

May 10, 1900. MOUIII St. Helens erupts. The north face collapses in a gigantic landslide. Superheated gas and ash shoot more than $13\frac{1}{2}$ miles into the morning sky. The vol-



cano's snowcovered crown is sliced by more than 1.300 feet. The

bridges, roads, homes and enough timber to build 300,000 small houses.

Fifty-seven people die.

Out of destruction comes a slow recovery. Plants and animals struggle to regain a home in the rugged landscape. The mountain draws scientists. engineers, foresters and tourists, and becomes a national monument.

Today, plants and animals continue to reclaim the stricken land. But small earthquakes rumble almost daily beneath the mountain. The story is far from over.





Mount St. Helens puffs a cloud of steam a month before the May 18, 1980, eruption devastated the landscape with mud and ash (top). Four months after the blast, Spirit Lake appears dead and the ridges north of the peak are totally devoid of greenery (bottom).

A ravaged mountain comes back to life

By KATHIE DURBIN, RICHARD L. HILL and PAUL KOBERSTEIN of The Oregonian staff

ount St. Helens' flattened silhouette, floatng white above the horizon, has become a amiliar, almost reassuring landmark in Oregon and Southwest Washington since the peak erupted cataclysmically on May 18, 1980.

When sunlight bathes its distant, snow-covered slopes, it's possible to forget the violence and death of that Sunday 10 years ago

The view from the south shields the mountain's ravaged and gutted north side, where two sharp earthquakes, a monstrous landslide and an explosion equal to 250 million tons of TNT blew off the top off the mountain, obliterating 150 square miles of alpine forests, meadows and lakes and sending an avalanche of snowmelt and debris roaring down the western river valleys.

From the air, the plain that spreads from the mountain's gaping crater is a bleak moonscape of mud, ash and sand-textured pumice, carved and furrowed by rivulets flowing off the mountain's flanks.

Ten years' time has not transformed the graybrown devastation zone to green.

But on the ground, near seeps and trickling streams and on the borders of small pools, renewed life in many forms has made a stand.

Bright green stalks of horsetail poke out of warm freshets like trees in a miniature forest. Clumps of grass and cattail and young willows and alders create hidden oases for birds and insects, frogs and squirrels.

Stubby fir and hemlock seedlings punctuate the high snowy ridges to the north. Ground-hugging plants break the monotony of gray even on barren, tephra-covered Johnston Ridge, six miles northwest of the crater.

And near Castle Lake, at the head of the debris avalanche that contains the mountain's insides,

willows along the Toutle River's North Fork. Slowly, at its own pace, Mount St. Helens is com ing back

Witnessing and documenting the rebirth of the mountain has occupied a small army of entomologists, zoologists, botanists and ecologists from all over the world since 1980, when scientists descended ed on the area to document the regeneration of plants and animals in a landscape that appeared devoid of life.

The blast area and its borders created a huge, accessible field laboratory where researchers could study what happens when a vast natural landscape is covered with varying depths and textures of volcanic material and all above-ground plant and animal life is destroyed.

The eruption killed an estimated 5,000 black-

REBIRTH, Page 8

INSIDE Scientists investigate Geologists search a living lab/ Page 2 for causes/ Page 3

Survivors remember sheer terror/ Page 6

Visitors await road with a view/ Page 7



A LIVING LAB

A new beginning: Volcano presents scientists with unique opportunity

By RICHARD L. HILL of The Oregonian staff

R2

im Sedell vividly remembers his plunge for science 10 years ago The May 18 eruption of Mount St. Helens had left Spirit Lake a foul-smelling concoction of logs. mud and ash. Methane and carbon dioxide bubbled up from below.

OUT OF THE ASHES

Microbiologists wanted to know what was going on in that murky stew. Sedell, a Forest Service ecologist, went in search of the necessary water samples a few weeks after the eruption. Getting them meant going into the water, "which we found later was chemically similar to a pulp-mill lagoon." Sedell said.

So, after peering at the lake from a hovering helicopter, Sedell took his one small step for biology.

"Part of the reason for jumping was the unpredictability of the volcano at that time," said Sedell, also an associate professor of fisheries and wildlife at Oregon State University. "The helicopter always had to be going because of the danger of another eruption. So, if you were given expensive helicopter time at 300 bucks an hour, you'd better come away with some data. So, that meant jumping into a lake with a sample bottle."

Sedell discovered before the microbiologists that bacteria were thriving in the lake. "I just got overwhelmed by that bacteria. I was sick for two or three days. You're talking about billions of cells

The Indiana Jones approach to data-gathering wasn't exactly sane, Sedell said. "but because of the short amount of time we had to work — and the euphoria of trying to see what was going on - we did a lot of foolish things."

Since the mountain has quieted, however, Sedell and hundreds of other instrument-wielding scientists have been able to take a less hit-and-run approach to their field studies in the area.

More than 500 studies in the past decade have looked at virtually every aspect of the volcano's environment: bacteria, fungi, soils, rocks, plants, trees, insects, amphibians, reptiles, mammals, birds, fish, lakes, streams and ther-



Scientist Gene Iwatsubo of the U.S. Geological Survey (above) measures movement of Mount St. Helens. Don Zobel, an **Oregon State University** botanist, examines tree growth (right) near the volcano. Jim Sedell, a Forest Service ecologist, takes water samples (far right) in Ryan Lake in the blast zone





because often it's very difficult to separate incoming spiders from spiders that were already there."

To get to the inhospitable moonscape, he said many spider species used a method called ballooning. which involves the spiders "trailing long silk threads into the air and being picked up by the wind as if they were kites.'

"Over the study's five-year peri-

spiders. Richard Waitt, a geologist with the Cascades Volcano Observatory in Vancouver, Wash., has focused some attention on the massive water wave from Spirit Lake that swept 600 to 800 feet up surrounding ridges May 18.

"This phenomenon probably isn't very well known, and it was going on while other spectacular things were going on at roughly the ly clean."

gical interactions in a relatively accessible place, said Peter Frenzen, scientist for the Mount St. Helens National Volcanic Monument. "I may be prejudiced because of the amount of time I've spent here, but, in a lot of ways, I think it's the

THE SUNDAY OREGONIAN, MAY 13, 1990



Scientists who have been engaged in research at the mountain are seeking \$900,000 from Congress for a funding base to support ong-term studies

More than \$200 million has been committed to making the monu-

viore man our studies in the pas decade have looked at virtually every aspect of the volcano's environment: bacteria, fungi, soils, rocks, plants, trees, insects, amphibians, reptiles, mammals, birds, fish, lakes, streams and ther-

l springs. Scientists also are continuing to look for answers to complex geologic questions, including earthquakes, eruptions, mudflows and gas emissions. Others have looked at the effects of ash on humans and agriculture.

'The eruption provided a unique situation," said Marvin D. Lilley, research assistant professor of oceanography at the University of Washington.

"It seems like such an incredible disaster, yet it's a totally natural phenomenon that obviously occurs in this part of the world often," said Lilley, who has participated in studies of thermal springs and the area's lakes.

"I'd say the aquatic systems recovered more quickly than I would have expected in mid-1980," he said. "They also recovered more quickly than the terrestrial systems

Lilley's colleague, John Baross,

study primitive archaebacteria microorganisms that are thought to have existed since the earliest times of Earth's history, and that thrive on a diet of noxious gases such as methane, carbon monoxide and hydrogen sulfide. These ancient and exotic microorg exist in volcanic areas and in hydrothermal vents deep on the ocean floor. The springs give scientists a look at conditions that existed during the early stages of the development of life on Earth.

Studies of the near-barren pumice plain have brought new insights into small creatures and how they disperse and colonize new areas

"By blowing up, Mount St. Helens did biologists a tremendous favor," said Rod Crawford, spider expert with the Burke Museum at the University of Washington. "It created a completely sterile habitat where we could watch the development of a new ecosystem from Day One.'

Crawford said he focused on the blast zone, where no native spiders survived. "That meant that any spiders that we caught there must have come in on the wind. And that provided a golden opportunity,

used a method called ballooning, which involves the spiders "trailing long silk threads into the air and being picked up by the wind as if they were kites.

