# Nature Trails

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Miller Lake, Oregon. Photo by B. Clemens

## The Heroic Journey of the Miller Lake Lamprey: A Call to Adventure

## Benjamin Clemens

### Statewide Lamprey Coordinator and Research Project Leader
### Oregon Department of Fish and Wildlife

### Friday, 15 January 2021, 7:30 p.m.

Here is how to join the audience for the January presentation. The Zoom meeting will open at 7:00 but our meeting will begin at 7:30. This is to make sure everyone has enough time to get properly connected.

August Jackson is inviting you to a scheduled Zoom meeting.
Topic: January ENHS Meeting
Time: 15 Jan. 2021 07:00 p.m. Pacific Time (US and Canada)
Join Zoom Meeting: https://zoom.us/j/97499095971 We plan to use this Zoom link for the remainder of ENHS meetings. However, please double-check each time to make sure the link hasn't changed. Please invite interested friends and family members. From anywhere.

Benjamin Clemens grew up in Sanford, Michigan, a small town in the central part of Michigan's lower peninsula, about a two-hour drive north of Detroit. The town lies at the southern end of Sanford Lake and extends part way up both sides of it. Two rivers, the Salt and the Tittabawassee, border the town on the west and south. Lake Michigan, to the west, can be reached in two hours, Lake Superior, to the north, in just over three hours, and Saginaw Bay of Lake Huron is only a half-hour to the east. With all this water so close at hand perhaps I should not have been surprised by Clemens' answer to the question, "How long have you been interested in fish?" He said he has been a fish person since he was two years old.

Growing up, Clemens was aware of the negative press the sea lamprey was getting, due to its terrible effect on commercial fisheries in the Great Lakes. At that stage of his life he was a fan of Star Wars, Godzilla, and ugly monsters in general, so his eventual attraction to lampreys was natural.

From high school in Sanford, Clemens first went to Saginaw Valley State University, in Saginaw, Michigan, then transferred to Central Michigan University, where he got his B.S. in Biology in 1999. He got his M.S. in Zoology from the University of Guelph, in Guelph, Ontario, Canada in 2002.

When he finished at Guelph he moved to Oregon and began his career in fisheries. His first job was with the Oregon Department of Fish and Wildlife at Little Goose Dam on the Snake River. He monitored steelhead and salmon smolts there. Then he moved to Corvallis and became a Faculty Research Assistant, studying smolt survival and behavior in the lower Columbia River, from Bonneville Dam to the estuary.

In 2006 he began his graduate work at Oregon State University, for his thesis research studying the physiology and ecology of the native Pacific lamprey. This work included a combination of laboratory studies, specimen collections in the Klamath and Willamette rivers, tissue analysis, and tracking radio-tagged lamprey in the Willamette River. He received his Ph.D. degree in October 2011.

Clemens then returned to working for ODFW full time, where he served as a Project Leader of the ODFW Aging Lab during 2011–2016. In recognition of his leadership potential he was chosen to participate in ODFW's Leadership Development Program during 2013–2015. Before taking his present position as Statewide Lamprey Coordinator and Research Project Leader in 2016 he served as president of the Oregon Chapter of the American Fisheries Society. He works at the intersection of research, policy, and management to benefit Oregon's native lampreys and their use by humans.

Lampreys have existed in a virtually unchanged form for an amazingly long time. Fossils 360 million years old have been found that look almost the same as some modern lamprey species.

We have learned quite a bit more about lampreys since the Aberdeen Bestiary, a twelfth-century compendium of animals, was written. According to this book, "lampreys … are of the female sex only and conceive from intercourse with snakes; as a result, fishermen catch it by calling it with a snake's hiss." The bestiary also has advice for those who have used their snake hiss to good effect: "You need to beat it repeatedly with a stick. It is a fact that the life-spirit of the lamprey is its tail, for when it is beaten on the head, it is difficult to kill; but when it is beaten on the tail, it dies at once." Lamprey have literally been the food of kings. In a no-doubt apocryphal historical note, King Henry I was said to have died from a meal heavily laden with lamprey. His reign was from 1100 to 1135, the first thirty-five years of the twelfth century, so the lamprey that killed him must have been snake-hissed into a net and then beaten soundly on their tails until dead. But I digress.

