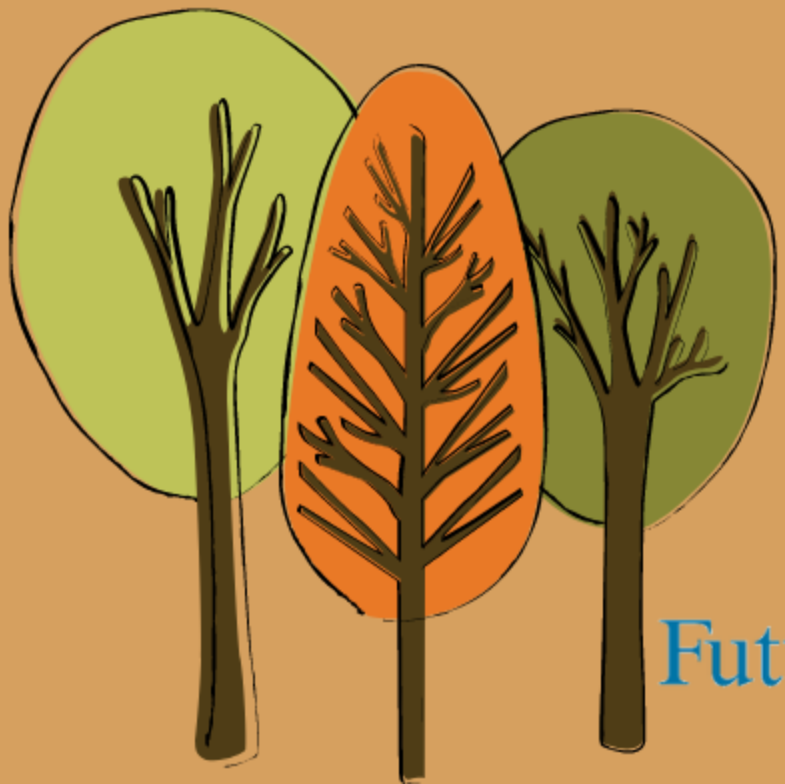
Quality Tapping & Backyard Mapling Workshops

IN-PERSON WORKSHOPS:



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MORE SAP!!

From Quality Tapping

Optimizing your sap flow and syrup making begins at the tree, and your first annual interaction with your trees is when you go out to tap. Contrary to popular belief, anyone who can pull the trigger on power drill is not qualified to tap your trees. Poor tapping will reduce your profits. Poor tapping can cause long term damage to your tees, and once the hole has been drilled poorly tapped trees can't be fixed during the season.

So, why not tap correctly? This workshop will provide you with the background science, so you understand why good tapping is so important. It will also provide you with the skills you need to tap correctly, and hopefully the motivation needed to make sure your bush is tapped out just right. Your trees will thank you, and so will your pocketbook.

Workshops will be held at collaborating producer's operations and include a 9:00 am tour of their sugarhouse and woods.

Workshop Agenda (10:00 - noon)

1. Tapping from the tree's perspective
    a. Why "robbing the cradle" is not a good idea
    b. "Ouch" said the tree, "that hurts" – the reaction of a tree to injury, and why some trees live to be 60 years old and others 600.

2. Examining the patient before surgery - Why you should spend more time looking at the tree than tapping it.
    a. The tapping zone, and how to extend it without a ladder.
    b. What to look out for in choosing your spot to tap
        i. Old tapholes
        ii. Dead wood areas
        iii. Rough disfigured bark areas

3. How to drill the perfect taphole
    a. The tapping bit
    b. Always know when to STOP.
    c. Why pulling out is more important than pushing in
    d. Clean tapholes
    e. Being precise and precision tappers

4. Tap Tap Tap, don't Wallop, Bang, Smash
    a. The importance of being gentle but firm
        i. Sap loss due to over tapping
        ii. Sap loss due to under tapping

5. "Different strokes for different folks" or "who can make the better mousetrap" an examination of spouts, spiles, and taps.

6. Practice makes perfect – on somebody else's trees

7. Review and Closing – a demonstration of the five mistakes that lead to imperfect tapping.

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Maple Sap and Tapping Lore

"The lower the tap the more the sap."

"The higher the tap the sweeter the sap."

"Sap is sweeter on trees that have been previously tapped."

"Trees differ as much for sugar as cows differ for butter."

"A tree will run the most sap on the side that has the coarsest bark."

"Trees by a brook or spring will run much sap."

"A tree that leans will run the most sap if tapped on the lower side" and,

"One pound of the first run is often worth two of the last."

"The first run, like first love, is always the best, always the fullest, always the sweetest."

Wade Bosley's Tapping Dos and Don'ts Tapping Best Practices Proctor Maple Research Center

A video presentation found at: https://www.youtube.com/watch?v=7Lg2xqvHGxk

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- 5/16" sweet spot for spout diameter, ¼-inch spout diameter 10% less sap
- 2-inch tapping depth for max sap yield
- Straight in – no need to slope the tap hole
- Tap 2 inches over and 6 inches up or down from last year's tap hole
- Examine tree for health indicators on approach
- Pattern tap, use the entire circumference of the tree
- Stabilize drill with 2 hands, and use the tree to stabilize
- Hanging chips or chips in hole indicates an oval hole
- Clean out holes of any remaining debris with a clean wire – especially on 3/16 systems
- Use tubing for drill stop to maintain 2-inch depth
- No overhead tapping
- Seat spout by sound and bounce
- Use light commercial tapping hammers
- Don't scrape bark prior to tapping
- Fully overdriven spouts produce 40% less sap. Half overdriven taps produce 10% less
- Don't tap under 10 degrees F. Frozen wood splits
- 2 gallons of additional sap per season for each inch diameter on the tree – minimum diameter to tap is 10 inches (12 inches better)
- 18-inch diameter tree 50% more sap on second spout, on red maples, even less
- Monitor percent of dark wood encountered while drilling

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Over Tapped Tree

https://royalpurplenews.com/36421/community/influencer/wisconsin-tree-tapping/

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How Close To an Old Taphole Can You Tap?

This board shows the distribution of tap holes and resulting stain columns when the living tree was tapped for sap. Tap holes were spread fairly evenly around the trunk. A few tap holes encountered stained non-conducting wood from previous taps. Photo: Ken Elliott, MNRF

Suggest Tapping Pattern: 2" over and 6" up or down from the previous year's taphole, minimum. If using high vacuum, more spacing is recommended.

https://onmaplesyrup.ca/tapping-101/where-to-tap/
https://www.reddit.com/r/mildlyinteresting/comments/75qeq5/maple_syrup_tap_scars/

