CORPS'PONDENT

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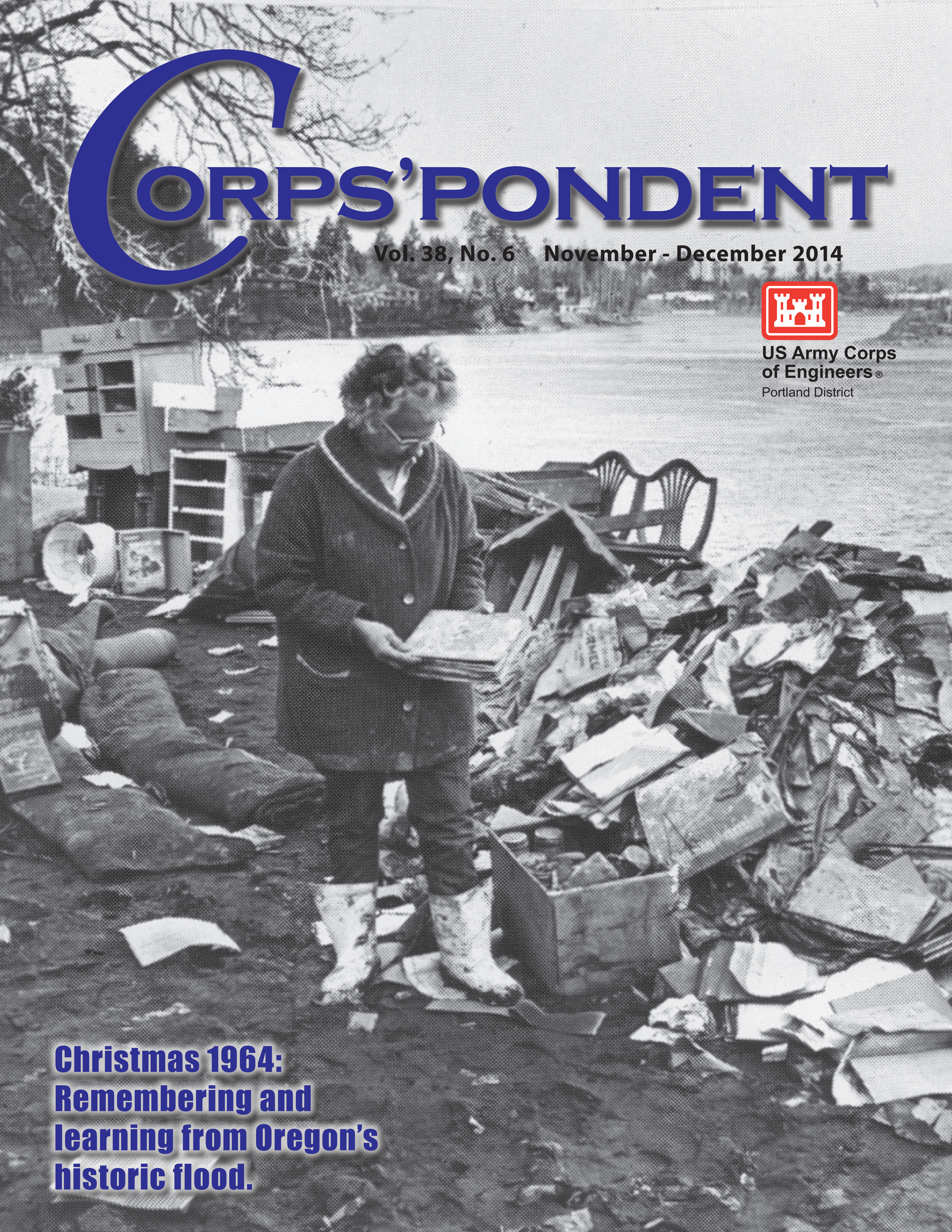
US Army Corps of Engineers®
Portland District



Christmas 1964: Remembering and learning from Oregon's historic flood.

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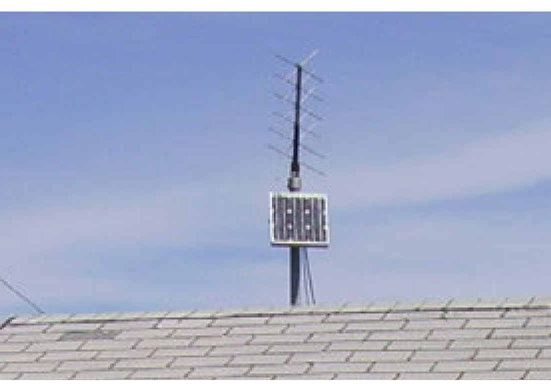

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Errata

In the September/October Corps'pondent Nick Cooper was incorrectly identified. This is Mr. Cooper. We regret the error.

Cover photo: The 1964 Christmas Flood brought immeasurable loses. Corps of Engineers Archives.

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Commander: Col. Jose L. Aguilar
Chief, Public Affairs: Matt Rabe
Editor: Erica Jensen

Commander's Column

Portland District Teammates,

Thank you for your tremendous contribution to the success of the District's mission this past year. We met our obligation to the American people by providing engineering solutions to complex problems – all of you had a hand in making this happen.

Our higher headquarters, congressional delegations, state and local elected officials, industry partners and Tribal leadership continuously provide accolades for your professionalism and passion as you execute our mission. We must continue to nurture these great relationships while still working through complex problems with diverse viewpoints. We are entrusted to deliver decisions which do not make everyone happy, but most understand our charge as given to us by Congress and the Administration – we are the honest broker. Additionally, you create a superb environment respectful of differing views, demanding of superior performance and sensitive to the human element in all of us. As a fellow team member, thank you for creating a climate which brings out the best in all of us.

The Corporate Board offsite was a superb event which allowed the District's leadership to discuss several of the District's pressing and multiple long range objectives. In addition to what I discussed in the previous column, we are taking actions to improve our acquisition strategy. This is not just a contracting and legal matter but a District effort to ensure we are operating within our legal and ethical parameters while we excel at delivering on our program. We also decided to stand up a KM/QMS/Technology initiative (thanks, LDP and others, for your contributions) and to encourage a culture of innovation. Finally, I will personally make an effort to host additional forums to interact with all of you to stay abreast of your concerns/observations/recommendations allowing me to work with our leadership to develop solutions to our collective challenges and to capitalize on opportunities.

