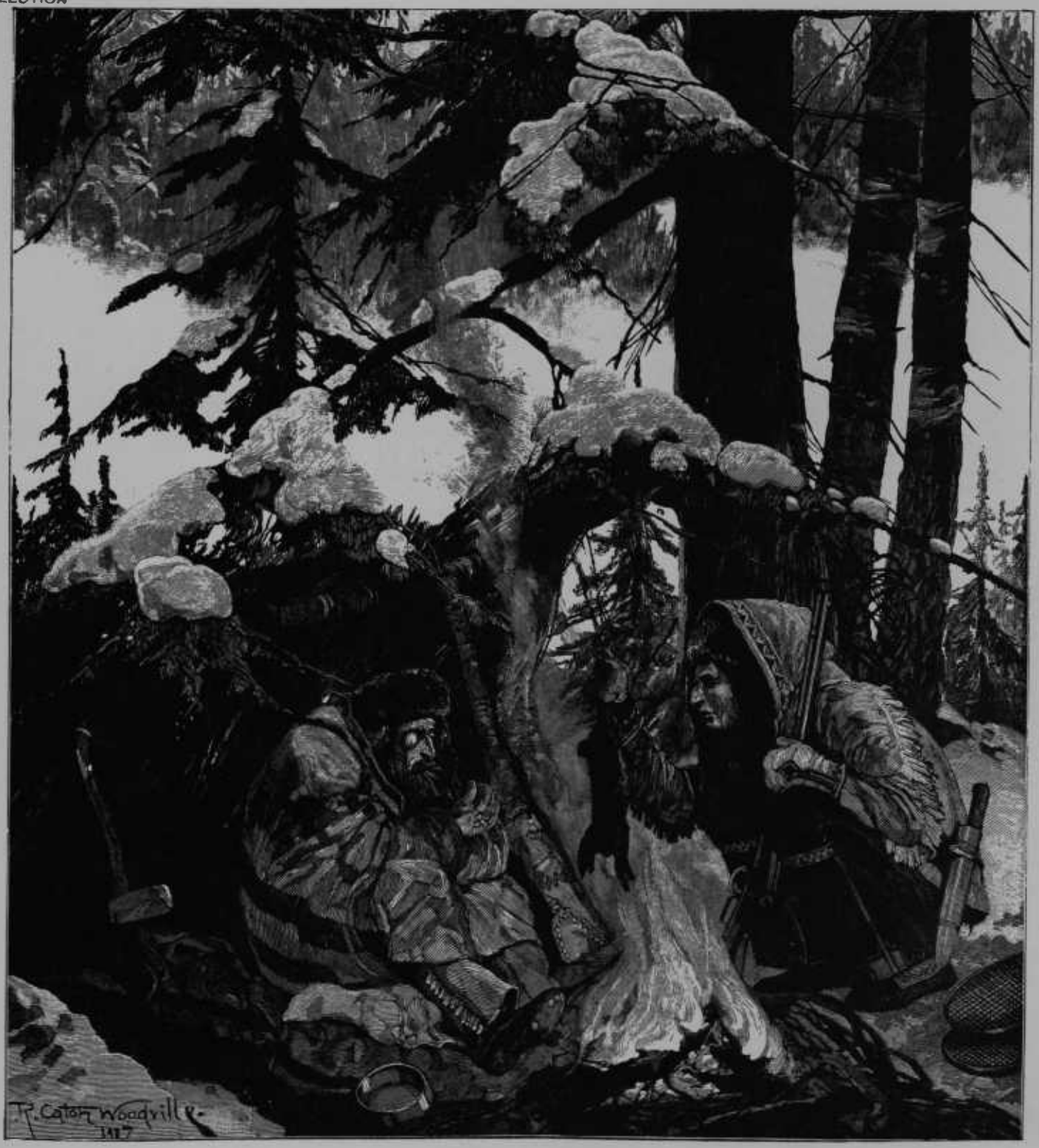
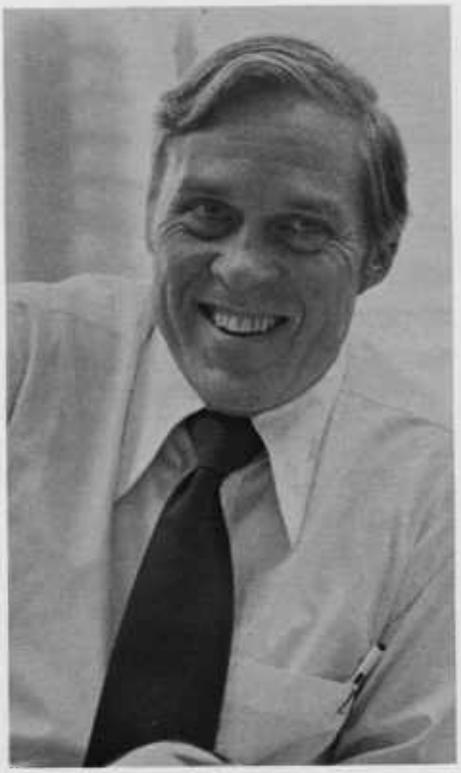
Oregon's Agricultural

Progress

Winter 1977



Agricultural Experiment Station
Oregon State University



Director John R. Davis

Coyotes and grit

Coyotes are often admired because they are so smart, crafty and able to survive against high odds. They seem to adapt to urban sprawl, fences, highways —everything that smells of civilization.

I remember watching the movie "On the Beach," which depicted the West Coast after an accidental nuclear attack. Supposedly, every living thing in San Francisco was dead—except that the film editor missed clipping out a sea gull wheeling through the air. Even though I knew it was a technical goof, I thought, "Hooray for the sea gull—not even a nuclear blast can kill that blasted bird."

All of us seem to have a high regard for those creatures who retain their independence and style in spite of man. The wily coyote, the indestructible sea gull and the stubborn camel are some of the critters destined to demand our respect—mainly because they survive in a humble and stubborn way. Maybe one could say this is "true grit" and these days anything with true grit is admired.

