Walnut Council Bulletin

Promoting Walnut and other Fine Hardwoods for 50 Years

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Using Cover Crops in Hardwood Plantings for the Midwestern United States

Part I. Integrating Cover Crops into Tree Plantings

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This is the first in a series of three articles about using cover crops. Part II: "Improvements in Site Quality" and Part III, "Enhancement of Pollinator Habitats within Tree Plantings" will be printed in future issues.

Within the last few decades, new programs using cover crops to improve soil health have been initiated that could benefit establishment and management of hardwood plantings because of the strong positive link between soil health to tree growth. Recent Farm Bills have put forward agendas to address declining soil health on agricultural soils by promoting the use of cover crops to improve soil health during the fallow period in rotation with agronomic crops. Crop yields have been increased by 2 to 4 percent when grown in rotation with cover crops (SARE 2017). Cover crops could play an even bigger role in hardwood plantings because we can grow annual cover crops to maturity without the need to terminate for another crop. In addition, we can effectively use permanently established perennial ground covers.

The table in this paper summarizes cover crop suitability for hardwood plantings for 70 candidate cover crop species. Another table in the next issue of the Walnut Council Bulletin on how cover crops improve site quality to improve tree growth will summarize the agronomic information for establishing and managing these same 70 cover crops. Although many other species could have been chosen, the final list was selected to include some of the most frequently used cover crops, ground covers (both good and bad) commonly found in hardwood plantings and nut orchards, and some promising native forbs for creating pollinator habitat.

Hardwood plantings are usually not established on our most fertile and productive agricultural lands. The use of annual or perennial cover crops is an opportunity to increase soil fertility and tree growth rates. Integrating cover crops into a timber management operation can have some unique challenges as well as benefits not found when using cover crops in the normal fallow period between cash crops. Studies show having a ground cover can reduce hardwood tree growth anywhere from a few percent to more than 70 percent (Van Sambeek and Garrett 2004; Van Sambeek 2019). It is important to recognize that the degree to which different cover crops compete with the trees varies substantially. A few cover crops result in less than a 20 percent reduction in tree growth such as oats, soybeans, and crownvetch compared to other cover crops, such as tall fescue, that can result in more than a 50 percent reduction in tree growth (Table 1: Compatibility). Tall fescue, one of the easiest grasses to establish and

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President's Thoughts

Bill Hammitt

"Two roads diverged in the woods, and I –

I took the one less traveled by

And that has made at all the difference". – Frost

Like Robert Frost, anyone who grows Black Walnut as a crop, has taken the road less traveled. The road most traveled leads to corn or bean fields; the lesser one to our black walnut plantations. AND, I think for most of us the black walnut road/journey has made all the difference.

The black walnut road has led me to serve as your Walnut Council president during the 2019-2020 year. I look forward to the position, for I believe strongly in the mission of the Walnut Council. We are a small organization; however, it is made up of a devoted membership.

This was no more evident than this past October 10 – 11th when approximately 25 members gathered at Al Goetsch's tree farm near Beloit, Wisconsin for a workday and the Walnut Council Fall Board meeting. Learn more about why we visited Al's and had our board meeting there on page 8 of this issue.

It is amazing how much work can get done when you devote 25 people to the job! Several individuals pruned approximately 5+ acres of 30 foot tall walnuts, while a smaller group worked at cleaning out a storage/tool shed. Pruning poles, pruning saws, loppers and other tools were brought to the site by various members, and the work was performed from 8:30 to 3:00 on the 10th of October.

While pruning the plantation trees, we all had the pleasure of viewing Al's many mature walnuts of 25-29 inches (dbh) and 80 plus feet in height. The many large trees are a perfect example of how a little silvicultural management, plus a lot of patience and years, can "make all the difference" in yielding an awesome walnut stand of veneer quality trees. Just last December 42 walnut trees, 30 inches dbh and greater, were harvested from Al's woods. Still, it is estimated that nearly 200 mature walnuts remain for future harvest.

While very few, if any, of us have trees like Al Goetsch to manage, winter is coming and the ideal time to prune, identify crop trees, and thin our plantations. The last two years have been excellent growth periods for walnut trees in the Midwest, with plenty of rain during Spring and early Summer. In Ohio, where my trees are located, growth has been good and the nut crop average this last year. All they need, in addition to the ample rainfall, is some good silvicultural management, patience and time to produce quality trees, assuming they exist on a good quality site.

The Walnut Council can help you with both site selection and management practices; the patience and time are up to you. I hope you attend and participate in the field days of your state chapter. There function is to provide site and management knowledge at the local level. And, please volunteer to host a field day at your place! You will be surprised how much you will learn from fellow members.

Here is wishing this next year will be a great growth year for your walnut trees. Please do not hesitate to notify me or other members of the Walnut Council with questions and/or comments we might address.

Bill Hammitt,
National Walnut Council President

Mark Your Calendar for the 2020 Annual Meeting

On July 26-29 we are returning to Carbondale, Illinois and the Southern Illinois University campus, last visited by the Walnut Council in 1989. SIU is one of the largest forestry schools in the nation and the region is surrounded by beautiful high quality hardwood forests.

Nearby Shawnee National Forest, Giant City State Park, Touch of Nature Environmental Center, and Crab Orchard National Wildlife Refuge are just a few of the beautiful natural areas in the vicinity.

SIU's College of Agricultural Sciences and Department of Forestry are pleased to host us and share their latest research and demonstration field plots. Lodging will be at the Holiday Inn Carbondale. Watch for more information at *www.walnutcouncil.org.*

Using Cover Crops in Hardwood Plantings *Continued from page 1*

manage, on average reduces walnut growth by nearly 70 percent. This means if it takes 3 years to put on one inch of DBH growth in a weed-free planting, it will take more than 9 years if the trees are growing in a tall fescue sod. Data is not available on how long (if ever!) it will take for walnut trees in a tall fescue sod to grow harvestable sawlogs much less veneer-quality logs.

There appears to be a trend for cover crops with deep roots to be the least compatibility (Table 1: Rooting depth) and a trend for perennial cover crops to be less compatible than annual cover crops (Table 1: Forb type), but not whether they grow as winter annuals or grow during the cool-season or warm-season of the year (Table 1: Growing season). Surprisingly there does not appear to be a strong relationship between cover crop compatibility and biomass productivity (Table 1: Productivity), production of phytotoxic compounds (Table 1: Known allelopath), or N-fixation rates among the legumes (Table 1: Nitrogen source). Table 1 does not include annual grasses such as soft chess, annual fescue, or cheat because they have not been tested in hardwood plantings. They ought to be highly compatible as these grasses are short, drought tolerant, self-reseeding winter annuals that mature very early in the spring when soil moisture is plentiful and reduce surface evaporation by mulching the soil.

Legume cover crops provide more benefits than do grasses because legumes have nodules on their roots containing bacteria that can take N from the air and fix it into forms that the plants can use in exchange for sugars from the plant. Some of that N can escape from living roots but most is slowly released as plant residues decompose (Fig. 1). In the absence of other cover crops and weeds, this N can be taken up by trees and other plants and replace N fertilizers (Van Sambeek, et al. 1986). Decaying biomass is expected to release 50% of the bound N the first year, 30% the second year, and 10% the third year.

Nitrogen fixation rates can range annually from less than 50 to over 150 pounds of N per acre depending on the species (Table 1: Nitrogen source). The amount of N added is highly depended on whether seed was inoculated with the correct rhizobium, the amount of forage produced, and the crude protein content of that forage. As a general rule, most legumes fix 60 to 75% of the N needed for their growth with approximately 60 to 70% of that N utilized in the aboveground forage. In theory this means there should be little net loss or gain of available soil N when legume cover crops are harvested for hay. If not harvested, legumes should provide a net gain as plant residues decompose into ammonium and nitrate N that the trees can take up.

The amount of sunlight available to the cover crop in a hardwood planting depends on row orientation, tree size, and tree density. In a black walnut stand with open-canopy trees (branches not touching), sunlight can be reduced by 50 (moderate shade) to 80 (dense shade) percent. Studies conducted by University of Missouri Center for Agroforestry (UMCA) growing forages under moderate to dense shade have shown some cover crops such as Kentucky bluegrass, sweet clover, white and red clover have better growth under moderate shade than under full sun (Van Sambeek, et al. 2007). Other cover crops such as field peas and oats do poorly under moderate shade (Table 1: Shade tolerance). Most warm-

Figure 1. Walnut seedlings in the second year of growth with weed control using only chemicals (left) or only a hairy vetch living mulch without chemical weed control (right).

Figure 2. Eastern gamagrass, a shade-tolerant warm season grass, growing within a black walnut alley-cropping practice.