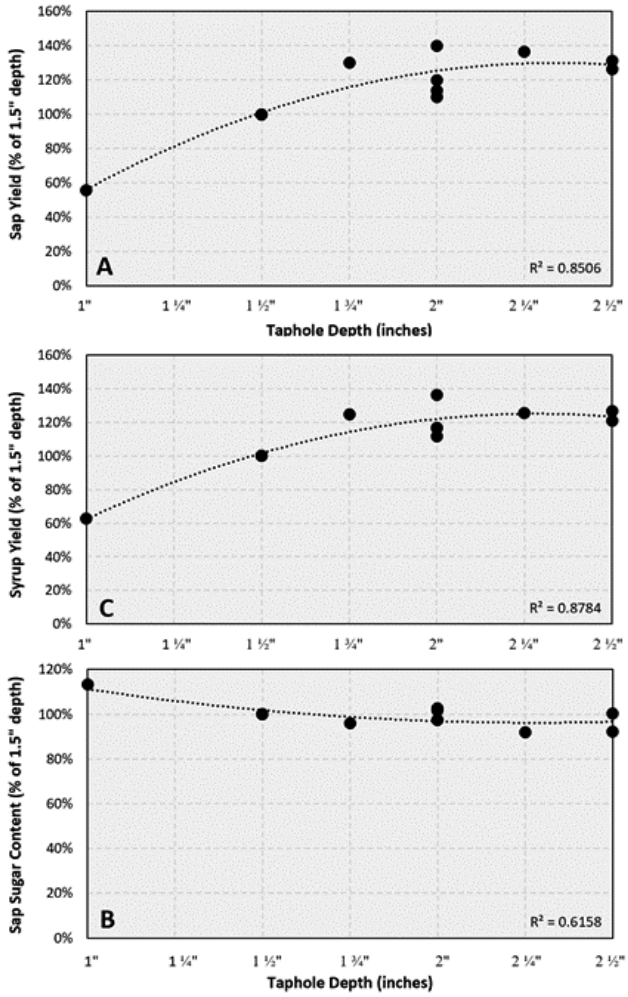

Figure 1. Sap yield (A), sap sugar content (B), and syrup yield (C) from tapholes drilled to depths from 1" to 2 ½" (including bark) in sugar maple stems expressed as a percentage of the tapholes at 1 ½" deep from 2018, 2019, and 2020. Number of independent samples (mainlines) for each depth is indicated in figure C. The R2 value for a fitted 2 order polynomial (dashed line) is shown indicating the proportion of variance explained by the model curve.

Tapping deeper that 1.75-2.00" appears to produce no appreciable increases in syrup yield, but increases wound size, the probability of hitting stain, and decreases sustainability.

Perkins, T.D., van den Berg, A.K., & Bosley, W.T., (2021). Effects of Tapping Depth on Sap Volume, Sap Sugar Content, and Syrup Yield Under High Vacuum. *Maple Syrup Digest,* March 2021, 8-12. https://mapleresearch.org/pub/depth0321/

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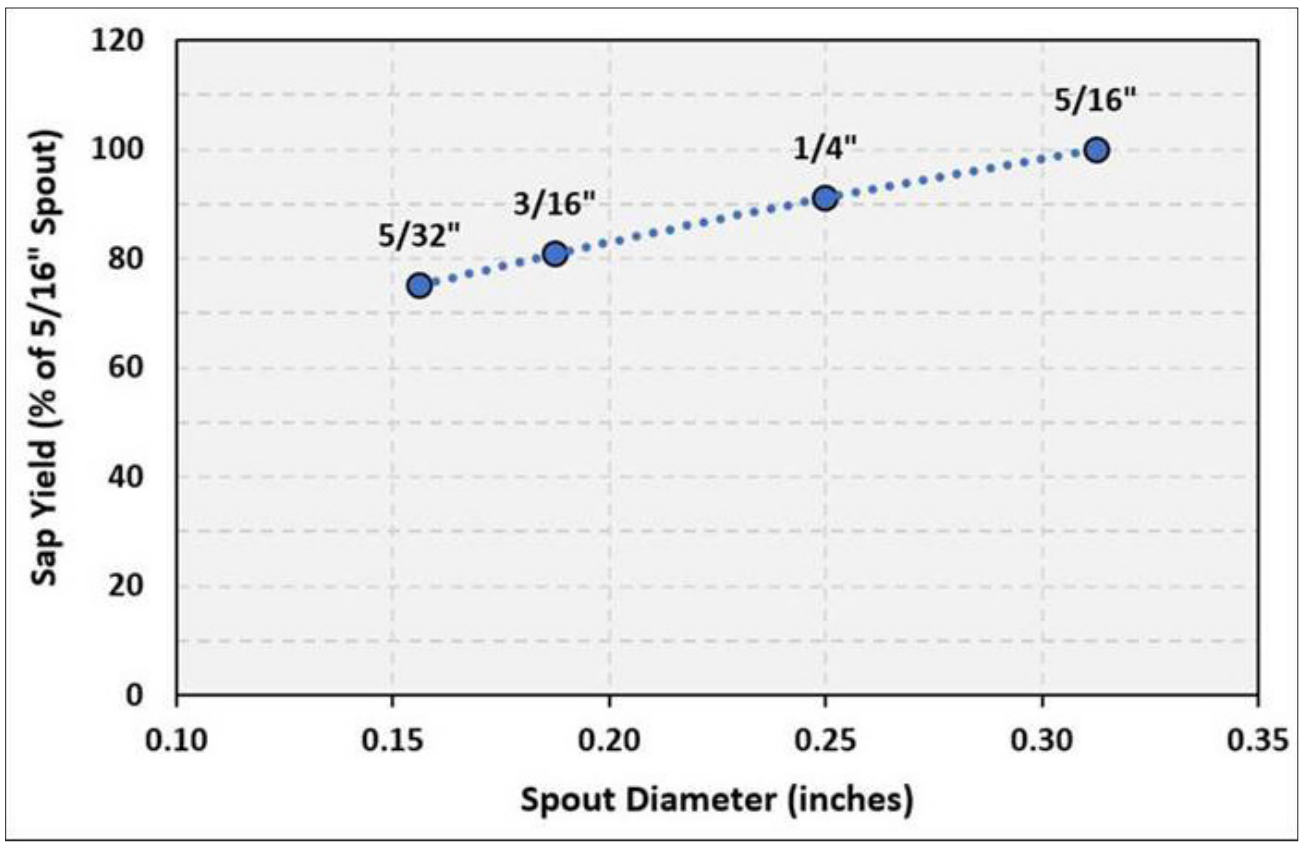
Tapping Drill Bit v. Regular Drill Bit

Benefits of the Tapping Bit:	***Drawbacks of the Regular Bit:***
Smaller point makes it easier the center	*Higher pressure is needed*
Reduced risk of slipping on the tree	*Harder to center*
Designed to remove the wood chips	*Not designed to remove chips*
Faster tapping	*Slower Tapping*

https://leaderevaporator.com/drill-bit-5-16/
https://mbausa.com/cobalt-drill-bit-5-16-jobber-length/

Nips

News and notes on the maple industry



UVM Proctor Maple Research Center examines effect of spout diameter on sap yield

UNDERHILL, Vt. — In order to determine the optimal approach to sap collection in their operation, maple producers need to be informed about how the choices they make will affect sap yield. One of the decisions they face is what spout size (diameter) to use.

Average sap yields from tapholes of different diameters as a percentage of yields from 5/16”-diameter (control) tapholes.

Data are summarized from several studies conducted at the UVM Proctor Maple Research Center in Underhill, Vermont.

Average vacuum level was 25”Hg. Under these conditions, 1/4” spouts produced ~10% less than 5/16” spouts.

Similar results were observed in a study by Centre Acer, which compared yields from 1/4” and 19/64” spouts at 28”Hg (Lagacé et al. 2015, Évaluation de nouveaux prototypes de chalumeaux et de tubulures au diamètre réduit pour la collecte de la sève d’érable. http://centreacer.qc.ca/).

Although not measured in this work, spout diameter did not appear to affect the propensity of spouts to leak vacuum.

T.D. Perkins & A.K. van den Berg
UVM Proctor Maple Research Center
http://www.uvm.edu/pmrc

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Poor Sap Flow: Tapped into scarred wood.

