



**Vermont Evaporator Company  
Presents:**

**Curriculum for Little Kids, Big Kids and  
Biggest Kids!**

**For use with the Sapling Evaporator**

**[www.vermontevaporator.com](http://www.vermontevaporator.com)**

**[info@vermontevaporator.com](mailto:info@vermontevaporator.com)**

# Evaporation Experiment

Background: Making maple syrup is easy and fun, and there's a lot to learn during the process. 'Sugar maple sap contains as much as 2% sugar, and it takes about 40 gallons of sap to make 1 gallon of syrup. If you tap another variety of maple, it can take even more. The process of making maple syrup provides opportunities to discuss a plethora of topics including: scientific observations, sugar content calculations, hydrometers, the evaporation process, tree identification, Native American history, and provides a tasty treat sure to please all students.

Procedure:



1. Tap your trees and collect maple sap.
  1. For tree ID, check out the tree id infographic at the end of this packet as well as the blog post: Hobby Maple Syrup Makers: Time to Identify Your Trees. <https://vermontevaporator.com/2020/09/time-to-identify-your-trees/>
  2. For how to tap your trees, check out the infographic at the end of this packet as well as the blog post: DIY Maple Syrup: How to tap, <https://vermontevaporator.com/2021/01/diy-maple-syrup-how-to-tap/>
2. When you have collected a sufficient amount of sap, pass through cheese cloth or a pre-filter and pour at least 5 gallons of sap into the Sapling Evaporator Pan.
3. Start a fire in your Sapling Evaporator. Small pieces of soft wood get hotter quicker.
4. Once the sap starts boiling, simply keep fire going and talk with your students about what they see, smell, and taste, and how that differs between the three chambers of the Sapling Evaporator Pan. You can use the attached sheets to track your observations.
5. Ensure you replenish the sap in the pan by adding sap to the back of the pan, either with a Sapling Warming Pan, or a scoop full at a time. Make sure there is always 1-2 inches of sap in the pan at all times to prevent burning!
6. Continue to make observations throughout the day. You can pour off into a vessel for observation by the pour off valve, but be careful, it can get hot! And make sure to add more sap to the back.
7. Pour off sap when color gets dark, texture is almost syrup like, and temperature is close to 218° F. You can finish on a burner next to the evaporator, or even a kitchen inside. You can use any thermometer to track your syrup to 218° F.
8. When you are cleaning up for the day, be sure to remove the pan from the evaporator completely before pouring off the sap/syrup. If the pan is empty and still over a fire, it will burn the pan. By removing it first you ensure your Sapling pan will be around for another sugaring season!

# For Little Kids



# Maple Evaporator Worksheet

Name \_\_\_\_\_

Date \_\_\_\_\_

Weather \_\_\_\_\_

Temperature \_\_\_\_\_

How are you feeling today? \_\_\_\_\_



## OBSERVATION #1

What does the sap in the pan look like?

\_\_\_\_\_

What can you smell while the sap is boiling?

\_\_\_\_\_

What does the sap taste like?

\_\_\_\_\_

What else can you notice?

\_\_\_\_\_

## OBSERVATION #2

What does the sap in the pan look like?

\_\_\_\_\_

What can you smell while the sap is boiling?

\_\_\_\_\_

What does the sap taste like?

\_\_\_\_\_

What else can you notice?

\_\_\_\_\_



### OBSERVATION #3

What does the sap in the pan look like?

---

What can you smell while the sap is boiling?

---

What does the sap taste like?

---

What else can you notice?

---

DRAW A PICTURE of what is happening while you wait. It could be the evaporator, the sap, the steam, or a friend.



## Evaporator Pan Drawing

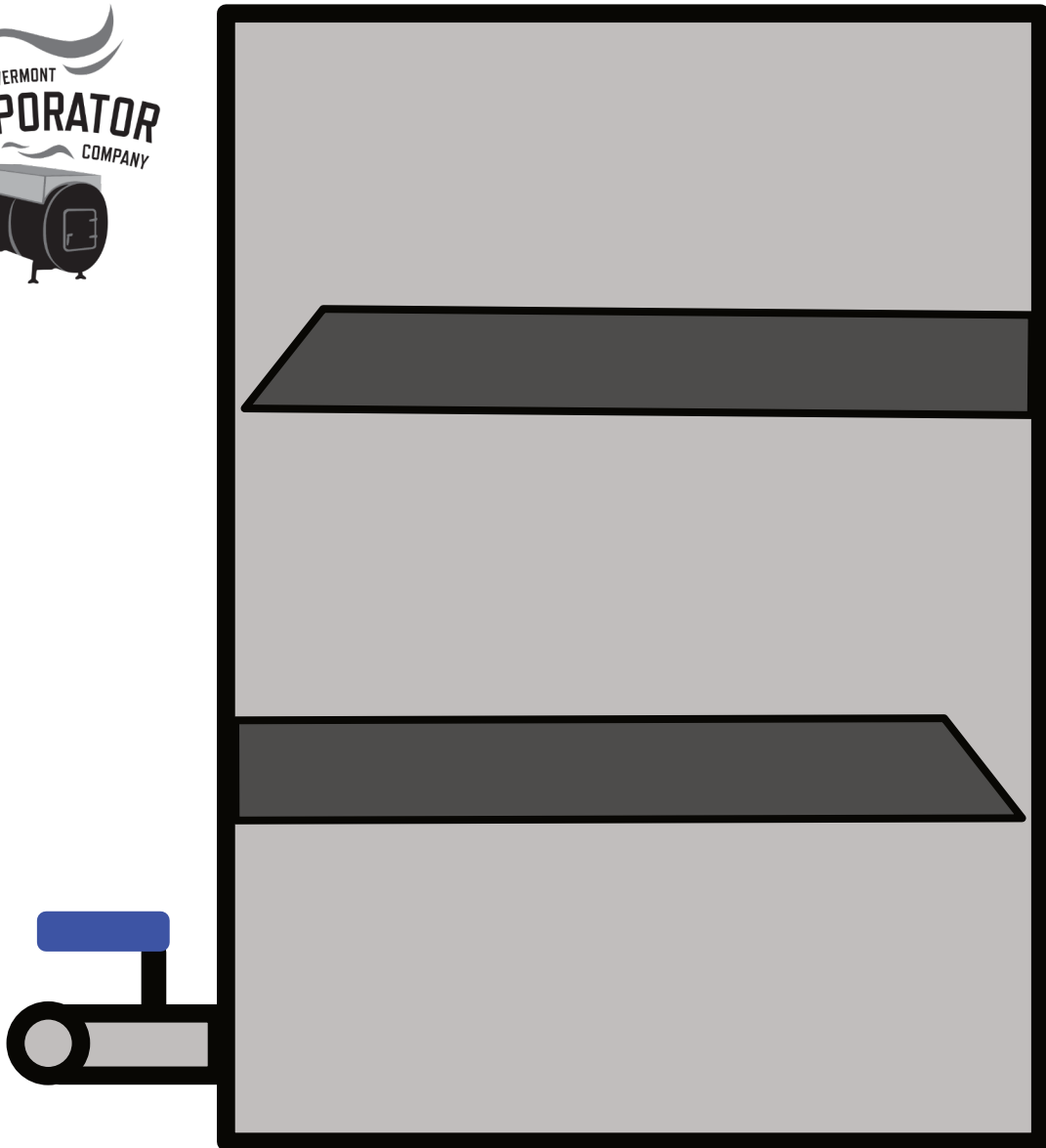
On the evaporator pan below, draw:

