

Western Cave Conservancy

Protecting the West's Last Frontier

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Slender Salamanders in Central Sierran Caves and Karst

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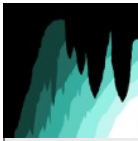
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If a younger me had been told that I would move 3,000 miles away from where I grew up to study an animal found in my hometown, I would have laughed at the premise. Yet, at 27 years old, I somehow found myself doing just that! My name is Nick Van Gilder: I was raised in the foothills of the Sierra Nevada, completely enamored with the natural landscape around me. Though I started life as a “dinosaur kid”, my eyes quickly opened to their contemporary relatives that I shared the landscape with, the reptiles and amphibians. Much of my early life was spent dreaming and thinking about these animals, and when it came time to think about college and graduate studies, my mind went to what must be my favorite of the broad group of amphibians, the salamanders.

One of the most fascinating groups of salamanders that exists are the Slender Salamanders, members of the genus *Batrachoseps*. *Batrachoseps* is the most diverse genus of salamanders in the Western United States, totaling 23 different species that range from northern Oregon to northern Baja California,



Figure 1: An adult *Batrachoseps diabolicus* from the northern end of their range in El Dorado County, CA. This animal looks outwardly similar to many other species in the genus.



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Mexico, with the bulk of the genus found only in California. These small, slim-bodied salamanders lack lungs and as a result require some amount of ambient moisture to breath. Knowing this, it is surprising to consider the diversity of habitats these animals occupy, ranging from pristine temperate rainforest to altered urban parks, and from high-altitude mountain slopes to rugged chaparral. How do these tiny, lungless animals manage to exist in places without obvious access to water?

It may come as no surprise that all species of *Batrachoseps* similarly spend most of their time underground, where conditions tend to be cool and favorably moist. The biological limitations on their surface activity means that many basic facts about these animals are still unknown because of how infrequently they are encountered. In many places where these animals live, there may be only a month to as little as a single day of weather conditions that support activity of these salamanders on the surface. Because of this limited surface activity, for many species of *Batrachoseps* researchers and managers know nothing about interactions between and among populations, or even how dense their populations are.

The uncertainty surrounding many of the species in this genus has spurred management bodies to fund studies designed to answer some of these lingering questions, especially for species that are already of concern. In my research as a graduate student at the University of Connecticut, I employ molecular techniques and analyses to inform the conservation of *Batrachoseps*. Specifically, one of my study species is *Batrachoseps diabolicus*, the Hell Hollow Slender Salamander, a species only found in the north-central Sierra Nevada foothills. *B. diabolicus* is a species designated as a “Special Animal” (CNDDDB 2020) by the CA Department of Fish and Wildlife, meaning that it is thought to need conservation action but is data deficient. Part of my graduate work is focused on increasing the amount that we know about this species using genetic techniques.

The DNA found in even a small speck of tissue allows for insight into many facets of the biology of these animals, meaning that I can estimate things like how often individuals migrate between two sites without observing the animals physically doing that (a huge upside, considering most *Batrachoseps* tend to move on a scale of only a few feet per year). So, instead of driving myself crazy attempting to document *B. diabolicus* moving on infrequent rainy nights, and rather than getting an inaccurate physical count

of just the animals found on the surface, I can travel between sites getting a sample or two of tissue and more accurately answer my questions. Ironically enough, it also allows me to study animals found in my home state from across the country. However, I am certain that some of you reading this are thinking of one more way to observe *Batrachoseps* in less-accessible places.

Of course, I am talking about looking for these animals underground in places familiar to everyone reading this article – caves! While tiny and easily overlooked, there is evidence that *Batrachoseps* are occasionally found in and around caves by recreational cavers and biologists performing inventories. A compilation of cave inventories in California lists various *Batrachoseps* observations from caves in Tulare, Fresno, Santa Cruz, and Calaveras counties (Elliott et al. 2017), suggesting that this could be a more widespread phenomenon. With this in mind, while planning my fieldwork for the winter of 2021 I reached out to the Western Cave Conservancy (WCC) about getting access to Conservancy-owned properties in order to expand my potential sites to search for *B. diabolus*. The WCC went above and beyond supporting my inquiry for land access in this region, and on a cold morning in early December I found myself driving south down the familiar twists of Highway 49. The plan for the day was to meet with the preserve manager at Weller Preserve, in an area of the foothills that comprises a large gap in the known distribution of *B. diabolus*. Then, I planned to search the surface in the vicinity of Rippled Cave in hopes of locating a slender salamander or two.

