

WONALANCET



OUT DOOR CLUB

CARING FOR
THE SANDWICH RANGE
SINCE 1898

WODC.ORG
FALL-WINTER 2024

2024 FALL TRAILS REPORT CAPPING A SIXTEEN-YEAR EFFORT

We have finished up another trails season. We are grateful that this season was notably drier than last. The rain doesn't significantly interfere with trail work but the heavy rains of last summer increased the process of erosion, making it possible to observe where trail problems may develop in the future.

The Annual Maintenance on our 55 miles of trails was done. One glitch was that the Forest Service was going to give us some help on Sleeper and the high trails. That plan fell through but they did send a crew to do Sleeper late in the season. With good weather we were able to get in all four volunteer trail work days. We spent a day each on Cabin (cleaning the infamous water bars) and on Dicey getting the trail in condition for professional trail builder Jed Talbot and his crew who were due in August.

We also did a relo on Square ledge in July and some erosion control work on lower Dicey in September. As usual the adopters and volunteers did a great job on their respective trails. Many volunteers helped both carrying in and out the heavy tools and gear for the reconstruction project. By carrying in tools and setting

up and taking down the campsite this creates more time for Jed's crew to perform actual rock work and we get to charge those volunteer hours as part of our match for the applicable grant.

With the completion of the Dicey's project this summer we have reached our goal to harden both the Blueberry Ledge and the Dicey's Mill trails with rock steps and rock water bars. This project began in 2009. We spent three seasons on Blueberry and three seasons on Dicey's over that time. The gating factor in scheduling the work seasons was the availability of grants. We received six grants to support this work: there were two NH Trails Bureau RTP (Recreational Trails Program) grants, two ARRA (the Obama-era stimulus grants for shovel-ready projects), one grant from the White Mountain Trails Collective, and one grant from the US Forest Service. The total value of the grants was approximately \$300,000. Of that total, WODC paid approximately \$30,000 in matching funds,

This effort required many hands over the 16 years. We are grateful to Jed and his crews for doing the heavy lifting, and also to the countless volunteers who showed up to pitch in, and finally to our membership who provided the financial support to make this project feasible. It took a lot of team work over the years but we had a great team

every rock step
along the way.

Thanks,

Jack Waldron,
Trails Chair



WODC Trailcrew
and professional trail
builders.
WODC Vice-President
Mike Schneider is front
and center wearing
WODC hat and shirt.

Photo by Peter Christ

LOOKING UP & BACK: NEWS FROM THE SANDWICH RANGE

SELECTED FROM THE COLUMNS OF THE SANDWICH REPORTER AND WHITE MOUNTAIN REPORTER

By Jim Mykland

August 18, 1887

We are glad to announce that Chocorua mountain is about to be opened up to the public by a highway leading to the top. Already Mr. Liberty, of Tamworth, has a road built nearly half way up, and proposes erecting a stone house on top in season for next year's travel. With this carriage road to the top, it will be very easy for the lovers of the grand and beautiful to make the ascent, and we doubt not that thousands will avail themselves of the opportunity. The road runs up the Southern slope, and about half way up there is a stable and a shanty for transient accommodation the present season where you can get your teams taken care of, or stay overnight. Parties will have to provide their own provender.

August 1, 1889

The new road on Chocorua Mountain has recently been put in repair and with a good stable, half way up, for horses, and a good tent near the top, makes it a fine chance to go up on the mountain and camp out.

August 11, 1892

Quite a party of boys camping out on the shores of Squam Lake, walked to Whiteface on Friday and on Saturday morning they climbed the mountain and then walked back to their camp, a distance of nearly twenty miles.

August 24, 1899

The Wonalancet Out Door Club is having excellent

The Reporter

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Entered at the North Conway Post
Office as Second Class matter.

THURSDAY, May 11, 1916

support this summer. Since its organization a year ago the following work has been done under the auspices of the club: a path six feet wide has been opened from the summit of Mt. Whiteface

to Mt. Passaconaway; a path has been nearly completed from the summit of Mt. Passaconaway to Square Ledge, connecting with the trail from Birch Intervale to Albany Intervale; a path has been cut from the open intervale along the Wonalancet river to the Falls, a beautiful shaded promenade with steps and railings at the Falls, so that this really wonderful place is now accessible to all; the path up Mt. Passaconaway has been cleared up and spotted anew; a new path has been opened to High Ledge on Mt. Katherine, as it is now to be called.