"Over the study's five-year peri-od, we picked up well over a 100 species of spider that had ballooned in, which was easily the longest species list of ballooning spiders ever assembled for any one spot in the entire world," Crawford said.

"But probably the most interesting result was the quantity of spiders arriving by air, which actually was enough to equal the number of spiders that you would catch in the same sort of traps where there were native populations: In other words, they are falling out of the sky all of the time.

Crawford estimated that 2 million spiders fell per square mile each day from June to October 1983. The prevailing wind swept more than 75 spider species to the Toutle Valley, home of the pumice plain, from the western Washington lowlands 30 miles to the west. He even found 10 spider species that had blown in from as far as 200 miles east.

Studies haven't been limited to the tiny dimensions of bacteria and basin. The slopes were rinsed near-

Sive water wave nom Spirit Lan that swept 600 to 800 feet up surrounding ridges May 18.

'This phenomenon probably isn't very well known, and it was going on while other spectacular things were going on at roughly the same time," Waitt said. The volcanic blast was preceded by the avalanche that swept down the mountain's north side. But the blast's velocity overtook the landslide in the lower flank of the volcano, he said.

"So, if you were at Spirit Lake on May 18th and could have somehow survived all of this, the first thing that you would have felt was this density current — this so-called blast — sweeping through," he said. "That's what knocked the timber down. And then the second thing would be the landslide coming in and smashing into the lake.

"This hit the lake so forcefully that it displaced the lake water and pushed it up to the north and to the east, where it swirled around the basin. In the process, it removed all of the timber that had been just laid down by the blast.

"Then that water - now carrying the timber — catastrophically flowed back into the Spirit Lake

accessible place, the Mount St. Hel-zen, scientist for the Mount St. Hel-ens National Volcanic Monument.

"I may be projudiced because of the amount of time I've spent here, but in o lot the amount of time i receptor here, but, in a lot of ways, I think it's the best place anywhere to see the basic concepts of biology and geolo-gy. They're way billouting and geology. They're readily visible in an area where a large-scale geologic event set back the biological system.

Frenzen likes to refer to the mountain as a "living laboratory," where visitors, as well as scientists, can watch the area rebuilding.

He said the monument will serve as a kind of environmental teaching laboratory for the public. "Given the simplicity of the system here and the ability to watch it change one step at a time, we'll have the ability to watch a forest created one brick at a time. That makes it an excellent place for people to learn how the forests of the Cascades developed and how ecosystems function.

The intent behind the 110,000acre monument is to let the area proceed as naturally as possible, Frenzen said.

Bringing in large numbers of visitors could influence the early

tain are seeking \$900,000 from Con gress for a funding base to support long-term studies.

More than \$200 million has been committed to making the monument more accessible to the public, but the information needs to be continually updated for the public to be informed about the ongoing changes, Frenzen said. Fred Swanson, a professor of

geology and forest science at Oregon State University and a U.S. Forest Service geologist, said research money of almost \$1 million a year in the early 1980s has dwindled to "just a small fraction of that," he said

Research on Mount St. Helens has become routine and the thrill may be gone, "but the biology is still there," Swanson said, and needs to be continually followed.

Frenzen agreed, saving the initial excitement over the 1980 eruption may have waned, but the comeback of the ecosystem is important to document. "Rather than being a textbook sequence, what we see is a very active trialand-error process," he said.

"The story of Mount St. Helens is still very much unfolding.'

Slicing through time: Discovering secrets in the volcano's past

By RICHARD L. HILL

of The Oregonian staff



By cutting through debris-buried logs on Mount St. Helens, he also slices through time, uncovering the tale of the volcano's tumultuous past. That past gives a possible indication of what to expect in the future.

Yamaguchi is a dendrochronologist, a scientist who uses the growth rings of a tree — one for each year of its life - as a scale for counting time. His work suggests that the mountain erupted for four centuries before 1857 — the last explosion before 1980 — indicating that the latest event may portend a long eruptive cycle.

Yamaguchi, now at the University of Colorado's Institute of Arctic and Alpine Research in Boulder, received his doctorate in forestry from the University of Washington. Three years ago, he spent a year as a postdoctoral fellow at the U.S. Geological Survey's Cascades Volcano Observatory in Vancouver, Wash., where he pursued his on-going tree-ring study.

Geologists have identified several eruptive periods in the last 4,500 years, determining that Mount St. Helens has been more

David Yamaguchi

"The general picture over the last 500 years or so is a volcano that was periodically active from 1480 until 1857.... Something was happening every century."

active and explosive than any other volcano in the 48 contiguous states.

The most recent eruptive periods before 1980 were from about 1500 to 1660 — the Kalama eruptive period - and from 1800 to 1857 — the Goat Rocks eruptive period.

"The question was whether there was a quiet gap between those eruptive periods," Yamaguchi said in a telephone interview. 'What this work shows is that was not the case.

"The general picture over the last 500 years or so is a volcano that was periodically active from 1480 until 1857. It wasn't every year and not every decade, but something was up, something was happening every century."

Some trees are killed when the

volcano erupts, either by the blast, mud flows or from hot ash and debris. By comparing the distinctive growth-ring patterns of those trees to a master list compiled from other trees in the area that have survived for as long as 900 years, Yamaguchi can determine the exact year the euption occurred. Occasionally, if the tree died during the growing season, he can estimate the month of the eruption.

With the aid of a microscope, individual tree rings are measured to one-hundreth of a millimeter, allowing them to be precisely matched with the master series.

Approximate dates of past erup tions have been determined by other scientists using carbon 14 dating techniques. Yamaguchisaid that because of complex measuring and analysis problems, a carbon 14 age is usually only good to within about 100 or 200 years on either side of the actual date.

If he cannot find an exact corresponding tree-ring pattern, he uses a computer data set, which has a continuous record of the tree-ring pattern from the volcano that goes back 900 years.

In addition to Mount St. Helens, Yamaguchi has examined trees that appear to have died abruptly in the 1680s on the Southern Washington coast. His research provides additional evidence for the theory that massive earthquakes have struck the region in the past and could do so again.

Yamaguchi said he is continuing to work on Mount St. Helens projects when he has time.

"I'm still working on things there," he said. "There's a key deposit southwest of the volcano that we really want to know what the dates are. . . . it was a hot pyroclastic flow that came down into the Columbia River valley sometime I think in the 1480s or 1490s, but I just haven't gotten back to looking at the exact date of that last one yet.

"The whole idea is to understand how volcanoes work, and it provides just one more piece of the puzzle," he said.

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Mount St. Helens erupts on May 18, 1980, sending a colossal column of ash and gas more than 131/2 miles into the atmosphere.





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OUT OF THE ASHES

A LIVING LAB

Landslides and earthquakes: The mechanisms of a volcano lurch into motion

By RICHARD L. HILL of The Oregonian staff

THE VOLCANIC CASCADE MOUNTAINS

or the past 10 years, geologists have examined the events of May 18, 1980, for a better understanding of a volcano's intricate mechanisms and the variety of hazards it presents.

"The thing that stands out the most about the May 18th eruption was its distinctive style," said Steve Brantley, a geologist at the U.S. Geological Survey's Cascades Volcano Observatory in Vancouver, Wash.

"The volcano didn't simply 'blow its top,' as most people think," he said. "Most of the material that was removed during the day fell off of the mountain in a giant landslide. It was the landslide that uncorked the volcano's internal pressure, giving rise to the blast.'

For two months before the eruption, the mountain was shaken by thousands of earthquakes as magma slowly worked its way up into the volcano.

"All of those earthquakes that occurred — more than 10.000 of them — were the result of this magma fracturing rocks of the older volcanic cone," Brantley said. "They weren't the result of a single fault, but hundreds of thousands of fractures and tiny faults in the volcano itself."

The magma heated the inside of the mountain, and March 27 an eruption of steam and ash blew a 250-foot-wide crater in the summit. A bulge developed on the northern slope, and its walls continued to swell and steepen, making a landslide inevitable.

