# The North American Truffler

Journal of the North American Truffling Society

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### Winter 2024

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#### Announcements

Room **2602** in Cordley Hall on the Oregon State University campus is ready for NATS speaker meetings!!! NATS will now have in-person meetings every month for local members. All meetings will also be broadcast on Zoom for those of you who live farther away. See you soon either way!

The address for Cordley Hall is 2701 SW Campus Way, Corvallis, Oregon. Parking is across the street, and you'll need to enter at the NW corner of the building.

### NATS's 2024 Annual Potluck To Be Held February 10, 2024

#### **EVENT DETAILS**

When: 6:30 pm Sat, Feb. 10, 2024 Where: C3 Community Center 2601 NW Tyler Avenue, Corvallis What to bring: An edible dish\* to share, tableware, beverages of choice.

#### YOU CAN HELP!

- Donate decorative centerpieces for potluck
- ◆Come early for potluck setup
- ◆Stay late for potluck cleanup
- Volunteer to bring treats to upcoming January or March speaker meetings.

To volunteer, contact us at: <u>natrufflingSociety@gmail.com</u>

It's nearly time for the 2024 NAT'S Annual Potluck Dinner. This event is a great opportunity to renew annual dues, donate to the Pavelek scholarship fund, bid on the eclectic array of table centerpieces wrought yearly from the imagination of NAT'S members, elect officers, and win fantastic raffle items.

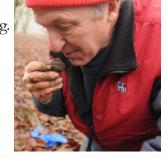


A very Northwest plate glass centerpiece by NATS President, Marilyn Hinds.

The potluck is the only fundraiser that we hold to raise money for the Pavelek Scholarship fund. Put on your creative pants and make a centerpiece for a good cause!

Enjoy good company and delicious dishes followed by a presentation by truffle farmer

Dr. Patrick Long.



\*Please provide an ingredient list for your dish for those on restricted diets.

## NATS 2024 Winter Speakers

### January 9, 2024: Kim Kittredge Growing shiitake on logs...

Have you ever wanted to grow your own mushrooms at home? A number of fungal species can be cultivated via a number of methods, and the resultant variations in color, texture, and flavor make for a novel meal, even if cooking is not your strong point.

Join NATS for its January 9th, 2024 speaker meeting where Kim Kittredge will present a summary of her extensive experience growing shiitake mushrooms on logs. She will offer information as to what is right, and why she has done what is wrong, successfully! Long affiliated with NATS, Kim, formerly of NW Mycological Consultants, has delighted NATS audiences over the years with her hands-on presentations. Not a talk to miss!



Kim shows NATS members Dan Luoma, Carolina Pena Paez, and President Marilyn Hinds how to grow oyster mushrooms at home in a 2017 presentation.

> Barbie is a fan of mushrooms, you can be also!



....now is the time!!



### February 10, 2024 Potluck Speaker: Dr. Patrick Long

This year's potluck speaker will be Dr. Patrick Long, semi-retired veterinarian and the closest thing to a truffle-whisperer the Willamette Valley has seen. Dr. Long has an enduring soft spot for rural endeavors dating back to his upbringing on a Kansas farm. Here in Oregon, he's become a forerunner in the nascent culinary truffle industry, being the first person reported to grow, harvest, and sell black Perigord truffles (*Tuber melanosporum*) in Oregon. His 1999 chance encounter with truffles via their mention in an inflight magazine resulted in a whirlwind courtship. Despite having never tasted a truffle, and, having recently purchased a 60-acre property on the outskirts of Corvallis, Dr. Long immediately planted his own truffle orchard. Early yields were modest but his 5th harvest (upwards of 100 truffles) convinced Long he was doing something very right.

So what is that? It's true growing conditions in the PNW are comparable to those of the black truffle's native France as well as Spain but that does not account completely for Dr. Long's success. He had much to consider in the establishment a non-native crop whose inherent value hinges on its short-lived aromatics: land use history, soil composition, appropriate irrigation, soil acidity, to till or not to till...not to mention pathogens, amorous critters, and (perhaps eventually) poachers.