September 12, 1904

Mrs. Cleveland and a party of friends visited Waterville the first of last week, and if the writer is correctly informed, Mrs. Cleveland and a lady friend going up the mountain Sandwich Dome and down the other side where teams awaited them.

May 11, 1916

North Sandwich – Clarence Brown began his duties at Mt. Israel Look Out Station on Monday of this week.

For a number of years the NH Forestry Department had a Look Out Station on the northern summit of Mount Israel mainly because of the logging activity at that time in the Beebe River valley. The original Warden's Trail ran from Mount Israel Road, near today's Booty Farm, up the northeast spur to the summit. It had a phone line running parallel to it to report any smokes. Remains of this trail and phone line could still be found 25 years ago by this writer.

– JM

Wonalancet – Two trappers from West Ossipee stayed at Ferncroft Sunday night and climbed Whiteface Monday. They report snow waist deep and that the roof of the upper camp blown off. Elias Sanborn came from New York to have a look at it before it was remodeled and to do some fishing.

This would have been Camp Heermance, the upper of the two shelters on Whiteface.

– JM

THE REPORTER

Another version of The Reporter masthead.

MURDEROUS FLESH EATING MUSHROOMS

The kingdom of fungi contains millions of species and — like the kingdom of animals — those species are wildly varied. We know that some of them are pathogens that make their living by killing and consuming their victims, but we tend to think that the mushrooms on the forest floor or our plate (which, after all, we are killing and consuming), are peaceful species, innocent of murder and the consumption of the flesh of victims. (The vegans among us may be especially eager to believe that they're not eating second hand flesh.)

Alas. Mushrooms are as violent as the rest of us, always looking to increase their body mass at the expense of someone else's. Our territory hosts two very different types of fungal fruiting bodies that look innocent but are carnivorous; one an edible (but culinarily undistinguished) mycorrhizal symbiont in a mutualistic relation with trees, and one a prized edible that rots dead wood. They differ in the most basic ways, except that they're both venomous killers, who consume their animal prey.

Let's start with the symbiont.

Most fungi are basically amalgams of microscopic filaments called hyphae. The mushrooms that we see are the occasional sexual fruiting bodies of the true long-lived (in some cases, immortal) fungus, whose mass of hyphae is called a mycelium. The mushroom itself is also a mass of hyphae — but a more organized mass (just as we are an organized mass of cells). Because hyphae are tender and nutritious, they're constantly being eaten by various underground creatures and are a favorite food of collembola, which we call springtails; luckily, hyphae are also constantly regrowing. In 2001, John Klironomos and Miranda Hart published the results of a group of

experiments where they grew the hyphae of four species of mushrooms symbiotic with pines. (1) Each chamber of growing hyphae also contained springtails. After two weeks, they counted the springtails. In three of the four chambers, the springtail population had increased (due to the nutritious hyphae available). But in the fourth chamber, the fungus was healthy but almost all the springtails were gone. They had been poisoned, digested and eaten by the hyphae of one species of mushroom: *Laccaria bicolor*.

All four mushroom species tested are symbiotic with pines, with the fungus and the plant exchanging nutrients. But it seems that this *Laccaria* species is offering its tree partners a special inducement to make room on its roots: nitrogen from springtails to support its growth. The researchers backed this up with an ingenious and painstaking experiment. *Laccaria* and one other species, together with their affiliated pine seedlings, were each grown in the presence of N-labeled live and dead springtails. (Dead springtails

were supplied on the grounds that although only *Laccaria* could kill them, the other species might be able to extract and share N from dead material.) The results were dramatic: after two months, up to a quarter of the N in the pine grown with *Laccaria* was labeled, while the other species of mushroom contributed less than 5% to its pine. Furthermore, the pine affiliated with *Laccaria* experienced significant growth compared to pines growing with the other fungus.

