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OREGON'S AGRICULTURAL PROGRESS

Facing the SWAT Team

Also:

Oregon's Land-grant Legacy
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OREGON'S AGRICULTURAL PROGRESS

SUMMER 2010, VOL.56, NO. 1, OREGON STATE UNIVERSITY

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Oregon's Agricultural Progress is published by the Oregon Agricultural Experiment Station (Sonny Ramaswamy, director). Send comments to the editor, Extension and Experiment Station Communications, OSU, 422 Kerr Admin., Corvallis, OR 97331-2119. Written material may be reprinted provided no endorsement of a commercial product is stated or implied. Please credit *Oregon's Agricultural Progress,* Oregon State University. To simplify terminology, trade names of products or equipment sometimes are used. No endorsement is intended nor is criticism implied of products not mentioned.

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Private funds, provided by the Agricultural Research Foundation, help pay for color reproduction.

Editor's Note

Discover, Learn, Engage

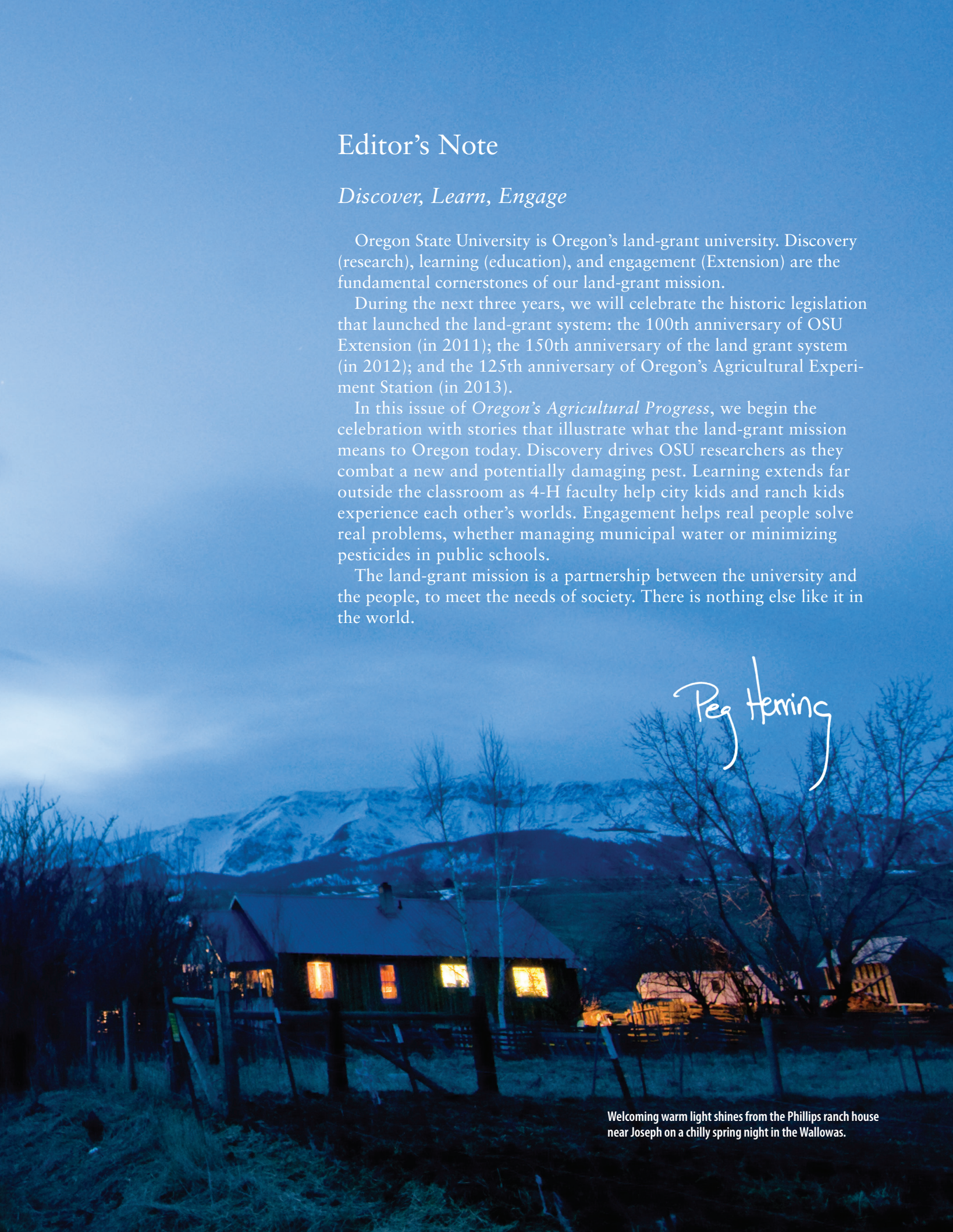
Oregon State University is Oregon's land-grant university. Discovery (research), learning (education), and engagement (Extension) are the fundamental cornerstones of our land-grant mission.

During the next three years, we will celebrate the historic legislation that launched the land-grant system: the 100th anniversary of OSU Extension (in 2011); the 150th anniversary of the land grant system (in 2012); and the 125th anniversary of Oregon's Agricultural Experiment Station (in 2013).

In this issue of *Oregon's Agricultural Progress*, we begin the celebration with stories that illustrate what the land-grant mission means to Oregon today. Discovery drives OSU researchers as they combat a new and potentially damaging pest. Learning extends far outside the classroom as 4-H faculty help city kids and ranch kids experience each other's worlds. Engagement helps real people solve real problems, whether managing municipal water or minimizing pesticides in public schools.

The land-grant mission is a partnership between the university and the people, to meet the needs of society. There is nothing else like it in the world.

Peg Herring



Welcoming warm light shines from the Phillips ranch house near Joseph on a chilly spring night in the Wallowas.

THE *Legacy* OF THE LAND GRANT

BY PEG HERRING

Imagine a country where enemy combatants terrorize citizens at home and at work; where civil hostilities tear apart families; and where the largest share of the nation's treasury fuels domestic warfare.

That place was the United States in 1862. At that time, during the middle of the Civil War, Abraham Lincoln signed the law that created the states' land-grant universities. Weeks earlier, Lincoln had signed the Homestead Act and established the U.S. Department of Agriculture. It would seem that the nation's leaders, at a moment of national crisis, saw education and agriculture as necessary to national security.

How much do we still depend on education and agriculture? What is the legacy of the land-grant university in the 21st century?

Before 1862, higher education was a privilege for the wealthy, patterned after the European class system. A college education was generally available if you were wealthy, white, and male. You would study Latin, literature, law, or the classics at a private school. Education of the working class was left to guilds, where tradesmen instructed apprentices, or to seminaries, where clergymen taught religious novices. In the young United States, a few well-educated planters studied scientific agriculture, but generally it was the pioneering yeoman farmers who tilled the soil in the same way their grandfathers had back in the old country.

The idea of education for all people was revolutionary. There was nothing else like it in the world. At the beginning of the industrial revolution and the massive migration into the western United States, the land-grant universities represented a radical idea: public education is fundamental to the nation's economic development.

Oregon Agricultural College was established in 1868 with funds from the sale of 90,000 acres in southeast Oregon that had been granted to the state by the federal government. The first class—one woman and two men—graduated in 1870 with Bachelor of Science degrees, the first degrees granted in the western United States by a

LYNN KETCHUM

Since its beginning in 1911, OSU Extension has sent OSU faculty into the field to deliver education where it counts. Extension instructor Nick Andrews helps a grower identify insects captured in a sticky trap (near photo, right), mirroring consultation of OSU Extension agents through the century.

The land-grant universities represented a radical idea: public education is fundamental to the nation's economic development.

OREGON STATE UNIVERSITY ARCHIVES

state-supported university. OAC (Oregon Agricultural College) eventually became OSU (Oregon State University) in 1961, and it remains a leader among the nation's land-grant universities.

With the radical idea that research was fundamental to the nation's economic development, Congress passed the Hatch Act in 1887, which established a network of Agricultural Experiment Stations. And in 1914, at the onset of World War I, Congress passed the Smith-Lever Act that established the Extension Service to deliver research-based education to all people, reinforcing the idea that education is fundamental to a strong nation.

"The three-part mission of research, Extension, and teaching is part of our DNA as a land-grant university."

Oregon State University is Oregon's land-grant university, and the radical ideas of public education, practical research, and the Extension Service are written into its mission. Oregon's Agricultural Experiment Station has 11 branch stations in 15 locations across the state, where scientists are improving crops and ways to keep water clean and soil healthy. OSU Extension has faculty working in every county in the state, where they deliver research-based education to communities, industries, and youth.

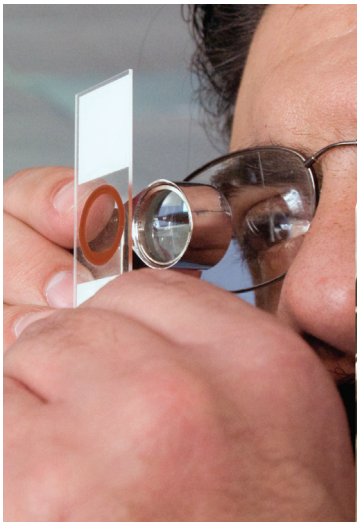
"The three-part mission of research, Extension, and teaching is part of our DNA as a land-grant university," said Sonny Ramaswamy, Dean of the College of Agricultural Sciences and Director of the Oregon Agricultural Experiment Station. "It gives our work a sense of purpose and guides our contributions to society." Those contributions have helped create a food system in the United States where less than two percent of the population is able to feed the other 98 percent of the population, in addition to huge numbers of people around the world.

"Agriculture touches everyone's lives," Ramaswamy said. "And the need for innovations will continue as we face a 50 percent increase in the world's population in the next 40 years. Increased agricultural production must occur, and it must be environmentally sustainable, using less water and energy.

