

# Hemlock and Reishi

## *Tsuga canadensis* and *Ganoderma tsugae*

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### *Ecology of Tsuga canadensis*

Most people who spend time outdoors have a favorite species of tree – a certain tree that speaks to them - usually for reasons not possible to fully put into words. It is not uncommon for a lot of those living in our region to consider the Eastern Hemlock (*Tsuga canadensis*) such a tree. There is perhaps no other local native tree that so distinctly defines and is defined by its micro-habitat. When one climbs over a forested rise, dappled with chestnut oaks and maples, low bush blueberry extending under the canopy, and then drops down into a cool, dark hemlock grove, one enters another place entirely. Although *Tsuga* can be found naturally scattered about our woods, and can be grown easily in most locations, it is in these places that hemlock thrives – sloping valleys nestling a stream or brook. The cool moist environment in these riparian habitats is in large part due to the insulating effect of the hemlock's thick, evergreen canopy – a classic example of a plant not simply responding to the environment by thriving in the habitat it prefers, but actually contributing to the creation of its preferred habitat. The graceful upturned boughs of the hemlock, combined with its frequent companions *Rhododendron* (*R. maximum*) and Mountain laurel (*Kalmia latifolia*), often lend a hemlock grove the atmosphere of an enormous Japanese garden.

*Tsuga canadensis* is a climax species, meaning that in the slow rhythm of a forest succession, the hemlock enters in the late stages – once a shady forest canopy has been established by more pioneering species such as birches and poplars. Donald Culross Peattie writes with his usual poetry that as the hemlock then grows and creates a much deeper shade, “at last only the shade-loving Beech can keep company with Hemlock. They associate together gladly, shaggy bole contrasted with paper-smooth one; somber, motionless needles with light and flickering blades; strength with grace.”<sup>1</sup> In our region Hemlock is also often seen growing with White Pine (*Pinus strobus*). The undergrowth is sparse in hemlock groves, owing not only to the shade but also to the high acid content of the needles that once fallen mulch the forest floor.<sup>2</sup> The slow-growing hemlock can reach over 100 feet in height and four feet in diameter over two to three hundred years, with the largest known individual trees being 600 years old, over 160 feet high, and six feet in diameter. The high tannin content of the bark, valuable to

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<sup>1</sup> Peattie, Donald Culross, A Natural History of Trees of Eastern and Central North America, Houghton Mifflin Co., 1948, p.40

<sup>2</sup> Collins, Beryl and Karl Anderson, Plant Communities of New Jersey, Rutgers U. Press, 1994, p.116

the tanning industry, doomed such old growth groves, which had been so common in a swath extending from the southern Appalachians through New Jersey and Pennsylvania, and up into New York State, New England, and Canada. Like so many of our native plants, close relatives of *Tsuga canadensis* are found in Asia as well as North America, but not in Europe. *Tsuga* is a member of the enormous Pinaceae family, and is easily identified by its short evergreen needles with two white stomatic bands on the underside (not to be confused with balsam fir, *Abies balsamea*).

### ***Medicinal Uses of Tsuga canadensis***

As is true for many other trees and shrubs high in tannin, such as oak and witch hazel, a poultice made from the inner bark of hemlock is useful in treating sores, burns, and wounds. Tannins being astringent by definition, the inner bark can also be used to stop minor bleeding, treat hemorrhoids, and to control diarrhea when taken internally. The pitch of hemlock, known as Canada pitch, was official in the U.S. Pharmacopeia, 1831-1894, as a medicinal plaster in the treatment of rheumatic pain. According to Karl Brooks "collecting hemlock pitch was at one time an important industry in northern Pennsylvania, large quantities being taken to Philadelphia."<sup>3</sup>

An infusion of the young green needles is diuretic and diaphoretic, making it useful to break a fever. Such a needle infusion is also high in Vitamin C, and has been credited, together with White Pine needles, with curing early European colonists of their voyage-induced scurvy, who learned the cure from Native Americans. The tea has a pleasant though odd flavor, and is highly recommended - sure to make one feel that (s)he is standing in a cool, moist hemlock grove. Because of the high tannin content, however, regular consumption of the tea is not recommended, except in small quantities or occasional use (such as warding off a cold).