So it was with the farmer years ago. He and his family suffered terrible hardships at times but always seemed to survive. The farmer was fiercely independent. When he died of pneumonia, his wife carried on with all the farm work as well as with raising the kids. The farmer was tough, a rugged individual, dependable, honest—the salt of the earth. He had true grit.

But the farmer has changed along with the rest of society, and the public perception of the farmer has also changed. The farmer has become a businessman, a conservationist, an educated and sophisticated leader of the community. He is now one of us. He watches TV and goes to football games and his kids go to college and he seems to be just as vulnerable as the rest of us to economic and social problems.

Isn't it a pity that the old-time farmer now is extinct? Don't you feel a great loss when you see tractors instead of horses, or when you know that the solid, rugged farm family living off the land in a simple and humble way is no longer there? Where is the true grit of the farmer or the rancher or the cowboy? What hath we wrought?

If you've ever asked the above questions, have felt that farming should return to the good old ways, or thought we've lost a prized possession by modernizing farming, you are obviously a person who would like to return to a simple, uncomplicated life. But you have been fooled! That fiercely independent, rugged, dependable, gritty farmer still is there—cleverly disguised in double knits. True grit is still there—fighting weather, fearing God, going broke, but somehow surviving like the wily coyote or the indestructible sea gull. If you really face up to it, we haven't lost that old rural spirit of independence and style at all—our backbone is still there!

I mention this because I encounter many people who feel we should return to the old ways in farming to capture the spirit of independence, to conserve energy, to make life simple or whatever. So much of our population is urbanized that the nature of farming is not well understood; it is not recognized that farming still requires the instincts of survival we all admire. But that spirit is still there—the desire for independence, the love of the land and the outdoors, the ability to produce food and to survive. So keep the faith, faint hearts, for the U. S. farmer still is there—true grit and all. Let's be thankful for that, and keep it that way.

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More than a century later, few of us realize the hardships many faced in surviving a winter in the Oregon country. As you wait out the raging winter weather this year, take a moment to reflect on how agricultural research has improved our lives. We hope you enjoy this issue with its nostalgic illustrations. Most were reprinted from the *Illustrated London News*.

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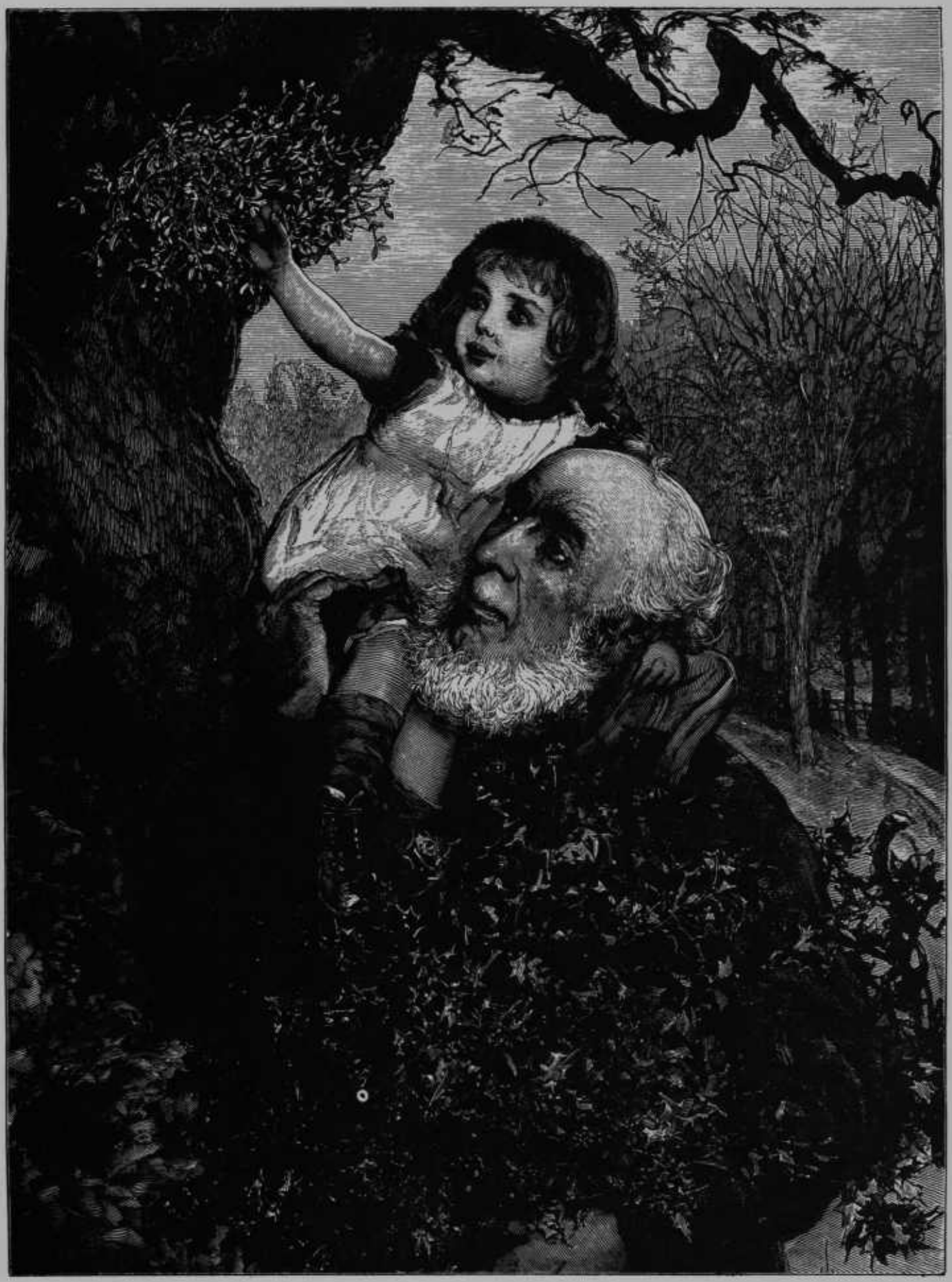


Deck the halls –and bow to Oregon's holly

Nearly 90 percent of the English holly used to deck the nation's halls during the holiday season is grown in Oregon.

