public outreach.

Making informed decisions about climate change

Oregon State leads the Climate Impacts Research Consortium (CIRC), which was

designated by NOAA in 2010 as the new Regional Integrated Sciences and Assessments (RISA) center for the Pacific Northwest. RISAs connect regional climate scientists with the people making decisions concerning water resources, weather hazards, agriculture, public health and other issues. The CIRC translates climate responses to shifting concentrations of global-scale atmospheric pollutants into finer, spatial-scale climate impacts information that's meaningful in local contexts. Approaches include social network analyses for community-based problem solving. For example, CIRC data is informing drought-adaptation responses in Oregon, Washington and Idaho, resulting in strategies to mitigate drought impacts and prepare for changing climate conditions.

U.S. Department of the Interior (DOI)

DOI support for Oregon State research during the past five years has totaled nearly \$28 million, including more than \$5 million in FY13.

Managing cultural and natural resources in the context of climate change

Oregon State serves as the central location and administrative center of the Northwest Climate Science Center, established by the DOI in 2010 to address the challenges climate change brings to managing cultural and natural resources in the Pacific Northwest. A collaboration that includes Oregon State, the University of Idaho and the University of Washington, the center also taps into the scientific expertise of the U.S. Geological Survey. The center has worked with the 52 federally recognized Native American tribes in the Pacific Northwest to study impacts of climate change and has also created an annual Climate Boot Camp — a unique, weeklong interdisciplinary training program that prepares graduate students and early-career professionals to work in climate science, science communications and science policy.



Helping keep Oregon waterways clean

Oregon Sea Grant is partnering with the Oregon State Marine Board to improve boaters' awareness of, access to and use of sewage pump-outs, dump stations and floating restrooms. Funded by the U.S. Fish and Wildlife Service and led by Dave Hansen, program leader for Oregon Sea Grant Extension, the Clean Vessel Act (CVA) Education and Technical Assistance Initiative has taken a stakeholder-based approach by first surveying boaters and interviewing marina operators on their needs and concerns, then developing appropriate signage, local events and videos to promote clean boating practices. The initiative is working. Last year, Oregonians kept 750,000 gallons of untreated sewage out of the state's waterways.

National Aeronautics and Space Administration (NASA)

NASA support for Oregon State research during the past five years has totaled more than \$27 million, with more than \$5 million in FY13.

Observing ocean and wind dynamics from space

NASA-funded research led by Oregon State oceanographer Dudley Chelton has been combining satellite measurements of four different variables — sea surface elevation, sea surface temperature, surface winds and oceanic chlorophyll — to investigate the interaction between the physics and the biology inside ocean eddies. Synergistic analysis of these four satellite data sets has shown that eddies generate vertical velocities within their interiors from the combined effects of surface winds, the rotational velocity of the eddies and the influence of eddies on sea surface temperature within the eddies' interiors. The swirling motion of an eddy interacts with the overlying wind field to cause nutrients that are normally found in colder, deeper waters to rise to the nutrient-poor upper ocean, or vice versa, depending on whether the eddy rotates clockwise or counterclockwise. Concurrent satellite measurements of near-surface chlorophyll reveal that the associated upwelling or downwelling of subsurface nutrients can strongly influence ecosystems trapped within the eddies.

Space Grant promotes STEM education

With funding from NASA, the Oregon NASA Space Grant Consortium (OSGC) promotes science, technology, engineering and mathematics (STEM) education through fellowships, scholarships, internships, competitions and research projects for undergraduate and graduate students. Examples include helping Oregon State's

American Institute of Aeronautics and Astronautics Team compete at the Design/Fly competition; putting together a NASA Student Symposium featuring research conducted by OSGC-funded students; backing Oregon State's Mars Rover Team, which won first place in 2008 and 2010 and third place in 2011 at the annual University Rover Challenge at the Mars Desert Research Station in Hanksville, Utah; and making it possible for a team of Jackson Middle School students in Portland to fly an experiment on space shuttle Endeavor's final mission as part of the Student Spaceflight Experiment Program.

Department of Transportation (DOT)

DOT support for Oregon State research during the past five years has totaled almost \$21 million, including \$2.4 million in FY13.

Developing ecological approaches to transportation planning

Lisa Gaines, director of Oregon State's Institute for Natural Resources, leads a project funded by the Transportation Research Board of the National Academy of Sciences and national partners to develop an Integrated Ecological Framework (IEF), a collaborative ecosystem-scale approach to decision-making during infrastructure planning, environmental review and permitting. The nine-step IEF addresses barriers transportation agencies experience, along with the scientific and technical processes needed to implement ecological approaches in transportation planning. It also brings together a variety of well-tested methods, data and tools that take into account resources regulated under the Clean Water Act and the Endangered Species Act, and it provides guidance about how transportation agencies can develop and use ecosystem crediting systems and markets.

