# THE HIGH KNOB HERALD WINTER EDITION

**JANUARY 2022, ISSUE 13** 

THIS IS THE FIRST ARTICLE OF OUR SERIES ABOUT HIGH KNOB, ONE OF THE MOST DIVERSE BIOSPHERES IN THE COUNTRY.

## **Magical Rime**

### The Capture Of Clouds By Trees

On dark, cold wintry days when cloud bases hang low across the great High Knob Massif there is magic in the air. Literally! For when clouds part and sunshine returns, trees stand like polished jewels against sapphire blue and shed streams of sparkling crystals into air with every gust of bitter wind.

Reaching upward into the heavens, above cloud bases, this magical process occurs along windward slopes when water vapor is transformed to solid. This may skip the liquid phase or occur directly via cloud droplet deposition. In both cases, deposition releases latent heat energy directly into the air as accumulation occurs on trees, shrubs, weed-stems, and other objects standing upright in moving air. The substance being deposited is called rime.

Rime is differentiated from snow in that it is deposited on only the windward facing side of tree limbs, trunks, and other upright objects when air flow is from a single direction. Seemingly against intuition, as wind speeds increase rime deposition and growth accelerates into the wind.

This is very unlike snow whose movements increase with wind speed and whose accumulations occur most evenly in light winds. A snow covered limb is blown clean by wind. A rime covered limb is not.

In the High Knob Massif rime takes many forms that vary from clear and icy to white and feathery, solid, and multilayered. These differences arise due to variations in air temperature, wind velocity and direction, cloud droplet size, and turbulence.



Depositions vary from novelty dusting to those great enough to break limbs, droop and topple trees. Classic one-sided depositions contrast with those that completely encircle trees and limbs during events featuring moisture transport on varying wind directions. This form of rime is hard in nature and develops during strong winds characteristic of winter storms.

High basins holding lakes and wetlands in upper elevations of the High Knob Massif occasionally feature exotic riming episodes that include strange, other-worldly twists and swirls which apparently are influenced by enhanced moisture and temperature gradients within more restricted air movement.

This rime is generally of a soft, feathery composition, much like occurs along windward facing crests and ridges in events characterized by less intense upslope winds.

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Rime deposition is physically a product of water's ability to remain vapor or liquid at temperatures as frigid as 40 degrees below zero, as well as the ability of this supercooled water to undergo direct transformation from vapor into solid.

Riming is not relegated to merely trees and upright objects, but also to snowflakes that fall and immediately add water volume to winter snow cover and snowpacks.

Delayed addition of moisture occurs from trees when rime deposition drops to either the snowpack or bare forest floor. It is in this way that rime functions as an important secondary moisture source (a source not directly measured by precipitation gauges) at upper elevations of the High Knob Massif.

Without trees the capture of frozen clouds of water vapor is greatly reduced, with the vast majority of this moisture evaporating away with leeward descent (sinking) of air. For the typical Appalachian ridge, riming is not a major factor due to generally narrow ridges. High Knob is no typical mountain, with its top spreading outward for miles to generate one of the widest singular mountains in the entire Appalachian range.

This is exemplified by its five mountain-top lakes and many wetlands embedded within its sprawling summit, the most of any single mountain in the Appalachians. Riming in this environment tends to be much more expansive, with occasional transformation of upper elevations into a vast rime forest.

Significance of High Knob Massif riming is increased by the number of days with rime formation during each cold season, with an effective contribution of moisture that is analogous to having an extra month or two of precipitation days each year.

This is driven by development of clouds in subfreezing air on multiple air flow trajectories within its wet climatic setting. Along with even more significant fog drip from trees in above freezing air, this functions to greatly enhance the importance of trees to the annual moisture budget, ecology, and geomorphology of the high country and those downstream locations benefiting from its moisture supply.

Draining of Big Cherry Lake during 2005 to build the new dam was a grand experiment that verified the importance of rime deposition drop and fog drip from trees. Despite a drought pattern, with much below average precipitation and local predictions that it might take years to refill the drained lake, it filled and overflowed into mid-winter.

This occurred through a combination of rain, snow, and nearly 50 rime formation days during the 2005-06 winter season.

Trees growing at upper elevations in the High Knob Massif should be given a higher conservation priority, not only because they also include and support many northern species of both flora and fauna, but also because they capture cloud vapor and greatly enhance the annual moisture budgets of critical headwater streams, water supply lakes, and wetlands.

While rime represents the capture of clouds by trees, it is much more than merely beautiful.



Truly, it is magical!

Written & Photography taken by Wayne Browning, Governing Board Member, The Clinch Coalition

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## Activities

#### What's New on High Knob?

Interested in spending the summer outdoors, protecting our natural resources? The Clinch Ranger District is seeking volunteers to serve as Campground Hosts for our 2022 season.

A personal RV or camper is required. Please contact the District office at (276) 679-8370 or search for the "Clinch Ranger District" at <u>www.volunteer.gov</u> to find out more!

### Plant of the Month

#### Fancy Fern Dryopteris intermedia

Fancy Ferns (*Dryopteris intermedia*), also known as Evergreen Wood Ferns or Glandular Wood Ferns, are evergreen ferns native to the Clinch Ranger District area. It is one of the most common ferns in the eastern United States. Its range extends from Newfoundland west to Minnesota and south to Missouri, Virginia, Tennessee, Alabama, Georgia, and South Carolina.

The Fancy Fern is a member of the genus *Dryopteris* (Wood Ferns). As of now, there are no current medicinal or food uses for the wood fern.







Dryopteris intermedia. Photo by Bill Harris



### **TCC's Reading Nook**

#### TCC donates books to local teachers

The Clinch Coalition has donated 235 copies of Teach the Clinch 2.0 to K-12 science teachers in the Lee, Scott, Wise and Dickenson Counties and City of Norton school systems. Edited by Dr. Carol Doss, Executive Director of the Upper Tennessee River Roundtable, and Dr. Chris Anama-Green, these books are "a place-based guide for educators in the Clinch River Watershed and beyond."

If you would like to become a member or make a donation, please visit www.clinchcoalition.org.