Good Sap Flow: Tapped into fresh sap wood.

https://onmaplesyrup.ca/tapping-101/how-to-tap/

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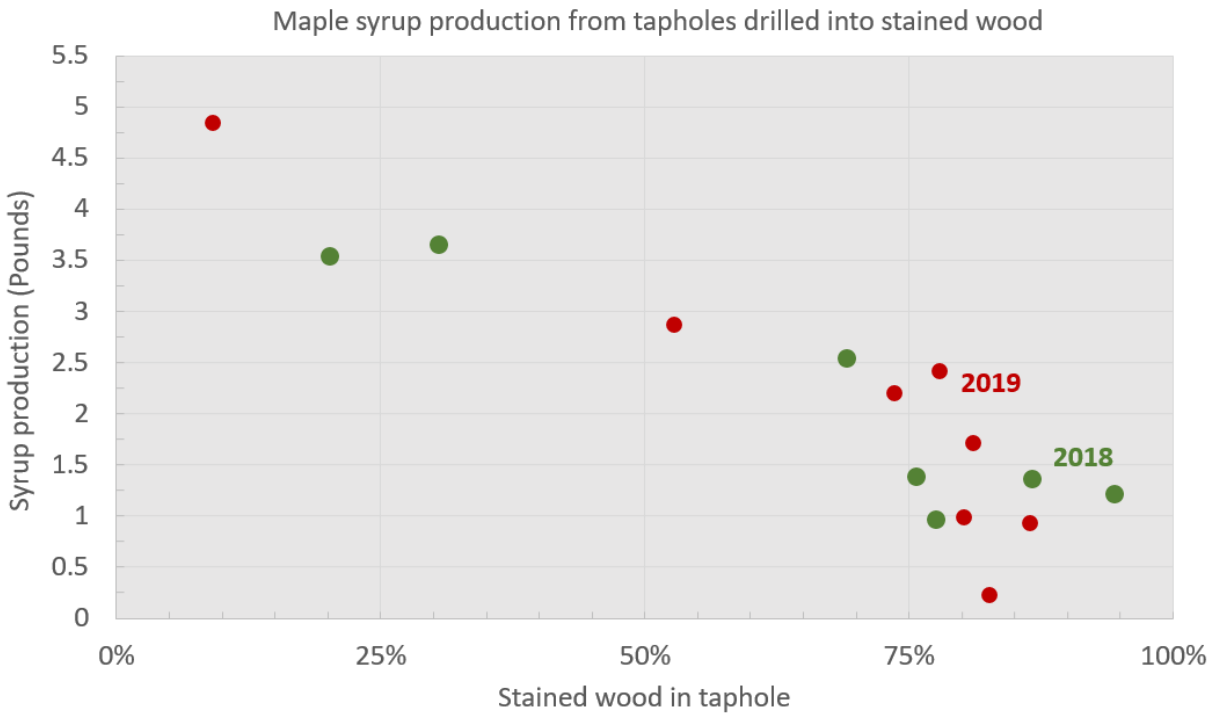

Isselhardt, M. (2020, September 16). *Sap Yields and Tapping Stained Wood* [PowerPoint slides]. Extension, University of Vermont. https://blog.uvm.edu/farmvia/files/2020/09/Sap-Yields-and-Tapping-Stained-Wood_Sept2020.pdf

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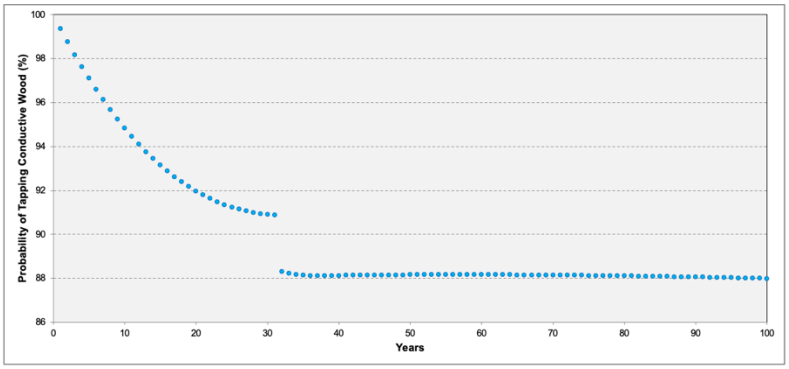
Tapping Zone Model - Tubing v. 10.08.13
University of Vermont - Proctor Maple Research Center

	Enter values into blue cells:	Inputs†
Current tree DBH (inches)	12	6-48
Dropline length (inches)	24	8-48
Spout size (inches)	5/16	1/4, 5/16, 19/64 or 7/16"
Tapping depth (inches)	2	1-3
Number of taps	1	1 or 2
Number of years tree has been tapped	0	0-100 years

Lowest Proportion of Conductive Wood in the Tapping Zone	87%	Potentially Unsustainable - Consider Revising Practices

If this tree is tapped with the practices specified above, this is the lowest that the proportion of conductive wood in the tapping zone will be during the next 100 years.

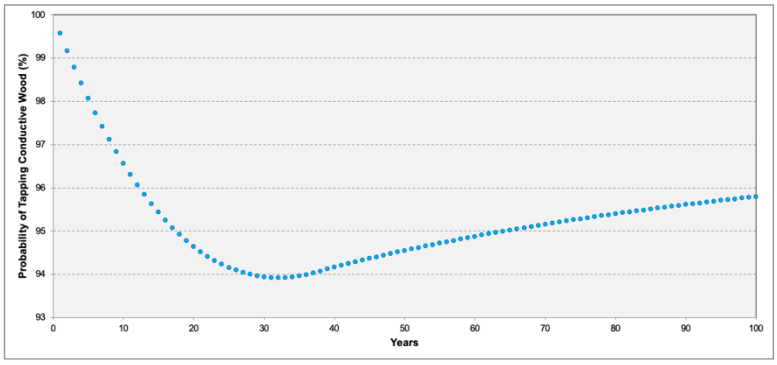


Tapping Zone Model - Tubing v. 10.08.13
University of Vermont - Proctor Maple Research Center

	Enter values into blue cells:	Inputs†
Current tree DBH (inches)	12	6-48
Dropline length (inches)	36	8-48
Spout size (inches)	5/16	1/4, 5/16, 19/64 or 7/16"
Tapping depth (inches)	2	1-3
Number of taps	1	1 or 2
Number of years tree has been tapped	0	0-100 years

Lowest Proportion of Conductive Wood in the Tapping Zone	94%	Likely Sustainable Tapping Practice

If this tree is tapped with the practices specified above, this is the lowest that the proportion of conductive wood in the tapping zone will be during the next 100 years.



24" Dropline = 13% chance of hitting stained wood after 25 years
36" Dropline = 7% chance of hitting stained wood after 25 years

van den Berg, A.K., Perkins, T.D., Isselhardt, M.L., & Wilmot, T.R. (2016). Growth Rates of Sugar Maple Trees Tapped for Maple Syrup Production Using High-Yield Sap Collection Practices. *Forest Science,* 62(1), 107-114. http://dx.doi.org/10.5849/forsci.15-019