But each year, many holly growers are left without their ho-ho-ho's at the end of the season because of damaged boughs.

"The biggest cultural problem holly growers have to face is a disease caused by Phytopthora ilicis," said Robert Ticknor, horticulturist at the North Willamette Experiment Station near Aurora.

The disease causes black spots on leaves and holly berries, followed by defoliation of the branches. Damage can be disastrous if picked holly has been prepared for shipping before the disease symptoms have been spotted. Branches have arrived at their destinations with blackened leaves and berries dropped from the branches.

"Presently available fungicides haven't proved satisfactory either because control has been marginal or control has been good but holly injury occured under certain conditions," Ticknor said. "What our research is aimed at finding is a holly plant resistant to the disease."

After testing 191 cultivars being evaluated for the U.S. National Arboretum in Washington, D.C., Agricultural Experiment Station researchers found some varieties resistant to Phytopthora ilicis, but the resistant holly does not resemble the Christmas holly sold commercially.

And hybridization of disease resistant holly with traditional Christmas holly is a slow process.

"Holly is an unfortunate plant in that regard," Ticknor said. "Seeds from holly plants take two or three years to germinate because the embryo takes a very long time to develop. After that the first seedlings to bloom—the males —take five years. It is usually seven years before the females bloom."

Disease problems with holly also are influenced by environment and weather.

"Probably 100 percent of the holly orchards along the coast are affected by the disease and it can be found in at least 40 percent of the holly orchards throughout the state," Ticknor said.

"It comes on in October when the spores begin to spread from stem cankers and is worse if the plants are wet—1973 was a vintage year for Phytopthora blight because wetter than normal weather provided ideal conditions for the disease. The excessive rain also prevented growers from applying fungicides."

Working with Duane Coyier, plant pathologist for the USDA's Agricultural Research Service facility at OSU, and David Adams, Multnomah County Extension agent, Portland, Ticknor has tried various methods of protecting cut stems from the disease.

Most Oregonians take holly for granted, but it is an unusual and welcome gift for those who live in other areas.

"On apples and pears, low rates of copper sulfate applied in irrigation water prevented the development of another Phytopthora disease on leaves and fruit," Ticknor said. "But we found the rate used for apples and pears—seven parts per million was too low for holly."

The researchers dipped cut holly into copper sulfate solutions of 10 to 300 ppm. They found that 30 ppm would control the spread of the fungus spores when mixed with the standard dip of napthaline acetic acid at 100 ppm with a four-fold safety margin for the holly leaves.

"Applications of copper sulfate will only prevent new infections and will not affect the development of infections which had occurred prior to treatment," Ticknor said. "Therefore, it is essential that we develop better measures for controlling the disease in the field."

Post-harvest problems related to shipping holly across the nation to arrive in top condition have shown part of the leaf-drop problem is related to temperature. Working with OSU horticulturist Daryl Richardson, Ticknor learned that when storage temperatures rose above 32 degrees, plants began to deteriorate and when the temperature reached 40 degrees, there was a risk of losing leaves.

Other phases of holly culture are under investigation in the OSU labs and at the North Willamette Experiment Station. Weed control in young, containerized plants is a problem, Ticknor said, and a project to study chemical controls has been funded.

Packaging methods for retail sales in mass market outlets are under investigation using 12 treatments on two varieties of holly.

But despite its thorny problems, holly continues to be Oregon's unique gift to the nation—one rich with tradition and welcome during the holidays.

Prunes get a big boost from boron

After several shriveling years, Oregon's Italian prune industry may be on the move again thanks to efforts of commercial growers and Oregon State University researchers.

Approximately 8,600 acres of plums and Italian (Prunus domestica) prunes—a freestone plum by horticultural definition—are grown in Oregon, down from a peak acreage of 56,800 in 1929. Two-thirds of the production is centered in the Willamette Valley where growers sell most of their crop for canned purple plums, dried prunes and a very small amount of prune juice. The remaining third of the crop grows in the Milton-Freewater area of eastern Oregon where the crop is sold mainly on the fresh market, said OSU Extension fruit and vegetable marketing specialist Roland Groder.

"Historically, erratic fruit set has been a problem on Italian prunes grown in western Oregon," said Michael Chaplin, OSU associate professor of horticulture. "But during the late 1960s and early 1970s, the fruit set was lower still and growers began funding research to find out why."

Maxine Thompson, another OSU associate horticulture professor, and graduate student L. J. Liu started the Agricultural Experiment Station research. They identified cool spring temperatures during the bloom period as one of the factors contributing to erratic fruit set.

Because a similar experiment had helped increase fruit set in pears, the researchers applied a spring spray of boron, a chemical element lacking in many Oregon soils, to the trees shortly before and during the bloom period. Fruit set was not increased and the project confirmed earlier observations that the commonly used practice of spring spraying with boron either did not affect or slightly reduced yields of Italian prunes.

But fall boron sprays also had helped increase fruit set on pears and researchers tried that approach. In a commercial orchard near McMinnville, prune trees were sprayed in the fall with boron before leaves dropped.

Said Chaplin, who heads OSU's plant analysis laboratory, "Even though the standard leaf analysis tests conducted in August showed the trees did not have boron deficiencies, boron sprays did increase fruit set the following year and yield was very good, almost twice as much in some cases."

A more extensive experimental boron spray program conducted by Chaplin and graduate student Nancy Callan confirmed the findings.

"The lack of fruit set growers had been seeing was not caused by a classical boron deficiency," Chaplin said. "We think the trees have a transitory need for more boron during the spring and, by spraying in the fall, trees were able to take in the boron and store it until it was needed."

The OSU researcher said one spray cannot be considered a permanent cure, however. For greatest effectiveness, boron must be sprayed every fall unless the standard August leaf analysis indicates a boron toxicity.

"Chances are good that if growers apply boron at five to eight pounds per acre, they will have average increased yields of 35-40 percent," Chaplin said.

Groder said work of commercial growers also must be considered an integral part of stabilized production in Oregon's prune industry.

"The Oregon Prune Commission, organized in 1962, and the awareness of the problems growers mutually faced has made a big difference. Good growers started investigating their own orchards, pruning their trees, applying fertilizers and spraying. Most of the changes in the industry have evolved just creating an awareness of the problems."