*Table 1. —Traits of candidate cover crops when grown as monocultures on compatibility with trees, tolerance to various stresses, growth rate, productivity, crude protein, rooting depth, moisture use, and ability to improve soil health. An * marks the top cover crop species for the Midwest.*

Species	Forb type[1]	Growing season[2]	Compatibility[3]	Shade tolerance[4]	Flood tolerance[5]	Drought tolerance[6]	Low fertility soils[7]	Mowing tolerance[8]	Juglone tolerance[9]	Known allelopath[10]	Growth rate[11]	Productivity (dry tons per acre)[12]	% Crude protein[13]	Rooting depth (ft)	Moisture use[14]	Nitrogen source[15]	Nutrient scavenger[16]	Soil builder[16]	Subsoiler[16]	Topsoil loosener[16]	Erosion preventer[16]	Weed suppresser[16]	Can be invasive[17]	Hardy thru zone[18]
Ann. lespedeza	AL	WS	C	D	D	B	A	D	S	N	B	1 – 2	13	1	A	C	C	C	D	C	C	B	Y	8
Arrowleaf clover	AL	CS	B	D	D	C	D	B		N	B	2 – 3		1	C	B	B	A	C	A	B	B	N	6
Balansa clover	AL	CS		B	B		A				A	2 – 4	20		C	A	B	A	C	A	B	B	Y	6
Berseem clover	AL	WS		C	C	C	C	A		N	A	3 – 5	25	2	A	A	C	A	D	B	B	B	N	8
Black hay bean	AL	WS	A	D	C	B	C		T	N	A	2 – 4	30	1	C	C	C	D	D	D	D	C	N	9
*Black medic	AL	WS	B	C	D	D	C	B		N	B	1 – 2	20	1	B	C	D	C	C		C	B	Y	6
Burclover	AL	WA		C	C	C	B	A		N	B	1 – 3	18	1	C	B	D	C	F	C	C	B	Y	5
Chickling vetch	AL	WA		B		A	B	C			C		30	1	A	A	B	C	D	C	C	B	N	8
*Crimson clover	AL	WA	B	C	D	D	B	C	M	N	C	2 – 3	21	2	B	B	C	A	C	B	B	B	N	7
Cowpea	AL	WS		C	D	C	A			N	A	2 – 4	20	1	A	B	C	C	D	C	B	A	N	9
Field pea	AL	CS		D	D	D	D		M		B	2 – 3	14	1	B	A	D	C	D	B	C	C	N	7
*Hairy vetch	AL	WA	B	B	D	C	D	B	T	Y	B	1 – 3	16	1	B	B	D	B	C	B	C	C	Y	4
Lentil	AL	CS			D	A	C						14	1	A	B	C	D		D	C	D	N	5
Partridge pea	AL	WS		B	D	B	C	A		N	B				C	C		B			B	B	N	3
Soybean	AL	WS	A	D	C	B	B		T	N	A	2 – 4	17	1	C	B	C	D	D	D	D	C	N	9
Subclover	AL	WS	A	A	B	B	B	B		N	B	2 – 4	28		A	B	D	B			B	A	Y	7
Sunn hemp	AL	WS		D	D	B	B	F	T	N	A	2 – 5	30	4	B	A	C	A	A		A	A	N	9
Woolly pod vetch	AL	WA	B	B	D	B	B	B		N	A	2 – 4	17	1	B	A	C	A	C	B	C	A	Y	6
*Sweetclover	BL	CS	B	C	B	A	A	C	M	Y	B	2 – 3	15	3	C	C	D	A	A	A	B	B	Y	4
Alfalfa	PL	CS	D	D	C	A	D	D	S	Y	B	4 – 6	18	8	F	A	C	A	A	C	B	B	N	5
Alsike clover	PL	CS		D	A	C	C	C	M	N	C	1 – 2	20	1	F	A	D	C	D	C	B	B	S	
Bird-foot trefoil	PL	CS	C	D	A	B	B	B		N	B	2 – 4	18	3	B	B	B	C	B	B	B	A	Y	5
Crownvetch	PL	CS	A	A	D	A	B	B	M	Y	B	2 – 4	18	4		A	B	B	A	B	A	A	Y	4
Flat pea	PL	CS		C	D	C	B	F		N	C			4	C	B		B			A	A	Y	3
IL bundleflower	PL	WS	C	C	B	C	C	D		N	C	1 – 4	24	5	C	D	C	C		B	C	C	Y	5
Kura clover	PL	CS	B	B	C	C	B	C		N	C		25	2	C	B	B	B	C		B	B	N	4
Ladino clover	PL	CS	C	B	B	C	A	B	T	N	B	1 – 2		2	C	A	D	C	D	B	B	B	Y	5
*Red clover	PL	CS	B	D	B	B	D	B	T	N	B	1 – 3	15	3	C	B	C	B	C	B	B	B		4
Sainfoin	PL	CS		D	D	B	D	D		N	B	3 – 5	17	4	D	B			B			B	N	2
Tick trefoil	PL	WS	C	A	D	B	B		T	N	B				A	D		B	B		B	B	Y	2
White clover	PL	CS	C	C	B	D	B	A	T	N	C	1 – 3	25	2	C	B	D	B	D	B	B	B	Y	4
*Buckwheat	AB	WS	C	C	D	D	B	C	T	Y	A	1 – 2	5	1	B	F	C	C	F	B	D	A	Y	8
Forage radish	AB	CS		C	D	C	D			N	B	2 – 4	28	4	F	F	A	B	A	B	C	B	Y	6
Kale	AB	CS	A		D		D	D	S	N	A	2 – 4	20	2	C	F	B	C			B	A	N	
Mustard	AB	WA		C	D	C	C		S	Y	B	2 – 4	12	2	D	F	C	B	D	B	B	B	Y	5
Phacelia	AB	CS		D	B	C	C	D		N	A	1 – 2		3	B	F	B	C	D	C	D	C	N	8
Rapeseed	AB	WA		C	D	C	C			N	A	1 – 3	14	3	C	F	B	C	C	B	B	B	Y	7
Safflower	AB	WS			D	A	C	D			A		12	8	F	F	A	C	A			C	N	5
Sunflower	AB	WS		C	D	B	B		T	Y	C		12	4	D	F	B	C	A	C		C	N	9
Forage turnip	BB	CS			D	D	D			N	A	2 – 3	16	3	F	F	B	D	B	B	D	C	Y	6
Goldenrod	PB	WS	F	B	D	A	B	C	T	Y	A			7	C	F			B			A	Y	2
Milkweed	PB	WS		C	C	B		A	T	N	C			4		F					C	C	N	2
Perennial aster	PB	WS	D	C	C	B	B		T	Y	B			7		F					C	A	Y	3
*Ann. ryegrass	AG	WA	D	C	B	D	C	A		N	B	2 – 4	13	2	C	F	A	A	A	A	A	B	Y	6
*Cereal rye	AG	WA	B	C	C	B	A	C	T	Y	A	3 – 5	9	2	F	F	A	A	B	A	A	A	N	3
Forage corn	AG	WS	A	B	C	A	D	D	T	N	A	5 – 7	10	5	F	F	B	B	C	B	C	C	Y	
Foxtail millet	AG	WS	B	D	C	B	B	D	T	N	A	1 – 2	15	1	A	F	A	B	D	C	C	B	N	
Grain sorghum	AG	WS	D	D	D	A	C	D		Y	A	3 – 4	18	2	C	F	B	B	C	B	C	B	N	9
Japanese millet	AG	WS		D	A	B	A	D		N	A	1 – 2		2	B	F	A	B	D	D	A	B	Y	8
Pearl millet	AG	WS		F	C	A	B	D		N	A	2 – 6	13	1	A	F	A	B	C	D	A	B	N	9
*Spring oat	AG	CS	A	D	D	D	C	D	T	N	A	1 – 4	12	2	C	F	A	C	F	B	A	A	N	8
*Sorgh x sudan	AG	WS	F	D	D	A	C	D		Y	A	4 – 5	18	4	C	F	A	A	C	C	A	B	N	8
Sudan grass	AG	WS	F	D	D	A	D	D		Y	A		11	4	B	F	A	A	C	C	A	B	N	9
Teff lovegrass	AG	WS		D	B	A	C	B	T	N	A	2 – 6	14	1	C	F	C	B	D	C	A	C	Y	3
Triticale	AG	CS	B	C	C	C	B	C	T	Y	B	2 – 4	13	2	F	F	B	B	C	C	A	B	N	4
*Winter barley	AG	WA	C	D	C	B	B	A	T	Y	B	1 – 5	12	2	A	F	A	B	C	B	A	B	N	7
Winter wheat	AG	WA	B	C	D	B	B	A	T	Y	B	2 – 4	10	2	D	F	B	B	C	C	A	B	Y	4
Bermuda grass	PG	WS	B	D	B	C	C	C		Y	B	4 – 8	7	1		F	B	B		B	A	D	Y	4
Brome grass	PG	CS	D	B	C	B	C	B	T	Y	A	2 – 4	15	4	C	F	B	B	B	B	A	A	Y	2
E. gamagrass	PG	WS		B	C	B	C	C		N	A	3 – 5	17	7	F	F	B	A	A	B	A	B	N	5
KY blue grass	PG	CS	B	B	D	C	D	B	T	N	C			1	F	F	B	B	D	A	B	C	N	2
Little bluestem	PG	WS		C	D	A	B	D		N	B		8	6	B	F	B	B	B	B	B	C	Y	3
Orchard grass	PG	CS	C	B	D	C	B	D	T	N	B	2 – 4	12	4	A	F	B	B	B	C	A	C	N	5
Per. ryegrass	PG	CS	C	C	C		C			N	B	2 – 5	16	3	D	F	B	A	A	C	B	C	Y	
Red fescue	PG	CS	B	B	B	B	C	A	T	Y	C			3	D	F	B	B		A	B	B	Y	2
Redtop	PG	CS	B	C	A	C	A	B	T	N	A		9	4	C	F	B	B		B	A	B	Y	2
Switchgrass	PG	WS		D	B	B	A	D		N	A	5 – 9		9	C	F	B	A	A	A	A	A	Y	4
Tall fescue	PG	CS	F	C	B	B	C	A	T	Y	A	2 – 4	19	4	B	F	B	A	B	B	A	A	Y	3
Timothy	PG	CS	C	C	C	D	B	C	T	Y	C	2 – 4	11	2	B	F	D	A	D	C	A	C	N	2

