Corps'pondent

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US Army Corps of Engineers®
Portland District

Riggers and mechanics work on the unstack of Bonneville Lock and Dam's unit 4 generator in Powerhouse 1

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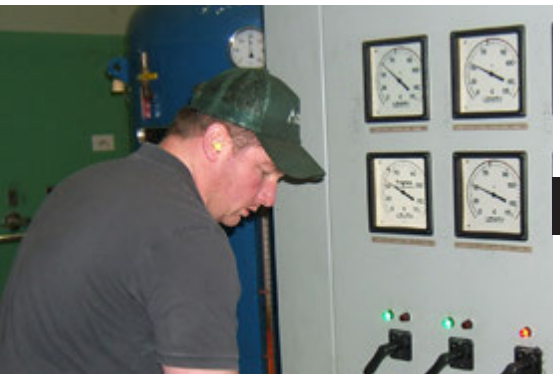

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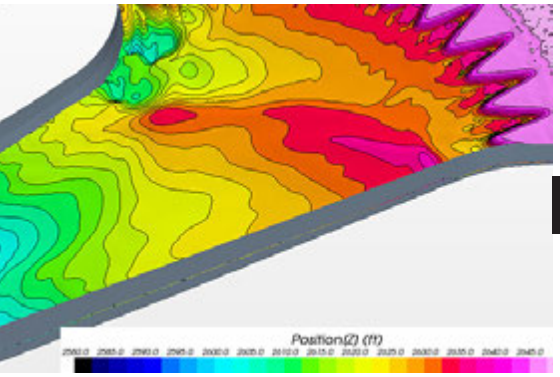

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CONTENTS

January - February 2015

INSIDE THIS ISSUE:

3 Commander's Column: Portland District Teammates

5 Portland District People: John Leonard

6 Engineer in Training program: 50-year old recruiting tool still works

9 Kudos to Portland District's photographers

13 Photography 101: Taking prize-winning photos

14 Power plant operators keep everything safe and sound

16 3-D modeling key to innovative labyrinth spillway

19 Anglers - Leave no trace

20 Corps Message: Sea lion predation at Bonneville Lock and Dam

Cover photo: Vanessa Van der Borg, Planning, Programs and Project Management Division

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Commander: Col. Jose L. Aguilar
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Commander's Column

Portland District Teammates,

Happy New Year! I trust you had a fine holiday season spending much-needed time with family and friends, recharging your batteries. It is nice to see everyone back. Major Shawn Patrick, his wife Michelle, and Suzanne and I had the pleasure of hosting a holiday reception for Portland District senior leaders on Jan. 10; what a tremendous team. The reception was by invitation but we are planning a District birthday event on or about April 17 which will be open to all employees. I hope to see you there.

In this column, I want to highlight the history of the Corps of Engineers' contributions to our nation and what we, as Portland District, do as a professional engineering organization to continue to support the prosperity of the Pacific Northwest and beyond.

As you likely know, our first missions to the nation began in 1776, two days after the U.S. Army was formed and Col. Richard Gridley was appointed our first Chief of Engineers. He, along with other engineer officers and companies of sappers and miners, formed the first Corps of Engineers organization. In 1802, however, the Corps was re-established as its own entity with a specific mission – support our military through every conflict by building infrastructure, facilities and other structures that supported our positional advantage against our adversaries. While these projects were designed to protect our troops and country, this early infrastructure also became the foundation for our transportation systems of today. That's just a snapshot of our history. I encourage you to spend a few minutes on the USACE website to learn more.

The value of engineering cannot be overstated. Portland District was established in 1871 when Maj. Henry Robert, our first district commander, set foot on the banks of the Willamette River. Our first missions focused on navigation to ensure safe passage of people and commerce. Today, however, it has a long history of engineering and construction … which includes our coastal jetties, our dams and navigation locks on the Columbia River and our dams in the Willamette Valley and Rogue River Basin, whose primary purpose is for flood risk mitigation, recreation and irrigation.

Corps of Engineers photo

Portland District Commander Col. Jose Aguilar addresses senior leaders and their family members during a New Years reception, Jan. 10.

Portland District also supports the American people through our engineering efforts abroad. Since 2003 we have deployed more than 300 District personnel in support of our military forces – both in combat zones as well as through multiple visits to other countries to provide technical assistance.

Jon Gornick, a civil engineer from the Channel and Harbors Operating Project, is one example of how we share our engineering expertise with other nations. He traveled to Brazil in 2013 as part of a national Corps team with one goal: develop a dredging program for a navigable stretch of the 1,811-mile São Francisco River. What he and the team did is exciting in terms of how we share our knowledge. I encourage you to read about their efforts through the article, '*Waterways experience advances Corps/Brazil partnership,*" on the District's online *Corps'pondent.*

We've also hosted several international delegations here, including a recent delegation from the Korean Water Academy who met with engineers from our Engineering and Construction and Operations divisions to discuss water management issues.

Photo courtesy of Calvin Creech, Mobile District

Jon Gornick (2nd from left) cruises the Rio São Francisco with Rafael Siqueira from CODEVASF (left), Calvin Creech, Corps project manager from Mobile District (right) and Waleska Echevarria, a hydraulic engineer from Buffalo District.

Photo by Amber Tilton, The Dalles Lock and Dam

Students get busy learning and building during one of Portland District's Engineering Day interactive workshops Feb. 18. 2014.

It is awe inspiring to see what we do as an agency and how we're creating a legacy for future generations. We are benefiting from what they did and will continue the standard of excellence they established.

Much of this is possible, partly, because of our continued investment in STEM programs and in students. STEM is a term that refers to a group of academic disciplines: science, technology, engineering and mathematics. And, we have not had to seek schools out to promote our engineering excellence. They come to us, like Vickei Hrdina, a regional science coordinator with Education Service District 112 in Vancouver, Wash., who recently asked us to meet with 24 of their staff to develop a STEM "nPower Girls" curriculum for middle school girls. After that, they sought us out again for our support of a grant that invites us to collaborate with them on more curriculum development, as well as seeks female engineering mentors for their 2016 "nPower Girls" summer camp.