L. bicolor grows right here within a couple of miles of where I'm writing this; you can find it in the Big Pines Natural Area. You can find it in other places as well, but I love seeing it

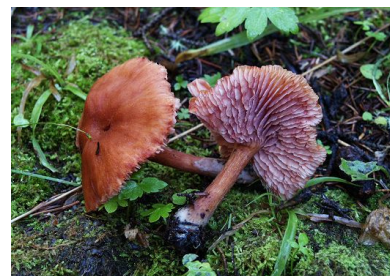


Image: Michael Kua

ALAS.
MUSHROOMS
ARE AS VIOLENT
AS THE REST OF US,
ALWAYS LOOKING TO
INCREASE THEIR
BODY MASS AT THE
EXPENSE OF SOMEONE
ELSE'S.

in Big Pines since I'm privately convinced that this mushroom is why the pines here are so big. (Well, that and the fact that logging white pine for the King's masts somehow missed Great Hill.) Not only was I delighted to learn about the murderous little mushroom that was fertilizing those massive pines; I shared my delight by writing about this relationship in numerous publications.

There's a saying that a little knowledge is a dangerous thing. My personal take on this is that if you learn something that gives you pleasure or supports your hypothesis, stop. Don't learn more. But I've never been good at taking advice; even my own. We know that *Laccaria* uses a toxin to paralyze the poor nematodes, prior to digesting and absorbing them, and what I really wanted to know was the chemistry of that toxin. So I started hunting and, when I came across a 2022 paper² that pinpointed a class of toxins called mycocybins and claimed that *Laccaria* was a super producer of these. I felt certain that this was it. Especially after reading, "... these *L. bicolor* mycocybins have toxic and feeding deterrent effect on nematodes and collembolans, respectively." Although it was annoying that these defensive chemicals are widely distributed among mushrooms, and there were no specific toxins cited for *Laccaria*; just generalities about the class. So I continued to search. Imagine my dismay when a particularly alluringly titled article, *Chewing up the Wood-Wide Web: Selective Grazing on Ectomycorrhizal Fungi by Collembola*³, yielded results as follow: "*Collembola* had significant negative effects on the growth of fungi in pure culture, but the strengths of the effects were dependent mainly on the species of fungi, and also whether they were in the establishing or established phase of growth. *L. bicolor* was consistently affected by grazing the most, and the growth rate of establishing mycelia decreased by 26x in response to collembola. By contrast, *collembola* reduced the growth rate of the other three species of fungi by only 3x– 8x. These effects were amplified in the mixtures, where *L. bicolor* growth rate was 95x less in the presence of *collembola* compared to controls, while the growth rate of other species were only reduced between 2x to 4x. In established mixtures of ECM fungi, *L. bicolor* was the only species where consumption led to negative radial extension."

In other words, not only was this lab's *Laccaria* not eating the springtails; the springtails were eating the *Laccaria*. And, at a rate much higher than the rates at

which they were consuming other species! And yes, the authors do cite the Klironomos and Hart paper, but only in the most general terms; "Microcosm studies have shown that *collembola* can have both positive and negative effects on nutrient uptake and growth of ectomycorrhizal seedlings."

So much for carnivory and sharing all that animal N. I trust the Klironomos results, but what I didn't think about was that not all *Laccaria bicolor* individuals are genetically identical; this is a species with a world-wide distribution in boreal forests (the paper quoted above is from Scotland) that has probably accumulated significant genetic diversity; *Laccaria* may only expend energy to produce the toxin in certain growth phases; the two research groups used different species of *collembola*, and so on *ad infinitum*. In my excitement over a result I wanted to be true, I took a specific instance and expanded it into a generality. In fact, we don't know if our big pines are getting the forest equivalent of steroids from their mycorrhizal partners or if they're big because they're on a slope that's too steep to cut, and they've grown undisturbed for a few centuries in soil that hasn't been impoverished by clear-cutting. Your guess is as good as mine. But they're magnificent; the closest thing we have to old growth, and we should celebrate them. And we're all free to believe that those drab little mushrooms are actually mass murderers sharing their violently acquired N with the pines that are reciprocating by sharing their C (which they acquire in a way that is not only benign, but beneficial). For my part, I believe.

