

ROB MARVIN

Fred Bierlmaier, forest technician with the U.S. Forest Service, measures snow pack in the Andrews Experimental Forest west of the Three Sisters. After collecting snow in the tube, he will weigh it to measure the amount of water the snow contains.

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Trees squeeze water from low-flying clouds

By ROB MARVIN

Special writer, *The Oregonian*

Trees draw moisture from the soil, using water that could otherwise go into Portland's water supply from the Bull Run Watershed.

Clear-cutting the watershed's timber in the Cascades east of Portland could provide residents with an extra sip, except that the trees also snatch water from the clouds.

The trees cause an additional 35 inches of precipitation a year.

The bonus 35 inches comes from "fog drip," one of the little surprises hydrologists run into as they probe water cycles in the

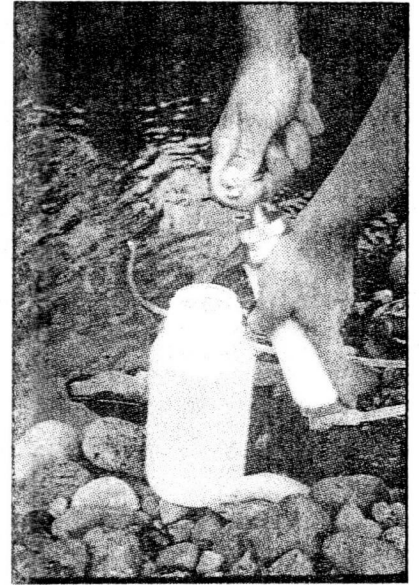
Cascades.

What started as a simple question is full of unpredictable unknowns. Working to make these unknowns more predictable is Gordon Grant, research hydrologist with the U.S. Forest Service in Corvallis. He is helping adapt a U.S. Geological Survey computer model to trace the flow of water through the forest.

Fog drip was first noticed by forest crews working in the Bull Run Watershed. On clear sunny days, they'd leave their rain gear behind, but under the Douglas firs they would get soaked. When they left the forest at the end of the day, they'd ask "How much did it rain?" When they looked at the rain gauge, it was empty, said

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VERA JAGENDORF

A Cascades hiker uses a Katadyn filter to make stream water purer. Filters such as the Katadyn force water through a filtration unit, which removes the giardia parasite and other impurities.

Medicare studies long-term home care for patients with Alzheimer's disease

☐ Caring for the patients eats energy and time, which means the project has trouble finding participants

By OZ HOPKINS KOGLIN

of *The Oregonian* staff

Alzheimer's disease is so emotionally overwhelming that researchers are having a hard time finding patients and caregivers for a national study on long-term care.

The federally funded Medicare Alzheimer's Disease Project is using the traditional scientific model — a treatment group weighed against a control group — to determine the

kinds of services families need so they can take care of a relative at home. The government wants to know whether home care for these patients would be cost-effective.

Medicare covers many acute care services for patients over the age of 65, but little or nothing for long-term care.

Alzheimer's disease, a progressive degenerative brain disease of unknown cause, strikes approximately 10 percent of Americans over the age of 65, and 47 percent of those 85 or older. An afflicted person can live many years before declining into physical illnesses. In the terminal stages, patients lose weight and have difficulty swallowing, controlling bladder and bowel function, walking and speaking. Victims often die of repeated infections or pneu-

monia.

Poppy A. Warren directs the three-year, \$3.5 million project at Good Samaritan Hospital & Medical Center, one of eight study sites in the country. She said the project represents the first national effort to study Alzheimer's disease and other dementias, with family caregivers, as well as people who have the disease.

"There is a blatant need out there for things like adult day care and respite and in-home services, and much of that is not reimbursed by anything other than out of pocket," Warren said.

Mentally disoriented Alzheimer's patients require a lot of care, which often makes caregivers feel forced to

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The Oregonian

Trees in the Bull Run Watershed provide an additional 35 inches of precipitation a year by wringing water from low clouds.

Trees: Loggers get rained on despite sun

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research hydrologist Dennis Harr of the U.S. Forest Service in Seattle.

Harr, then with the Forest Service in Corvallis, guessed the forest was wringing the "rain" from the clouds as they blew through the trees. To find out, he put troughs in open clear-cuts and in the forest. In a study costing taxpayers \$372, Harr learned that the mature trees were snagging a big portion of Portland's water supply.

Fog drip, or as some might say, low-flying-cloud drip, is the forest's way of getting water that doesn't fall as rain.

The fog involved is not the ground fog that hugs streams and hangs on the Willamette Valley floor. Rather, fog drip comes from the bottom of narrow gray stratus clouds 500 to 1,000 feet thick. Southwest winds

concentrate fog in the upper basin for Bull Run's rich fog drip.