Production since 1973 seems to have stabilized at about 32,000 tons per year but research at OSU and work by growers are continuing.

Melvin Westwood and Alfred Roberts, OSU horticulture professor, have been investigating tree rootstocks to determine whether improved production is related to tree genetics. Some rootstocks resulted in more than a 50 percent increase in yield per tree when compared to the standard peach seedling rootstock.

Robert Cain, OSU food science professor, attended a meeting in Michigan where a halving machine for prunes was demonstrated. Oregon's Italian prune held up well under the testing and industry officials are hopeful that new canning procedures may help increase sales of canned purple plums in schools and other institutions.

Chaplin's research into tree nutrition is continuing and he said nutritional information gained during the prune experiments also may prove useful in other tree crops including cherries and filberts.

All OSU researchers involved in the project admit there still are problems in prune production. Numbers of farms, acres of trees and numbers of trees in production all fell about 27 percent between 1969 and 1974, but may be stabilizing now. Varying prune size and a brown rot disease have hurt cannery production and weather presents an annual threat.

But they are hopeful that with cooperative efforts in the future, the wrinkles of Oregon's prune industry can be ironed out.

Jennie's Sweet Stuffing

Soak ½ pound of dried prunes and 2 tablespoons of raisins in boiling water for about five minutes. Drain. Remove the pits from the prunes and cut the fruit into small pieces, then peel, core and slice one large apple.

Mix the prunes, raisins and apple with the beaten yolk of one egg, 2 tablespoons of cracker crumbs, ¼ teaspoon of sugar and a pinch of salt and cinnamon.


M Walker

Mistletoe foe fights the kiss of death

A kissing cousin of holiday mistletoe has a deadly bite.

Lewis Roth, Oregon State University professor of forest pathology, has been on the trail of the kissing cousin of kissing mistletoe since 1955.

"In Western America, there are two kinds of mistletoe—the leafy oak parasite, or traditional kissing mistletoe, and dwarf mistletoe, found on coniferous trees such as firs and pines. This one is very inconspicuous but damaging."

Dwarf mistletoe—like kissing mistletoe—exists as a parasite on its host tree. In nature, such parasitic relationships may not be greatly damaging, but in the case of dwarf mistletoe, Roth said human influence has tipped the balance.

"The forest community no longer is natural," Roth said. "As managed, we have made changes that, in spite of us, have favored mistletoe over trees and we need to reverse that pattern to keep a sensible balance."

Another factor Roth said has changed the balance in favor of mistletoe is absence of fires in forests.

"Fire was very important historically because it scorched out the mistletoe and thinned forests so only trees with high vigor survived. I regard it as a razor-edged affair—if managers do the wrong things, mistletoe is favored; if the right things are done, trees are favored. Research needs to acquaint forest managers with what the right things are."

Roth is a leading expert on mistletoe. Through years of extensive research, he has plotted the life cycles of the plants, their living conditions, friends and enemies.

"Mistletoe is a flowering seed plant. Flowers are very small—almost inconspicuous—and while some flowers bloom in the spring and others in the fall, fruit ripens in late autumn. The fruit is single-seeded and highly explosive."

Roth studied the explosive qualities of mistletoe seeds to find out how seeds are distributed. He said the path of the seeds is similar to the pattern of artillery shells (projected from missles).

"The path they follow is just like the path of a mortar shell," he said. "Although the seeds are adhesive, they will ricochet if they hit a solid object, but they eventually will get caught in something. Most seeds fall harmlessly to the ground but many get caught in needles of trees. Feathers of birds and fur of rodents are great catchers of mistletoe seeds and these animals may play a part in mistletoe spread," he said. "If trees are on a slope, infected trees higher up shoot seeds directly onto the trees further down the hill."

The innocent-looking menace clings almost inconspicuously to tree branches.

When a seed lands on a pine needle, it is very sticky. Then, Roth said, rain turns the sticky substance into a lubricant.

"That lubricant gives the seed a chance to slide down the needle and lodge at the needle base next to the branch. Then it becomes adhesive again and sticks to the tree, but this time it won't relubricate. Finally, a special penetrating device of the root forces its way into the bark," he explained.

Mistletoe grows slowly. After three years, the plants begin to appear above the bark and a shoot is produced. Plants are either male or female with male shoots producing pollen and female shoots producing receptive ovaries. The next year, another generation of the plant appears.

"Mistletoe is a very complicated plant both ecologically and physiologically," Roth said. "Damage often is subtle and is seen in the form of growth reduction. Most often, severe mistletoe damage occurs on thin or poor growing sites."

Control of mistletoe on trees also is complex, Roth said, because the plants do not contain phloem, a cell tissue used to distribute food material in plants.

"Researchers from Weyerhaeuser and the OSU Forest Research Laboratory found roots of trees affected by mistletoe were starved even when the trees had been pruned and thinned. Those trees showed a reduction in the food system which leads to an underdeveloped plant," Roth said.

To control mistletoe growth with a chemical herbicide, researchers would have to find a chemical which could kill the parasite but not the host plant. Several herbicides have been tested at the U.S. Forest Service Pringle Falls Field Station 40 miles southwest of Bend, but Roth said none has worked yet.

However, he said lack of chemical success has not stopped the search for some way to control excessive mistletoe damage in coniferous trees.

"There still is a great deal of room to explore," he said. "We know of a number of parasites and pathogens in mistletoe, some of them so specialized they appear to blend right in with the plant. Insects, too, have had some effect in controlling mistletoe and we also know of three or four common fungal parasites on flowering plants and parts. But the process of finding out what can be used to control the plants' spread is slow because the plants themselves take so long to grow and also because each mistletoe species is specific to the host it inhabits."

Computer simulations of mistletoe damage have been charted and researchers are trying new ways to fight mistletoe in standing trees, including pruning and limited burning.

"If an area is heavily damaged by mistletoe and the stand is young, we will recommend the stand be removed," Roth explained. "But older stands are too valuable to take out entirely, so ways must be found to limit mistletoe damage."

For Roth, a main ingredient of mistletoe research is patience.

