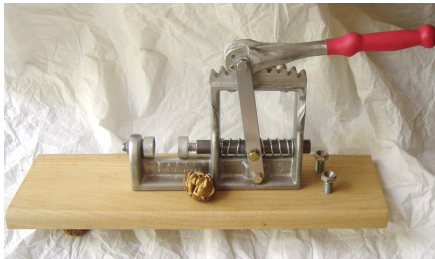


Shagbark and Hybrid Hickory Evaluation Protocol

Things you'll need:

- Master Nut Cracker: It is worth buying from www.masternutcracker.com/about.html because they are much better quality and wear better than the dukes. You'll have to send a check in the mail. He has cancer now so it may not be possible to purchase the original Master nut cracker.
- A scale with accuracy down to 0.05g. I use the Fuzion Digital Pocket Scale, 200g x 0.01g
- A pocket nut cracker



- Cheap aluminum tree labels and a mesh sack that won't let nuts fall through



- OR Plastic ziplock quart bags and a sharpie on a small scale or in a pinch (make sure to open the bag when curing and not have nuts stacked more than 4 nuts thick and kept out of the sun)
- Sizing nuts for comparing a new nut to known good sized nuts. Call Alex for sizing nuts or just collect your own after you have nuts of a good size. Remember the nut size is very different than kernel size and nut size doesn't matter at all.
- Label trees using a stainless steel fender washer, 1" to 1 1/2" stainless steel screw, and an etching tool. I use a AC etching tool with a cheap AC battery power supply with the power supply in my backpack; clunkier but works well.
 - Flag tape and a sharpie is a really shitty alternative. Be ready to replace the tape right after midwinter evals.

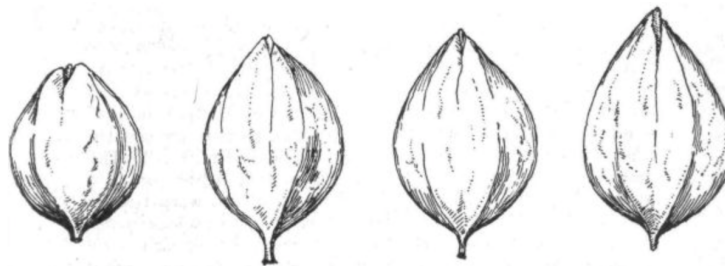
What I am Looking:

1. Oil, multipurpose, and Breeding nuts
 - Oil nuts should be over 47% kernel and at least 2.0g kernel
 - Breeding nuts is anything very interesting or with kernels over 45% & 1.5g
 - Multipurpose nuts crack out well and are over 47% kernel. These are rare gems
2. Cracking and milking nuts

- Cracking nuts should be at or over 2.5g kernels and crack out at least 50% to halves and less than 20% to pieces smaller than quarters
- Milking nuts don't need to crack out well but should make good tasting milk (pure shag or shell or their hybrids), be at least 40% kernel and near or over 3g kernels

Some Fundamental Beliefs that I Have Pertaining to Evals:

- Bearing characteristics in the wild are only vaguely related to fertilized, spaced bearing characteristics. Nuts are pretty much just nitrogen; nitrogen is made by microbes for the tree if it has water in the surface soil; water makes nuts; nitrogen makes nuts. If a tree bears heavily on untended soils, it will bear heavily under cultivation. If a tree bears only medium amounts but the trees around it bear much less under the same conditions, that tree may bear heavily under cultivation. If the tree bears under high-low patterns unfertilized, I'm betting it will bear annually if well fertilized. If the tree bears strictly alternately, it may bear annually with fertility and water still. As a side note, walnuts will change from purely alternate to annual bearing under fertility in many cases. Trees next to houses, driveways, roads, large rocks, rock fences, well fertilized farm fields, and in lawns will tend to produce more nuts, more annually. Overbearing can cause biennial bearing and shaking down immature nuts or adding fertility can mitigate this and this is confirmed with pecans. Overbearing in bitternuts and bitshag hybrids typically reduces nut size and/or causes alternate bearing but does not cause underfill like with pecans (breeding for yield has gone too far with USDA pecan varieties).
- Canopy surface area is directly related to yield.
- Nut size and kernel percentage is only lightly related to fertility and site conditions. A 2.5g Weschcke nut in the WI may be a 3.0g nut in PA under similar fertility conditions. I have seen poorly managed farm fields make a Fairbanks and Weschcke shrink nut size by 20%. When Weschcke managed his trees, his Weschcke clones were a different shape than they are today. Today at weschcke's farm, they look like they did on the ortet rather than his 1941 shape. This may affect kernel percentage; my guess is high fertility and proper management will generally reduce kernel percentage a percent or two though that may take one more year to prove.