This marks the 3rd presentation Dr. Long has given to NATS.

Don't miss the update on his trials, tribulations, and lessons learned after 2 decades of truffle farming!

### NATS 2024 Winter Speakers March 5, 2024: Alija Mujic A major revision to the North American species of *Rhizopogon*



If ever there were a perfect blend of computer geek and nature child, it would have to be Alija Mujic. His educational trajectory reflects this- after earning bachelor's degrees in both computer science and environmental studies at the University of California, Santa Cruz, he went on to earn a Ph.D. at Oregon State University's Botany & Plant Pathology in 2015.

The computer science was no simple indulgence- it was Mujic's express intent to use his computational aptitude to doubly indulge himself in his *other* fundamental interest: The Outdoors, or, more specifically, the fungal systematics in it.

Broadly trained in various facets of mycology, Alija's primary research interest is the mutualistic relationships between fungi and plants. He is an expert in molecular genetic analyses of fungi in both the in-vitro culture and natural environments. He has worked with several fungal lineages but his taxon of focus is the genus *Rhizopogan*, particularly the evolutionary biology of the subgenus *Villosuli*, on which his doctoral thesis is based.

After completing post-doctoral work at the University of Florida, Alija's educational journey led him back to his native California. There, he holds a tenure-track assistant professorship at Fresno State. Make no mistake- his educational endeavors are by no means over; they've simply evolved. He now finds himself playing a critical role in the education of future mycologists.



In his spare time, he's working on a major revision to the North American species of *Rhizopogon* and will share some of this research with NATS.

The following article will be featured in 'The Quarterly Bark', a publication by the Oregon Small Woodland Association. Visit their website at <u>https://oswa.org/benton</u> to learn more about the organization.

### Talk about a beneficial symbiosis....

Perhaps you haven't heard about the North American Truffling Society, but I'm sure as a small woodland owner you are aware of the important symbioses between trees and mycorrhizal fungi. Many of the forest mushrooms in the Pacific Northwest have a beneficial relationship with their host trees, often to the point where our trees can not successfully grow without their fungal partners. As an added benefit to people, most of our good edible mushrooms are mycorrhizal fungi. Did you know that almost all truffles are also "good" fungi that help your trees to grow?

Truffles are the reproductive bodies (fruits) of certain species of mycorrhizal fungi which mature in the soil. They are fleshy structures, shaped like small potatoes, and contain spores. The spores germinate to form hyphae, and when they encounter plant rootlets they form mycorrhizae—beneficial root associations with host plants to exchange nutrients. Truffles are evolved from mushrooms by adapting to a specialized habit. By forming in the soil, truffles are more protected from frost and drying than above-ground mushrooms. At the same time, they require animals for spore dispersal, whereas mushroom spores may be carried away by the wind. Truffles are an integral part of the forest food web and are a major food source for small mammals such as the northern flying squirrel—a primary prey of the northern spotted owl. Humans also love to eat some of these truffles, and hunting for them is fun and challenging.

(con't)

#### Con't from previous page

Over the years, NATS has cultivated a unique group of enthusiasts including mycophiles, poets, mycology professors, housewives, artists, graduate students, gourmands, truffle dogs, nerds, oenophiles, forest lovers, and dentists - all are welcome! NATS has occasionally been contacted by forest land owners curious to know whether their property harbors, or could potentially harbor, truffles, as well as how to go about broadening their contribution to the public's understanding and appreciation of truffles. Recently, such interest has increased to the extent that NATS is pleased to partner the with the Benton Small Woodlands Association with the hope of working together to advance our respective organizations' goals.