"I think foresters are some of the most conservative people in the world," he said. "When it takes as many years as it does to grow a crop of trees, no one can afford to take chances."

Umbrellas for trees? These strange contraptions were used by Roth to study the explosive qualities and distribution of dwarf mistletoe seeds. Great care was required to find the few seeds that could pass through the windows in the hemispheres and land on the planes placed on the ground. Roth said each seed is smaller than a grain of wheat.

Center of interest

Seeking gold in the Treasure Valley

The gold in Malheur County's Treasure Valley spills out each summer and fall: the harvest of diversified crops.

In the slightly rolling land, touched by the tortuous Snake River, the loamy soils are varied. At an elevation of about 2,200 feet, rainfall is not plentiful —the average annual precipitation is 9.5 inches.

With water for irrigation, growers have put the land to work. With intensive cropping, sugar beets, onions, potatoes, corn, other vegetables, alfalfa, mint and some grains are produced. The watery help is relatively cheap, however. Irrigation charges run around $10 per acre annually, compared to over $200 in parts of Southern California and Arizona.

Production keeps climbing. Last year, for example, onion production in the valley, where the yellow sweet Spanish is king, was 1,500 tons. Worth: approximately $2 million.

Diversity plus intensity in crop management equal problems. One of the major ones in the area—and one the Malheur Agricultural Experiment Station has focused on for most of its 35 years—is control of weeds and insects in crops.

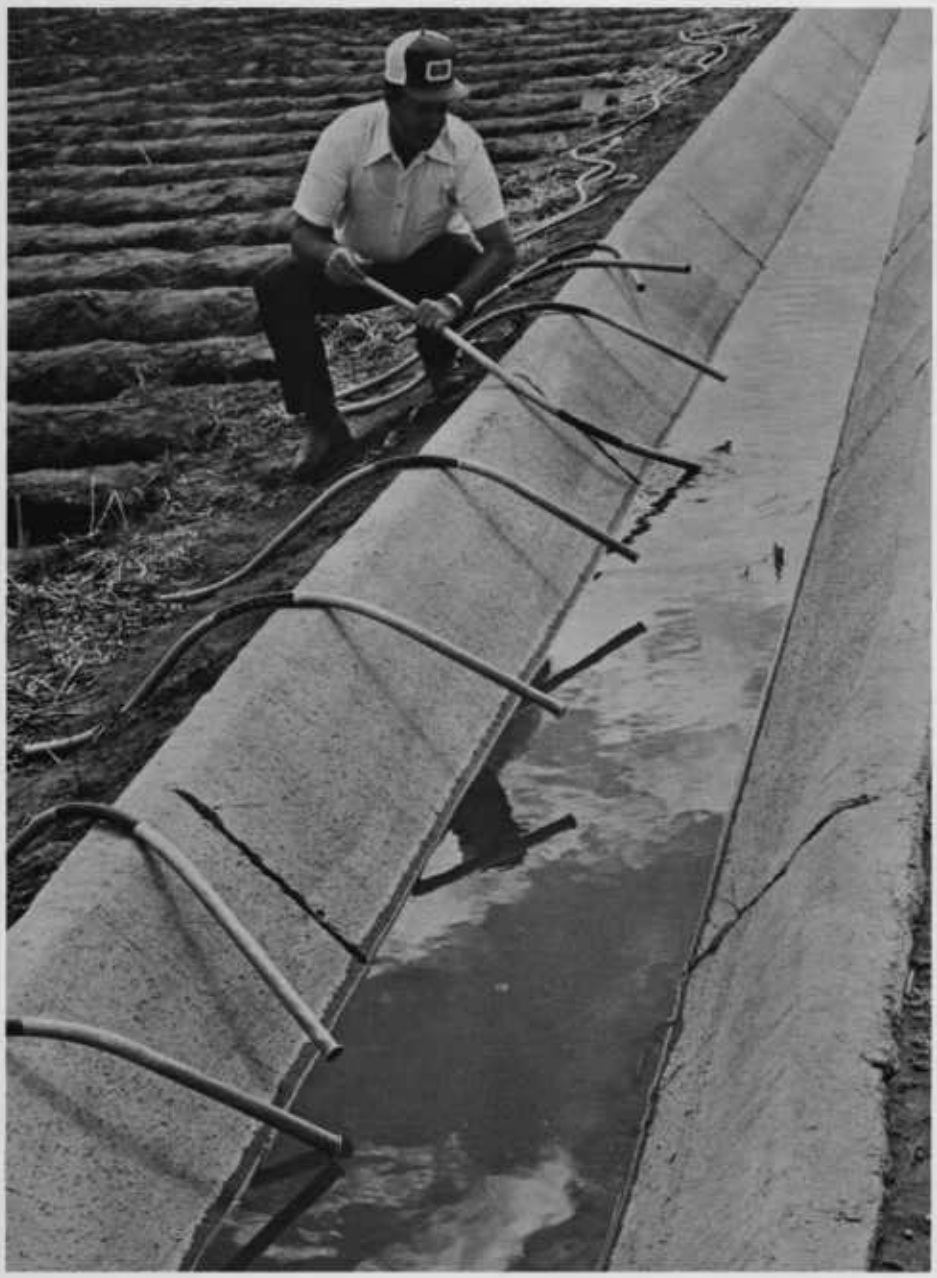
Like the problem, the weeds are familiar—yellow nutsedge, Canada thistle, white top, bindweed, Russian Knapweed, kochia, lambsquarters and pigweed. Some of the diseases are familiar, too—in onions, pinkroot, neckrot and stem plate rot, for example.

Pesticides have become a vital part of production for the Malheur growers. Station scientists are continuing to help the growers find the best chemicals to selectively control pests, sometimes moving their research to area farms.

Evaluation of varieties—yield, hardiness and, sometimes, sweetness quality—also has been a primary interest of Station personnel, usually in cooperation with campus scientists, and with strong interest of area growers.

Potato selections obtained from the USDA at the University of Idaho Experiment Station, Aberdeen, have been evaluated for yield and quality.