Specifications for cast-in-place concrete

With support from the Washington Department of Transportation and the Federal Highway Administration, Oregon State construction engineer David Trejo is investigating the influence of time and drum revolutions on the performance of cast-in-place concrete, assessing whether specifications established in 1935 and 1955 are justified. Currently, concrete that exceeds a 90-minute time limit or 300 drum revolutions must be discarded. If extended time to placement or high drum revolution counts result in low-strength concrete, eliminating these limits could be catastrophic. However, keeping the limits in place when no detrimental performance results from the longer times or drum revolutions is a waste of resources. Preliminary results indicate existing time and truck drum revolutions limits may not be applicable for most concrete mixtures, can result in higher costs and may not be value-adding to a construction project.

Assessing highway buffers for storing stormwater

Roadside vegetated filter strips provide a buffer zone to store stormwater, but they can generate runoff when saturated. In research funded by the Oregon Department of Transportation and the Federal Highway Administration, Oregon State's Chad Higgins has developed a network of five monitoring sites on highways in western Oregon. Each site was instrumented with a novel "groovy bucket" design for in situ runoff measurement, along with instrumentation to quantify soil physical properties and soil water content. Initial tests over the winter of 2013 indicated that soil infiltrability decreased dramatically after intense rainfall and snowfall, reducing the ability of the filter strips to retain runoff for incoming storms. Further field monitoring is needed to develop a reliable and robust design equation to optimize the width of roadside filter strips.

OREGON STATE UNIVERSITY ECAMPUS: TOP-TIER ONLINE EDUCATION

Oregon State University Ecampus is widely considered among the nation's best online degree programs, providing a high-quality education to students no matter where they live. Ecampus is an essential component in serving Oregon State's land-grant mission of accessible education, outreach and engagement.

Ecampus partners with 10 Oregon State colleges and more than 500 world-class faculty to deliver 35 degrees and programs online. All Ecampus students earn an Oregon State University degree — with the same transcript and diploma as on-campus students.

Ecampus serves adult learners in all 50 states and more than 40 countries, including working professionals, stay-at-home parents, military personnel and those returning to school to finish their degrees. While most Ecampus students are distance learners who cannot attend courses at Oregon State's Corvallis or Bend campuses, Ecampus also serves on-campus students who take an occasional online course due to a schedule conflict or preference for online learning. All Ecampus students have access to career services, student success counseling, 24/7 online tutoring, OSU Libraries and other support resources.

Ecampus continues to win recognition as one of the nation's top-tier online programs based on academic quality, student support, faculty credentials, student satisfaction and other criteria.

Oregon State Ecampus recent national honors:

- Best Online Bachelor's Program – U.S. News & World Report (2014)
- Smart Choice 25 Best Online Colleges – SuperScholar (2012, 2013, 2014)
- Nation's Best Public Online Colleges – Affordable Colleges Online (2013)
- The 25 Best Online Colleges – TheBestSchools.org (2012)
- Top 20 Online Colleges – TheBestColleges.org (2011)

ECAMPUS BY THE NUMBERS

17

Undergraduate degrees

18

Graduate programs

900+

Online classes

500+

Faculty partners

13,580

Students who took one or more
Ecampus class in 2012-13

1,934

Students who have earned an
Oregon State University degree
online since 2002

4

Years in a row Ecampus has been
ranked one of the nation's best
online universities

Vital is the word Paul Jepson uses to describe the Extension Service, not just in Oregon, but worldwide.

It has a double meaning, he says. Extension is a vital part of agricultural production and food security in the United States. At the same time, Extension is vital because it's a vibrant, dynamic and agile system that is constantly adapting and also developing state-of-the-science decision-support tools to help farmers increase yields, manage resources and apply new techniques and technologies.

The director of Oregon State's Integrated Plant Protection Center, Jepson has taken the integrated Extension and science model to West Africa — and has brought back insights that can inform Oregon agriculture.

The United Nations' Food Agriculture Organization (FAO) first approached Jepson about bringing this model to West Africa in 2005. An OSU study published in February 2014 by the London-based Royal Society found extensive use of highly toxic pesticides poses widespread and significant threats to human health and terrestrial and aquatic wildlife throughout the region. At the same time, evidence shows when chemical use goes down by about 80 percent, crop yields on vegetables increase by about 25 percent, Jepson says.

"The idea is to have sustainable yields, healthy families and an ecosystem that can support agriculture with low risk to wildlife," Jepson says. "It's a win-win-win."

Although West Africa has no equivalent to the Extension Service, Jepson says there is an "ecosystem of cooperation where everybody in the community gets involved." Just as in the U.S., his team listens to and collaborates with the community to find solutions and apply the latest science. They've also worked within FAO's farmer field schools, which train a member of the community to be a facilitator who then works with local farmers, explaining where there are pesticide risks and helping them implement alternative pest management strategies.

"It's the farmers themselves who are the experts in their own fields, so we're empowering them to make better decisions," Jepson says.

It's a strategy that can work anywhere. And it's vital to feeding a hungry world.

EXTENSION MODEL HELPS FARMERS IN WEST AFRICA CUT PESTICIDE USE





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