Sources: Blecher 2014; Clark 2007; Ingels, et al. 1986; Yatskievych 1999-2013; MCCC 2014; USDA-NRCS 2017; and others.

1 whether the species is an annual (A), biennial (B), or perennial (P); and whether the species is a grass (G), legume (L), or a non-legume, broad-leaved forb (B)

2 if the species is normally grown as a winter annual (WA), a cool season (CS) forb, or a warm season (WS) forb

3 Compatibility is one of the more important columns for growers as it indicates how much a cover crop will likely decrease tree growth when compared to trees grown in plantings without a ground cover where A = less than 20%, B = 20-30%, C = 30-40%, D = 40-50%, and F = more than a 50% reduction in tree growth.

4 reduction in biomass produced under moderate shade compared to biomass produced in open fields where A = less than 20%, B = 20-40%, C = 40-60%, D = 60-80%, and F = more than 80% reduction in biomass

5 ability to survive partial inundation where A = more than 3 weeks, B =1 to 3 weeks, C = up to a week, D = for a few days, and F = listed as intolerant of flooding

6 ability to tolerate drought on a scale of A = excellent, B = very good, C = good, D=fair, and F= poor

7 ability to tolerate low fertility soils on a scale of A = excellent, B = very good, C = good, D=fair, and F= poor

8 how well they tolerate (recover from) fall mowing (September for Chinese chestnut, October for walnut, and November for pecan)

9 whether the cover crop is listed as tolerant (T), susceptible (S), or results are mixed (M) when exposed to juglone

10 whether these plants produce chemicals that can slow the growth of other plants and potentially trees as Y = yes and N = not reported to be allelopathic to other plants

11 values from A = very rapid once initiated and excellent for weed suppression to F = slow and may require management of other vegetation if it is to become established

12 expected cumulative annual forage yields in air-dried tons per acre if harvested one or more times at early to mid-bloom

13 Average % crude protein in forages harvested for hay during early flowering. The product of % crude protein times productivity gives an estimate of potential input of N into the soil as forages decompose (N-fixation in legumes normally peaks at early flowering).

14 How efficiently the cover crop uses soil moisture to produce a ton of biomass ranging A (less than 3" of precipitation per ton) to F (over 4" precipitation per ton). Forage yields and water use can be substantially less than reported values if the crop is not harvested and left to mature and go dormant.

15 As nitrogen sources, an A means plants can fix more than 150 pounds, B = 100-150 pounds, C = 50-100 pounds, D = less than 50 pounds actual N per acre, and F = a non-nitrogen-fixing cover crop

16 rated A = excellent, B = very good, C = good, D = fair, and F= poor based primarily on values assigned by Clark (2007), the Midwest Cover Crop Council (MCCC 2014), and my knowledge of the species

17 if a species can become invasive (Y = yes) and should be terminated before they produce mature seed unless we want it to reseed itself in future years

18 how far north a plant will survive overwinter based on the plant hardiness zone maps (*http://planthardiness.ars.usda.gov/PHZMWeb/Default.aspx*).

season grasses exhibit little shade tolerance; however, eastern gamagrass may be an exception (Fig. 2).

Tillage in a hardwood planting is usually discouraged to minimized damage to tree roots; however, it should also be discouraged to maintain soil health. Deep tillage for site preparation to seed a crop or for incorporating green manure crops is discouraged as it leads to more rapid turnover of organic matter, loss of N through volatilization and leaching, and break down of soil structure or soil tilth. When surveyed, most growers indicated they establish

Continued on page 18

Highlights of the 2019 National Walnut Council held in Kansas

150 people from multiple states, with an interest in forestry came to Mayetta, Kansas for Walnuts in Indian Country. Field tours ventured to two riparian forest buffer sites on the Kickapoo Reservation and to Copperhead Hill Ranch for a variety of discussions and demonstrations from assessing timber to birds of the forest, agroforestry to stream processes, plant identification to drones, wildlife to pruning, and many more. Indoor sessions included women owning woodlands, lumber vs. nut production, ticks and diseases, Potawatomi and Kansas histories, and effects of fire from speakers Dr. Bill Reid, Dr. Tamara Walkingstick and Dan Dey to name a few. The event was a great experience and many compliments were offered to Kansas for our efforts. Thank you to all who were able to attend and thank you to all who helped make this event a success.

How to assess black walnut and grading saw logs was demonstrated by Danny Barrow & associates. Attendees were able to see the qualities and potential flaws of several examples of lumber logs from the eyes of logging professionals.

Charlie Barden & Bob Atchison, along with Watershed Foresters Jarran Tindle & Andy Klein discuss stream form, streambank stabilization and riparian forest buffers. The vast scope of the issue and efforts to utilize forest buffers to reduce sedimentation were included.

2019 Spouses Tour

Spouses from 7 states participated in the optional tour provided during Monday and Tuesday, June 17th and 18th at the National Walnut Council meetings. A variety of stops in Topeka allowed the 19 participants to explore a few of the attractions on Monday. Tuesday's weather was equally pleasant when the group toured Old Prairie Town at Ward-Meade Historic Site. The group was divided into three smaller groups which allowed the guides to share the 1870 Victorian Mansion, 1854 replica cabin, Potwin Drug Store, a small railroad station, old school house and 1880 Mount Zion Methodist Episcopal church moved in from western Kansas.

Submitted by Carolyn Turney, KFA Board Member and Tree Farm Chair

Walnut Council Foundation Grant Produces an Archive of Walnut Publications for Members

A recent Walnut Council Foundation grant to the Hardwood Tree Improvement and Regeneration Center (HTIRC), Purdue University Department of Forestry and Natural Resources, provided for the creation of black walnut flash drives loaded with the all the past newsletters and symposium proceedings of the Walnut Council. In addition, several publications from the USDA Forest Service and the HTIRC providing valuable information on the planting and management of black walnut and other fine hardwoods were included on the drive. The documents and table of contents of the flash drive are searchable, so topics of interest can be explored from the historical publications of the Walnut Council.

This project was pursued in part to recognize the significant contributions of the Walnut Council to the knowledge and practice of growing black walnut and other hardwoods over the 50 years Walnut Council has been in existence. The black walnut flash drives, engraved with the Walnut Council logo, name and the year of production, 2019, are available for $20 from the Walnut Council Foundation. Several state chapters are purchasing multiple drives to sell at upcoming meetings so check them out at your Spring 2020 events. Drives will be available at the national meeting in Carbondale in 2020. Funds from the sale of the drives will provide more opportunities to produce additional drives in the future, and support the continuing work of the Walnut Council Foundation.

Lenny Farlee directed the project. Liz Jackson and Jerry Van Sambeek contributed archive materials for the project and Janis Gosewehr and Wes Schempf scanned many pages of newsletters and symposium proceedings to create this reproducible digital archive. We hope this will be a useful tool to help you manage your trees and learn from the vast collection of articles provided.

Walnut Council Foundation News and Notes

The Walnut Council Foundation (WCF) has been very active this year. The WCF has adopted a budget for FY 2019 and the Walnut Council Annual Meeting has produced revenues that have exceeded budget expectations. The meeting, held near Topeka, Kansas, was a huge success.

All proceeds generated for the WCF are earmarked toward the Endowment Fund, except revenues from the Silent Auction. These funds are split 25% to the Walnut Council, 25% to the host chapter, and 50% to the WCF Operating Fund. In summary, $3,036.00 was earmarked toward the Endowment Fund and $2,044.28 went toward the Operating Fund. Major Endowment Fund revenues were produced from “Pass the Hat” at the awards banquet ($1,159.00) and the Chainsaw Raffle ($1,245.00).