1930—Weschcke Hickory as borne by parent tree at Fayette, Iowa.

1939—After several years of bearing grafted on Northern Bitternut hickory at River Falls, Wis.

1940—Still further change in shape and size from graft on Bitternut.

1941—Change and increase in size now is so pronounced as to almost extinguish its original identity.

- Low weevil infestation rates in the wild will probably mean low weevil infestation under cultivation BUT high weevil infestation in the wild does not doom a tree to a life of weevils under cultivation. Early maturing and large nutted trees are targeted in the wild but this 1) will be less of a problem under good cleanup conditions 2) these individuals won't be the target of the whole weevil population when the whole orchard is full of large nutted and/or early varieties and 3) I believe that we will figure out an organic method to mitigate weevil populations in our lifetimes via nut shakedown and cleanup, ect.
- Hybrids are often the target of weevils but that doesn't mean they will have issues in cultivation and their offspring may be much more resistant to weevils.
- During low nut years and during severe drought I have observed that kernel percentages typically go up 2-3% by stuffing the shell with more kernel which appears to reduce extraction quality. I have observed multiple bitshags increase their kernel percentage by up to 8% and a walnut increase 5% (not just from fill but shell thickness and rib development). This large change in kernel percentage shows heterozygosity in the tree's genetics; these trees may have hybrid vigor associated yields; they do not appear to put on faster growth; they will likely produce highly diverse, interesting, but inconsistent offspring. This demonstrates that evals on low nut years or severe climatic years should not be assumed to be the nut the tree normally makes but it is informative.

How to evaluate Shag and Hybrid hickory trees in orchards when you don't want to eval every tree and are just looking for the clone-worthy ones:

1. Walk around when the nuts are dropping with your pocket nut cracker, flag tape, and a sharpie.
2. Pick up any medium-small, medium, and large nuts OR hybrid looking nuts and crack it with your pocket cracker to inspect the cross section. If it seems like the kernel percentage is over 40%, flag the tree and come back later to give it a permanent tag and collect a full sample. Note that an empty nut will feel thinner in terms of force applied but the shell will look similarly thick.
 - a. Here are traits to look for with hybrids in a cultivated orchard: thin shucks, wings on the shucks where the split to drop the nut, wavy/rippled and non-angular/non-ribbed nut shell, very broad nut-shell shoulders, a nut butt with cheeks that extend past the butt hole, nut is crackable with teeth (don't push your teeth anywhere near their limit), dark shell color on a filled fresh nut, astringency in the nut meat, bitternut bark, bitternut buds, thin 1 year twigs, more than 5 leaflets, and any combination of ovata or cordiformis.
 - b. Remember, Vest (a hybrid) is a 2.5g 55% nut which will look similar in nut size to a 1.8g 40% kernel nut which is only a small-medium size nut. Generally, larger nuts from the outside have thicker shells. Kernel size is more consistent than nut size in walnuts and the hickories are hinting that to be true as well; this means that you are more likely to find a small nut to have very high kernel percentage. That said, outliers are much more of a norm with hybrids

How To Collect A Sample (Ideally)