The Eclectic doctors of the nineteenth and early twentieth centuries included hemlock in their materia medicas.<sup>4</sup> For example, in addition to the uses already listed, Finley Ellingwood wrote in 1919 that the oil of hemlock "may be applied with advantage to all sprains and bruises and to lumbago, rheumatism and sciatica...It is also a good stimulating expectorant in chronic bronchitis and

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<sup>3</sup> Brooks, Karl, A Catskill Flora and Economic Botany, Vol. III Coniferales, p.56

<sup>4</sup> For those interested in historical uses of hemlock, in the nineteenth century it was most often classified as *Abies canadensis*, sometimes *Pinus canadensis*, and usually referred to as hemlock spruce.

chronic coughs.”<sup>5</sup> Both Ellingwood and King also cite the usefulness of a strong decoction of the inner bark in treating urinary tract irritation and infection.<sup>6</sup>

One final note on the uses of hemlock: one can hardly look up hemlock in a botanical reference without coming across a warning to the reader not to confuse *Tsuga canadensis* with *Conium maculatum*, known as poison hemlock (infamous for the death of Socrates, and still a cause of occasional deaths due to its confusion with wild carrot, *Daucus carota*). This is certainly crucial to keep in mind, as a casual recommendation of hemlock tea could result in grave and unintended consequences! However, the plants are not closely related at all (*Conium* being an herbaceous, non-native annual in the Apiaceae family), and cannot be confused except by way of the name. The Merriam-Webster’s Dictionary states that the word “hemlock” derives from the Old English “hemlic”, but I have yet to find any reliable explanation for how or why the two plants ended up with the same English name.

### *Ecology of Ganoderma tsugae*

Those who have walked with an observant eye through hemlock groves in early to mid-summer have more than likely seen *Ganoderma tsugae*, a beautiful orange-red bracket fungus growing on dead hemlock trunks (both standing and fallen trees). *Ganoderma* means “shiny skin” in Latin; thus *Ganoderma tsugae* literally means “the shiny-skinned fungus growing on Tsuga”. It is often listed in field guides as “hemlock varnish shelf”,<sup>7</sup> but it must be kept in mind that like most fungi, it has no traditional English name per se (the English names attributed to most mushrooms in field guides are simply invented by the authors). *Ganoderma tsugae* is also often referred to as Reishi, the Japanese name for *Ganoderma lucidum* (known to the Chinese as Ling zhi), which grows on hardwoods and is much rarer in our region.

The genus *Ganoderma* (family Ganodermataceae) encompasses up to 166 species worldwide, although in reality the number is probably significantly lower, with the highest genetic diversity of the genus occurring in Africa.<sup>8</sup> The most authoritative and comprehensive field guide for our region, Mushrooms of Northeastern North America (Bessette, Bessette, and Fischer), includes four species as occurring in the region: *Ganoderma tsugae*, and the closely related

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<sup>5</sup> Ellingwood, Finley, American Materia Medica, Eclectic Medical Publications (reprint 1983), first published 1919

<sup>6</sup> Ellinwood, *ibid*; King’s American Dispensatory, Eclectic Medical Publications (reprint 1983), originally published 1898.

<sup>7</sup> Bessette, Alan; Bessette, Arleen; Fischer, David, Mushrooms of Northeastern North America, Syracuse University Press, 1997

<sup>8</sup> Moncalvo, Jean-Marc, “Molecular Systematics of *Ganoderma*: What Is Reishi?”, International Journal of Medicinal Mushrooms, Vol.7, Issue 3, 2005

*G.lucidum*; *Ganoderma applanatum*, and the closely related *G.lobatum*. *Ganoderma curtisii* also grows in our region. I have personally found it on the edge of the Pine Barrens in southern New Jersey, growing on the roots of Sweet gum (*Liquidambar styraciflua*), but it is most likely not included by Bessette et al., because it is widely considered to be a variant of *G.lucidum* and not a distinct species. In general the genus is a confused one: phylogenetic (DNA) analysis reveals that many “species” of *Ganoderma* should in fact be grouped together. For example, some researchers consider all *Ganoderma lucidum* occurring in North America to be in actuality *Ganoderma resinaceum*, while others consider those two species to be “conspecific”.<sup>9</sup>