We've grown our STEM partnerships with nearly 20 schools that support our annual Engineering Day event. These include the ACE Academy and the Center for Advanced Learning, both of which have strong math and science programs.

The Engineering and Construction Division and Hydroelectric Design Center also work with many college engineering programs to support undergraduate-level students on their capstone projects, as well as participate in their recruiting career fairs so those same students can have a chance to come to work for us – before and after graduation.

We also use other events to promote a student's interest in engineering, like Take Your Sons and Daughters to Work Day, because we know studies show that our fifth graders are one of the best audiences to light the spark of passion for STEM academics.

Our STEM program is growing, mostly because local schools recognize our expertise and the value we can add to their students' education – but also, in large part, because of your willingness to serve others.

We must continue to inform and educate our society about our engineering expertise and our continued value to this region and nation – just as our forefathers did. All of us are ambassadors of our mission so I hope you will share this message with those in your circle of influence.

Again, Happy New Year and thank you for your superb contributions to the American people. We are on glide path for yet another banner year in 2015!

Competence follows Character.

Col. Jose Aguilar

61st Colonel of the District

Portland District People

John Leonard

Visual information Specialist, ACE-IT

John Leonard spends most of his time on the third floor of Block 300 in front of a computer. But his world is filled will color, design and creativity. He supports Portland District by creating graphic products that help illustrate the Portland District's story. Collaborating with his customers on audience and messages is an important part of his job and helps him produce the right visual to meet their need – a brochure, poster, publication, exhibit or flyer.

What do you find most rewarding about your job?

I really enjoy helping someone express their ideas in a visual way. It makes it all worth it when a customer tells me that the end product was exactly what they needed.

What challenges do you encounter when doing your job?

One of my biggest challenges is discovering what the customer wants and needs. In many cases, they know they need a product but are not sure what they need. When this happens, I help them hone their key message and confirm their audience. Once this is decided … we're on our way to creating the correct product.

What are your career aspirations and how are you preparing to accomplish them?

I really enjoy the graphics field and would like to eventually move into a position where I can help other designers with their mission. Like most jobs, there is always room to improve training, procedures and equipment.

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

I like the diversity of the people and the work. At any time, someone may walk through my door and need help with any number of projects. I really enjoy helping people solve problems to get to the product they really need.

First job

In high school I did odd jobs for neighbors and family. Two hours after I graduated from high school I enlisted in the U.S. Army and spent the next four and a half years in airborne infantry. It was the best first job I could have ever imagined. I traveled overseas, pushed myself to the limit and made some of the best friends a person could have.

Who or what inspires you?

My family inspires me. I love to see my kids learn, grow and laugh. I married by best friend who is always there for me. I spend most of my free time with my family and wouldn't have it any other way.

Favorite film

I am a Star Wars nerd so the answer is obvious. I watched all the old movies as a kid, have seen all the new ones and now can't wait for number seven to come out. Yep, I'm a nerd.

Photo courtesy of the Leonard Family

Engineer in Training program: 50-year old recruiting tool still works

Portland District finds new engineers; new engineers find successful careers

By Diana Fredlund, Public Affairs Office

If you were a newly minted engineer or scientist just out of college and looking for that next step in your career, how would you find a job that sets you on the right path?

The U.S. Army Corps of Engineers' Engineer in Training program has been introducing young engineers to the Corps for more than 50 years.

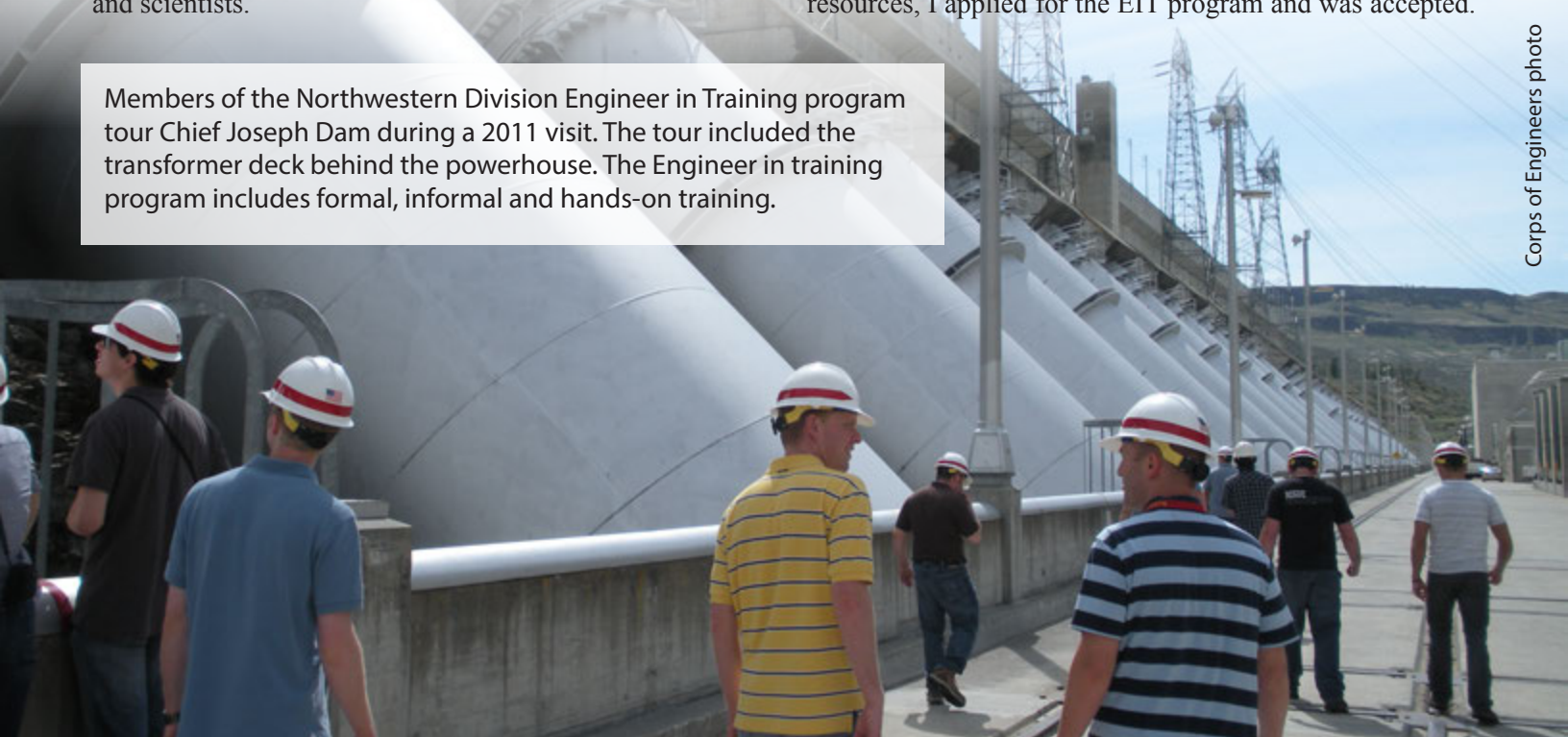
"The EIT program can't be beat for new engineers and scientists looking for a career in the engineering discipline," said John Etzel, deputy director of the Hydroelectric Design Center in Portland, Oregon, and a former EIT himself.