About 20 seconds after 8:32 a.m. on May 18, an earthquake registering 5.1 on the Richter scale rocked the mountain. The unstable north flank plunged away in the largest landslide ever witnessed.

As the huge mass slid off, the tre mendous pressure inside was unleashed. "The thing just blew," said Edward Taylor, a geologist at Oregon State University. "The water held in cracks in the mountain flashed to steam.

By then, the top "was shaped like an amphitheater," Taylor added, "so instead of blowing straight up, it blew sideways.' Brantley said by studying the



Mount St. Helens and similar deposits at other volcanoes, "we have come to realize that the catastrophic collapse of one side of the volcano is much more common than had been realized."

The lateral blast — as hot as 570 degrees Fahrenheit — accelerated from about 220 mph to 670 mph, devastating a 150-square-mile area. It sped past the landslide, toppling trees up to 19 miles away. The slide crashed into Spirit Lake, sending a wall of water as high as 800 feet up

The mountain began to spew a massive column of ash 131/2 miles into the atmosphere. Some 540 million tons of ash spread over 22,000 square miles in three days, and circled the Earth in 15 days.

Two mudflows became the next elements of destruction.

The first flow in the morning did little damage, according to Thomas Dunne, professor of geological studies at the University of Washing. ton. Hot ash melted ice and snow as it rolled down the mountain, trigRiver's South Fork.

The second mudflow that afternoon was more destructive. The massive landslide at 8:32

a.m. broke into three slices, with the middle one shattering when the mountain exploded. "Glacial ice in the middle slice was fragmented into blocks smaller than a meter," he said. "They came to rest on a landslide deposit that had been heated by volcanic gases. After 41/2 hours, the ice melted. Then, gases streaming up the volcano's throat

gling the wet landslide debris. The shaking of the saturated mud liquefied it, and it started to flow.' The mud passed through housesized chunks of ice from the first landslide slice. This flow, lasting six hours, contained more than 130 million cubic yards of debris enough to fill 13 million cement mixers. The mud, more than 30 feet deep and five football-field lengths wide, pushed through the valley at 15 mph, engulfing roads, bridges and homes on its way to the Columshipping channel.

Five smaller explosive events occurred during the summer of 1980, producing ash plumes 5 to 8 miles above sea level and sending pyroclastic flows - streams of hot ash, pumice and rock — down the volcano's north flank.

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From Oct. 16, 1980, to Oct. 21, 1986, eruptions formed a lava dome in the crater of Mount St. Helens. The dome now stands 920 feet above the crater floor and is about 3.330 feet wide. Hundreds of small emissions of ash and gas have occurred from small craters and fractures on top of the dome.

Although the mountain has been relatively quiet since 1986, small earthquakes rumble beneath the volcano almost daily, Brantley said

He said daily monitoring of the volcano is the major aspect of the research program at the observatory. Scientists keep tabs on earthquakes, gas emissions, tilting and cracking of the ground, and the formation of faults.

"By using all of these different types of observations, we've been able to pinpoint the time when we expect the volcano to erupt," Brant-ley said. "We have been able to predict 19 of the past 21 eruptive episodes of the volcano that have erupted new magma on to the surface."

Brantley stressed that predicting eruptions is based on recognition of a pattern, "not that we inherently know what the volcano is doing or how it erupts.'

Although the observatory has been successful in predicting upcoming eruptions at Mount St. Helens because of its distinctive pre-eruption pattern, Brantley said the same pattern cannot be applied to other volcanoes. "Each volcano apparently displays its own peculiar pattern of activity. Sometimes there is no pattern that can be detected by current monitoring techniques.'

Geologists say it is difficult to predict which of the other Cascade volcanoes will erupt next, or whether Mount St. Helens will explosively erupt again in the near future. But with the knowledge gleaned from the past 10 years' study, scientists have a better idea of what clues to look for.

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mountain exploded. "Glacial ice in the middle slice was fragmented into blocks smaller, than a meter," he said. "They came to rest on a landslide deposit that had been heated by volcanic gases. After $4\frac{1}{2}$ hours, the ice melted. Then, gases streaming up the volcano's throat caused the mountain to shake, jig-

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1980," Brantley said.

Recovery: Time, water resurrect Spirit Lake

By RICHARD L. HILL of The Oregonian staff

efore Mount St. Helens erupted in 1980, Spirit Lake was a typical high Cascades lake: clear, scenic, cold. In the summer, visitors sought out the serenity and beauty of the 2-square-mile lake. Around its forested edges, they camped, hiked and picked the seemingly inexhaustible supply of huckleberries. Canoeists shared the lake with fishermen angling for trout stocked in its 200-foot depths.

On May 18, however, Spirit Lake, less than four miles northeast of the peak, was transformed into a murky, virtually dead body of water in seconds.

The north flank of the mountain fell away and part of it surged into and across the lake, raising its bottom by 295 feet and the elevation of the lake's surface by about 200 feet. Thousands of trees blown down in the eruption formed a drifting log mat at the northern end.

Spirit Lake, no longer fit for artists and fishermen, became a unique environment for scientists.

"It is a once-in-a-lifetime opportunity to document the ecological recovery of this system," said Douglas Larson, a lake scientist with the U.S. Army Corps of Engineers who directed a \$1 million study at Spirit Lake from 1983 to 1986. In addition, he said, it provides scientists a look at the way lakes have developed in the volcanic history of the Northwest.

The only life in the polluted environment was bacteria, which reached a level thought to be unprecedented for natural lakes. Among the tiny organisms were Legionella, the bacteria that causes the sometimes fatal Legionnaires disease

The lake was anoxic - deprived of oxygen - with high concentrations of sulfides, methane, iron and manganese along with dissolved organic matter. Only the bacteria multiplied, "feeding on the metals that had been dumped in the lake.' Larson said



A new Spirit Lake sits on the surreal landscape beneath Mount St. Helens

Larson has found, however, that the lake is making a comeback.

"Even within a year or two things had changed dramatically," he said. "I attribute this to the massive influx of fresh water.... This overwhelming influx of snowmelt and runoff water was adequate to dilute the waters, then we began to see sharp increases in phytoplankton and zooplankton, and things returning to what things were presumably like before the eruption."

Many of the floating trees sank, with their roots pulling the logs into upright positions as they submerged. Sonar equipment has detected an underwater forest of about 20,000 of these upright trees.

Larson returned to Spirit Lake last September and found the lake's clarity had improved to near preeruption levels. One could see about 25 feet into the water.

There are no plans to reintro-

duce fish to the lake, said Peter Frenzen, scientist for the Mount St. Helens National Volcanic Monument. "At St. Helens you have the opportunity to look at lakes that will be allowed to proceed naturally to see how the systems evolve in the absence of fish.

The discovery of Legionella bacteria raised concern about the danger to people working or hiking through the area.

Michael Glass, a microbiologist with Washington state's Office of Public Health Laboratories, found high levels of the bacteria at several sites in Spirit Lake and also in Coldwater Creek and the Toutle River.

Thirteen Legionella species were found, including two new ones, which were named Legionella sainthelensi and Legionella spiritensis.

A report by Glass and Larson

MOUNT ST. HELENS: THE VOLCANO

Just two weeks following the eruption, The Oregonian published a special 46-page book, "Mount St. Helens, The Volcano." The book, a best-seller in the Pacific Northwest, sold nearly 225,000 copies

After 10 years, The Oregonian is again pleased to offer readers the opportunity to own this dramatic photographic account of a remarkable event

The book is available for \$3 in limited quantities beginning Monday, May 14. To purchase your copy, stop by our main lobby at 1320 S.W. Broadway, Monday-Friday from 9 a.m. to 5 p.m.

said that the high levels of the Legionella bacteria "represent an unknown but possibly significant public health threat," and urged continued monitoring of the bacte-

No additional monitoring has been done, Glass said. "I don't think the questions ever got answered whether the bacteria really did present a risk to people. ... I assume people aren't getting sick because we don't hear about

Glass said the highest risk would come from people with previous health problems walking in areas where spray from waterfalls or hot springs might carry bacteria that could be inhaled.

"That tends to be the way Legionella is transmitted," he said. "You can drink a ton of the stuff and you're OK, but if you inhale it, it gains a foothold.'