Miller Lake lamprey. Photo by B. Clemens

Clemens has been quoted as saying, "Lamprey are a fascinating group of jawless, boneless fishes that have endured for at least 400 million years! Ten species of lamprey, about 25 percent of all lamprey species, live in Oregon! Pacific lamprey were harvested and used by Native Americans for culture, ceremony, medicine, and food." He points out that because there are so many lamprey species in Oregon waters they have diverse impacts on and needs in freshwater or marine habitats. For the 10 Oregon lamprey species, five status assessments have been conducted. Every assessed lamprey species has been ranked on the state's Sensitive Species List, making them an Oregon Conservation Strategy species.

In his talk to us Clemens will focus on the Miller Lake lamprey (*Entosphenus minimus*), the smallest freshwater species in the world. This poor animal, only three to six inches

long, was mistakenly accused of decimating the trout in Miller Lake and was blocked from spawning in tributary streams and then poisoned out of the lake back in the 1950s. Clemens will tell us more about this intervention and how it was later recognized as misguided. The animal has been reintroduced to the lake and is being monitored to see if it can rebound to its original numbers and distribution. Also, in his talk we will learn about the many beneficial contributions lamprey make to their native environments. Please join the Zoom meeting at 7:30 p.m. on Friday, 15 January 2021, to hear Benjamin Clemens present "The heroic journey of the Miller Lake Lamprey: A Call to Adventure." Invite anyone, from anywhere!

John Carter

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**Our Neighborhood Newts** by Tom A. Titus

Soon warm winter rains will slide onshore, heavy as wet wool blankets. The quiet rustle of neighborhood rough-skinned newts will begin. They will peek from beneath woodpiles and all manner of cast-off cover objects before waddling resolutely toward Tugman Park. They know where they are going. Tugman Creek is their birthplace, a thin quarter-mile stream that bends around the west side of the park before vanishing into a culvert beneath Hilyard Street.

On the last Saturday in April, humans will also home in on Tugman Park. They arrive for the annual *Wow Newts!* program sponsored by Nearby Nature. Beginning in 2016, adults and children of all shapes, sizes, and colors have shown up for the joy of learning about newts. With kids pressing earnestly in around me and a newt in my hand, I tell them why the skin is rough and how the skin of one newt may have enough nerve poison to kill ten people. The kids learn the difference between poisonous and dangerous. The parents absorb a loud but unspoken

Rough-skinned newt. Photo by T. Titus.

message: *I am holding a toxic newt in my hand and your kids will be fine*.

We focus on the finer points of newt watching. Rough-skinned newts like quiet water. Their dark backs blend well with cobbles on the creek bottom. But if you sit still as a stone and stare into the pools, newts will show themselves. I explain that the newts come to the creek to make more of themselves. Reproduction is so important that there might be a ball of several males trying to mate with a single female. We do not discuss the details of newt sex—that a male might clasp a female for two continuous days to coax her over a packet of sperm he has placed on the creek bottom. I keep the sex education innocuous and basic and leave the uncomfortable questions for the adults.

Rough-skinned newts have always bred in this spot. Before European occupation, the unnamed stream made a short plunge from the South Eugene hills and meandered across a wet prairie on the valley floor before entering nearby Amazon Creek. This wetland would have been excellent habitat for pond-breeding amphibians such as rough-skinned newts. But channelization of the creeks in the early 1900s removed much of the quieter water and aquatic vegetation. The insults continued. In 1925 a municipal burning dump was created near the head of Tugman Creek, leaving the stream to run directly beneath the trash. The City of Eugene purchased the first parcel of what was then South Amazon Park in 1939 and then renamed the park in honor of William M. Tugman, a staunch advocate for public parks and editor of the Eugene Register-Guard from 1927 to 1954. Loss of terrestrial habitat increased when grass playing fields with subsurface drainage were installed. The dump was finally decommissioned and capped with a layer of soil in 1956. In the 1950s and 60s suburbia with its attendant driveways, streets, yard chemical runoff, and newt-squishing traffic engulfed the park like a concrete amoeba. Despite widespread degradation of their breeding and terrestrial habitat, the newts persisted in the lower reaches of Tugman Creek.