The Corps' goal is to recruit the best individuals available and provide them with the best training program it can develop. The two-year program includes formal and informal instruction as well as rotations in design, operations and construction. EITs are hired under a progressive grade structure, beginning the training as a GS-7 (EITs with GPAs below 3.0 start at the GS-5 level); when they complete the program they are GS-11 employees. Once they complete the training, EITs begin their careers as journeyman engineers and scientists.

In spite of its name, the EIT program includes more than just engineers. "We train computer scientists, economists, resource specialists – just about any science and technology specialists are welcome and encouraged," said Etzel. "Clearly, engineering is a big part of the Corps' mission. What is less known is that our engineering projects need all types of technical services, including wildlife biologists, water resource specialists and many other specialties. The EIT program offers all of them a well-rounded learning experience."

As EITs receive hands-on experience with actual projects, they learn about the Corps culture and its Civil Works mission. Each EIT receives a personalized work plan designed to introduce all aspects of the engineering mission. It also allows new engineers to decide where they want to focus their career paths.

"I started with the Corps under the Stay-in-School program," said Rachel Hanna, a new Engineering and Construction EIT. "After I graduated from Portland State University with my master's in civil engineering and water resources, I applied for the EIT program and was accepted.



Members of the Northwestern Division Engineer in Training program tour Chief Joseph Dam during a 2011 visit. The tour included the transformer deck behind the powerhouse. The Engineer in training program includes formal, informal and hands-on training.

Corps of Engineers photo

It's a competitive program – I know a lot of students who weren't accepted."

Hanna worked in the Hydraulics and Hydrology Branch during her Stay-in School job, which she finds a good fit. "I really enjoy the work we're doing," she said. "I've been modeling Columbia River flows to determine flood damages prevented by dams for the Columbia River Treaty. It's not a cookie-cutter job; I find it a thoughtful job with lots of challenges."

EIT rotations vary based on project needs, said Matt Hanson, Engineering and Construction Division's EIT coordinator. Hanson also is an EIT graduate. "While training for the EITs is important, we also need to utilize manpower in a way that supports our mission. For example, if Bonneville has fewer construction projects scheduled, we can schedule a rotation in another division first and wait until there's a greater need at Bonneville."

Hands-on experience is only one aspect of the training. In addition to formal classroom training, EITs learn how all parts of the organization work together to accomplish a goal, said Etzel. "It doesn't matter if they've selected operations, design or construction as a focus. EITs learn what's important to each team on a project, whether it's how to create a scope of work or how to execute the actual plan."

Working in each department helps the EITs to understand what each department needs to complete its part of the project, said Etzel. "That makes them more insightful engineers; by rotating through each department they can understand why something is needed – not just what is needed."

With about 1,200 employees in the Portland District, knowing who can help can be problematic. During their rotations, EITs build relationships with people who have valuable knowledge – knowledge that will help in future projects.

"Networking is a vital part of the EIT experience," said John Easton, Construction Branch's EIT coordinator – he is also a former EIT. "I still work with people I met when I was an EIT. Not only do you meet your colleagues – by working beside them on actual projects you have a group of experts you can rely on for advice and support in future projects."

Corps of Engineers photo

Engineer in Training Anna Pesola and Scott Cotner, Hydroelectric Design Center, discuss hydropower at Bonneville Dam. EITs receive hands-on experience in design, operations and construction during their two-year training program.

Corps of Engineers photo

Engineer in Training Sarah Rask crawls through a fish ladder opening after it was dewatered.

As valuable as the experience is for EITs, it's equally successful for the District. "It's a tremendously successful program for the Portland District," said Col. Jose Aguilar, the Portland District commander. "In addition to offering exceptional opportunities to individuals, it gives the District access to good prospective employees. That means we can effectively manage our overall manpower objectives."

Corps of Engineers photo

Engineer in Training Tom Grant studies generator shaft alignment measurements at Chief Joseph Dam.

Corps of Engineer jobs require technical expertise, but an employee who works well in a federal organization is equally important. "EITs not only receive experience and training in design, operations and construction, they learn leadership skills and an understanding of, and appreciation for how to work effectively in a government system," Etzel said. "The program helps build loyalty to the organization. Not only are the projects we do interesting and challenging, they also require a commitment to our processes. The EIT program allows new engineers to build the skills to work within the system by learning why we do things as we do."

One measure of a successful program is employee retention. The EIT program has an excellent retention rate. According to Etzel, Hanson and Easton, very few EITs leave before completing the program and most remain with the Corps. Chances are, if you work for the Portland District you know at least one former EIT – and likely many more.

"I'd say at least half of the engineer-type colleagues I know in Portland District were once an EIT," Etzel said. "My EIT training laid the foundation for my career with the Corps. I learned about the Corps culture and how each department operates, gained experience in my chosen field of engineering and met an incredible group of colleagues who remain central to my job today. It was one of my best career decisions."

The Engineer in Training program is a time-honored successful recruiting strategy for the Portland District, stretching back to the 1960s – and likely even earlier, although historic records are difficult to find after more than 50 years. Former EITs include mid-level and senior managers – and they remember their own mentors and managers who were former EITs.