Frenzen said no easy access would be provided for visitors to go. near high-risk areas. "Even if we put a trail in, it would be a difficult trail, so that the least tolerant individuals would be edited out by not being able to get there."

Larson said little research has been done on the lake since 1986 because of lack of money - and that's a problem

"We're not going to have an opportunity to study a lake like this again," he said.

health effects are likely to be," Buist said.

hen a volcano goes off anywhere in the world, Dr. A. Sonia Buist can expect a call. So can Dr. James H. The research they did after the

1980 eruption of Mount St. Helens provides the most solid data available to residents caught in similar disasters and health officials trying to cope with them. "They all want to know the same

Health threats:

Psychiatric impact

lingers far longer

thing: A volcano has erupted in their back yard, and they want to know what

By OZ HOPKINS KOGLIN

of The Oregonian staff

Shore.



BUIST she's been on

the line to people concerned about the Redoubt Volcano in Alaska.

Shore, former chairman of psychiatry at OHSU, headed a team that studied the psychiatric effects of the disaster. He is now superintendent of the Colorado Psychiatric Hospital in Denver.

Buist was principal investigator in a five-year, \$2 million study that looked at the health effects of volcanic ash.

When people call about an erup tion. Buist tells them to find out what the volcano is spewing. For example, she advises that a complete analysis be made of the ash, particularly of how much crystalline silica it contains. Depending on whether the particles are large or extremely small, the silica is the most important and potentially dangerous ingredient in ash. The smaller the particles, the worse the

threat. "So you have to look at the ash and what it consists of and take some measures of the gas vapors, and from that you can predict fairly precisely what the physical

In general, researchers questioning the acute and chronic effects of exposure to Mount St. Helens' ash found reassuring answers. From human and animal

studies, the investigators concluded that exposures after a volcanic eruption would be too low to pose a serious threat of developing respiratory disease.

Moreover, the acute effects of volcanic ash on the eyes and respiratory tract went away when people were no longer exposed to it. And inhaled volcanic ash did not appear to have a serious, long-term effect on children or the elderly.

The psychiatric impact of the Mount St. Helens eruption was less reassuring, however.

Shore said a four-year follow-up showed some people were experiencing post-traumatic stress reaction, a psychiatric condition similar to that afflicting some Vietnam War combat veterans, and rape or accident victims. He expects that now, 10 years later, a small percentage of residents of the affected rural Washington logging communities may suffer recurrences of the reaction.

Shore said the Mount St. Helens psychiatric study was the only one to show a dose-response relationship to the stress of a disaster: The more stress people underwent, the sicker they became.

Unfortunately, the study found that the mental-health services placed in the community after the disaster did not reach any of the people with major psychiatric disorders caused by it. As it happened, emergency mental-health services went to existing agencies and reached people who already received such services.

Overall findings of the study suggested that most of the psychiatric effects of the eruption occurred in the first two years after the event. However, four years after the eruption about one-seventh of the people in the high-exposure population suffered post-traumatic stress, and a few experienced depression and general anxiety related to the erup-1 tion

DEVASTATION TO REBIRTH

Windy Ridge Interpretive Site: Nearly 500,000 people visit Windy Ridge and other interpretive sites each year.

ON THE MOUNTAIN

Lava Canyon: Once hidden by a forest of moss, fern and tall evergreens, Lava Canyon was scoured by powerful mudflows. Today the canyon displays lava outcrops and spectacular waterfalls

Pine Creek Information Center Muddy River Muddy River viewpoint: : frie South of the volcano along F Lava Dome: A 920-foot-tall Old-growth forests: Tall, mound inside the the trees covered the lands Forest Service Road 25, bi 2,000-foot-deep crater, the before the eruption. Vis visitors can see boulders can see remaining old stands at Cedar Flats lava dome was formed and debris carried many through a series of miles from volcano the by "dome-building eruptions" Natural Research Area mudflows. the Pine Creek Informa since the summer of 1980. Each eruption adds a new Station. lobe or layer of volcanic rock to the the existing dome. Mount St. Helens Mudflows Castle Lake Trees removed by blast Elk Rock

The May 18, 1980, eruption created a bizarre moonscape around Mount St. Helens of mudflows, blown-down forests, lava outcrops and braided streams. Use this page to discover the history of the mountain, the story of the eruption and the geologic features 10 years later.

Chunks of ice followed by ice-cold mudballs and ash fell on witnesses.

R4

OUT OF THE ASHES

Norway Pass: Hikers get an outstanding view across Spirit Lake into the crater from Norway Pass. They reach the viewpoint by hiking 2.5 miles on the Boundary Trail, beginning along Forest Service Road 26.

Ghost Lake: At the edge of the blast area, singed trees killed by the eruption stand like silent sentinels. This lake, one of many within the national monument, still flourishes with aquatic life, and provides solitude for hikers who explore trails and viewpoints near the volcano.

LOCATION OF MOUNT. ST. HELENS

Morton

Sprirt Lake

Bear Meadow

Iron Cree

Spirit Lake

Hanaford Lake

Elk Lake

Coldwater Lake

Fawn Lake

THE SUNDAY OREGONIAN, MAY 13, 1990 •

THE SUNDAY OREGONIA



40,000 years ago: Mount St. Helens, the youngest of all Cascade volcanoes, is born. Intermittent eruptions continue until about 500 B.C. 1550: Mount St. Helens begins almost non-stop eruptions for nearly a century. 1842: Fifteen years of intermittent

eruptions begin. After 1857, the volcano remains relatively quiet for 123 years. March 20, 1980: Earthquake

measuring 4.0 on Richter scale shakes Mount St. Helens.

Mount St. Helens began growing during eruptions 40,000 years ago



March 22: A second major

- 7,000 feet high. Mile-long crater forms at summit. North flank begins to bulge.

NORTH

March 28: Second eruptive explosion at 2 a.m. lasts two hours and spews ash to the east. By nightfall, at least a dozen more eruptions occur. March 29: Second crater forms at the summit. April 1: Harmonic tremors begin. Magma moves through mountain's core. North slope begins swelling. Ash dusts communities 50 miles away.

The last major eruption was in 1857

April 3: State of emergency declared. Strong quakes, tremors and avalanches agitate peak. April 8: The two craters merge near the summit. Bulge on north flank

extends outward 320 feet and moves at rate of 5 feet per day. April 22: Eruptions temporarily cease.

ril 30: Washington Gov. Dixy Lee Ray closes area within 10 miles of volcano.

May 8: Strongest pre-eruption quake, 5.0 on the Richter scale, jolts mountain. Harmonic tremors cease.

May 12: Another 5.0 quake jolts mountain.

May 14: Last minor eruption before May 18.

May 18: At 8:32 a.m., an earthquake of 5.1 magnitude causes a landslide on the north flank. The mountain erupts in a blast of rock, ash, gas and steam that sweeps 670 miles per hour over the landscape. The top 1,377 feet of the mountain was blown away. Fifty-seven persons die.

Mount St. Helens unleashes its fury on May 18, 1980

May 19: Volcanic debris closes ship traffic in the Columbia River. May 22: President Carter declares portions of Washington and Northern Idaho disaster areas after they are covered with up to 8 inches of ash. May 25: Volcano erupts again, sending lightning-tinged plumes to 45,000 feet and depositing ash over wide area of western Washington and Oregon.

921

Starting with an earthquake and major avalanche on the north side

June 12: Third major eruption casts ash over large part of th Northwest. Lava dome begins form in crater.

July 14: Fourth major eruption blasts a new hole through the lava dome.

Aug. 7: Fifth major eruption. Dome rises again in crater. Aug. 27: Water spills over debr dam on Marrata Creek and moves down the North Fork of the Toutle River, destroying temporary bridges and parts of access roads.







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92

Oct. 18: Sixth major eruption spews light ash from Portland to The Dalles. New lava dome emerges at dramatic rate. By next day, it grows to 130 feet in height.

March 19, 1982: A minor explosion sends mudflow from the crater six miles to the North Fork of the Toutle River. The flows wipe out a temporary debris-retention dam above Camp Baker.