History is an important element which influences our culture. It serves as a testament that our forefathers have performed some magnificent feats. It is a testament of what we can do and it should motivate us to commit to rise to any challenge. Please read the "Flood of 1964" stories within the pages of this issue. They provide a glimpse of what can happen in this region, and provide a shot of encouragement for whatever challenge you are dealing with in your job.

As we enter the Holiday Season, very soon many of us will take some well-deserved time with family. Enjoy your time, and don't allow yourself to get stressed out. This is a joyous time, so please be safe in whatever you decide to do. We want to see everyone back safely in 2015.

Suzanne and I wish you a happy and safe Holiday Season.

Competence follows Character

Col. Jose Aguilar

Col. Jose L. Aguilar

"As a fellow team member, thank you for creating a climate which brings out the best in all of us."

"This is a joyous time, so please be safe in whatever you decide to do."

Portland District People

Julie Ammann

Hydraulic Engineer
Engineering and Construction Division

Julie Ammann works in the Hydraulics and Hydrology Branch as a hydraulic engineer. She says her work allows her to participate in a wide variety of projects. Lately she stays busy by serving as technical lead on a large planning study to help endangered fish in the Willamette Valley. She also serves as the District's floodplain manager, helping communities in Oregon and southwestern Washington understand their flood risk.

What do you find most rewarding about your job?

I like the sense of purpose that comes with the types of projects at the District. Whether it's working to keep our large dams operating for flood risk management or helping listed fish, it is satisfying to work on something that benefits the greater good.

What inspires you or motivates you as you do your job?

I really enjoy the interagency coordination that comes with working on the Oregon Silver Jackets team. Together, the Corps and other federal and state agencies are working towards a common goal of reducing flood impacts in Oregon. We can accomplish so much more together through leveraging our resources and expertise and are able to produce more comprehensive flood risk management solutions for our state.

What do you like most about working for the Portland District?

Portland District has a wide variety of projects and there are great opportunities to work on a range of things. As a hydraulic engineer I get to work with large structures and big rivers. The work is challenging and I am continually problem solving – the work does not get boring here. Portland District also has great staff and I enjoy working with my co-workers.

First Job?

My first job, at age 15, was flipping burgers at a burger joint. It was fun at times, but I remember wilting as I cooked over the big grill during the summer with no air conditioning. I always smelled like ketchup and fry grease, and my hands permanently smelled like onions. It was very glamorous.

What are your hobbies?

My hobbies tend change with the seasons. In the spring I like to garden, in the summer I like to go camping and in the fall and winter I like to craft inside. The seasonal changes help keep me from getting bored with any one hobby.

Facing yesterday's storm today

A commentary by Amy Echols, Public Affairs Office, and Julie Ammann, Engineering and Construction Division

Frozen ground and heavy snow collided with torrential rainfall and increased temperatures in December 1964 to wipe holiday shopping and family gatherings off the calendar. The generations of Oregonians who lived through the flood came to a hard-won understanding of the consequences of living in vulnerable areas and the power of a Pacific Northwest "atmospheric river," locally known as a Pineapple Express. The generations that followed, and newcomers to the state, remain free of the harrowing memories but still face flood risks for some of the same, and some evolving, reasons.

Where the rain fell in the past is no guarantee of where it will fall in the future. Technical information from 1964 and other floods consistently indicate that flooding is often the result of concentrated rain inundating one area while a tributary basin "just over the ridge" may be spared heavy rainfall. The eye of the storm can shift like the weather.

While the weather conditions leading to the historic 1964 Christmas flood and the more recent 1996 flood were extraordinary, those same conditions in our more urbanized state today could result in river levels exceeding those in 1964. Watershed conditions have changed around the state to meet urban and updated agricultural needs. Large areas of historic floodplains no longer function in their natural form. They are now housing developments, roads, parking lots, rooftops and other impermeable surfaces that alter drainage patterns and force flows into unsuspecting communities.

So while the Corps' storage dams and state and localized actions have reduced risks for some populations downstream, a growing population and newer development remain in harm's way. Not all our actions, not all of our agencies together, can eliminate risk. The conditions of our land and the forces of the sky together play roulette with our future.

Photo by Robert E. Landsburg

Debris clogged waterways and ports for weeks after the 1964 Christmas Flood.

Planning and technology on our side

With modern forecasting and weather technology, experts can better detect a storm of 1964's magnitude and duration days in advance. Watches and warnings through radio, internet and television will alert citizens of the approaching risk. Emergency management and first responders will pull in resources from across the country in advance. Shelters will await citizens evacuating from low-lying areas.

Improvements in floodplain conservation, flood warning systems, emergency response and recovery programs will greatly reduce the consequences. Programs, at the local, state and national levels now assist communities before, during and after natural disasters. And we have a clearer understanding of the combination of factors that create flood risks. The most notable difference between those days and now would be dramatic reduction in loss of life.

Today, the national approach for reducing risk is to share responsibility across government, community and individual levels. This approach can only be effective if individuals – in their roles within communities, households and businesses – have access to and use technical information. As individuals, we should understand the likelihood and consequences of flooding where we live. Consideration for the effectiveness of risk reduction actions and the limits of pre- and post-flood assistance allows us to make the best decisions and may provide incentives to take on preparedness actions.

Without this preparation – and once a Pineapple Express moves in – there is far less that can be done to prevent many of the same consequences Oregon has already experienced.

There is a drier (and more hopeful) side, as many local agencies advance their own hazard reduction investments and increase their attention to the relationship between land use and flood risk. The Corps, for its part, has taken big steps in the last decade to improve risk communication by sharing information and hosting collaboration.

As members of Oregon's current generations, as descendants of witnesses to 1964 or newcomers, we can reflect on our own vulnerabilities (such as life safety or economics) and consider all information available today. We should accept the challenge of preparing for the conditions around us and take action and make choices that better resist what nature will throw at us in the future.