1. Clean up every nut on the ground before sampling starts. There shouldn't be many nuts if done at the right time. Place cleanup nuts in EAT. If they are hybrids, keep them in a hybrid eat bag because these may not be milkable or even edible.
2. Knock down 5 or so nuts with a stick to see if all of the shucks easily split when pried with a thumb. If filled nuts have shucks that split then continue. If shucks don't split or only empty nuts split shucks, move to the next tree. Empty nuts shuck split sometimes over 2 weeks prior to healthy nuts.
3. Shake down as many nuts from the tree as is safe.
4. Put all the nuts in-husk into an onion sack with a aluminum forestry tag label indicating tree ID. Shuck nuts after dusk when not busy. Alternatively, let shucks ripen until they split and shuck via the thumb method, foot rolling method, or slam against a tree trunk. Beware of squirrels and mice - set traps and bring a pellet gun.
5. Do it again for years

If unable to shake/knock down nuts from the tree try your best to keep trees isolated! In breeding orchards, many seedlings can look nearly identical and have totally different nut traits which is very hard to make sense of in winter.

Nut Evaluation Procedure for Each Sample Bag starting mid-December.

Note: Nut evals should be done between 4-7.5% moisture by drying nuts in a cool place like outside, in a basement, or a walk in cooler. Keep nuts out of very dry areas like in heated living spaces. As a rule of thumb, a low humidity Wisconsin winter fireplace heated house brings nuts to 4% kernel moisture and 10% shell moisture. Outdoors and very cool, and relatively humid locations as described above bring nuts to 5.5% kernel moisture and 13% shell moisture. Kernels stay in tact best at 7.5% moisture. Flavor is the best when bone dry at 0% moisture, good at 4%, and notably worse at 5.5%. Individual varieties appear to have more affinity for kernel moisture than others; it is my educated guess that that higher oil content kernels exclude water more and will make for a lower moisture content under the same conditions which may cause more kernel shattering; measuring kernel AND SHELL moisture content via the oven @170F dehydration test will give more information by providing the moisture baseline of shell moisture; this is only relevant if you air dried the nuts without forced air and did not re-moisten nuts recently as those nuts may not have reached moisture equilibrium between shell and kernel yet. Keep all this in mind: don't judge flavor until moisture is low and don't judge kernel shattering until kernel is moistened; you can still judge shell cracking locations with low moisture content. Official kernel percentages relate to 4% kernel moisture evaluations; kernel percentage will weigh out 1% lower for 40-50% kernel nuts at 7.5% moisture; kernel weights will weigh out ~4% above official 4% evaluation weights at 7.5% moisture.

1. Take a random sampling of 5 nuts
2. Determine how they like to be cracked with a master nut cracker. Side over size, or head over heel.
3. Take a random sample of 10 nuts. Take a photo of the nuts with the label.

4. Record the weight of each individual nut and keep the nuts in a line for evaluation.
Record the following data after each crack in a nut:
 - a. Kernel weight from 100% of the kernel, kernel %, mold infection description/weevil infestation. Do not dispose of or disregard a nut because it doesn't have a kernel or isn't filled well; keep this info in the log.
 - b. Once you have the data for all the nuts, individual nut kernel percentages, discard outliers and note typical kernel percentage, average filled nut kernel weight, percentage of halves, quarters, and pieces, the percentage of kernel that fell out with a bit of agitation and finger rubbing but not grabbing, the percentage requiring a nut pick or wiggling fingers to extract, kernel face entanglement with shell, kernel stuck in corners, kernel flavor, kernel color, and pellicle adhesion.
Take a photo of the separated kernels.
5. With any additional nuts from interesting trees, the following quantities to Alex for testing:
 - a. If the kernel percentage is over 47% and over 2.0g kernel:
 - i. Save 4 quarts nuts for oil pressing testing
 - b. If the nut cracks out exceedingly well and is over 42% kernel and 2.0g kernel:
 - i. Save 50 nuts for testing in Alex's Lineage Hickory Cracker
 - c. If the kernel weight is over 3.0g
 - i. Save 2 pints for milking testing

Give Alex a ring anytime at 608-577-4309 if you find anything really interesting by the standards above.