a SQUARE where the fresh sap enters the pan

Circle where the syrup comes out of the pan

Put a triangle where the sap is darkest

Put a star where the sap is lightest



### **Additional materials for Little Kids:**

Infographics located at the end of the packet:

- Maple Tree Identification
- Syrups of the World
- Sap/Cider to Syrup
- Maple four ways
- Maple producing states
- How to tap a tree
- Grades of maple
- Filtering and storing
- Cord of wood
- Continuous boil pan
- Baking with Maple
- Backyard Bingo



Recommended Little Kid books:

- Maple Trees by Marcia S. Freeman
- Curious George Makes Maple Syrup
- Sugar on Snow by Nan Parson Rossiter
- Sugar White Snow and Evergreens by Felicia Sanzari Chernesky
- At Grandpa's Sugar Bush by Margaret Carney and Janet Wilson
- The Big Tree by Bruce Hiscock
- The Sugaring-Off Party by Jonathan London
- Sugarbush Spring by Marsha Wilson Chall

Maple School Blog posts:

#### **MAPLE SCHOOL: THE MATH OF TAPPING A MAPLE TREE**

<https://vermontevaporator.com/2020/04/maple-school-the-math-of-maple/>

#### **MAPLE SCHOOL: THE EARLY HISTORY OF MAPLE SYRUP**

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Additional resource for teachers:

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<https://scholarworks.uvm.edu/cgi/viewcontent.cgi?article=1022&context=rsmpp>

# For Big Kids



# Maple Evaporator Worksheet

Name \_\_\_\_\_

Date \_\_\_\_\_

Weather \_\_\_\_\_

Temperature \_\_\_\_\_

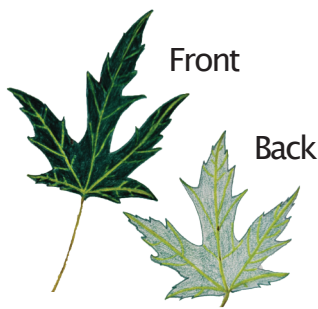
How are you feeling today? \_\_\_\_\_



Sugar Maple



Red Maple



Silver Maple



Big Leaf Maple

## Observation 1

Time: \_\_\_\_\_

Temperature: \_\_\_\_\_ °F, \_\_\_\_\_ °C

Color: \_\_\_\_\_

Clear      1      2      3      4      5      Dark Brown

Texture when poured off a spoon or spatula: \_\_\_\_\_

Liquid      1      2      3      4      5      Syrup

(Low viscosity - water)

(High viscosity - honey)

Taste: \_\_\_\_\_

Water      1      2      3      4      5      Maple Syrup

Other Observations: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### **Observation 2**

Time:

Temperature: \_\_\_\_\_ °F, \_\_\_\_\_ °C

Color: \_\_\_\_\_

Clear            1                      2                      3                      4                      5            Dark Brown

Texture when poured off a spoon or spatula: \_\_\_\_\_

Liquid            1                      2                      3                      4                      5            Syrup

(Low viscosity - water)

(High viscosity - honey)

Taste: \_\_\_\_\_

Water            1                      2                      3                      4                      5            Maple Syrup

Other Observations: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### **Observation 3**

Time:

Temperature: \_\_\_\_\_ °F, \_\_\_\_\_ °C

Color: \_\_\_\_\_

Clear            1                      2                      3                      4                      5            Dark Brown

Texture when poured off a spoon or spatula: \_\_\_\_\_

Liquid            1                      2                      3                      4                      5            Syrup

(Low viscosity - water)

(High viscosity - honey)

Taste: \_\_\_\_\_

Water            1                      2                      3                      4                      5            Maple Syrup

Other Observations: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



### Evaporation Rate Calculation

Volume of sap before evaporation begins \_\_\_\_\_

Volume of syrup after evaporation ends \_\_\_\_\_

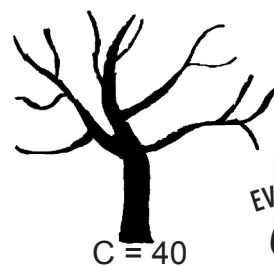
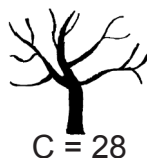
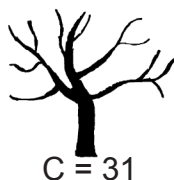
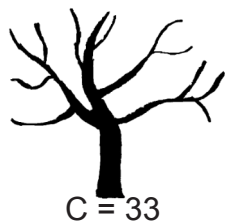
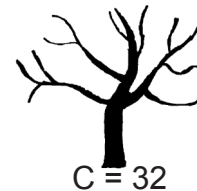
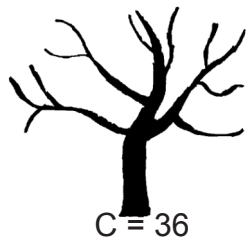
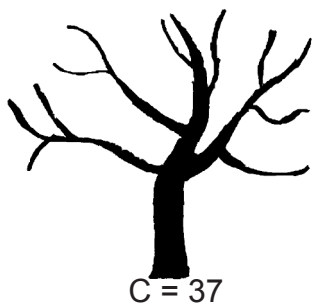
Time spent evaporating \_\_\_\_\_