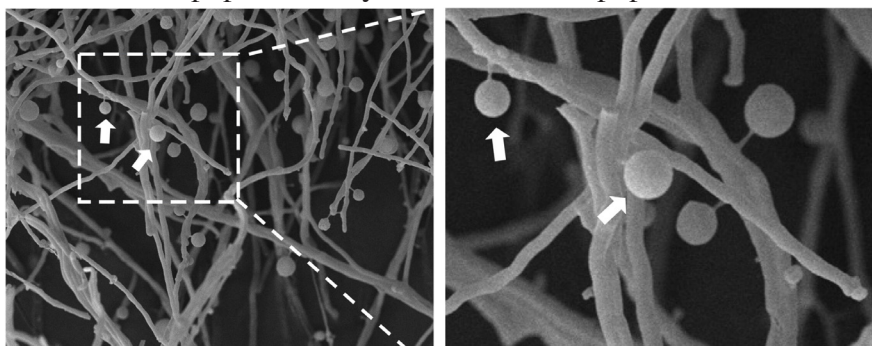
So having led you down this trail ending in a tangle of briars and vines, it's a pleasure to introduce you to a real, verifiable, invariably murderous, carnivorous group of fungal fruiting bodies that many of us have enjoyed consuming: the Oysters. There are many species of oyster mushrooms and they all kill and consume nematode worms. This is such an iron clad rule that it's considered a diagnostic feature of the *Pleurotus* genus, and all of its close relations, like having parallel gills or growing on rotting wood. Our local species,



Pleurotus ostreatus is a prized edible, which grows on dead, rotting wood, and it has the added virtue of being the rare edible that you can find in our

region in every month of the year (I've collected it in January in Tamworth). In fact, the winter fruitings are more desirable because they're bug-free.

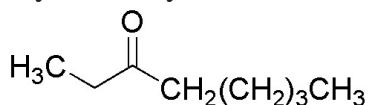
Anyone who's tried to compost wood has learned that you need to add N to the pile; wood is composed of cellulose and lignin, and neither of these contains N. But damp rotting wood is an ecosystem, full of animals, fungi and bacteria, acting out a complicated and ever evolving resource grab for each other's N. Microscopic nematode worms (there are thousands of species of nematodes and they come in a variety of sizes, but it's the tiny ones that hang out in moist organic habitats like soil and rotting wood) are ubiquitous and plentiful and they are the preferred targets of oyster species*, each of which has evolved a different method of chemical attack, the details of which are only now starting to be understood. *P. ostreatus* also uses its hyphae as weapons but until recently, we didn't know the details. Here's what we've learned: some of their hyphae generate vesicles filled with a substance poisonous to the nematodes. These "lollipops", as they've been called, pop when



Greatly enlarged image of *Pleurotus* hyphae and the "lollipops" they form. When a nematode touches them, they burst and release toxin.

a nematode touches them, and release the poison. A recent publication⁴ gave us a gorgeous micro-photo of them, which we've kindly shared with our readers) and identified the toxin they released when a nematode touched them.

This seems like fascinating and amazing work but the identification of the toxin left some researchers surprised by two things. First, that the chemical dispersed by the lollipops was not what we humans regard as a poison; 3-octanone is a benign (to us) molecule, often used by the flavor and fragrance industry, and found in such plants as lavender, rosemary, basil, thyme, etc.



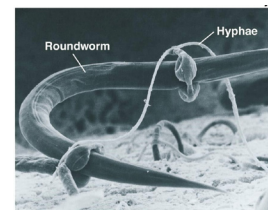
The chemical structure of 3-Octanone

And second, if you look at venoms, across the animal kingdom, they are huge, complicated molecules. No one doubts that fungi are able to manufacture huge, complicated molecules; in fact, fungi are famous for their ability to do just that. But 3-octanone is small and simple. Nevertheless, it does the job on nematodes, triggering paralysis, cell membrane dissolution and cell death. One has to admire our edible oyster for accomplishing so much with so little.

(While you're eating a delicious dish containing wild oyster mushrooms, you might recall Hamlet saying "Your worm is your only emperor for diet.")

