PLANT PROFILE

Top to bottom: Cones, winter needles, and new spring growth. *Photos by Robert Dirig.*

Eastern Hemlock

by Carri Marschner

Eastern Hemlock, by Carri Marschner of NYS Hemlock Initiative

THE EASTERN HEMLOCK (*Tsuga canadensis*) is a common sight in our landscape, but sometimes is overlooked because of its abundance. Despite what we might imagine from our perspective in the Finger Lakes Region, it's the third most common tree in New York. The densest populations are found in the Catskills, the Adirondacks, and the Tug Hill region. In the Lake George region of the Adirondacks, Hemlock comprises 60% of the forest canopy. Here in the Finger Lakes, Hemlock is often a riparian and lakeside species, preferring the deep shade and moist soils of those habitats. Its drooping boughs and feathery texture are an integral part of our Finger Lakes gorges and lakeside views.

Eastern Hemlock is interesting because it creates a very specific habitat that supports a unique assemblage of plant and animal life. As a common species that creates the conditions for other species to thrive, it is considered a foundation species. Hemlock woods actually host fewer species than the surrounding hardwood forests, but their presence in the hardwood landscape increases the diversity of habitat that's available at the landscape scale — which is valuable, even if the specific habitat it creates has a limited species list. Hemlock groves are shady year-round, and provide shelter both in summer heat and winter cold. Many animals seek out Hemlocks' cool shade in summer (up to twenty degrees cooler than the air above the canopy), and also find refuge under Hemlock from wind and deep snow in winter. Hemlock needles decay slowly, creating a deep, acidic duff that can contain viable seeds over a century old. Together with the reduced rain and snow caused by the dense canopy, the area under Hemlocks is shadier, drier, and more acidic than surrounding habitats, which favors a specific group of plant species. These include Partridge Berry (*Mitchella repens*), Wintergreen (*Gaultheria procumbens*), Canada Mayflower (*Maianthemum canadense*), Northern Wood Sorrel (*Oxalis montana*), Indian Pipe (*Monotropa uniflora*), Witch Hazel (*Hamamelis virginiana*), and Mountain Laurel (*Kalmia latifolia*). Animals that use Hemlock groves include Red-backed Salamanders, Red Efts (juvenile Red-spotted Newts), and a wide array of insects and spiders. Spiders are actually more diverse in Hemlocks than in the surrounding deciduous forests, especially web-building spiders. Black-throated Green Warblers, Acadian Flycatchers, Blackburnian Warblers, Canada Warblers, Hermit Thrushes, and Red-shouldered Hawks all use Hemlock groves, along with Ruffed Grouse in the winter.

Hemlocks are the most shade-adapted species in our forests, which they achieve with some interesting physiological tricks. Hemlock needles (*previous page*) are particularly good at using very limited light to photosynthesize, so unlike most other trees in our woods, they maintain a full canopy all the way down the tree to take advantage of every fleck of sun. Young Hemlocks are able to hang on in very deep shade for decades, waiting for a canopy gap to open so they can really grow. Many of the "saplings" in a Hemlock grove can be nearly a century old, despite their small size. Another trick Hemlocks have is the ability to pause their growth multiple times during their life; if conditions become unfavorable, they stop growing and hang on until those conditions change. Most of our hardwoods can't do that once they commit to rapid growth, and once mature can't handle sudden changes in light, even if it's an increase in light.

While any Hemlock forest provides valuable ecological services, old-growth Hemlock forests have some additional features that make them even more precious. Hemlock can live six hundred years or more, and doesn't reach maturity until about 250 years. Like other old-growth forests, they have a varied age structure and the characteristic pit-and-mound topography caused by centuries of trees falling and rotting in place. The large logs of downed old-growth Hemlock can remain intact for over seventy years, and act as nurseries to new trees and understory plants. The varied topography provides a range of microhabitats that support a wider range of understory species in more abundance than second-growth Hemlock forests support. Some of the species favored by New England old-growth Hemlock conditions are Hobblebush (*Viburnum lantanoides*), Canada Yew (*Taxus canadensis*), Clasping-leaved Twisted Stalk (*Streptopus amplexifolius*),* and Evergreen or Fancy Wood Fern (*Dryopteris intermedia*).

Bud Ververka of Mianus River Gorge Preserve with an old-growth Hemlock at Mianus River Gorge. Photo by Nicholas Dietschler of NYS Hemlock Initiative.