That's something for the newest group of EITs to think about. In 10 years how will they view the program? It's possible they will be like Matt Hanson, John Etzel and John Easton – three former EITs who are now ensuring this dynamic and flexible program continues to offer career opportunities with the Corps of Engineers to future young engineers and scientists.

Corps of Engineers photo

Engineer in Training Chauncey Hamilton inspects repair work underway on the South Jetty at the Mouth of the Columbia River. Hamilton is currently the only EIT in the Construction Branch program; new EITs are scheduled to begin the program in 2015.

Kudos to Portland District's photographers

Last fall, Portland District held its annual photo contest and received more than 50 entries. More than 170 employees voted for their favorite photos online in four categories People, Project Focus, Scenic/Recreation and Technical/Engineering.

And without further ado, the 2014 winners are …

PEOPLE

1st Place Winner:
Meghan Fischer, Bonneville Lock and Dam

Riggers and mechanics work together to attach the lifting device for the unstack of the Unit 4 generator in Bonneville Lock and Dam's Powerhouse 1.

2nd Place Winner:
Jessica Stokke, Operations Division

Fishing is equal parts sport and an excuse for Alan Stokke and Brian Roche, Engineering and Construction Division, to get out on the water at Portland District's Cottage Grove Reservoir.

3rd Place Winner:
Kyra Fulkerson, Willamette Valley Project

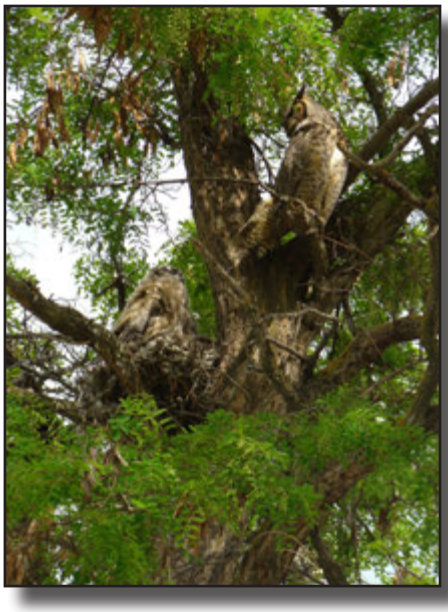
Nick Hansen, 22, of Etna, California, rides a jet ski at Fall Creek Reservoir on May 31, 2014.

SCENIC/RECREATION

1st Place Winner:
Vanessa van der Borg, Planning, Programs and Project Management Division

Unusually calm day on the John Day River across from Philippi Park.

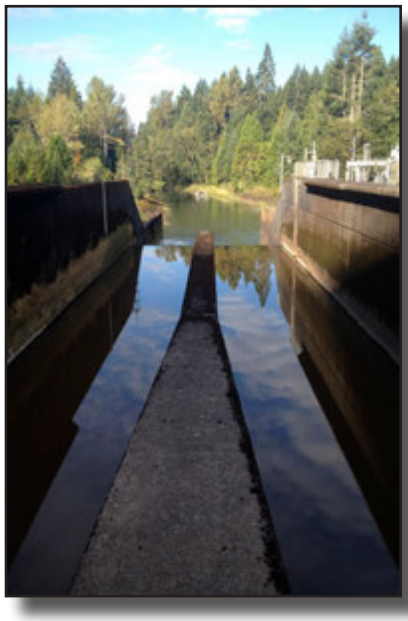
2nd Place Winner:
Greg Volkman,
John Day Lock and Dam



Great Horned Owls raised a brood of three in the campground at Plymouth Park located near John Day Lock and Dam.

3rd Place Winner:
Jacob Watts, Engineering and Construction Division

Peaceful early morning at the Fall Creek Dam stilling basin prior to a hard day's work performing a hydrographic survey.



PROJECT FOCUS

1st Place Winner:
Richard Morris, Operations Division

Dredge
Yaquina

2nd Place Winner:
Travis Davidson,
Engineering and Construction Division

The new setback levee (foreground) with the new tidally influenced wetland area flooding for the first time.

3rd Place Winner:
Amber Tilton,
The Dalles Lock and Dam

The Columbia River flows west toward Mount Hood while power is generated by the John Day Lock and Dam. Juvenile fish use the bypass tunnel during their downstream migration to the ocean.

TECHNICAL/ENGINEERING

1st Place Winner:
Meghan Fischer, Bonneville Lock and Dam

Brian K. Smith, a rigger at Bonneville Lock and Dam, checks the clearance of the rotor and Unit 3 generator in Powerhouse 1.

2nd Place Winner:
Chris Fordonski,
Bonneville Lock and Dam

Electricians perform maintenance at Bonneville Lock and Dam.

3rd Place Winner:
Amber Tilton, The Dalles Lock and Dam

Avian wires crisscross sections of the Columbia River at John Day Lock and Dam deterring predatory birds from making easy prey out of migratory fish.

To see all of the contest photos, visit Portland District's PortlandCorps flickr page.

Photography 101
Taking prize-winning photos

Always set your cameras (or SmartPhones) to 'fine quality' which guarantees a printable photo for publications. If you're taking 2 to 3 MB images, you're probably meeting the minimum standard.

News value – Great photos should attract the reader's attention (interest), carry your message (inform), provoke thought or an emotional response (provoke) and just be visually pleasing (entertaining). If it carries more than one of those elements, chances are you have a prize-winning photo!

Be sure to capture the people, action and mood in your photos.

Plan ahead. Plan your photo shoot in advance. Who's going to be doing what, where and when? Where do you need to be to shoot it? Eye level is often not the best position from which to shoot a photo. Stand on a chair or squat down. And above all, don't be afraid to move to where you need to be in order to get your photo! You want to capture faces not backsides!

Watch the background! When framing the subject, pay attention to surrounding objects. There is nothing more disconcerting than finding a tree branch you didn't notice growing out of someone's head.

Shoot lots of action and angles. Fill the frame fully with your subject and move around to shoot a variety of angles (kneel down, hold the camera high, move in close and be sure to capture hands and eyes. Place people's heads near the top of the frame rather than dead center.