Calculate the Evaporation Rate in gallons per hour. Show your work below:

Calculate the Evaporation Rate in Liters per hour. Show your work below:

### Tree Diameter Calculation

In order to safely tap a maple tree, the Diameter of a tree must be at least 10 inches. Listed below are the Circumference of several maple trees. Circle the ones that are safe to tap this year.



### **Evaporation Observation Sketch**

Draw a sketch of what you are observing. This can include the evaporator, steam, colors of the sap in the evaporation pan, shape and color of maple leaves, or anything else you find relevant to the maple syrup making process. Be sure to include a scale!





## Evaporator Pan Drawing

On the evaporator pan below, draw:

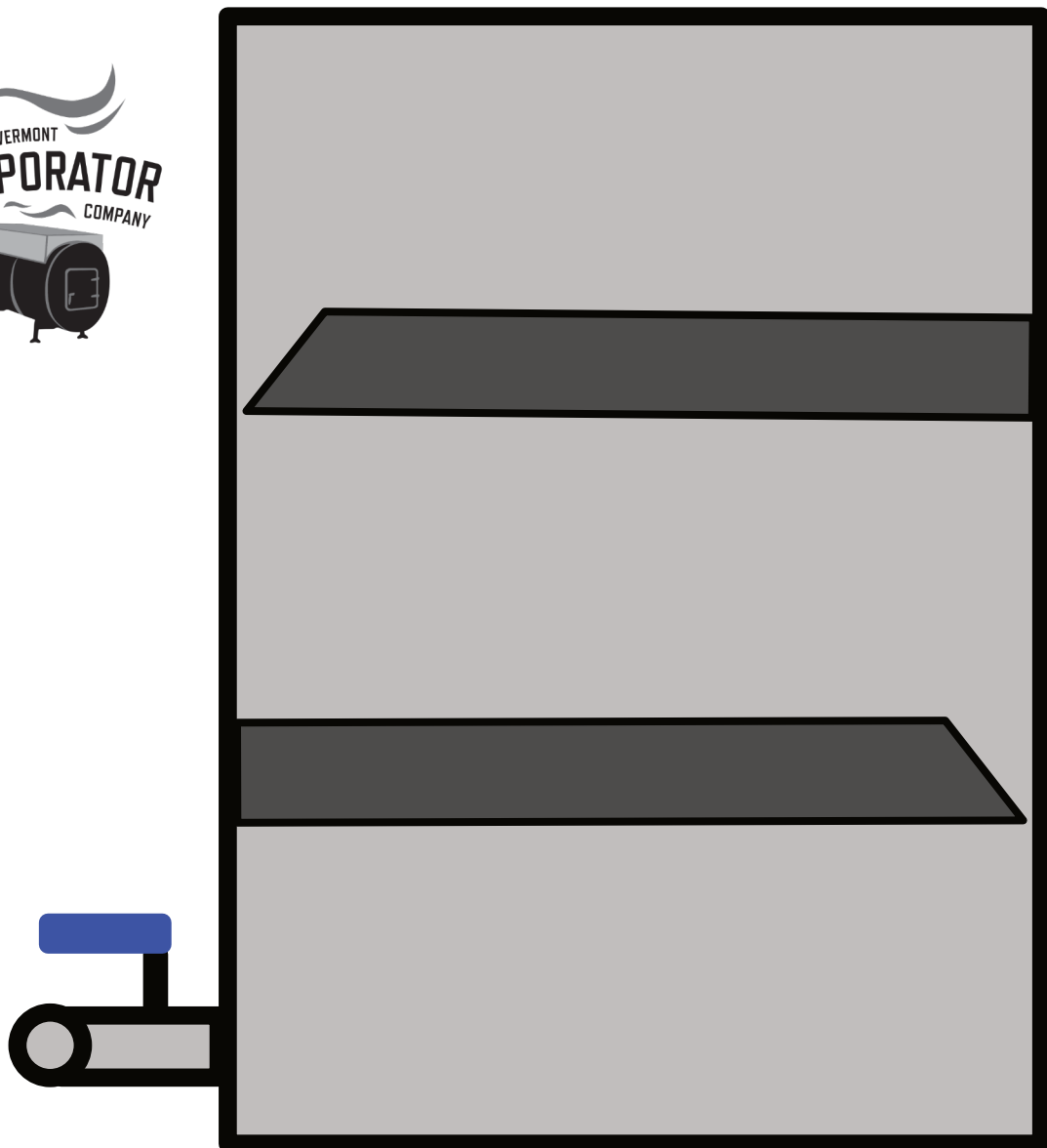
a SQUARE where the fresh sap enters the pan

Circle where the syrup comes out of the pan

Indicate where sugar density is lowest, and where it is highest

Use arrows to demonstrate the flow of the sap as it turns into syrup

Indicate where the sap has lowest viscosity and highest viscosity



### **Additional materials for Big Kids:**

Infographics located at the end of the packet:

- Maple Tree Identification
- Syrups of the World
- Sap/Cider to Syrup
- Maple four ways
- Maple producing states
- How to tap a tree
- Grades of maple
- Filtering and storing
- Cord of wood
- Continuous boil pan
- Baking with Maple
- Backyard Bingo



Recommended Big Kid books:

#### Chapter Books:

- Miracles on Maple Hill by Virginia Eggerson Sorenson
- Little House in the Big Woods by Laura Ingalls Wilder