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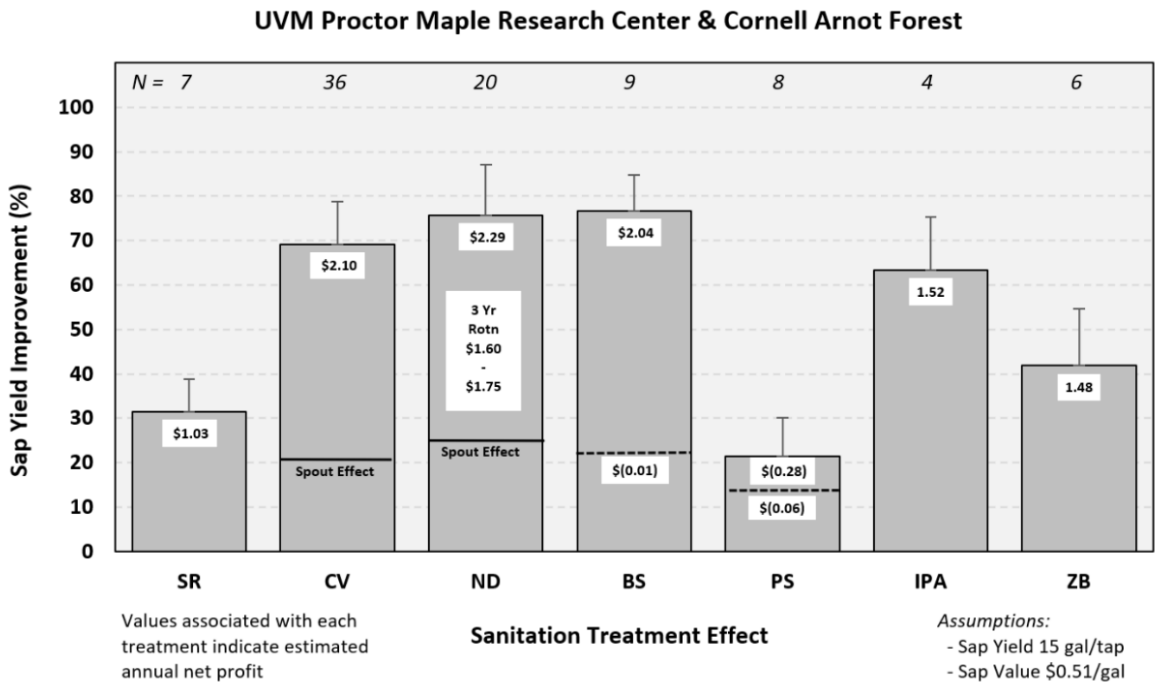
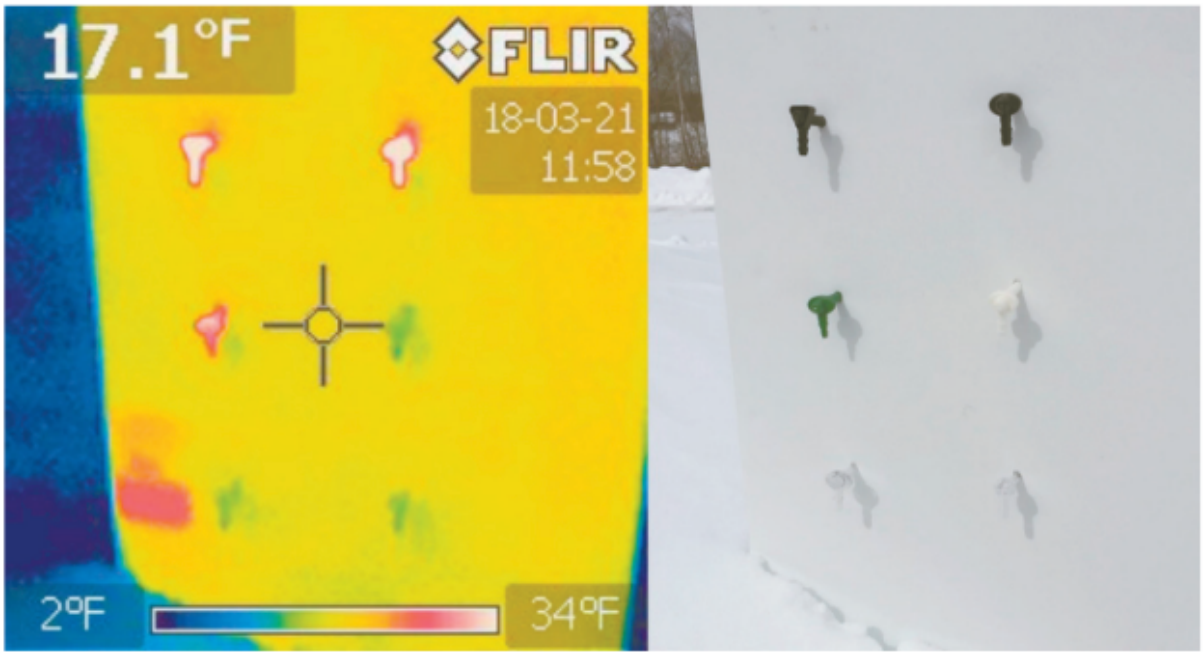


10 Year Summary of 5/16" Spout and Tubing Sanitation Research at UVM Proctor Maple Research Center and Cornell Arnot Forest.

Perkins, T.D., van den Berg, A.K., & Childs, S.L. (2019). A Decade of Spout and Tubing Sanitation Research Summarized. *Maple Digest,* October 2019, 8-15. https://mapleresearch.org/pub/1019sanitation-2/



Mark Isselhardt, UVM Maple Extension

FIGURE 1. Thermal IR (left) and normal color (right) photos of a selection of maple spouts exposed to sun on a cold, wind-less winter day. Ambient temperature is yellow in the IR image. Dark-color spouts show up as warmer (red to white), while white or clear spouts are near ambient temperatures or cooler (yellow to green).

Dark solid-color and dark-tinted spouts warm up a lot in the sun.

Perkins, T.D., van den Berg, A.K., Isselhardt, M., Stowe, B., & Bosely, W. (2018). Does Color Matter?: Spounts come in a variety of hues. Does it affect yield? *The Maple News,* June/July 2018, 9. https://mapleresearch.org/pub/spoutcolor-2/

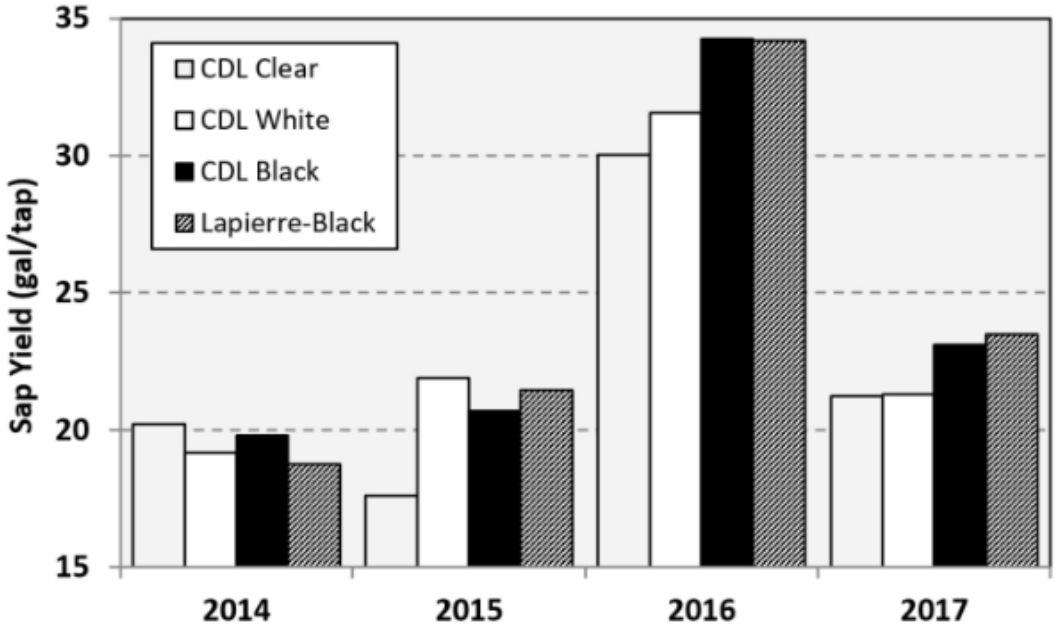


FIGURE 2. Average sap yield (gal/tap) by spout color and year at the UVM Proctor Maple Research Center.

The effect of spout color on sap yield tends to be highly variable and dependent upon season.

Clear (polycarbonate) spouts tend to slightly underperform white or black spouts in most seasons, but are often preferred due to the ability to see sap flow and leaks because they "stick" in the tree.