When my family moved to the neighborhood one block north of the park in 1994, Tugman Creek was festooned with disappointing signs warning of contaminated water. We knew nothing of events happening just upstream. The Oregon Department of Environmental Quality became involved with the park in 1990 when waste was exposed by erosion of the soil dump cap. By 1995, lead and other contaminants had been reported in the creek and three adjacent lots. The City was required to remove

this contaminated soil from the residential lots. But the bigger news for humans and newts downstream was that Tugman Creek was rerouted around the landfill. The City excavated more contaminated soil from the lower end of the dump in 1999, and a storm pipe containing Tugman Creek was extended to below the foot of the landfill. The dump was finally covered by a new and expanded cap and planted with grasses. Our kids and other animals were free to splash in the creek below.

The story gets better. In 2004 the City implemented a restoration of Tugman Creek below the dump. A key feature of this project was to reintroduce sinuosity into the straightened channel. Boulders and woody debris were added to slow the current and reduce erosion. Native riparian vegetation was planted for shade, bank stabilization, and water purification. For the newts, pools for breeding and stems and roots for attachment of aquatic eggs were again available over the entire length of the creek. Following this restoration, I noticed an increase in the decibel level of trilling Pacific chorus frogs. Two years later a juvenile rough-skinned newt appeared beneath my woodpile.

For the past five years, the *Wow Newts!* kids and I have insinuated ourselves into this ongoing story. We divide the quarter-mile-long stream into three sections, split ourselves into three roughly equal groups, and head for the water. For a few delicious minutes, I feel like the pied piper of newt-dom, leading an entourage of colorful rubber boots, sharp eyes, and enthusiasm. Our goal is to count every newt in the creek. This is unachievable. There will be newts hidden in roots and rocks and deeper pools that escape even the most intent young gaze. There will be enthusiastic double counts. Our effort is not intended as a census of the local newt population. The females will have been coming and going from the creek since January, and the last Saturday in April is only a sliver of time in the mating season. But never mind the details. The kids learn that they are contributing to our knowledge of the neighborhood newts. Besides, they have a blast!

Here at the onset of 2021, I'll leave you with a smidgeon of good news. The April rough-skinned newt count in Tugman Creek has steadily risen, from 37 newts in 2016 to a high of 93 in 2019. They dropped to 42 in that aberrant and much-maligned year of 2020 when *WOW Newts!* was canceled because of Covid, and the counting was done by Nearby Nature volunteers and me one week later than normal. So good work, City of Eugene. Nice job, Nearby Nature. Way to go, kids. And to the newts, thank you for your slow-moving persistence. The remediation, restoration, and community involvement at Tugman Park is a microcosm of everything we would love to see moving into the future.

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**Viruses** by John Carter

This essay is not about bad viruses and how to avoid them. It is about numbers. Huge numbers. And it is about how we each are exposed to many viral particles every minute of our lives, and only a tiny fraction of those exposures causes us harm. I hope this gives the sort of comfort Winston Churchill once voiced about being in combat: "There is nothing more exhilarating than to be shot at with no result."

To be a success, an individual viral particle must commandeer a cell of its host organism. That cell will eventually die, burst by the myriad copies of the virus, the components of which it has been forced to generate. Viruses have been much in the news in the past few years. Ebola. Equine encephalitis. H1N1 flu. Bird flu. Swine flu. MERS. SARS. Colds. And now our world is being savaged by a tiny spikey ball: severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes Covid-19.

These are the really bad ones, but there are more. Many more. Some viruses infect bacteria, some archaea, others plants, others fungi, and still others animals like us. According to virologists, there are roughly 4,000 different virus types. Four thousand doesn't sound very intimidating, but that number is sort of a species count, although we don't give viruses the honor of having different species. What about overall numbers? How many viral particles are there? Thanks to advances in science we can now make some decent estimations. I have gone through the arithmetic for marine viruses and airborne viruses.