* There are hundreds of fungal species that kill nematodes. It's hard not to admire the nematodes for surviving and thriving under this pressure. This article is limited to two fungal fruiting bodies that grow in our region and might have ecological or culinary significance to us. If you'd like to learn more about the ingenious weapons that other fungi have developed, go to: <https://www.sciencedirect.com/science/article/pii/S2452316X17302223#fig2> This article will not only

fill you in on oyster relatives who produce physical weapons which mimic those used in medieval warfare, but also the unrelated fungus, *Arthrobotrys*, which kills nematodes by generating hyphal rings, which tighten upon contact. (see illustration) This species is the hero of a 1968 novel (*Omnivore*) by Piers Anthony; it rescues



a human, exploring a planet ruled by fungal life forms, from a giant nematode by lassoing and killing the vile worm.

✍ Susan Goldhor

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4. Lee, C.-H. et al., 2023. A carnivorous mushroom paralyzes and kills nematodes via a volatile ketone *Sci. Adv.* 9, eade4809(2023).DOI:10.1126/sciadv.ade4809

Dig we must, for a greater Sandwich Range.

Since the WODC was founded in 1898, there have been periods of increased interest in hiking and trail building alternating with periods of disuse and neglect. We seem to now be riding a dramatic upturn in hiking activity, at least partly fueled by 4000-footer lists. Similarly, the founding of the club was immediately followed by an astonishing amount of trail building. (An 1899 news report of the WODC construction boom and the astonishing list of trails that were opened in that year is one of the fascinating newsbits in Jim Mykland's historical Look Up & Back elsewhere in this issue.) Heavier hiker traffic requires not only more annual maintenance, but also construction in many areas for long-term prevention of trail erosion. The magnitude of the work the club has accomplished in the past few years is bracingly laid out in Jack Waldron's trails report, page 1.



George Brown was running this operation last May for our much larger and better-funded White Mountain neighbor, the Appalachian Mountain Club. (That's George with his hand on his hip and the Yep-I'm-using-a-helicopter smile.) As anyone who has hauled tools or lumber into the woods in a backpack can attest, a helicopter certainly could come in handy from time to time.





Kevin Hart, Crew Leader Sam Brakeley and Madylin Partridge at work building stone steps to prevent trail erosion



And it is exciting to watch them beat their way skyward from our Ferncroft parking lot, levitating huge bundles of construction supplies and soaring away with them. But the product of this particular project – although certainly commendable – doesn’t quite live up to its airborne grandeur. The chopper was ferrying materials to build . . . outhouses.

The old facilities at Camp Penacook, Flat Mountain Pond Shelter and Jim Liberty Cabin were just pit privies, and pretty worn out, while these new ones are the latest composting technology. By the way, George was back in September to supervise the removal (also by helicopter) of all the left-over junk from the three construction sites.

∞ Doug McVicar

COMING NEXT SPRING: SOILS

“Essentially, all life depends upon the soil ... There can be no life without soil and no soil without life; they have evolved together.”

Charles E. Kellogg,
USDA Yearbook of Agriculture, 1938

The below ground is the largest and arguably the most diverse ecosystem on earth. It’s what supports our forests, grows our food, filters our water, cycles nutrients and stores carbon. We are dependent upon healthy soil, just as we are dependent upon clean air and water, which are all interlinked.

INTRODUCING OUR NEW CONTRIBUTOR

Jim Mykland is an expert with wide-ranging knowledge of local history. He is currently the Director of the Sandwich Historical Society. He is also a mountaineer: more than 40 years a member of the Wonalancet Out Door Club, a founding member of the WODC Trails Committee, and former adopter of the Wonalancet Range Trail. Jim will be back in future issues with more breaking Sandwich Range news (breaking the time barrier, that is).

WE NEED YOUR INPUT!



Whether you are a first-time visitor to WODC trails or a veteran, we want to know about your interests. To take our 2-minute questionnaire, scan the QR code or follow this link: <https://forms.gle/nkePC2SgtX74sLfx9>

Thank you in advance for your answers, and for your continued interest in and support of the mission and work of Wonalancet Out Door Club.

EDITORIAL
Susan Goldhor
Doug McVicar
Jack Waldron

LAYOUT
Peggy Johnson

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