After making our way to the site, my jaw dropped. Such a large outcrop of karst smack-dab in the middle of a madrone, live oak, and ponderosa pine forest was truly unlike any place I had ever seen in the Sierra

Foothills. Following a review of the history of how this parcel of land came to be the Preserve it is now, I set off to search the property for salamanders. Usually, for terrestrial salamanders this means gently lifting rocks and logs to see what's underneath, but for salamanders as small as *B. diabolus* possible places to hide expands to moss mats, piles of leaf litter, and small cracks and crevices in rock faces—plenty of ground to cover in a day, at any rate! I worked around the property in somewhat of a circle, saving the tantalizing areas above and around the cave entrance for last. I wormed my way through patches of poison oak, gently sifted leaf litter at the base of trees, and checked underneath suitable cover objects.

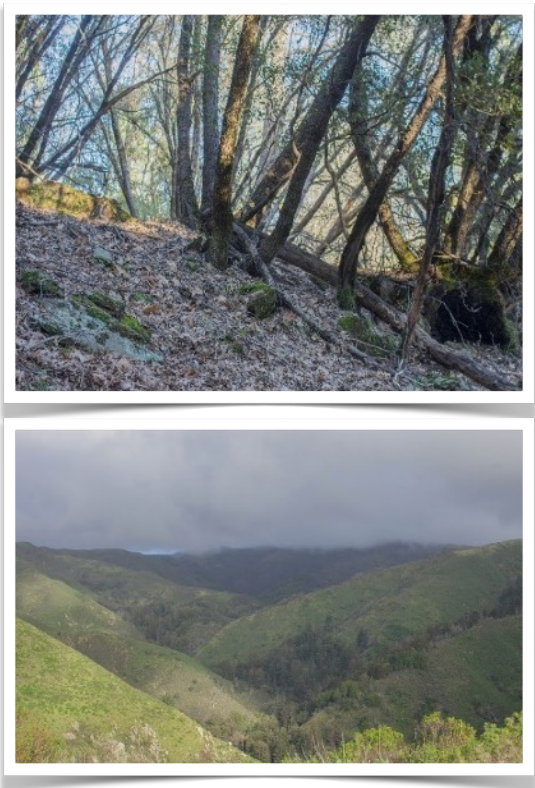


Figure 2: Habitat of *Batrachoseps* species from El Dorado (top) and Monterey (bottom) counties. Shrubby interior chaparral and coastal regime forest are two very different types of habitat that one might expect to see a slender salamander in, with some luck!

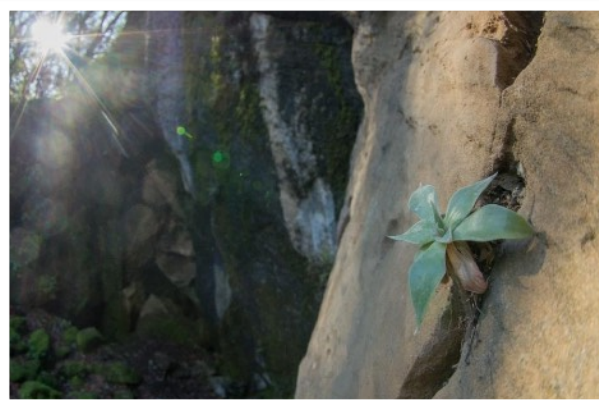


Figure 4: A Canyon Live-Forever (*Dudleya cymosa*) clings to the karst that makes up Rippled Cave.