The best photos contain only one center of interest. Anticipate action and be patient in waiting for it to happen.

Apply the 'Rule of Thirds." To do that, visually divide the frame into thirds, vertically and horizontally. Locate your dominate element at one of the intersecting lines. This suggests direction and movement within a photo.

Photograph your subject at varying distances. A 'long' shot provides context, showing the environment and introducing your subject. A 'medium' shot identifies the subject and action. A close-up shows the face and action and an extreme close-up details a unique or interesting aspect of the subject or action.

Move the horizon line. When taking outdoor photographs, many place the horizon dead center—the worst possible place. Move it down to focus on the sky or up to focus on the land.

You be the judge! Do your photos comply with Corps safety, security and other policies that prohibit the portrayal of endorsements or unflattering or illegal behaviors? Are your photos accurate and aesthetic? Are they proper and not embarrassing to anyone or any organization?

Get written parental permission if your photos include close-up images of individuals under 18.

Above all … take lots and lots of photos!

Power plant operators keep everything safe and sound

By Scott Clemans, Public Affairs Office

True to form, Rogue River Basin and Willamette Valley project power plant operators protested when told they were to be profiled in the *Corps'pondent*.

"We're recluses," Lost Creek shift operator John Funke joked. "We just want to stay in our lane and do our job."

"We definitely try to stay out of the limelight," agreed Lookout Point shift operator Tim Pierce.

"Due to our schedules, we tend to get left out of social and organizational stuff," added Lookout Point shift operator Luke Wikstrom.

Well tough luck, guys: After highlighting the District's Reservoir Regulation Team in December, it's time to turn the spotlight on the group that takes Res Reg's water and hydropower orders and turns them into action, while keeping people, property and the environment safe and sound.

"Our main job is to control and operate the dams' multi-million dollar power generation and flood control equipment," said Lookout Point senior operator Paul Gallegos.

That means opening and closing spillway gates; regulating outlets and penstock valves; adjusting and monitoring hydropower turbines and their associated equipment; and a variety of other related tasks.

Photo by Scott Clemans, Public Affairs Office

Power plant operators like Foster Dam's Jim Williams log and interpret temperatures, flows, pressures and other data to assure a dam's equipment is running right.

Some of that work can be done from the control room, but some requires the operator to get out into the powerhouse or other parts of the dam.

"We do inspections of equipment, and log temperatures, flows, pressures and other data and interpret them to assure the equipment is running right," said Detroit shift operator Chad Tschida.

"Data's important," Pierce agreed, "but you also need to learn to detect differences in sights, smells and vibrations of a generating unit."

"A lot of what makes a good operator is a mindset thing – you have to want to know more; to be curious about something you see or hear when you're walking around a dam," added Wikstrom.

And sometimes a single operator simply can't do it all – especially at the south end of the Willamette Valley, where nine dams are managed from one control room.

"Roving operators like me go out to the remote facilities to be the eyes and ears of the control room operators," said Wikstrom.

They also operate dams locally when remote operation isn't possible.

"For example, we have to go out and manually operate the spillway gates at most of our projects," Wikstrom said.

Water releases are usually managed according to Res Reg schedules, but operators have broad authority to ask for schedule changes or take action on their own when necessary, especially

because their knowledge of on-the-ground conditions is usually better.

"We're always watching reservoir conditions and how much flow we can manage through our different outlets," said Funke. "I've called Res Reg at 2:30 a.m. and asked for higher releases because the original schedule wasn't realistic – I knew inflows would go way higher way quicker than the schedule called for."

Gallegos agreed. "An important part of our job is understanding the big picture – how the releases we make impact the system of reservoirs and rivers, and the people around us. We're always thinking of public safety."

In addition to public safety, power plant operators play a key role in ensuring the safety of maintenance and other project personnel, whose work on gates, equipment and hydropower units is essential to the effective operation of the dams.

Before anyone can enter an area to do construction and maintenance work, operators must write and impose a "clearance" – the switching, valving and other actions needed to remove hazardous energy like electricity or water from the work area, and place a boundary around it.

"There really is no room for error with clearances," said Pierce. "People sometimes call us anal, but we have to be or people can die. We have to double- or triple-check ourselves and others or the results can be catastrophic."

And once the construction and maintenance work is done, operators are integrally involved in making sure the work was done right.

"Commissioning a new or replacement piece of equipment is a real challenge," Wikstrom said. "We have to test every single system multiple times and ways to ensure it works right."

Because they have a big-picture view of what's happening – and because they sit where all the phone lines come together – operators also end up being the communication hub at their project.

"We field a lot of public inquiries, especially from fishermen," said Funke. "We're also on the phone a lot providing real-time data to Res Reg, working with police and emergency services that patrol the area, and coordinating with a lot of other agencies, like Fish and Wildlife and State Parks."

Gallegos said people sometimes don't realize how many balls operators have in the air at the same time.

"People see us sitting down all the time, so they think we don't have much to do," he said. "They don't understand when they ask for something that sometimes we have 10 other people asking at the same time. We'll do our best to help – have patience."

Despite all the challenges – including a rotating work schedule they almost universally loathe – operators love what they do.

"It's a job with purpose," said Funke. "We're protecting the public, fish and the environment."

Operators remember lost colleagues

Willamette Valley Project employees are mourning the loss of two veteran power plant operators over the past few months.

Detroit power plant shift operator Randy Hood passed away in October. Coworkers most remember him for his friendship and positive attitude.

"He was a really nice, laid-back guy," said fellow operator Chad Tschida. "He never had a bad word for anyone, and was always willing to help."

Lookout Point senior power plant operator Greg Zeiber passed away in November. He will be most remembered for his constant striving for perfection.

"He was really involved with his work, because he always wanted to do it right the first time with no regrets," said fellow senior operator Paul Gallegos.

"He was really self-sacrificial to the job," added shift operator Tim Pierce. "He was the one who was always in early and home late to come up with extremely detailed answers when there was an issue to be resolved."

In addition, Rogue River Basin Project employees are mourning the loss of Zachary Jones, son of longtime power plant operator Bearl Jones, in December.