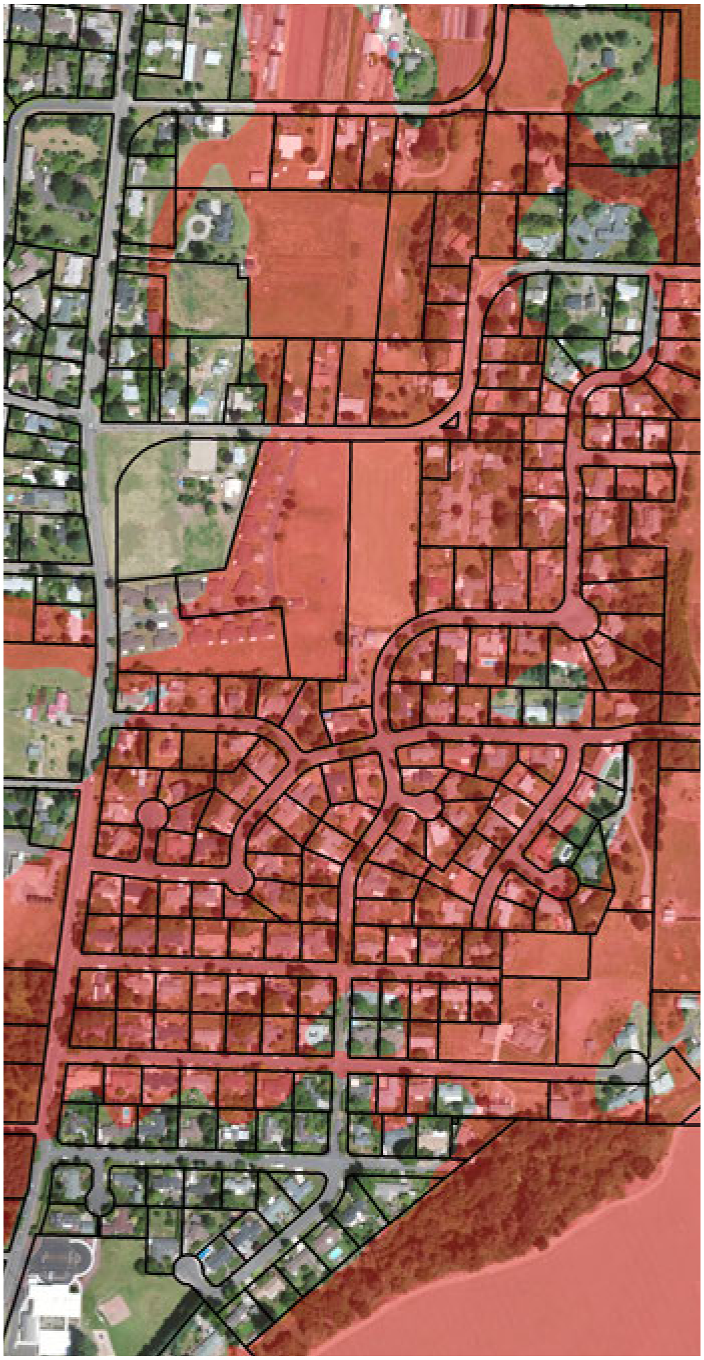


Image source: Oregon Department of Land Conservation and Development

Vast areas of agricultural land around Oregon were developed for residential use after 1964 as population increased. The Federal Emergency Management Agency designated the shaded land on this map as vulnerable to certain levels of flooding. Regulations require that homeowners with federally backed home loans in these areas purchase flood insurance. The Willamette River is bottom right.

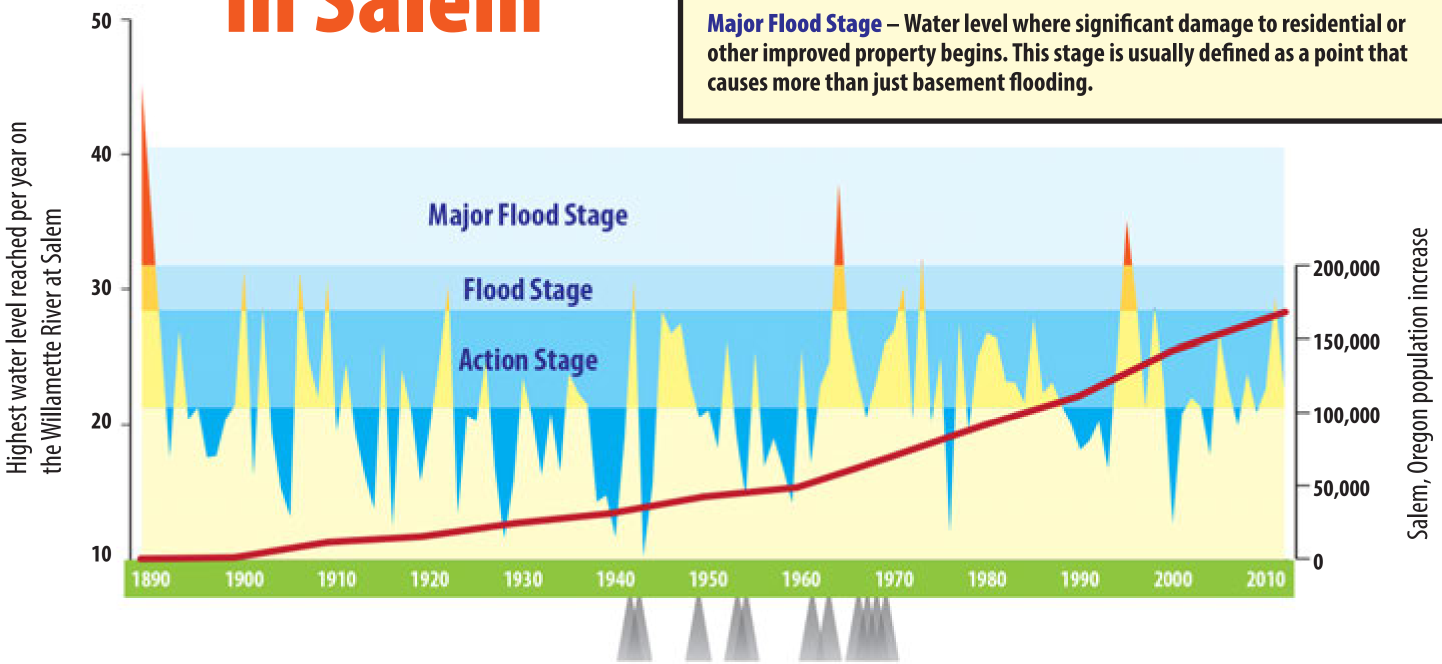
Population growth and flood history in Salem

Water level stages, defined by river height at gaging stations, help identify impacts to property along a river. Water levels will vary at different points on a river during the same storm and many factors, such as topography, influence property impacts. The National Weather Service uses the following stage definitions to categorize river levels:

Action Stage – Water level at which a stream, river or lake is at the top of its banks; further rises result in water moving into the floodplain.