Specifically, if you are a small woodland owner pondering truffles, we would be interested in teaming up to see which truffle species might be present on your property. NATS can bring a group of truffle hunters, some with trained truffle dogs, to search for truffles in your woodlands. Even if your property is devoid of culinary truffles, you may be interested in helping us understand the diversity and distribution of these fascinating organisms - learning more about your woodland property is infinitely valuable even if culinary truffles take a back seat.

We are planning on a small inaugural foray combining members of the North American Truffling Society and the Benton Small Woodlands Association, hopefully with many shared forays in our futures!

We look forward to a fruitful partnership!

And here is the plan for our small inaugural foray....

### January 28, 2024 Joint Foray Opportunity!



NATS to partner with members of the Benton Small Woodlands Association



This January, the North American Truffling Society plans to hold a joint foray with members of the Benton Small Woodlands Association. We will be truffling to assess the diversity of fungal species on their forest property. The habitats focused on at this time are not expected to have a lot of culinary truffles. Later in the season, when culinary truffles typically ripen, another foray will be held on parts of the property more likely to harbor culinary truffles.

The owners would welcome a few dogs to join the hunt, but we will be limiting the number of dogs. Watch your email for instructions from NATS on how to register for the foray!

# The enigmatic Prototaxites by Matt Trappe

In the summer of 1843, Canadian geologist William Edmond Logan was surveying the Gaspé Bay region of Quebec for coal deposits when he found a peculiar fossil. It resembled a fragment of a small tree, but particularly intriguing was its location in an early Devonian strata (~420-370 mya), a geologic layer predating large plants. In the early Devonian, colonization of land by primitive plants was just beginning; most were only a centimeter tall. Ferns and horsetails began to emerge toward the end of this period, so this fossil would have been by far the tallest land organism at the time.

Logan's find was set aside and forgotten until 1855, when many of his collections were sent to McGill University geology professor John William Dawson for further study. Dawson observed rings in the fossil that led him to believe that they were of a partially rotted conifer, permeated by fungal mycelia. He went to Gaspé in the field seasons of 1858 and 1859 to seek more specimens, and after collecting several additional samples described and named it *Prototaxites* ("first yew") in 1859. He returned to Gaspé in 1869 and observed more specimens with entire trunks embedded in sandstone, some up to a meter in diameter, supporting his belief he had found fossilized trees.

He was invited to present his findings to the Royal Society of London in 1870 and brought samples to share with other researchers, one of whom was British botanist William Carruthers. Carruthers examined his specimen carefully, and based on his observations of parallel tubular structures concluded that it was actually a giant rolled up alga. In 1872, Carruthers published a paper redefining it as such and renaming it *Nematophycus*. Carruthers insisted on using that name in subsequent publications, initiating an acrimonious rivalry with Dawson that would last the rest of their lives.

Dawson continued visiting the Gaspé through 1881, making numerous observations but collecting few samples, perhaps because they were so large – one intact specimen was over a meter in diameter and almost 10 meters tall (Fig. 1). He commissioned an artist's conception of what the organism might have looked like (Fig. 2), inferring branches from spirally arranged punctures he observed on larger trunks. By 1889, the scientific consensus had shifted that microstructures in the fossils could not be those of a woody plant. Dawson started using the name *Nematophyton* and denied he had ever claimed it to be a plant, despite an extensive published record to the contrary.

Oxford botanist Arthur Church in 1919 was the first to propose that *Prototaxites* was a fungus, however the technology of the day made positive confirmation difficult. He noted tubular structures resembling hyphae, but he could not discern septa. The debate on the nature of *Prototaxites* simmered throughout the 20th century, with occasional treatises published in 1952, 1976, and 1992, as other sites were found in Ohio, Ontario, New York, Wisconsin, Tennessee, Wales, Belgium, Germany, Australia, and Saudi Arabia (Fig. 3).