Followed by a lateral blast

Feb. 5, 1982: The U.S. Forest Service reopens most of the devastated area around Mount St. Helens to visitors. Sept. 1, 1982: Congress creates 110.000-acre Mount St. Helens National Volcanic Monument, to be managed by the U.S. Forest Service.

September 1984: U.S. Army Corps of Engineers begins 8,000-foot tunnel to drain Spirit Lake, dammed with debris by the eruption.

1985: The U.S. Geological Survey concludes that a debris dam behind Castle Lake is only "marginally stable." It says failure of the dam could create mudflows up to five times worse than the 1980 flood. April 1986: Volcano spews

ash plume up to 30,000 feet high for four days.

Then the explosive eruption

Helens is missing its upper north side.

vents magma.



OUT OF THE ASHES

DEALING WITH DISASTER

Planning: Blast gives disaster managers guide for next event

By PAUL KOBERSTEIN of The Oregonian staf



R6

blew up, officials weren't ready for it. They think

'The experience of Mount St. Helens gave everyone a pretty good idea of what the potential was, said Tom Warden, spokesman for the Oregon Division of Emergency Management.

'We now have an annex to the state emergency plan for dealing with volcanoes," he said. "But there are many unknowns about that kind of a catastrophic event, so the plans have to be rather general.

Ten years ago, emergency response officials in Washington had only sketchy information on what a major volcanic eruption might do - and they had no systematic plan to deal it.

"People weren't prepared for Mount St. Helens," said Richard Buck, a manager in the Federal **Emergency Management Adminis**tration's disaster response office in Seattle.

The eruption sent a steaming torrent of mud. rock and water down the Toutle River Valley, destroying everything in its path for 17 miles. A super-hot blast of gas and ash leveled miles of timber. Fifty-seven persons died. The eruption caused more than \$1 billion in damage, at last count.

'We were dealing with a lot of unknowns, and we made a lot of mistakes," said Terry Simmonds, who has been chief of Washington's Mount St. Helens response effort since the eruption.

Hugh Fowler, who became director of the Washington Department of Emergency Services in 1981, found in a review that public agencies were slow to realize the volcanic hazards in the Northwest, which left them too little time to draw up emergency plans and coordinate their responses.

He also concluded that communications breakdowns led to delays in response time and needless duplication of effort.

From the beginning, Fowler said, search and rescue should have been a coordinated effort among counties, the state and federal agencies. Instead, he said local elected officials waged turf battles while state and federal



Bruce Nelson now lives in Longview with his wife, Traci, and daughter, Marianna. "You don't realize how much you want to live," he says, "until you think you're going to die."

SURVIVORS: BRUCE NELSON

Camping trip turns into nightmare when mountain erupts into monster

fallen down on us.'

on a scorched tree.

By KATHIE DURBIN

of The Oregonian staff

ONGVIEW, Wash. - Bruce Nelson will commemorate the 10th anniversary of the Mount St. Helens eruption as he has every other: by putting flowers on the graves of Terry Crall and Karen Varner.

Since that hellish day 10 years ago, when he lost his friends in the seconds after the volcano erupted, Nelson has followed the simple annual ritual.

On May 18, 1980, Nelson and his girlfriend Sue Ruff saved themselves and rescued another companion by walking for 14 hours through hot ash and fallen trees from their campsite on the Green River, 14 miles northwest of the mountain

Nelson learned that day that life is a gift.

The Oregonian/STEVE DIPAOLA

"You don't realize how much you want to live until you think you're going to die," he says.

Nelson is a lean, athletic 32year-old now, brimming with optimism and a love of the outdoors that the disaster hasn't dimmed. He's married to 25-year-old Traci and has a 15-month-old daughter, Marlaina. He has moved on with his life

But he can close his eyes and remember as if it were yesterday the black ash cloud that darkened the morning sky, the wave of withering heat, the stone wind that

of dust and ash, without food or water, until a helicopter pilot spotted them and picked them up near dusk. "All day long we didn't know if we were going to live," Nelson says. "It was a whole day of fear. I never found God, but I did pray. It made me feel how strong Mother Nature is. She put us here, and she

son said. "And it was amazing how hard it was to find them on the 18th.

After the eruption, only the National Weather Service told people where the ash was headed, Buck said. Other agencies weren't prepared to warn people about the consequences. Once the ash cloud began descending on unwary Eastern Washington towns. Buck said.

SURVIVORS: JAMES SCYMANKY The day the world turned black **By PAUL KOBERSTEIN** of The Oregonian staff

THE SUNDAY OREGONIAN, MAY 13, 1990

snapped entire forests to the ground in an instant and turned a lush green landscape into a moonscape drained of color.

"If you talk to me about any part of it, I can see it like a camera," he said, sitting in his living room on a quiet Longview street. "All of a sudden the blue sky turned into a monster. All the timber came down so fast, in the snap of a finger. We fell into the hole where the trees were uprooted. We thought the whole hill had

Fate was kind to Nelson and Ruff. Trees covered the opening like giant pickup-sticks, shielding them from the holocaust above.

But Varner and Crall's tent had been hit by a tree, and Nelson couldn't find them in the rubble. Two others in their camping party were injured — Brian Thomas, who suffered a shattered hip, and Dan Balch, who burned his hands

With their four-wheel drive rig blocked by fallen trees. Nelson and Ruff trudged through clouds

can take us off."

They returned for Thomas that evening. Balch had been rescued earlier in the day.

Five days later, Nelson guided rescue crews back to the ash-covered, tree-littered campsite, hoping to find Varner and Crall alive.

Instead, rescuers found their bodies still in the tent. And they found Terry Crall's German shepherd and her three pups alive. Nelson kept one of the pups, Dusty.

Nelson and Sue Ruff were married in 1983, but they divorced three years later.

After a stint in Alaska, Nelson is back in Longview, at the same bakery where he worked 10 years ago. He still camps every year on the Green River at a spot where he can look up the canyon and see the old campsite where his friends died

"It was one of my favorite places to go," he says. "The ground was so thick with moss it was like a carpet."

Nelson has become close to Crall's parents, who are like grandparents to his daughter. But they never discuss the eruption's tragic toll.

With others, however, Nelson speaks freely about that day 10 years ago.

"I don't mind talking. People should know. I saw something that nobody else has seen.'

duplication of effort.

From the beginning, Fowler said, search and rescue should have been a coordinated effort among counties, the state and federal agencies. Instead, he said local elected officials waged turf battles while state and federal agencies jostled for major roles.

That led to several days of delay in the organized search for the dead, although he and other officials said none of the dead victims could have been saved with a quicker response.

Both geologists and the mountain itself issued warnings before May 18.

In 1976, Dwight Crandall and Donal R. Mullineaux, two U.S. Geological Survey scientists, predicted Mount St. Helens would re-awaken before the end of the century.

"Mount St. Helens probably will erupt violently and intermittently just as it has in the past, and these future eruptions will affect human life and health, property, agriculture, and general economic welfare over a broad area," the two geologists wrote.

The Geological Survey issued its first official notice of the potential hazards of an eruption at Mount St. Helens in December 1978. Despite this warning, no one — not local government agencies, the state of Washington or the federal agencies - prepared any emergency plans to deal with an eruption at that point.

"If public policy-makers had paid attention to the Geological Survey report even one year prior to the May eruption and had committed the appropriate resources to the planning effort, government agencies at all levels would have been much better prepared to deal with the events that occurred immediately before and following the May 18 eruption," Fowler wrote.

In March 1980, Mount St. Helens started shaking and spouting ash. raising concern that a major eruption might occur. Geological Survey scientists concluded in April that the odds of a significant eruption had substantially increased, but the agency itself did not make that judgment, according to USGS geologist Robert Wesson, who reviewed the agency's performance during the disaster.