Perkins, T.D., van den Berg, A.K., Isselhardt, M., Stowe, B., & Bosely, W. (2018). Does Color Matter?: Spounts come in a variety of hues. Does it affect yield? *The Maple News,* June/July 2018, 9. https://mapleresearch.org/pub/spoutcolor-2/

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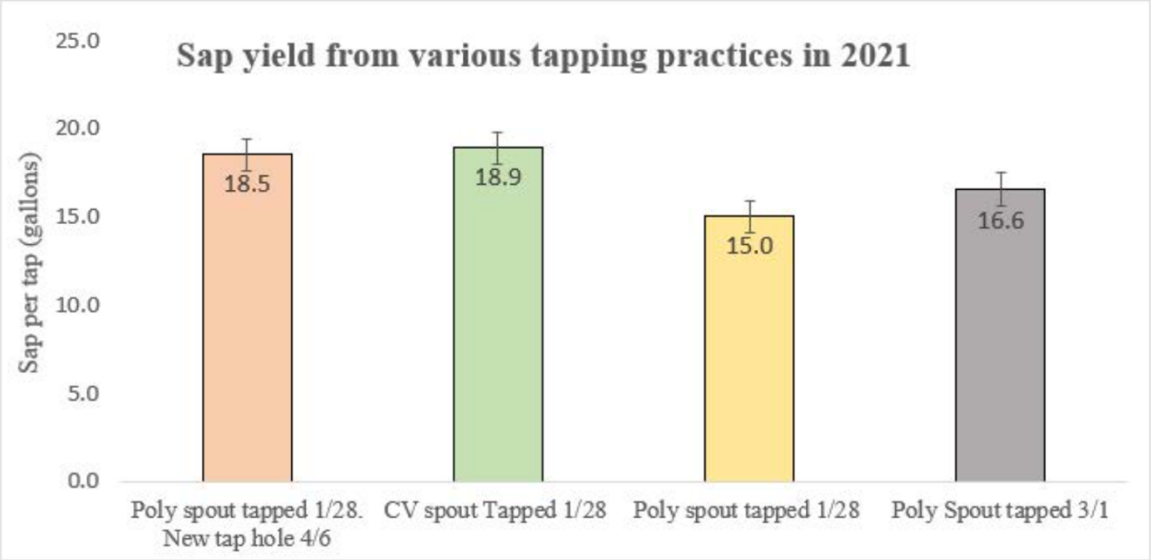
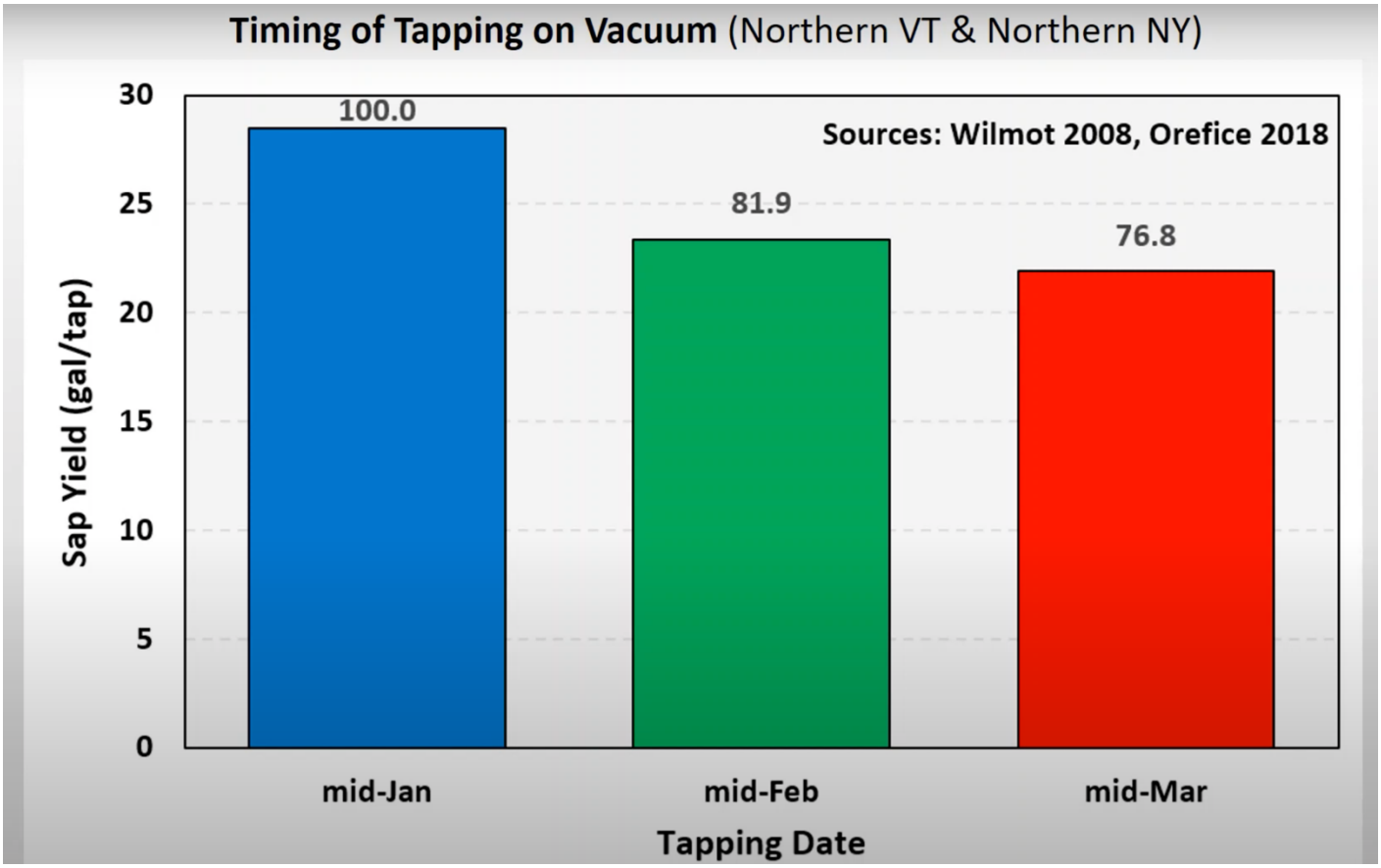
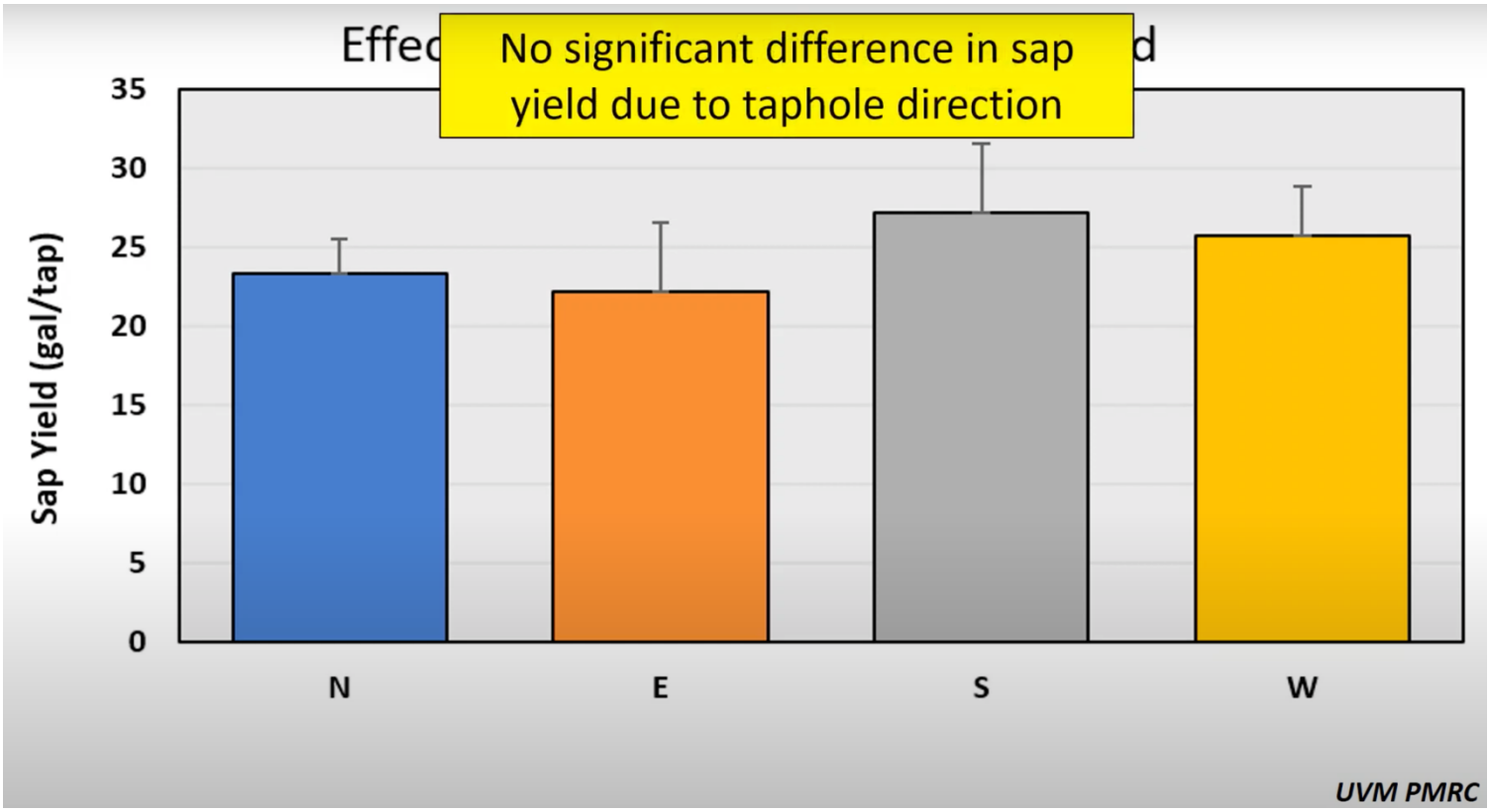


