The University of Vermont **PROCTOR PAGE** *News from the University of Vermont Proctor Maple Research Center*

Cost of hitting stained wood when tapping

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UNDERHILL CENTER, Vt.— Avoiding tapping near previous tapholes is a common practice in maple production.

This is because previous wounds create a zone of stained wood that extends slightly wider and deeper than the taphole, but extends upwards and downwards, often reaching 6-12 inches in length in each direction, affecting a volume of wood approximately 50 times (range of 15-150X) larger than the volume of the taphole (van den Berg et al. 2023).

Due to physiological and anatomical changes associated with this stain (also referred to as non-conductive wood or NCW), sap will not pass through affected vessels. Tapping into these areas produces lower sap yields proportional to the amount of NCW hit (Isselhardt 2022).

The higher the percentage of tapholes that hit stain and the greater the amount of stain hit in those tapholes the lower the sap yield.

In a survey conducted about ten years ago by UVM Proctor Maple Research Center (PMRC) researchers, it was determined that maple producers considered hitting stain in 5% of tapholes to be an acceptable rate.

Because tapholes close over due to the new radial growth over a period of a few years, the sustainability of tapping is linked to annual growth rate.

Dominant/codominant trees normally follow a predictable progression in which growth peaks in "middle age" and tapers off as the tree gets older. Thus, in large mature trees it may take even longer before it is safe to tap over or adjacent an old taphole.

This, combined with the tendency to add a second (or third) tap in large trees compounds the problem.

Although it can take 20-30 yrs for enough new wood to grow over the wound to prevent hitting stain if a taphole is placed in the same spot, there are several possible measures producers can take to lessen the changes of hitting stain when tapping.

These include:

Careful scrutiny of the full tapping band to avoid tapping near old wounds

Moving the taphole around the stem a set distance to the side and up/down from the previous taphole (pattern tapping)

Using dropline lengths of 36-40"

Marking tapholes (if permitted for organic production or by landowners)

Using small spouts (1/4", 19/64", 5/16") rather than 7/16" spouts

Optimizing taphole depth for tree growth in your stand

Tapping below the lateral (for producers utilizing vacuum)

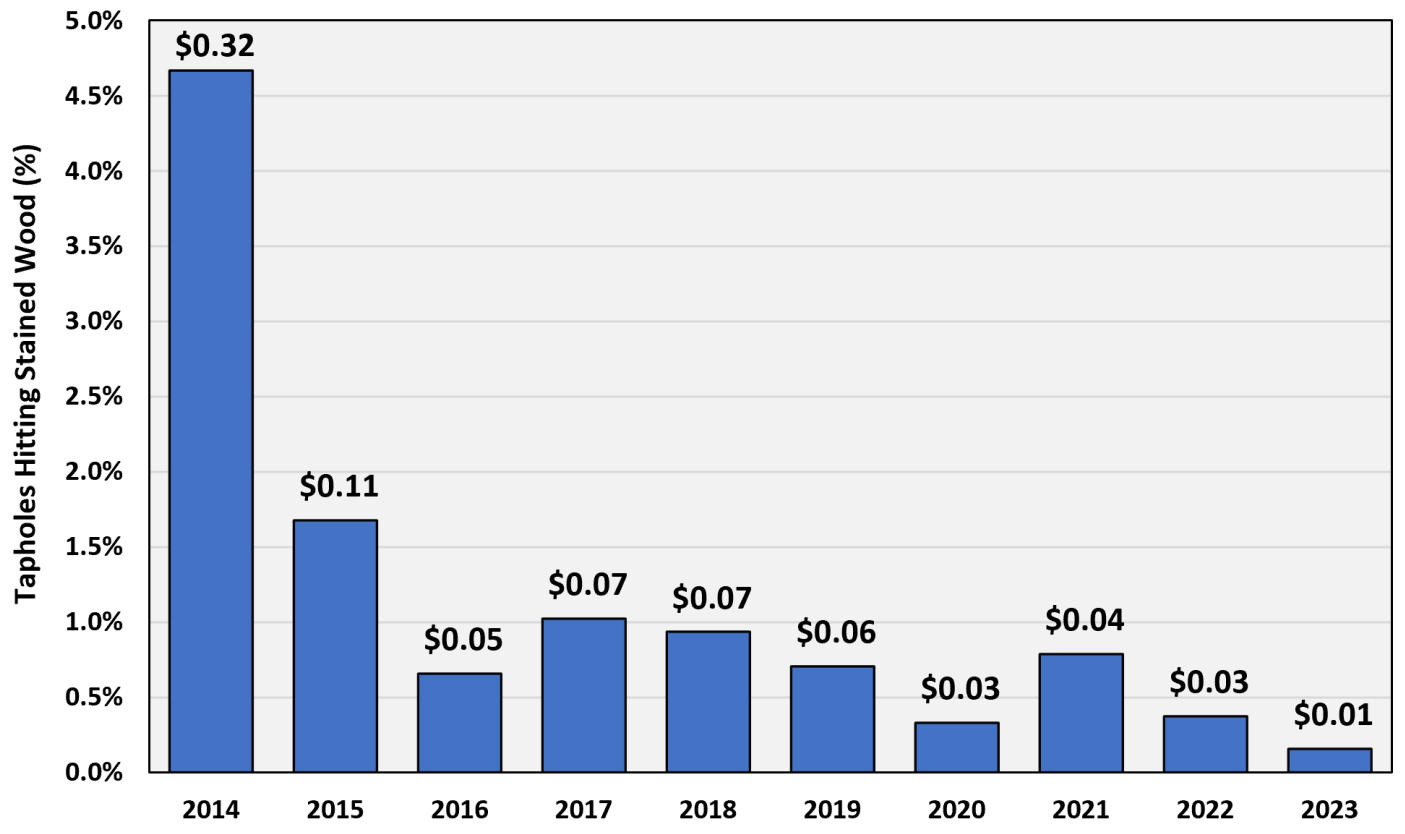
Avoiding practices that lead to overtapping or cluster tapping (multiple short droplines, tapping only on the south sides of trees or above/below roots or large branches)