According to Lost Creek shift operator John Funke, Zachary, age 25, spent a lot time at the project with his father and was well known and liked by the crew. Zach's goal was to work for the Corps as a utility man and ultimately move up to operator.

3-D modeling key to innovative labyrinth spillway

Inter-District staffing provides dam safety solution

By Amy Echols, Portland District Public Affairs Office and John Prettyman, Sacramento District Public Affairs Office

The U.S. Army Corps of Engineers' Sacramento District is facing one of its toughest engineering projects with help from Portland District: upgrading Isabella Lake Dam in southern California. Earthquakes, seepage and extreme storms could all potentially cause the dam to fail, resulting in catastrophic damage to nearby Bakersfield, with economic impacts nationwide.

Designing an emergency spillway to increase the dam's capacity to safely release large volumes of water and significantly reduce risks to the large downstream population is well underway. But the local topography and limited space to construct the spillway made traditional engineering solutions ineffective. As explained by Sacramento District engineers, this project required some solutions from outside the handbooks.

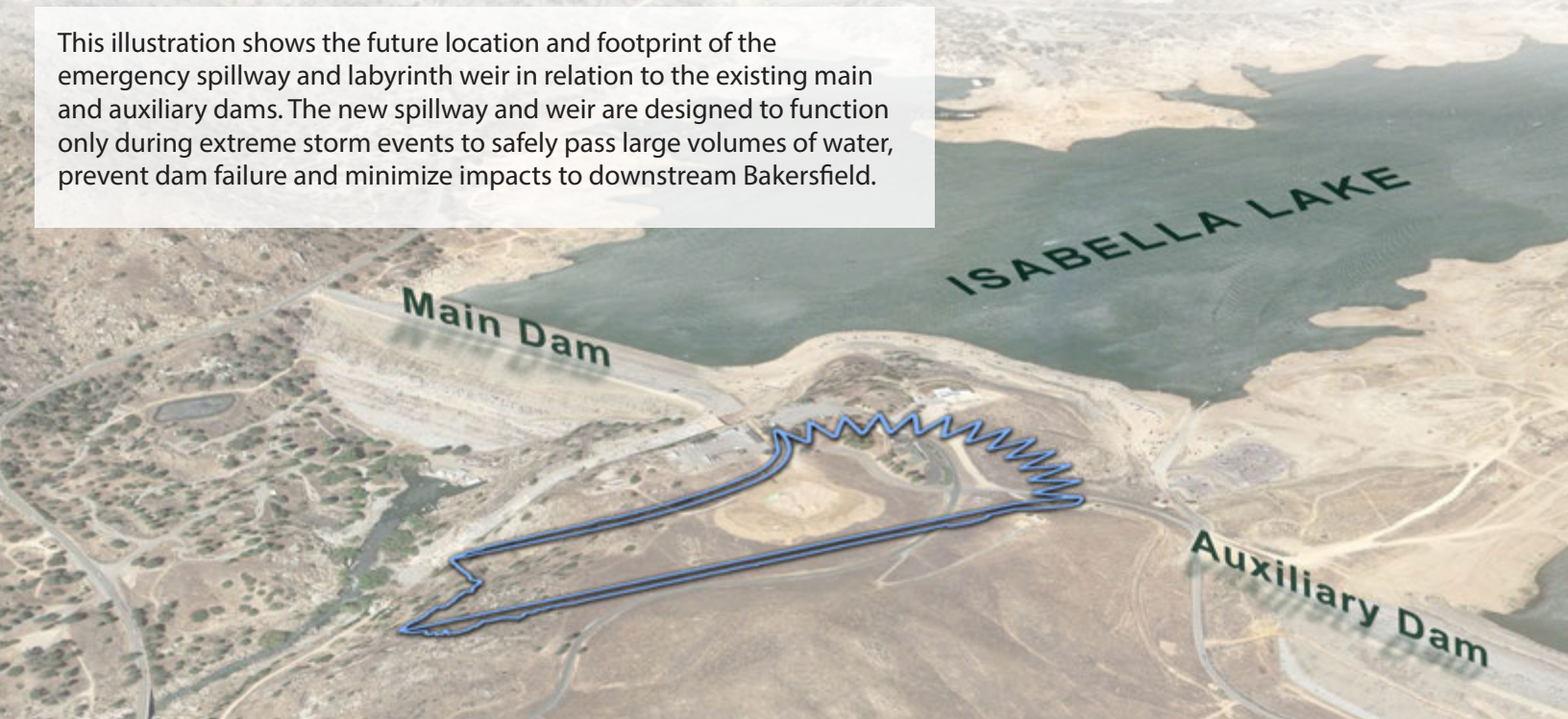
A dam safety risk assessment determined that Isabella Lake Dam was threatened by the risk of failure from overtopping due to a spillway unable to handle the maximum estimated peak flow. Sacramento District evaluated a wide range of potential spillway modifications, including Tainter gates found on many Portland District dams.

Several years of initial alternative testing provided a front-runner design for further evaluation: the innovative, horizontal labyrinth weir. The 3,000-foot labyrinth weir will channel flow into an 800-foot wide spillway. The location and size of the spillway and its chute had to support the design objective of passing peak flows, while avoiding some seismically sensitive locations. Engineers further optimized the design within the limited space by aligning the labyrinth pattern of the weir crest along a curve instead of a more typical straight line.

To help ensure the labyrinth weir could provide maximum flow capacity in the limited space available, Sacramento District sought the specialized, seasoned expertise of Portland District hydraulic engineers Liza Wells, Laurie Ebner and Sean Askelson to conduct 3-D Computational Fluid Dynamics modeling for the Isabella project.

This modeling uses numerical methods and algorithms to study the physics of fluid flow. In particular, Portland District uses CFD modeling to provide information about how water passes through and near structures as part of the design process. To accurately model flow, specialized

Illustrations and photos by John Prettyman, Sacramento District



This illustration shows the future location and footprint of the emergency spillway and labyrinth weir in relation to the existing main and auxiliary dams. The new spillway and weir are designed to function only during extreme storm events to safely pass large volumes of water, prevent dam failure and minimize impacts to downstream Bakersfield.

software divided the volume of water in the reservoir forebay, spillway and spillway chutes into about 2.5 million computational cells. Computations for each cell provided information on velocities, water surface elevations and pressures, depending on what was happening to the cells around it. For example, one model simulated a portion of the reservoir forebay, confirming flow patterns as water approached the labyrinth spillway. More detailed modeling simulated flow over the weir to ensure the weir's performance.