#### Picture Books:

- Maple Trees by Marcia S. Freeman
- Curious George Makes Maple Syrup
- Sugar on Snow by Nan Parson Rossiter
- Sugar White Snow and Evergreens by Felicia Sanzari Chernesky
- At Grandpa's Sugar Bush by Margaret Carney and Janet Wilson
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# For Biggest Kids



# Maple Evaporator Worksheet

Name \_\_\_\_\_

Date \_\_\_\_\_

Weather \_\_\_\_\_

Air temperature \_\_\_\_\_

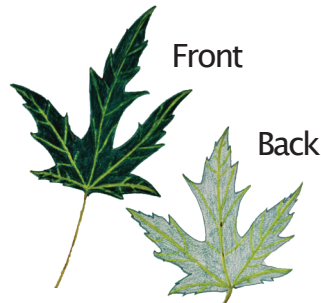
How are you feeling today? \_\_\_\_\_



## Sugar Maple



## Red Maple



## Silver Maple



## Big Leaf Maple

### Evaporator Observations

[illegible]

## Wood Calculations

Measure the amount of wood that you have been using in the first hour of boiling in square feet:

If your evaporation rate is 6 gallons per hour, how long will it take you to make 1 gallon of syrup?

If you intend to make a gallon of syrup, how much wood will you need?

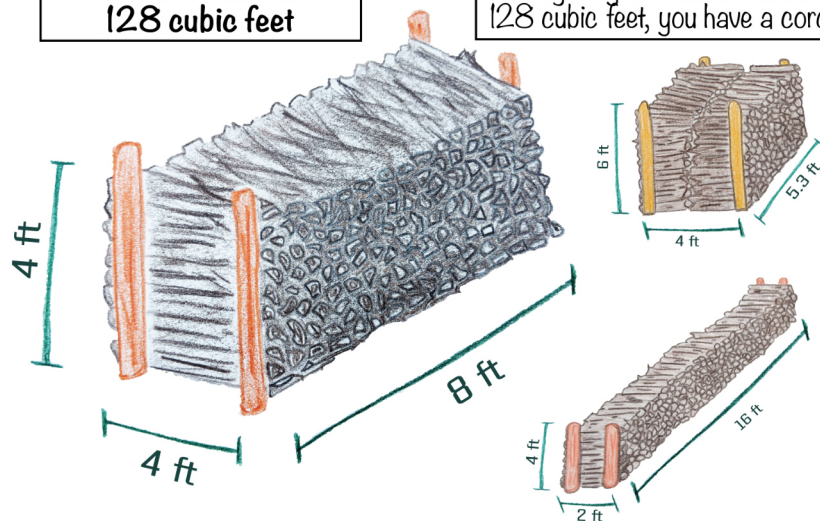
How many cord is that?



### How To Measure a Cord of (Sugar) Wood

One cord of wood measures  
**4 ft x 4 ft x 8 ft**  
and has a volume of  
**128 cubic feet**

However, you can have  
different size wood piles.  
As long as your volume measures  
128 cubic feet, you have a cord.



### **Sugar Content Calculation**

Volume of sap before evaporation begins \_\_\_\_\_

Volume of syrup after evaporation ends \_\_\_\_\_

Calculate the sugar content of your sap. Show your work below:

### **Evaporation Rate Calculation**

Volume of sap before evaporation begins \_\_\_\_\_

Volume of syrup after evaporation ends \_\_\_\_\_

Time spent evaporating \_\_\_\_\_

Calculate the Evaporation Rate in gallons per hour. Show your work below:

**\$\$\$**

So now you know how long you have to boil sap to make 1 gallon of syrup, and how much wood it takes to make 1 gallon of syrup. If a cord of wood costs \$300 and a gallon of maple syrup sells for \$55, how many gallons of syrup would you have to sell to pay for the wood? (note: wood can only be sold in full cord volumes!)

If you wanted to get paid for your time, say \$10 per hour of boiling, how many gallons of syrup would you need to sell?

On average, syrup producers expect to get 10-20 gallons of sap per tap. If it is a good sugaring year, meaning lots of days above freezing and nights below freezing, and you get 20 gallons of sap per tree, how many taps would you have to place in the spring time to make the amount of syrup you calculated in the question above?