To date, the WCF has a total of $83,006.34 in Endowment Fund revenues. Of this, $65,000 was previously set as the base limit where funds cannot be withdrawn below that level. Funds that are used to pay expenses and to fund grant applications are taken from the Operating Fund. To date, this fund has a total of $16,035.43. Combining these funds, the WCF has assets totaling $99,041.77!

This year, the WCF awarded two grant applications. The first recipient was Bill Hammitt to fund the printing of “An Ohio Black Walnut Initiative” brochure. The second was awarded to Lenny Farlee, to produce flash drives that record the historical publications of the Walnut Council and other valuable material. This flash drive brings everything together as we continue to celebrate our 50th year of the Walnut Council.

Therefore, thanks to everyone who contributed to the WCF at the WC Annual Meeting. Also, thank you in advance to the many members that contribute to the foundation when renewing their Walnut Council membership. It is so much appreciated!

Ken Konsis

Treasurer, Walnut Council Foundation

Wisconsin Member Honored with Black Walnut Achievement Award

Albert Goetsch of Wisconsin was awarded the BWAA at the annual meeting this summer. Al was recognized for his long-standing tenure on the national board of directors and his commitment to walnut management and the furthering of walnut research. His recent donation of his property to the Walnut Council will allow the organization to further its mission and to ensure its long-term financial stability. His commitment will create a legacy of outreach and demonstration that is an important goal of Walnut Council. Due to his health, Al was not able to travel to Kansas for the meeting but was recognized at the October national board meeting, held near his property.

Member Donates Property to Walnut Council

Albert Goetsch of Clinton, Wisconsin donated his 33-acre property to the Walnut Council in 2019. Al has a mix of beautiful, mature walnut trees trees and various ages of younger walnut plantations which have been well managed since the 1970's. Al made the decision to donate due to his inability to continue managing the property by himself. He recognized that the Walnut Council could assume ownership, manage the property, and seamlessly continue his passion.

Al Goetsch (L) with John Ouellette(R) at his Wisconsin property.

In 2019 we have been working to complete the appraisal and transfer of ownership and have had three field days with Wisconsin chapter members and national board members to prune and thin the plantations.

Walnut Council is truly grateful to Al for his foresight to donate this property. Not only can it serve as a financial asset to the Council through thoughtfully planned future timber sales, but as a demonstration of proper management for members, youth, and other audiences. Thank you Al!

State Chapter Reports

The **Maryland Chapter** held its annual Fall Workshop on Saturday, November 9th. A small but dedicated group of members and guests braved the unseasonably cold weather to learn the basic concepts and tools of the Forestry profession. Participants were taught the scientific principles behind modern forest management, and had the opportunity to use the tools of the trade to collect forest plot data. In the afternoon, the group toured the Cunningham Falls Visitor Center and Aviary, learning many interesting facts about our native birds of prey. Participants then enjoyed an interpretive walking tour of the historic Catoctin Furnace, a 245-year-old iron furnace that had tremendous impacts on the forest and landscape of the area. Despite the cold, a good time was had by all! Special thanks go out to Aaron Cook, of the Maryland Department of Natural Resources Forest Service, for putting together a very informative presentation and sharing his vast knowledge with us.

Consulting Forester, Chris Lohmann, explaining Timber Stand Improvement at the Missouri Chapter fall field day.

Dave Robbins, Maryland Chapter President

The **Michigan Chapter** held its Fall Field Day on October 5, 2019 at the Demick Family Hickory Hollow Farm in Jerome, Michigan. They hosted a wonderful program highlighting thousands of walnuts in plantations and a tour of a mixed hardwood, natural woodlot. There were 32 people of diverse affiliations in attendance. A Spring Field Day is in the works but not yet finalized.

Mike Jones, President, Michigan Chapter

The **Missouri Chapter** held its fall forestry field day Saturday, October 19th. Nearly 50 people attended hosted by Norm & Beth Stucky at their Mockingbird Hill Tree Farm in Cole County. Topics covered during the day included:

- Crop Tree Release (CTR)
- Timber Stand Improvement (TSI)
- Corrective Pruning
- Using Dendrometers
- Managing Toxic Fescue
- Fertilizing Hardwoods

Virtually all of the learning stations were instructed by members of the Missouri Chapter: Chris Lohmann, Harlan Palm, Shelby Jones & John Dwyer, Jerry Van Sambeek, Jim Ball, and Hank Stelzer.

Dave Boyt, Missouri chapter president

Thank You to Kansas Annual Meeting Hosts and Sponsors

A special thanks to the following meeting organizers and volunteers for their time and assistance to make the meeting a success:

Ryan Armbrust
Bob Atchison
Charlie Barden
Larry Biles
Dave Bruton
John Buchanan
Dennis Carlson
Amila Darshana
Katy Dhungel
Amy Hawkes
Tom Hogard
Jillane Hogard
John Katzke
Andy Klein
Keith Lynch
Debra McDaniels
Shane Neel
Ryan Neises
Conner Nickerson
Darci Paull
Les Pinkerton
Ryan Rastok
Kylie Rethman
Thad Rhodes
Floyd & Sue Schmidt
Luke Terry
Jarran Tindle
Roy & Carolyn Turney
Cassie Wandersee

Sponsors

A special thanks to the following individuals and groups for their financial and in-kind contributions to make the meeting a success:

USDA Forest Service Rocky Mountain Region, State & Private Forestry
Kansas Forest Service, KSU
Hugh B. Pence, Pence Walnut Plantation
Roy & Carolyn Turney
American Walnut Company
Fred Crouse
Custom Forestry Applications
Phillip Eastep
Ecotone Forestry, Ryan Neises
Forrest Keeling Nursery
Hammons Products Company
Cindy Heisdorffer
Illinois Chapter Walnut Council
Hammons Products Company
Haskell Indian Nations University
Kansas Chapter Walnut Council
Kansas Department of Wildlife & Parks
Kansas Forestry Association
Kansas State Research & Extension
Kickapoo Tribe of Kansas
Ken Konsis
Larry & Sandy Krotz
Log to Bench, Debra McDaniels
Timothy Martinson
Ford & Christine Maurer
Missouri Chapter of Walnut Council
Pence Legacy Group
Floyd & Sue Schmidt
Dan Schmoker
The Nature Conservancy
Timber King
Walnut Council Foundation
Wisconsin Chapter Walnut Council

Grazing Goats Control Invasives

Mike Trial, Missouri Walnut Council member

Editor's Note: The May 2018 bulletin cover story identified goats as one option in controlling invasive species. This account is one member's experience this year with that option.

We used contract goat grazing to control invasive species and fescue on my black walnut tree farm from mid-April to mid-October 2019.

The walnut trees varied in age from 2 years to 30 years old. Trees less than five inches DBH had wire cages installed for protection from deer, which generally proved effective against goat browsing.

We contracted with the local affiliate of an Iowa-based company called "Goats-on-the-Go". The contract required them to provide enough goats to browse off invasive species and fescue in an 11-acre area with one pass of rotational grazing.

The contractor would do all fence set-up and take-down, and remain responsible for goat health. The contractor normally provides the electric fence and charger for goat paddocks, but I elected to buy fence and charger, since I was certain I wanted to try goat grazing for several years in a row.

I bought the electric fence and charger from Premier1Supplies. The fence is light gauge nylon mesh with wire woven into it, the posts are Fiberglas step-in, and the charger has a solar panel to keep the battery

Goats were delivered spring 2019 to an area infested with sericea lespedeza and autumn olive. We used 2-gallon plastic jugs to fill a water pan for the goats.

Sericea lespedeza after goat browsing. Nothing left but stems which are very easy to mow off. Goats like fresh sericea!

charged. One person can set up and take down enough fence for a 1-acre paddock in one to three hours. The fence is only 38" tall, but the contractor's goats are conditioned to avoid the fence, so we had no trouble with goats trying to go over, under, or through the fence.

The contractor provided 25 Boer goats, all female. Twenty of the goats were just over one year old and inexperienced, five were three years old or older and had experience. The contractor was agreeable to changing the age mix, or increasing or decreasing the herd size if our objectives were not being met, but as it turned out we kept the same 25 goats all season.

We discussed paddock layout with the contractor before each move. Each paddock size was slightly different due to type and density of foliage to be grazed, estimated rate of foliage growth, and the length of time we estimated it would take the goats to graze off the foliage.

To minimize the time and effort needed for fence set up and take down, each paddock was adjacent to the last paddock. Before setting up fence we close-mowed an aisle where the fence would be. We did this for two reasons: ease of setting up the fence, and to reduce the likelihood of fence voltage drop due to current leakage into tall grass when it is wet with dew. We also found we should not leave unused fence standing during the height of the growing season since tall grass makes fence take down more difficult.