After several hours, I'd located some interesting species of crickets and arachnids, a several-month-old shed skin from a snake (likely a Chaparral Whipsnake, *Coluber lateralis*) and one salamander: a lovely adult female Yellow-eyed Ensatina (*Ensatina eschscholtzii xanthoptica*) at the eastern edge of the species' range. Finding the *Ensatina* was a good sign after several hours of looking with no amphibians to show for it, but she ended up being the first and only salamander that I was able to find that day. Ultimately, I concluded that it was probably just slightly too cold to encourage surface activity of salamanders, but this trend unfortunately got worse as December gave way to January, and I never was able to return to check.



Figure 3: An adult Yellow-eyed Ensatina (*Ensatina eschscholtzii xanthoptica*) from the forested portion of Weller Preserve.

That being said, I do think that *B. diabolicus* occurs at Weller Preserve, despite my lack of proof. The day of searching this site was in line with many of my days spent in the field during the winter of 2021: over the course of 19 days in the field, I returned to Connecticut with tissue samples from 47 individual *Batrachoseps*, putting me at a rate somewhere in the ballpark of one salamander for every four hours of concentrated searching! (in reality, it was many more hours per salamander, as several of them came from under the same cover objects). To confirm my suspicions of *Batrachoseps* occurring at Weller Preserve and elsewhere, I am hoping to enlist members of the various grottoes of Central California on a salamander-spotting mission with a fairly simple task: to keep their eyes open for small salamanders while underground! Hearing reports of (or seeing photos of) salamanders observed while caving in the Sierra Nevada Foothills (or elsewhere) would go a very long way to untangling some of the remaining questions on the distribution and behavior of these cryptic animals. And beyond just *Batrachoseps*, caves may represent a significant source of biologic novelty, even in 2022. It would not surprise me in the slightest to learn that a brand-new species of salamander has been discovered lurking in the depths of a cave unbeknownst to the biologists limited to the surface above — we just might need some help from the people who are already down below. Please feel free to email me at nicholas.van_gilder@uconn.edu if you ever have anything interesting to share, as I would love to know more about any subterranean salamander encounters. They might just be exactly what I'm looking for!

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- [1] California Natural Diversity Database. Special Animals List. 116.
- [2] Elliott, W. R., Reddell, J. R., Rudolph, D. C., Graening, G. O., Briggs, T. S., Ubick, D., ... & Taylor, S. J. (2017). The cave fauna of California. *Proceedings of the California Academy of Sciences*, 64(4), 1-311.

Malheur Cave Graffiti Clean-Up

Neil Marchington

The Malheur Cave Clean-Up Project took an amazing team of volunteers, hundreds of hours, and thousands of dollars (mostly for new hose) to complete. Every person who came out did an amazing amount of work, and was vital to this project. Malheur Cave is graffiti free for the first time in decades. Huge thanks to the Western Cave Conservancy, Western Region NSS, Oregon High Desert Grotto, Willamette Valley Grotto, Oregon Grotto, Motherlode Grotto, Mazamas, Burns Masonic Lodge, and so many individuals for their support. Malheur Cave is back open to NSS members after years of closure. You can come tour this amazing underground lake thanks to the restoration work of our volunteers and members!

Almost half of Malheur Cave is flooded. The waters form an amazing, clear, underground lake which snakes through the massive lava tube. For thousands of years, the cave has been a retreat in the Eastern Oregon desert. The ground outside is littered with obsidian flakes from the earliest human visitors. Ranchers have stopped by to explore the cave for generations. A lonely highway passes nearby, granting easier access to travelers brave enough to venture into this desolate part of Oregon. The cave is on most maps.

Sadly, with modern visitation, people have decided they must leave their mark on nature. Over decades, graffiti has built up on the towering ceilings above the lake. Trash has been dropped carelessly or on purpose. The destruction got bad enough that the owners of the cave, the Burns Masonic Lodge, decided to close the cave to all visitation. The Masons erected a stout and artistic gate at the entrance. Some of the materials they used are salvaged rail tracks more than 100 years old. The cave was now safe from vandalism, but the marks of the past remained. The cave was closed to everyone outside the Masonic Lodge.