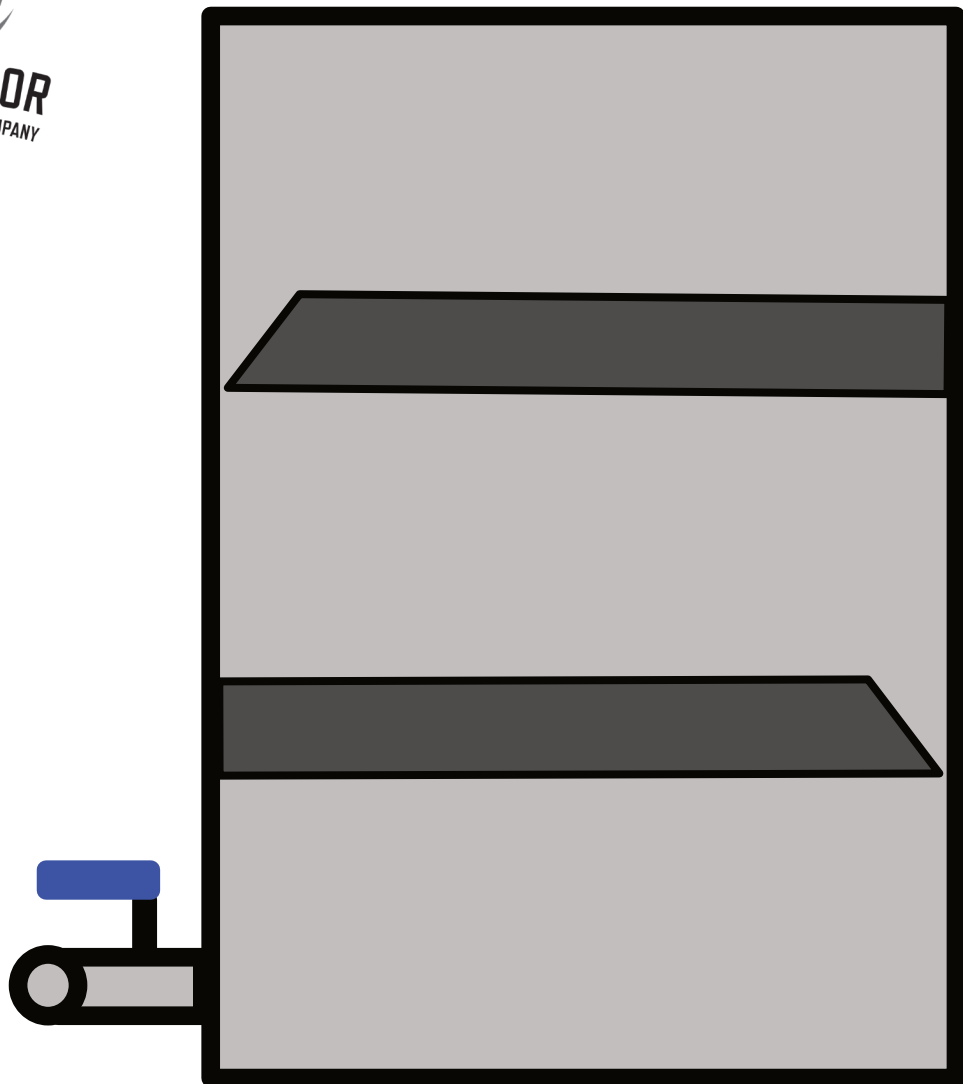


## Evaporator Pan Drawing

Label the chambers with the following terms:

<b>Medium sugar content</b>	<b>Syrup</b>	<b>Light brown</b>
<b>Clear</b>	<b>High viscosity</b>	<b>Low sugar content</b>
<b>Low viscosity</b>	<b>Sap</b>	<b>Dark brown</b>
<b>High sugar concentration</b>		<b>Medium viscosity</b>

Draw arrows to indicate how the sap enters the pan, flows through the pan, and exits the pan.



### **Additional materials for Biggest Kids:**

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- Maple producing states
- How to tap a tree
- Grades of maple
- Filtering and storing
- Cord of wood
- Continuous boil pan
- Baking with Maple
- Backyard Bingo



List of recommended books:

#### Young Adult Books:

- Miracles on Maple Hill by Virginia Eggerson Sorenson
- Little House in the Big Woods by Laura Ingalls Wilder

#### Adult books:

- The Maple Sugar Book by Helen & Scott Nearing
- Maple Sugarin' In Vermont: A Sweet History by Betty Ann Lockhart
- The Maple King by Matthew Thomas
- Amateur Sugar Maker by Noel Perrin

#### Cookbooks:

- Maple: 100 Sweet and Savory Recipes Featuring Pure Maple Syrup by Katie Webster

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# Infographics



# The Hobby Sugar Maker's Quick Tree ID



## Sugar Maple

- Five fat lobes
- Smooth edges
- Multicolored in the fall

## Red Maple

- Three fat lobes
- Saw toothed edges
- Early, red foliage in fall

## Silver Maple

- Five skinny lobes
- Smooth edges
- Light green ("silver") on underside
- Late to turn in fall



## Tree Syrups:



Alder	Hickory
Birch	Ironwood
Black Walnut	Linden
Butternut	Maple
Carob	Shagbark Hickory
Cherry	Spruce Tip
Cherry Blossom	Sycamore
Coconut Palm	

# Syrups of the World

## Flower Syrups:



Clover
Dandelion
Elderflower
Fireweed
Forsythia
Ginger
Queen Anne's Lace
Rose
Violet

## Fruit Syrups:



Apple Cider
Apricot
Berry
Cherry
Nectarines
Peach
Pear
Plum
Rhubarb





# Ratio of Sap/Cider to Syrup

Maple



40:1

Birch



110:1

Apple



8:1



# Maple Four Ways

## Syrup



- Start with sap
- Boil to 219° F
- Filter

## Cream



- Start with syrup
- Do not stir
- Boil to 235°F
- Cool to 100°F
- Stir until lighter in color and the thickness of peanut butter (30+ minutes)

## Candy



- Start with syrup
- Do not stir
- Boil to 246°F
- Cool for 5 minutes
- Stir until lighter and thicker (1-5 minutes)
- Pour into shallow pan(s) lined with lightly oiled parchment paper to 1" thick or so
- Cool completely
- Cut into cubes