Flood Stage – Water level at a given location that begins to create a hazard to lives, property or commerce. The issuance of flood warnings is linked to this stage.

Major Flood Stage – Water level where significant damage to residential or other improved property begins. This stage is usually defined as a point that causes more than just basement flooding.



Completion years for Corps' Willamette Valley flood management dams. Portland District completed four additional multiple-purpose projects after 1964.

Portland District operates 15 dams and reservoirs to reduce flooding. The dams prove their worth annually and provide a considerable return on the federal government's investment decades later. Despite their role, they cannot prevent floods. Unregulated tributary streams in the Willamette and Rogue river basins and other factors contribute to flood risks. Increased development and encroachment on floodplains, for example, continue to present threats to people and property downstream.

Willamette Valley dams today can manage about 77 percent of the water flowing from the drainage system in the Eugene-Springfield area. By the time that water gets to Albany, Corps dams manage only about 43 percent. In Salem, that drops to 41 percent. Only about 27 percent of the water passing through Portland goes through these dams.

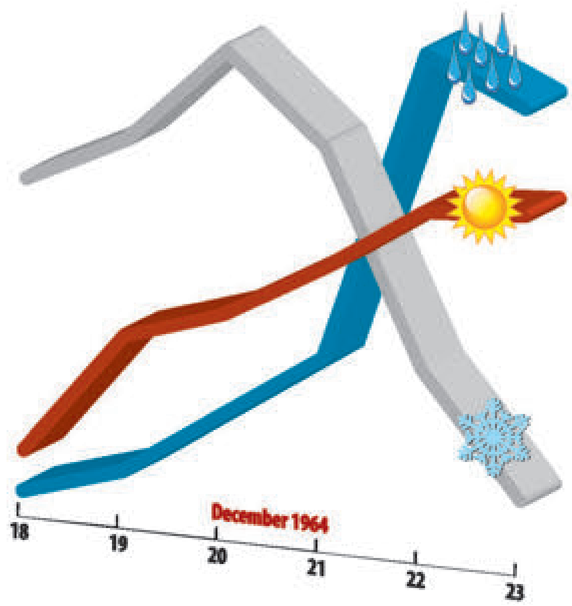
The Corps completed both Rogue River Basin projects in southern Oregon in the 1980s. Today, William Jess Dam and Lost Creek Reservoir control about 28 percent of the basin's drainage area and about 50 percent of the average annual runoff at Grants Pass. Applegate Dam and Reservoir controls about 29 percent of the Applegate River Basin.

How it all came down

Extreme weather conditions deliver the 1964 Christmas Flood

By Dave Elson and Andy Bryant, National Weather Service

Flooding can be a common occurrence in the Pacific Northwest in the late fall and winter. Indeed, the wettest months of the year in a region known for its rainfall are generally November and December. Storms moving in off the Pacific are responsible for the frequently wet weather. Occasionally these storms will pull moisture-rich air up from the tropics, often from the vicinity of Hawaii. Known locally as a Pineapple Express and broadly as "atmospheric rivers," the connection between storms and tropical moisture can result in impressive rains. The windward sides of the mountains of western Washington, Oregon and northern California see the heaviest rains in these storms, where 24-hour totals on occasion exceed 6 inches.



Simply illustrated, torrential tropical rains fell on frozen ground and an unusually high snowpack, producing the 1964 Christmas Flood. The graph represents conditions at Government Camp, Oregon.

December 1964 brought such a storm, but on a scale rarely matched in the region's history. Torrential rains falling on an unusually high snowpack produced one of the region's great floods, known today as The Christmas Flood.

November and the first half of December were a little wetter than normal across the Pacific Northwest, but not extremely so. It was an outbreak of arctic air in mid-December that set the stage for the floods that would follow. On Dec.15, arctic air pushed into northeast Oregon, dropping the temperature in Pendleton from 41 degrees Fahrenheit during the day, to just 8 F by midnight. The temperature would fall to 12 below zero the next day. Two inches of snow accompanied the cold front in Pendleton.

An arctic cold front brings a "silver thaw," encasing everything it touches in ice.

National Weather Service photo

Christmas Flood rainfall around Oregon		
Location	December 19-27, 1964 (in inches)	Normal (in inches)
The Dalles	7.24	2.55
Hood River	11.11	5.8
Redmond	4.36	1
Eugene	14.4	7.7
Detroit Dam	20.1	14.5
Dorena Dam	11.1	7.2
Crater Lake	25.2	11.1
Grants Pass	11.3	5.6
Medford	8.8	3.4

Rain fell steadily around the state.

The cold air continued to push southwest and by Dec. 17 covered all but the far southern part of Oregon. The morning of Dec. 17 saw new record lows for the month. Minimum temperatures west of the Cascades were generally from 5 to 15 F, while east of the Cascades minimum temperatures dropped to between -5 and -38 F. This was the coldest December weather since 1919.

The end of cold weather outbreaks in the Pacific Northwest are often connected to warm Pacific storms that meet the cold air, resulting first in snow and freezing rain and eventually just rain. In 1964, storms off the Pacific began to push in Dec. 18, dumping heavy snow and gradually warming the air mass. All but the warmest valley locations saw snow, and within 36 hours near-record snow depths for this time of year had accumulated around the state, including much of the Willamette Valley. Up to one foot fell in the Coast Range, with three to four feet in the Cascades. In the lower western valleys, snow amounts ranged from just a trace in Medford to 11 inches in Portland. Substantial snows also fell in central and northeast Oregon, while blizzard conditions trapped hundreds of motorists and stopped rail traffic in the Columbia River Gorge.