"The new economy is visible in the economic growth of China, Russia, India, Brazil, and other countries that compete with the U.S. in the global marketplace," said Ramaswamy. "But everyone, everywhere, in all sectors and economies, is concerned about the same things. Food, water, energy, the environment, disease, population; these are the concerns of the world. And they are the subjects of OSU's land-grant mission of research, teaching, and Extension." OAP

OREGON STATE UNIVERSITY ARCHIVES

LYNN KETCHUM



LYNN KETCHUM

Women have been part of the land grant mission from the first graduating class. A horticulture class (above) prepares a vegetable garden with scientific precision in the late 1800s. Left, graduate students lay fiber-optic cable in a tributary of the John Day River to measure incremental changes in water temperature.

OREGON STATE UNIVERSITY ARCHIVES

LYNN KETCHUM

Crop improvement by OSU researchers has increased quality and yields of Oregon's grains and vegetables for generations. Most of the wheat grown in the Pacific Northwest and many of the vegetables you buy in the market are varieties developed by OSU plant breeders.

OREGON STATE UNIVERSITY ARCHIVES

LYNN KETCHUM

Fisheries management has changed dramatically since the late 1800s, when seines set at the mouths of coastal rivers captured salmon returning to spawn. Today, fisheries science students use smaller seines to examine the life in coastal bays, an ecosystem that salmon depend on for survival.

Innovations come and go, such as the Bugmobile entomologists used to sweep insects in the field. Today's entomologists (at left) are at the forefront in helping people combat pests in schools and in orchards.

The roots of a Revolutionary Idea

Support for education and agriculture has long been seen as necessary for a secure and democratic nation. In forming a vision for the new nation, George Washington said, "It will not be doubted that, with reference to either individual or national welfare, agriculture is of primary importance … Institutions promoting it grow up, supported by the public purse."

While drafting the nation's Constitution, John Adams wrote: "The education of a nation, instead of being confined to a few schools and universities for the instruction of a few, must become the national care and expense for the formation of the many."

And Thomas Jefferson called for "a crusade against ignorance; establish and improve the law for educating the common people; … the tax that will be paid for this purpose is not more than the thousandth part of what will be paid … if we leave people in ignorance."

So, our founding fathers, who had pronounced that all men were created equal, also professed that all should have equal access to education.

"It will not be doubted, that, with reference either to individual, or national welfare, agriculture is of primary importance."

Support for Multicultural Students is Building New Professionals

By Rachel Robertson

LYNN KETCHUM

Multicultural Scholars Omar Miranda-Garcia and Emily Escobedo have chosen a rigorous program of bioresource research to reach their career goals and eventually to make a difference in migrant worker communities.

Six minority students at Oregon State University will get closer to achieving their career dreams through OSU and the U.S. Department of Agriculture Multicultural Scholars Program.

USDA grants will provide each student with four years of tuition, a paid summer internship, and a trip to a national career conference, all part of the mission to promote multicultural diversity in agriculture, especially in high level positions where minorities are underrepresented.

Two of the USDA Multicultural Scholars have specific goals that are rooted in migrant worker communities where they hope to make a difference. Emily Escobedo foresees a career in protecting migrant workers and their families from exposure to pesticides; Omar Miranda-Garcia will focus on improving the health and nutrition of minority populations.

All six students are part of OSU's Bioresource Research Program (BRR), a nationally recognized undergraduate program that engages students in high level, real-world research in agriculture, natural resources, and human health. In addition, OSU supports minority scholars through the student organization Minorities in Agriculture, Natural Resources, and Related Sciences (MANRRS). MANRRS provides leadership training, peer mentoring, and the opportunity to make connections during its national career conference.

"We know that bioresource research training is really valuable to under-represented, first-generation diversity students," said Wanda Crannell, who advises students in the BRR and MANRRS programs. "Pursuing a tougher major with more breadth and experience is going to make them more competitive in their careers."

These OSU programs, and support from the USDA, have already made a difference for pre-veterinary student Ashley Seeley. Unable to pay for a fourth year of college, Seeley's goal of becoming a Spanish-speaking vet in Oregon was in doubt. As a Multicultural Scholar, Seeley is now looking forward to completing her pre-vet-med program with a language immersion exchange in Spain and an internship in applied genetics at the OSU School of Veterinary Medicine.

Although the graduation rate is low for freshmen from historically under-represented groups (within the Oregon University System, about 54 percent graduate within six years), according to Crannell 95 percent of OSU's MANRRS students have graduated. The funding and support from OSU and USDA encourage minority students to challenge themselves in research and leadership, and build the skills they will need for successful professional careers. OAP

Fighting Disease with a Double-Edged Sword

Dioxin is a double-edged sword.

Scientists at Oregon State University have found that dioxin can be effective in fighting diseases triggered by faulty immune systems. The only catch? Dioxin is toxic. It's in the Vietnam-era herbicide Agent Orange and can cause a disfiguring skin disease in humans.

So a team of OSU researchers led by toxicologist Nancy Kerkvliet is searching for a chemical that works like dioxin to fight autoimmune diseases, but will not trigger new diseases.

Studying one type of dioxin referred to as TCDD, Kerkvliet unraveled dioxin's effect on the immune system of mice. First, it binds to a protein (AhR) found inside a cell. The bound dioxin and AhR then pass into the nucleus, latch onto DNA, and turn certain genes on or off. This process produces regulatory T cells, which then shut down the immune system's response, which in turn suppresses the development of diabetes.

LYNN KETCHUM

Searching for chemicals that can suppress a faulty immune system, immunotoxicologist Nancy Kerkvliet and research assistant Sam Bradford analyze cells with a flow cytometer.

To help Kerkvliet find alternatives to dioxin, OSU cancer biologist Siva Kolluri and his crew are screening 50,000 compounds in search of ones that function like dioxin to induce regulatory T cells.

If they're successful, their results could bring relief to people who suffer from autoimmune diseases such as rheumatoid arthritis, multiple sclerosis, psoriasis, and type 1 diabetes.

Kerkvliet and Kolluri's work is supported by a $1.8 million grant from the federal American Recovery and Reinvestment Act. OAP

Two Universities Deliver One Top-Flight Program

By Aimee Brown

Clark Seavert is an economist. He studies agricultural finance, returns on investment, production economics. You might think that Seavert is a bit boring, a bit dry, a product of marble libraries and linoleum floors. You would be wrong.

In 1984, Seavert enrolled in Oregon State University's Agriculture Program at Eastern Oregon University in La Grande. He was one of the 27 freshmen that made up the program's first graduating class.

"I had family living in the area," says Seavert, who is originally from North Dakota and is now the director of OSU's North Willamette Research and Extension Center in Aurora. "At that time fishing and hunting were really important to me, maybe more than school. It was the setting that drew me there—but the agriculture program kept me there."

This year, that program celebrated 25 years of partnership between OSU and Eastern.

"When I got there, the class sizes were small, and the professors were passionate," says Seavert. Although he admits he was not the best student at the time, he got the extra help he needed and formed close relationships with faculty.

When the OSU/EOU partnership began, there were only two teaching faculty and a single degree with one minor offered. Today, the program supports nine faculty members, 160 full time students, and one of the nation's largest programs in rangeland ecology and management. Degrees are offered in five different agriculture and resource areas, with seven minors; and 500 students have received degrees from OSU through this program.

Many graduates have stayed in eastern Oregon, according to Larry Larson, the OSU Agriculture Program Coordinator at EOU. "They remain part of the agricultural community and the land-grant mission of the state," he says.

Then there's Seavert: the student who joined the program for its proximity to hunting and fishing and who once left a frozen lutefisk on a professor's desk over a long weekend. Seavert, when it comes down to it, is not boring at all.

"Really, though, the program was, and continues to be, a place where students can have the laidback lifestyle of eastern Oregon while getting a serious education that prepares them to excel in agricultural and natural resource fields." OAP

OSU Oregon State University
College of Agricultural Sciences

and

EASTERN OREGON UNIVERSITY

Suzukii: A New Fly in

the Ointment

A SWAT team pursues a tiny fly that threatens a ton of fruit

By Peg Herring

It began with a handful of blueberries. You couldn't actually hold the berries in your hand, or at least, you wouldn't want to. Although they had been picked fresh just a few days earlier, the berries now looked like they'd been frozen and thawed; they were squashed and oozing liquid.

A Willamette Valley blueberry grower had brought the berries in to the office of Vaughn Walton, an OSU research and extension entomologist, to get his opinion on what could be wasting the fruit. Walton put a hand lens up to his eye and zeroed in on one deflated berry. He saw a few thin, white threads wriggling through the pulp, the larvae of some kind of fly.

MICHAEL DURHAM

Walton kept the infected berries and grew out the larvae in an incubator chamber, to see what they were. In less than a week, tiny flies emerged within the chamber.

"The adults looked very much like our common vinegar fly, so at first we assumed that's what they were," Walton said in a soft, laconic South African accent. But something wasn't right.

That was August, 2009. Walton got on the phone with colleagues in other states. A few California growers had reported similar disintegration of ripe raspberries and strawberries the year before. By 2009, the problem was found in California cherries and Florida strawberries. Researchers confirmed the culprit to be the spotted wing drosophila, *Drosophila suzukii*, a vinegar fly native to southeast Asia and never before reported in North America, until now.

News spread rapidly. The Oregon Department of Agriculture posted a pest alert and more growers reported problems. By the end of the summer, the spotted wing drosophila had been confirmed for the first time from California to British Columbia and in parts of Europe, and in more than 16 different kinds of fruit. And damage was mounting. By September 2009, about one third of the California cherry crop was lost, as was a quarter of Oregon's late season blueberries, raspberries, and as much as 80 percent of some late season peaches. How could a tiny fly never before seen in North America suddenly cause so much trouble in so many places?