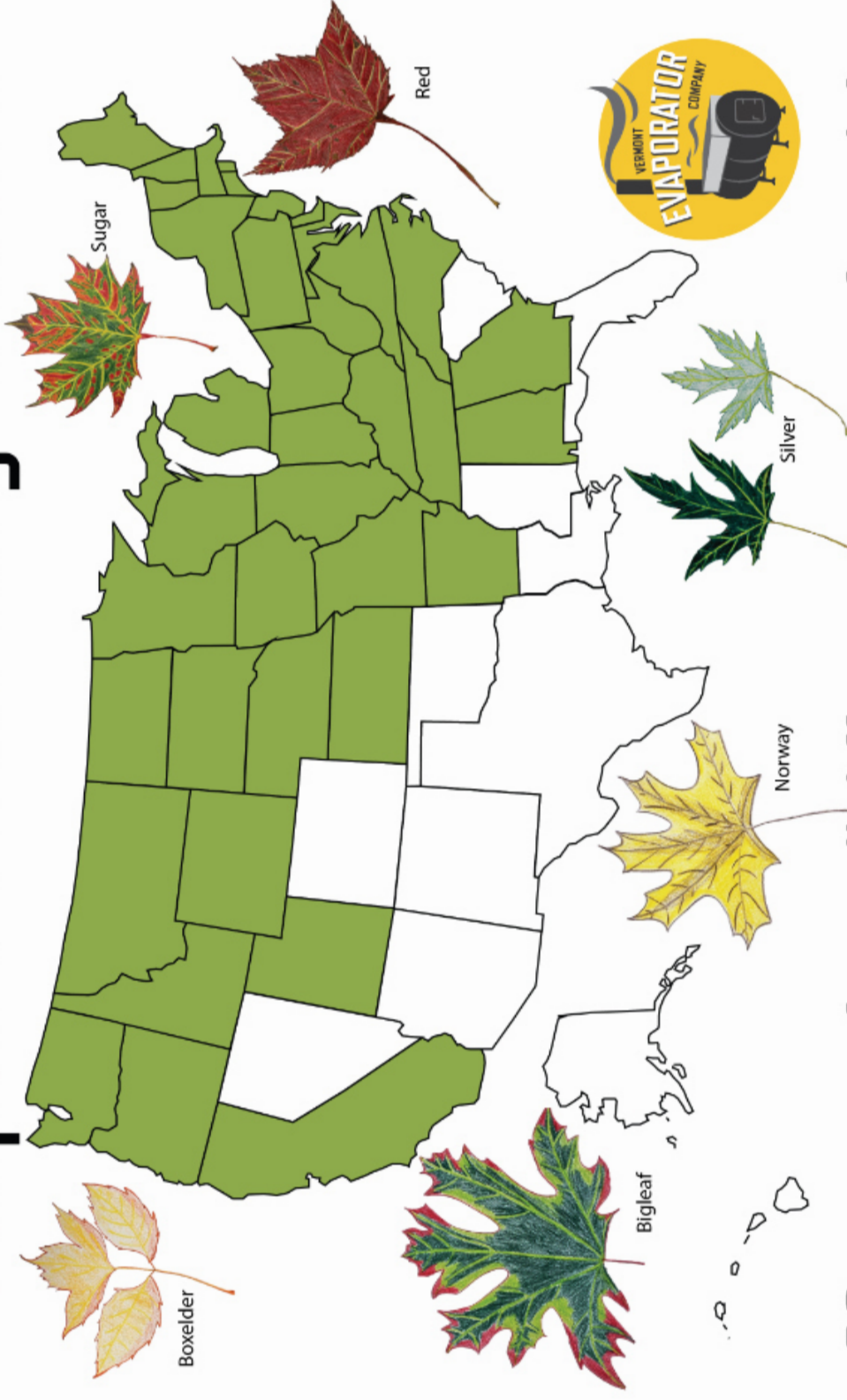
## Sugar



- Start with syrup
- Do not stir
- Boil to 257° - 262°F
- Take off heat
- Stir vigorously as maple cools and crystals form (20+ minutes)
- Sift and grind any lumps with mortar and pestle or food processor



# Maple Producing States



38 states... from all different species of maple!





# How To Tap a Tree

Avoid knots and wounds

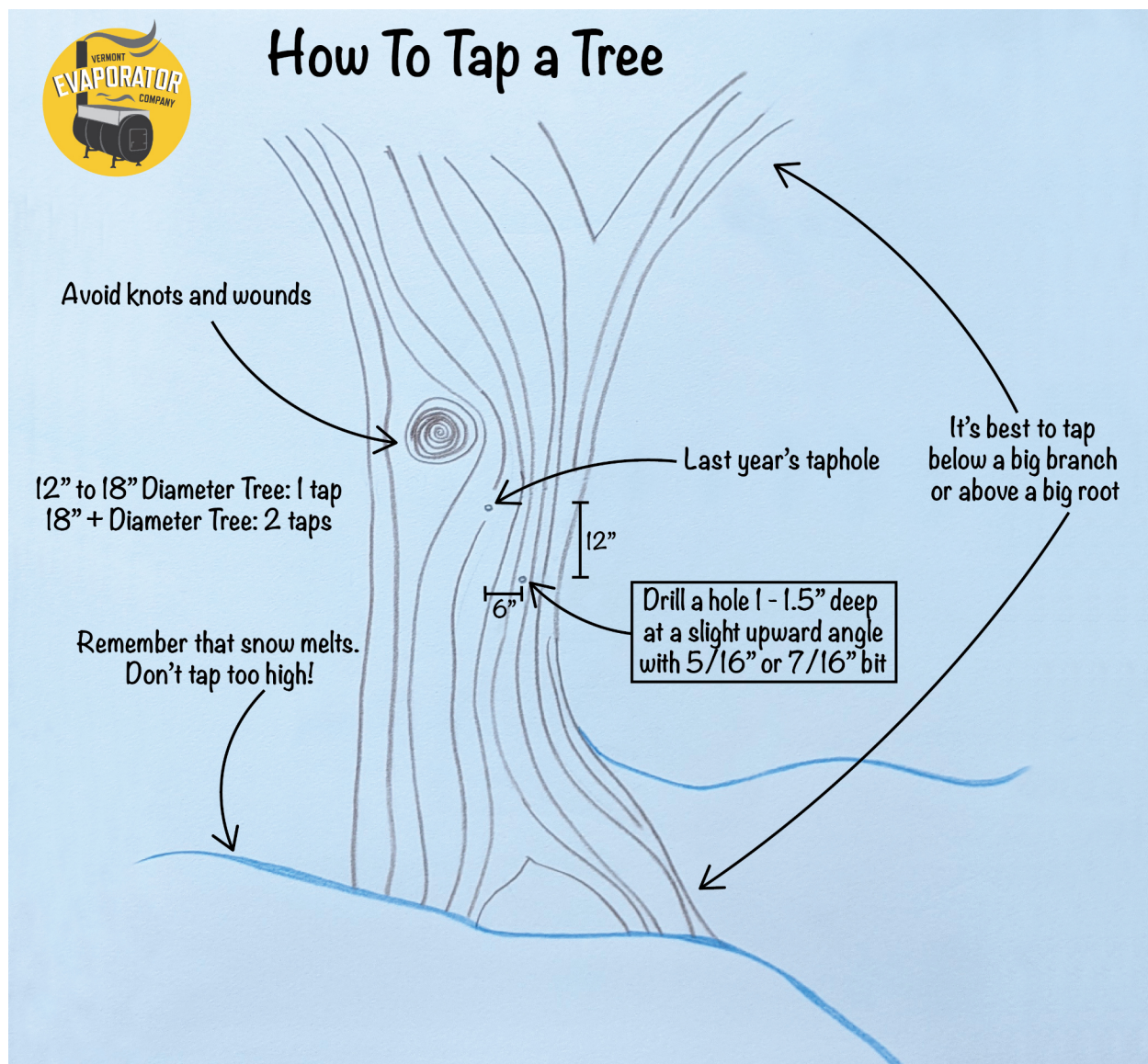
12" to 18" Diameter Tree: 1 tap  
18" + Diameter Tree: 2 taps

Remember that snow melts.  
Don't tap too high!