Out over the Pacific Ocean, the weather was no less interesting. Super-typhoon Opal formed over the west Pacific on Dec. 9 and grazed the Philippines as a Category 5 storm on Dec. 13. Opal dissipated by the Dec. 16, but remnants of the storm moved east and energized the atmosphere over the northeast Pacific Ocean. A strong jetstream then developed and stretched from north of Hawaii to the Pacific Northwest. This persistently strong atmospheric river brought moisture-rich and much warmer air, including the remnants of Typhoon Opal, into Oregon and northern California. This combination of conditions resulted in extremely heavy rain over an extended period.

Corps of Engineers photo

Deep snow and ice atypically accumulates on the banks of rivers in Eastern Oregon before the Pineapple Express sweeps the region.

An unusually heavy snowpack initially absorbed some of the rain. The melt water, however, ran directly into creeks and rivers, since the ground was already saturated and frozen in many areas. The freezing level rose from the valley floor on Dec. 18 to over 8,000 feet by Dec. 21. The high temperature at Salem was only 28 F on the Dec. 18, rising to 61 F on Dec. 22.

The snowpack in the Coast Range and Cascades collapsed over three days, creating massive amounts of rainfall and snowmelt running off together. At Government Camp on Mount Hood, located at 3,900 feet, the snow depth was 55 inches on the morning of the Dec. 20. The amount of liquid water contained in the snowpack was 5.4 inches. On the morning of Dec. 21, the snow depth had dropped to 45 inches, but water content increased to seven inches. By Dec. 23, snow depth was only six inches, with most of the seven inches of water content released from the snow. Meanwhile, nine inches of rain had fallen for a total of 16 inches of runoff.

This storm toppled many 24-hour and monthly rainfall records across the state and many of those records still stand today.

IT CAME AND IT CONQUERED

By Amy Echols, Public Affairs Office

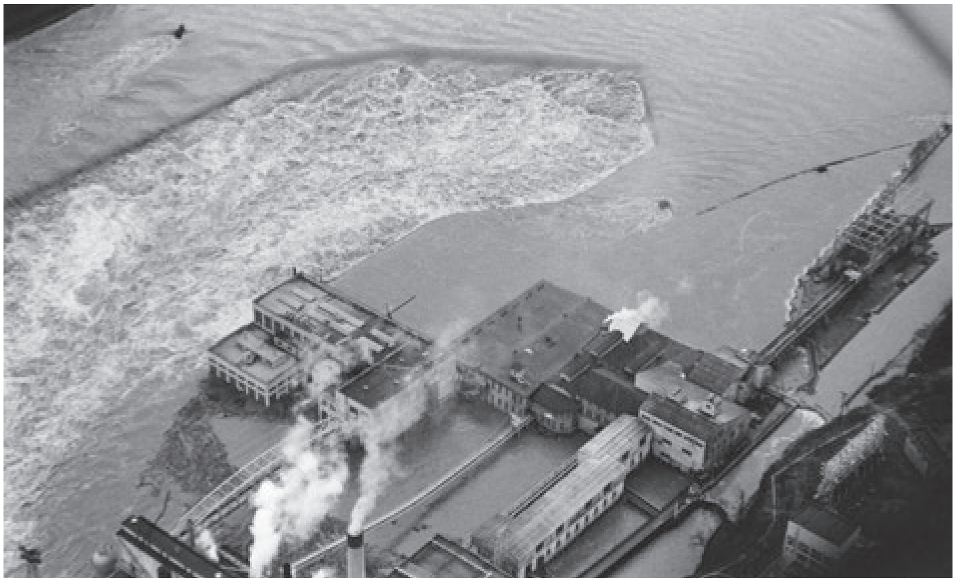
The early weeks of winter in 1964 delivered a massive punch to the Pacific Northwest. Floods struck hardest in Oregon's Willamette, lower Columbia, Rogue, Umpqua and Coquille river basins and took 18 lives in Oregon alone. The region incurred great damage and took years to recover.

On the ground, Portland District Engineer Col. William Talbott directed the activation of control and disaster operations and mobilized emergency flood fight and rescue operations. He assigned 14 engineers to temporary emergency field offices in Salem, Albany, Corvallis and Eugene. The District deployed 212 employees in the days leading up to Christmas 1964 to assist in inspection, construction, control and maintenance of permanent and temporary flood control projects. District staff in Portland coordinated with local authorities on the flood fight on the Sandy, Clackamas and lower Willamette rivers.

The USS Bennington, an aircraft carrier that furnished helicopters to Eureka, California during the flood, used the radio facilities at the U. S. Government Moorings for relay of radio messages. – Corps' 1966 post-flood Report

High water conceals Willamette Falls

The Willamette River, reaching record levels, almost completely submerged Willamette Falls at Oregon City. Articles, books and photographs record the huge business and residential losses along the lower Willamette. The flood weakened and damaged wharf and dock facilities and debris made ship movement in Portland's harbor dangerous.



Corps of Engineers photo

Willamette Falls is a ripple under the high flows on Christmas Day, 1964.

Lower Columbia gets upstream relief

Reservoir storage upriver on the Columbia and its tributaries – from projects in the Willamette basin, to Grand Coulee Dam in eastern Washington and others as far away as Idaho – kept this flood from becoming the second largest on record for the lower Columbia River. Additionally, 42 levee projects protected much of the floodplain and flood fight teams used an estimated 31,534 Corps' sandbags to provide some relief to the area.

High water overtakes the Upper Willamette

While the Eugene area greatly benefitted from the storage of water in existing Corps reservoirs, flows exceeded flood stage on every tributary to the Willamette River: the mainstem Willamette was as high as 8 feet above flood stage. At Eugene, Albany and Salem, high waters remained above bankfull stage for many days. Water up to 9 feet deep flooded 300 houses in the north section of Salem and destroyed Salem's municipal sewage plant.