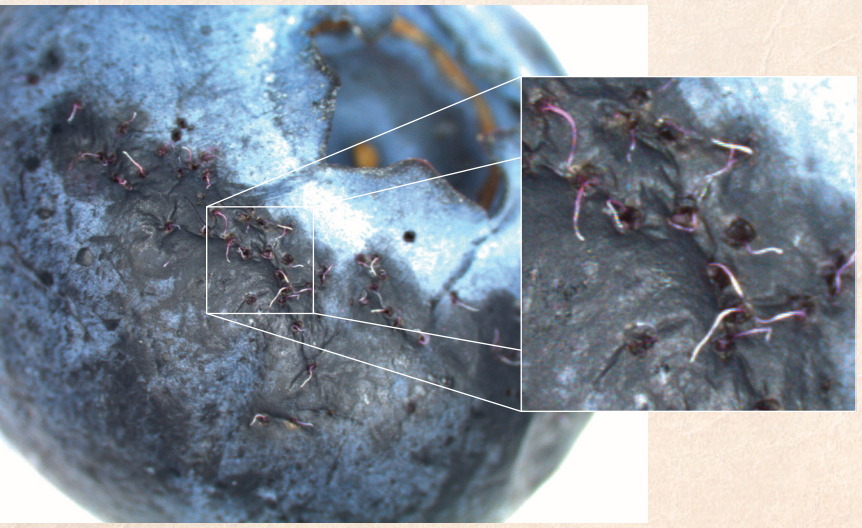
"You find things when you know to look for them," said Amy Dreves, an OSU entomologist who is working with Walton and others on an integrated pest management strategy. "Since the fly is new to the continental United States, we had to look everywhere and learn everything about it as fast as we could."

Dreves is a small spitfire of a woman who can do many things at once, very fast. As soon as the fly

was identified, she dove into the scientific literature to learn all that she could about the new invader. A Japanese researcher working in Corvallis helped her translate references from Japan going back as far as the 1930s.

Mostly, the Japanese reports gave the researchers a starting point for understanding the fly's biology. They learned that it is most active in cool weather (between 50 and 80 degrees), which would make much of western Oregon's long growing season a comfortable home for these flies. And because Oregon has a variety of fruit that ripen at different times throughout the season, the spotted wing drosophila population could move from one crop to another and build up to high numbers by the end of the season.

Dreves learned that the spotted wing drosophila is a problem for fruit producers in Asia, where losses of up to 80 percent of the cherry crop have been reported some years. So, how do Asian farmers control the fly?



The first sign of infection is the appearance of tiny, threadlike snorkels that the *suzukii* larvae use to breathe. Oregon State University photo.

There are millions of farmers in China, according to Wei Yang, an OSU blueberry specialist at OSU's North Willamette Research and Extension Center in Aurora. Family farms are much smaller there and the farm labor force is much larger, so monitoring and control are at a very different scale. Peach growers wrap each immature peach in an individual paper bag to protect the ripening fruit from the egg-laying fly.

Throughout the fall of 2009, the OSU researchers worked closely with colleagues from other states, especially with fellow entomologists Jana Lee and Denny Bruck, researchers from the USDA Agricultural Research Service. The team launched field and laboratory tests to learn how the fly might survive the winter, how quickly it reproduces, at what ripeness the fruit is most vulnerable, and what kinds of controls would be most effective. One month after first identifying this fly in Walton's lab, the research SWAT team published an OSU Extension bulletin with photos of the spotted-wing bandit and evidence of its crimes.

The evidence is barely noticeable at first. Look close with a magnifying glass, and you might see a tiny pinhole where the female fly has laid her eggs. In a couple of days, two thin white feathery threads poke out from the hole, like little snorkels that the larvae use to breathe. Soon the fruit begins to soften and collapse, eaten from the inside out. Berries turn mushy; peaches show brown spots from secondary infections. Even without a hand lens, you can see the tiny larvae looping through the pulp.

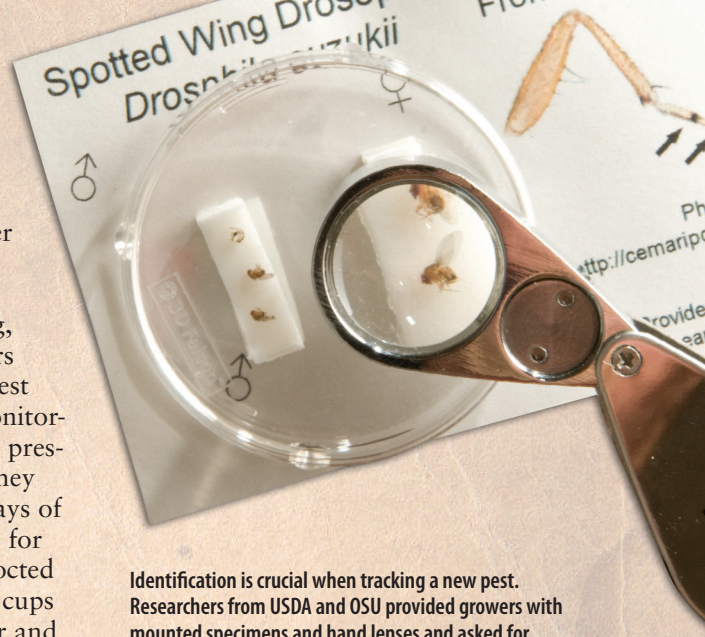
How could a tiny fly never before seen in North America suddenly cause so much trouble in so many places?

ERIK SIMMONS ILLUSTRATION

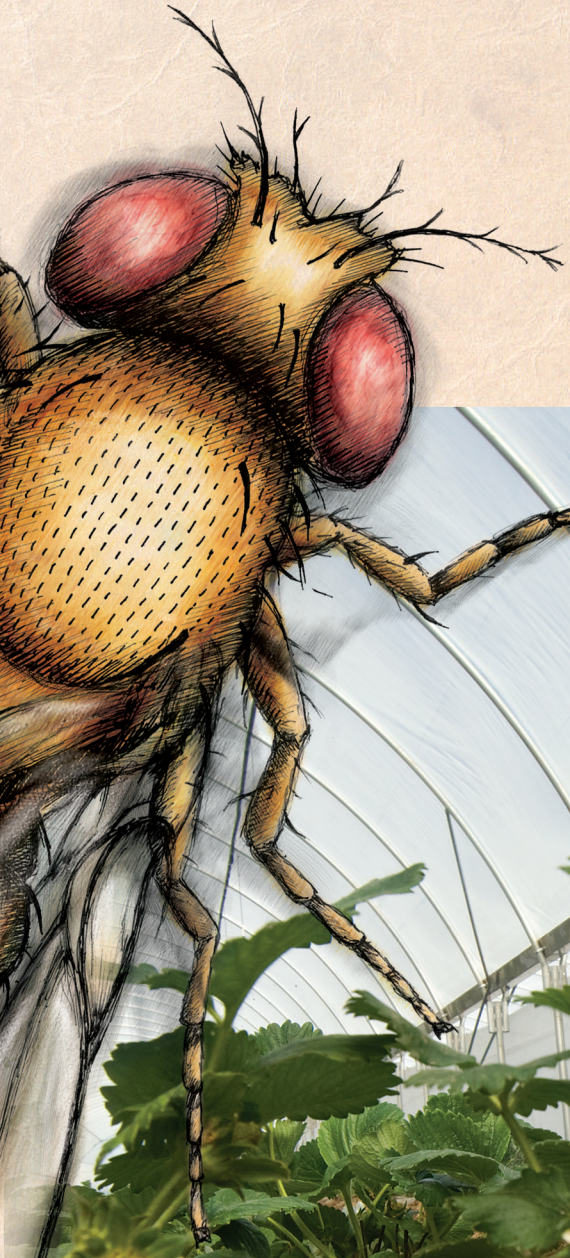
Throughout the winter, the researchers plowed through tests, desperate to learn what they could about the fly. They confirmed that the spotted wing drosophila will feed on a wide range of grapes, berries, cherries, peaches, and plums in Oregon, California, and Washington.

An especially cold December made some people hopeful that the spotted wing drosophila would be wiped out. But the first warm weather of February brought the first few adult flies out of hiding.

Throughout the early spring, the OSU and USDA researchers met with hundreds of Northwest fruit growers, mobilizing a monitoring force to help track the fly's presence throughout the region. They handed out small plastic displays of mounted flies and descriptions for easy identification. They concocted inexpensive traps from plastic cups baited with apple cider vinegar and loaded with sticky flypaper. They showed growers how to test for the



Identification is crucial when tracking a new pest. Researchers from USDA and OSU provided growers with mounted specimens and hand lenses and asked for their help in reporting what they see in their orchards, vineyards, and fields. Photo by Lynn Ketchum.



OSU entomologist Amy Dreves gets down to work as she monitors home-made fly traps in a Willamette Valley strawberry field. The spotted wing drosophila made its first big appearance in North America last fall, so Dreves and her fellow researchers have everything to learn about this new, potentially damaging pest. Photo by Lynn Ketchum.

presence of the drosophila larvae by dunking a sample of crushed fruit into a clear container of sugar-water (the larvae, if present, quickly float to the top).

"We call this our 'fly-by' demonstration," Dreves said as she gave each of the growers a hand lens and encouraged them to zero in on a display of flies the size of sesame seeds.

"Only the males have a spot on the wings," she said. "But the females have something far more impressive."