Currently, at the request of sugar beet growers, 13 varieties of sugar beets are being tested. Onion variety testing is an annual project. Scientists from campus and local industry have cooperated with personnel to evaluate



Charles Stanger, agronomist, checks irrigation lines at the Malheur Station. Although rainfall is not plentiful, irrigation water is relatively inexpensive and intensive cropping helps increase yields.

potatoes, wheat, barley and other grain varieties and also to test various chemicals for efficiency in combating weeds, insects or diseases.

The project to develop the leaf cutter bee into a pollinating source for alfalfa began to flower when a "hotel" of bored holes in boards was set up in a shed at the Station and became home for a colony of the small, surprisingly efficient bees which helped save alfalfa crops by increasing yield.

In addition to working closely with fellow OSU scientists, Malheur Station personnel share findings with personnel at the University of Idaho Experiment Station at Parma, just across the nearby Idaho border.

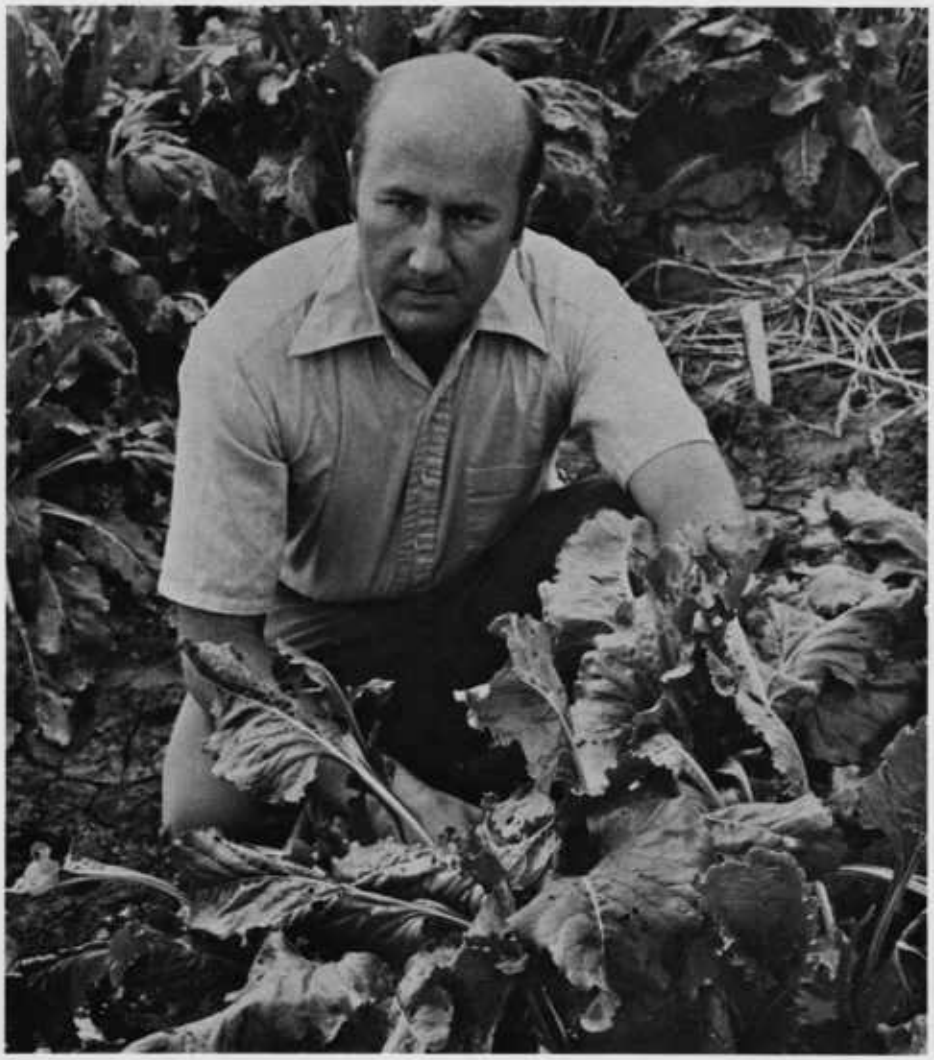
Looking ahead, Station personnel plan to continue coordinating activities with the Parma Experiment Station of Idaho and continue evaluating herbicides on many crops and testing new varieties.

Also to be studied may be cropping systems, with scientists hoping to find out how one crop fits in with others, so the valley may some day have more intensive multiple cropping and, perhaps, intercropping, or several crops in one field, growing in strips and interspersed with other compatible crops.

Agricultural research has given the valley much of its golden look and could change the makeup of the area again, if the cropping studies turn up the right answers.

Either way, the flow of Malheur onion rings, the versatile potato, corn, sugar and other favorites will keep strong, helping fill the nation's dinner basket with quality products.

Stanger examines onions grown in a weed control test (right), while Dwayne Buxton, new station superintendent, checks the progress of sugar beet varieties in test plots. Visitors always are welcome on the station, located west of Ontario.



work in Progress

Mr. Boysen's berry fights for survival

The distinct flavor of boysenberries in jams, jellies and pies may soon be hard to savor if ways are not found to make them more economically attractive for farmers to produce.

The boysenberry, a cross between loganberries and blackberries, was created by a man named Boysen in southern California in the early 1900s. Its popularity soon spread through California and Oregon. But, now Lloyd Martin, superintendent of the North Willamette Experiment Station near Aurora, says boysenberry acreage in Oregon has declined from about 1,500 acres to less than 600 acres in 10 years, mostly because of low yield and lack of sufficient profit to growers. Use of boysenberries in yogurt is currently stimulating the market but low and variable production remains a problem.

"The boysenberry is not always genetically stable," said Martin. "A planting may look healthy and productive, however, new plants taken from this field for establishment of a new field may not keep all of the desirable characteristics. Some plants may exhibit a different leaf pattern and some may be devoid of fruit."

The North Willamette Experiment Station, with assistance from the J. M. Smucker Company, is trying to solve the variability problem by developing a more uniform productive planting stock.

"Growers have been called on to flag outstanding plants in their fields during production season," said Martin. "That way we can tell the good plants from the poorer ones in the fall."