Paddocks were laid out so that goats had trees for shelter from summer sun and heavy rain since we did not provide any other shelter for the goats. We kept a thirty gallon pan full of water at all times by bringing cans of water to the paddock as needed in a pickup truck. Over the course of 22 weeks we set up and took down 14 paddocks, which ranged in size from 0.3 acres to 2.0 acres.

Early in the season we put the goats in paddocks with mature bush honeysuckle which did not work well because much of the foliage was out of reach. But by the middle of the season we had figured out what size foliage the goats could handle and the operation then went smoothly. Excluding the first two months of trial and error, our average paddock size was 0.6 acres, which the 25 goats would graze off in an average of 9 days.

Conclusion:

We found that contracting for goat grazing was easy, effective, and comparable to (though slightly more expensive than) the cost of machine mowing. As with any invasive species suppression effort, once is not enough. As with spraying or machine cutting, goat grazing will need to be done over multiple years to achieve control of these invasives.

Our Findings

Effectiveness:

We found the goats were effective in browsing off all the leaves of autumn olive and bush honeysuckle when the plants are no taller than 6 feet and stalk diameter is no larger than one inch. Goats will climb and break down small stalks, and eat the leaves, but they are not big enough to break big stalks. The goats effectively ate all leaves off sericea lespedeza leaving only the bare stalk, and they kept fescue browsed as low as it had been when we mowed it.

NOTE: If you have full-grown autumn olive or bush honeysuckle plants, you can cut the stalks with a chainsaw and the goats will eat the fallen stalks bare of leaves very quickly. But you are then left with a thicket of stumps and bare stalks that is time consuming to clear. We recommend machine clearing areas of mature autumn olive and bush honeysuckle first, then bringing in goats the next year to graze off the resprouts. An alternative is to hinge-cut the stalks (if they are not too densely intertwined), let the stalks fall, and the goats will browse off the leaves.

Cost:

- This season we used the goats to both defoliate (to the browse line) tall invasives and to graze fescue, so we cannot make a direct cost comparison with mowing. Next year we will be able to make that comparison since we will have the invasives cut to ground level.
- To make an accurate comparison we will need to graze goats over the same acreage every year for several years. These numbers do not include the one-time cost of buying fence. This first year was an experiment and some of paddocks were in areas unsuitable for goat grazing, so the cost per acre was higher than we expect it to be next year. We will plan appropriate paddocks and have the goats do two passes in future years.
- This season the goats cost about $820 per acre.

Convenience:

With goat grazing, we found it very convenient to:

- not be responsible for any animal care (or machine maintenance and fuel) if we had continued to mow the same areas
- be able to mutually agree with the contractor as to location and size of each successive paddock,
- be able to mutually agree with the contractor when a paddock had been sufficiently grazed, and
- have the contractor do all fence moves.

Additional Key Points:

Two advantages goat grazing has over mowing are:

- goats can graze right after a rain while mowers have to wait until grass is dry, and goats can graze the weeds, grass and invasive species right at the base of trees which mowers can't reach.
- We saw no instances of goats rubbing the trees enough to cause bark damage, nor did we see any evidence of soil compaction.

We had no trouble with predators trying to attack the goat herd, but we purposely did not put them in isolated areas or use any mother goats with goat kids.

Goats can break down branches on autumn olive as tall as six feet, but you still have the stalks standing. When invasives are smaller, several years of browsing off the leaves should kill the whole plant leaving only a small stalk that can be easily mowed.

Invasive Plant Profile: Oriental Bittersweet

Fall colors are fading away, but the bright orange-red fruits of bittersweet vines remain. Beware of impostors though, as the highly invasive oriental bittersweet (Celastrus orbiculatus) can look a lot like our native American bittersweet (Celastrus scandens). Mistaking these two plants could have grim consequences, as oriental bittersweet overruns forest understories and strangles native trees.

Once oriental bittersweet makes its way into a forest, no tree is safe. Growing as a vine to nearly 100 feet in length and 7 inches in diameter, this nasty invasive species can kill or break trees in several ways. By coiling itself around tree stems, it can strangle trees, cutting off the flow of water and nutrients. If that doesn't finish the tree off, oriental bittersweet's foliage can overtop and shade out trees, weakening them to other stressors. All this extra weight also increases the risk of branch or stem breakages during snow, ice, and wind storms. Plants on the forest floor or in open fields are at just as much risk, as dense mats of low-growing oriental bittersweet block out the light to shrubs, grasses, and wildflowers.

Now might seem like a good time to start chopping away at any vines with red berries, but don't forget about American bittersweet. Fortunately, identification is simple, even when the leaves fall off – just look for the fruits! American bittersweet fruits are clustered at the tips of stems, while oriental bittersweet fruits are spread out along the stems. Another thing to look for are the capsules that cover the red fruits. Capsules are orange on American bittersweet and yellow on oriental bittersweet.

(A) Oriental bittersweet infestations can engulf entire trees (Chris Evans, University of Illinois). (B) Climbing vines girdling a tree (Leslie J. Mehrhoff, University of Connecticut). (C) Oriental bittersweet berries are distributed along the stem, rather than clumped at stem tips (Chris Evans, University of Illinois). (D) American bittersweet berries are clustered at the tips of stems (Missouri Department of Conservation).

For information on oriental bittersweet identification and control methods, see the best control practices guide from the Michigan Department of Natural Resources at *https://mnfi.anr.msu.edu/invasive-species/OrientalBittersweetBCP.pdf.*

This was previously published in the Missouri Department of Conservation MO Tree Health News.

Welcome New Members

We are pleased to welcome these new annual members to the Walnut Council since March 2019:

Alan Ball, Columbia, MO
Harlay Blankenship, Louisville, KY
Weldon Bontrager, Ligonier, IN
William & Stephenia Bosch, Bradford, IL
Anish Chopra, Lexington, KY
Sue Churchill, Versailles, KY
Linda Cline, Franklin, IL
Lanny Copeland, Brentwood, TN
Greg Corson, Pleasant Hill, MO
Mark Eurich, Eagle, NE
Miles Fugate, Ozark, MO
Greg Gathers, Topeka, KS
Larry Geil, Topeka, KS
William Glover, Elko, NV
Chris Gonso, Coal City, IN
Steven Hill, Dixon, IL
David Hoffman, Stoddard, WI
Toby Hummel, Columbia, MO
Patrick Hurley, Palos Heights, IL
Shelby Jones, Jefferson City, MO
Peter, Mary, & Kris Lipp, Barrington, IL
Dave McGill, Morgantown, WV
Stanley Mehrhoff, Prairie Home, MO
Ryan Milliron, Muskegon, MI
Eric Olson, Sparta, WI
Pam & Rod Reynolds, Urbandale, IA
Susan Sanders, Wichita, KS
Jim Schiller, Verona, WI
Mary Scott, Rocheport, MO
Kris & Doug Shoemaker, Kokomo, IN
Gary Smith, Neosho, MO
Douglas Warnecke, Morristown, IN
Reagan Wilkinson, Plainfield, IN
Doug Zimmerman, Greenfield, IN

Glyphosate Questions & Answers

Editor's Note: *There has been a lot of negative press lately, including television commercials, suggesting (and flat-out saying) that Glyphosate, the active ingredient in Roundup®, is carcinogenic. These claims are largely based on false reports and speculation. The following information, presented in "Q & A" format, was published on the Oregon State University Extension Service website.*

What is glyphosate?

It's a weed-killing chemical found in Roundup and many other weed killers. Like other herbicides, it is usually combined with one or many other ingredients to make the final product.

Does OSU have an official position for or against using glyphosate?

No. It is our mission to educate, not to legislate. We're happy to answer questions and help find solutions using any legal, effective methods, while considering the risks.

Does glyphosate cause cancer in humans?

Maybe, at high enough doses. If it caused cancer at realistic exposure levels from using weed-killers, then farmers and other applicators would be the first to show this effect. The largest study ever published, looking at farmers and other applicators, found no association between glyphosate and solid tumors, including Non-Hodgkins Lymphoma (NHL).

That study found a potential association between glyphosate exposure and a certain type of blood cancer that was not statistically significant. Another study suggested that using fertilizers could account for this risk.

Why do regulators disagree about this?

They don't. Not really.

The International Agency for Research on Cancer (IARC), an arm of the World Health Organization (WHO), determined in 2015 that glyphosate is a probable human carcinogen. That determination was surprising to many. IARC responded to critics by clarifying its intent – to identify potential hazards. They asked, "Can it cause cancer under any circumstances?" They group hazards based on the strength of evidence, not the potency of the carcinogen(s). They defer to national and international bodies to take the next step, which is risk-assessment. Risk assessment is based on expected levels of exposure and background cancer rates.