Francis Hueber, a paleobiologist with the Smithsonian Institution, was the first to study Dawson's samples using electron microscopy, and published his results in 2001. With the newer technology, he was able to identify several distinctly fungal structures, such as hyphal septa, clamp connections, sterigmata, and a hymenial layer. Based on the totality of anatomical and ecological evidence, he concluded it was likely an early basidiomycete fungus. Even still, his conclusions were received by the paleobotanical community with skepticism, in part because the sheer size of the organism seemed unsupportable by hyphae alone. However, in 2007 a team from the University of Chicago suggested the tissue was likely tough and conk-like, which could have provided the structural rigidity needed to support its stature and could also explain the "growth rings". More conclusively, they performed isotopic analyses of samples, the results of which supported Hueber's fungal hypothesis. (con't pg. 6)

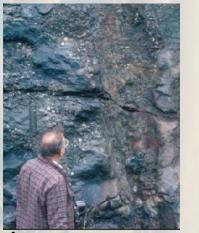


Fig. 2. Artist's concept of *Prototaxites*, 1888 ◆



← Fig. 3. Fossil *Protoaxites* from Saudi Arabia

← Fig. 5. Cross section of fossil *Prototaxites* stem.

Fig. 4. Artist's conception, "rolled liverwort" hypothesis.

Isotopes are naturally occurring variations within For example, all carbon atoms have 6 elements. protons. Almost all carbon atoms (about 99%) also have 6 neutrons and are thus called carbon-12. However, about 1% of carbon atoms have 7 neutrons (carbon-13), and an extremely small proportion have 8 neutrons (carbon-14). Some natural processes, such as photosynthesis, discriminate against heavier isotopes such that proportion of carbon-13 in plant tissue is "depleted" (less than that of ambient air). In contrast, saprotrophic (decomposer) organisms that absorb sustenance from a variety of organic sources are likely to be closer to the 99:1% natural ratio. The isotopic signature of Prototaxites, preserved in the fossilized tissue, was not depleted in carbon-13 thus indicating the organism did not primarily derive its carbon from photosynthesis.

Did this put an end to the controversy? Of course not. The next study, from the University of Wisconsin in 2010, hypothesized that Prototaxites were actually mats of liverworts rolled into cylinders by wind or water (Fig. 4). Liverworts are early primitive plants that photosynthesize, but also draw carbon from the soil ("mixotrophic"). The authors posited that this duality in carbon sources could explain the carbon-13 signature. They noted alternating layers of tissue in cross-section (which Dawson took for tree rings), and radially oriented tubules or rhizoids seemingly inconsistent with fungal morphology. This hypothesis was refuted within the year by a University of Kansas team based on four points: First, the anomalous tubule orientation observed in Chicago was an artifact of the oblique sectioning plane they employed, whereas in radial section the tubules were clearly longitudinal. Second, upon close inspection, the "rings" were clearly concentric and not spiral (Fig. 5). Third, a rolled up liverwort would

have other material, plants, and "bits and pieces" incorporated into its tissue, which these fossils did not; and fourth, the carbon-13 signatures of *Prototaxites* differed markedly from contemporaneous liverwort fossils.

A French team in 2015 questioned whether an organism of such size could nourish itself on decomposition alone, and speculated that there might have been a symbiosis with an algal or actinobacterial phototrophic partner, which might make *Prototaxites* the first lichen (rather than "first yew"). Swiss researchers in 2018 using the latest in electron microscopy not only showed phototrophic bacteria incorporated into the tissue, but also asci with ascospores enclosed, suggesting the structures Heuber interpreted as basidiomycete clamp connections were actually ascomycete croziers.

The state of the science as of today is that *Prototaxites* was probably a large ascomycete that possibly symbiosed with phototrophs of some sort. There are now 12 named species of Prototaxites. At least one fossil (the "Schunnemunk tree") found near Monroe, New York clearly has branches, some up to a meter in length and 10 cm in diameter. No phylloids (leaflike structures) have ever been conclusively associated with *Prototaxites* fossils, however if they existed may have been too fragile to be preserved. The landscape this organism dominated would have been quite different than any we know today, but artists have rendered an idea of how it may have looked (Fig. 6). What more information future technologies will provide of course remains to be seen. Among all this uncertainty one thing appears certain: in the lifelong feud between Dawson and Carruthers, they were both wrong. Perhaps the moral of that story is one of humility. But I could be mistaken.