Viruses are by far the most abundant entities in the world's oceans. Back in 2014 we learned that a virus was the cause of the tragic die-off of sea stars along the Pacific coast. Viral infections are also blamed for the loss of many corals in more tropical and semi-tropical seas. Before the sea star fiasco I had never considered that there might be viruses in water. After diving into the subject a little I resurfaced amazed. I have not dealt with such numbers since my chemistry days. Because viruses are so tiny it has only been with the advent of modern microscopic methods that we have been able to estimate their populations. I learned that in seawater, marine viruses range in concentration from ten thousand to one hundred million per milliliter. So one milliliter of ocean, about 20 drops from an

eyedropper, contains on average a million viral particles.

There are a LOT of milliliters in the world's oceans. Virologists tell us that marine viruses are mainly found in the upper reaches of the sea. To come up with an estimate of the total number of viral particles in all the seas, assume that "the upper reaches" means that no marine viruses occur deeper than 100 meters. This probably means that the number I am about to regale you with is an underestimate, so try to be even more than normally impressed. There are about 30,000,000,000,000,000,000,000,000,000 ($3 \times 10^{28}$) individual virus-like particles (VLPs) in all the seas, down to 100 meters.*

When numbers get this big, our feeble brains turn off. We are not wired to cope with numbers in the millions, much less millions of millions of millions of millions. Trying to give perspective to them is a real challenge. To help me get a feel for 3 followed by 28 zeros worth of VLPs I decided to estimate how long a line of them would be. Viruses vary a lot in size, but they average about 100 nanometers in diameter, assuming a spherical shape (this reminds me of the physicist who when asked to estimate the maximum velocity a horse could achieve started out by saying, "Assume a spherical horse."). Now cut 100 nanometers in half to be conservative, and we have 50 nanometers, or $5 \times 10^{-8}$ meter. I did the math. The thread is 1,000,000,000,000,000,000 kilometers long.** Still too big a number to wrap my mind around. Here's a thought: our solar system is roughly a circle 300 billion ($3 \times 10^{11}$) kilometers in circumference. Our thread is $10^{18}$ kilometers long, so we could wrap it *3 million times* around our solar system.

Here's another stab at grasping the magnitude of marine VLPs. Assuming viruses are little cubes 50 nanometers on a side, they would cover 25 times the surface area of the entire USA. Stacking them all on Autzen Stadium's field would require five billion layers. Each layer is 50 nanometers thick, so the stack would be about 250 meters tall.

As mind blowing as those numbers are, those are only the VLPs in the ocean. We rarely come in contact with them, and we aren't hosts (but I will not be able to swim in an ocean again without thinking about how many viruses I'm contacting). More compelling are airborne viruses, since it's by breathing that we can come in contact with SARS-CoV-2. There are roughly one million VLPs in one cubic meter of outdoor air. This is *all* VLPs, not just the one that is killing so many of us, so relax just a little. The total number of VLPs in the world's atmosphere, from ground level to 100 meters up, is about 10,000,000,000,000,000,000,000 (10 sextillion, or $10^{22}$), another incomprehensibly large number. What we are concerned with, though, is not all of them, just the number in the air we breathe. Pulmonologists say the average total volume of air entering an adult human's lungs is about six liters per minute. There are 1,000 liters per cubic meter, so 1,000 VLPs in a liter. Every minute we spend outside we are breathing in about 6,000 viral particles. Whether or not we're social distancing, we still have to breathe. Indoor air has roughly half the number of VLPs compared to outdoor air, but 3,000 VLPs per minute is nothing to sneeze at. Or maybe a lot to sneeze at. At first, I was shocked by these numbers. On reflection, I am strangely comforted by this: even though we are breathing in between *four and nine million* viral particles every twenty-four hours—depending on how much time we are indoors or outside—we rarely get a viral disease. Either the dosage of harmful airborne viruses is too low to overcome our defenses, or we are not hosts for the vast majority of those we breathe in, or both.