STATE DECLARED DISASTER AREA

The Oregonian

Worst Flood In History Hits Oregon

VOL. CIV — 31,578 WEDNESDAY, DECEMBER 23, 1964 36 PAGES PRICE FIVE CENTS

Corps of Engineers photos

The Oregonian covers the disaster on December. 23, days ahead of the highest floodwaters.

The Corps' Willamette Valley Project Office received Weather Bureau forecasts from Portland and relayed them to local communities. With no comprehensive levee system in place, the problem was one of warning and evacuating people from threatened areas, as well as providing shelter and food for evacuees. Portland District personnel helped with both tasks.

Flooding destroyed two cofferdams and a bridge trestle at the construction site of the Corps' Green Peter Dam, now the largest in the Willamette system. Water filled the powerhouse draft tube with rock and debris, ruining the pumping plant.

Rogue River Basin goes it alone

The Rogue basin in southern Oregon, without any flood storage reservoirs upstream of Grants Pass, felt the uncontrolled fury of the flood. Assembling complete flow records became impossible because some of the measuring gages were simply washed away. Along one stretch of the Rogue River, surging water destroyed or heavily damaged 250 homes and 30 commercial establishments. It destroyed or greatly damaged every bridge across the river. Gold Beach, at the mouth of the Rogue, lost residential, commercial and marine facilities. Total losses in the basin exceeded $25 million in 1965 values.

But it could have been much worse

Without the existing storage in the Willamette Basin and to a lesser extent the Columbia River, Portland would have experienced a disaster of historic proportions. – Corps' 1966 post-flood Report

The system-wide operation of the Corps' seven completed flood storage projects in the upper Willamette Basin during the 1964 flood remains unprecedented today. They reduced river stages in Eugene by 14.8 feet; at Salem by 7.5 feet; at Oregon City by three feet; and by 4.5 feet at Portland. These reductions prevented extensive damage to residential and mill properties in the Eugene-Springfield area, the thorough inundation of downtown Salem and minimized the destruction of low-lying industrial developments in Oregon City. In 1965 dollars, the operations prevented an estimated $540 million in damages; that equals almost $3.9 billion in 2014 dollars. It's impossible to know precisely how many lives Corps' operations spared.

The lift span on Portland's Steel Bridge remains open to allow logs and debris to pass, taking pressure off the structure on Christmas Day, 1964.

Heavy runoff floated a barn roadside in the Umpqua River Basin.

Raging water in the Rogue River Basin moved houses downstream of their foundations.

New technology means better water management when flood season arrives

By Diana Fredlund, Public Affairs Office

Rivers are the lifeblood of many communities. They irrigate crops and provide transportation and drinking water and generate electricity to power our lives. Without rivers, many communities would never have been settled. Rivers have a dark side, too. They can, with little warning, swallow entire communities, move buildings off their foundations and sweep away anything in their paths.

The Christmas flood of 1964 was one such flood.

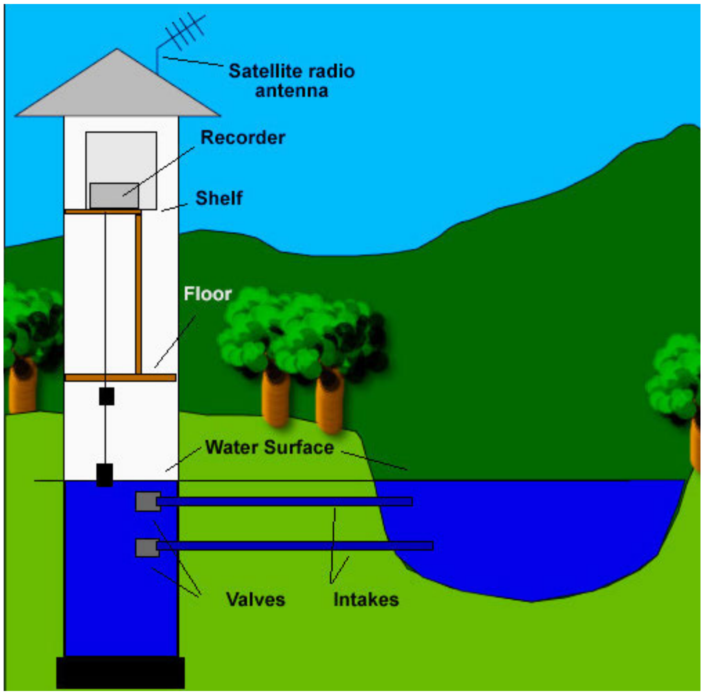
Before the snow started falling in December 1964, the stream gage readers, known as hydrographers, who worked for the U.S. Geological Survey saw little to be worried about. The gages were located upstream and downstream of several U.S. Army Corps of Engineers dams and helped hydrologists maintain a balance between inflow and outflow. In 1964, hydrographers had to physically check each gage, write down the results and find a phone to call in the data.

"Before satellite technology, reading a river gage took time and could be a wet, messy job," said Glen Hess, a surface water specialist with the U.S. Geological Survey. "When floods are forecast, that's when we need the most up-to-date information. In 1964 before the big flood hit, our hydrographers were out in snow, wind and rain to help us know in real-time what was happening."

These days, technology means most visits to stream gages are for maintenance; the gages upload information hourly via satellite, radio or telephone to the USGS.

While each gage uploads its data independently, they are viewed collectively to get a broader picture of what's going on in the system, Hess said.

"We – water managers from state and federal agencies – manage river flows near major population areas like Salem or Portland as a system of control points and each control point has specific target," said Mary Karen Scullion, Portland District Willamette Valley reservoir regulator. "If a control point spikes, decisions are made that specifically address the needs of a population area. That's when we need to decide how best to protect the region."



The 1964 flood was so large and came on so quickly that water managers had few options available to them.

"There was a lot of water introduced into the system in a short amount of time in 1964," Scullion said. "Many people don't realize that even today the Corps' Willamette Valley dams control only 27 percent of the water by the time it reaches Portland. All the agencies work as a team to limit the flood risk, but if Mother Nature throws more water at us than the system can handle, all we can do is minimize, not prevent flooding."

"River depth is important for flood risk management," Scullion said. "When the depth changes at a gage upstream of our dam, it tells us how much more water is flowing into the reservoir. Based on predictions of outflow we can determine how we will maintain target levels of the river."