The planning that was done was uncoordinated. For example, Fowler said, the Cowlitz County sheriff's department made warning and evacuation plans without the knowledge of the county Department of Emergency Services. And Fowler concluded that the Federal **Emergency Management Adminis**tration failed to exert its proper role of coordinator among several federal agencies

Les Nelson, who retired in 1986 as Cowlitz County sheriff, agreed with Fowler. "It was amazing how many people were in charge," Nel-

After the eruption, only the National Weather Service told people where the ash was headed. Buck said. Other agencies weren't prepared to warn people about the consequences. Once the ash cloud began descending on unwary Eastern Washington towns, Buck said. residents got little advice on how to

deal with it. Buck said agencies did issue accurate warnings that an eruption could cause mudflows. And as the towering flows roared down the valley, thousands evacuated their homes

However, he said those agencies failed to keep sightseers and Spirit Lake property owners out of harm's way. An unknown number of them died at a roadblock set up by the Cowlitz County sheriff's department about 10 miles west of the volcano.

But Nelson, then Cowlitz County sheriff, defends his agency's response.

"We were as prepared as could be expected," he said. "But people thought it was going to be like a big Roman candle, shooting fireballs into the night. They didn't take the danger seriously.

President Carter declared the volcano a national disaster three days after the eruption. That made the area eligible for federal disaster aid, which continues to pay for ongoing projects, including the just-finished dredging of the Cowlitz River.

Federal payments through April 1990 amounted to \$950 million, Simmonds said.

Immediately after the blast, Oregon and Washington developed plans for dealing with future eruptions at Mount St. Helens. And Washington has new plans for Mount Baker, a Northern Cascades volcano that has shown signs of life in recent years.

The disaster also led to specific plans for responding to an eruption at Mount Hood. The Mount Hood Interagency Volcano Plan would coordinate efforts among the U.S. Forest Service, Federal Emergency Management Administration, Oregon Division of Emergency Management, Clackamas, Hood, Multnomah and Wasco counties, and the city of Portland.

If Mount Hood did erupt, the Mount Hood National Forest headquarters in Gresham would serve as the command post where officials would coordinate the response. In case the mountain gave early warnings of an eruption, the Forest Service would order an evacuation of ski resorts and other

federal property. "You'd probably have people mad, just like on Mount St. Helens, because their finances are involved," said Casey Marley, director of emergency services for Clackamas County. "But you'd have to prepare for the worst.'

The day the world turned black

By PAUL KOBERSTEIN

of The Oregonian staff

OODBURN — First came the screams. James Scymanky, Leonty Skorohodoff and Evlanty Sharipoff peered deep into the Douglas firs on the slope above them. That's when they saw the smoke — thick, throat-choking smoke - and Jose Dias, screams spewing from his lips, trying to outrun it.

Moments later, the scalding smoke engulfed the loggers and left them gasping for air.

"It was pitch black," Scymanky says now, sitting in the living room of his Woodburn home. Although Mount St. Helens exploded 10 years ago, Scymanky still remembers.

"I've never seen anything blacker in my life," he says. "Even if you stand in the closet in the middle of the night — it was blacker than that.'

The four men were logging for a Weyerhaeuser Co. contractor 13 miles northwest of the volcano's peak Sunday, May 18, 1980. Skorohodoff and Sharipoff belonged to the Old Believers of Marion County, descendants of Russian Christians who follow the rituals of the Russian Orthodox Church.

Scymanky, the only member of the crew who wrote or spoke English, often logged with them. Dias, a Mexican national, had recently moved to Mount Angel from Stockton, Calif.

The loggers tried to flee in Skorohodoff's pickup, but the road was blocked by a landslide. The men, their skin raw, burned and bleeding, began hiking down the mountain.

Finally, after nearly five miles of wandering, they tossed themselves in a mountain stream to cool their seared flesh.

Three of the men decided to stay put, waiting for help, but Sharipoff opted to continue. It was the last time anyone saw him alive.

"Evlanty thought he knew the way out," says Scymanky, now 46. "He crawled on his hands and knees in the direction he thought he should go. About an hour later, we saw a huge river of rocks and trees and mud — all steaming and flowing towards where Evlanty had gone."

Eight hours later a Washington National Guard helicopter landed by the stream and rescued Scymanky, Dias and Skorohodoff. They were flown to Emanuel







Skiers cross deep snow on Mount St. Helens. The snow covers a mudslide that roared down the mountain during the eruption.



OUTLE, Wash. — The muddy roadbed slashes into a steep bank above the Toutle River's North Fork. It skirts the vigorous young Douglas fir stands that blanket Weyerhaeuser Co.'s vast tree plantation and climbs steadily to Elk Rock, perched at 4,300 feet.

The Spirit Lake Memorial Highway, now under construction, is a \$140 million engineering tour de force. Built on an unstable volcanic geology of ash, rock and soil, it will take tourists to within 4.5 miles of the Mount St. Helens crater when it is completed in 1994. Congress created the 110.000-acre



Workers build

By LEVERETT RICHARDS Special writer, The Oregonian and PAUL KOBERSTEIN of The Oregonian staff

ount St. Helens hurled millions of tons of rock, mud, ice and trees 17 miles down the Toutle Valley when it erupted in 1980. Mud clogged the Cowlitz River and blocked shipping in the Columbia River 70 miles downstream.

And the U.S. Army Corps of Engineers got the job of cleaning up the mess.

Ten years and \$1 billion later, a dredged scooped the last shovelful of debris from the Cowlitz River in March. The job was finished. Or was it? Some people believe the corps has walked away from a

The Oregonian/1984

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Cleaning up: Much complete, but issues remain

hundred eighty-four feet high, it is designed to stop any volcanic sand, pumice or ash from clogging up the river. A clogged river could flood during normal rains, threatening the thousands of residents of the Toutle and Cowlitz river valleys. It was completed six months ago at a final cost of \$119 million, but it will not be officially dedicated until May 19.

The corps also built an \$8 million fish passage system at the dam. Adult fish swimming upstream to spawn are supposed to be trapped at the facility, trucked upstream around the dam and then released to spawn. But the fish trap clogs with silt and ash, and log debris has accumulated behind the dam, restricting downstream migration of young salmon and steelhead.

For all the corns' dredging da

geology of ash, rock and soil, it will take tourists to within 4.5 miles of the Mount St. Helens crater when it is completed in 1994.

Congress created the 110,000-acre Mount St. Helens National Volcanic Monument in 1982 as a scientific laboratory and national treasure, expanding substantially the U.S. Forest Service's 1981 proposal for an 84,700-acre monument.

The monument already is internationally known by mountain climbers, cross-country skiers and hikers as well as by car tourists.

The soaring Mount St. Helens Visitor Center, opened in 1986 at Silver Lake east of Castle Rock, drew 485.000 visitors in 1989.

But to get close to the blast area, drivers now must go north on Interstate 5 to U.S. 12, east to Randle and south on Forest Service roads to Windy Ridge

"The amount of tourism we've seen in Cowlitz County has been minimal so far because of the lack of access," said Commissioner Van Youngquist. "Once the access is there, I think people are going to come from all over.'

The opening of the new highway will open up the heart of the monument as well — to 1,400 visitors per hour during the peak summer season, according to Forest Service projections. It is uncertain is how the onslaught of tourists will affect the fragile volcanic features and vegetation in the blast area.

"I would like to get people in to see these features," said Charlie Raines of the Sierra Club's Seattle chapter. "But I fear the impact on some geological features could be significant.

The Washington Department of Transportation is rebuilding Washington 504, the old road into Spirit Lake, in stages. The money comes from emergency relief funds appropriated after the 1980 eruption buried the upper end of the original highway.

The new, ridge-hugging highway is scheduled to open to Coldwater Lake in the fall of 1992 and to Johnston Ridge two years later. There, the Forest Service will erect an observatory and pave a section of the blast area to make room for 300 vehicles.

The new highway and the recreational and interpretive features along its route will be the centerpiece of the monument. Views of the crater, the dome, the debris avalanche and the devastation zone will be an hour away from the interstate.

Seven miles down the road, at Coldwater Lake, the Forest Service will build an orientation and interpretive center, a restaurant, restrooms, picnic grounds, trailheads and paved parking for an additional 250 vehicles.

But hikers, mountain-climbers, cross-country skiers and snowmobilers haven't waited for the highway. They began entering the blast area as soon as the U.S. Forest



Service opened it to recreational use, and the agency quickly established a permit system limiting the number of climbers to 100 per day between May 15 and Oct. 31. Last year 15,000 persons climbed the mountain.