Although we rage at the viruses that cripple or kill us, we must acknowledge that the history of life on earth would be radically different without viruses. They are important drivers of evolution. They have contributed to the present forms of countless species. Viruses have been leaving bits of their genomes in the genomes of their hosts for billions of years. Without viruses, very likely *Homo sapiens* would never have appeared. Almost ten percent of the human genome is viral in origin. A virus can change the genome of its host in this way, and sometimes the change yields a beneficial mutation. For example, our ability to digest starch is because a snippet of a viral genome was incorporated into our genome or that of one of our ancient ancestors.

Every living thing on earth has reproductive machinery and desperately "wants" to use it. Viruses lack such machinery and so are generally not considered living things. But they are fiendishly expert at getting themselves replicated. What is the difference between this drive of living things to reproduce and a virus getting a cell of its host organism to make copies of itself? Can the universal urge to reproduce or replicate be reduced to the minimal code found in the smallest virus? Even though we are dying by the millions I sense no malevolence, only the evolutionary edict to "make more."

*The area of the world's oceans can be determined from modern maps. Adding together the areas of the Pacific, Atlantic, Indian, and Arctic oceans gives 330,000,000,000,000 square meters. The volume of the world's oceans to a depth of 100 meters is 33,000,000,000,000,000 cubic meters. There are 1 million

milliliters in each cubic meter, so the volume of the world's oceans to a depth of 100 meters is 33,000,000,000,000,000,000,000 milliliters. Each milliliter has a million VLPs so this comes to $33 \times 10^{27}$ (which is easier: $10^{27}$ or twenty-seven zeros?) VLPs in all the seas, down to 100 meters. Round it off to $3 \times 10^{28}$.

**Putting each of the million VLPs present in the one milliliter of seawater next to each other gives a viral thread 0.05 meters long (or 5 cm or about 2 inches, but I'm going to stick with the metric system. How can you not love the metric system?). The whole thread is $30 \times 10^{21}$ times that, or $165 \times 10^{19}$ m. To be conservative (and simplify the arithmetic), make that 100 instead of 165, so $10^{21}$ m. There are 1,000 meters in a kilometer, so our thread is $10^{18}$ kilometers long.

## Events of Interest in the Community

**McKenzie River Trust** https://mckenzieriver.org/events/#event-listings
**Wednesdays, 3 and 10 February, 9 to 11:30 a.m. Watershed Wednesdays at Green Island.**
**Friday, 5 February, 9:30 a.m. to noon. Friends of Finn Rock Reach.** Sign up if interested in helping landowners affected by the Holiday Farm fire.

**Lane County Audubon Society** lanecountyaudubon.org
**Tuesday, 26 January, 7 p.m. Polyglottal Passerines—Mimicry Is Not Just for Mockingbirds.** Rich Hoyer will present examples of mimicry in songbirds from throughout the Americas. Hoyer has been working as a professional birding tour leader for WINGS for the past 23 years. Check *The Quail* for instructions on how to join the Zoom meeting.
**Saturday, 16 January, 8 a.m. Third Saturday Bird Walk**. Meet at SEHS parking lot, 19th and Patterson.

**Mt. Pisgah Arboretum**
For MPA activities go to https://mountpisgaharboretum.com/festivals-events/

**University of Oregon's Museum of Natural and Cultural History** https://mnch.uoregon.edu/museum-home
MNCH is now open to the public with new limited hours: Wednesday through Sunday 11 a.m. to 12 noon for seniors and COVID-vulnerable visitors. 12 noon to 3 p.m. for everyone. Current exhibits: **Explore Oregon** and **Oregon—Where Past Is Present**. Learn more.