Many governments have published risk assessments about glyphosate, finding it is unlikely to cause cancer in humans when used according to the label directions as required.

- US Environmental Protection Agency, December 18, 2018
- European Food Safety Authority, November 12, 2015
- Australian Pesticides and Veterinary Medicine Authority, March 15, 2017
- New Zealand Environmental Protection Authority, August 2016
- Health Canada, April 2015
- International assembly of experts: FAO/WHO May 16, 2016

To put the IARC determination in context, they put the following items in the same category as glyphosate, Group 2A "Probable human carcinogens."

- Red meat
- Indoor emissions from burning wood
- High-temperature frying
- Late-night work shifts

The following items were placed in a stronger-evidence category, "Known human carcinogens."

- Processed meats
- All alcoholic beverages
- Sunlight
- Engine exhaust
- Outdoor air pollution

Photo credit, Oregon State University

Glyphosate comes in many varieties and formulations, and is sold under many brand names - Roundup® is just one of them. Regardless of the formulation, you should always, always, ALWAYS read the entire label and follow all directions, particularly those detailing proper mixing, application, disposal, and personal protective equipment.

The work of hazard identification is important, but it's only the first step in understanding risk.

What about the other ingredients in Roundup?

Researchers reviewed the scientific literature on glyphosate, its major metabolite AMPA, formulated Roundup® products

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Pruning Central Hardwoods

Adapted from Central Hardwood Notes 6.09, North Central Forest Experiment Station. Available online at https://www.nrs.fs.fed.us/pubs/ch/ch_notes/chnotes.pdf.

Pruning, properly done, is one of the best ways to assure high quality wood. Although the overall volume of hardwood has been increasing during the last several years, the volume of high quality hardwood continues to be in short supply. So high quality logs will continue to be worth more at market time. Potentially, pruning can be an important silvicultural treatment for central hardwoods. The primary questions are which species should be pruned and what is proper pruning?

Deciding Whether to Prune

The 70+ species that comprise the central hardwood forests vary considerably in how well they shed branches naturally and in the value placed on knot-free wood. Based on those two criteria, the following species should be considered for pruning in decreasing priority:

- Very poor to poor branch shedding: black walnut, sugar maple, scarlet oak
- Poor to good branch shedding: black oak, white oak, butternut
- Good branch shedding: red oak, cherrybark oak

The local markets and the stand stocking level will determine whether you should undertake pruning. A price differential of only 40 dollars per thousand board feet (MBF) between clear, pruned compared to rough, unpruned logs, is all that is needed to make pruning an economically viable treatment for black walnut, sugar maple, and scarlet oak. If, in addition, a stand is growing at less than "B" level stocking, you should consider other species for pruning as well, as they may not shed branches sufficiently well at this low stocking.

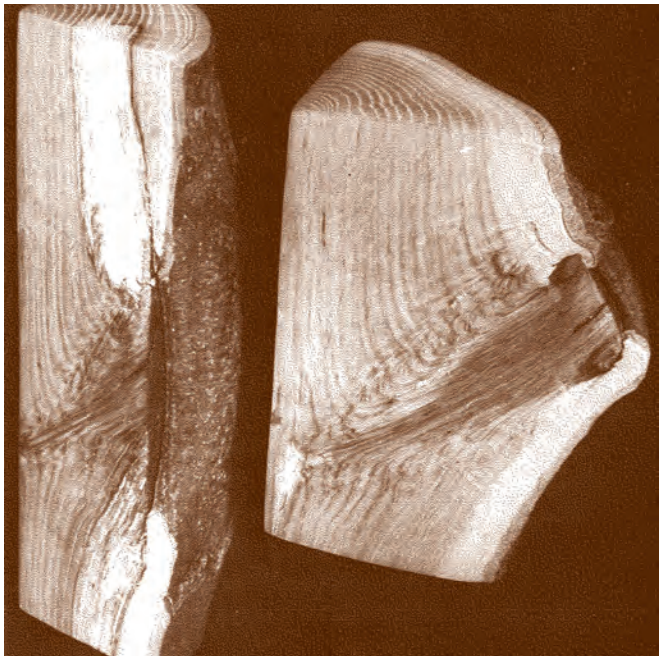

Figure 1. A proper cut (right) and improper flush cut (left) on red oak. Both samples are from the same tree 6 years after pruning. Decayed wood developed above and below the flush cut.

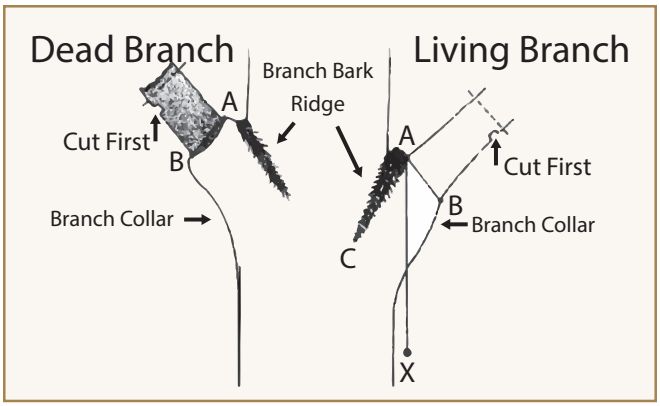

Figure 2. Diagram of natural target pruning.

What To Do

Once you decide to prune, your most important job is to be sure that the pruning is done right. A proper cut removes the living, dying, or dead branch by cutting as close as possible to the collar at the branch base (fig. 1). The collar should not be injured or removed. The collar may be swollen, and the swollen collar that re- mains is not a stub. On dead branches, a ring or "doughnut" of living tissue surrounds the branch at its base. Do not injure or remove the ring of living wood.

Natural Target Pruning

Because every branch and every collar will be slightly different, a pruning method centered about targets was developed and is called natural target pruning (fig. 2). To implement:

1. Locate the branch bark ridge.
2. Find target A outside of the branch bark ridge.
3. Find target B where the branch meets the branch collar.
4. If B is hard to find drop a line at AX. The angle XAC is equal to the angle XAB.
5. If the branch to be pruned is large, avoid splitting and tearing by making a stub cut a few inches from the branch collar.
6. Make the final cut at line AB.

CAUTION: Do not cut behind the branch bark ridge. Do not leave stubs. Do not cut the branch collar. Do not paint cuts.

When branches are pruned properly, a ring of callus will form completely around the cut after the first full growing

season (fig. 3). Flush cuts will have callus only to the sides of the wound or in a horseshoe shape (open at the top if the cut was flush at the top and open at the bottom if the cut was flush at the bottom).

The best time to prune is during the late dormant season. However, when proper pruning cuts are made, pruning can be done at anytime. But it is best to avoid pruning when leaves are forming in the spring and are falling in the fall.

What Not To Do

Avoid making flush pruning cuts. We know through research that flush cuts start at least 14 serious problems, including discolored wood, decayed wood, resin- soaked wood in conifers, wetwood, a host of cankers, circumferential and radial cracks, and weak spots with low amounts of energy reserves that are sites where sudden cold or heat will cause cracks and dead spots, and where insects often infect wood. Indeed, the flush cut is one of the most injurious treatments man has inflicted on trees both in the forest and in the city.

Flush cuts cause large wounds and rapid callus rib formation. We know now that callus formation is not associated with the decay process, and if wounds close rapidly, infection into the wood will be stalled. Unfortunately it is rare that large wounds completely close. And, when callus forms too rapidly, as it frequently does on flush cuts, the ribs of tissue turn inward to form a “ram’s horn.” When this happens, the wound will never close because bark will be between the inrolling ribs. Such a condition benefits the wood-inhabiting pathogens. Likewise, there are no data to show that any wound dressing stops rot.

How Much To Do

For best results, prune in two or more steps, starting when the trees are 4 inches d.b.h. and continuing until at least the first 17 feet of the bole is clear. Generally only dominant and codominant trees, and no more than 100 to 150 trees per acre, should be pruned. Pruning can reduce growth if too much of the live crown is removed. The “rule of thumb” is to remove no more than 25 percent of the live crown at any one pruning and to maintain a 50 percent live crown/bole ratio.

The time needed to prune depends upon several factors; the most important are the numbers and sizes of branches removed. Estimates of pruning time per tree range from 1.5 minutes to 9 minutes. The average time to prune to a height of 17 feet is 6 minutes.

Figure 3. When proper pruning cuts are made, a circle or “doughnut” of callus will form about the cut after a complete growing season.