US Geological Survey photos

Stream gages have become fully automated. Information is transmitted via satellite or internet to the USGS.

One critical reason the Corps uses upstream gages is to be sure a dam doesn't overfill. (The cardinal rule of reservoir regulation: Don't overfill and don't overtop your dam.)

"Between inflow and outflow at our dams – and the unregulated rivers – we decide how to manage the water flows. If we have to hold some water in the lake, we change the outflow," Scullion said. "If the downstream gages also show water levels rising, that confirms that yes, something new is occurring and we may need to change the flow to stay within our target points."

Stream gages don't just check river elevations these days. Technology allows them to multi-task, offering an array of data. "Gages today collect data on water flow rates, river depth, water temperature and, if they're located near a dam, they can monitor turbidity and total dissolved gas levels," said Art Armour, a hydraulic engineer with the Portland District's Reservoir Regulation and Water Quality Section.

"Measuring temperatures and total dissolved gas helps us know we're doing right by the fish. We need to know if the water was warm before it reached the dam, or did the reservoir affect the water temperature? Advances in technology have allowed us to monitor water temperature upstream and downstream of our dams for the past 10 years; we've been monitoring dissolved gas for at least two years."

Water regulators don't look just at the rivers; they also search the skies for clues to what is coming their way. Technology has brought the next generation of radar to weather forecasters like Andy Bryant with the National Weather Service. "Compared to 1960s, NEXRAD, the newest radar, offers greater detail, sees farther and updates more frequently. That helps the National Weather Service develop its short term forecasting by telling us what's happened in the past several hours and what will happen in the next several hours," Bryant said.

The hydrographer from 1964 would hardly recognize his modern-day counterpart. One rarely does a physical check of a gage anymore, except for maintenance; gages upload their data via satellite to the USGS computers. That data helps all the water management agencies make better decisions about how best to manage the watersheds. Today's technology could have helped residents better understand the dangers before the 1964 flood even arrived.

Amazingly, the 1964 flood wasn't even the biggest the region has seen. "Gage records began in 1858, and based on historic data, the December 1964 flood was not a record-breaking flood in many areas," Hess said.

For some river basins in southern Oregon the 1964 flood is the largest in available stream gage records, Hess added. "Some locations exceeded the record by several feet."

Populations have expanded and the Portland, Salem and Eugene metropolitan areas are home to many more people than in 1964. That makes managing the rivers even more important, and Hess and his colleagues deploy every technological advantage they have. Usually it's enough.

"River forecasts are based on weather forecasts. We have a lot more confidence multiple days ahead of time based on all this new technology," Bryant said. "We don't have to wait until the water's on the ground to make decisions that help keep people safe."

Regulators behind the scenes keep reservoirs, rivers on target

By Scott Clemans, Public Affairs Office

When you woke up this morning, you probably took a quick look out the window or at your favorite news outlet to see how much rain to expect. For most, those few seconds of advance notice and planning is all we need.

But a small team of engineers and scientists at Portland District headquarters has been watching that rain forecast for more than a week and calculating what to do as the rain runs off into the streams and rivers in the District's area of operations.

They are the Reservoir Regulation Team, and their main job is to determine how much water to release from the Corps' 13 Willamette Valley and two Rogue River Basin project dams, as well as John Day Project's Willow Creek Dam. They're on call 24 hours a day, 365 days a year, but most of the time they don't attract much attention.

As we head into the November-January time frame, though, when most floods occur west of the Cascade Mountains, the spotlight often shines on our flood fighters.

"About 10 days out, we start to see rainstorms in the National Weather Service forecast," said Reservoir Regulation Team Chief Laurie Nicholas. "Their radar and satellite imagery can pick the storms up over the Pacific Ocean and track them."

"It seems like a long way out, but we really do start planning reservoir releases based on the 10-day prediction," Nicholas said. "We evaluate our reservoirs' actual and desired pool elevations; current and expected future downriver flows; what the weather's expected to do in the meantime; required minimum and maximum flows for fish, water supply and other uses; and a variety of other factors."

The Willamette and Rogue "teacup" diagrams on Portland District's website give a snapshot of current reservoir and river levels.

Regulators use a unique shared National Weather Service model that provides a real-time analysis of how different releases might affect reservoir and river levels and helps them understand the resulting depths and flows at various points downriver. The Northwest River Forecast Center's official river flow forecasts, including any flood watches or warnings, are based on the model's projections.

"Portland District and Northwestern Division have a special relationship with the National Weather Service," said Mary Karen Scullion, Willamette Valley reservoir regulator. "We collaborate so that the Weather Service can send watches and warnings based on actual dam operations."

The National Weather Service points to this relationship as the standard for how its regional river forecast centers should work with water managers.

Scullion explains that a daily schedule provides a pretty complete description of operations and restrictions, telling operators how much flow to release, which outlets to use, when to generate electricity, how quickly to change flows, how to manage downriver water temperatures and what kinds of activities are going on at and below the dam.

"Each season has specific goals: the goal during flood season is to keep the reservoir pool elevations at or below the rule curve, and the river levels below action stage," Scullion said.

The rule curve for each reservoir shows the maximum desired pool elevation for any given day of the year, except during a flood fight when the reservoir is storing water to reduce downriver flood impacts.

The regulators' overall strategy for handling a flood situation is fairly straightforward. They monitor river levels using a system of cooperatively managed gages to learn how much a river below the dam is rising from runoff. Correspondingly, regulators ask dam operators to reduce dam outflows to store water that might otherwise push downstream rivers above critical levels. When levels begin to subside, they increase dam outflows to get rid of the extra water and regain storage space for the next storm.

The devil's in the details, though. For example, the gages don't tell the regulators the whole story of how flows are affecting downriver communities. Regulators will work very closely with staff at the operating projects during serious storm events, sending spotters to known trouble spots to relay if releases are too high, or if there's more room in the river than the gages indicate.

And, of course, flood storage in the reservoirs isn't unlimited.

"Multiple back-to-back storm events can fill our reservoirs – especially the smaller ones like Cottage Grove – faster than we can draft them," Scullion said. "Once that happens, there's nothing more I can do except pass the water flowing into the reservoir, sending it downriver."