The female spotted wing drosophila is armed with a serrated saw at the end of her body that she uses to stab

Joe DeFrancesco (left), an OSU entomologist, checks a blueberry for signs of the spotted wing drosophila during a joint OSU/USDA workshop for fruit growers at the North Willamette Research and Extension Center. The group (above) also learned how to make and set traps to monitor SWD activity in fields and orchards. Photos by Lynn Ketchum.

through the skin of a fruit and lay her eggs in the flesh. With each puncture, she lays one to three eggs, eventually depositing up to 350 eggs in her four-week lifetime. USDA's Denny Bruck explains that if you begin with one male and one female under ideal conditions, in two weeks you'll have 100 females; in another two weeks you'll have 10,000; in another month, 100 million; and onward toward something like the national debt.

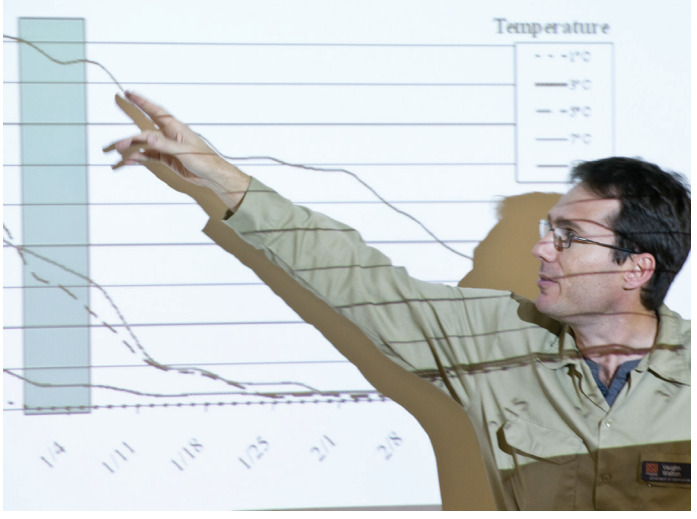
The stakes are high and the potential for economic damage makes this a race against time. After discovering the fly in his raspberries last fall, a fruit grower in Jefferson shut down his harvest, losing his entire late season crop of berries and peaches. "I didn't want to lose my customers," he said. The fruit industry is a multi-million dollar enterprise in Oregon. The farm gate value of Oregon berries is more than $100 million. Oregon wine grapes are valued at about $68 million, Oregon cherries at $49 million, according to the Oregon Department of Agriculture.

The researchers have tested the effectiveness of dozens of chemicals, from full-spectrum insecticides to organic bait sprays that can be used to attract and kill flies before they lay eggs. But they know this is not a problem that can be wiped out with a barrage of chemicals. Jeff Miller, an OSU insect ecologist on the research team, warned that controls must not harm pollinating insects or other beneficial organisms that are necessary for healthy orchards and fruit fields. The research team is concerned about increased human exposure to pesticides and they want to avoid secondary pest outbreaks that might result from new or more powerful pesticides.

ERIC LAGASA

Spotted Wing Drosophila
(Drosophila suzukii)

The female spotted wing drosophila is armed with a saw-like ovipositor she uses to bore through the skins of fresh fruit, including relatively tough-skinned fruit such as apples and pears.



LYNN KETCHUM

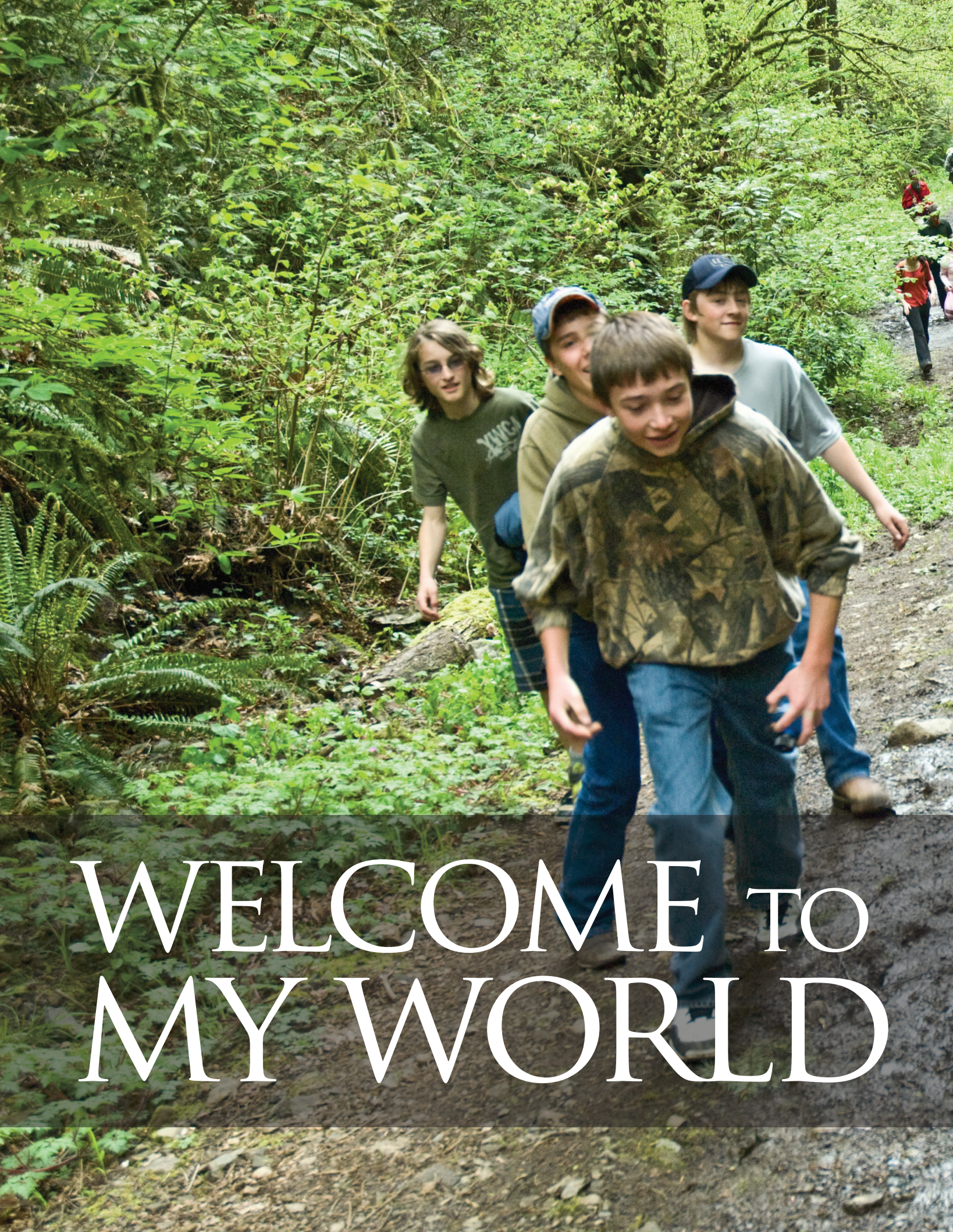
OSU entomologist Vaughn Walton shares overwintering data with growers at one of the many "fly-by" workshops the researchers hosted during the winter. "We don't know if the fly will show up again," he said. "But we want to be ready if it does."

In addition, chemical resistance is a problem when combating any insect with up to 10 generations a year, as has been reported for this fly in Japan. Remember that the spotted wing drosophila, *Drosophila suzukii*, is a cousin of the more familiar, rotten-banana-loving vinegar fly, *Drosophila melanogaster*, that is used to teach classroom genetics expressly because it mutates so rapidly.

As the flies emerge in the warmth of summer, the researchers have yet to witness an entire season in the field. They don't yet know what triggers the flies to lay eggs or what predatory bugs could stop the flies before they lay their eggs.

But they are learning, as much and as fast as they can. The Oregon legislature provided $225,000 for monitoring; and the USDA granted $5.7 million to the three-state team to extend their research and extension. The "fly-by" outreach continues. "The thing that keeps me awake at night," Dreves said, "are all those questions that we don't have answers for." OAP

For up-to-date information about the spotted wing drosophila, see:
http://swd.hort.oregonstate.edu/



WELCOME TO MY WORLD

Fostering understanding is a walk in the park for these students from Wallowa County as they share a laugh with their Portland hosts hiking in Forest Park.

The Urban-Rural Exchange bridges Oregon's greatest divide

by Judy Scott

Photos by Lynn Ketchum

Six lanes of Portland traffic filled the rear-view mirror as the van headed east on I-84. On the left, the Columbia flowed through its gorge below giant windmills scattered like toys, turning with the breezes. After a few hours, sagebrush took the place of Douglas-fir and fern.

The riders from Portland's Sunnyside Environmental School had reason to be nervous as they watched the familiar give way to the unknown. And it wasn't just the landscape that would change.

The 15 middle-school students were already immersed in a life-broadening experience: the 4-H Urban-Rural Exchange program, sponsored by Oregon State University Extension Service. For five years, host families from Grant, Klamath, and Wallowa counties have opened their homes and lives (sometimes nervously) to city kids. In turn, Multnomah County families introduce rural students to life in Portland.

Wallowa County in northeast Oregon was the destination for one of this year's four exchanges. The young guests from the city arrived in the thick of calving season, a dynamic leap into ranch life.

The Portland students (above) weren't sure what to expect when they arrived in Wallowa County to stay with rancher Charley Phillips and his wife Ramona. Soon, the students were pitching in to help with all the chores, including branding calves at the Birkmaier ranch (right).

Deep in the Wallowa Mountains, hosts Tom and Kelly Birkmaier and a crew of friends rounded up 65 calves for branding. While unhappy mother cows bawled in the distance, the job was to brand, inoculate, and ear-tag the calves as quickly as possible while muscling them securely into a metal chute.

This was no spectator sport for Portland middle-schoolers Zoe O'Toole and Birch Clark. Although reticent at first ("I'm not really sure how I feel about branding," Zoe had confided earlier), the girls gamely took turns with both the branding iron and the syringe.