Figure 1: Sap yields from trees tapped with various tapping practices at Cornell University's Uihlein Maple Research Forest during the 2021 maple season. If tapping early on older, uncleaned tubing, check valve spouts provided better yields than tapping early with regular polycarbonate spouts, or even waiting to tap just before the season. Check valve spouts had equal production as relocating a regular polycarbonate spout to a new taphole later in the season but the additional labor costs and wounding to the tree negate the increase in production from re-tapping.

Wild, A. (2021). Timing of Tapping: Spout Selection and Timing of Tapping and its Impact on Production. *The Maple News,* 20(9), 1+10. https://mapleresearch.org/pub/wildtaptiming-2/



Bosely, W. [UVM Extension]. (2020, February 13). *Bosely Tapping Dos and Don'ts.* YouTube. https://www.youtube.com/watch?v=7Lg2xqvHGxk&t=1s



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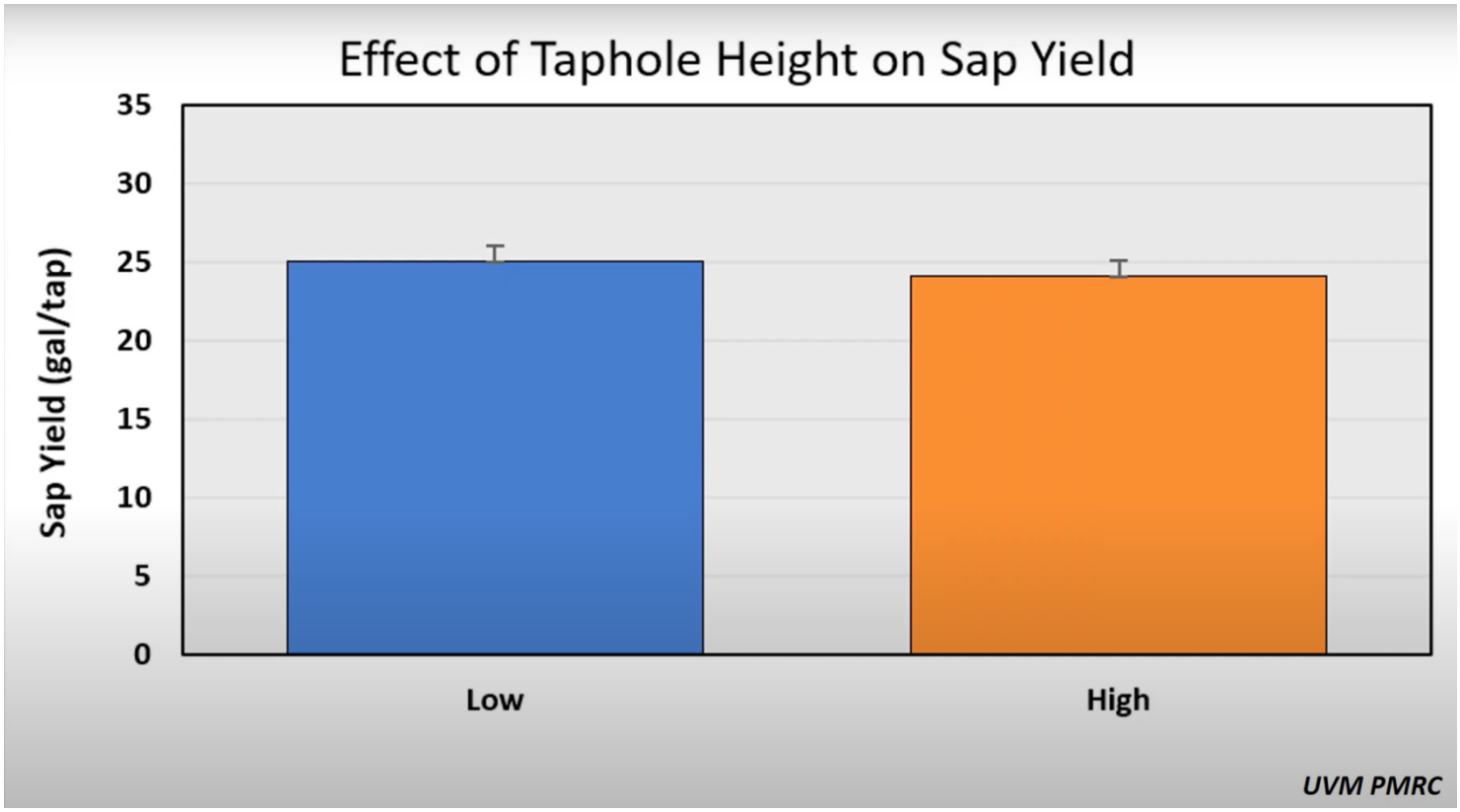

Bosely, W. [UVM Extension]. (2020, February 13). *Bosely Tapping Dos and Don'ts.* YouTube. https://www.youtube.com/watch?v=7Lg2xqvHGxk&t=1s