Last year's taphole

It's best to tap  
below a big branch  
or above a big root

Drill a hole 1 - 1.5" deep  
at a slight upward angle  
with 5/16" or 7/16" bit



# Grades of Maple Syrup & Their Uses



Golden Color  
with  
Delicate Taste

## **Fancy**

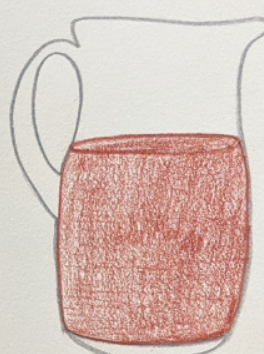
- drizzled over vanilla ice cream
- mixed with soft cheese or butter
- as the sole ingredient of maple cream, candy or sugar



Amber Color  
with  
Rich Taste

## **Versatile**

- with pancakes or waffles
- in salad dressings and sauces
- in chocolate milk, hot cocoa & mixed drinks



Dark Color  
with  
Robust Taste

## **Practical**

- with roasted and baked vegetables and meats
- paired with smoky and spicy foods



Very Dark Color  
with  
Strong Taste

## **Work Horse**

- preserving & canning fruits, veggies and meats
- in baking



# Filtering and Storing Maple Syrup

219° syrup in

②

...but as long as it is at least 180° when put in sterilized bottles or jars, it does not need to be reheated prior to bottling. So it pays to have everything ready to go before you start!

①

Let syrup pass through two prefilters nested inside one maple syrup filter. (When inner prefilter becomes clogged, remove and use only one.)

Syrup will cool as it filters...

③

Screw on cap or lid, lay bottle or jar on its side for 30 seconds. Store upright sealed containers at room temperature for up to 2 years!