Down in the valley at another host home, a cow notched up her tail, and three other city students learned what that meant: the cow was ready to give birth. Lanie Novick and her middle-school colleagues watched in awe as the calf dropped from its mother's womb while Lanie documented the event on her cell phone. Ramona and Charley Phillips, who hosted the girls at their ranch near Joseph, were impressed with the students' enthusiasm and unending questions as they collected eggs each morning and tossed baled hay from the back of a truck to a "sea of cows."

Calving season knows no time clock. After midnight, the girls bumped along with the Phillipses in their pickup truck, scanning the range with spotlights in search of cows with newborns. The girls learned that if they spotted cows bawling and bunched up around their calves, there might be predators such as cougars or wolves stalking nearby.

Wallowa County in northeast Oregon was the destination for one of this year's four exchanges. The young guests from the city arrived in the thick of calving season, a dynamic leap into ranch life.

Part of each exchange includes spending a day at the host school. Portland students Morgaen Schall and Joseph Unfred swelled enrollment of the one-room schoolhouse in Imnaha by 40 percent on the day they went to class with the school's five local students.

Morgaen and Joseph both love working with horses in Portland but prefer being "in the middle of nowhere." Their stay was not romantic—mending fences seldom is—but they enjoyed the outdoor work, and to show their appreciation, the two boys made a special Sunday breakfast for their hosts, Cynthia and Dan Warnock and their three sons.

Seventh grader Lanie Novick (above) displays a memorable snapshot of her Sunnyside classmate Julia Glancy holding a newborn lamb. The learning experience includes classroom time at the Imnaha School (left, top), where five local students make up the total K-8 enrollment. Back on the ranch, feeding time is fun for students and cows.

More than half of the urban-rural exchange students have kept in touch with their host families. Sometimes during the summer they cross back over the cultural divide to reunite with their hosts and to share the experience with their parents. The exchange expands when parents get involved. Thirty families in Portland now buy beef directly from a host rancher as part of a new beef cooperative, an idea that grew from the young people's exchange.

"The basic mission of 4-H is education for youth," said Jed Smith, a 4-H faculty member at the Extension office in Klamath Falls. "But 4-H also involves parents in Extension education. When you get young people in the conversation, you've got a good start towards better understanding between remote rural Oregon and the rest of the state."

Smith wants his urban visitors to experience first-hand the life of rural ranchers and farmers. "They see that ranch families are good with animal husbandry, they're responsible stewards of the land, but they face different challenges than urban families," he said.

One of those challenges is the reintroduction of wolves, which sparked the creation of the urban-rural exchange. In 2005, after Sunnyside students completed a class project on how westward U.S. settlement affected wildlife, the students gave testimony at a state Fish and Wildlife Commission hearing in favor of reintroducing wolves. The urban students didn't expect that their opinions would spark controversy in rural Oregon, where ranchers bemoaned that city dwellers didn't understand rural life. To foster better understanding across the state, OSU 4-H and Sunnyside joined forces to create the first Urban-Rural Exchange in 2006.

Everyone involved that first year, from both sides of the Cascades, ventured into unfamiliar territory. At least one rancher would have pulled out at the last minute if the city kids were not already on their way. However, at the end of five days of sharing chores and meals together, both students and families described the exchange as one of the best experiences of their lives.

At the end of five days of sharing chores and meals together, both students and families described the exchange as one of the best experiences of their lives.

The bustle of city life contrasts with the quiet of dinner time after a long day's work on the ranch.

Students from Klamath County get a tram's-eye-view of Portland (above left) while Hot Lips pizza shows off their spin cycle (above right).

At right, middle-schoolers from very different parts of Oregon find friendship as they negotiate Portland's mass transit and share organic fast food from the farmers' market.

Each year, some of the city students come home thinking that farming and ranching would be professions they'd like to pursue. "We want them to learn about the care of natural resources from a rural perspective," said Maureen Hosty, the OSU 4-H Extension faculty member who coordinates the exchange. "Sometimes they take it to a personal level. They want to live there."

Fewer rural students visiting Portland express a strong desire to relocate to the city. Perhaps city living is an acquired taste. Dylan Denton and Trevor Wentz, both from Wallowa County, enjoyed their day exploring mass transit and gliding over the skyline by tram. But considering that a square mile in Portland is home to 3,939 people, and in Wallowa County, it's home to 2, they had to conclude, "There are too many people!" Nevertheless, according to their host family mom, Dylan and Trevor readily took to "a crash course" in riding bicycles in city traffic, even while pedaling in cowboy boots.

Portland hosts helped their rural visitors understand sustainable urban living. They climbed to the top of city buildings to see rooftop landscapes that temper winter stormwater and summer heat. They visited the city's massive recycling system. And they walked through one of Portland's 20 farmers markets, where they ran into a potato vendor from faraway Wallowa County.

More city kids have made the exchange than their rural counterparts, and Hosty encourages more students from rural Oregon to visit Portland. "We want to build a strong bridge of understanding that goes both ways," she said.

"We have a lot more in common than we realize," Hosty said. "But if we don't spend some time walking in each other's shoes, then misunderstandings will continue to divide our state." The 4-H Urban-Rural Exchange can make a difference. "Kids are leading the way and are willing to spend some time to learn. And the real learning happens in family homes at the dinner table." OAP

Communities go back to nature to manage the rush of urban stormwater

HARDWORKING LANDSCAPES TAME the STORM

By Judy Scott

OSU watershed educator Robert Emanuel puts the finishing touches on a bioswale in Tillamook County, where he is helping coastal Oregon communities manage urban stormwater.

LYNN KETCHUM

On days with heavy rain, we first hear its patter, then its drums. Rain water rolls off roofs and churns down driveways. It picks up speed and chemicals along the way and careens down city gutters in torrents. But when stormwater drops into underground pipes, pollutants of modern life disappear from both sight and mind.

Household chemicals, gas, oil, bacteria, pesticides, pet waste, and even copper dust from brake pads can foul natural areas and drinking water. You can't point to the sources of this pollution because there are too many of them.

Roofs, roads, and sidewalks that do not allow water to soak in are the starting place of "nonpoint" pollution, the largest polluter of Oregon's rivers, lakes, and streams. Because of these impervious surfaces, a typical city block generates more than five times the runoff of a woodland area of the same size, according to the U.S. Environmental Protection Agency. When storms hit developed areas, runoff pours across parking lots and streets, rushes untreated into waterways and can strain the capacity of water treatment plants, overflowing stormwater and sewage.

ISTOCK

In contrast, the natural water cycle seems almost romantic compared to urban stormwater runoff. Rain falls on forests and meadows, buffered by foliage as it percolates into the soil, filtered by plants. Watershed experts have discovered new tools to slow stormwater from torrents to trickles with strategies for "low impact development" that replicate natural watershed hydrology. These tools, including rain gardens (also called bioswales), are surprisingly effective—and beautiful.

"Unfortunately, we have replaced the natural landscape with hard surfaces that can't absorb water," said Robert Emanuel of Oregon Sea Grant and Oregon State University Extension. "But with rain gardens, we turn stormwater management on its head. Instead of funneling excess water into storm sewers, we retain it on site and allow it to slowly filter through vegetation and soil, a process much like natural hydrology."

A bioretention system is a sunken, landscaped area that retains stormwater long enough to allow the water to soak into the soil. Native plants accustomed to flooding and drying are placed at the base, on the slope, and at the top of the swale to help slow down and clean the water. The plants help clean water naturally because they have deep root systems that anchor soil and act as filters, according to OSU horticulturist Linda McMahan. She has developed a list of 50 plants native to Oregon that are well suited to three rain garden planting zones: moist, moderate, and dry.

Consider shrubs such as the fragrant Douglas spirea or golden current; flowering perennials such as large-leaved lupine and Oregon iris; or feathery curly sedge and tufted hair grass. Now imagine these beauties in parking lot islands and street right-of-ways. Practical rain garden retention systems can be as elegant as water features in an English garden.

According to Sam Chan of Oregon Sea Grant Extension, man-made bioswales trap most pollutants, and water coming out of a rain garden can be cleaner than when it goes in. Water pollution was once an easy-to-trace problem in the United States, when industry and sewage-treatment plants discharged their chemical waste through pipes at specific places, usually into rivers. The federal Clean Water Act of 1972, one of the first big environmental cleanup measures, was successful in regulating this "point pollution." The Clean Water Act was updated in 1987 to address nonpoint pollution in surface and groundwater resources at the coast and inland.

Water quality has improved dramatically in the last 38 years, but nonpoint pollution continues to accumulate in stormwater runoff, according to Chan. It is more cost-efficient to treat stormwater close to where it flows, rather than piping it miles away to be treated in a multi-million-dollar water treatment facility.

LYNN KETCHUM

OSU Extension's watershed education team takes the message to the streets. Above, Derek Godwin outlines choices for stormwater management. Below, Sam Chan (far right) checks out permeable pavement in Portland.

LYNN KETCHUM

DEREK GODWIN

A dry bioswale in front of the Pepsi-Cola Bottling Co. building in Eugene where grasses, sedges, and rocks will capture and slow rainwater, allowing it to infiltrate into the ground below.

One of the trade-offs that came with building our modern cities was replacement of our natural vegetative water systems with culverts and pipes, according to John Lambrinos, a landscape ecologist with the OSU horticulture department. "Bioswales and green roofs that help protect our water are inexpensive compared to the price of culverts and pipes that just keep getting bigger." Lambrinos helped create a green roof landscape atop the Portland Building – 17 stories above Portland's city streets – that absorbs rainwater and limits the runoff that gushes into city sewers after a storm.