Bull Run has everything it needs for fog drip: wind, moisture, and plenty of fir needles for the fog to crash into.

Both fog and clouds are made of microscopic droplets. In rain clouds, embryonic raindrops have been "twirled and swirled, rolled and aggregated," Grant said. As the drops get physically mashed together, they grow until the drops are too heavy for the upward air currents to keep them aloft. The result is rain.

In the forest, embryonic droplets crash into needles instead of each other.

As winds drag a cloud through the forest, the needles skim water out of the cloud. The size of the tree is important. If trees are large and

the forest dense, a droplet of water has little chance of making it through miles of trees without hitting one, Harr said.

Needles provide the kind of nucleation points a droplet needs to turn it into a raindrop, much as an oyster needs a grain of sand to make a pearl.

The bonus moisture is a boon for plants and animals needing the 121 inches of water a year in the Bull Run Watershed. Without the extra water, Harr said, some of these species may become endangered. Species most affected may be in the drier marginal areas where forests meet the grasslands, where there is barely enough water to go around.

Coastal species are also vulnerable. The coast is a major beneficiary of fog drip, especially in the otherwise dry summer.

Deforestation in fog zones can reduce summer precipitation in the dry season when rainfall is needed the most. But man's meddling can work both ways.

In the deserts of Peru, which haven't seen rain in 30 years, people have hung old cargo nets on posts and planted trees beneath them. The nets, once used to load ships, comb enough moisture from the air to water the trees. When the trees grew large enough to catch their own moisture, the nets were removed. Now, said Harr, the Peruvian desert has a small forest sustaining itself on its own fog drip.

And what does hydrologist Grant know from all this?

"The single answer is that there is no single answer," he said. "The more you know, the more you need to find out."

Snow: Forests can prolong runoff, halt flood

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It takes a whopping amount of heat to evaporate or boil water. The vapor stores the heat, and when the drop condenses, all that heat is given off. A drop of condensation provides many times more heat than a drop of rain. Even in a 2-inch rain, the little bit of condensation provides up to three times more heat than the rain itself.

Wind brings heat to the snow. It swirls in little eddies, recycling the vapor again and again against the

level, and snowpacks built up in the mountains. Next, clouds dumped 20 inches of rain up to the 10,000-foot elevation in air warmed to shirt-sleeve weather. Snow turned to water, causing serious flooding in Oregon and Northern California and as far east as Idaho and western Nevada.

This winter the Willamette Valley was fortunate.

As in the storms of 1964, a warm air mass stalled over the Northwest in early January. Rain fell high in

Rather than following a rigid 75 percent, the question is "How fast does water move through the soils, and how stable are the channels?" she said.

If the transient snow zone is too heavily clear-cut, a storm of the size that comes along every five or 10 years can damage the stream channels as well as cause flooding, McSwain said.

Rapidly moving water can erode the channels and cloud the streams with sediments. Channel sides can be sloughed off. Channels once rich

predict how logging affects flooding.

The model is important because there is no such thing as a generic forest. Subtle changes in slope, soils, vegetation and hundreds of other characteristics distinguish one plot of forest from another. They shape a forest as clearly as small changes in noses and eyes distinguish one face from another.

One curious thing Grant has found is that selective clear-cutting may help prevent floods as well as cause them.

Grant said that every time it rains

referred to as a cyst — is excreted in the feces of infected individuals and can survive for months in even the coldest and seemingly purest mountain stream water.

When someone drinks that water the cyst becomes active, thriving in the small intestine. A hundred cysts — possibly as few as 10 — may be enough for an infection, sending the victim running for the nearest toilet. The incubation period varies widely but is usually seven to 10 days, making it difficult to trace the exact source of contamination.

Giardia can also be spread through contaminated food, either if the food-handler fails to wash his or her hands, or if the food is rinsed in polluted water. People who swim in contaminated water are also at risk but the most common source of backcountry infection is probably untreated drinking water.

Since giardia affects animals as well as humans, it isn't safe to drink directly from any mountain stream. Even if there is no human contamination, there is always the danger of infected rodents, including beavers, rats, and mice, and probably marmots and picas as well. In fact, giardia is so non-specific that all animal species, including birds, must be regarded as potential carriers, and any water source can be contaminated.

A single careless backpacker — or a single infected beaver — can pollute an entire stream. According to some estimates, one stool from an infected human may contain enough giardia cysts to contaminate a many as 10 million gallons of water.

Furthermore, just because someone isn't ill, it doesn't mean that the person is unaffected. Many people may contract giardia without ever showing any symptoms, but these asymptomatic carriers may pollute the water just as thoroughly as people who are more obviously infected.

It's not yet clear how many people are giardia carriers. Various studies have identified the parasite in from percent to 20 percent of the surveyed individuals, but none of these studies can be generalized to the population at large. What is clear is that there is a substantial number of