The project involves taking cuttings rather than allowing canes to peg down and take root as is normally done commercially. The resulting plants will be grown in the field and evaluated at the station.

"We want to know if there are major differences between boysenberry clones," said Martin. "We will compare a number of growth and fruiting characteristics and assuming we find superior clones, we want to know how well these plants retain their superiority. Also, will it be transmitted uniformly to successive propagations?"

The clones that are identified as superior will be released to qualified nursery propagators and eventually will replace inferior planting stock in the fields.

Yogurt lovers are increasing the sales of boysenberries, but low and variable production remains a problem.

Pinch of sulfur jumps the yield of wheatgrass

Nitrogen fertilizer combined with sulfur can nearly double the spring yield of crested wheatgrass on a semi-arid soil, say two researchers at the Eastern Oregon Agricultural Research Center in Burns.

"When used by itself, 20 to 30 pounds of nitrogen per acre is the most efficient fertilization rate for crested wheatgrass—a rate capable of increasing yields by 64 percent. Adding small amounts of sulfur to the nitrogen can boost yields an additional 36 percent provided the fertilization rate approaches but does not exceed 30 pounds per acre of nitrogen," said Forrest Sneva, Agricultural Research Service range scientist.

To develop management techniques and to increase wheatgrass yields, the impact of fertilization plus row-spacing and age on crested wheatgrass were evaluated by former OSU range scientist Larry A. Rittenhouse.

They tested nitrogen fertilization rates of 0, 20, 30, 50 and 80 pounds per acre both annually and biennially on test stands grown at the Squaw Butte Experiment Station in Burns. The Station is 4,500 feet above sea level and receives about 12 inches of precipitation each year, mostly in the form of snow or rain during winter months.

The average yields of the wheatgrass during 10 years of testing using no nitrogen fertilizer was 497 pounds per acre. Using 20 pounds of nitrogen per acre raised average yield to 814 pounds per acre and using the 30 pound rate raised the

average to 795 pounds per acre. Fifty and 80 pound rates were less effective.

For those ranchers interested in establishing ground cover early, stands grown in narrow spaced rows (6 and 12 inches) reached peak production within the first two years of testing then began to decline. Although average yields from all row-spacings were about the same, over the 10-year period, widely spaced rows peaked later in the test than narrow spaced rows.

Yields decreased as wheatgrass stands aged. "Fertilization could not offset the decreasing yield trend though fertilized stands did maintain a higher yield than did non-fertilized stands," Sneva said.

In addition to yield, Sneva and Rittenhouse also measured the loss of soil moisture and herbage crude protein.

Generally, the loss of soil moisture was most rapid when the soil was fertilized but at 20 pounds of nitrogen per acre the rate of loss was not much different from non-fertilized stands. Row-spacing had little effect on soil moisture loss.

Crude protein concentrations of spring herbage increased as row-spacing and nitrogen fertilizer rates increased and were greatest for stands fertilized biennially. Concentrations in regrowth were significantly affected by age and nitrogen levels but not by row-spacing or frequency of fertilization.

"Fertilization also had little or no effect on grass regrowth after spring harvest and this could pose problems for a grazing program. Fertilization places extreme demands on wheatgrass at a critical growth stage and unless ranchers remove their grazing livestock early enough to allow the grass sufficient time to grow back, root systems will falter and the grass will die out," said Sneva.

Empty bottles can contain store problem

Beverage containers returned to Oregon supermarkets under requirements of the Oregon Bottle Bill, pose potential sanitation problems, two Oregon State University researchers found.

Harvey Meier and Michael Weimar, OSU agricultural and resource economists, have completed a study of sanitation problems associated with handling returnable containers in four Oregon supermarkets.

"To identify sanitation problems associated with handling returnables," said Meier, "we developed a flow chart to diagram the movement of containers from the time they arrive at the front door until they come to rest in the storage area, usually in the back of the store."

Customers usually move the containers by cart or by hand from the parking lot or front door to the check stand. Then a bagger or clerk counts the containers for refund and separates bottles from cans.

The economists noticed three potential sanitation problems in the observed handling practices.

"One problem involved pest and rodent attraction in the backroom storage areas," said Meier. "This was attributed to odors from the containers and partially filled containers. But to minimize the potential problem of cross-contamination with food, all the stores we observed segregated returned containers from food products in their backroom storage area."

A second problem concerned the hazards and sanitary problems of handling partially filled containers during check-in, transportation and storage. Liquids from the containers were observed dripping on the floor when customers brought them back, while they were stored in the front of the store and while they were being transported to the storage area at the rear of the store.

"These problems were noticeably reduced by two stores which used

Some store managers give the job of handling empty bottles to one employee. Economists believe that may be one way of reducing possible sanitation problems.

solid bottom carts to temporarily store and transport the containers," said Meier. "But if used, these solid bottom carts should be cleaned routinely and sanitized monthly."

The third potential problem dealt with visibly insanitary containers. The Oregon Bottle Bill provides the stores with the right to refuse containers because of insanitary conditions.

In talking with store managers, the economists found that recently relatively few grossly contaminated containers were being returned compared to the period immediately following implementation of the bottle bill. Also, the managers surveyed may have been reticent to exercise their right of refusal, reluctant to offend the customer.

The researchers also observed that most of the stores assigned the task of moving, sorting and storing the returned containers to a specific employee. This person performs a limited amount of other activities involving food products. This helps limit any potential cross-contamination.

"While some sanitation problems were observed in this study," said Meier, "on balance, the grocery department people handling returnable containers did so in a manner which appeared to maintain the wholesomeness and safety of food products sold in their stores."

Animal health gets some help —from humans

Animals who have helped answer medical questions for humans at last may be getting something in return.

Lavern Weber, Oregon State University professor of pharmacology and fisheries and new director of the Marine Science Center in Newport, said information and medical tools developed to solve human health problems are helping wildlife scientists do a better job of researching animal health problems.

"I came here with the hope of building a setting where environmental problems would be considered with pharmacology," said Weber, who moved to OSU from the University of Washington Medical School in 1969.

"Setting standards for water quality became my immediate interest."

Working with Charles Warren, OSU professor of fisheries, Weber set up experiments to study effects of water pollution on fish health.