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News and Notes

Illinois Trelease Woods Has 100 Years of Data

University of Illinois has long-term data on this important old prairie woodlot, and now U of I students are doing a 100% inventory of the forest. See more at *https://las.illinois.edu/system/files/inline-files/LASNews_Magazine_Fall2019_web.pdf#page=9.*

New Pests Website

The U.S. Department of Agriculture’s Animal and Plant Health Inspection Service (APHIS) is launching a new “Pests and Diseases” webpage. The new page lists all pest and disease programs managed by APHIS as part of its mission to protect American agriculture and natural resources. Users can search by type (plant, animal), keyword (avian, fruit fly, cotton), or by the specific pest or disease (coconut rhinoceros beetle, brucellosis). You can also scroll through the page, which lists the pests and diseases alphabetically and includes a corresponding image. To visit the page, go to *www.aphis.usda.gov/pests-and-diseases* or click the Pests and Diseases link under the Resources tab on the APHIS homepage.

Pruning Young Hardwood Trees: Maryland Chapter Guidelines

Produced By the Maryland Chapter of the Walnut Council

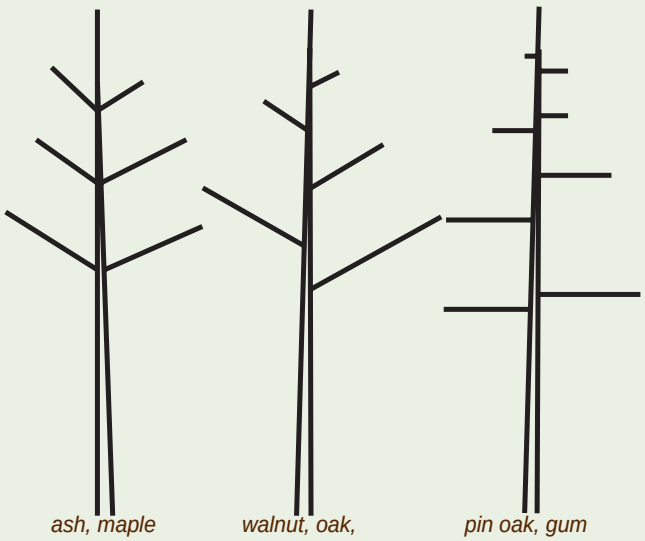
The primary reason that young black walnut and other hardwood trees are pruned is to produce quality timber – straight, free of limbs, knots, decay, and other defects. Secondary reasons include access for mowing, spraying, thinning, vine removal, etc., to reduce the likelihood of trunk or branch splits and breaks, to reduce the likelihood of decay from large dead limbs or breakage, and to remove the "ladder" for vines & briars that may climb and damage the trees.

This pruning can be characterized as two basic types, though there is a certain amount of overlap between them: Corrective Pruning – to promote the growth of one straight central stem; and Limb Removal or Side Pruning – to promote the growth of a clear, knot-free trunk by removal of branches along the central stem.

Below are some "rules of thumb". Keep in mind that there may be situations where these rules conflict with each other, in which case the worker needs to exercise judgment to do what is best for the tree. How much to prune and how much to leave is a balancing act - the more leaf-bearing branches the faster the tree will grow and the faster it can recover from injuries and minimize decay; while the fewer branches the fewer the knots.

- Visit and individually inspect each tree each year, and prune if needed. It is better to prune a little each year than to prune heavily at longer intervals.
- Pruning is usually best done in winter or early spring (December 1st – April 1st). Minor pruning or removal of dead limbs can be done year-round.
- Don't worry about the "bleeding" of sap from wounds that often occurs in late winter and early spring, it does no harm as long as the pruning is otherwise properly done.
- Begin corrective pruning (if needed) while the tree is still small, less than 4 feet tall, and repeat each year until a straight section at least 17 feet tall is achieved.
- Top Priority - If there is more than one terminal shoot, select the best (largest, straightest) and remove the others. If not influenced by another shoot near it, the terminal shoot will usually straighten up.
- Terminal shoots and upper branches generally tend to push each other away when growing. This is one reason why it is important to remove (or shorten) all but one terminal shoot. You can also use this tendency to straighten up a leaning terminal by temporarily leaving a branch just below it.

Typical Desirable Form of Several Species
Trees should look similar to this after pruning

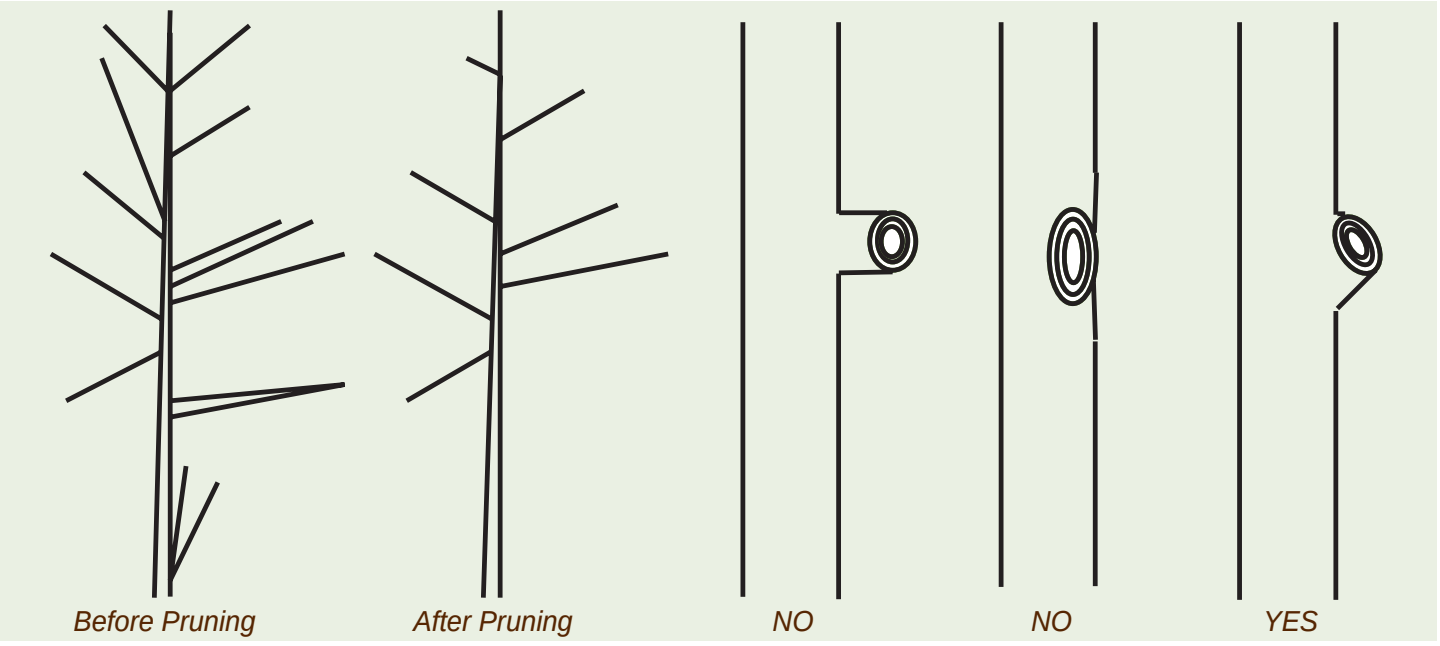


ash, maple opposite branching | *walnut, oak, tulip-poplar alternate branching* | *pin oak, gum right-angled branching*

- Taping together opposing forks or splinting very crooked terminals can be used if needed, but most terminals will straighten well without this.
- Minimize removal of the lower branches on sapling-sized trees to one or two each year. Removing too much will force excessive growth onto the top of the tree, causing it to lean, fall over, or break.
- Where there are several shoots in the top whorl, and the top of the tree is still fairly easy to reach (and you are prepared to prune again in subsequent years) one or more of the extra shoots can be shortened rather than removed. This allows the retention of more leaf bearing branches, and may reduce forcing extra leaf growth (and weight) onto the terminal the following season.
- When shortening a branch or terminal shoot, always cut back to another branch or bud, preferably one pointed away from the terminal.
- Remove acutely upward-angled side branches (less than 45 degrees) each time you prune; retain right-angled branches (near 90 degrees) for a longer period of time.
- Remove suckers or sprouts that emerge from the base of the tree or around wounds from prior pruning or injury.