The trio from Portland also recommended that Sacramento District use a composite modeling approach that combines physical and CFD modeling to balance the benefits and limitations of both technical tools. Engineers often use physical scale models as highly visual tools for observing design performance, validating flow capacity or evaluating features for design projects like Isabella's labyrinth weir.

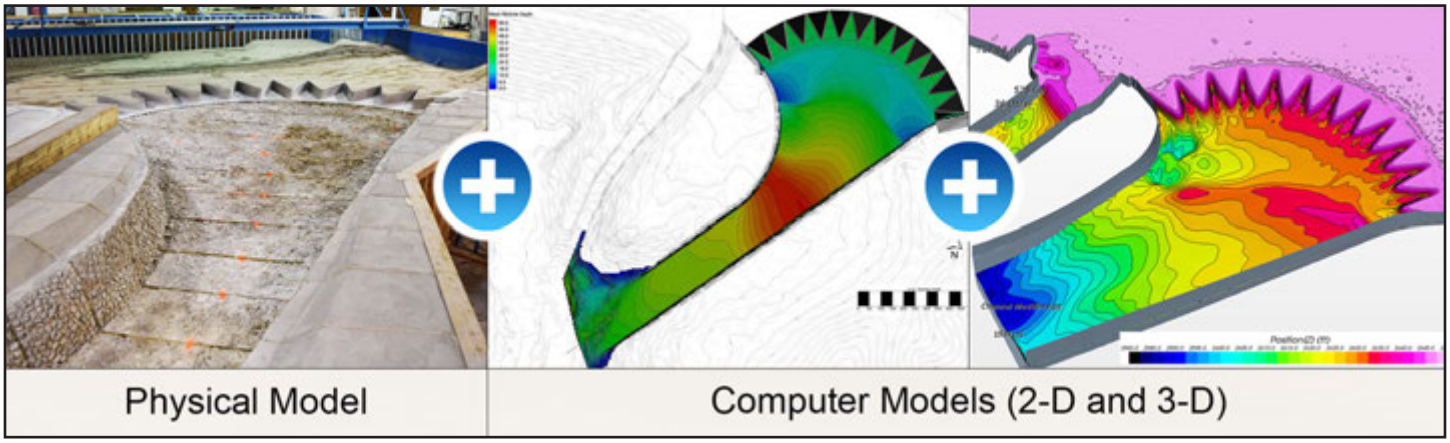
Isabella Reservoir is located on the Kern River in southern California, one mile upstream of the town of Lake Isabella and approximately 42 miles northeast of the city of Bakersfield (with a metropolitan area population exceeding 500,000).

The physical model footprint for this 800-foot weir could have become impractically large to appropriately model the flow physics. Portland District's composite modeling approach, however, supported the building of a cost-effective and technically sound 1:45-scale physical model by Utah Water Research Laboratory staff at Utah State University.

"The flexibility of CFD modeling allowed us to reproduce detailed flow patterns and test flows under a variety of conditions that can't be practically modeled physically," said Askelson. "And while CFD modeling has its advantages, it has not frequently been used for design of this type of labyrinth weir, so confirmation of the design through physical modeling was critical to the process."

Askelson explained that seeing the physical model in action helped validate CFD modeling results and identified areas where CFD modeling could further improve the weir's design. "Another advantage to the CFD model is that we can look at any model results and analyze them differently in the future."

As the composite modeling progressed, Ebner and Askelson frequently met with the Sacramento District



Modeling is an essential part of the Corps' engineering and design phase and allows engineers to test the design against extreme storms and improve it before construction begins. Engineers used the best from both physical and computer models to validate the effectiveness of the labyrinth design that will translate better into the full-scale construction, ultimately saving both time and money.

project team and researchers in Utah to make sure the modeling tools worked together successfully.

"Marrying the results from both CFD and physical modeling provided the design team an important level of technical confidence in our decisions," said Ebner. "This hybrid approach also offered engineers a chance to learn from each other's specific experience and specialized disciplines and added significant value to the project."

After testing and modifications, engineers confirmed that raising the existing Isabella Lake Dam 16 feet and constructing the new labyrinth spillway would allow reservoir flows to meet dam safety objectives.

Ebner and Askelson anticipate playing consulting roles as the design moves into construction. They explained that even with the best design, the excavation and concrete construction phases of the project may require hydraulic modeling to help adjust the alignment of the project.

"The Isabella Lake Dam project demanded staff to function at the highest possible level. They operated in a very positive manner, with unusual technical ability, in the demanding atmosphere of a constrained project schedule," said Sacramento District Commander Col. Michael J. Farrell. "The team's performance continues to receive positive feedback from counterparts at the Corps' Risk Management Center, academia and subject matter experts in private industry."

And with many Corps dams in need of additional spillway capacity, the methods developed by the Isabella Composite Modeling Team may be applied readily to significantly benefit other projects.

Laurie Ebner, hydraulic engineer with the U.S. Army Corps of Engineers' Portland District, and David Serafini, geotechnical engineer with the Corps' Sacramento District, observe modeling of 506,000 cubic feet per second flow of water through a 1:45-scale model labyrinth weir and emergency spillway. This flow is equivalent to the largest storm predicted to hit the region.

Wells, newly appointed as chief of Portland District's Hydraulics and Hydrology Branch, added praise for Ebner and Askelson: "They are a model themselves for the success of effective regional and national knowledge-sharing and collaboration that will serve the Corps well in the future."

Learn how extreme storm water flows and 3-D modeling helped develop the best design to modernize Isabella Lake Dam.

- Take a video tour of Sacramento District's new Isabella Lake Dam scale model at Utah State University's Water Research Laboratory: *http:/youtube/wXTvvKkSxpo*
- More photos available on Sacramento District's Flickr page: *http://bit.ly/1ms3YiF*

Anglers - Leave No Trace

Know Before You Go

Know the regulations and special concerns for the area you'll visit.
Recreation hours vary seasonally. Be prepared!
Bring supplies for extreme weather, hazards, boating and emergencies.