And as often happens during a crisis situation, the people that usually do daily routine work are suddenly in the spotlight.

"The demand for information – from our own coworkers, leaders, partner agencies and the general public – goes up exponentially during a flood fight," Nicholas said. "That, of course, is exactly the time the regulators most need to work undisturbed."

So during a flood fight, sit back and let the "Res Reg" team do its job – but be sure to thank them later for keeping our reservoirs and rivers on target.

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XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
APW R 103014 1229 NO LOP CGR FOS NPD NPB NPP NPC
WILLAMETTE NON-POWER PROJECTS

SCHEDULE FOR: FRI - THU,  31 OCT  -  6 NOV 2014
GENERAL NOTE: AS PROJECTS APPROACH MIN POOL, TRANSITION TO PASS INFLOW
THE FOLLOWING IS GUIDANCE FROM TODAY'S FORECAST
FLOW CHANGES DURING DAYLIGHT HOURS ARE PREFERRED

PROJECT     :  APROX TOTAL RELEASE            EFFECTIVE
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FALL CREEK  :  RELEASE =      1140 CFS      0900 HRS 30 OCT
CONTINUE TO DRAFT TO ELEV 714 AND PASS INFLOW AT THAT ELEVATION
UNTIL ENVIRONMENTAL CLEARANCES ARE OBTAINED
**************************************************************
COTT GROVE  :  RELEASE =       340 CFS      0900 HRS 30 OCT
SUNDAY: REDUCE OUTFLOW TO 200 CFS AT 50 CFS/HR
MONDAY: REDUCE OUTFLOW TO 100 CFS AT 50 CFS/HR
PASS INFLOW BETWEEN EL 750-755 FT
**************************************************************
DORENA      :  RELEASE =      1400 CFS      0900 HRS 30 OCT
SATURDAY: REDUCE OUTFLOW TO 1000 CFS AT 100 CFS/HR
SUNDAY: REDUCE OUTFLOW TO 700 CFS AT 100 CFS/HR
MONDAY: REDUCE OUTFLOW TO 400 CFS AT 100 CFS/HR
PASS INFLOW BETWEEN EL 770-775 FT
**************************************************************
BLUE RIVER  :  RELEASE =      440 CFS      0900 HRS 30 OCT
MONDAY: REDUCE OUTFLOW TO 300 CFS AT 500 CFS/HR
TUESDAY: REDUCE OUTFLOW TO 150 CFS AT 50 CFS/HR
PASS INFLOW BETWEEN EL 1180-1190 FT
**************************************************************
FERN RIDGE  :  RELEASE =      1500 CFS      0900 HRS 30 OCT
BEGINNING FRIDAY, REDUCE OUTFLOW BY 100 CFS EACH DAY
PASS INFLOW BETWEEN EL 353-354 FT
*************************************************************
MAXIMUM 24-HR RAMP RATE IS 1.0 FT OR 50% FLOW REDUCTION IN
24 HOURS AT DOWNSTREAM GAGE.
MAXIMUM DAYTIME HOURLY RAMP RATE IS 0.2 FT AT DOWNSTREAM GAGE.
MAXIMUM NIGHT-TIME HOURLY RAMP RATE IS 0.1 FT AT DOWNSTREAM GAGE.
DAYTIME FLOW CHANGES ARE PREFERRED BUT NIGHT TIME CHANGES ARE ALLOWED.
IT IS OPTIMAL TO SPREAD INCREMENTAL CHANGES ACROSS A 24 HOUR PERIOD.
APPLY DAILY AND HOURLY BIOP RAMP RATES WITH EACH FLOW CHANGE.
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The Reservoir Regulation Team's schedules give dam operators a complete description of the water management operations to be carried out.

Volunteers: vital to community preparedness

By Michelle Helms, Public Affairs Office

"We had lots of rain in the years before," said Carolyn Booth. "But nothing like this."

The amount of water from rain and snow melt in February 1996 took a lot of people by surprise.

"The water was about three feet from the foundation posts," said Booth, who lived near a creek in Beaverton, Oregon, when the Pineapple Express came through that year. "It was a raging river."

When a disaster strikes, such as the 1996 flood, the U.S. Army Corps of Engineers springs into action alongside other local, state and federal agencies to help respond and recover.

The agencies also rely on organizations and volunteers. The Corps works with these groups to train their members to support their communities' and neighborhoods' preparedness, response and recovery efforts.

One such group is the Oregon chapter of the National Voluntary Organizations Active in Disaster. The Corps coordinates with the nonprofit group to train other nonprofits, faith-based groups and neighborhood associations to prepare for, respond to and recover from disasters.

"It is very important for all organizations who respond to disasters to train and work together whenever possible," said Steve Courtney, Oregon VOAD President. "It's important that everyone knows what each other is prepared to do and how they will do it. It eliminates duplication of efforts and resources."

Courtney said when they train together organizations are better prepared to work together effectively and efficiently, helping their communities recover more quickly and minimizing the economic impact. Cooperation, communication, coordination and collaboration are the guiding principles of the National VOAD. They're also vital to responding and recovering during a disaster.

A recent resurgence of citizen involvement, through employers and membership in faith-based and civic-service organizations, enhances government's ability to support the nation according to Les Miller, Flood Preparedness Program Manager for the Portland District.

Miller said working with organizations such as VOAD is essential to sustain the Corps' effectiveness. "They help us to more effectively reduce the whole community's risk and damages from natural disasters, especially the Northwest's most frequent and costly hazard: floods," said Miller.

Booth and her husband were lucky; the water from the normally small creek behind their home stopped rising before doing any damage. Others living in the Willamette Valley where the waters raged had very different stories. Booth said after the flood waters receded she put together a kit with extra food and water, batteries and blankets.

Are you ready?

Learn about volunteer opportunities to prepare for and respond to emergencies at the VOAD website: https://orvoad.communityos.org/cms/home.

Photo by Eckard V. Joy

Web resources to get you started

This one-stop shopping website provides information and resources for Oregon residents to improve individual and community responses to a flood and reduce risk to people and property. The information also is helpful for other natural disasters and emergencies.

www.nwp.usace.army.mil/missions/emergency/preparedness.aspx