### Hunting the rare truffle Fevansia aurantiaca by Heather Dawson



Morphological features of *Fevansia aurantiaca*. Peridium (lower left), gleba (top), spores (lower right).

This spring, I decided that this would be the year I'd find *Fevansia aurantiaca*. For those unfamiliar with this truffle, it's an endangered species of the family *Albatrellaceae* (Smith et al, 2013, *Mycorrhiza*) which includes the truffles *Leucogaster* and *Leucophleps*, and the mushrooms *Albatrellus* and *Albatrellopsis*, among others. This rare species has only been found in a handful of locations in Oregon. Based on earlier collection data, I expected August in the Cascade Range to be the best time to find it, and I put "Look for *Fevansia*" on my calendar for the first weekend in August.

I am spoiled by my ability to relatively easily find all different kinds of truffles thanks to my truffle dog, Rye. I keep a mental list of "holy grail" rare truffles that I hope to find. *Fevansia* was #1 on my summer list, and when August rolled around my sister Hilary Rose and I headed out to one of the areas where it was found long ago in the '60s. It was hot, dry, and we were eventually thwarted by some angry ground-dwelling wasps (luckily no stings!). That was it for August, but I still had my hopes for finding it.

We went backpacking on the east side of the Cascades during the highly unusual summer rain in the beginning of September. We had just set up camp at a lake when Rye ran up an ephemeral creek bed and dug up several large truffles; I noticed a few more emerging from the duff nearby. My first thought went to *Lencogaster* based on the somewhat banana-like aroma, but the odd rainbow splotches on the pale peridium didn't match. When I cut one in half I vacillated between being certain I had finally found my *Fevansia*, and also certain it couldn't be that; there were too many for such a rare species, and they were too easy to spot. And yet, the pattern of the gleba was unmistakable. Microscopy confirmed it, the fusoid spores were no match for any *Lencogaster*.



3 summer collections of *Fevansia aurantiaca* from 3 sites in the Cascades.
1) Eastern side of the Cascades; 2)
South of Diamond Peak; 3) North of Diamond Peak.

Later I learned I was not the first to find *Fevansia* in this exact location, and that it's an area where it has been found fruiting unusually abundantly. I believe the early rains triggered the major fruiting event that we came across. However, our *Fevansia* story continues. Two weeks later at a lake south of Diamond Peak, Rye dug up two more *Fevansia* truffles. These were properly hidden in the soil. I couldn't help but notice some similarities in the habitat: both sites were close to a lake, and in the specific area where water either drains into the lake or seems to pool nearby during snowmelt or rain. Once I noticed this pattern, I started walking around each lake we visited during our hikes to see if this habitat hypothesis held true.

I was gratified a few weeks later when Rye dug up a single *Fevansia* truffle near a different lake exactly where I expected to find it based on my earlier observations. Two might be coincidence, but three is a pattern!

While I am certain *Fevansia* also fruits outside of this pattern, I believe this type of habitat offers an increased chance of finding it. While the first location was a re-discovery of a known site, the other two finds are (as far as I know) completely new locations for this rare truffle. Of course, without Rye I would never have stood a chance of findings those new sites, as the truffles were undetectable without a good nose!



Rye at the third site where he found *Fevansia aurantiaca*, October 2023.





This opportunity closed at the end of 2023. Heather Dawson brilliantly partnered with Thanks to a partnership w Mycota, all FunDiS Local NATS' FunDis project, and has submitted 77 e. Our FunDiS Volunteer Projects truffle specimens for free sequencing. Way to go Sequence mines the species. Read instruction A sequencing.