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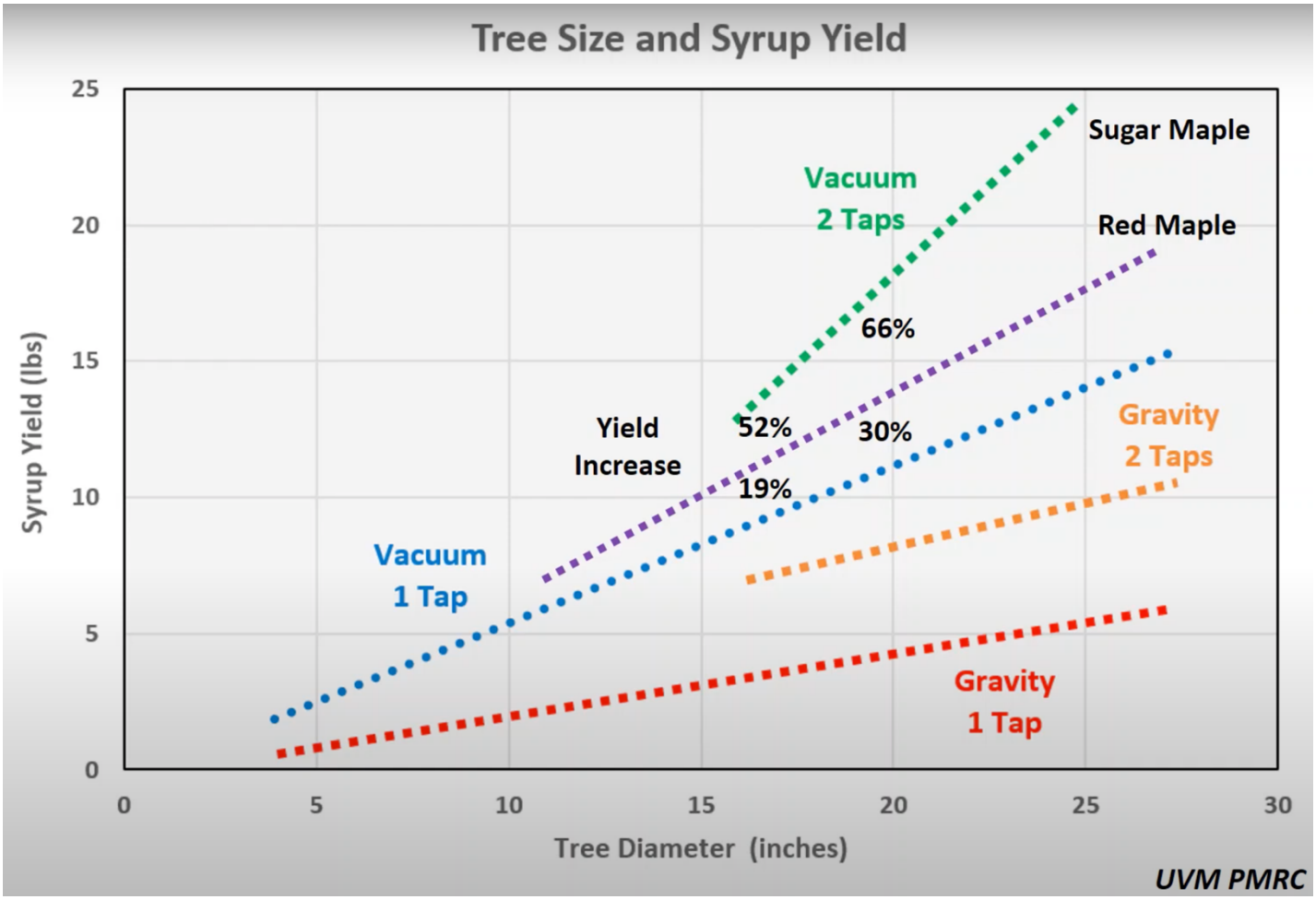

Bosely, W. [UVM Extension]. (2020, February 13). *Bosely Tapping Dos and Don'ts.* YouTube. https://www.youtube.com/watch?v=7Lg2xqvHGxk&t=1s

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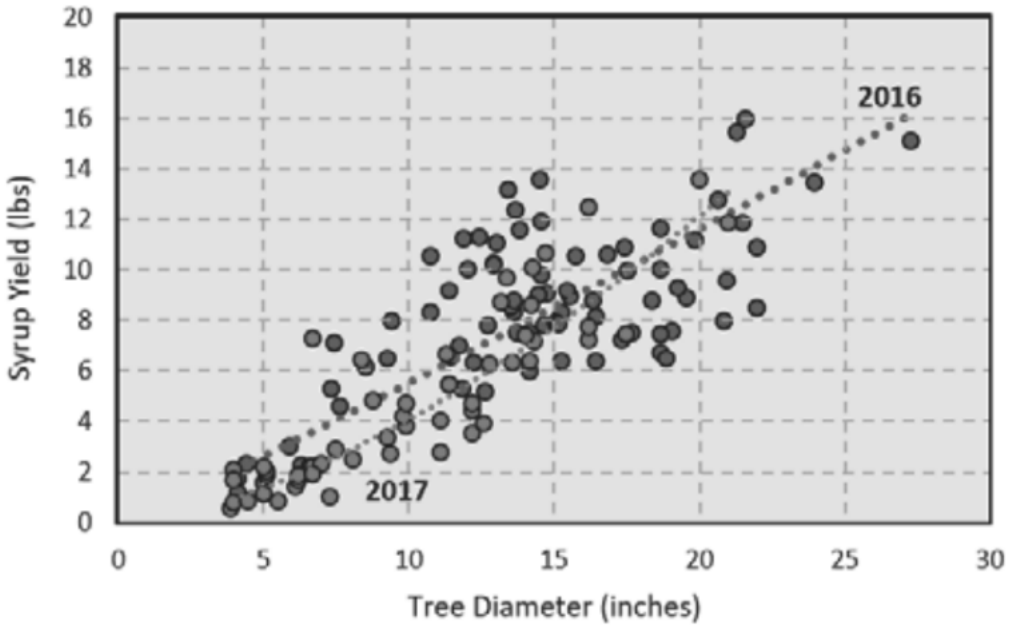
Effect of Tree Size on Syrup Yield

(Single-Tap, High Vacuum)



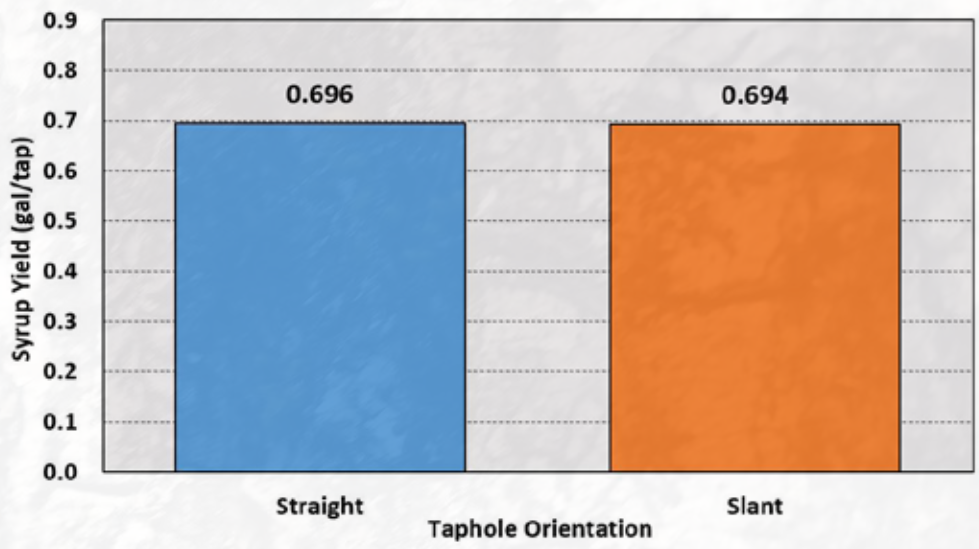
~2 gal sap or ~0.5lb syrup per inch diameter increase

Note: We are **NOT** *recommending tapping of small trees for production.*

Isselhardt, M., Perkins, T. & van den Berg, A. (2018). Tree Size Matters. *Maple Syrup Digest,* February 2018, 36-38. https://mapleresearch.org/pub/m0218treesize/

The University of Vermont Proctor Page
News from the University of Vermont Proctor Maple Research Center

AVERAGE SYRUP YIELD from tapholes drilled straight or at a slight angle (downward slant) as calculated by total sap yield and average sugar content over the 2020 sap flow season in Underhill, Vermont.



TAPHOLES: Straight or *Slanted*?

By T.D. PERKINS and W.T. BOSLEY
University of Vermont Proctor Maple Research Center

UNDERHILL CTR., Vt. — Straight or slanted? The sap doesn't care the angle of your spout.

Historically it was recommended that tapholes be drilled at a slight angle to allow sap to run out to reduce freeze heaving of spouts and to reduce sap souring in the taphole.

Starting shortly after the introduction of the "small" spout (19/64", 5/16"), maple equipment manufacturers started to recommend that tapholes be drilled straight in.