Locating lateral lines on the opposite side of the tree when retubing

Ensure tappers understand the "quality" of tapholes is as important as "quantity" of tapholes

Periodic thinning to encourage strong tree growth

In 2014 we started tracking the number of tapholes that hit stain in the UVM PMRC sugaring operation by examining the wood shavings while tapping.



FREQUENCY OF TAPPING into stained wood at the UVM Proctor Maple Research Center from 2014-2023. Bars represent the percentage of tapholes that hit stained wood (NCW). Values above bars are the loss in revenue per taphole averaged across the entire sugaring operation calculated from a bulk sap value of $0.50 per gallon. If syrup were sold retail, losses would be approximately double the values shown.

Mark Isselhardt, UVM Extension Maple

DRILL SHAVINGS from a maple taphole. Darker orange-brown and black flecks are bark tissue. Creamy-white shavings are sapwood. Significant presence of darker-tan colored wood indicate that the taphole has hit stained, non-conductive wood, likely from a previous taphole or other stem wound.

Although there will always be some darker material (bark) in the shavings, the actual sapwood should appear a uniform, creamy white color. Stained wood has a darker, tan-brown appearance.

Initially, 4.7% of the taphole shavings showed evidence of staining. The vast majority of stain was encountered while tapping the area of the sugarbush within the original "Harvey Farm", which were mostly large (16+ inches diameter) trees that had been heavily tapped since at least the early-1900s with 7/6" spouts and with multiple taps per tree.

In 2015 we started researching tapping below the lateral, finding that sap yields were not significantly reduced as long as high vacuum and good spout/tubing sanitation were employed (Perkins et al. 2016).

Because the legacy sugarbush has never been tapped low on the stem, this simple change reduced the percentage of tapholes that hit stain greatly, dropping to 1.7% in 2015.

Over the next several seasons, through a combination of close inspection of the full tapping band while tapping, identifying the last several seasons of tapholes and moving away from those in a regular direction (quasi-pattern tapping), moving to longer droplines, and regular use of tapping below the lateral when appropriate, the percentage of tapholes hitting stain has been reduced further and maintained at or below 1%.

In most years stain is encountered less than 0.5% of the time. Between 2016 and 2023, the percentage of stained wood hit while tapping the sugarbush at UVM PMRC has averaged 0.7%, a 7.5-fold reduction in frequency of NCW encountered compared to the 2014 season.

While not hitting stained wood is of interest, what is more important to producers is how much sap and how much money this can save.

In the chart accompanying this article, the numbers above each bar represent the estimated cost PER TAP of hitting stained wood.

It is important to realize that this is the estimated loss in revenue PER TAP averaged across EVERY tap in the sugarbush, not just those trees that hit stained wood during tapping. For the UVM PMRC sugarbush (3,405 taps in 2014), 159 of the tapholes hit stained wood, for a total of 4.7% of trees hitting stain.

Assuming a loss of 50% of sap from each affected taphole, and given our sap yields for that season, we lost more than a barrel of syrup (42.1 gallons) due to tapping into NCW that year. At bulk syrup rates that year ($2.35 per lb), our economic loss was $0.32 per taphole (that is across ALL taps, not just those hitting NCW) or a total of nearly $1,090 in revenue.

To put it another way, that is like paying a tax of $0.32 on every tree you tap. Nobody likes paying taxes. Why pay more than you have to? If selling syrup retail, the economic losses would be double that value or more.

While you can never guarantee that you won't hit stain during tapping, producers should take measures to lower the probability of it happening in their woods. By using the techniques described above, we were able to reduce the losses to an average of only $0.07 per taphole from 2016-2023.

While that means we're still losing about $450 (across 6,400 taps currently) each year due to tapping into NCW, at the previous rate of loss ($0.32 per tap), we are saving $0.25 per tap as compared to our 2014 taphole stain rate by reducing the losses from $0.32 to 0.07 per tap.

That's an economic gain of $1,600 (by avoidance of losses) made simply by paying close attention to the rate of hitting NCW during tapping and following a few simple strategies to minimize those chances.

Bottom line…it is worth paying attention to limit the amount of NCW encountered when tapping.

More information on this subject is available at: https://mapleresearch.org/pub/4221eco/

Literature Cited

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