Specifically, and more relevant for us, it is not at all clear that *G.lucidum* and *G.tsugae* are in fact distinct species, rather than varieties of the same species growing on different media. Paul Stamets writes that “These North American ‘Reishi’ – *Ganoderma lucidum*, *G.curtisii*, *G.oregonense*, and *G.tsugae* represent a constellation of closely related individuals, probably stemming from an ancient ancestry. The argument for retaining them as separate species may be primarily ecological and host specific and not biological.”<sup>10</sup> Gary Lincoff, the author of both Audubon and Smithsonian field guides to mushrooms and one of our region’s foremost mycological experts, agrees with this assessment and considers these two *Ganodermas* in particular to be the same species.<sup>11</sup> Perhaps most significantly, *G. tsugae* is used interchangeably with *G.lucidum* in Asia by traditional practitioners.

This is important to establish because as a general rule one cannot assume that closely related species in the same genus, whether fungi or plants, will have similar activity and can be used interchangeably. (In contrast *Ganoderma applanatum*, or Artists Conk, is clearly a species that is distinct from the *G.lucidum*/*G.tsugae* group. Although it may prove to have similar properties, it is not well studied or widely used as compared to the previous species.)

### ***Medicinal Uses of Ganoderma tsugae***

Reishi, or ling zhi in Chinese (“spirit plant”), is one of the most highly regarded tonics throughout Asia. Its effectiveness as an immuno-modulator is beyond dispute. The triterpene compounds in *Ganoderma* have shown adaptogenic and hypotensive activity, while the long-chain polysaccharides have been shown to have anti-tumor activity as well as immune-potentiating effects, making Reishi a

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<sup>9</sup> Moncalvo, *ibid*; Soon Gyu Hong, Hack Sung Jung, “Phylogenetic analysis of *Ganoderma* based on nearly complete mitochondrial small-subunit ribosomal DNA sequences”, *Mycologia*, 96(4), 2004, pp. 742-755, Mycological Society of America, 2004

<sup>10</sup> Stamets, Paul, *Growing Gourmet and Medicinal Mushrooms*, Ten Speed Press, 1993, p.357

<sup>11</sup> Personal communication.

common component in a wide range of cancer protocols.<sup>12</sup> A 2003 study involving 34 patients with advanced cancer found that using an extract of Ganoderma polysaccharides resulted in “significant increase in T-cell populations and NK activity at the 12-week period compared to baseline.”<sup>13</sup> Ganoderma has also been shown to protect the liver and promote liver regeneration, similar to milk thistle, making it ideal for patients with chronic liver disease such as Hepatitis C, since it will boost the person’s immune system while also protecting the liver. Its immuno-modulating effect means that it normalizes immune function rather than artificially suppressing or stimulating it, making it useful in almost all immune system imbalances.<sup>14</sup> This would include both hyper-immune conditions such as allergies and auto-immune disease, and hypo-immune conditions such as HIV or cancer. I have personally seen it work again and again to build resistance in people with deficient *Wei Qi* and who are constantly coming down with colds and/or flus – of course, as in all these examples, in conjunction with eating well and adopting a healthy, fulfilling lifestyle. Reishi has also been shown to be helpful in treating cardiovascular disease, reducing blood viscosity, blood pressure, and blood lipid levels.<sup>15</sup>

Despite its potency, Reishi is a very mild remedy. It is listed by AHPA as Class 1, meaning that it “can be safely consumed when used appropriately”. Side effects are rare and include “dryness of the mouth, throat and nasal area; itchiness; stomach upset, nosebleed, and bloody stools.”<sup>16</sup> The only true contraindication is for those with allergies to mushrooms. That being said, idiosyncratic reactions are always possible, and of course one should consult a trained herbalist or practitioner if dealing with a serious illness.