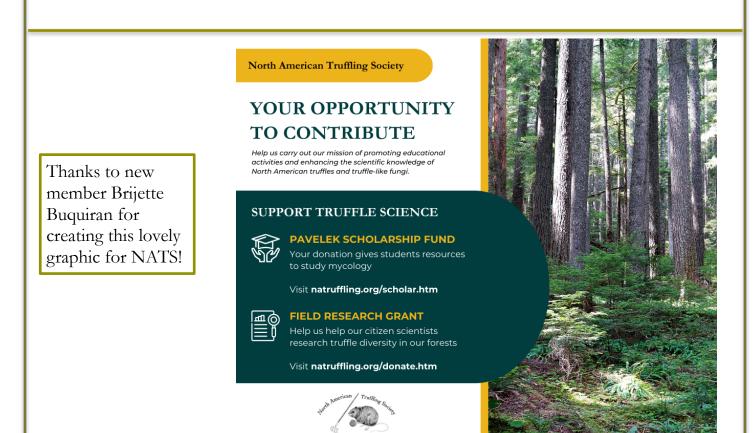
Heather, Hilary Rose, and of course the brilliant dog Rye (who actually found the truffles)! In order to ust join or start a FunDiS Local ect, contact us at <u>natrufflingsociety@gmail.com</u> if Project. NA you are inter rung out more.

### The FunDiS West Coast Rare Fungi Challenge continues!! October 2020 - March 2025



What is the Fungal Diversity Survey? FunDiS is a nonprofit 501(c)(3) organization dedicated to the documentation, appreciation, and protection of the fungal kingdom. Just under 10% of fungal species are documented and the need to catalogue and map fungal species before they expire is acute.

Get involved! Participate in community science with the West Coast Rare Fungi **Challenge.** Visit to learn more. <u>https://fundis.org/protect/take-action</u>



### NATS ZOOM Speaker Meeting Refresher

Our meetings this season will all be hybrid meetings, giving you an opportunity to attend in person or connect via Zoom. If Zoom seems a mystery, you are certainly not alone! Direct your questions to <u>natrufflingsociety@gmail.com</u>. The in-person meetings will be held in Room **2602** in Cordley Hall on the Oregon State University campus.

For the foreseeable future, NATS monthly speaker meetings will continue via Zoom. Meetings will usually start at 7:00 pm with a short business meeting. The speaker portion of the meeting will follow when our business portion is finished. The speaker will be introduced, fascinate us with their subject material, and linger for follow-up questions/discussions. In an effort to keep meetings short, speakers will present for 45 minutes or less. Zoom participants will be able to interact with audio or through the Zoom chat.

When you receive your monthly NATS email about upcoming meetings you will need to register ahead of time to attend via Zoom by clicking on the link in the email. Just fill in the short form to receive an invitation to that month's Zoom meeting. Our meetings are hosted through Oregon State University, and we will be very sure to keep them securely password protected to avoid uninvited guests.

Want to share your Zoom meeting invite with an interested non-NATS member?

Don't forget to let us know their name and email address so we will allow them into the meeting!

### NATS iNaturalist Submission Process

If you have a specimen that you think should be accessioned, be sure to dry the truffles to prevent rot (see <u>https://fundis.org/sequence/collect-dry/dry-your-specimens</u>), and please email <u>natrufflingSociety@gmail.com</u> to learn if we can accept your specimens.

Additional information fields are provided to record your observations on iNaturalist. Such information is often crucial for specimen identification, so if possible, please include:

Collector's (real) name for the specimen label

Elevation\*

Slope\*

Overstory/understory trees & shrubs (scientific name preferred)

Substrate (moss, mineral soil, soil, wood, or litter)

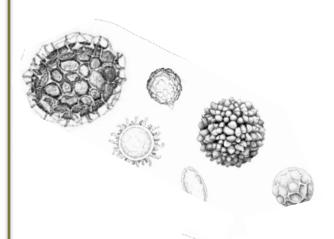
Fresh notes such as colors and odor (using the notes section on iNaturalist)

\*Estimates of these data are acceptable, however, PLEASE denote such instances.