Portland has had to spend billions of dollars on stormwater management to meet new clean water requirements. The "Big Pipe" project and other smaller-scale stormwater projects have made the city a leader in management of runoff, Chan said. The city is restructuring old stormwater and sewage treatment systems that for years pumped raw sewage into the Willamette River. Now, pipes as tall as a house are being installed under the city to carry sewage and storm water to a huge holding tank before treatment as wastewater.

It is more cost-efficient to treat stormwater close to where it flows, rather than piping it miles away to be treated in a multi-million-dollar water treatment facility.

Most small cities don't have the resources to engineer such expensive water treatment systems. Low impact development, however, can protect wetlands, riparian areas, and forests as cities grow. After Emanuel moved to Tillamook as part of OSU Extension's water resources faculty, he found grant money to demonstrate the ease and effectiveness of bioretention. His demonstrations prompted two north-coast city ordinances to embrace the idea .

With Oregon Sea Grant funding, Emanuel gathered volunteers to help dig bioswales along the parking area of a park adjacent to Houquarton Slough in Tillamook. The shallow swales are nearly 200 square feet in size. In and around the swales, the volunteers planted shrubs and perennials from McMahan's list of native plants that can thrive without chemicals in both drought and flood. When stormwater rushes into the rocks and naturally filtering plants, it slows down and loses its eroding edge. When tamed, it flows gently back into the slough. The greenery helps slow and clean the water and adds a friendly feeling to what would otherwise be asphalt and concrete.

Emanuel and his colleagues have introduced city administrators to other low-impact development innovations such as clustered new housing, fewer streets, and shorter driveways. One of the most effective actions is simply to plant and protect trees.

Another larger demonstration rain garden at Bay City receives runoff that flows from a residential area down a roadway near a creek. It took less than half a day for a backhoe to shape the bowl and place the rocks to create the bioswale, according to Dave Pace, public works superintendent for the city of Bay City.

"We had drainage problems before we had the bioswale, and it's working better than expected. There's good flow into the swale, the ground saturates, there's no overflow, and the neighbors like how it looks and works," he said.

The city plans to require such low impact development techniques in its development standards, he said. "We're very proactive about eliminating pollution here. We want to learn to do it right." OAP

"Oregon Rain Garden Guide: Landscaping for Clean Water and Healthy Streams" is available online: **http://seagrant.oregonstate.edu/sgpubs/onlinepubs.html**

De-bugging public schools combines sleuthing with integrated pest management.

PEST QUEST

Tim Stock unlatches a rickety door and steps into the dim, musty basement of an elementary school. His eyes adjust to the darkness. Cables and pipes crisscross overhead. He shines a flashlight, searching the space. There it is, on a dirt ledge. Rat poop.

Stock points to a small opening in the outside wall where sunlight enters through a broken screen. A hand could easily fit through the hole. So could a rat. Stock makes a mental note: tell school to fix screen.

BY TIFFANY WOODS

Tim Stock peers into the hidden recesses of Oregon schools in his quest for pests.
Photo: Lynn Ketchum

Stock is the coordinator of the School Integrated Pest Management program for the Oregon State University Extension Service. Today he's inspecting Salem Heights Elementary School, hunting for rodents and insects. He'll use what he learns here to create pest-fighting plans for school districts across the state. But these won't be just any old plans. They will use integrated pest management (IPM) to eliminate the conditions that attract pests, using chemicals only as a last resort. The goal is to reduce pests, decrease the use of pesticides, cut costs for schools, and create a healthier environment for students and staff.

The Oregon legislature mandated that the OSU Extension Service create a statewide model plan and requires the state's 197 school districts to adopt IPM plans by July 2012. Twenty-six Oregon school districts already have IPM plans, according to a survey that Stock conducted earlier this year. He is studying those plans and a few national ones to create models tailored to the new regulations and to Oregon's various regions and pests.

Stock has crawled through cafeterias and classrooms in three states. "They're all similar," he says. "Every place has rats, mice, and ants." According to his survey, the three most problematic indoor pests in Oregon's schools are ants, mice, and spiders. Outdoors, the big three are yellow jackets, weeds, and gophers.

Being a pest detective involves a combination of science and gumshoe sleuthing — and some agility. Stock and his colleagues spend much of their time on their knees, poking around behind bookcases and under sinks. Today, the group starts in the kitchen at Salem Heights where a woman in a hairnet is preparing chili con carne for the school's lunch.

"If you get way down here, you can see daylight," says Stock, pointing to a gap under a door that's just big enough for a pencil to slide under. That means a mouse could squeeze through. He recommends installing a brush-type sweep to cover the opening.

Keeping pests *out* is one of the main principles of IPM. Conventional pest control relies on pesticides, and sometimes pest controllers need to spray repeatedly. But as OSU Extension entomologist Gail Langellotto says, "Spraying doesn't get to the core of the problem. It's like cutting a few hairs off the monster." IPM attacks the source of pest problems by making sure buildings are impenetrable fortresses with no cozy housing or tempting food for critters.

LYNN KETCHUM

Marc Collins, a custodian for the Salem-Kaiser school district, marvels at the split ends on the hairs of a bee during an IPM workshop for school staff.

The average elementary school offers many pest amenities. Art projects made of seeds and cereal are a feast for rodents. Colorful ears of corn decorating classrooms at Thanksgiving can harbor Indian meal moth larvae. Food wrappers plastered inside trash cans draw yellow jackets. The scum in kitchen drains can breed drain flies. Corrugated cardboard boxes are condos for cockroaches. Crumbs under a microwave are a mouse's midnight snack.

Rodents and roaches, Stock explains, can trigger asthma. In the U.S., nearly 7 million children – or nine percent of all people under 18 – have asthma, according to a 2008 survey by the U.S. Centers for Disease Control and Prevention. Eight percent of all Oregon children have asthma, according to a 2007 report by the Oregon Department of Human Services. Other pests present other public health concerns. Some flies can spread diseases, as can the droppings of certain birds. Insect stings can send some people into anaphylactic shock. Bats can carry rabies, and their droppings can cause histoplasmosis, which can result in flu-like symptoms.

EVERY PLACE HAS **RATS MICE & ANTS**

LYNN KETCHUM

LYNN KETCHUM

Above, OSU entomologist Gail Langellotto regales an audience of school district custodians in the finer points of blood-sucking insects.
Left, Tim Stock (with flashlight) is working with Tom Tacchini from Pacific Pest Control to implement the least toxic means of pest control in schools.

Dousing these invaders with chemicals can create new health hazards. Children are especially vulnerable to pesticides because their bodies are still developing, Stock says. Little tykes can increase their exposure when they crawl on floors and tussle on lawns sprayed with pesticides.

Stock knows pesticides. One of his duties at the OSU Extension Service is to teach farm workers to handle pesticides safely and to look for signs of poisoning. He has done similar work in prior jobs in California, Washington, Cambodia, China, and Honduras. In Nicaragua he developed an IPM curriculum to help farmers manage pests using fewer chemicals. As a consultant in Pakistan for the United Nations he contributed to the creation of a national program to implement IPM on farms.

Stock and his colleagues move on from the school kitchen to the multipurpose cafeteria. They roll out the risers under a stage. Then they see it. A juvenile roof rat, dead in a trap.

LYNN KETCHUM

Tim Stock, working here with custodians and staff from the several school districts, is leading action on the Oregon legislature's mandate that OSU Extension create a statewide plan for integrated pest management in schools.

Identifying the pest helps to know if there's a health or safety risk. Some pests, like silverfish and earwigs, aren't health threats, just nuisances. By knowing that this is a young rat, Stock would guess that there's a nest nearby. Knowing that it's a roof rat, which is skittish of traps, suggests that it may have overcome its fear with recurring visits to the same spot. "Know your enemy," Stock says. "If you don't understand what you're dealing with, you might treat it incorrectly."

To help with this, Stock invited Langellotto, OSU Extension entomologist, to teach custodians from the Salem-Keizer school district how to identify insects. Equipped with forceps, hand lenses, identification books, and bugs, the custodians learned how to identify everything from firebrats to cigarette beetles.

"Nothing makes me happier than to talk about bedbugs and lice," said the otherwise reserved and soft-spoken Langellotto. "The sucking lice have hooks on the end of their legs so they can stay on a kid's head even if they scratch."

She spellbound the custodians with other entomological party trivia: "Spiders will eat almost anything, including their brothers and sisters." "You would not meet a shyer spider than a black widow." "All bees have split ends on their hairs."

The custodians held up the insects and squinted into hand lenses as they swapped commentary. "Here's a fine looking fungus beetle." "This silverfish needs a frickin' haircut." "I'm trying to see the split ends on the bee."

"You put these in the staff room and kindergarten, near a doorway or a sink. Then check them once a month," he says. "If you ever see a cockroach, it's something we'd want to deal with."

Educating school employees about the ABCs of IPM is part of Stock's job. Earlier this year he organized a workshop for custodians and maintenance managers from the Albany, Portland, and Salem-Keizer school districts. To help deliver the message, Stock invited Ricardo Zubiate from the Salt Lake City School District to share his experience with IPM.

Salt Lake used to apply pesticides once a month in their schools regardless of whether they needed them, Zubiate said. With IPM, custodians got rid of cockroaches by scrubbing drains. They lured bats out of a high school by installing bat houses on the roof. And they evicted voles from a middle school field by cutting the grass close to the ground, aerating the soil, and cleaning up littered food wrappers. IPM has saved the district thousands of dollars, Zubiate said. Saving money, however, wasn't why the district switched to IPM. It was for the health of the students. Kids, he reminded the

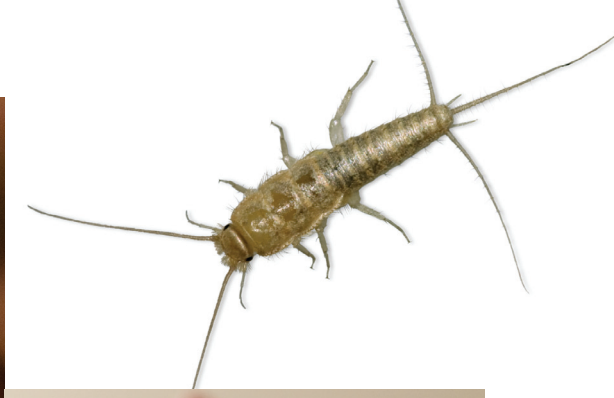
LYNN KETCHUM

"I can talk about spiders all day long because I love them," says Gail Langellotto (above). She animates insect life history as custodians learn to identify specific insects by examining wings, legs, and antennae.