Reishi is much more than a laundry list of wonderful properties. There is something indefinably powerful about it – and empowering. Standing beside it in the midst of a hemlock grove, a cool stream running close by, one can feel its subtle but real effects on the mind and spirit. Ganoderma is both nervine and adaptogenic, meaning that while it is soothing and calming, it also works to nourish the hypothalamus-pituitary-adrenal axis, reestablishing balance between the resting parasympathetic state and the stimulated, stress-induced sympathetic state of the autonomic nervous system. In other words, it builds while it calms, making it a wonderful remedy for anxiety, insomnia, mild depression or

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<sup>12</sup> Hobbs, Christopher, Medicinal Mushrooms, Interweave Press, 1996, p.98

<sup>13</sup> Gao Y, et al. “Effects of ganopoly (a Ganoderma lucidum polysaccharide extract) on the immune functions in advanced-stage cancer patients”, *Immunol Invest.* 2003 Aug;32(3):201-15.

<sup>14</sup> This is in my opinion the quintessential difference between conventional medicine and the holistic approach: the former often works to *impose* a change in the body, which can be effective but rarely without unintended consequences, while the latter works to re-establish homeostasis or balanced, normal functioning.

<sup>15</sup> Hobbs, pp.99-100

<sup>16</sup> McGuffin, et al., Botanical Safety Handbook, American Herbal Products Association, CRC Press, 1997

melancholy. I know of one TCM practitioner who claims that Ganoderma “makes you healthy because it makes you happy”. It seems entirely consistent that “in addition to its medicinal indications, Reishi has been used in the Orient as a talisman to protect a person or home against evil.”<sup>17</sup>

Reishi is available at very affordable prices because it is now widely cultivated in Asia, and anyone with access to an Asian herb market will find it with no difficulty. (Those who wish to move beyond the relatively easy cultivation of shiitake mushrooms could take this on as a healthy challenge). But only twenty years ago, before effective cultivation techniques were developed, reishi was very expensive. To this day buying wild reishi is not an easy or affordable prospect, and so our access to it is quite special indeed. Furthermore, harvesting the fruiting bodies of fungi (i.e. mushrooms) is ecologically sustainable and akin to harvesting fruit from a plant, in that the fungal mycelium is left intact and alive. That being said, it is always recommended to leave at least a few fruiting bodies unharvested to ensure adequate spore production for long term species survival. All in all, it is probably the remedy I use most in my practice, and by far the most treasured of medicines that I gather from the wild.

Ganoderma, once thoroughly dried, can be stored for several years, and is best prepared by decoction – cooking at a low, rolling boil for several hours. Its long chain polysaccharides make it relatively inert if left uncooked.

### *The Woolly Adelgid*

The hemlock wooly adelgid, *Adelges tsugae*, is an insect native to Asia and introduced to the United States in 1924. It has been slowly making its way North on the East coast of the U.S. since the 1950s, ravaging hemlock stands on its way. It has now reached northern New Jersey and southern New York. The introduction of a non-native insect such as the wooly adelgid is exacerbated by what Karl Anderson calls “human interference with the natural processes by which insect populations normally would be controlled” – specifically, the use of pesticides and other chemicals that kill off natural predators and parasites.<sup>18</sup>

Although labor-intensive methods exist for saving individual trees, nothing effective has been developed for halting its spread. We may see the demise of the Eastern hemlock in our lifetimes. Although the hemlock’s disappearance would not have an immediate economic effect like the loss of the American chestnut a century ago, it would arguably be an ecological catastrophe of at least equal proportions. Hemlock cones are an important source of food for wildlife, and it is difficult to imagine what other native tree could so effectively fill the

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<sup>17</sup> Ibid, p.97

<sup>18</sup> Anderson, p.69

ecological niche that hemlock does. In recent years I have seen an increase in the numbers of *Ganoderma tsugae* while on my annual harvest. This may be due to the high levels of rain that had fallen, but may also very well be due to an increase in hemlock mortality. If we do lose the graceful and noble hemlock, we would expect to see a brief explosion in the local Reishi population, followed by a sad silence. Hopefully we will discover a way to prevent such a tragedy.

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