### WANTED

Creative suggestions for newsletter topics, comments about articles, your opinions about any truffle and/or fungi related topic. Send contributions to: newsletter editor Sarah Shay at <u>natrufflingsociety@gmail.com</u>



Information contained in *The Truffler* is to be used at your own risk. NATS Inc., its officers, editors, and members are not responsible for the use or misuse of information presented herein. If you are unsure of mushroom identification or safety, **please** consult an expert! In addition, attending and participating in a NATS event is entirely at your own risk. No person associated with NATS is either directly or indirectly responsible for anything that occurs during, or in transit to/from, a NATS event. Be responsible.

### **UNIDENTIFIED TRUFFLE?**

### What to do?

Visit <u>www.natruffling.org</u> for a printable field data card (hand-written submissions on awesome stationary certainly welcome). Please provide a description of significant characteristics of the habitat immediately surrounding the collection site, including the dominant trees and other vegetation species and slope/exposure. Also include site coordinates (GPS data, if available) and, when possible, color digital images showing a surface view and an interior section, cut top-tobottom, through the center of the truffle.

Prior to submission, gently remove loose soil from the specimen. DO NOT scrub briskly or use a stiff brush; an intact outer skin is important for identification. Dry thoroughly using a food dehydrator OR by refrigerating samples in a loosely closed paper bag for a couple days. For faster drying, cut truffles in half to reduce moisture trapped by the outer skin.

Mail your dried specimen to:

#### The North American Truffling Society P.O. BOX 296 CORVALLIS, OREGON 97339

If you mail a dried specimen, please let us know by sending an email to <u>natrufflingsociety@gmail.com</u>.

#### The North American Truffling Society, Inc.

The North American Truffling Society is a non-profit organization based in Corvallis, Oregon that brings together amateurs and professionals who are interested in fungi that fruit below ground. The mission of NATS is to enhance the scientific knowledge of North American truffles and truffle-like fungi, and promote educational activities related to truffles and truffle-like fungi.

NATS is the only organization of its kind in the world devoted to gathering truffles and enhancing our knowledge about them. Primary activities include educational meetings and truffle-collection forays. NATS members collect truffles worldwide, thereby contributing to our understanding of their habitat and range, identification and classification, and edibility. NATS specialists also provide truffle identification services.

NATS offers:

- Forays (field trips) to collect truffles.
- Monthly educational meetings (autumn through spring) on varied mycological topics.
- A periodic newsletter, "The North American Truffler: Journal of the North American Truffling Society", describing recent truffle finds, program meetings and other topics.
- An annual potluck dinner.
- The excitement of participating in valuable scientific research.
- New and interesting friends.

NATS welcomes new members. As a nonprofit, membership dues may be considered a tax-deductible donation for those who itemize their taxes. Dues may be paid by cash (in person) or by check (US Mail). If you pay by check, please retain your canceled check as your receipt for tax purposes. You can also pay online with a credit/debit card via Paypal at www.natruffling.org/renew.htm.

For further information on truffles and membership, contact NATS and START TRUFFLING! Please return completed form (with check made out to NATS) to

THE NORTH AMERICAN TRUFFLING SOCIETY, INC. P.O. BOX 296 CORVALLIS, OREGON 97339 www.natruffling.org				
Name(s):		Phc	one:	
Address:				
City:	State: (Province)	Zip: (Postal cod	Country: de)	
Email address(es):	·			
<ul> <li>Annual membership fees: \$20 first family member, \$10 each additional family member in the same household over the age of 18 years. Businesses: \$20. Individuals/Businesses from other countries: \$20, payable in US funds.</li> <li>Annual contribution categories: Donor: \$15-\$49; Contributor: \$50-\$499; Sustaining \$500+</li> </ul>				