Nothing makes me happier than to talk about

BEDBUGS & LICE

The identification of pests is only one part of integrated pest management. It also includes monitoring, as Stock explains in a meeting with the principal and two custodians at Clover Ridge Elementary School in Albany. They gather in an office off the library, where Stock is folded into a kid-size chair, his long legs bumping against the low table. He holds up some sticky insect traps.



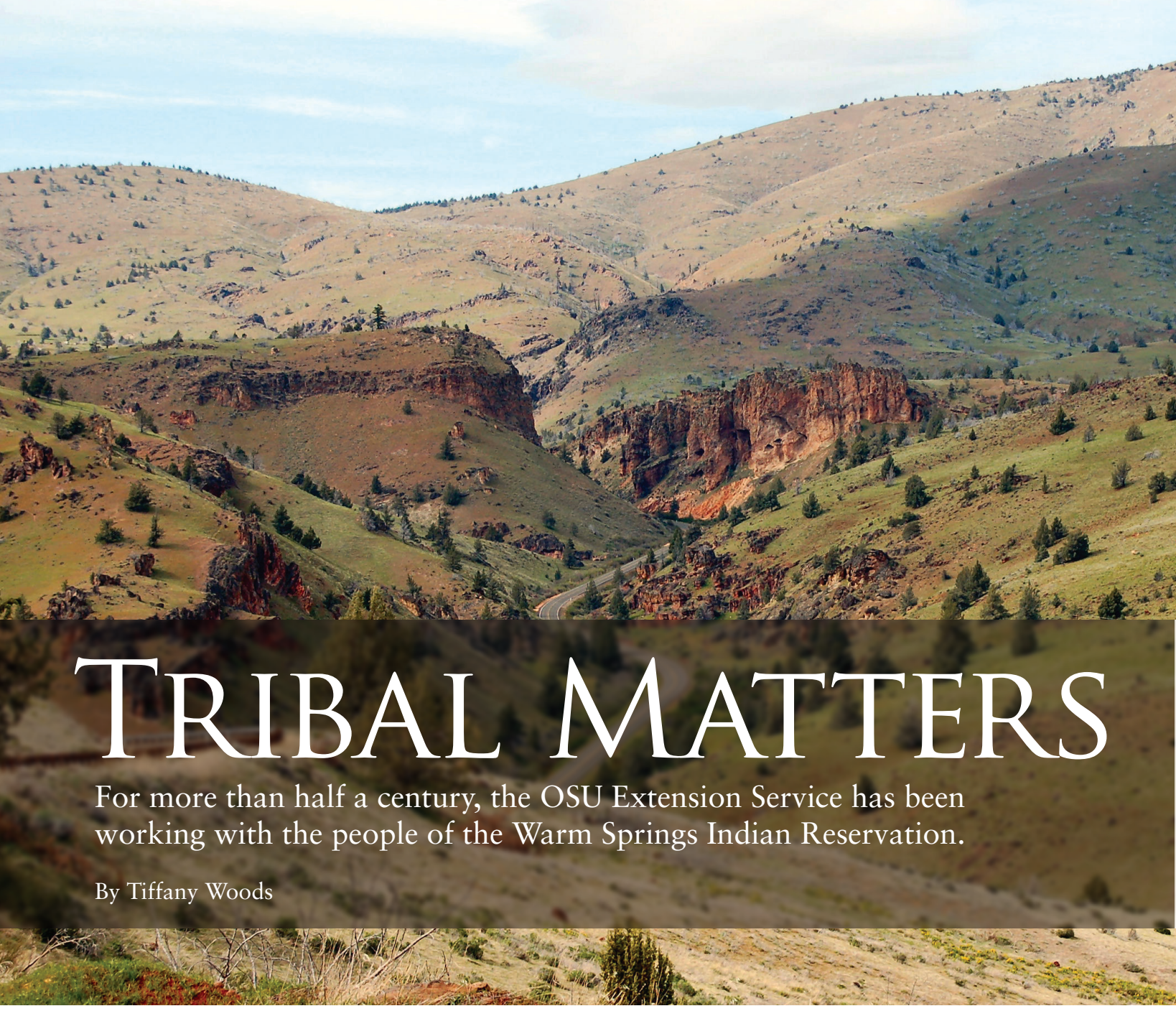
LYNN KETCHUM

custodians in the audience, are the ones who are most impacted.

"You're dealing with the future of America in your hands," he told the custodians. "Embrace the responsibility."

Oregon's children are the driving force behind Stock's work. He tirelessly explains IPM to school-related groups. He inspects schools, reports their progress, and drives to the state Capitol to update a Senate committee on his work. And month after month, he works to convince administrators that IPM should be a priority.

It's not an easy pitch. Schools have other pressing problems, especially now in these tough economic times. But Stock perseveres. He gently reminds school officials to fix the screen in the basement or scrub a kitchen drain. He shines his flashlight into crevices and offers kudos when a school cleans out a cluttered room. He continues to train custodians as the first line of defense. Stock won't stop until all 197 school districts embrace IPM. He's one good pest who's not going away. OAP



Tribal Matters

For more than half a century, the OSU Extension Service has been working with the people of the Warm Springs Indian Reservation.

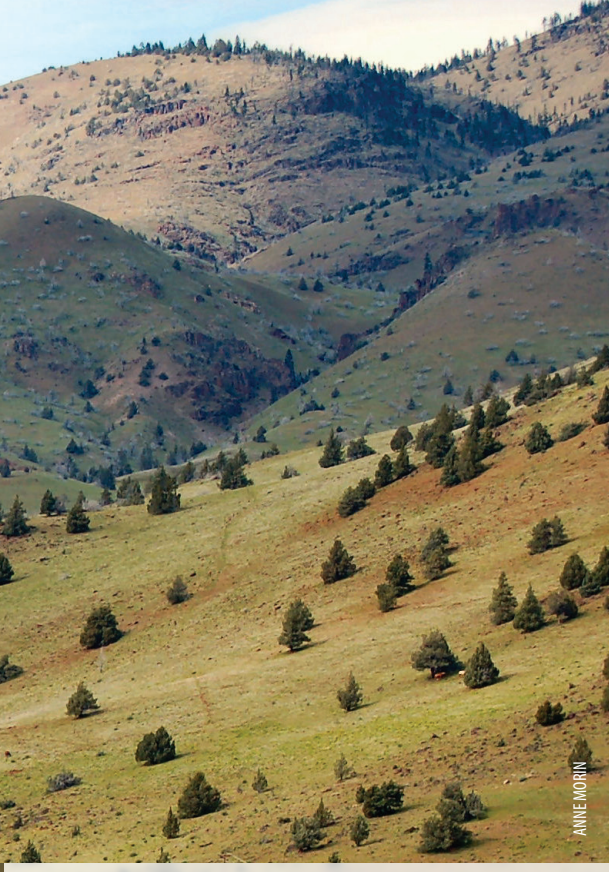
By Tiffany Woods

Zelma Smith slides her cane into the gun rack of her 1972 GMC truck. She grips the steering wheel and hoists her 83-year-old body onto the bench seat. She has cows to feed on her ranch on the Warm Springs Indian Reservation. She guns the mustard-yellow rig through mud holes. Her kerchief-covered silver hair and weathered face shine back in the rearview mirror. Bouncing on a bent tailgate behind bales of hay, Fara Brummer holds on.

Brummer is along for the ride to check out Smith's cows and provide her with a nutritional analysis of her hay. Brummer is an educator in agriculture and natural resources with the Oregon State University Extension Service. She works with the Confederated Tribes of Warm Springs and is one of only 28 Extension educators across the country funded by the U.S. Department of Agriculture's Federally Recognized Tribes Extension Program. She's part of a team of OSU Extension faculty at Warm Springs, who also teach nutrition classes and deliver educational 4-H activities for youth on the reservation. It's the only Extension office on tribal land in Oregon.

"The scope of Extension's work is so huge here," Brummer says. "There are many things to work on in agriculture and natural resources. Partnering with tribal groups and natural resource agencies is vital."

One of those partnerships is with the tribal Range and Agriculture Department. OSU graduate Jason Smith, a tribal member and Zelma's nephew, manages the department. One of their collaborations is a project to supplement livestock on the reservation with the appropriate mix of minerals, including selenium. The soil on the reservation, and thus the plants cows eat, are low in selenium.


ANNE MORIN

The deficiency can lead to a deadly paralysis in young calves and retained placentas. Brummer earned her master's degree at OSU studying the effects of low selenium on two reservation cattle herds and found a significant improvement with supplements. Since then, two mobile mineral feeders have been constructed for range use.

About 10 families raise nearly 1,700 cattle on the reservation. Edison Yazzie and his two daughters are among them. He's a regular customer in Brummer's office, which she shares with a tribal nurse. It's a hard-working office, where a table piled high with children's car seats shares space with posters about healthy cows. Yazzie, dressed in a Seattle Seahawks baseball cap and work boots, stops in to ask Brummer to look up the cost of a hay chopper on the Web. He has an Internet connection at home but he's not comfortable with technology. "She always comes through," Yazzie says. "She's never said, 'I can't help you.' " And, he adds, she never says anything bad about anyone, not even cows.