Pack It In, Pack It Out!

Take all trash and food with you when you leave- there are no garbage services in this area!
Inspect your area for any trash or spilled foods.

Leave It As You Find It

Walk or bike on designated trails only.
Use only authorized fishing access trails. Leave rocks, plants and other objects of interest as you find them.
Avoid introducing or transporting non-native species.

Be Careful with Fire

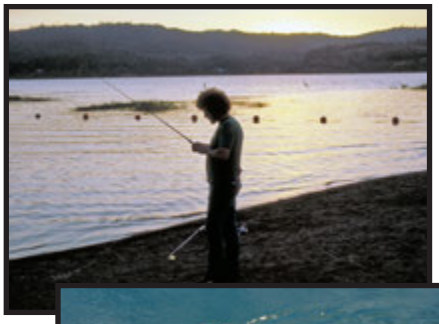
Fires are allowed in grills only- no open fire pits!
Don't bring firewood from other areas as it can harbor tree killing insects and diseases. Many states regulate the movement of untreated firewood.

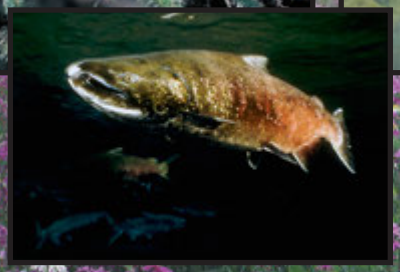
Keep Wildlife Wild

Observe wildlife from a distance and never approach, feed or follow them.
Human food is unhealthy for all wildlife and feeding them starts bad habits.

Share Our Trails and Manage Your Pet

Keep your pet under control to protect it, other visitors and wildlife.
Listen to nature. You will see more wildlife if you are quiet and remember, other visitors are there to enjoy the outdoors too!





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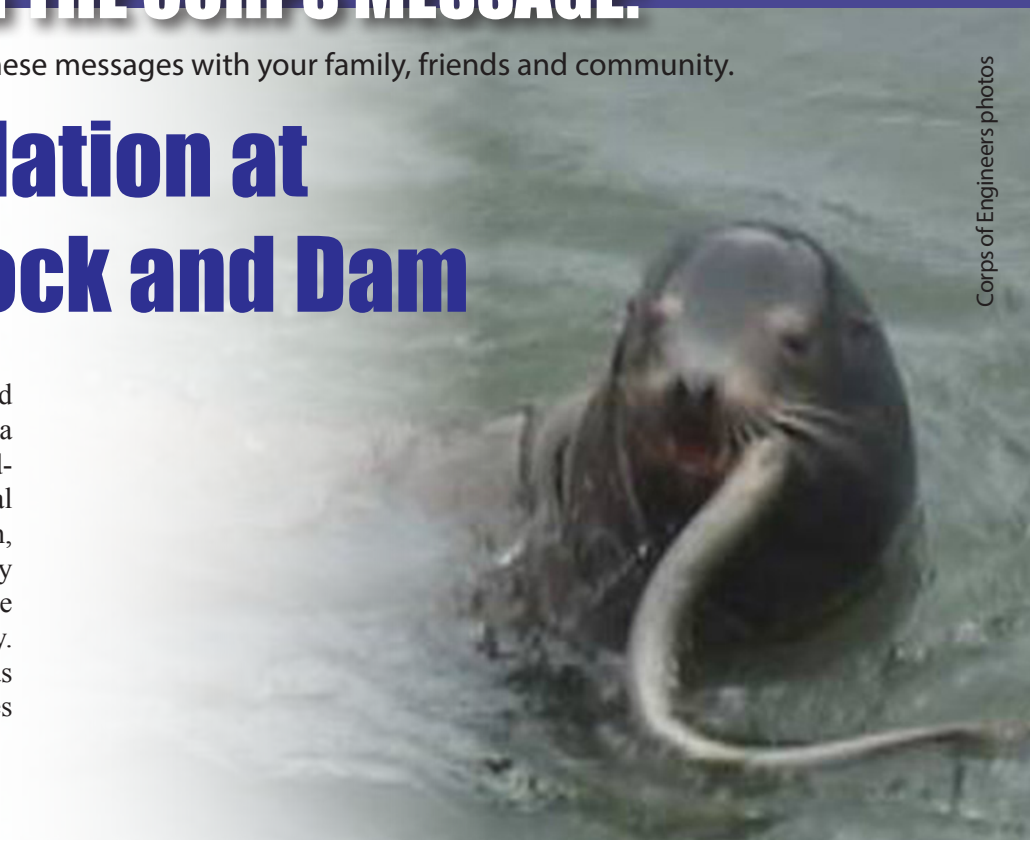
Sea lion predation at Bonneville Lock and Dam



Corps of Engineers photos

Predominantly male California and Stellar sea lions swim up the Columbia River to Bonneville Lock and Dam in mid- to late-February to eat part of the annual spring migration of sturgeon, salmon, steelhead and other anadromous fish. They do this to gain weight and energy for the spring mating season and leave by mid-May. The number of fish eaten by sea lions has increased nearly every year since studies were first undertaken by the Corps.

- The Corps' role in sea lion issues at Bonneville Lock and Dam Project is limited to monitoring sea lion numbers and predation; evaluating the effectiveness of management techniques; and keeping sea lions out of our fishways.
- We support the actions of NOAA Fisheries Service and state and tribal agencies to ensure the protection and continuity of native fish species.
- The Corps has contracted with U.S. Department of Agriculture's Wildlife Services to harass sea lions from the dam structure to keep them away from the fishway entrances. Wildlife Services is not shooting or killing sea lions.
- While the Corps operates the dam and the fishways, NOAA Fisheries Service has responsibility for sea lions under the Marine Mammal Protection Act, and the state fish and wildlife departments have hands-on responsibility for any animal within their borders
- Stellar sea lions – which can be hazed but are currently protected from removal – are having an increasing impact on white sturgeon below Bonneville.