After long talks with Art Bush of Masonic Lodge, a small group from Oregon High Desert Grotto (Ron Delano, Edd Keudell, and I) ventured into the desert to meet at the cave and talk about a clean-up. We took a nice tour, did a resurvey, and talked. A basic plan to help clean up the cave came together. Edd Keudell drafted a beautiful new map including the upper section left off in earlier survey maps. Mike Schoen, Claude Koch, and I spent hours designing and building a work platform to put on Jeremy Holbrook's 14-foot-long white water raft.

Claude did some custom welding to make an extension wand for the sandblaster gun and a support leg for the blast pot. We spent hours setting up the new air hoses and trying to think of any need. While sandblasting caves isn't new, Malheur Cave presented another level of complexity. We needed to drag in and use heavy equipment on a makeshift floating platform that we would assemble deep in the cave. We spent hours designing and testing the equipment.



Malheur Cave is about 4 hours from our home base of Bend, Oregon. A small army formed at the cave on November 6th 2021. Cavers from all over Washington, Oregon, and Idaho showed up. Multiple trailers of gear, an ATV, and portable toilets arrived. Mike Schoen had reached out to his friends in the Mazamas for help, and several showed up.

As we started pulling out thousands of pounds of gear, we knew the task ahead was daunting and uncertain. We would be doing a major sandblasting operation on an underground lake that is over 1000 feet long. Some of the graffiti was 15 feet in the air. We would be sandblasting on rope. So many tasks had never been tried.

The volunteers started running hose, bringing in equipment and getting everything in place. Claude Koch took the lead on getting the raft platform assembled and tied down. The drop in the lake had left deep and viscous mud which seemed to suck people in with every step! Mud started to coat everything in a slippery goo.



Our goal was to start at the end of the cave and work backwards. I wanted to prioritize the lake portion of the cave. The lake, with the floating raft and sandblasting high on the cave wall, was going to be difficult and labor-intensive. Several hours later, Dave Nissen and I took to the subterranean waters. We were piloting a 14-foot-long white water raft through a cave powered by a trolling motor and white water paddles. We had hundreds of pounds of blasting sand, a large sandblaster, protective equipment, a ladder, ropes, cams, and lots of other equipment to support a long day of sandblasting. Smaller support boats joined us to help secure us to cracks in the walls with rock-climbing cams. As we approached the back of the cave, we all were wondering if this would even work....

As the first graffiti started disappearing from the walls, we learned the sandblaster propels a 14-foot raft much better than I could have imagined in the opposite direction of where you need to be. The power of the sandblaster was so great that our original idea of how to anchor to the wall needed to be much more aggressive. Once we got our wall anchor system down, we started making excellent progress. The huge graffiti was disappearing before our eyes. This was working!

The lake level had dropped considerably over the years with our western mega-drought. The lake was about 3 feet lower than it had been in May. A big challenge came as we found some graffiti was now 15 feet in the air instead of 12 feet. We had brought a 6-foot ladder, a 6-foot caver, and a 6-foot extension rod based on the conditions in March. That was going to give us a roughly 12-foot reach. As we found this was just not enough, Karl Helser came up with the brilliant idea of tying the extension rod to a 2x4. It was heavy but worked. Blasting that far out made it a great lever that fought against my control of the blaster. It nearly pushed me off the boat a few times, but it worked!

Help the WCC Pay Off The Volcano Natural Preserve!

We will happily accept any donations of any size. (And don't forget, it's tax deductible!) You can always donate online at www.westerncaves.org/donate. Or send a check to: Western Cave Conservancy, P.O. Box 230, Newcastle, CA 95658

The next big challenge was removing the graffiti in the upper area only accessible by rope. Large graffiti spanned a section of the ceiling at the entry to the upper tube area. Removing the graffiti would have to happen while suspended and free-hanging on rope. This was something I had never attempted. As I started blasting off the graffiti, everything worked well. Blasting on rope was fairly easy.