**Native Plant Society of Oregon, Emerald Chapter** https://emerald.npsoregon.org/
**Sunday, 10 January 2 to 4 p.m. Field Trip. Plant Lover Ramble.** Due to public health concerns, we ask that attendees preregister by emailing your name and contact number to em_president@npsoregon.org.
**Monday, 18 January, 7 to 9 p.m. Online Program: Darlingtonia Botanical Wayside: A Unique Plant Community on the Oregon Coast.** Mary Santelmann, Professor at Oregon State University, will cover the history of the site and its ecological setting, as well as ongoing research designed to help the Oregon State Parks monitor site conditions and manage the vigorous population of *Darlingtonia* currently found at the site. Santelmann will also discuss potential threats to the *Darlingtonia* population and the fen itself and present results from monitoring conducted at the site over the past three years. Check https://emerald.npsoregon.org/ a few days before the 18th for instructions to join the Zoom meeting.
**Sunday, 24 January, 2 to 4 p.m. Field Trip: Twig Identification. Exploring Winter Branches.** Registration open between 3 and 22 Jan. 2021. Accompanying handouts and specifics will be emailed to registrants. Due to public health concerns, we ask that attendees preregister by emailing your name and contact number to em_president@npsoregon.org.

**Nearby Nature** https://www.nearbynature.org/
**Thursday, 21 January, 12:30 to 4:30 p.m. January-February Nature School Sessions Begin.** Go to NN website for details.

**Friends of Buford Park and Mt. Pisgah** https://www.bufordpark.org/
Because people and nature need each other, the Park is OPEN during the Coronavirus/COVID-19 pandemic. Please refer to Lane County for instructions about the park and updates.

**WREN (Willamette Resources and Educational Network)**
**Tuesday, 12 January, 9 to 10 a.m. Wetland Wander**. **Location:** Tsanchiifin Trail; 751 S. Danebo Ave. Walk Leader: Sally Villegas-Moore, Program Restoration Lead, West Eugene Wetlands. To ensure the safe distancing for all attendees, our maximum threshold for this event is 10 people. To guarantee impartiality, we will be choosing participants via the lottery system. Those interested in participating can register by emailing their name and email addresses to info@wewetlands.org. All tour attendees will be asked to wear masks for the duration of our exposure to one another, and attendees are asked to maintain 6-foot physical distancing between households. For other upcoming events go to http://wewetlands.org/community-programs/ or info@wewetlands.org.

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Post-fire logging, also called "salvage logging," is a destructive way to treat recently burned land. Forest regeneration is actually slowed in burns that are salvage logged. Much of the forest lands burned in Oregon in 2020 were privately owned commercial plantations, often monocultures of a single species, Douglas-fir. The timber owners are logging their properties, as is their right. But there are also hundreds or thousands of acres of our publicly owned land—BLM or Forest Service holdings—coming up for salvage logging sale. We have already missed chances to comment on sales connected to the Archie Creek and Holiday Farm Fires. But there will be more sales all over the state. If you are interested in commenting, especially to prevent or

minimize salvage logging, by signing petitions or writing letters, please get in touch with Oregon Wild for information concerning planned salvage logging sales on public land. Contact Chandra LeGue, Western Field Office Coordinator, Oregon Wild cl@oregonwild.org. You can sign up for the e-newsletter and alerts.

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**ENHS welcomes new members! To join, fill out the form below. Membership payments allow us to give modest honoraria to our speakers and pay for the publication and mailing of *Nature Trails*. Our web address:** http://eugenenaturalhistorysociety.org/

## MEMBERSHIP FORM

Name_____
Address_____
City_____State & Zip_____ Phone_____
E-mail (if you want to receive announcements)_____
I (we) prefer electronic copies of *NT* rather than paper copies. ___Yes ___No
If yes, email address (if different from the one above):_____