When she runs into ranchers she asks about their cows as if inquiring about their families. Brummer likes all animals and has ever since she was a little girl in India. She remembers a fairytale childhood by the ocean with tropical weather, mangos, coconuts, and beautiful open spaces. But in India she also saw poverty, starvation, leprosy, and corpses on the side of the road. When she was 10, Brummer and her family moved to New York, where she earned her degree in biology and environmental science. She spent time at a ranch in Oregon, caring for thousands of cattle, and she was hooked. Now here she is, an Indian from the country where cows are sacred, working with cows on an American Indian reservation.

Part of Brummer's job is to bring university-based research to the Warm Springs community. And much of that research is conducted on the reservation. OSU agronomist Marvin Butler is studying how to restore native bunchgrass where weedy annual grasses like medusahead and cheatgrass have set up housekeeping and destroyed the natural cohesiveness of the soil. Brummer and Jason Smith have demonstrated how grazing land can be improved inexpensively. For example, cattle can work grass seed into the ground with their hooves and prune old willows and dried-up bunchgrass as they graze, so the plants grow back healthier in the spring.

Meanwhile, Brummer's colleagues at OSU Extension are addressing another challenge facing the Warm Springs reservation: proper nutrition. As in many rural communities and low-income urban neighborhoods, the Warm Springs community has a limited supply of fresh fruits and

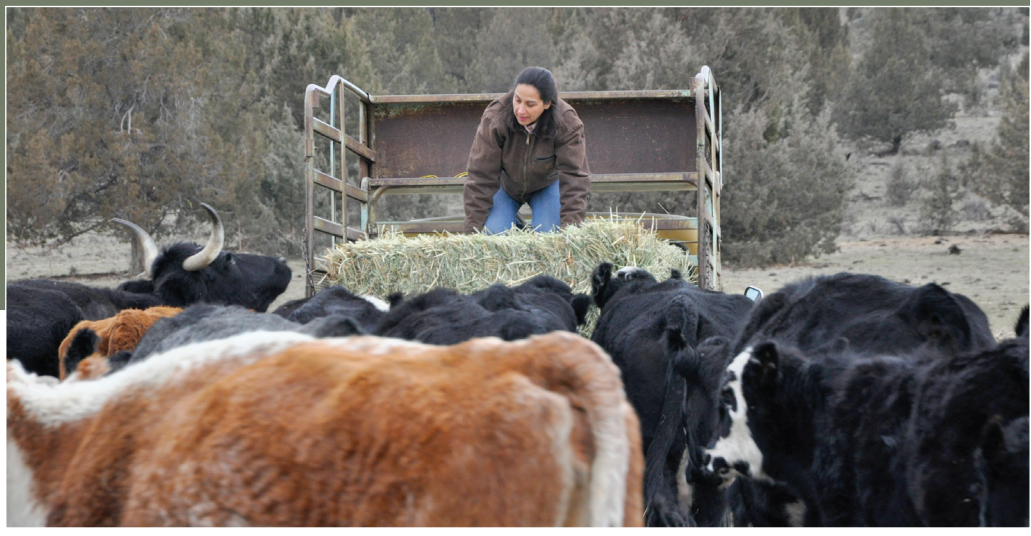
Three tribes—Warm Springs, Wasco, and Paiute—make up the Warm Springs community, which has been an honored partner with OSU since 1955


TIFFANY WOODS

Zelma Smith was born on the reservation and has spent most of her life raising Herefords and caring for her parents, who lived to be 96 and 101.

vegetables. The aisles at the local grocery store are lined with chips, soda pop, cookies, and frozen pizzas. Only a couple of shelves in a corner are set aside for produce.

"If people in this community ate the way their ancestors did, their diet would be mainly roots, deer, and elk meat," says Shawn Morford, OSU Extension's staff chair and 4-H director in Warm Springs. "When sugar and white flour were brought in, the long journey began to the diet that people have now." Efforts to reverse the rate of obesity and diabetes in the community rely primarily on traditional culture and values. "Our message is that the closer the food can be to the way it comes out of the earth, the healthier it is for you," Morford says.



(Top left) OSU President Ed Ray (left) and Tribal Chairman Ron Suppah sign the revised Memorandum of Understanding between OSU and the Confederated Tribes of Warm Springs. Photo by Dennis Wolverton.
Emilee Hugie (in background, left), a former nutrition educator with OSU Extension in Warm Springs, teaches fifth graders how to make healthy fruit parfaits. (Below) Fara Brummer tosses hay to cattle on Zelma Smith's ranch. Wild horses (left, below) on the reservation outnumber cows two-to-one. Photos by Tiffany Woods.

The lessons begin in grade school. One Tuesday morning finds fifth graders learning the importance of a healthy breakfast. The kitchen is hopping. The air smells of toasty granola. Twenty apron-clad bodies gather around tables and electric skillets, measuring vegetable oil, slicing strawberries, and pouring pancake batter into animated shapes. For some students, it is the first time they have made pancakes. They set the tables and dig in.

"When we asked the students to draw pictures of agriculture for an annual calendar contest, they drew pictures of their cultural foods," Brummer says. "We realized that there was a missing component: cultural plants." Since then, field trips every April teach how to dig traditional wild roots, and how to preserve and cook them.

Neon yellow signs point out one more problem the tribal government is addressing: wild horses. They're a problem when unmanaged because they destroy habitat for fish and ground-nesting birds and overgraze the roots and berries that are traditional foods. Smith and Brummer teamed up in 2003 to organize a tribal horse auction, which has become an annual event. As a result, nearly 1,200 horses have been sold.

Three tribes—Warm Springs, Wasco, and Paiute—make up the Warm Springs community, which has been an honored partner with OSU since 1955. A key moment in the relationship between OSU and the tribes came in 1960, when the university completed a five-volume study with recommendations to develop human and natural resources on the reservation. Out of that study came suggestions for the tribes to build a tourist resort, purchase a lumber mill, divide the range into livestock management areas, and reduce the number of wild horses. Today OSU Extension at Warm Springs is a department within the tribes' education branch. That means it reports not only to OSU but also to the tribal government. Last year, representatives from OSU and the tribes signed a revised memorandum of understanding. They agreed to increase tribal members' access to degree programs at OSU and recognize indigenous knowledge as a respected resource for education and research.

Back at Zelma Smith's ranch, the overcast sky is bluish-gray as Brummer tosses the last flake of hay out of the truck and sweeps the bed clean. The coyotes are singing. "I feel privileged to work in a job that makes a difference," Brummer says. OAP

Changing the **brain drain** to the **brain gain**

By Peg Herring

Stephen Machado was born in Zimbabwe. As an associate professor of agronomy at Oregon State University, he helps Columbia Basin growers find new agricultural success in a land of very little rain.

Machado is one of thousands of African scientists working outside of Africa. Because of civil unrest, political dysfunction, or the economic collapse of their countries, these professionals have had to leave their homes to build their careers as scientists. They have become accomplished scientists, many like Machado, within the land-grant system of American universities. They represent immense intellectual and technical expertise in the U.S., but their exodus has resulted in a brain drain in Africa.

"We want to change that brain *drain* to a brain *gain*," said Machado. "We have been sending money back home; now we want to send our brains and our technology."

Machado has joined 17 other African-born scientists across the U.S. and Canada in an effort to bring scientific expertise and technology back to Africa. They are not waiting for African governments to organize themselves. Nor are they thinking that North American aid money is all it will take to make a difference in Africa.

Machado and his colleagues have formed the Association of African Agricultural Professionals in the Diaspora to help build capacity in their home countries. Diaspora refers to people who have dispersed beyond their homeland. With help from a $234,000 grant from the Bill and Melinda Gates Foundation, Machado is helping to organize African-born scientists to bring research, education, and extension to their home countries.

"We are the sons and daughters of Africa and we can make a difference," Machado said. "We want to help African farmers make a living, not just subsist on hand-outs. We want them to mill their flour, press their oil, add value and profit to the things they grow. But they need technology, business skills, access to solar energy and irrigation, lots of things that we know how to teach.

"We realize many groups are doing the same thing," he said, "but we have roots in Africa. We can involve African people in their communities so they own the projects and will sustain them after we leave."

Machado and his colleagues returned to Africa last year, recruiting collaborators among scientists throughout the continent. They found little governmental support for agricultural research. Basic food security and rural livelihoods in Africa have deteriorated over the past three decades, according to Machado, despite billions of dollars spent on agricultural programs. Most existing programs have been short-term and uncoordinated, run by outsiders with little understanding of local cultural and political realities.

"We can do better," Machado said. His group is connecting African scientists in the U.S. and Canada with African scientists in Africa to help reverse the draining of human capital and strengthen professional expertise in African countries. So far they have recruited more than 1,300 scientists in and beyond Africa. Through this network, collaborations of credible, reputable experts can guide much more effective research, extension, and education in Africa. Their main objective is to improve the livelihoods of small-scale landholder farmers, 80 percent of whom are women.

"We are the sons and daughters of Africa and we can make a difference."

Stephen Machado is creating a network of African-born scientists to help build capacity in African communities through research, extension, and teaching.
Photo: Lynn Ketchum

Machado's work in Oregon is well known and well-respected. At the Columbia Basin Agricultural Research Station near Pendleton, he tests alternative crops for growers in this region of dryland agriculture. He has refined the idea of intercropping, where two or more crops share a field, the plants benefiting from each other in terms of natural fertility or weed suppression. And he works closely with the Columbia Basin's growing number of organic farmers, testing plants with compounds that function as natural herbicides.

Machado sees opportunity in all his work, as well as similarities in the landscapes of his homeland and his adopted home in Oregon. Like the Columbia Basin, Africa is resource-rich. "The farmers of Africa could feed the world," he said. "It is time to turn history around." OAP

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