"Standards already had been set for individual chemicals. We wanted to know what would happen when pollutants became grouped."

With the help of graduate student Perry Anderson, Weber started a research project partially funded by the Oregon Agricultural Experiment Station at OSU's Oak Creek Laboratory. Three organic compounds—pentachlorphenol, dieldrin and cyanide—and three metals —copper, nickel and zinc—were studied.

Methods of keeping humans healthy also may work with some animals.

"A lot of information was available about the chemicals already," Weber said. "For instance, we knew that if we added a small amount of copper to a nickel solution, it would be like adding more nickel. They act just like each other."

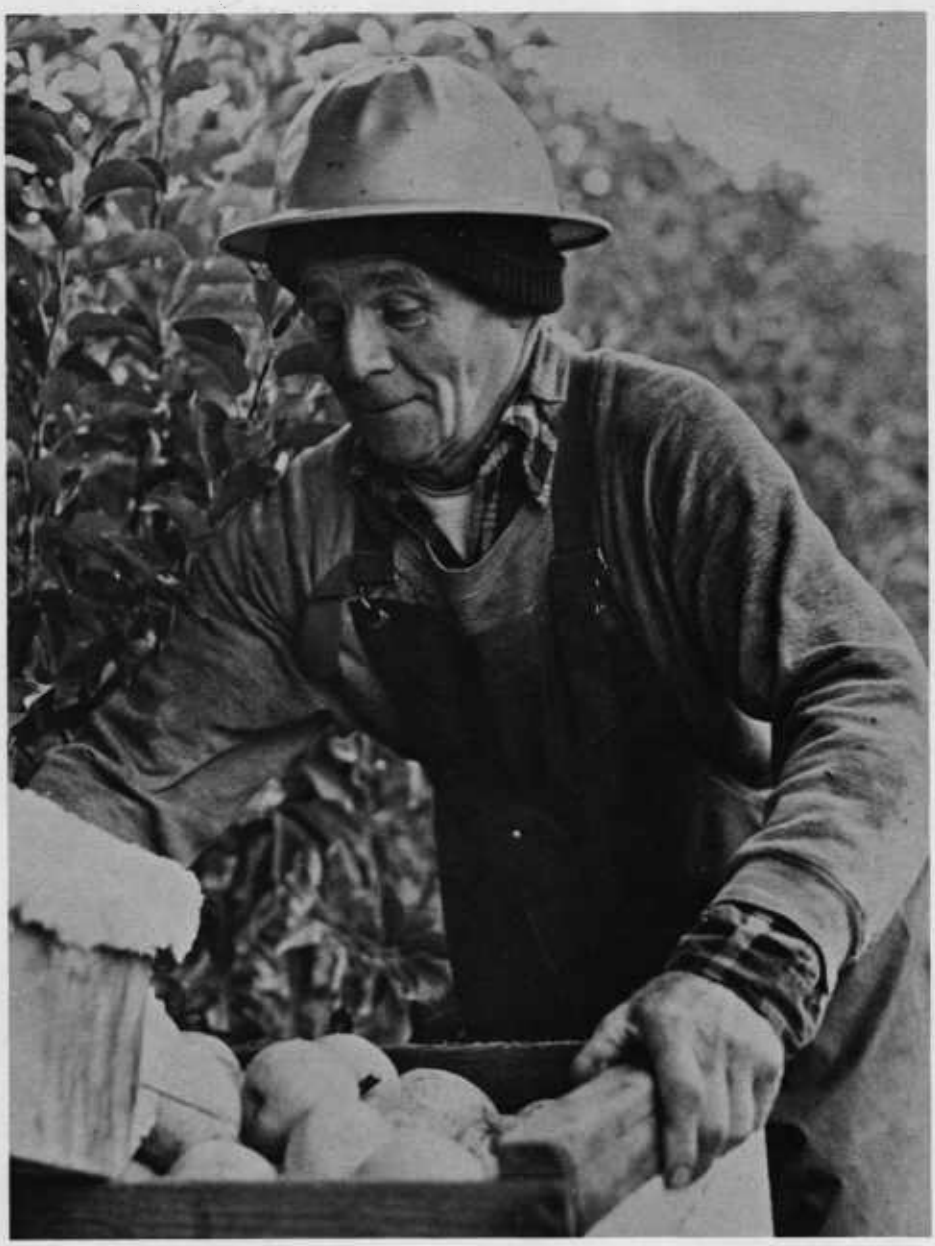
What the researchers needed was information necessary to predict interactions in advance. With the information collected, Anderson and Weber developed a scientific model to predict reactions of fish to mixtures of pollutants. Subsequent research, sponsored by the OSU Environmental Health Sciences Center, has confirmed the accuracy of the model.

"James Hedtke, now at University of Oregon, used the model to look at salmonids, a less homogenous group than the guppies used initially," Weber said. "The model still held up. Since then, graduate students Carl Muska and Elizabeth Kiokemeister have studied non-lethal doses of the six pollutants and the model appears to work there, too. Growth is an indicator in those tests."

Weber said the same model also may be used to predict the effects of environmental pollutants on human health. In return, methods used to study human health problems are being used to predict the responses of animals to pollution.

"Our researchers have looked at liver function as one test of pollution damage," Weber said. "The same tools which tell doctors whether an alcoholic has liver damage have been used in these tests to tell whether fish have been damaged by an environmental pollutant.

"There has been so much done in the area of human and mammalian health and it is all basic pharmacology which can be applied to other animals," he said.



Look, folks, no hands

Early this fall, researchers tested a slightly modified berry picker on apples at the Lewis-Brown horticulture farm near Corvallis. Although bruises and cullage rates were high, the USDA-developed machine managed to pick apples three to four times faster than a human picker could.

"Under current conditions, there is no real economic use for a mechanical harvester," said Donald Langmo, OSU industrial engineer. "But we are addressing ourselves to inevitable changes in conditions. The labor force seems to be diminishing and the cost of production always is increasing. Sooner or later, we will find a way to make a machine that, in combination with human labor, is more efficient than hand picking and will provide a product of acceptable quality."

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