**ANNUAL DUES**: Family $25.00
Individual 15.00
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Contribution _____

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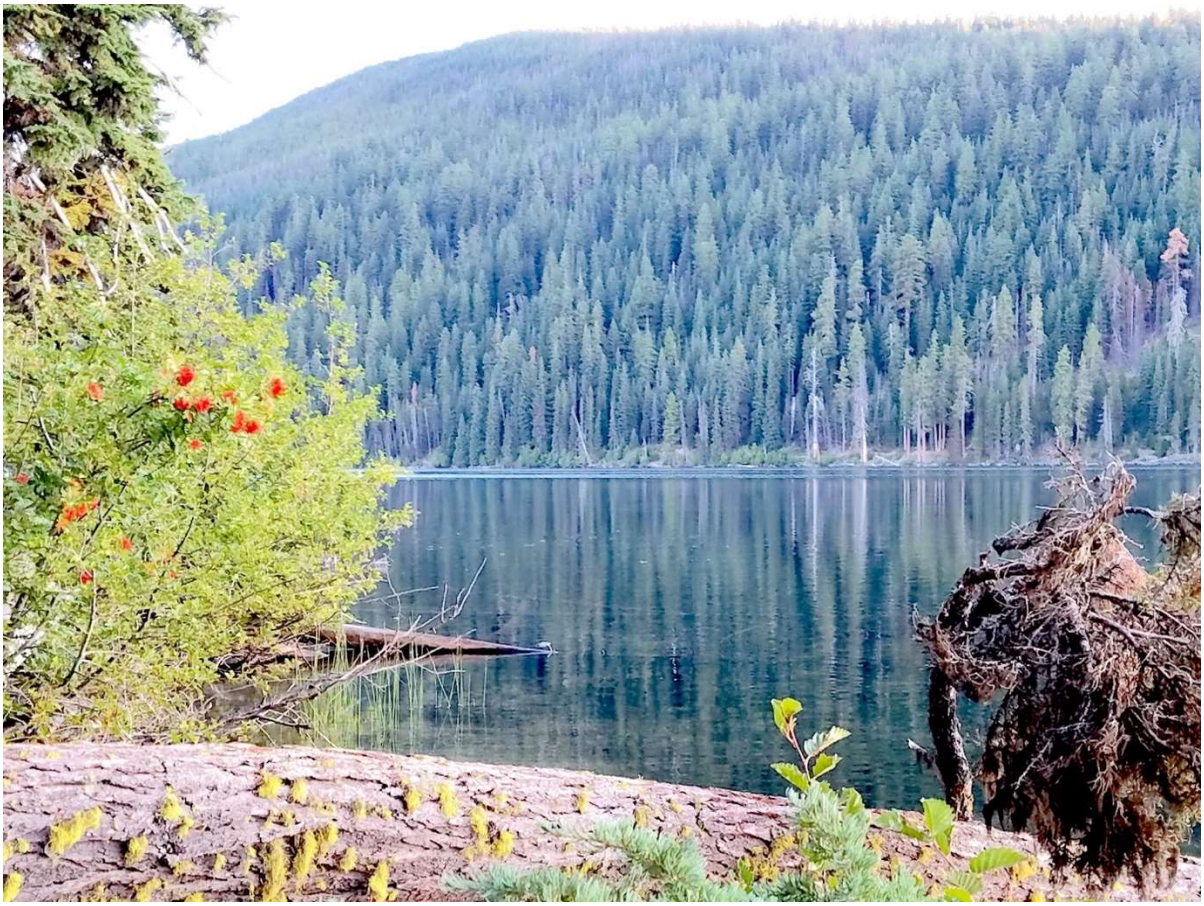
**Annual dues for renewing members are payable in September. Memberships run from September to September. Generosity is encouraged and appreciated.**

The Eugene Natural History Society website has moved to a new host at: http://eugenenaturalhistorysociety.org/ This is a new site under old management. Changes and improvements to the site will be ongoing. If you have any questions or concerns, please let Tim Godsil know at tgodsil@gmail.com



Miller Lake, Oregon. Photo by B. Clemens

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## 2020–2021 Speakers and Topics

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| **15 Jan.** | **Benjamin Clemens** | **The Heroic Journey of the Miller Lake Lamprey: A Call to Adventure** |
| **19 Feb.** | **Terryl Whitlatch** | **The Natural History of Creature Design** |
| **19 Mar.** | **Pepper Trail** | **Fighting Crime with Feathers: The Casebook of a Forensic Ornithologist** |
| **16 Apr.** | **Daphne Stone** | **Lichens: How They Tell Us About Their Environment** |
| **21 May** | **TBD** | |