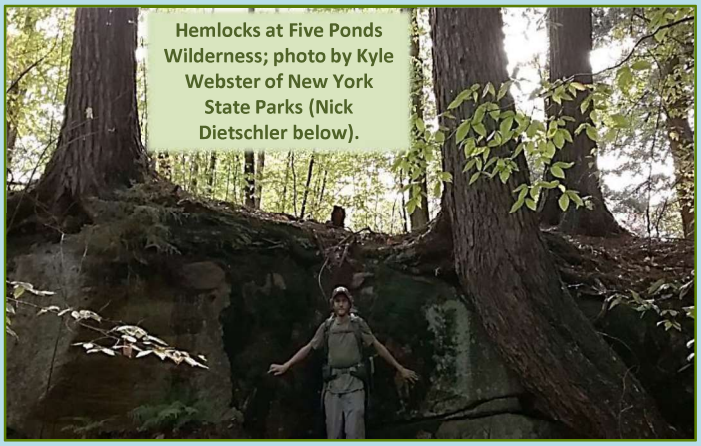
* Its congener, Rose Twisted Stalk (*S. lanceolatus*; older name *S. roseus*), may grow under Hemlocks in the Finger Lakes. – Ed.

EASTERN HEMLOCK IS AT RISK throughout its range from an invasive insect, the Hemlock Woolly Adelgid (HWA). This small, aphid-like insect attaches to Hemlock twigs near the base of needles (*see next page*) and feeds on stored starches in the xylem. There are seven regions in the world that have trees in the Hemlock genus (*Tsuga*), and six of them have a

native Hemlock adelgid — including the Pacific Northwest, where an enthusiastically woolly Hemlock Woolly Adelgid is kept in check by a suite of HWA predators. It's not the feeding of the insect that kills the Hemlocks, it's a combination of the sheer density of the pest and the tree's response to wounding. In a heavy infestation, the tree's walling-off of so many tiny wounds prevents it from getting sap to the end of its twigs to make new foliage, eventually starving the tree.

The HWA present on the East Coast is from southern Japan, and has spread through most of the Eastern Hemlock's range. In the southern U. S., it kills Hemlock in 4-10 years; in New York it's more like 4-20 years, depending on tree location and health, and how many severe winters reduce the HWA population during the infestation. All over the eastern seaboard, scientists and foresters are working hard to develop appropriate biocontrols for this pest; until a solution is found for New York, chemical treatment is the only option to preserve Hemlocks once HWA arrives in a stand. If we are unable to find a biocontrol solution to HWA, we are likely to lose Hemlock as a functional part of our forests in New York.

Eastern Hemlock is a critical part of the ecology of our eastern forests, and an interesting, beautiful species that creates a unique habitat. The cathedral-like coolness of a Hemlock grove is a special experience, and the habitat they create adds to the rich complexity of our eastern forests. Take the opportunity to visit one of our region's lovely Hemlock groves this fall to appreciate their shade and grandeur. Beautiful Hemlock groves can be found at *Robert Treman, Buttermilk Falls*, and *Taughannock Falls State Parks*. The Nature Conservancy's *O.D. Von Englen Preserve* is an example of a Hemlock swamp, one of New York's rare ecological habitats. There are Hemlock stands at *Hammond Hill State Forest*, and the Hemlocks at *Texas Hollow State Forest* are a good example of the decline caused by HWA. Cornell Botanic Gardens has several rich Hemlock sites: *Fischer Forest Preserve* has a few old-growth Hemlocks; *Ringwood Natural Area* has good Hemlock stands; and there are some lovely Hemlocks along *Beebe Lake* on Cornell University's campus, several of which have been treated for HWA by Cornell Botanic Gardens to preserve them into the future. For information on Cornell Botanic Garden preserves, please visit www.cornellbotanicgardens.org.



Hemlocks at Five Ponds Wilderness; photo by Kyle Webster of New York State Parks (Nick Dietschler below).

Notes and References

Most of the interesting facts and research reported in this article were found in the excellent book, *Hemlock: A Forest Giant on the Edge*, by David R. Foster of the Harvard Forest (Yale University Press, 2015). Dr. Wallace has been researching Hemlocks and the impacts of HWA at the Harvard Forest for many years, and there are several ongoing experiments relating to Hemlocks in the Harvard Forest. For more details, please visit his website at http://harvardforest.fas.harvard.edu/david-r-foster.

The information on spider abundance came from Rachel E. Mallis & Lynne K. Rieske's article "Arboreal Spiders in Eastern Hemlock," published in the journal *Environmental Entomology* in 2011 (Vol. 40, No. 6, pp. 1378-1387).

Some of the details on understory vegetation were from Anthony W. D'Amato, David A. Orwig, & David R. Foster's article "Understory Vegetation in Old-growth and Second-growth *Tsuga canadensis* Forests in Western Massachusetts," published in the journal *Forest Ecology and Management* in 2009 (pp. 1043–1052).

Information on Hemlock longevity is from the book *Knowing Your Trees* by G. H. Collingwood & Warren D. Brush, edited by Devereaux Butcher, and published in 1984.

For more information on HWA in New York and the Finger Lakes Region, please visit the ***NYS Hemlock Initiative*** at www.nyshemlockinitiative.info.

▲ HWA, by Mark Whitmore of NYS Hemlock Initiative

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