Unlimited climbing and access to the blast area north of the mountain is available during winter months, Nov. 1 through May 14.

Sno-parks and ski trails on the mountain's south side are crowded on winter weekends. Snowmobiling has become so popular — and so destructive to fragile areas north of the mountain - that Brad Powell, the monument's manager, recently announced they won't be allowed inside the crater next winter.

But climbers and hikers don't spend a lot of money in the small communities around the mountain Small-business owners along the highway hope its completion will help boost their timber economies.

A 1983 study commissioned by the Washington state Department of Commerce and Economic Development projected a sixfold increase in tourist spending between 1977 and 1990 if the region acted quickly to capitalize on its new tourist attraction.

Although a few motels and gift shops have opened in the Castle Rock area, and a private developer has announced plans to build an Omni Dome theater nearby, winding Washington 504 is not adequate even for the summer tourist traffic jams it gets now.

Butch Brennman, president of the Toutle Community Council, is ambivalent about the changes that tourism will bring to the little mountain community.

"I love it the way it is," he said. 'I hate to see it grow, but we know it's going to. If you have a business, you're eager. But we'll drag our feet as long as we can." Communities on the east side of

the mountain, especially in Skamania County, hoped for a road that would cross the monument, allowing travelers to drive a loop route east and then south to Interstate 84.

The Forest Service rejected that alternative, citing the impact on sensitive geological features in the Spirit Lake Basin.

Still, some people are worried about the level of tourist access that the Forest Service has chosen - and how it will affect the natural processes of recovery occurring in the devastation zone.

In 1985, then-Regional Forester Jeff M. Sirmon signed a final environmental impact statement for the monument calling for a one lane shuttle bus road from Coldwater Lake to Johnston Ridge. But in December 1988, without holding public hearings or notifying all interested parties in writing, the Forest Service changed its plan and decided to allow cars all the way to the ridge.

Robert W. Williams, supervisor of the Gifford Pinchot National Forest, chose the two-lane highway despite findings in an environmental assessment that the two-lane option would remove the most vegetation, destroy the most wildlife habitat, dump the most sediment into streams and pose the greatest risk of trampling and compacting the soil.

The environmental assessment also warned that the two-lane road to Johnston Ridge could produce possible landslides and drainage problems, which in turn might damage the road.

But Powell, the monument manager, defended the decision.

"That watershed is one of the most highly eroded in the nation." he said. "This would have created a very small increase in a very highly erosive watershed.'

As for the possibility of road

Workers build the foundation for \$13 million bridge over Hoffstadt Creek (above), while a buildozer moves earth for the new Spirit Lake Highway (left).

Photos by TOM TREICK The Oregonian

base failure, Powell said: "When you're building roads in country like that, there's always potential for failure. That's why we're spend ing so much time to determine the exact alignment.'

Monument officials said the terrain over which the last leg of high way will be built is more stable than engineers believed in 1985.

But they said tourist preference also influenced their decision to push the road through to the awesome Johnston Ridge viewpoint.

For many families, a charge of \$5 per person for the shuttle would be a hardship, they said. They also cited a one-season experiment running a shuttle from Meta Lake nine miles to Windy Ridge northeast of the mountain as evidence that people prefer to drive.

'Not that many people wanted to get out of their cars," said Wayne Harpel, an engineer on the Coldwater-Johnston project.

Jean Durning of The Wilderness Society questioned whether tourist convenience should be the deciding factor, however.

"It is a worthy goal to increase opportunities for citizens to see this magnificent site," Durning said. "But it's narrow thinking to say we do this by roads because that's the way we've always done it."

Jack Winjum, a professional forester who heads the Mount St. Helens National Volcanic Monument scientific advisory board, said his committee will closely monitor the route of Washington 504 and has recommended closing existing roads in the area once it is finished.

Winjum said the challenge of balancing public enjoyment and minimum disturbance of fragile natural features gets more complicated with greater public access.

"Enforcement is going to become a very important issue," he said. "And I'm not sure the Forest Service has the means to do this."

Ten years and \$1 billion later, a dredged scooped the last shovelful of debris from the Cowlitz River in March. The job was finished.

Or was it? Some people believe the corps has walked away from a serious problem at South Castle Lake, where a natural debris dam holds back 6 billion gallons of water. The corps says the dam is safe: others disagree

The eruption of Mount St. Helens posed a challenge of wartime urgency for the Corps of Engineers. The explosion hurled a billion cubic yards of mountaintop into the atmosphere. Another 3 billion cubic yards, the biggest landslide in recorded history, roared down the mountain into Spirit Lake. Water splashed up surrounding hillsides. as though a big baby had been dropped in a bathtub. When the water drained back down, the lake sat 200 feet higher on piles of debris.

Three waves of debris and mud flowed down the North and South forks of the Toutle River, into the Cowlitz and on down to the Colum-

Debris blocked the shipping lanes of the Columbia and filled the channels of the Toutle and the Cowlitz, threatening to inundate 45,000 residents of the Castle Rock, Lexington, Kelso and Longview areas.

"The next surge from the mountain, or the normal fall rains, would flood them out," recalled Jack Bechly, chief of the operating section of the corps' Portland division. "We had to clear the channel by the end of October if we were to avoid a disaster."

The corps threw everything it had at the problem. It had the Columbia open to ships five days after the eruption. At one point, 60 dredges and other heavy equipment were working the 21-mile stretch of the Cowlitz from the Toutle to the Columbia.

"It was the biggest operation of its kind in the annals of the Army Engineers, as far as we know,' Bechly said. The total cost of dredging the 159 million cubic yards of volcanic debris was about \$233 million.

The corps also oversaw construction of dams on the North and South forks of the Toutle at the foot of the massive landslide from the mountain. Outlet channels were cut to prevent Coldwater and Castle lakes from bursting through the unstable debris that blocked their exits.

To relieve the threat of a huge flood from Spirit Lake, which was rising behind a debris dam, the corps drilled an 11-foot wide tunnel through Harry's Ridge. The 11/2mile tunnel cost \$30 million. It lowered the lake level by 20 feet, where it has remained.

The final step in controlling the volcano came Dec. 5, 1986, when a \$56.5 million contract was awarded for construction of a permanent dam on the North Fork of the Toutle near the town of Toutle. Onethe Army Engineers to make further studies on the Castle Lake dam and the ability of the 184-foot retention dam downriver to control any flood. He also has contracted with the U.S. Geological Survey to monitor the dam and the lake.

"All agencies agree that there is no immediate danger," Powell said. He expects to make a decision in June whether to lower the level of the lake, drain it, or let nature takes its course.

to spawn. But the fish trap clogs with silt and ash, and log debris has accumulated behind the dam, restricting downstream migration of young salmon and steelhead. For all the corps' dredging, dambuilding and tunneling, some officials still think the job isn't finished. They worry about South Cas-

arouna m

tle Lake.

come next fall.

hazards.

and the lake."

Five miles northwest of the summit, the lake was formed when a massive slide cut off Castle Creek, which flows into the North Fork of the Toutle, during the 1980 eruption. Now 11/2 miles long, a quartermile wide and about 60 feet deep, it holds 6 billion gallons of water. The U.S. Geological Survey in 1985 said the debris dam is only marginally stable. If the dam fails, 45,000 Cowlitz County residents face mudflows potentially five times worse than the massive 1980 flood that swept down the Toutle and Cowlitz rivers, according to the Geological Survey.

Although the Survey's warning is not universally shared, authorities such as Susan Huntington, emergency programs manager for Cowlitz County, feel that the threat of a disastrous flood hangs over residents' heads.

To Huntington, it's a question of when the debris dam will fail, not if. A series of events, such as a heavy rainfall followed by a moderate earthquake, could bring disaster, she said. She advocates draining the lake before the rains

"We cannot afford to take no action, with the potential for seismic activity in the area of Mount St. Helens and the instability of the sediment surrounding South Castle Lake," Huntington said. "It could decimate this area.'