As we moved through the lake, we worked through the various challenges. In some areas, there were no good anchor cracks. I asked Phillip Clark to join us on the boat and run the blaster so I could hold the slippery wall to keep the raft in position. Several times my grip failed, sending us gliding out into the lake away from the graffiti. In some places, we worked in the middle of the lake on the ceiling using the smaller boats paddling to keep us in position. Ron Delano and Vandy Hall were in the smaller boats taking videos and photos as we worked. The smaller boats started disconnecting the hoses and removing unneeded gear as we got closer to the shore. I knew our volunteer numbers were going to reduce greatly the following day, so getting the lake section done and the raft out of the cave were major priorities. We worked late into the night to make every minute count.

We completed removing graffiti from the area containing the lake. A team started breaking everything down and carrying things out. As I stumbled out into the frozen night, barely able to stand, Ron Delano put a giant bowl of hot chili and cheese into my hand. Next Ron put a cup of boozy hot cider in my other hand. The ice coating my chair started to melt from the warmth of my backside. We sat around Mike Schoen's propane heater. I was a bit amazed and deeply satisfied that we finished the lake on the first day. The dry passage remaining for the next day seemed like a very easy task compared to what had been completed.



The next morning we awoke to very cold and icy conditions. Crystalized mud and a very thick ice crust seemed to cover everything in sight. Steam billowed out of the cave and quickly thinned down to wisps in the dry desert air. Crawling out of warm tents and campers for breakfast happened with much reluctance. Ron Delano impressed us again with an enormous cast iron griddle which we used to cook pounds of bacon and heaps of pancakes. Certainly camping in high style!

We descended into the steamy entrance well fed and ready to face another day! One crew went deeper into the cave to finish breaking down and removing gear by the lake. Some people toured the cave in our little fleet of boats. A few more volunteers came out to help, but our crew was smaller on day 2. Vandy Hall, Phillip Clark, and I started blasting graffiti off the walls of the dry passage. The work was easy and fast in general. By early afternoon we had finished blasting and started the massive and messy task of packing the muddy gear into trailers. The cave was done, but we were four hours from home and the November sun was low already.

Well into the night we arrived home and parked the trailers. A few hardy volunteers came over the following days for the massive task of pressure washing off the gear and running everything through

White-Nose Decontamination. The cleaning took more than two days of hard, hot work. The mud was embedded with the sand from the blasting. Getting the white water raft clean was a very difficult task which took several people and several hours.

Malheur Cave is an incredible wonder of nature. The long underground lake is graffiti-free for future visitors. The cave, which was completely closed, is now regularly open to NSS cavers. The Burns Masonic Lodge has sent out regular invitations to tour the cave to members of the NSS. Access to this amazing cave is restored through the efforts of our dedicated volunteers and donors. If you would like to support future efforts, please go to www.westerncaves.org and donate today!

Letter From The President

Steven Johnson

Now that the COVID-19 Pandemic is finally loosening its hold in much of the USA, and the weather has gotten hot, that means one thing: time to start getting underground again! In California, this time of year usually means better access to higher-altitude caves, but don't let that deter you from visiting WCC preserves..

We're seeing more and more visitation to the Volcano Natural Preserve (as more cavers start to get more familiar with it); this time of year it can be pretty hot there during the middle of the day, but the Board has now approved limited camping at the Preserve, which means less hiking and more exploration. (Be sure to get a permit and find out the details!)

But don't forget about the other options that the WCC provides. Rippled Cave remains one of the best options for first-time/beginner cavers in the Mother Lode, and the hike can't be beat, especially when the temperature is scorching. Cave of the Catacombs is a small but lovely treat, and this time of year often involve some refreshingly cool water. Windeler Cave has finally reopened for limited trustee-led trips (check with your grotto for details). And in the most exciting news of all, we've finally been able to renew the MOU for the SVR caves after a few years of virtually no access, so we anticipate trustee trips there to resume soon!

As always, we'd love to hear your thoughts on all things related to the conservation of caves, and how the WCC can help everyone succeed at this goal. Please feel free to share them with me at steven@westerncaves.org.

Cave softly!

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