- Don't remove more than 1/3 of the leaf-bearing branch area in one year.
- Remove dead or broken branches each time you prune.
- Cut lower limbs that interfere with maintenance such as mowing, spraying or vine removal. Often limbs that reach out between the rows are removed sooner than limbs that are oriented within the row.
- Cut limbs before they reach 1½ inch in diameter, though smaller is better. Larger limbs can be cut if necessary, but a larger wound will result. Over 3 inches diameter, it is probably better to leave a live healthy branch than to remove it and create a large wound that will likely result in decay. "Better a live knot than dead rot."
- Trees that are grown at a close spacing will tend to grow straighter and need less pruning, especially in mixed species plantings, particularly if the hardwoods are mixed in with conifers such as white pine.
- Keep about half the total height of the tree in live leaf-bearing branches. This proportion may gradually be reduced to one-third as the tree grows toward sawtimber size. Removing more will reduce diameter growth, and may force too much weighty growth onto the top of the tree, causing the top to bend over or break.
- Remove all the side branches where the trunk is about 4 inches in diameter or greater.
- Try to space out the branches left after pruning, both in height and circumference.
- Where there are whorls or clusters of side branches, remove a few each year - spacing them apart around the circumference of the trunk – to avoid later having to remove them all at one time.
- Don't remove too many branches from one side. This could unbalance the tree, or disrupt too much of the vascular system on that side of the tree.
- When removing a branch or shoot, cut back to the trunk. Don't leave a stub. Also, do not cut the branch off flush with the trunk if there is a branch collar or raised area around the base of the branch. Keep the pruning wounds small. A "good" pruning wound is nearly round rather than oblong.
- Be particularly careful not to allow the bark to tear down the trunk when the limb is cut off. On larger live limbs first removing most of the limb to remove the weight and/or slightly under-cutting the limb at the proper location, and then making the final cut close to the trunk can prevent this. Small and dead limbs can usually safely be removed in one cut.
- Do not paint or put tree wound compound on any pruning wounds.
- Limit most pruning to the lower 17 feet of the trunk (yielding a 16 ft. log). The higher you prune the greater the difficulty and less the economic benefit. Above 17 ft., if it can be accomplished without danger or difficulty, remove forks when small, and dead or broken branches of any size.
- As soon as future crop trees can be selected, stop pruning the others except as needed for access or to help keep climbing vines out of the tree canopy. Concentrate efforts on the crop trees.
- Be sure to maintain vigor by controlling weed competition, and thinning when needed. Vigorous, fast-growing trees "heal" over wounds faster and better with less potential for internal defect and decay, as well as reaching ecological and economic goals sooner.

Prepared 3/03, Revised 2/05 • Phil Pannill, Forester



Using Cover Crops in Hardwood Plantings *Continued from page 5*

cover crops by drilling in the seed or lightly incorporating after broadcast seeding. It may require several years of no-till following continuous tillage before improvements in soil health and crop productivity are observed. One source I found estimated it takes 7 to 9 years of no till to restore soil health and soil structure; however, cover crops can jump start the process reducing the time to as little as 2 to 4 years because live roots are continually present supporting a diversity of soil microbes. If tillage is necessary, consider conservation tillage using equipment which minimally disturb the soil and leave plant residues on the soil to minimize water and wind erosion. An early publication on no-till reported that earthworms alone can move more soil in a year than does annual tillage with a moldboard plow.

Because perennial ground covers can be established and maintained in hardwood plantings, we have more cover crop options than for agricultural fields. A continuous plant cover moderates soil temperature compared to exposed soil. For walnut growing in grass sods compared to cultivated orchards, average spring soil temperatures are lower and can delay bud burst and flowering by 4 to 5 days so new growth is less susceptible to late spring frosts. Perennial cool-season cover crops should be left to flower, produce seed (unless the cover crop is invasive), and then go dormant over the summer to help conserve soil moisture. Summer mowing is discouraged because it can stimulate regrowth, especially with grasses, and renewed competition to the trees for available soil moisture and nutrients.

An added value of using forage cover crops in widely-spaced tree plantings maybe the production of high-quality hay for livestock. When grown under moderate to dense shade, most plants produce less biomass with a higher quality forage (Pang, et al. 2019). Some cover crops like field peas and sorghum x sudan grass are better suited for harvesting as forage crops while others like ryegrass, oats, and turnips are better suited for grazing. Some cover crops should be grazed with caution because they can result in bloating, nitrate poisoning, or contain toxic compounds. Apparently, the plant species to be the most concerned about are the vetches and some peas because of toxins present in the seeds when the plant matures. Forage value, suitability for grazing or hay, and toxicity to livestock will be include in a table in the next issue of the Walnut Council Bulletin.

In addition to improved livestock performance, benefits of grazing a hardwood planting can include pasture rent and reduced costs for mowing. In some cases, the value of a cover crop on soil health can be increased by grazing. Benefits from grazing, however, need to be weighed against additional costs for fencing and fertilizer. Animal wastes, i.e., urine and manure, are not a substantial source of N as approximately half the N is volatilized as ammonia back into the atmosphere. In grazed pecan plantings, fertilizer rates for N and K should be increased by 30 and 20 pounds per acre, respectively (Olcott-Reid and Reid 2007).

When grazing a hardwood planting, follow the UMCA silvopastoral guidelines to minimize compaction and overgrazing. Their guidelines suggest creating multiple small paddocks so livestock can be rotated when forage cover is reduced by two-thirds or plants grazed early in the rotation show new growth. To minimize compaction in the planting, maintain some open pasture, so livestock can be removed from the tree planting when soil moisture is near field capacity (Jose, et al. 2017). A timber harvest study conducted in Missouri reported swine cause more decay than do other livestock (Hart, et al. 1986).

When choosing a cover crop consider how plant residues will impact the harvesting operation if also managing for nuts or acorns. Plants with tall woody stems will make it difficult to pick up the nuts even if the planting is mowed. Most mechanical harvesters are not designed to handle the large volume of biomass produced by cover crops. Another consideration, especially for perennial cover crops, is how well they will recover from late fall mowing needed to prepare the orchard floor for harvesting (Table 1: Mowing tolerance). Although Daikon tillage radish can be used to break up the plow pan found under hardwood plantings on old-field sites, it should not be used in nut orchards as the roots are easily pulled up by mechanical nut harvesters, jamming the machinery and leaving holes that nuts can fall into.

When cover crops are planted into black walnut plantings and to a lesser extent in pecan and hickory plantings, some though should be given to the susceptibility of the cover crops to juglone produced by these trees. Numerous lists exist as to what plants are supposedly tolerant and susceptible to juglone (Table 1: Juglone toxicity). By improving soil health, i.e. increasing the organic matter and microbial populations, we lessen the likelihood of juglone toxicity occurring. The most likely explanation for the contradictions found among the lists of susceptible and tolerant plants has to do with differences in the biological activity of a soil. Soils high in organic matter, diverse populations of microbes, and good aeration are unlikely to show toxicity from juglone (von Kiparski, et al. 2007).

Pecan and to a lesser extent walnut are likely to be planted on sites subject to flooding. Grass cover crops are more likely to survive extended periods of flooding than legumes or other cover crops. There is considerable variation in sensitivity to flooding within both the grasses and legumes (Table 1: Flood Tolerance). Alsike clover and redtop are two of the more flood tolerant perennial cover crops.

Integrating cover crops into a hardwood planting can create some unique problems (Olcott-Reid and Reid 2007). Because legumes, especially the clovers, aggressively take up P, K, and zinc, plantings may require broadcast application of PK fertilizers and foliar application of zinc. Legume cover crops are attractive to deer and may increase browsing and buck rub problems. Cover crops are also likely to increase the mice and vole populations followed by increased population of snakes. Pecan growers may not want to mow or harvest the cover crop after August 1 to lessen movement of stink bugs into the trees.

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Glyphosate Questions & Answers

Continued from page 13

manufactured by Monsanto, and the surfactant POEA. They concluded that none of the components caused cancer. However, POEA can be harmful to a variety of aquatic wildlife (i.e. minnows, frogs, micro-organisms).

It can be difficult to determine the risks associated with other ingredients in pesticide formulations, including Roundup. This is because manufacturers are not currently required to identify "other ingredients" on product labels.

How have the courts ruled?

Courts have ruled in different ways on this issue. A California jury found Monsanto liable in August 2018 for causing a man's cancer. The man used glyphosate weed-killers for years. The case has been appealed. In contrast, a federal judge in California ruled in June 2018 against the state's case for placing warning labels on containers of glyphosate under Proposition 65. It would have required warnings about the potential for glyphosate to cause cancer. The judge cited a "heavy weight of evidence" that the risk was very low. The courts will likely evaluate more cases in the future.

Are foods with glyphosate residue safe to eat?

A tiny amount of glyphosate is not likely to cause harm, even if we eat those foods daily. There are residue limits for glyphosate on many fruits, vegetables, corn, grains, milk, and eggs. The FDA monitors the level of glyphosate on foods in the marketplace. So far, they have not found foods with too much residue, based on risk assessments. The dose makes the poison.

How can I reduce my risk?

If you choose to avoid glyphosate exposure altogether, seek out organic foods with the official logo from USDA. Glyphosate is not allowed to be used in organic settings. Use alternative methods of weed control. Talk with your local master gardeners about what's working for them.

If you choose to use glyphosate weed-killers, make sure to follow the product label carefully. The label is the law. While glyphosate is poorly absorbed through the skin, some parts of the body are more absorptive than others. Minimize your exposure, and keep others away until sprays have dried. Talk with your neighbors about any concerns they might have, and take steps to accommodate their needs.

Application for Membership

Please add my name to your membership list and advise me of future activities of the Walnut Council.

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