Milton Harr, a specialist hired by the Federal Emergency Management Agency, flew to the area June 25, 1989, and agreed on the possible

But the corps studied the lake and in 1986 reported that "the risk in existing conditions is low."

And Alden Jones, a retired Weyerhaeuser Co. engineer and environmental activist who knows the area like his own back vard. says, "It would be sheer political arrogance to monkey with the dam

Brad Powell, manager of the Mount St. Helens National Volcanic Monument, has contracted with

OUT OF THE ASHES

no

Rebirth: Blast naturally creates a field laboratory

BIRDS

Birds survived the eruption only

at the edge of the blast zone, but

many species recolonized the area within days, and geologists working

in the crater were divebombed by

hummingbirds attracted to their

birds in the devastation zone are

white-crowned sparrow. Standing

dead forests provide habitat for the

American robin, hairy woodpecker

SMALL MAMMALS

Many small mammals died in the

The most successful survivor was

the pocket gopher, which weathered

eruption, and others died due to a

loss of food, water and cover.

the blast underground and then

helped new plants take root by

zal fungi to the surface.

food base, have returned.

bringing buried soil and mycorrhi-

Ten years later, species such as

the deer mouse and golden-mantled

ground squirrel, which have a broad

GAME

Large mammals have fully recov-

Before the blast, a herd of 300 to

ered. A major elk herd quickly

moved back into the blast zone as

400 Rocky Mountain elk spent the

the Toutle. By 1985, the herd had

250. Now, some 500 elk spend the

area found good forage, which

West through 1986

encouraged them to reproduce at

in the herd were the highest in the

younger ages. Pregnancy rates with-

A 2,500-acre tract along the upper

North Fork has been purchased by

and will be set aside as a wildlife

the Rocky Mountain Elk Foundation

around.

winter next to the upper reaches of

rebounded from near zero to about

winter and about 100 live there year

Elk moving into the unpopulated

soon as grasses began to emerge from the ash, and deer are plentiful.

raven, mountain bluebird and

and red-breasted nuthatch.

Ten years later, the most common

bright orange flight suits.

Continued from Page One

tailed deer, 1,500 elk, 200 black bears and 15 mountain goats, plus unknown numbers of mountain lions, bobcats, small rodents, birds, fish and insects — and the area's entire population of northern spotted owls.

But in some areas, new life poked through the ash so swiftly that scientists were amazed.

Jerry F. Franklin, a U.S. Forest Service plant ecologist, remembers climbing from a helicopter at Meta Lake northeast of the mountain two weeks after the eruption to see fireweed sprouting among standing and fallen dead trees and newly dug pocket gopher burrows.

Scientists soon discovered beetles, deer mice, fish, frogs and salamanders in the blast area.

A deep snowpack protected many plants that had not yet emerged from their winter dormant state. Scientists say that a midsummer eruption would have produced very different patterns and rates of survival.

Within a year, the devastation zone had been recolonized by mountain bluebirds, gophers and squirrels, and bell-shaped avalanche lilies, trailing blackberry, pearly everlasting, lupine, fireweed and bracken fern carpeted the ashen hills.

Huckleberry branches buried in the ash gradually put down new roots and began to send up fresh shoots as recently as last summer.

One lesson Mount St. Helens has taught scientists is that a volcanic eruption, like most natural catastrophes, does not wipe the slate clean, but leaves a rich biological legacy. In the devastation zone, living organisms, dead plants and animal carcasses helped regeneration occur much more rapidly and vigorously than most biologists expected.

"Survivors were the key," Franklin said recently at a Lewis and Clark College lecture. "They escaped, came back and recolonized. Some areas were almost totally recovered within a year. What the new ecosystems got was a legacy from the old."

Scientists have been intrigued by

REGENERATION

Recovery of the landscape and the reappearance of plants and animals began almost immediately after the Mount St. Helens eruption. Though appearing barren 10 years later, life in the devastation zone continues its slow evolutionary dance, with full recovery still decades away.

Rocky Mountain elk: Returned to graze on young willow along rivers. Population has recovered completely; 500 elk spend winters and 100 live year-round west of the mountain.

> White-crowned sparrow: Now common in the devastation zone.

> > **Woody debris:** Helped control soil erosion, creating sites for plants to become established.



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Scientists have been intrigued by the way in which all of the small, seemingly insignificant parts of the ecosystem are playing key roles in its recovery. Ecologists have gained a new appreciation of how small animals, diverse wildlife and decaying debris work together to restore life to an area devastated by natural or man-caused disturbances.

VEGETATION

Weedy plants such as fireweed and pearly everlasting, which survived in the clear-cuts, and young stands north and west of the blast area, provided a tremendous seed source for colonization of the blast zone. In the fall, millions of cottoncovered seeds from these plants drift over the monument.

Plants grew back first where water eroded the ash into small gullies and exposed pre-1980 mineral soils.

Streamside vegetation is returning rapidly except in areas of continued flooding and erosion. But plant life is recovering more slowly at middle- and low-elevation lakes, and slowest of all at Spirit Lake, where the water level continues to fluctuate wildly.

Recovery has been much slower in the uplands than in low-lying areas. One limiting factor, according to Roger Del Moral, a University of Washington botany professor, is the scarcity of mycorrhizal fungi. The fungi, spread by small rodents, live in the soil and attach to the roots of plants, increasing their ability to take in nutrients.

In the blast area, willows and other shrubs eventually will succeed weedy plants, followed by hardwoods, such as red alder and black cottonwood, and then coniferous trees. Within 100 years, barring another eruption, a mature forest will cover most of the blast area.

INSECTS

Some insect populations were virtually wiped out by mud and debris slides that scoured the streambeds. But many flying insects flew right back in, according to Norm Anderson, a professor of aquatic entomology at Oregon State University.

Populations of many streamdwelling bugs have gone through a "boom and bust" cycle as glacial melt has continued to sweep mud, logs, ash and other debris through streams, Anderson said.

Spiders, beetles, ants and other species came back where there was ample refuge and where plant life survived. encouraged them to reproduce at younger ages. Pregnancy rates within the herd were the highest in the West through 1986.

A 2,500-acre tract along the upper North Fork has been purchased by the Rocky Mountain Elk Foundation and will be set aside as a wildlife sanctuary for the herd.

FISH

The eruption destroyed 77 percent of fish habitat in the Toutle River drainage. It left almost no spawning habitat in the main stem of the North Fork Toutle, once one of the most productive fish-rearing streams in the Columbia Basin, and it wiped out a chinook salmon hatchery on the Green River.

Except for a wild spring steelhead run on the Toutle's North Fork, the anadromous runs — coho and chinook salmon, summer steelhead and sea-run cutthroat trout — are recovering. They have withstood high amounts of turbidity, silt and sediment in the water.

Although it will take decades for the runs to reach pre-eruption numbers, biologists are amazed with results to date, said Rob Jones, a biologist with the National Marine Fisheries Service. Some biologists believe the Toutle's fish have genetically adapted to the extremely hostile, volcanic environment.

In Bear Creek, a North Fork tributary that is buried for about a onemile stretch, cutthroat trout are migrating from one end of the tunnel to the other.

REFORESTATION

Before the eruption, centuries-old forests of Alaska cedar, Douglas fir, noble fir, Pacific silver fir, western red cedar, western hemlock and mountain hemlock covered much of Mount St. Helens.

Those old-growth forests and their inhabitants, including the northern spotted owl, are gone.

No reforestation has occurred on land within the boundaries of the 110,000-acre Mount St. Helens National Volcanic Monument, where natural recovery is proceeding largely without human interference. Fallen dead trees still litter the ground where the force of the blast leveled them, and the spires of standing dead trees cluster in ghostly forests.

But outside the monument, in reforested sections of the Gifford Pinchot National Forest and on the vast Weyerhaeuser Corp. tree farm, the slopes are greening.

Weyerhaeuser lost 68,000 acres of timber, 14 percent of its Longview, Wash.-based plantation.

Between 1981 and 1987, Weyer haeuser planted 18.4 million seed lings on more than 45,500 acres. Today, the once-naked ridges are thick with young Douglas firs and other species.

