

## **PURIFIED AT THE SOURCE: Umpqua National Forest uses meandering wetland system for reclamation of historic mine**

Once a moderately barren hillside, the ground surrounding the historic Champion Mine on the Cottage Grove Ranger District of Oregon's Umpqua National Forest has been transformed into a vibrant meandering wetland. Part of the formerly thriving Bohemia Mining District, Champion Mine was developed in the late 1890's, producing healthy amounts of gold and silver ore. During its lifespan, the mine changed ownership numerous times. Comprised of numerous mining claims, the workings of Champion Mine create a web of over three miles of tunnels beneath the earth's surface. As one of the largest mines in the Bohemia Mining District, Champion Mine featured a mill, an aerial tram system, a bunkhouse large enough for 75 men, as well as, a number of additional structures.

Champion Mine remained periodically active throughout the early 1960's before falling into disrepair. Located at the headwaters of Champion Creek, the tunnel system began to fill with water. Traveling through the mineral-rich soil, the water collected an overabundance of heavy metals, including iron, arsenic, mercury, cadmium, and nickel. Laced with a large concentrate of heavy metals, Champion Creek, which eventually flows into Dorena Reservoir, took on a strong orange color, the result of the acid mine drainage created by the mine workings. Although the mine fell on National Forest system lands, the mine had been abandoned decades prior, meaning that the Forest Service didn't have anyone to hold responsible for the management and restoration of the mining site.

In 2003, Champion Mine was recognized under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which initiated a reclamation effort. The Forest Service's Pacific Northwest regional office provided funding for the reclamation work, which was initially overseen by a specialized contract company. After breaking ground in 2006, the reclamation work was completed in 2009. When the Umpqua National Forest regained responsibility of the project in 2011, they also received an Operations and Maintenance Plan from the contractors to help with continually keeping the reclamation efforts effective.

Cottage Grove Ranger District Geologist, Aili Gordon, has been overseeing the Champion Mine Reclamation project since she came to the Umpqua National Forest in 2011, after receiving her bachelor's degree in geology from the University of Oregon.

"I enjoy working on this site because it's challenging," Gordon reflects. "It's like a big experiment. You don't know what is and isn't going to work."

Currently, the reclamation site is composed of two settling ponds connected by a series of channels. Each settling pond holds approximately 36,000 gallons of material and is over five feet in depth. Before the water reaches the settling pond, it is filtered through three basins. Each basin contains a 50-pound flocculant log, which interacts with the heavy metals, forcing them to sink to the bottom of the settling pond. A second settling pond had to be added after the first pond filled with removed iron sediment.

Once traveling through the flocculent log system and settling pond, the water receives further purification by working its way through a wetland. By the time the water begins to flow down the stream channel, over 95 percent of heavy metal toxins have been removed. Routine water sampling is completed to ensure that the passive wetland treatment system remains effective.

Gordon, who grew up rockhounding with her dad, also a geologist for the U.S. Forest Service, continually inspects the Champion Mine Reclamation site as weather conditions allow.

“I’ll usually head up there in the beginning of May, or whenever the snow melt allows, to make sure that the work from the previous year has held,” explains Gordon. “After that, I’ll usually inspect the site a half dozen times or more during the field season.”

In addition to these inspection visits, Gordon also spends a significant number of days at the site during yearly improvement projects. Because the site falls at an elevation where rain-on-snow happens frequently, erosion is a major concern. As a result, each summer Gordon works with the Forest’s road and fire crews, as well as volunteers, to improve culverts, berms and roadways. Gordon focuses specific attention on ensuring the settling ponds are thoroughly armored and not susceptible to erosion. Recently, Gordon and her workforce completed a ditch encompassing the site to catch any loose sediment.

Located directly off of a county road, Champion Mine receives a fair amount of attention from the public. Bright orange water trickling through terraced wetlands proves to be rather conspicuous amongst the dark greens of the forested hillside, provoking the curiosity of those passing by the reclamation site.

“People see the site and are interested in it. If I’m there, they’ll stop and ask questions,” remarks Gordon, who plans on creating an interpretive installment at the site. “The public has been very respectful of the land and the work being done there.”

Despite the decades of inactivity at the Champion Mine, a number of smaller claims are still being prospected for gold throughout the Bohemia Mining District. The Forest Service regularly inspects these placer and load-rock claims, ensuring that the miners are following pre-established guidelines.

Aside from working on Champion Mine Reclamation, Gordon’s duties include managing the District’s aquatics program, monitoring the Forest’s rock pits, doing geological investigations for water wells, issuing rockhounding permits, and securing abandoned mine sites with bat-friendly steel grates. However, for Gordon, Champion Mine remains a focal point in her workload.

“I’ve spent a lot of time working on this project, so I definitely have a personal interest in it. The site has a great deal of history,” Gordon asserts, when considering why this work is important to her. “I also want to make sure that we’re keeping the value of the investment in the reclamation.”

Although the initial CERCLA construction efforts completed the basic structure of the passive wetland system, the reclamation project is an ongoing process. Gordon, and others, will

continue to monitor and evolve the site to combat erosion and remove collected heavy metal debris for the foreseeable future.

*Born and raised in the tiny mountain community of Kernville, California, Jaimie Olle is a seasonal forestry technician on the Diamond Lake Ranger District handcrew on the Umpqua National Forest. She graduated from Seattle University in 2014 with a double-degree in strategic communications and creative writing. Combining her passion for the outdoors and people, she plans to make a lifetime career with U.S. Forest Service.*