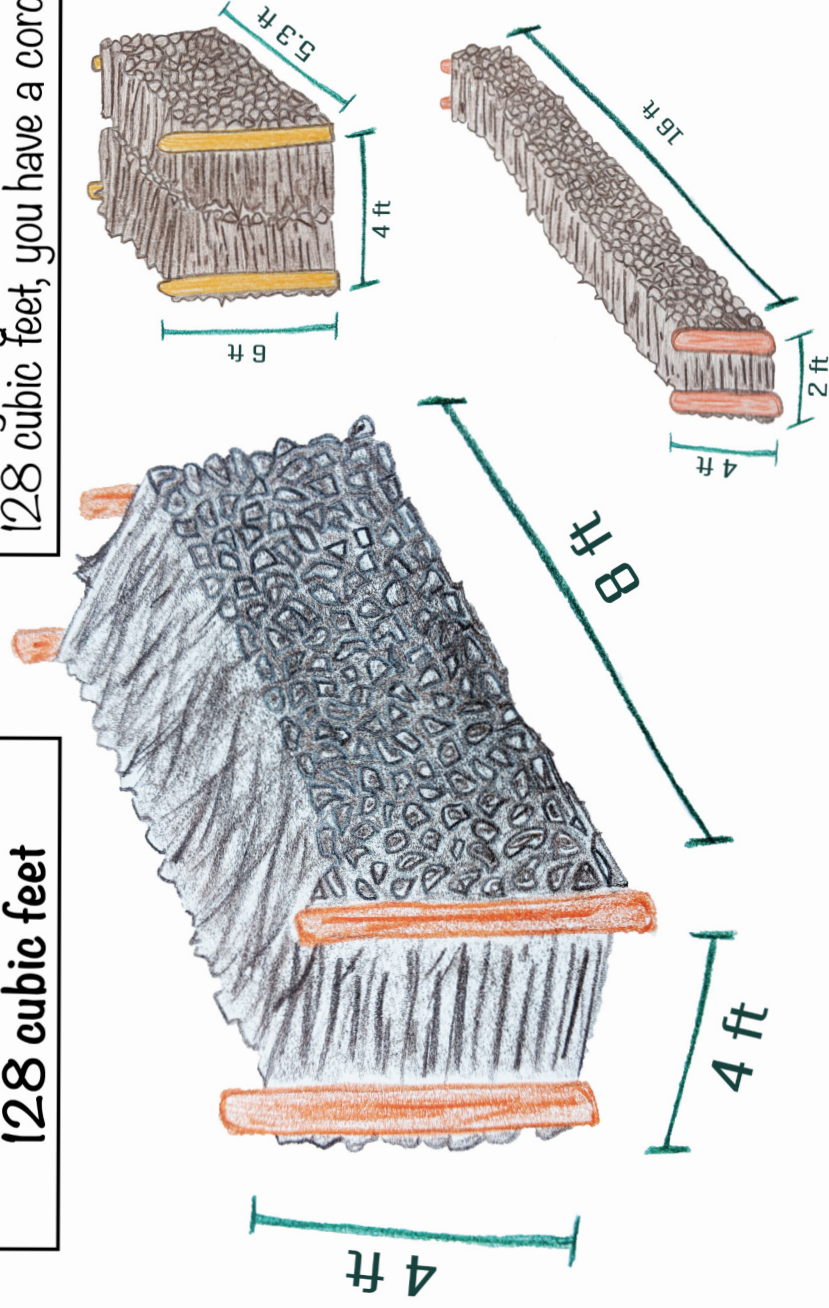




# How To Measure a Cord of (Sugar) Wood

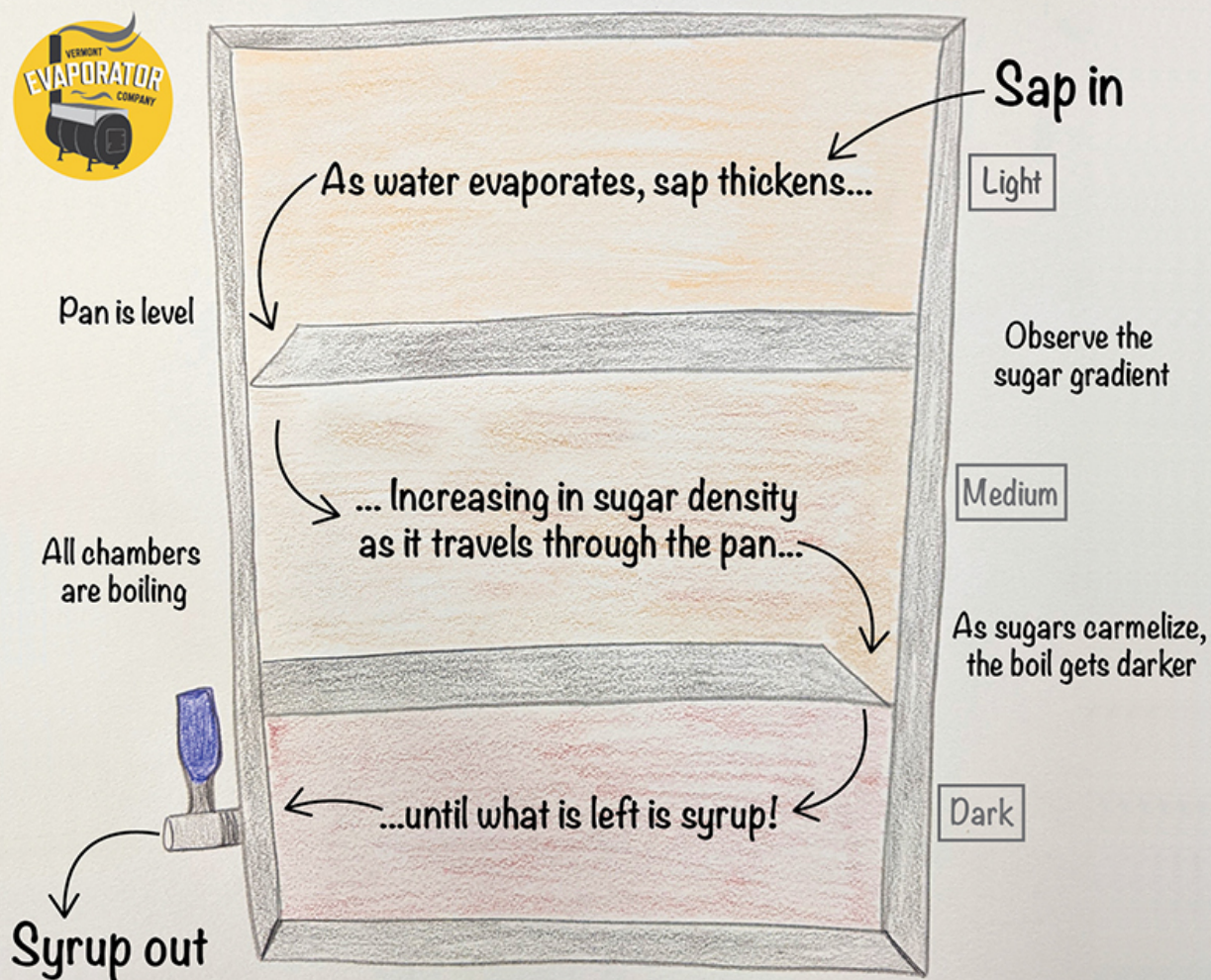
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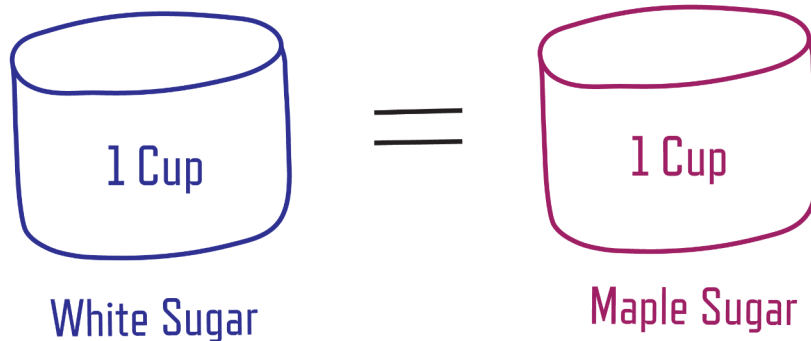
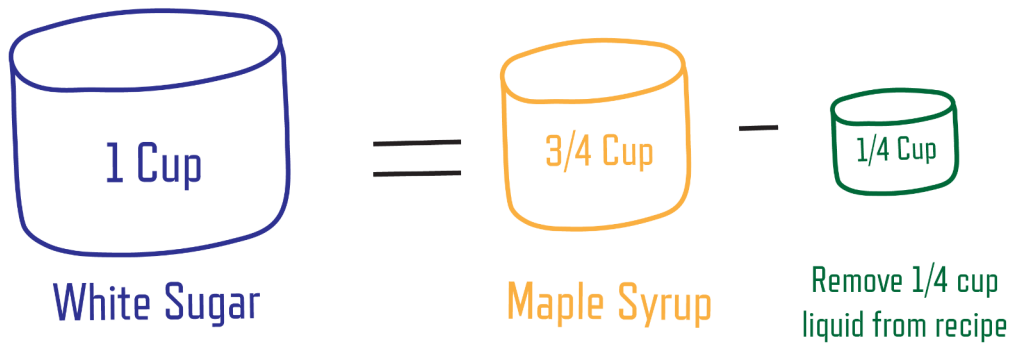
# From Sap to Syrup on a Continuous Boil Pan





## Replacing White Sugar with Maple in Baking

For each 1 cup of white sugar to be replaced:



# Backyard Bingo