The most common reason for this was stated that it avoided the creation of oval tapholes.

Geometrically, as long as care is taken to adopt a stable position and steady hand on the drill, it is not possible to create an oval taphole with a round tapping bit.

Rather, it is poor technique (bad footing, working too quickly, drilling with one hand, tapping too far overhead, or not fulling removing the bit from the taphole before moving the drill) that causes movement of the drill and bit.

Drill and bit movement during drilling a taphole is what results in oval tapholes.

Regardless of the cause, oval tapholes should be avoided as they can cause microleaks, weeping tapholes, and reduced sap yield.

The question still remains however, is there any difference in sap yield when tapping at a slight angle (the historical recommendation) or tapping straight in (the current recommendation)?

In the spring of 2020, we tapped all trees on three mainlines by drilling straight in.

Three other mainlines in the same area were tapped by drilling at a slight (~10°) angle upward towards into the tree.

The same spouts (Leader Evaporator Clear Polycarbonate one-piece Check-valve spouts) were used throughout, and all tapping was done by the same person over the span of two days.

Taphole depth was set to 2" with a bit-stop in all cases.

This was not modified in the slant treatment to account for the minor reduction in taphole depth due to tapping angle.

Each mainline was connected to an individual mini-releaser which incremented a counter every time the releaser dumped. All releasers utilized a common vacuum system operating at 25" Hg.

Releasers were calibrated near the end of the 2020 sap flow season so the volume of sap released from each could be established.

A tally was made of the number of dumps made for each releaser daily throughout the season.

The seasonal total count was multiplied by the calibration factor for each individual releaser to determine total sap volume for each mainline and divided by the number of taps on the mainline to arrive at a total sap yield (gallons of sap per tap). Sugar content measured during the season was used to calculate syrup yield for each mainline.

The three replicate mainlines for each treatment were averaged.

Total syrup yield for the two treatments is shown in Figure 1.

There was no difference in average syrup yield between tapholes when drilled straight (0.696 gallons syrup per tap) or at a slight angle (0.694 gallons syrup per tap).

It is easy to understand where the misconception about drilling at a slant and the formation of oval tapholes might have originated.

When you drill a taphole at an angle and look at it from straight away from the trunk it will appear to be slightly oval (elongated in the vertical axis).

However, when you look at the taphole from the same angle, the taphole will appear to be perfectly circular.

Again, a circular tapping bit, if drilled in without altering the drill angle, will produce a circular hole.

Movement of the drill or bit, whether going straight in or at a slant is what produces an oval taphole.

While there might be other considerations suggesting that tapping straight in is advantageous, from a syrup yield perspective, there is no apparent difference.

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The Goldilocks touch

Overdriving spouts reduces sap yield

Figure 1

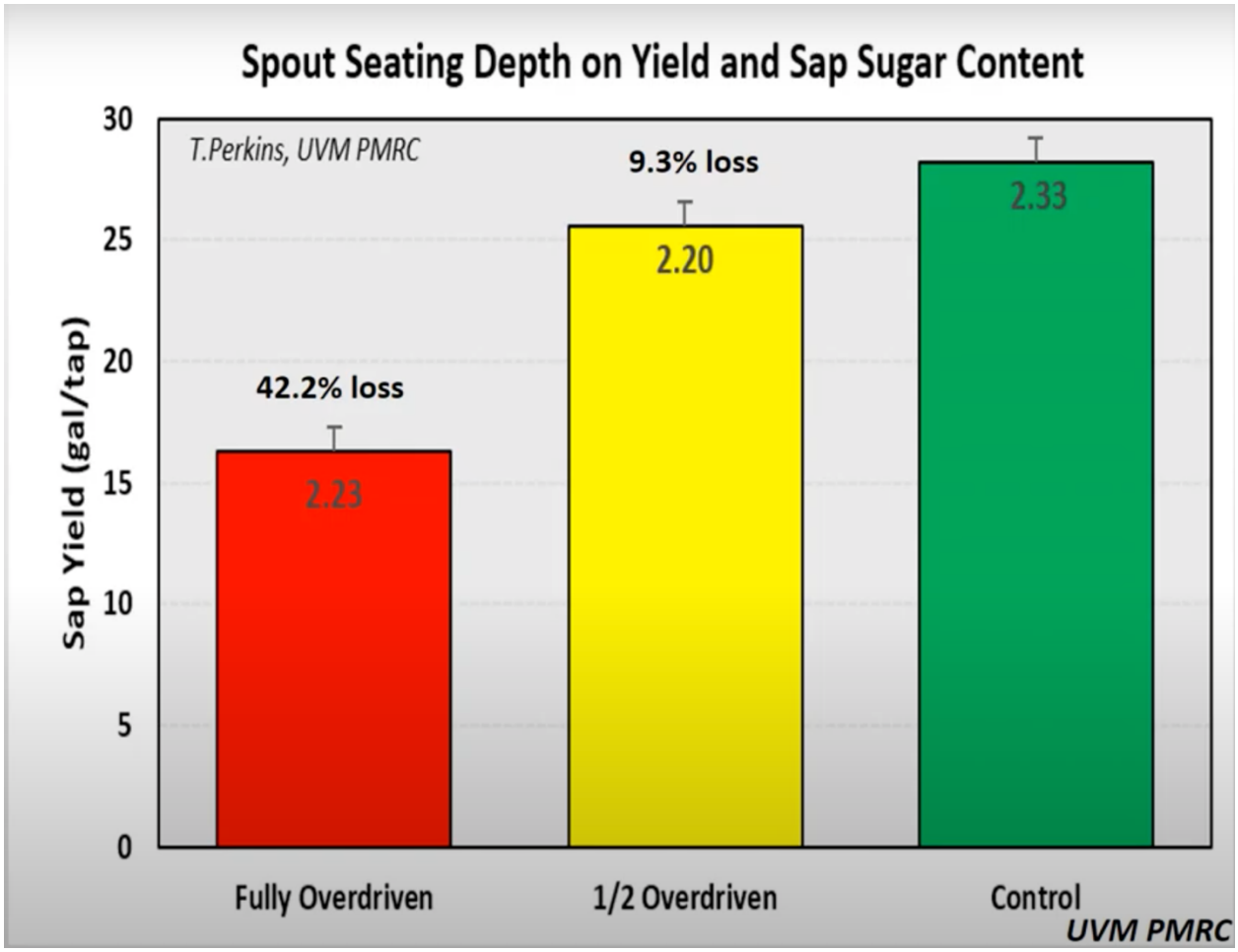
By T.D. PERKINS, W. T. BOSLEY and A.K. VAN DEN BERG

University of Vermont
Proctor Maple Research Center

One of the more common questions producers have when about tapping maple trees is "how deep should spouts be driven in to the taphole?". Unfortunately, there is not a simple answer, since different spouts have different dimensions, variable degrees of taper and steps, and are made of different materials with dissimilar degrees of "stickiness." Regardless, the importance of driving spouts in to the proper depth is readily apparent: if spouts are driven too shallow there is a risk that spouts can leak vacuum or heave easily during freezes, but if driven too deeply, small cracks may form which cause liquid and vacuum leaks or alternatively, the reduced amount of exposed wood surface area inside the taphole caused by driving spouts in too deeply may reduce sap collection. Most frequently, producers drive in spouts by sound – a change to a "deader" sound indicat-

See **SPOUT PG. 26** ➤

Perkins, T.D., Bosley, W.T., & van den Berg, A.K.(2019). The Goldilocks Touch: Overdriving spouts reduces sap yield. *The Maple News,* September 2019, 1+26.
https://mapleresearch.org/pub/overdrive2020/



Bosely, W. [UVM Extension]. (2020, February 13). *Bosely Tapping Dos and Don'ts.* YouTube. https://www.youtube.com/watch?v=7Lg2xqvHGxk&t=1s